U. S. DEPARTMENT OF AGRICULTURE
WEATHER BUREAU

In Co-operation with the

IOWA WEATHER AND CROP SERVICE

Annual Report for 1917

GEO. M. CHAPPEL, M. D., Director

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Des Moines

LETTER OF TRANSMITTAL

HON. W. L. HARDING, *Governor.*

SIR: In compliance with the requirements of the law, I have the honor to submit herewith the twenty-eighth annual report of the Iowa Weather and Crop Service for the year 1917.

GEO. M. CHAPPEL, M. D., *Director.*

Des Moines, Iowa, January 1st 1918.

HISTORICAL DATA

The Iowa Weather and Crop Service was established by an Act passed by the Twenty-third General Assembly, and approved by the Governor April 25, 1890.

The object of the Service is to cooperate with the U. S. Weather Bureau in collecting crop statistics and meteorological data, and more widely disseminate the weather forecasts and storm and frost warnings for the producers and shippers of perishable products, and to promote general knowledge of meteorological science and the climatology of the State.

In accordance with the Act, on the recommendation of the directors of the State Agricultural Society, J. R. Sage was duly commissioned by Governor Boies on June 3, 1890, and General Greeley, then Chief Signal Officer, U. S. Army, detailed Dr. George M. Chappel to serve as assistant director of the State Service. Mr. J. R. Sage resigned as director December 31, 1907, and Dr. George M. Chappel was commissioned on January 1, 1908, as director, and has since served in that capacity.

OFFICE FORCE, DECEMBER 31, 1917.

Geo. M. Chappel, M. D., Director.
Charles D. Reed, M. S. A., Meteorologist and First Assistant.
Ed. W. McGann and Lawrence C. Organ, Assistants.
Ruby C. Sage, Stenographer and Statistician.
Joseph E. Frankford, Apprentice.

ANNUAL REPORT, 1917

For convenient reference and comparison with past and future years, this report contains the summaries of the monthly and weekly bulletins of the Iowa Weather and Crop Service in cooperation with the Weather Bureau of the United States Department of Agriculture for the year 1917.

The regular meteorological, climatological and crop statistical work of the Service has been maintained and kept up to the high standard of efficiency of past years; more than the usual attention having been devoted to the accuracy of the reports and the exposure of instruments.

Twenty-four thousand copies of the monthly Climatological Reports, and 30,000 copies of the weekly Weather Crop Bulletins were distributed during the year. Five hundred copies of the monthly reports are distributed each month through the Weather Bureau, U. S. Department of Agriculture, to scientific institutions and libraries in this and foreign countries.

The daily weather forecasts were distributed by telegraph at the expense of the U. S. Weather Bureau to 80 towns, by franked mail to 1,918 addresses, by rural delivery to 819 addresses, and by free telephone to 115,207 subscribers. Preparation was made to have frost warnings sent, in case of necessity, during the fruit blooming season, to all orchardists in the state who were prepared to use orchard heaters in case of frost or injurious temperatures.

CLIMATOLOGY OF THE YEAR 1917

The mean temperature, 44.8°, is the lowest in the 28 years of record and 2.6° below the normal. The temperature deficiency was accumulated chiefly in February, April, May, June, August, October and December. High temperatures occurred toward the close of July and November was abnormally warm. The total precipitation 27.81 inches, is 4.16 inches below normal. April and June were excessively wet, particularly in the latter month in the southern portion of the State, while deficiencies occurred in all other months but February. November was droughty. The season was

favorable for small grains, but unfavorable for corn, about half of which was caught by frosts, October 1-8. Considerable frost damage occurred in the northeastern counties on September 11. About 15 per cent of the crop remained unhusked in the fields at the close of the year, and much that was cribbed was damaged by heating. The low yields of winter wheat, clover, timothy and alfalfa were due to unfavorable conditions during the winter of 1916-17.

Barometer (reduced to sea level).—The average pressure of the atmosphere for the year was 30.06 inches. The highest pressure was 31.09 inches, at Sioux City, on December 29th. The lowest pressure was 29.02 inches, at Charles City, on January 21st. The range for the state was 2.07 inches.

Temperature.—The mean temperature for the state was 44.8°, or 2.6° below the normal. The highest annual mean was 49.3°, at Keokuk, Lee County. The lowest annual mean was 39.8° at Estherville, Emmet County. The highest temperature reported was 106°, at Clarinda, on July 30th. The lowest temperature reported was -40°, at Washta, on December 29th. The range for the state was 146°.

Precipitation.—The average amount of rainfall and melted snow for the year was 27.81 inches, or 4.16 inches less than the normal, and 1.09 inches less than the average for 1916. The greatest amount at any station was 36.00 inches, at Nora Springs, Floyd County, and the least amount was 20.78 inches, at Le Mars, Plymouth County. The greatest monthly precipitation was 13.82 inches, at Keosauqua, Van Buren County, in June. The least amount was a trace, at seven stations in the southern division in February, and at four scattered stations in November. The greatest amount in any 24 consecutive hours was 5.74 inches, at St. Charles, on August 4th. Measurable precipitation occurred on an average of 82 days, 8 days less than in 1916.

Snowfall.—The average amount of snowfall was 32.4 inches. The greatest amount reported from any station was 66.0 inches at Charles City, Floyd County, and the least amount was 7.6 inches at Corning, Adams County. The greatest monthly snowfall was 20.7 inches at Rock Rapids, Lyon County, in January.

Wind.—The prevailing direction of the wind was northwest. The highest velocity reported was 85 miles an hour from the west at Sioux City, Woodbury County, on June 22d.

Sunshine and Cloudiness.—The average number of clear days was 171; partly cloudy, 98; cloudy, 96; as against 178 clear; 98 partly cloudy, and 90 cloudy days in 1916. The average percentage of the possible amount of sunshine was 58 or about 3 per cent below the normal.

MONTHLY SUMMARIES

JANUARY.

Fair and mild weather till the 10th was followed by a cold wave, and temperatures of zero and lower occurred in nearly all portions of the State during the next few days. The coldest in the State during the month was —28° at Elkader on the 13th. A storm center in northern Arizona on the morning of the 20th passed over Iowa attended by snow on the 20-21st, and was followed by a cold wave. In the north part of the State, where the snow was heavy, it drifted and interferred seriously with rail traffic. The cold wave that followed was severe in the north portion of the State where temperatures 14 to 20 below zero occurred. Temperatures of 50 to 60 degrees, the highest of the month, were general on the 28th. General snow on the 30-31st was followed by the most severe cold wave of the winter which was sweeping southeastward across the State at midnight of the 31st.

As a whole, this may be regarded as a nearly normal Iowa January, though with an excess of precipitation and a deficiency in temperature in the northern and reverse conditions in the southern portions. Sunshine, averaging 67 per cent, is 17 per cent above normal and has seldom been equaled in January. Ice in the rivers averaged 9 to 13 inches thick at the beginning of the month and 11 to 22 inches at the close, and much ice of good quality was harvested.

Winter grain, which because of the deficiency in rainfall, did not become well established in the fall, is believed to have suffered somewhat from the glaze of December and the temperature extremes with deficient snow covering in January.

Pressure.—The mean pressure (reduced to sea level) for the state was 30.07 inches. The highest recorded was 30.99 inches, at Dubuque, on the 16th, and the lowest was 29.02, at Charles City on the 21st. The monthly range was 1.97 inches.

Temperature.—The mean temperature for the state, as shown by the records of 108 stations, was 17.0°, or 0.9° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 11.8°, or 2.8° lower than the normal; Central, 16.9°, or 1.3° lower than the normal; Southern, 22.4°, or 1.5° higher than the normal. The highest monthly mean was 26.1°, at Keokuk, and the lowest monthly mean was 8.1° at Estherville. The highest temperature reported was 60°, at eight stations in Wapello, Jefferson, Henry, Van Buren and Lee Counties, on the 28th, and the lowest temperature reported was —28° at Elkader, on the 13th. The temperature range for the state was 88°.

Humidity.—The average relative humidity for the state at 7 a. m. was 81.1 per cent, and at 7 p. m. it was 77.2 per cent. The mean for the month

was 79.2 per cent, or about 1.9 per cent less than the normal. The highest monthly mean was 88 per cent at Charles City, and the least was 73 at Omaha, Nebr.

Precipitation.—The average precipitation for the state, as shown by the records of 112 stations, was 0.83 inch, or 0.22 inch less than the normal. By divisions the averages were as follows: Northern, 1.17, or 0.33 inch more than the normal; Central, 0.78 inch, or 0.33 inch less than the normal; Southern, 0.55 inch, or 0.64 inch less than the normal. The greatest amount, 2.07 inches, occurred at Rock Rapids, and the least, 0.17 inch at Corning. The greatest amount in any 24 consecutive hours, 1.03 inches, occurred at Storm Lake, on the 21st.

Snow.—The average snowfall for the state was 7.2 inches, or about the normal amount. The greatest amount, 20.7 inches, occurred at Rock Rapids, and the least, a trace, at Lamoni.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 60 miles an hour from the northwest, at Sioux City, on the 10th.

Sunshine and Cloudiness.—The average percentage of the possible amount of sunshine was 67, or about 17 per cent higher than the normal. The percentage of the possible amount at the several regular Weather Bureau stations being as follows: Charles City, 62; Davenport, 58; Des Moines, 67; Dubuque, 67; Keokuk, 74; Omaha, Nebr., 77; Sioux City, 66. Clear days averaged 17, a record that has been equalled twice but never exceeded in 27 Januarys; partly cloudy days, 8; cloudy 6.

Miscellaneous Phenomena.—Halos, solar or lunar, occurred on the following dates: 3, 6, 7, 9, 13, 14, 20, 22, 24, 31. Fog: 2, 3, 4, 12, 21, 26, 27, 29, 31. Sleet: 4, 10, 20, 21, 26, 31.

COMPARATIVE DATA FOR THE STATE—JANUARY.

YEAR	Temperature				Precipitation					Number of Days		
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	19.7	+1.8	61	—27	2.02	+0.98	2.46	0.39					
1891	26.0	+8.1	58	— 4	1.75	+0.70	3.99	0.61		4	13	7	11
1892	15.3	—2.6	76	—38	1.09	+0.04	3.13	0.10	6.9	5	16	9	6
1893	9.3	—8.6	54	—34	0.74	—0.31	2.29	0.13	6.9	6	11	9	11
1894	13.3	+1.4	60	—27	1.09	+0.04	2.24	0.31	6.0	5	14	9	8
1895	13.6	—4.3	68	—21	0.85	—0.20	2.62	0.09	8.7	4	15	7	9
1896	23.4	+5.5	68	—20	0.48	—0.57	2.50	T.	2.8	3	10	10	11
1897	17.2	—0.7	66	—30	2.61	+0.96	6.16	0.15	8.2	7	12	7	12
1898	23.4	+5.5	52	—11	1.60	+0.55	5.22	T.	12.6	5	15	6	10
1899	19.8	+1.9	68	—34	0.28	—0.77	1.15	T.	1.5	3	15	10	6
1900	25.6	+7.7	66	—20	0.53	—0.52	2.47	T.	2.3	3	16	7	8
1901	22.7	+5.8	60	—21	0.74	—0.31	2.34	0.04	6.2	4	14	9	8
1902	22.4	+4.5	63	—31	0.88	—0.17	2.83	0.19	9.4	4	17	8	6
1903	23.0	+5.1	60	—12	0.28	—0.77	1.46	T.	2.0	4	13	7	11
1904	14.0	—3.9	57	—32	1.18	+0.13	3.68	0.02	6.1	6	12	8	11
1905	11.2	—6.7	56	—30	0.91	—0.14	1.82	0.12	11.1	7	14	7	10
1906	24.6	+6.7	60	—19	1.52	+0.47	4.71	0.28	11.3	5	14	6	11
1907	18.8	+0.9	68	—22	1.52	+0.47	5.39	0.10	6.0	7	8	7	16
1908	24.9	+7.0	60	—18	0.44	—0.61	1.50	0.00	4.6	2	17	8	6
1909	21.2	+3.3	72	—25	1.66	+0.61	3.74	0.41	7.8	6	9	6	16
1910	18.1	+0.2	56	—35	1.57	+0.32	3.15	0.55	12.0	6	13	7	11
1911	20.2	+2.3	66	—35	0.97	—0.08	3.73	0.11	7.3	5	9	8	14
1912	4.2	—13.7	49	—47	0.55	—0.52	1.90	T.	5.5	6	14	7	10
1913	20.9	+3.0	62	—25	0.77	—0.28	2.05	0.04	7.2	5	14	9	8
1914	27.8	+9.9	64	—10	0.88	—0.17	2.34	0.27	5.1	5	11	8	12
1915	17.5	—0.4	59	—32	1.63	+0.58	3.15	0.10	7.3	8	13	8	10
1916	17.8	—0.1	62	—34	2.02	+1.57	6.07	0.85	7.2	10	12	6	13
1917	17.0	—0.9	60	—28	0.83	—0.22	2.07	0.17	7.2	4	17	8	6

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

FEBRUARY.

February, 1917, was the driest month of that name since state-wide observations began in 1890, and it was the coldest February since 1905. It was, however, rather a pleasant winter month as there was only one bad storm which occurred on the 4th, when the temperature was below zero all day, north of Des Moines, and the minimum temperatures ranged from 8° below zero at Keokuk, in Lee County, to 28° below zero at Lake Park, in Dickinson County. The velocity of the wind ranged from 39 miles an hour at Des Moines to 69 miles an hour at Sioux City. Over the greater part of the State these conditions were accompanied by falling snow, which made the worst blizzard for many years. Railroad traffice was suspended for several days on some lines in the northern counties. Although cold, the remainder of the month was generally pleasant. Over the southern counties there was practically no snowfall, and the ground in that section has been practically bare during the entire winter, and it is thought that winter grains have been injured. Owing to the lack of moisture during last summer, fall and winter the ground is very dry and many wells have failed. At Des Moines there has been a deficiency

of precipitation every month for 13 consecutive months; the aggregate deficiency from February 1, 1916, to March 11, 1917, inclusive, is 13.94 inches. On the other hand, the northern counties have received about the normal amount of precipitation and sleighing has been good most of the winter. Some spring wheat was sown in Davis County on the 26th, notwithstanding the fact that the ground was frozen to a depth of three feet, except a few inches on the surface. At the end of the month there were no indications of ice breaking up in any of the streams.

Pressure.—The mean pressure (reduced to sea level) for the state was 30.16 inches. The highest recorded was 30.92 inches, at Omaha, Neb., on the 2d and the lowest was 29.20 at Sioux City on the 16th. The monthly range was 1.70 inches.

Temperature.—The mean temperature for the state, as shown by the records of 107 stations, was 15.2°, or 5.3° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 9.9°, or 7.2° lower than the normal; Central, 15.3°, or 5.4° lower than the normal; Southern, 20.5°, or 3.1° lower than the normal. The highest monthly mean was 24.8° at Northboro, and the lowest monthly mean was 5.9° at Forest City. The highest temperature reported was 68°, at Northboro, on the 25th, and the lowest temperature reported was -37°, at Inwood, on the 2d. The temperature range for the state was 105°.

Humidity.—The average relative humidity for the state at 7:00 a. m. was 80.2 per cent, and at 7 p. m. it was 70.2 per cent. The mean for the month was 75.5 per cent, or about 4.2 per cent lower than the normal. The highest monthly mean was 87.0 per cent, at Charles City, and the lowest was 64.8 at Omaha, Neb.

Precipitation.—The average precipitation for the state, as shown by the records of 114 stations, was 0.36 inch, or 0.79 inch less than the normal. By divisions, the averages were as follows: Northern, 0.59 inch, or 0.32 inch less than the normal; Central, 0.37 inch, or 0.93 inch less than the normal; Southern, 0.12 inch, or 1.23 inches less than the normal. The greatest amount, 1.19 inches, occurred at Nora Springs, and the least, a trace, at seven stations in the southern division. The greatest amount in any 24 consecutive hours, 1.00 inch, occurred at Nora Springs, on the 19th.

Snow.—The average snowfall for the state was 3.5 inches, or 3.9 inches less than the normal. The greatest amount, 11.6 inches, occurred at Storm Lake, and the least, a trace, at 10 stations in the southern division.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was 69 miles an hour from the northwest, at Sioux City, on the 4th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 63, or about 8 per cent higher than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 58; Davenport, 56; Des Moines, 61; Dubuque, 62; Keokuk, 71; Sioux City, 59; Omaha, Neb., 73.

Miscellaneous Phenomena.—Dates of: Fog, 13, 14, 15, 19, 22, 26, 27. Halos, solar or lunar, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 19, 28. Sleet or glaze

occurred at several stations in the southern counties on the 19th. Thunder was heard or distant lightning observed during the night of the 22d-23d at a number of stations in the southern division. Migration of birds at Fariham, blue birds and robins on the 23d and wild ducks on the 25th. At Bedford, wild ducks on the 22d.

THE WINTER OF 1916-1917.

The mean temperature for the three winter months was 17.0°, which is 3.2° below the normal for the State. The highest temperature reported was 68° at Northboro, Page County, on February 25. The lowest temperature reported was 37° below zero at Inwood, Lyon County, on February 2.

The average monthly precipitation for the State was 0.74 inch, and the average total precipitation was 2.23 inches, or 0.74 inch less than the winter normal. The average total snowfall, unmelted, was 17.4 inches, or 3.1 inches less than the normal and 0.4 inch less than the average fall for the winter of 1915-16.

The total number of days with .01 inch or more of precipitation was 13, or 6 less than the average for the winter of 1915-16. The average number of clear days was 46, partly cloudy 24, cloudy 20, as compared with 37 clear, 22 partly cloudy, and 32 cloudy days during the winter of 1915-16.

COMPARATIVE DATA FOR THE STATE—FEBRUARY.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	26.0	+5.5	67	-24	0.83	−0.22	2.18	0.11	.....	3	13	7	8
1891	19.4	−1.1	70	-31	1.16	+0.11	2.41	0.55	.....	3	13	7	8
1892	28.1	+7.6	68	-20	1.20	+0.15	2.18	0.12	5.0	6	6	7	16
1893	16.4	−4.1	60	-28	1.39	+0.34	2.91	0.06	8.1	6	10	8	10
1894	19.7	−0.8	60	-19	0.89	−0.16	2.41	T	8.4	5	16	6	4
1895	15.4	−4.1	73	-32	0.49	−0.56	1.34	0.02	3.3	4	13	9	6
1896	27.4	+6.9	78	-13	0.71	−0.34	2.40	0.04	5.4	4	12	9	8
1897	24.7	+4.2	61	-24	0.89	−0.16	1.81	0.22	8.0	5	6	10	12
1898	24.2	+3.7	62	-18	1.20	+0.15	2.63	0.10	7.8	5	10	9	9
1899	12.2	−8.3	75	-40	0.89	−0.16	4.32	0.12	7.1	5	11	10	7
1900	14.8	−5.7	60	-27	1.30	+0.55	4.57	0.16	9.9	6	10	8	10
1901	17.5	−3.0	49	-21	1.01	−0.04	2.60	0.12	9.7	4	15	7	6
1902	17.6	−2.9	60	-21	0.78	−0.27	2.03	0.02	2.6	4	13	8	7
1903	19.8	−0.7	56	-21	1.18	+0.13	3.25	0.30	7.9	4	13	7	8
1904	14.8	−5.7	70	-26	0.41	−0.64	1.09	T	4.5	4	10	9	10
1905	12.8	−7.7	69	-41	1.57	+0.52	2.27	0.44	15.5	7	14	6	8
1906	22.6	+2.1	66	-32	1.29	+0.24	2.91	0.29	6.1	5	14	7	7
1907	25.9	+5.5	65	-21	0.71	−0.34	1.95	0.06	4.6	4	14	6	8
1908	24.3	+3.8	59	-16	1.69	+0.64	3.95	0.23	8.9	6	12	6	11
1909	26.2	+5.7	62	-26	1.54	+0.49	4.72	0.30	7.7	5	11	6	11
1910	17.8	−2.7	58	-21	0.46	−0.59	2.09	T	4.0	3	14	8	6
1911	27.3	+6.8	71	-13	2.76	+1.71	5.46	0.59	7.9	6	12	6	10
1912	18.1	−2.4	57	-30	1.21	+0.16	3.25	0.04	11.2	5	10	9	10
1913	20.2	−0.3	70	-24	0.92	−0.23	2.39	0.07	7.3	4	14	7	7
1914	19.5	−1.0	59	-29	0.87	−0.18	1.99	0.23	9.2	6	10	9	9
1915	29.1	+8.6	62	- 8	2.95	+1.89	5.39	0.43	9.4	9	9	5	14
1916	19.0	−1.5	62	-32	0.55	−0.60	1.38	0.05	6.0	4	14	8	7
1917	15.2	−5.3	68	-37	0.36	−0.79	1.19	T	3.5	3	14	8	6

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

MARCH.

March opened cold with temperatures of zero or lower in all but the southeastern counties on the 4th and 5th, the lowest being -13 degrees at Lake Park on the 4th. Excepting a warm period, 9th-11th, it continued rather cold till the 19th when a warm period set in that continued till the close of the month. At Des Moines the ground was frozen to a maximum depth of about 4 feet on March 6, but by the 26th, practically all frost had disappeared. In the southern portion of the state the average daily excess in temperature was about 2.5 degrees, while in the northern portion there was a slight deficiency.

Precipitation, as in the two preceding months, was above normal in the northern, normal in the central, and below normal in the southern divisions. The principal periods with precipitation were, 7th, 12th-13th, and 16th. During the latter two periods, there was considerable glaze, sleet and snow, particularly in the north and central divisions. Over an area extending from Fort Dodge to Des Moines and east to the Mississippi River the mist and light rain beginning on the 12th froze to all exposed surfaces, giving them a heavy coating of ice that in many places measured an inch in thickness. On the 13th a considerable increase in the wind force, acting upon the overburdened telephone wires, caused great damage. More than 1,600 poles were snapped off and 10,000 breaks occurred in long distance wires alone. The damage is estimated at $175,000, besides the loss of business for nearly a week. Railway and telegraph wires seem to have suffered less. On the 16th, heavy snows, accompanied by shifting gales, occurred in the northern portion of the state, interrupting railway traffic for a few days.

There was no appreciable snow covering over the southeast one-third of the state or anywhere in the southern tier of counties, but in the western counties near the Minnesota line, the snow did not disappear till the closing days of the month.

By the close of the month grass was starting and field work was progressing rapidly in the southern division; seeding oats and spring wheat had been completed in a few southeastern counties; potato planting was reported well north in the central division; and sod plowing was being done as far north as Lyon county in the extreme northwest. Winter wheat, timothy, alfalfa, and clover both old and new, were seriously winter-killed, except that clover was favorably reported from some localities in the northern division, where it is most too early to form conclusions. The winter-killing in the southern division probably resulted from the prolonged drought that began last fall and continued through the winter, together with deficient snow covering and considerable extremes of temperature. In the central division, smothering seems to have occurred from a dense ice covering part of the winter. In the northern division the snow covering was deeper, continuous and more porous.

Live stock wintered well and ample feed remains.

Pressure.—The mean pressure (reduced to sea level) for the state was 30.02 inches. The highest recorded was 30.75 inches, at Sioux City, on the 3d; and the lowest was 29.26 inches, at Omaha, Neb., on the 16th The monthly range was 1.49 inches.

Temperature.—The mean temperature for the state, as shown by the records of 102 stations, was 34.6°, or 1.3° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 31.2°, or 0.3° lower than the normal; Central, 35.1°, or 1.5° higher than the normal; Southern 38.6° or 2.5° higher than the normal. The highest monthly mean was 41.3°, at Ottumwa, and the lowest monthly mean was 27.2°, at Estherville. The highest temperature reported was 85°, at Lenox, on the 21st. The lowest temperature reported was -15°, at Lake Park on the 4th.

Humidity.—The average relative humidity for the state at 7 a. m. was 78 per cent, and at 7 p. m. it was 62 per cent. The mean for the month was 70 per cent, or about 4 per cent lower than the normal. The highest monthly mean was 79 per cent, at Charles City, and the lowest was 62, at Keokuk.

Precipitation.—The average precipitation for the state, as shown by the records of 107 stations, was 1.84 inches, or 0.07 inch more than the normal.

By divisions the averages were as follows: Northern, 1.90 inches or 0.37 inch more than the normal; Central, 1.83 inches, or 0.04 inch less than the normal; Southern, 1.78 inches, or 0.14 inch less than the normal. The greatest amount, 4.35 inches occurred at Sanborn, and the least, 0.57 inch, at Audubon. The greatest amount in any 24 consecutive hours, 2.50 inches, occurred at Sanborn, during a thunderstorm on the 16th.

Snow.—The average snowfall for the state was 6.2 inches, or 1.0 inch more than the normal. The greatest amount, 20.0 inches, occurred at Sanborn; Williamsburg and Lacona reported no snow, and 18 stations reported only a trace.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 56 miles an hour from the northwest, this occurring at Sioux City on the 16th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 60, or about 2 per cent higher than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 51; Davenport, 52; Des Moines, 62; Dubuque, 61; Keokuk, 71; Sioux City, 53; Omaha, Nebr., 69.

Miscellaneous Phenomena.—Fog occurred in the northeastern counties on the 2d, 6th, 7th, 10th, 11th and 15th. Hail in south and east portions of the state on the tenth. Halos, lunar or solar, on the 1st, 2d, 3d, 4th, 5th, 6th, 7th, 10th, 17th, 19th, 20th, 24th, 30th. A lunar halo of radius 46° was observed at Des Moines, 9:15 p. m. of the 5th. Sleet on the 6th, 7th, 11th, 12th, 13th in the southern and eastern portions of the state, and quite generally on the 16th, 22d and 23rd.

Birds first observed.—Boone, robins, 13th; Centerville, robins, 20th; Des Moines, robins, 12th; Earlham, wild geese, 20th, pewees, 24th, cranes, 29th; Forest City, robins, 11th; Grinnell, blue birds, 18th; Nora Springs, wild geese, 17th, robins and black birds, 22d; Pocahontas, wild ducks, 8th,

brants, 9th, robins, 10th, meadow lark, 15th; Postville, robins, 21st, bluebirds, 30th.

Frogs appeared at Corydon on the 15th.

Rivers.—The ice in the Mississippi River broke up and moved out at Muscatine and Davenport on the 11th; LeClaire on the 19th; Clinton on the 21st; and Dubuque on the 22nd. The stages were moderate. The smaller rivers broke up quietly about the middle of the month in the southern half of the state where very little precipitation had accumulated during the winter. Further north the breakup was caused by a rather sudden change to warmer weather on the 19th, acting upon more than a normal accumulation of snow and ice. The Cedar River at Cedar Rapids passed the flood stage of 14 feet during the night of the 25th-26th, reaching a crest stage of 17.3 feet at 6 p. m. of the 26th. The Des Moines River at Boone, passed the flood stage of 17 feet on the 23rd, reaching a crest stage of 20 feet on the 25th. Several small rivers in northern Iowa, gorged, overflowed, washed out bridges and culverts, and seriously delayed railway and other traffic. This was the only damage reported.

COMPARATIVE DATA FOR THE STATE—MARCH

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snow fall	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	28.0	−5.8	75	−24	1.87	−0.20	5.67	0.32	----	--	--	--	--
1891	26.8	−6.5	66	−19	2.69	+0.83	4.59	1.32	----	10	6	8	17
1892	31.9	−1.4	84	− 6	2.22	+0.45	4.58	0.67	8.9	6	11	8	12
1893	31.8	−1.5	84	− 8	2.14	+0.37	4.40	0.64	4.0	8	9	11	11
1894	41.0	+7.7	84	− 6	2.03	+0.26	4.62	0.26	2.7	6	13	10	8
1895	34.4	+1.1	94	−11	0.83	−0.94	2.60	0.22	2.9	4	16	8	7
1896	30.9	−2.4	81	−12	1.10	−0.67	3.99	0.16	5.4	5	12	9	10
1897	32.0	−1.3	72	−22	2.39	+0.62	6.16	0.29	8.5	8	9	8	14
1898	37.6	+4.2	72	− 2	1.94	+0.17	6.21	0.32	5.7	6	12	9	10
1899	23.0	−10.3	75	−16	1.62	−0.15	5.90	0.37	8.0	6	7	12	12
1900	30.7	−2.6	81	−13	2.06	+0.29	5.15	0.45	6.6	5	12	9	10
1901	34.2	+0.9	76	− 8	2.04	+0.87	5.25	0.70	12.6	7	10	8	13
1902	39.1	+5.8	79	−12	1.45	−0.32	4.33	0.13	1.3	7	9	11	11
1903	38.8	+5.5	82	6	1.39	−0.39	3.90	0.15	3.9	7	11	7	13
1904	34.8	+1.5	78	8	2.13	+0.41	4.57	0.50	4.4	7	8	8	15
1905	41.5	+8.2	84	1	2.04	+0.27	3.70	0.89	4.1	7	8	8	15
1906	27.1	−6.2	66	−14	2.34	+0.57	4.65	0.58	8.9	10	8	7	16
1907	40.6	+7.3	92	− 7	1.55	−0.42	5.05	0.23	4.1	6	14	7	10
1908	37.9	+4.6	86	− 8	1.58	−0.19	3.74	0.45	1.1	6	13	7	11
1909	32.5	−0.8	71	−15	1.53	−0.24	5.00	0.23	9.8	6	12	10	9
1910	48.9	+15.6	92	−10	0.17	−1.60	1.32	0.00	T	1	23	6	2
1911	39.4	+6.1	83	2	0.98	−0.84	4.84	T	1.9	5	16	9	6
1912	24.9	−8.4	70	−19	2.01	+0.24	5.25	0.60	19.1	7	15	6	10
1913	31.9	−1.4	78	−23	2.48	+0.71	5.88	0.74	5.3	9	11	10	10
1914	34.7	+1.4	78	− 5	1.69	−0.08	3.84	0.28	1.8	7	12	8	11
1915	29.3	−4.0	61	− 6	0.96	−0.81	2.12	0.17	8.8	5	8	9	14
1916	35.2	+1.9	80	−18	1.57	−0.20	5.80	0.23	2.9	6	11	9	11
1917	34.0	+1.3	89	−22	1.84	+0.07	4.35	0.57	6.2	6	14	8	9

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

APRIL.

April, 1917, was generally cold, cloudy and rainy. Only a few days, particularly the 18th and 22d, were notably warm. The week, 9th-15th, was the least rainy, after which rain fell somewhere in the State every day, being heavy the last four days. Rainy days, averaging 11, nearly equaled the record of April, 1909, which had 12. Snowfall, 3.8 inches, has not been exceeded in April since 1896. It was heaviest in the southern division, where it averaged 5.4 inches which is greater than the total of the preceding three months. In Wayne and Decatur counties it exceeded one foot. The drought of several months in the central and southern divisions was effectually broken. Cloudy days, 14, is the greatest of record for April; and sunshine was correspondingly deficient.

Vegetation made slow progress. Winter wheat and meadows had winter-killed so badly that a large acreage was plowed up and devoted to other crops, mainly corn, though there was also a large increase in the acreage of oats and potatoes. Where the stand was considered promising enough to allow the winter wheat to grow, and this was mostly on heavy bottom lands, it made fair progress, as did other small grains, the seeding of which was about completed by the third week. Wet weather delayed the preparation of corn ground so that at the close of the month only a little planting had been done in the southern counties. Pastures and meadows were too backward to turn in stock. The pig crop was reported as below normal. Trees and fruits were generally dormant.

Pressure.—The mean pressure, (reduced to sea level) for the State was 29.99 inches. The highest recorded was 30.36 inches, at Sioux City, on the 8th, and the lowest was 29.51 inches at Omaha, Neb., on the 20th. The monthly range was 0.85 inch.

Temperature.—The mean temperature for the State, as shown by the records of 107 stations, was 45.5°, or 3.2° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 43.8°, or 2.9° lower than the normal; Central, 45.9°, or 3.0° lower than the normal; Southern, 46.8° or 3.8° lower than the normal. The highest monthly mean was 49.4°, at Mt. Pleasant and Tipton, and the lowest was 41.8°, at Sibley. The highest temperature reported was 88°, at Lenox, on the 19th, and the lowest was 17° at Guthrie Center on the 2d, and at Sibley on the 15th. The temperature range for the State was 71°.

Humidity.—The average relative humidity for the State at 7 a. m. was 78 per cent, and at 7 p. m. it was 63 per cent. The mean for the month was 70 per cent, or about 3 per cent above the normal. The highest monthly mean was 74 per cent, at Charles City and Sioux City, and the lowest was 64 per cent, at Dubuque.

Precipitation.—The average precipitation for the State, as shown by the records of 117 stations, was 4.55 inches, or 1.69 inches more than the normal. By divisions the averages were as follows: Northern, 3.93 inches, or 1.25 inches more than the normal; Central, 4.44 inches, or 1.58 inches more than the normal; Southern, 5.27 inches, or 2.22 inches more

than the normal. The greatest amount, 7.84 inches, occurred at Allerton, and the least, 2.05 inches, at Dubuque. The greatest amount in any 24 consecutive hours, 2.05 inches, occurred at Chariton on the 28th.

Snowfall.—The average snowfall for the State was 3.8 inches, or 2.0 inches more than the normal. The averages by divisions were: Northern, 3.0 inches; Central, 3.0 inches; Southern, 5.4 inches. The greatest amount, 15.0 inches, occurred at Allerton.

Wind.—The prevailing direction of the wind was from the northeast. The highest velocity reported from a regular weather Bureau station was at the rate of 47 miles an hour from the northwest at Sioux City on the 25th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 45, or about 15 per cent lower than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 37; Davenport, 48; Des Moines, 42; Dubuque, 53; Keokuk, 50; Sioux City, 40; Omaha, Neb., 51. At Charles City, Davenport, Des Moines and Sioux City, the percentages were the least of record for April. Clear days averaged 9; partly cloudy 7, cloudy, 14, the latter being the greatest of record for April.

Miscellaneous Phenomena.—Earthquake; Keosauqua, 3 p. m., 19th. Dense fog at a few stations on 17th and 30th. Hail, 17th, 19th, 20th, 24th, 28th, 29th and 30th. Sleet, 1st, 7th, 16th, 17th, 26th, 27th, 28th and 30th. Thunderstorms, 3d, 7th, 11th, 16th, 17th, 18th, 19th, 20th, 22d, 23d, 24th, 25th, 28th and 29th.

Birds first observed.—Earlham: turtle doves, 5th, mocking birds, 18th.

Frogs appeared at Earlham on the 10th.

Rivers.—Flood stages did not occur in any of the rivers, but all of them carried considerably more than the normal volume of water. In the boundary rivers, distinct crests, originating from the spring break-up at the headwaters, passed along between the 17th and 27th in the Mississippi, and between the 13th and 19th in the Missouri. The short, interior rivers fell steadily till about the 18th to 20th, after which a slight rise resulted from frequent, general and heavy precipitation. At the close of the month the soil was saturated and other natural storage well filled so that the streams will probably respond rather quickly to heavy rainfalls.

COMPARATIVE DATA FOR THE STATE—APRIL.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snow fall	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	51.8	+3.1	88	2	1.80	−1.06	4.46	0.38	.....	6	14	9	7
1891	50.6	+1.9	93	13	2.15	−0.71	5.06	0.59	.....	8	14	7	9
1892	45.4	−3.3	88	14	4.75	+1.89	8.38	2.43	5.7	9	8	9	13
1893	45.5	−3.2	96	15	4.21	+1.35	8.51	1.24	6.0	10	8	9	13
1894	51.7	+3.0	93	12	3.07	+0.21	6.91	0.55	0.2	9	11	11	8
1895	54.2	+5.5	98	8	2.62	−0.24	5.88	0.28	2.1	6	14	8	8
1896	54.5	+5.8	94	16	5.02	+2.16	9.67	2.35	4.5	11	11	10	9
1897	47.9	−0.8	89	19	5.35	+2.49	9.86	2.22	T	11	9	9	12
1898	48.1	−0.6	91	14	2.56	−0.30	4.82	0.27	T	8	13	9	8
1899	48.9	+0.2	89	1	2.40	−0.46	5.76	0.56	2.0	7	12	11	7
1900	52.2	+3.5	89	19	2.57	−0.21	6.62	0.43	0.9	6	12	9	9
1901	49.9	+1.2	92	15	1.79	−1.07	3.47	0.66	2.0	5	14	8	8
1902	48.2	−0.5	96	9	1.71	−1.15	4.15	0.40	T	5	14	11	5
1903	49.8	+1.1	86	17	2.98	+0.12	6.00	0.74	0.8	9	11	9	10
1904	44.1	−4.6	86	13	3.63	+0.77	8.97	1.52	1.4	7	15	6	9
1905	47.5	−1.2	90	10	3.03	+0.17	5.49	0.63	1.2	8	12	8	10
1906	52.5	+3.8	94	22	2.42	−0.44	5.35	0.53	0.6	8	14	9	7
1907	41.5	−7.2	80	10	1.32	−1.54	3.23	0.24	2.7	6	12	8	10
1908	50.5	+1.8	91	8	2.24	−0.62	4.59	0.67	0.3	8	14	8	8
1909	43.8	−4.9	86	14	4.58	+1.72	9.43	0.83	3.1	12	9	9	12
1910	52.5	+3.8	99	15	1.48	−1.38	4.86	0.10	3.0	7	14	7	9
1911	46.7	−2.0	86	3	3.09	+0.23	6.04	1.53	3.6	9	11	8	11
1912	49.9	+1.2	84	20	2.66	−0.20	5.66	0.78	1.1	8	13	8	9
1913	50.2	+1.5	88	16	3.28	+0.42	7.43	1.12	2.7	9	15	5	10
1914	48.6	−0.1	88	11	2.52	−0.34	5.03	0.37	0.3	8	10	8	12
1915	57.2	+8.5	95	18	1.41	−1.45	4.02	0.05	T	7	15	10	5
1916	47.1	−1.6	90	11	2.62	−0.24	5.92	1.13	1.1	10	10	9	11
1917	45.5	−3.2	88	17	4.56	+1.69	7.84	2.05	3.8	11	9	7	14

T indicates an amount too small to measure, or less than .005 inch rainfall, and less than .05 inch snowfall.

MAY.

Temperature and total rainfall were below normal, only May, 1892 and 1907, being cooler in the 28 years of record. Rainy days were slightly less frequent than normal and the period, 12th-18th, was nearly rainless. Clear days and sunshine were above normal. On the night of the 18th-19th, following the warmest day of the month, with maximum temperatures near or above 90°, destructive wind and hail storms were general in the Northern Division of the State. Ice, heavy frost, or freezing temperatures were general during the first week. Frost on or about the 23d damaged potatoes, corn, garden truck and fruit buds in some localities, particularly in the northeast and east central sections.

Small grain made good progress. Meadows and pastures were slow, so that stock feeding had to be continued in many sections till the close of the month, thus depleting the grain supply. By the 20th of the month about 75 per cent of the corn had been planted, but frequent rains during the last decade delayed field work, and some planting remained to be done at the close of the month, at which time early planted corn was up and was of good stand and color. Apples, plums and cherries were

backward, coming into full bloom in the southern counties about the 15th and in the northern counties about the 25th, but over most of the state the prospect is good.

Pressure.—The mean pressure (reduced to sea level) for the State was 29.96 inches. The highest recorded was 30.42 inches, at Sioux City, on the 14th, and the lowest was 29.36, at Sioux City, on the 26th. The monthly range was 1.06 inches.

Temperature.—The mean temperature for the State, as shown by the record of 108 stations, was 55.1°, or 5.4° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 53.8°, or 5.2° lower than the normal; Central, 55.4°, or 5.3° lower than the normal; Southern, 56.0°, or 5.7° lower than the normal. The highest monthly mean was 58.1°, at Keokuk, and the lowest 52.2°, at Estherville. The highest temperature reported was 95° at Tipton, on the 18th, and the lowest was 25° at Chariton, on the 5th. The temperature range for the State was 70°.

Humidity.—The average relative humidity for the State at 7 a. m. was 73 per cent, and at 7 p. m. it was 52 per cent. The mean for the month, 63 per cent, is about 4 per cent below the normal. The highest monthly mean was 65 per cent, at Keokuk, and the lowest was 60 per cent, at Sioux City.

Precipitation.—The average precipitation for the State, as shown by the records of 115 stations, was 3.87 inches, or 0.70 inch less than the normal. By divisions the averages were as follows: Northern, 3.87 inches, or 0.61 inch less than the normal; Central, 3.80 inches, or 0.79 inch less than the normal; Southern, 3.95 inches or 0.69 inch less than the normal. The greatest amount, 7.33 inches, occurred at Iowa City, and the least, 1.69 inches, at Rockwell City. The greatest amount in 24 consecutive hours, 3.05 inches, occurred at Glenwood, on the 21-22d.

Snowfall.—The average snowfall for the State was 0.6 inch, or 0.5 inch more than the normal, and in the 26 Mays of record has been exceeded only in 1907 and 1911.

Wind.—The prevailing direction of the wind was from the northeast. The highest velocity reported from a regular Weather Bureau station was at the rate of 54 miles an hour from the west, at Sioux City, on the 18th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 62, or about 1 per cent more than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 58; Davenport, 59; Des Moines, 58; Dubuque, 65; Keokuk, 68; Sioux City, 59; Omaha, Neb., 68.

Miscellaneous Phenomena.—Dense Fog, 14th; Hail, 9th, 10th, 18th, 21st, 26th; Halos, solar or lunar, 2d, 9th, 11th, 18th, 19th, 25th, 28th, 30th; Haze was more or less prevalent from the 8th till near the close of the month, being most noticeable on the 13th, 14th and 16th, when it was sufficiently dense to obscure objects less than a mile distant and give

the sun a yellowish cast at midday with red sunrise and sunset. At Washta it was described as resembling "Indian Summer" conditions; Meteors, 26th, 31st. See full account of the unusual meteor of the 31st on page 19; Sleet, 3d, 4th, 28th; Thunderstorms, 2d, 3d, 8th, 9th, 10th, 17th, 18th, 19th, 20th, 21st, 22d, 25th, 26th, 28th, 29th, 30th, 31st; Birds first observed, Grinnell, brown wrens, 9th; grossbeaks, 14th; red headed woodpeckers 15th.

Rivers.—Moderate stages prevailed in all of the rivers, and all fell slowly and steadily, except the Missouri, down which a slight crest passed toward the close of the month.

COMPARATIVE DATA FOR THE STATE—MAY.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snow fall	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	57.7	— 2.8	90	26	3.56	—1.01	6.44	1.61	.....	9	10	13	8
1891	58.2	— 2.2	94	21	3.18	—1.39	7.10	1.46	.....	8	14	9	8
1892	64.0	+ 6.5	95	37	8.77	+4.20	12.64	4.37	T.	16	5	9	17
1893	56.6	— 3.9	96	26	3.45	—1.12	5.82	1.65	0	9	13	9	9
1894	61.1	+ 0.6	96	22	1.87	—2.70	4.77	0.33	0	6	17	10	4
1895	61.7	+ 1.2	104	24	3.19	—1.38	5.79	0.84	0	9	11	12	8
1896	65.5	+ 5.0	100	34	6.69	+2.12	11.79	3.40	0	12	11	12	8
1897	58.5	— 2.0	96	20	1.92	—2.65	3.59	0.21	0	5	16	10	5
1898	59.6	— 0.9	92	26	4.67	+0.10	7.82	2.22	0	12	9	10	12
1899	60.2	— 0.3	90	27	6.23	+1.66	11.47	3.00	0	13	9	12	10
1900	63.2	+ 2.7	98	22	3.31	—1.26	6.98	0.96	0	8	14	10	7
1901	60.7	+ 0.2	95	28	2.35	—2.22	4.57	0.72	0	7	16	9	6
1902	63.8	+ 3.3	97	25	5.39	+0.82	18.04	0.87	0	13	10	12	9
1903	61.6	+ 1.1	91	24	8.55	+3.98	15.45	2.88	0	16	9	12	10
1904	60.6	— 0.9	93	27	3.78	—0.79	8.15	1.50	0	8	13	10	8
1905	58.3	— 2.2	88	23	5.96	+1.38	10.83	2.57	0	14	12	11	8
1906	60.8	+ 0.3	95	24	3.54	—1.03	10.73	0.89	0	11	13	10	8
1907	53.5	— 7.0	96	14	3.48	—1.09	7.68	0.71	1.0	10	11	10	10
1908	59.4	— 1.1	93	13	8.34	+3.77	14.33	1.33	0	15	9	11	11
1909	57.9	— 2.6	97	18	4.34	—0.23	7.85	1.86	0.1	9	12	12	7
1910	55.4	— 5.1	89	18	3.41	—1.16	6.91	1.29	T.	10	15	7	9
1911	64.9	+ 4.4	98	23	3.76	—0.81	8.73	0.42	0.7	9	16	9	6
1912	62.7	+ 2.2	97	29	3.53	—1.24	6.41	0.72	0	10	14	11	5
1913	59.4	— 1.1	102	26	6.34	+1.67	10.23	3.14	0	13	11	8	12
1914	62.2	+ 1.7	98	25	3.31	—1.28	6.90	0.30	T.	10	14	11	6
1915	56.1	— 4.4	99	25	7.34	+2.77	12.21	3.82	T.	14	9	9	13
1916	59.9	— 0.6	94	27	4.93	+0.36	10.44	2.14	T.	12	13	10	8
1917	55.1	— 5.4	95	18	3.87	— 0.70	7.33	1.69	0.6	10	15	8	8

T indicates an amount too small to measure, or less than .005 inch of precipitation, and less than .05 inch of snowfall.

METEOR OF MAY 31, 1917.

Shortly before 10 p. m., May 31, a meteor of greater brilliance than any other that has occurred in this section of the country for many years was observed in the northwest one-third of Iowa and territory in adjacent states. It appeared like a giant sky rocket, accompanied by a glare of light equalling the brightest lightning flash, and explosions of sufficient violence to rattle windows and shake houses in Woodbury and Plymouth Counties in Iowa, and adjoining counties

in Nebraska and South Dakota. Accounts of the direction of motion of the meteor vary greatly, due probably to the different angles from which it was viewed by the observers. The flash was distinctly seen by observers as remote as Fayette, in the northeastern portion of the State, Des Moines and Omaha, but no noises were heard at those places. A trail of smoke marked the path of the meteor for ten or fifteen minutes, when it dissipated without showing any direction of the higher air currents. A piece of material believed to have been a fragment of the meteor was found in the barnyard of E. Vander Hoop, a farmer living two miles north of Sioux Center, Iowa, and another similar piece was found near Osmond, Neb., by N. Welch, an auctioneer. The specimens were of identical appearance, resembling coarse grained baked clay, the outer surface of which had been molten and burned to a crisp brown.

While meteors have no appreciable effect on weather and belong to the science of astronomy rather than meteorology, the intense popular interest in this instance justifies more than ordinary consideration. Published herewith is the report of Mr. David E. Hadden, Fellow of the Royal Astronomical Society, and Corn and Wheat Region Observer of the United States Weather Bureau, at Alta, Iowa. Being both an astronomer and a meteorologist, his report is doubtly interesting.

DETONATING METEOR.

David E. Hadden, F. R. A. S., Alta, Iowa.

Date, Thursday, May 31, 1917.

Time of flash, 9:55 p. m.

Time of report 10 p. m.—five minutes' interval.

Location—Meteor first appeared some distance west of the zenith and traced a path through constellation Leo. A minute after the flash the location was easily observed by a bright streak about ten degrees in length directly below the star Epsilon of Leo, the right ascension of the streak was about 9h 27m and declination north 15 degrees. The streak was nearly parallel to a line drawn from the star Gamma Leonis to Alpha Leonis. The streak indicated approximately the location of the explosions, two in number, which followed each other rapidly and created much excitement. Reports indicate that the flash was observed over a radius of 100 miles, but the explosions were heard only about sixty or seventy miles.

Fire-balls, or aerolites as these meteors are called when they are large enough to explode and reach the earth, come from inter-planetary space, and when they reach the earth's atmosphere at about eighty miles above the earth's surface they either take fire or soon disappear, or take fire and burst in numerous fragments or fall to the ground as solid masses of stony matter fused with numerous metallic elements familiar to us on the earth.

Explosions take place from ten or fifteen to thirty-five miles above the earth's surface as a rule. At this height sound travels 700 or 800 feet a second, so that the distance of the explosion of the meteorite of Thursday night was between forty-five and fifty-five miles in a direct line from Alta a little south of a point due west.

Fire-balls occur at all seasons and places over the earth, but it is found that February, May and November are noticeable for their frequency. They have been recorded for more than 2,000 years in history. Specimens of them are found in all the leading museums of the world—they vary in weight from a few ounces to many hundreds of pounds, and some of tons weight are suspected to be of meteoric origin.

The last detonating one observed here was on May 2, 1890, at 5:10 p. m., in full daylight. This fell near the Minnesota line in northern Iowa and was the subject of litigation in the courts regarding its ownership.

No special significance attaches to meteors from a weather viewpoint. They are interesting scientifically to estimate the height and density of our atmosphere and indicate that space is strewn with matter which the earth attracts in its onward march around the sun and through the stellar spaces. Possibly they belong to lost comets or are the debris of shattered planets.

JUNE.

June, 1917, was cool and wet, the rainfall being the greatest since 1890. In the central and southern divisions many stations had the greatest rainfall of record in June; some had three times the June normal, and 30 to 40 per cent of the annual normal. Excessive rains during the first week, particularly in the southern portion, seriously eroded hillsides and overflowed lowlands, destroying thousands of acres of crops. Similar conditions prevailed in the northeastern portion of the State on the 23d-26th. Much of the overflowed land was replanted to corn toward the close of the month and the remainder will be used for various catch crops if seed is available. The last ten days of the month were favorable, but at the close corn averaged 10 days to two weeks late; early oats, rye, barley and winter wheat were heading in the Southern Division; hay short and thin, except alfalfa which was being cut and yielding a fair crop in some sections; potatoes excellent. The warm days at the close of the month brought on a better crop of strawberries than was expected.

Pressure.—The mean pressure (reduced to sea level) for the State was 29.94 inches. The highest recorded was 30.39 inches, at Omaha, Neb., on the 14th, and the lowest was 29.11 at Charles City on the 6th. The monthly range was 1.28 inches.

Temperature.—The mean temperature for the State, as shown by the records of 106 stations, was 66.0°, or 3.1° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 64.5°, or 3.1° lower than the normal; Central, 66.1°, or 3.2° lower than the normal; Southern, 67.4°, or 2.8° lower than the normal. The highest monthly mean was 69.8°, at Thurman, in the extreme southwestern part of the State, and the lowest was 61.9°, at Postville, in the extreme northeast. The highest temperature reported was

100°, at Clarinda and Omaha, Neb., on the 30th, and the lowest was 32°, at Matlock and Sibley, on the 15th. The temperature range for the State was 68°.

Humidity.—The average relative humidity for the State at 7 a. m. was 79 per cent, and at 7 p. m. it was 62 per cent. The mean for the month was 71 per cent, or 2 per cent higher than the normal. The highest monthly mean was 76 per cent, at Charles City, and the lowest was 66 per cent, at Sioux City.

Precipitation.—The average precipitation for the State, as shown by the records of 115 stations, was 6.65 inches, or 2.27 inches more than the normal. By divisions the averages were as follows: Northern, 4.87 inches, or 0.44 of an inch more than the normal; Central, 6.99 inches or 2.67 inches more than the normal; Southern, 8.09 inches, or 3.70 inches more than the normal. The greatest amount, 13.82 inches, occurred at Keosauqua, and the least, 3.04 inches, at Mason City. The greatest amount in 24 consecutive hours, 5.06 inches, occurred at Atlantic, on the 6th.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was 85 miles an hour, from the west, at Sioux City, on the 22d.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 62, or about 7 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 45; Davenport, 53; Des Moines, 63; Dubuque, 54; Keokuk, 77; Sioux City, 67; Omaha, Neb., 74.

Tornadoes and Windstorms.—At 8:45 p. m. on the 5th a tornado visited Van Wert, causing a damage of $2,500. On the 12th tornadoes occurred in Iowa, Jones and Jackson Counties; damage, about $5,000. At Williamsburg, the hail accompanying the storm measured from one-half to one and three-fourths inches in diameter.

Nearly all sections of the State experienced violent wind squalls during the night of the 22d-23d. Wind mills, fruit and shade trees and farm buildings were blown down in large numbers. The total damage is difficult to estimate, but in some single localities, for example, Jefferson, the damage is placed at $15,000. Destructive wind squalls occurred in some localities on the night of the 30th.

Miscellaneous Phenomena.—Fog dense, 10th, 24th; Frost, light, 1st, 15th; Hail, Northern Division, 14th, 22d, 24th, 30th; Central Division, 4th, 5th, 11th, 12th, 13th, 30th; Southern Division; Halos, solar or lunar, 1st, 2d, 3d, 16th, 17th, 18th, 22d, 24th, 26th, 29th; Thunderstorms, All days except 10th and 17th.

Rivers.—The Missouri River was moderately high throughout the month but no flood stages occurred. Nearly all of the interior rivers of the southern portion of the State overflowed between the 6th and 10th. In the Nishnabotna the water was said to have been the highest since 1861. The rivers of the northeastern part of the State were highest from the 23d to the 25th, when the stage reached was in some cases said to be the highest in 50 years. Moderate stages prevailed in the Mississippi.

COMPARATIVE DATA FOR THE STATE—JUNE.

YEAR	Temperature				Precipitation					Number of Days		
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	72.7	+3.6	106	44	7.76	+3.39	16.53	1.57	11	12	10	8
1891	69.1	0.0	99	37	5.39	+1.01	12.80	1.08	11	8	10	12
1892	69.2	+0.1	102	42	5.19	+0.81	14.15	0.67	10	12	11	7
1893	71.2	+2.1	100	40	3.91	−0.47	7.56	1.36	8	15	11	4
1894	73.2	+4.1	104	34	7.67	−1.71	6.29	0.57	7	16	10	4
1895	69.7	+0.6	102	34	4.32	−0.06	9.26	0.98	10	11	11	8
1896	69.1	0.0	100	40	3.11	−1.27	7.89	0.81	9	12	13	5
1897	69.1	0.0	103	29	3.81	−0.57	9.59	1.08	10	10	12	8
1898	71.4	+2.3	99	43	4.72	+0.34	12.48	1.90	9	13	10	7
1899	70.7	+1.6	100	42	5.04	+0.66	11.99	1.10	10	12	13	5
1900	69.7	+0.6	102	38	3.98	−0.40	12.55	0.67	8	17	10	3
1901	72.8	+3.2	106	39	3.71	−0.67	7.84	1.05	9	15	11	4
1902	65.2	−3.9	97	32	7.10	+2.78	16.04	1.48	14	8	11	11
1903	64.6	−4.5	99	30	2.80	−1.52	6.04	0.75	10	13	10	7
1904	67.1	−2.0	94	35	3.45	−0.93	8.25	0.44	7	13	10	7
1905	69.2	+0.1	96	36	5.53	+1.15	14.89	1.80	10	13	11	7
1906	67.9	−1.2	99	37	3.92	−0.46	8.27	1.48	8	15	10	5
1907	66.5	−2.6	98	36	5.55	+0.97	9.33	2.07	11	14	9	7
1908	67.1	−2.0	94	35	5.66	+1.28	11.88	1.77	13	13	10	8
1909	69.1	0.0	96	40	6.41	+2.03	13.30	2.80	13	12	10	8
1910	69.5	+0.4	105	33	1.99	−2.39	5.31	0.05	7	18	7	5
1911	75.7	+6.6	108	46	1.82	−2.56	6.28	0.06	5	20	8	2
1912	66.2	−2.9	101	34	2.74	−1.64	5.71	0.78	7	15	9	6
1913	71.5	+2.4	102	33	3.31	−1.07	8.95	0.74	7	19	8	3
1914	72.2	+3.1	101	40	5.87	+1.19	13.24	1.17	13	12	14	4
1915	65.1	−4.0	91	31	4.16	−0.22	9.99	1.72	11	12	12	6
1916	64.5	−4.6	98	28	3.71	−0.67	7.96	1.41	10	13	11	6
1917	66.0	−3.1	100	32	6.65	+2.27	13.82	3.04	13	13	10	7

JULY.

Cool weather prevailed during the first two decades, after which it was warm, with abnormally hot weather the last four days. Precipitation was deficient, but mostly well distributed till the last week of the month, when the drought accompanied by high temperature and hot winds damaged pastures, potatoes and garden truck. Corn which was 10 days to two weeks late at the close of June, made phenomenal growth the last half of July, but in the western part of the State the hot winds of the closing days of the month rolled the leaves considerably in the daytime. However, the abundant soil moisture caused a rapid recovery at night. It was beginning to tassel in all sections on the 31st. The season was generally favorable for small grain which, by the close of the month, was mostly harvested and some threshed, showing large yields and good quality.

Destructive wind squalls attended thunderstorms over Dallas and Polk counties between 7 and 10 p. m. of the 5th, unroofing many residences, uprooting large oak, walnut and linden trees and demolishing farm buildings. The destruction in the extreme western part of Des Moines was unusually large. Excessive rain fell in Allamakee County and adjacent territory in Wisconsin, on the 21st and 22d. At Lansing, the

total precipitation for those days was 5.77 inches, of which 3.65 inches fell in a period of 4 hours and 5 minutes, beginning at 5 p. m. of the 21st.

Pressure.—The mean pressure (reduced to sea level) for the State was 29.92 inches. The highest recorded was 30.16 inches, at Sioux City, on the 16th, and the lowest was 29.58 at Sioux City on the 13th, and at Omaha, Nebr., on the 12th. The monthly range was 0.58 of an inch

Temperature.—The mean temperature for the State, as shown by the records of 101 stations, was 74.3°, or 0.2° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 72.6°, or 0.1° lower than the normal; Central, 74.7°, or 0.4° higher than the normal; Southern, 75.7°, or 0.5° higher than the normal. The highest monthly mean was 79.0°, at Omaha, Nebr., and the lowest was 70.2°, at Postville. The highest temperature reported was 106°, at Clarinda, on the 30th; the lowest was 38°, at Rock Rapids, on the 3d. The temperature range for the State was 68°.

Humidity.—The average relative humidity for the State at 7 a. m. was 78 per cent, and at 7 p. m. it was 54 per cent. The mean for the month was 66 per cent, or 1 per cent lower than the normal. The highest monthly mean was 72 per cent, at Charles City, and the lowest was 57 per cent, at Omaha, Nebr.

Precipitation.—The average precipitation for the State, as shown by the records of 111 stations, was 2.27 inches, or 1.69 inches less than the normal. By divisions the averages were as follows: Northern, 3.28 inches, or 0.60 inch less than the normal; Central, 2.25 inches, or 1.73 inches less than the normal; Southern, 1.28 inches, or 2.74 inches less than the normal. The greatest amount, 6.06 inches, occurred at Nora Springs, and the least 0.23 of an inch at Northboro. The greatest amount in 24 consecutive hours, 3.65 inches, occurred at Lansing, on the 21st.

Wind.—The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau station was 39 miles an hour, from the north, at Sioux City, on the 11th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 81, or 8 per cent more than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 68; Davenport, 76; Des Moines, 90; Dubuque, 72; Keokuk, 87; Sioux City, 87; Omaha, Nebr., 86. Twenty-nine stations reported no cloudy days.

COMPARATIVE DATA FOR THE STATE—JULY.

YEAR	Temperature				Precipitation					Number of Days		
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	75.6	+1.5	110	45	1.98	−1.98	5.00	0.37	3	18	8	5
1891	68.5	−5.6	99	41	4.22	+0.26	8.23	1.67	8	13	13	5
1892	73.0	−1.1	104	38	5.29	+1.33	12.80	1.71	9	16	10	5
1893	75.0	+0.9	102	47	3.33	−0.63	8.84	1.49	7	19	10	2
1894	76.4	+2.3	109	39	0.63	−3.33	3.50	T	3	22	8	1
1895	72.1	−2.0	104	35	3.40	−0.56	10.10	0.45	7	16	12	4
1896	73.6	−0.5	104	42	6.90	+2.94	12.67	1.61	9	14	11	6
1897	75.6	+1.5	106	42	3.26	−0.70	7.60	1.01	6	18	10	3
1898	73.4	−0.7	102	42	2.98	−0.98	12.88	0.55	7	19	9	3
1899	73.1	−1.0	101	38	3.07	−0.89	8.66	0.42	7	16	10	5
1900	73.4	−0.7	102	37	6.15	+2.19	18.45	1.80	9	16	10	5
1901	82.4	+8.3	113	46	2.34	−1.62	5.97	0.27	5	21	9	1
1902	73.1	−1.0	99	41	8.67	+4.71	13.57	4.82	13	14	10	7
1903	72.9	−1.2	100	40	4.83	+0.87	12.73	0.94	9	17	9	5
1904	70.6	−3.5	100	38	4.41	+0.45	11.97	1.28	10	16	9	6
1905	70.6	−3.5	102	40	2.91	−1.05	7.08	0.69	9	14	10	7
1906	70.9	−3.2	102	42	3.04	−0.92	7.06	0.26	8	18	10	3
1907	73.7	−0.4	102	41	7.27	+3.31	13.66	3.97	13	16	11	4
1908	73.0	−1.1	100	42	3.66	−0.30	9.21	0.79	8	16	10	5
1909	72.3	−1.8	102	46	4.77	+0.81	12.30	1.29	10	15	8	8
1910	74.5	−0.4	108	43	1.86	−2.10	5.62	0.12	7	19	8	4
1911	75.5	+1.4	111	38	2.27	−1.69	6.62	0.08	7	18	10	3
1912	74.6	+0.5	103	38	3.71	−0.25	7.56	1.17	10	17	10	4
1913	76.1	+2.0	108	45	1.92	−2.14	6.23	T	5	21	8	1
1914	76.6	+2.5	109	43	2.27	−1.69	6.50	0.44	5	20	8	3
1915	69.5	−4.6	92	40	8.32	+4.36	15.83	3.68	14	10	12	9
1916	79.7	+5.6	105	48	1.78	−2.18	6.87	0.10	5	22	7	1
1917	74.3	+0.2	106	38	2.27	−1.69	6.06	0.23	7	21	8	2

Miscellaneous Phenomena.—Aurora, 11th, 28th, 29th; Fog, 7th, 9th; Hail, Northern Division, 12th, 14th, 16th, 23d; Central Division, 15th, 18th; Southern Division, 12th, 13th, 15th, 20th; Thunderstorms, All days, except 3d, 7th, 9th, 19th, 27th and 28th.

Rivers.—Ample stages for navigation continued throughout the month in the Mississippi River; and moderately high stages in the Missouri River till toward the close of the month when a steady fall began. The interior rivers fell steadily and became rather low by the close of the month.

AUGUST.

Droughty conditions that prevailed at the close of July were relieved by frequent and quite general showers during the first 12 days of August, followed by a nearly rainless week, after which only occasional local rains occurred. In many sections, particularly the south-central and southeastern, pastures had become brown and bare from drought and grasshoppers long before the close of the month, and stock was being fed. In the corn fields where a large supply of moisture had been stored earlier in the season and conserved by cultivation, the crop suffered little, though it would have been benefited by an additional supply. After the 4th, temperatures, especially at night, were generally so low that

the crop made slow progress and only the earliest fields had reached the roasting ear stage by the close of the month. Threshing was 80 per cent finished, the yield and quality of all grains being exceptionally good and that of oats being the largest of record. Late potatoes and truck crops suffered somewhat from lack of moisture. Very little fall plowing could be done.

Pressure.—The mean pressure (reduced to sea level) for the State was 30.01 inches. The highest recorded was 30.32 inches, at Omaha, Nebr., on the 2d, and the lowest was 29.69, at Dubuque, on the 24th. The monthly range was 0.63 of an inch.

Temperature.—The mean temperature for the State, as shown by the records of 108 stations, was 69.4°, or 2.4° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 68.0°, or 2.4° lower than the normal; Central, 69.6°, or 2.1° lower than the normal; Southern, 70.7°, or 2.5° lower than the normal. The highest monthly mean was 74.1°, at Mt. Ayr, and the lowest was 65.4°, at Postville. The highest temperature reported was 102°, at Lenox, on the 4th, and the lowest was 31°, at Matlock, on the 28th. The temperature range for the State was 71°.

Precipitation.—The average precipitation for the State, as shown by the records of 114 stations, was 2.29 inches, or 1.39 inches less than the normal. By divisions the averages were as follows: Northern, 2.21 inches, or 1.27 inches less than the normal; Central, 2.31 inches, or 1.46 inches less than the normal; Southern, 2.35 inches, or 1.43 inches less than the normal. The greatest amount, 6.31 inches, occurred at Onawa, and the least, 0.70 of an inch, at Davenport. The greatest amount in 24 hours, 2.80 inches, occurred at Olin, on the 7th.

Humidity.—The average relative humidity for the State at 7 a. m. was 80 per cent, and at 7 p. m. it was 54 per cent. The mean for the month was 67 per cent, or 4 per cent lower than the normal. The highest monthly mean was 74 per cent, at Charles City, and the lowest was 68 per cent, at Omaha, Nebr.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 42 miles an hour, from the east, at Sioux City, on the 6th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 71, or about normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 60; Davenport, 72; Des Moines, 70; Dubuque, 74; Keokuk, 74; Sioux City, 77; Omaha, Nebr., 72.

Miscellaneous Phenomena.—Aurora, 8th, 9th, 14th, 15th, and 25th, those of the 9th and 25th being particularly bright in some sections of the State; Fog, 12th, 13th, 14th, 15th, 16th, 17th, 20th, 21st, 22d, 23d and 27th; Frost, 10th, 28th, 30th; Hail, Northern Division, 19th; Central Division, 21st and 27th; Southern Division, 21st; Halos, (lunar or solar), 15th, 21st, 27th and 28th; Thunderstorms, All days except 3d, 10th, 13th, 14th, 15th, 16th, 18th, 24th, 28th, 29th, and 30th.

Rivers.—The rivers fell slowly and steadily and were generally quite low by the close of the month.

COMPARATIVE DATA FOR THE STATE—AUGUST.

YEAR	Temperature				Precipitation					Number of Days		
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	68.4	−3.4	102	36	3.41	−0.27	6.44	1.06	8	15	10	6
1891	69.1	−2.7	100	34	4.24	−0.56	13.02	1.23	8	13	12	6
1892	71.4	−0.4	102	40	2.24	−1.34	4.60	0.65	5	18	9	4
1893	69.4	−2.4	101	30	2.32	−1.26	6.22	0.40	5	19	9	3
1894	74.5	+2.8	108	38	1.58	−2.10	4.53	T	4	21	8	2
1895	71.9	+0.1	103	37	4.43	+0.75	10.63	0.67	7	17	9	5
1896	71.7	−0.1	104	34	3.32	−0.16	12.25	0.80	8	15	11	5
1897	68.9	−2.9	104	35	1.86	−1.62	4.98	0.47	6	15	11	5
1898	71.2	−0.6	103	40	2.44	−0.24	10.55	0.58	6	17	9	5
1899	74.4	+2.6	100	41	3.68	0.00	10.43	1.12	7	17	10	4
1900	77.4	+5.6	103	44	4.65	+0.97	10.42	1.28	8	18	10	3
1901	73.8	+2.0	105	40	1.29	−2.39	4.46	T	5	20	9	2
1902	69.1	−2.7	98	37	6.38	+2.90	15.47	1.57	11	11	11	9
1903	69.1	−2.7	101	41	5.64	+2.06	17.74	2.55	11	12	10	9
1904	69.1	−2.7	97	35	3.43	−0.25	6.75	0.66	7	17	8	6
1905	74.3	+2.5	104	44	4.66	+0.37	8.47	1.04	9	18	9	4
1906	74.1	+2.3	101	33	2.96	+0.27	10.51	0.92	9	17	9	5
1907	71.1	−0.7	99	37	4.32	+0.65	9.67	1.05	9	17	9	5
1908	70.0	−1.8	101	38	4.77	+1.09	10.50	1.25	9	17	9	5
1909	76.1	+4.3	103	33	1.31	−1.87	8.21	T	5	21	8	2
1910	71.9	+0.1	104	38	5.86	+0.90	11.22	0.37	8	15	10	6
1911	71.7	−0.1	107	34	3.32	−0.36	9.47	0.44	9	16	10	5
1912	71.9	−0.8	101	40	3.78	+0.10	7.90	0.80	10	15	10	6
1913	78.6	+4.8	108	40	2.68	−1.00	7.13	0.08	8	17	10	4
1914	73.7	+1.9	103	40	3.19	−1.49	4.90	0.42	7	17	10	4
1915	65.9	−5.9	93	30	2.81	−0.97	9.14	0.27	8	16	8	7
1916	74.0	+2.2	106	35	2.58	−1.10	6.23	0.49	7	18	9	4
1917	69.4	−2.4	102	31	2.29	−1.39	6.31	0.79	7	19	8	4

SEPTEMBER.

Temperatures were below normal in nearly all sections of the state, except a few stations in the western portion which reported slight excesses. A cool wave brought heavy to killing frosts to the lowlands of the northern and eastern sections on the morning of the 11th with freezing or near freezing temperatures at several stations, and considerable damage to corn, potatoes and other late crops. During a warm period that followed, the highest temperatures of the month occurred in the northern division on the 15th, though the high point was reached in the central and southern divisions on the 5th. It was during the 6-day period, 13th-18th, that corn made its best progress, but during most of the month the deficient temperature and sunshine made its progress very slow. At the close of the month, less than two-thirds of the crop was safe from on ordinary killing frost; and part of that was susceptible to serious damage by freezing temperatures. It was most backward in the northeastern one-third of the State and nearly all safe in the extreme southwestern section. Much more than the usual amount was saved in silo and shock, to offset the general hay shortage; and much good seed corn was gathered.

In the region west of the divide between the Missouri and Des Moines rivers and in Story, Polk, northern Warren, Mahaska, Wapello, and Davis

counties, precipitation was greatly deficient so that little or no fall plowing could be done and less than the usual acreage of winter wheat and rye could be sown. Just east of the divide from Greene southeastward to Lucas counties and in the eastern counties from Clinton and Cedar to Henry and Des Moines, there was a marked excess in precipitation. In other sections the precipitation was about normal in frequency and amount. There was a marked increase in the acreage of winter grains sown in the northern division. In the southern division the acreage, where conditions were favorable, was about the same as that sown in 1916.

In the areas of deficient precipitation, pastures failed, stock was extensively fed, and the potato crop will be moderate to light.

Pressure.—The mean pressure (reduced to sea level) for the State was 30.09 inches. The highest recorded was 30.63 inches, at Dubuque, on the 10th, and the lowest was 29.75 inches, at Sioux City, on the 27th. The monthly range was 0.88 inch.

Temperature.—The mean temperature for the State, as shown by the records of 102 stations, was 62.6°, or 0.8° below the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 60.6°, or 1.2° below the normal; Central, 62.6°, or 0.9° below the normal; Southern, 64.6°, or 0.4° below the normal. The highest monthly mean was 66.2°, at Northboro, and the lowest was 58.3°, at Decorah, Estherville, and Postville. The highest temperature reported was 97°, at Clarinda, on the 3d; the lowest was 28°, at Sibley, on the 27th. The range for the State was 69°.

Precipitation.—The average precipitation for the State, as shown by the records of 106 stations, was 2.90 inches, or 0.46 inch less than the normal. By divisions, the averages were as follows: Northern, 2.85 inches, or 0.20 inch less than the normal; Central, 3.03 inches, or 0.43 inch less than the normal; Southern, 2.81 inches, or 0.75 inch less than the normal.

The greatest amount, 8.68 inches, occurred at St. Charles, and at least, 0.39 inch, at Audubon. The greatest amount in 24 consecutive hours, 5.74 inches, occurred at St. Charles on the 4th.

Humidity.—The average relative humidity for the State at 7 a. m. was 85 per cent, and at 7 p. m. 65 per cent. The mean for the month was 75 per cent, or 1 per cent higher than the normal. The highest monthly mean was 80 per cent, at Charles City, and the lowest was 71 per cent at Omaha, Nebr.

Wind.—The prevailing direction of the wind was from the southeast. The highest velocity reported from a regular Weather Bureau Station was 40 miles an hour from the west, at Sioux City on the 18th.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 59 per cent, or 4 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 48; Davenport, 59; Des Moines, 54; Dubuque, 63; Keokuk, 69; Sioux City, 54; Omaha, Nebr., 67.

Miscellaneous Phenomena.—Fog, 9th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 20th, 21st, 22d, 26th, 27th; Frost, 10th, 11th, 22d, 25th, 26th, 27th, 30th; Hail, Northern Division, none; Central Division, 3d, 4th, 5th; Southern Division, 3d. Halos, (lunar or solar) 2d, 6th, 25th; Haze, 1st, 3d, 4th, 5th, 15th, 16th, 27th; Smoke, 16th, 17th, 18th, 26th; Thunderstorms, 1st, 2d, 3d, 4th, 5th, 6th, 7th, 9th, 11th, 12th, 13th, 14th, 15th, 18th, 19th, 20th, 23d, 25th, 26th, 27th.

Rivers.—The rivers generally were nearly stationary and at rather low stages throughout the month. In the upper Mississippi, the stages were so low as to interfere to some extent with navigation.

Destructive Hailstorm.—Probably the most destructive storm of hail, wind and lightning of the season occurred in Keokuk County, on Monday, September 3d. The storm began in Washington Township in the vicinity of Springfield near the middle of the west line of the County about 7 o'clock p. m. and moved east-south-eastward through Van Buren and German Townships to Clear Creek Township on the east side. The path of the storm was from 2 to 4 miles wide and about 20 miles long, the destruction of crops being complete over much of that area. Scores of farmers lost 100 acres or more of corn each. While most of the damage resulted from hail, there was also much damage to houses, barns, silos, and other structures by wind and lightning. There was much loss of live stock. The hail stones were so large that they cut through wire window screens and in some cases broke the siding of houses. Very few window panes in the path of the storm remained unbroken. One hail stone measured 6 inches in circumference.

COMPARATIVE DATA FOR THE STATE—SEPTEMBER

YEAR	Temperature				Precipitation				Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	With prec. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	59.3	−4.1	96	23	2.97	−0.39	4.85	1.36	7	13	10	7
1891	67.3	+3.9	104	28	1.33	−2.06	3.60	0.13	4	20	7	3
1892	64.7	+1.2	99	29	1.53	−1.83	4.15	0.16	4	16	8	6
1893	64.7	+1.5	102	18	2.34	−1.02	5.49	0.74	4	20	6	4
1894	65.1	+1.7	100	35	3.57	+0.21	7.42	0.67	8	15	10	5
1895	56.8	+3.4	102	22	3.03	−0.33	7.42	0.85	5	18	8	4
1896	58.5	−4.9	95	22	4.09	+0.73	9.96	1.82	10	11	9	10
1897	70.9	+7.5	106	26	2.64	−1.32	5.88	0.00	4	23	5	3
1898	65.3	+1.9	99	29	2.69	−0.67	8.45	0.41	7	16	9	5
1899	62.5	−0.9	104	15	0.96	−2.43	4.32	T	4	16	9	5
1900	64.4	+1.0	99	26	4.98	+1.62	8.82	2.48	9	13	8	7
1901	63.3	−0.1	102	26	4.77	+1.41	13.02	1.71	9	13	9	9
1902	59.1	−4.3	98	23	4.35	+0.99	10.41	1.45	9	15	6	9
1903	60.8	−2.6	94	28	2.81	+0.45	8.79	1.42	10	14	6	10
1904	64.9	+0.6	94	30	2.78	−0.58	8.33	0.09	7	13	8	9
1905	65.8	+2.4	96	36	3.81	+0.45	13.18	0.50	8	14	8	8
1906	67.2	+3.8	100	27	4.16	+0.80	11.10	0.64	8	16	8	6
1907	62.8	−0.6	98	25	2.75	−1.61	6.06	1.38	8	15	9	6
1908	67.9	+4.5	98	20	1.20	−2.16	2.46	0.25	3	21	6	4
1909	62.4	−1.0	94	30	5.58	+2.22	7.34	1.39	9	17	8	5
1910	63.2	−0.2	99	30	3.59	+0.23	7.43	1.18	9	14	7	9
1911	65.8	+2.4	102	32	5.12	+1.76	13.73	1.19	10	11	9	10
1912	62.1	−1.3	104	24	3.98	+0.62	10.13	0.28	11	12	8	10
1913	64.5	+1.1	107	19	3.31	−0.05	7.44	0.45	9	15	8	7
1914	64.5	+1.1	99	30	7.58	+4.02	16.24	2.48	10	16	7	7
1915	63.7	+0.3	91	30	6.03	+2.67	12.45	2.88	11	11	8	11
1916	62.5	−0.9	98	21	3.89	+0.53	9.71	1.45	7	17	8	5
1917	62.6	−0.8	97	28	2.90	−0.46	8.68	0.39	7	15	7	8

OCTOBER.

October, 1917, was 3.1° colder than October, 1895, which has heretofore been the coldest since state-wide records began in 1890. Killing frosts visited some sections of the State on the 1st, all but the southwest portion on the 6th, and all sections on the 8th. During a well defined cold wave that swept over the State on the 28th-30th, the temperature fell nearly to zero in the northern and western counties, the lowest being just zero at Galva. Precipitation was deficient, except in a few northeast and east-central counties. A general snowstorm on the 28th-29th was remarkably heavy for the season in the northeastern counties. Cloudiness was nearly the greatest of record; and sunshine was correspondingly deficient, particularly in the northeastern portion of the State where it was less than one-third of the possible amount.

Corn was seriously damaged by the unfavorable conditions; very little of it was fit to crib at the close of the month; that which was cribbed, heated so that it had to be dried and sorted; much soft corn in the fields, molded; and seed corn gathered since the freezes shows very low germination tests. Germination and growth of winter grains was much retarded. Less than the usual amount of fall plowing was done. Apples on the trees and potatoes in the ground were damaged in some sections. A few localities reported deficient water supply.

Pressure.—The mean pressure (reduced to sea level) for the State was 30.03 inches. The highest recorded was 30.59 inches, at Sioux City, on the 23d, and the lowest was 29.32 inches, at Davenport, on the 26th. The monthly range was 1.27 inches.

Temperature.—The mean temperature for the State, as shown by the records of 102 stations, was 42.9°, or 7.9° below the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 40.8°, of 8.2° below the normal; Central, 42.5°, or 8.0° below the normal; Southern, 45.1°, or 7.5° below the normal. The highest monthly mean was 47.8°, at Northboro, and the lowest 38.1°, at Northwood. The highest temperature reported was 85°, at Mason City, on the 2d; the lowest was 0°, at Galva, on the 30th. The range for the State was 85°.

Precipitation.—The average precipitation for the State, as shown by the records of 108 stations, was 1.41 inches, or 1.05 inches less than the normal. By divisions the averages were as follows: Northern, 1.31 inches, or 1.03 inches less than the normal; Central, 1.49 inches, or 1.00 inch less than the normal; Southern, 1.44 inches, or 1.10 inches less than the normal. The greatest amount, 4.00 inches, occurred at Davenport, and the least, 0.15 inch, at Rock Rapids. The greatest amount in 24 consecutive hours, 2.02 inches, occurred at Davenport on the 16th-17th.

Humidity.—The average relative humidity for the State at 7 a. m. was 75 per cent, and at 7 p. m., 55 per cent. The mean for the month was 65 per cent, or 6 per cent below the normal. The highest monthly mean was 77 per cent, at Charles City, and the lowest, 54 per cent, at Omaha, Nebr.

Snow.—The first light snow flurries of the season occurred in nearly all portions of the State on the 11th. Other snows covered portions of the State on the 22d-23d and 26th-27th, but the first large, general snow storm occurred on the 28th-29th, when the amount varied from 11.0 inches at Decorah in the northeast to none at Rock Rapids in the extreme northwest and Thurman in the southwest. At Decorah this snowfall is said to be the greatest in October for more than 40 years.

The average fall for the month for the whole State is 2.2 inches which has been exceeded but twice since 1892. The greatest monthly amount is 12.5 inches at Decorah.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was 57 miles an hour from the northwest, at Sioux City, on the 22d.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 44, or 17 per cent below the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 19; Davenport, 41; Des Moines, 51; Dubuque, 38; Keokuk, 45; Sioux City, 54; Omaha, Nebr., 59.

Miscellaneous Phenomena.—Fog: 1st, 2d, 6th, 11th, 17th, 18th, 19th, 24th, 25th, 28th, 29th.

Frost: 1st, 6th, 8th (not recorded after first killing).

Hail: 9th, 10th, 11th, 17th, 18th, 20th.

Halos (lunar or solar). 2d, 3d, 4th, 7th, 8th, 19th, 24th, 26th, 30th.

Sleet: 9th, 11th, 28th, 29th.

Thunderstorms: 2d, 9th, 16th, 17th, 18th, 25th.

Rivers.—The rivers remained nearly stationary during the month.

COMPARATIVE DATA FOR THE STATE—OCTOBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snow fall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	49.2	—1.6	86	16	3.48	+1.02	6.82	1.59	-----	7	11	11	9
1891	50.6	—0.8	92	19	2.77	+0.31	6.53	0.85	-----	6	18	7	6
1892	54.5	+3.7	96	14	1.55	—0.91	2.58	0.60	0.0	4	21	6	4
1893	52.4	+1.6	94	10	1.28	—1.18	4.56	0.02	0.0	4	16	9	6
1894	51.7	+0.9	90	20	2.47	+0.21	5.25	0.03	0.2	8	14	8	9
1895	46.0	—4.8	88	4	0.47	—1.99	1.38	0.00	T.	3	19	8	4
1896	47.9	—2.9	88	12	3.15	+0.67	5.05	1.51	T.	5	18	6	7
1897	50.8	+0.0	97	12	1.14	—1.32	3.30	0.02	0.0	4	17	8	6
1898	47.5	—3.3	88	17	3.56	+1.10	5.75	1.27	3.6	8	7	9	15
1899	50.7	+5.9	95	17	1.72	—0.73	4.64	0.15	0.0	5	17	8	6
1900	50.3	+8.5	90	21	3.91	+1.45	8.00	1.20	0.0	7	16	7	8
1901	54.3	+3.4	88	20	1.98	—0.48	4.23	0.45	T.	6	17	7	7
1902	52.5	+2.7	93	20	2.54	+0.08	6.66	0.28	T.	5	16	8	7
1903	52.2	+1.4	90	18	1.95	—0.51	4.50	0.32	0.0	5	19	6	6
1904	53.1	+2.3	96	16	1.67	—0.79	4.43	0.14	T.	6	15	8	8
1905	49.2	—1.6	95	16	3.40	+0.94	5.36	1.20	1.6	8	16	6	9
1906	50.5	—0.3	87	7	1.96	—0.50	4.25	0.50	0.1	6	14	7	10
1907	50.4	—0.4	85	10	1.59	—0.96	3.71	0.30	0.0	5	20	5	6
1908	51.1	+0.3	92	17	3.28	+0.92	8.83	0.58	2.6	8	16	6	9
1909	49.7	—1.1	97	10	2.23	—0.24	4.70	0.43	T.	6	16	6	9
1910	55.2	+4.4	93	10	0.77	—1.69	1.73	T.	0.1	4	21	4	6
1911	48.7	—2.1	87	14	3.84	+0.88	7.02	0.73	0.6	10	12	8	11
1912	52.2	+1.4	92	16	2.98	+0.52	5.77	1.03	T.	6	21	3	7
1913	49.2	—1.6	89	—2	3.03	+0.57	7.29	0.35	1.2	9	15	8	8
1914	55.9	+5.1	88	14	3.23	+0.77	6.64	0.74	T.	9	16	6	9
1915	54.4	+3.6	86	19	1.51	—1.15	3.25	T.	T.	5	19	6	6
1916	50.9	+0.1	92	0	2.00	—0.46	4.33	0.20	2.0	8	16	7	7
1917	45.9	—7.9	85	0	1.41	—1.05	4.00	0.15	2.2	6	10	11	10

T indicates an amount too small to measure, or less than .005 inch rainfall, and less than .05 inch snowfall.

NOVEMBER.

The weather was mild and dry. The full magnitude of the damage to corn by the frosts and freezes of October, became apparent when cribbing was attempted in November. In spite of favorable conditions for drying, the husked corn, though carefully sorted, heated in the cribs so badly that it had to be spread out to dry. Husking ceased generally the last week of the month with 43 per cent of the crop still in the fields; and unusual methods were adopted to save it. Many cattle and hogs were shipped into the State to consume the soft corn.

Because of the cold in October and drought in November, winter wheat made slow growth and is not entering the winter in resistant condition. Where it has germinated, the stand is fair, but up to the close of November many fields had not yet germinated.

Pressure.—The mean pressure (reduced to sea level) for the State was 30.21 inches. The highest recorded was 30.66 inches at Davenport on the 26th, and the lowest was 29.47 inches, at Dubuque, on the 21st. The monthly range was 1.19 inches.

Temperature.—The mean temperature for the State, as shown by the records of 102 stations, was 40.7°, or 5.7° above the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 39.2°, or 6.4° above the normal; Central, 40.8°, or 5.7° above the normal; Southern, 42.0°, or 4.9° above the normal. The highest monthly mean was 45.8° at Omaha, Nebr., and the lowest was 36.3° at Elkader and Estherville. The highest temperature reported was 77° at Indianola on the 7th; the lowest was 3° at Whitten on the 24th. The range for the state was 74°.

Precipitation.—The average precipitation for the State, as shown by the records of 108 stations, was 0.28 inch, or 1.23 inches below the normal. By divisions the averages were as follows: Northern, 0.41 inch, or 1.00 inch below the normal; Central, 0.28 inch, or 1.25 inches less than the normal; Southern, 0.14 inch, or 1.23 inches less than the normal. The greatest amount, 1.02 inches, occurred at Sanborn, and the least, a trace, at Charlton, Cumberland, Greenfield, and Maquoketa. The greatest amount in 24 consecutive hours, 0.60 inch, occurred at Rock Rapids on the 21st.

Humidity.—The average relative humidity for the State at 7 a. m. was 83 per cent, and at 7 p. m. 68 per cent. The mean for the month was 76 per cent, or 2 per cent above the normal. The highest monthly mean was 84 per cent, at Charles City, and the lowest, 66 per cent, at Omaha, Nebr.

Snow.—The average fall for the whole State was 1.4 inches. The greatest amount was 5.0 inches, at Sanborn.

Wind.—The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau station was 50 miles an hour from the northwest, at Sioux City on the 21st.

Sunshine and Cloudiness.—The average per cent of the possible amount of sunshine was 49, or 5 per cent below the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 40; Davenport, 41; Des Moines, 53; Dubuque, 46; Keokuk, 49; Sioux City, 55, and Omaha, Nebr., 58.

Miscellaneous Phenomena.—*Fog:* 3d, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 20th, 24th, 25th, 26th, 27th, 28th, 29th, 30th.

Glaze: 30.

Haze: 4th, 5th, 7th, 9th, 10th, 11th, 14th, 15th, 16th, 17th, 18th.

Halos: (solar or lunar): 10th, 19th, 24th, 25th, 29th.

Sleet: 24th, 25th, 26th, 30th.

Thunderstorms: 9th, 10th, 11th, 21st.

Rivers.—Rivers remained nearly stationary and at a low stage during the month

COMPARATIVE DATA FOR THE STATE—NOVEMBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With prec. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	38.6	+3.6	78	— 2	1.46	—0.05	3.55	0.71	.....	3	15	8	7
1891	30.5	—4.5	84	—24	1.70	+0.19	3.64	0.06	.....	7	10	8	12
1892	33.3	—1.7	70	— 3	1.10	—0.41	3.16	0.05	1.8	4	11	8	11
1893	34.0	—1.0	66	—13	1.17	—0.34	2.26	0.06	4.6	4	16	8	6
1894	32.7	—2.3	72	— 5	0.92	—0.59	2.42	T	0.4	4	9	11	10
1895	34.3	—0.7	86	—12	1.51	0.00	3.01	0.45	4.9	6	9	8	13
1896	29.6	—5.4	82	—15	1.83	+0.32	4.51	0.16	2.9	6	9	8	13
1897	34.3	—0.7	81	—19	0.66	—0.85	2.24	T	1.2	5	12	8	10
1898	32.2	—2.8	78	—17	1.50	—0.01	3.61	0.33	8.7	6	14	8	8
1899	43.9	+8.9	86	— 8	1.20	—0.31	2.97	0.13	0.5	5	12	8	10
1900	33.5	—1.5	79	— 6	1.06	—0.45	3.35	T	2.7	6	12	7	11
1901	35.8	+0.8	77	2	0.86	—0.65	2.50	0.20	2.6	3	18	6	6
1902	41.2	+6.2	79	4	2.13	+0.62	4.19	0.18	1.8	7	9	7	14
1903	34.2	—0.8	76	— 5	0.52	—0.99	1.74	T	1.1	3	13	8	9
1904	41.0	+6.0	80	4	0.15	—1.36	0.50	0.00	0.5	1	20	6	4
1905	38.4	+3.4	70	—12	2.84	+1.33	5.20	0.90	0.6	5	16	7	7
1906	35.4	+0.4	76	— 5	2.03	+0.52	3.86	0.35	4.4	8	9	7	14
1907	36.7	+1.7	69	— 4	1.66	—0.48	2.27	0.05	0.9	4	17	6	7
1908	39.3	+4.3	80	5	1.55	+0.05	3.31	0.23	1.4	5	13	7	9
1909	42.4	+7.4	84	— 3	5.39	+3.88	11.48	2.07	6.8	10	10	7	13
1910	33.4	—1.6	76	5	0.34	—1.17	1.03	T	0.7	3	13	9	8
1911	29.9	—5.1	79	— 8	1.42	—0.09	4.99	0.11	1.6	6	11	8	11
1912	40.1	+5.1	77	6	0.98	—0.53	2.38	0.00	T	2	18	8	4
1913	44.1	+9.1	78	10	1.18	—0.33	3.49	0.20	0.4	6	11	7	12
1914	41.9	+6.9	80	— 4	0.22	—1.29	0.95	0.00	T	2	19	6	5
1915	40.2	+5.2	83	— 6	1.96	+0.43	4.86	0.30	1.2	6	11	10	9
1916	37.3	+3.3	80	— 8	1.61	+0.10	3.65	0.05	3.6	5	16	6	8
1917	40.7	+5.7	77	3	0.88	—1.23	1.62	T	1.4	3	14	6	10

T indicates an amount too small to measure, or less than .005 inch precipitation and less than .05 inch snowfall.

DECEMBER.

December, 1917, mean temperature, 14.5°, is the lowest in the 28 years of state-wide records, the next coldest being 15.1° in December, 1909. Zero days were the most frequent of record. The largest temperature deficiencies were in the northwestern portion of the State. Sunshine was deficient, particularly in the eastern portion. Precipitation was deficient, except in portions of Lyon, Sioux, O'Brien, Cherokee, Webster and Hamilton counties. The ground was snow-covered about 25 days in the extreme northwestern portion of the State, and less than 15 days in the southwestern and east-central counties.

Although weather conditions seemed unfavorable, corn husking progressed, so that at the close of the month not more than 15 per cent of the crop remained in the field. Conditions were favorable for cribbed corn. Though severe temperatures prevailed for considerable periods, they were preceded and accompanied by porous snow covering, so it is believed that such winter wheat as was well established at the beginning of winter, is in good condition.

Pressure.—The mean pressure (reduced to sea level) for the State was 30.26 inches. The highest recorded was 31.09 inches, at Sioux City on the 29th, and the lowest was 29.63 inches at Sioux City on the 23d. The monthly range was 1.47 inches.

Temperature.—The mean temperature for the State, as shown by the means of 105 stations, was 14.5°, or 9.4° lower than the normal. By divisions, three tiers of counties to the division, the mean temperatures were as follows: Northern, 11.2°, or 10.6° lower than the normal; Central, 14.7°, or 9.4° lower than the normal; Southern, 17.6°, or 8.8° lower than the normal. The highest monthly mean was 20.9°, at Keokuk, and the lowest monthly mean was 6.3° at Inwood. The highest temperature reported was 62°, at Keokuk on the 2d, and the lowest temperature reported was -40° at Washta on the 29th, the range for the State being 102°.

Humidity.—The average relative humidity for the State at 7 a. m. was 83 per cent, and at 7 p. m. it was 77 per cent. The mean for the month was 80 per cent, or about normal. The highest monthly mean was 86 per cent at Charles City, and the least reported was 74 per cent at Omaha, Nebr.

Precipitation.—The average precipitation for the State, as shown by the records of 110 stations, was 0.56 inch, or 0.66 inch less than the normal. By divisions, the averages were as follows: Northern, 0.51 inch, or 0.56 inch less than the normal; Central, 0.63 inch, or 0.62 inch less than the normal; Southern, 0.54 inch, or 0.81 inch less than the normal. The greatest amount, 1.70 inches, occurred at Lacona, and the least, 0.14 inch, at Algona. The greatest amount in any 24 consecutive hours, 0.45 inch, occurred at Iowa Falls, on the 12th.

Snow.—The average snowfall for the State was 6.7 inches. The greatest amount, 17.0 inches, occurred at Lacona, and the least, 1.8 inches at Lenox.

Wind.—The prevailing direction of the wind was from the northwest. The highest velocity reported was at the rate of 51 miles an hour from the northwest at Sioux City, on the 9th.

Sunshine and Cloudiness.—The average percentage of the possible amount of sunshine was 38 per cent, or about 11 per cent less than the normal. The percentage of the possible amounts being: Charles City, 28; Davenport, 20; Des Moines, 46; Dubuque, 40; Keokuk, 44; Sioux City, 45; and Omaha, Nebr., 40 per cent. The average number of clear days was 10; partly cloudy, 9; cloudy, 12.

COMPARATIVE DATA FOR THE STATE—DECEMBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snow fall	With precipitation .01 in.	Clear	Partly cloudy	Cloudy
1890	29.1	+5.2	72	—18	0.45	—0.77	1.40	0.00	------	3	17	7	7
1891	32.3	+8.4	72	—14	2.41	+1.19	4.50	1.21	------	6	14	9	8
1892	18.9	—5.0	68	—29	1.65	+0.43	3.04	0.20	10.9	8	9	8	14
1893	22.0	—1.9	70	—21	1.31	+0.09	2.80	0.46	7.6	7	10	9	12
1894	30.1	+6.2	73	—17	0.95	—0.27	1.75	0.25	1.3	3	15	6	10
1895	25.4	+1.5	63	—16	1.63	+0.41	5.74	0.00	4.1	5	11	9	11
1896	30.8	+6.9	70	—10	0.65	—0.67	1.79	T	1.6	4	10	8	13
1897	18.0	—5.9	60	—25	1.65	+0.43	3.22	0.61	15.9	6	11	7	13
1898	18.1	—5.8	60	—25	0.48	—0.74	1.70	T	3.9	3	15	8	8
1899	22.6	—1.3	75	—19	1.61	+0.39	4.28	0.10	4.3	5	12	9	10
1900	20.9	+3.0	63	—10	0.45	—0.77	2.70	T	2.4	4	13	6	12
1901	20.5	—3.4	64	—31	0.93	—0.29	2.75	0.05	5.4	6	10	9	12
1902	20.1	—3.8	59	—20	2.23	+1.01	5.51	0.67	12.9	8	9	6	16
1903	19.6	—4.3	58	—27	0.41	—0.81	1.90	T	3.7	4	11	9	11
1904	23.4	—0.5	67	—19	1.44	+0.22	3.68	0.06	12.3	5	12	7	12
1905	27.0	+3.1	62	—11	0.62	—0.70	1.69	T	4.2	3	19	6	6
1906	25.7	+1.8	65	— 9	1.43	+0.11	2.81	0.37	1.4	6	11	7	13
1907	29.8	+4.9	62	+ 9	1.00	—0.22	2.28	0.05	4.7	5	10	7	14
1908	27.2	+3.3	67	—17	0.57	—0.65	2.07	0.05	3.8	3	15	8	8
1909	15.1	—8.8	60	—26	2.18	+0.96	6.10	0.89	12.7	11	10	5	16
1910	23.4	—0.3	57	—14	0.37	—0.85	1.39	0.01	3.0	3	15	7	9
1911	27.9	+4.0	60	—24	2.67	+1.35	4.43	0.62	12.6	7	13	6	12
1912	29.2	+5.3	64	—13	0.74	—0.48	1.75	0.10	1.1	3	18	7	6
1913	32.0	+8.1	65	—13	1.02	—0.20	4.73	0.00	1.3	4	15	5	11
1914	15.7	—8.2	63	—31	1.30	+0.80	2.24	0.57	11.1	9	10	6	15
1915	25.9	+1.1	56	—10	0.69	—0.53	1.70	T	4.6	5	11	8	12
1916	18.7	—5.2	67	—25	1.04	—0.18	2.00	0.25	6.7	6	15	8	8
1917	14.5	—9.4	62	—40	0.56	—0.66	1.79	0.14	6.7	6	10	9	12

T indicates an amount too small to measure, or less than .005 inch precipitation and less than .05 inch snowfall.

Miscellaneous Phenomena.—Fog: 1st, 2d, 3d, 7th, 16th, 17th, 18th, 19th, 20th, 22d, 23d.

Halos (lunar or solar): 2d, 3d, 5th, 6th, 8th, 9th, 10th, 13th, 21st, 23d, 24th, 25th, 26th, 27th, 28th.

Haze: 16th, 17th, 18th, 19th, 27th.

Parhelia: 8th, 9th, 27th, 29th.

Sleet: 5th, 29th, 30th (at only four stations).

MONTHLY STATE DATA FOR 1917.

YEAR.	Temperature.				Precipitation.					Number of Days.				
	Mean.	Departure from normal.	Highest.	Lowest.	Average	Departure from normal.	Greatest	Least	Snow fall	.01 inch or more precipitation.	Clear.	Partly cloudy	Cloud	Prevailing direction of wind.
January	17.0	— 0.9	60	—28	0.83	—0.22	2.07	0.17	7.2	4	17	8	6	nw.
February	15.2	— 5.3	68	—37	0.36	—0.79	1.19	T.	3.5	3	14	8	6	nw.
March	34.6	+ 1.3	85	—13	1.54	+0.87	4.35	0.57	6.2	6	14	8	9	nw.
April	45.5	— 3.2	88	17	4.55	+1.69	7.84	2.05	4.6	11	9	7	14	ne.
May	55.1	— 5.4	95	25	3.87	—0.70	7.33	1.60	0.6	10	15	8	8	ne.
June	66.0	— 3.1	100	32	6.65	+2.27	13.82	3.04	0	12	13	10	7	nw.
July	74.3	+ 0.2	100	38	2.27	—1.69	6.06	0.33	0	7	21	8	2	nw.
August	69.4	— 2.4	102	31	2.29	—1.39	6.31	0.70	0	7	19	8	4	nw.
September	62.6	— 9.8	97	28	2.90	—0.46	8.08	0.29	0	7	15	7	8	se.
October	42.9	— 7.9	85	0	1.41	—1.05	4.00	0.15	2.2	6	10	11	10	nw.
November	40.7	+ 5.7	77	3	0.28	—1.23	1.02	T	1.4	3	14	6	10	sw.
December	14.5	— 9.4	62	—40	0.56	—0.66	1.79	0.14	6.7	6	10	9	12	nw.
Annual	44.8	— 2.6	106	—40	27.81	—4.18	13.82	T.	32.4	82	171	98	96	nw.

COMPARATIVE DATA FOR THE STATE—ANNUAL.

Year.	Temperature.					Precipitation in inches.			
	Mean annual.	Highest.	Date.	Lowest.	Date.	Annual.	Greatest annual.	Least annual.	Av. snowfall.
1890	48.0	110	July 13	—27	January 22	31.30	45.74	16.00	------
1891	47.3	106	August 9	—31	February 4	32.90	49.05	23.48	------
1892	46.6	104	July 11	—38	January 19	30.58	48.77	24.78	34.2
1893	45.7	103	July* 13	—36	January 14	27.59	39.27	19.19	37.2
1894	49.7	109	July 26	—37	January 25	21.94	29.81	15.65	19.2
1895	47.2	104	May 28	—33	February 1	29.77	35.25	18.57	26.0
1896	48.6	104	July 3	—29	January 4	37.23	51.60	28.68	22.6
1897	47.8	109	July* 23	—30	January 25	30.98	39.98	20.21	38.8
1898	47.7	103	August 20	—35	December 21	31.34	50.47	19.51	40.3
1899	47.3	104	September 6	—40	February 11	29.98	42.06	21.79	23.4
1900	49.3	103	August 3	—27	February 15	35.05	47.33	25.05	25.8
1901	49.0	113	July 22	—31	December 15	24.41	37.09	16.35	38.5
1902	47.7	98	July 30	—31	January 27	43.82	58.80	30.14	28.0
1903	47.2	101	August 24	—27	December 13	35.39	50.33	26.41	19.4
1904	46.3	100	July 17	—32	January 27	28.51	38.93	19.34	29.2
1905	47.2	104	August 11	—41	February* 8	36.56	52.93	24.66	33.3
1906	48.4	102	July 21	—32	February 10	31.60	44.34	20.63	22.8
1907	47.4	102	July 5	—21	February 5	31.61	43.90	19.93	24.0
1908	49.5	101	August 3	—18	January 29	35.26	49.98	24.11	22.7
1909	47.4	103	August* 15	—20	February* 15	40.91	53.48	27.20	49.0
1910	48.6	108	July 16	—35	January 7	19.87	27.99	12.11	23.4
1911	49.5	111	July* 2	—35	January 3	31.37	46.77	19.74	35.2
1912	46.4	104	September 8	—47	January 12	38.89	53.13	16.25	39.5
1913	49.7	108	July* 16	—25	January 8	29.95	45.18	20.21	25.4
1914	49.1	109	July 12	—31	December 26	31.93	44.11	23.39	27.5
1915	47.8	99	May 14	—32	January 28	30.53	51.15	27.29	31.3
1916	47.2	106	August 4	—34	January 13	28.90	46.34	22.48	29.5
1917	44.8	106	July 30	—40	December 29	27.81	36.00	20.78	32.4

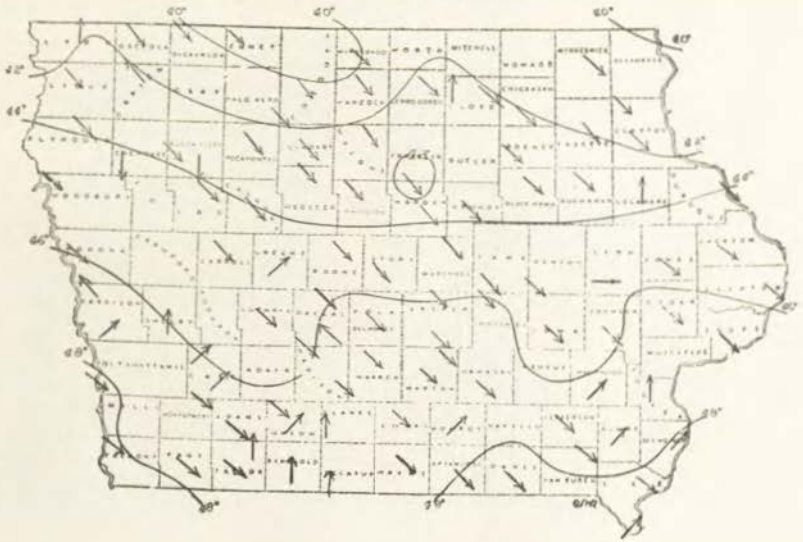
*And other dates.

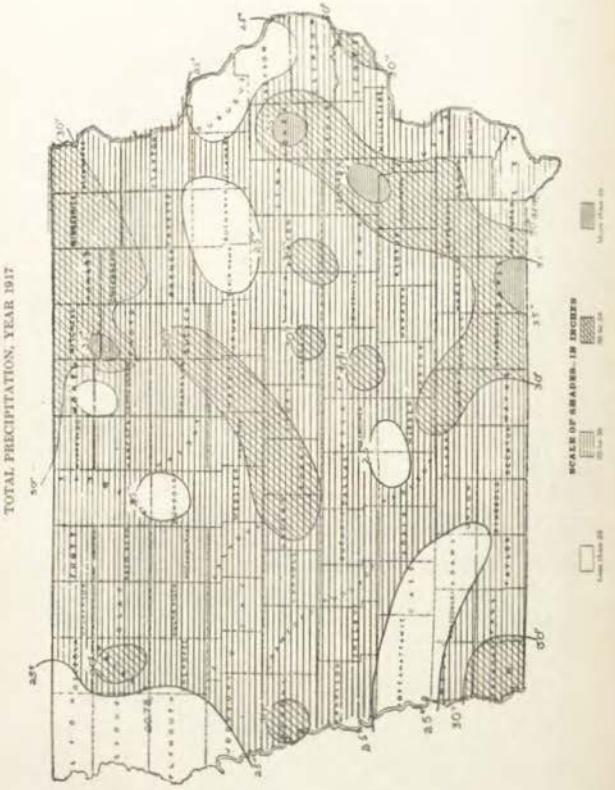
DATES OF KILLING FROSTS, 1917.

STATIONS	Killing Frosts. Last in Spring.	Killing Frosts. First in Autumn.
Northern Division		
Algona	May 23	Oct. 6
Allison	May 23	Oct. 6
Alta	May 4	Oct. 8
Alton	May 8	Oct. 6†
Belmond	May 7†	Oct. 6†
Britt	May 23†	Oct. 6†
Charles City	May 5	Oct. 6
Decorah	May 24†	Sept. 11†
Elkader	May 24†	Sept. 11†
Estherville	May 22†	Oct. 6†
Fayette	May 23†	Sept. 11†
Forest City	May 7†	Sept. 27†
Humboldt	May 6†	Oct. 2†
Inwood	May 13†	Sept. 30†
Lake Park		Oct. 6†
Le Mars	May 13†	Oct. 8
Mason City	May 22†	Oct. 11
Matlock	June 27†	Sept. 27†
New Hampton	May 23†	Oct. 6
Nora Springs	May 6	Sept. 11
Northwood	May 6†	Oct. 1†
Pocahontas	May 6†	Oct. 8
Postville	May 23†	Oct. 6†
Rock Rapids	May 23†	Oct. 6†
Sanborn	May 6†	Oct. 7†
Sibley	June 15†	Sept. 27†
Sioux Center	May 4†	Oct. 8†
Storm Lake	May 6†	Oct. 8
Washta	May 29†	Sept. 27†
Waverly	May 23	Sept. 11†
West Bend	May 25†	Oct. 8
Central Division		
Ames	May 7†	Oct. 1
Audubon	May 7†	Oct. 6†
Baxter	April 15	Oct. 6†
Bells Plains	May 23	Sept. 11
Boone	May 5†	Oct. 8
Carroll	May 7	Oct. 8
Cedar Rapids	April 15	Oct. 8†
Clinton	May 23†	Oct. 6
Davenport	April 13	Oct. 8
Delaware	May 23†	Oct. 6†
Denison	May 24†	
Des Moines	April 15†	Oct. 6
Dubuque	April 15	Oct. 6
Fort Dodge	May 2†	Oct. 6†
Galva		Oct. 6†
Grinnell	May 5	Oct. 6
Grundy Center	May 6†	Oct. 6†
Guthrie Center	May 8†	Oct. 6†
Harlan	May 7†	Sept. 27†
Independence	May 23	Sept. 11
Iowa City	May 23†	Oct. 6
Iowa Falls	May 23†	Sept. 11†
Jefferson	May 7†	Oct. 7†
Little Sioux	May 7†	Oct. 8†
Logan	May 7†	Oct. 6
Maquoketa	May 23†	Sept. 11†
Marshalltown	May 7†	Oct. 1
Monroe	May 5†	Oct. 6
Olin	May 23†	Oct. 1†
Onawa	May 7†	Oct. 8
Perry	May 7†	Oct. 6
Rockwell City	May 7†	Oct. 6
Sac City	May 4†	Oct. 6
Sioux City	May 5	Oct. 8
Tipton	May 7†	Oct. 7†
Toledo	May 23†	Sept. 11†
Waterloo	May 23†	Sept. 11†
Waukee	May 7	Oct. 6
Webster City	May 11†	Oct. 6
Williamsburg	May 23†	Oct. 6†
Southern Division		
Afton	May 5†	Oct. 6†
Albia	May 7†	Oct. 6
Allerton	April 30	
Atlantic	May 7	Oct. 6
Bedford	May 8	Oct. 6
Bloomfield	April 19†	Oct. 5
Bonaparte	May 5†	Oct. 6†
Burlington	April 10†	Oct. 8†
Centerville	May 5†	Oct. 6†
Chariton	May 30†	Oct. 6†
Clarinda	May 7†	Oct. 6
Columbus Jct.	May 23	Oct. 8
Corning	May 25†	Sept. 27†
Corydon	May 7	Oct. 6†
Creston	May 8†	Oct. 6
Earlham	May 7†	Oct. 6†
Fairfield	May 7†	Sept. 11†
Glenwood	May 7†	Oct. 8
Greenfield	May 7†	Oct. 8
Indianola	May 5	Oct. 6
Keokuk	May 5	Oct. 8
Keosauqua	May 7†	Oct. 6
Knoxville	May 7†	Oct. 6
Lamoni	May 4†	Oct. 6
Lenox	May 7†	Oct. 6
Mt. Ayr	May 4†	Oct. 8
Mt. Pleasant	May 5†	Oct. 6
Murray	May 4†	Oct. 6
Northboro	May 7	Oct. 6
Oskaloosa	May 7	Oct. 6†
Ottumwa	May 7†	Oct. 6†
Pella	May 6	Oct. 1†
St. Charles	May 4†	Oct. 8†
Sigourney	May 7†	Oct. 1
Stockport	May 7	Sept. 11†
Thornton	May 7†	Sept. 27†
Washington	May 23	Oct. 6
Winterset	May 8†	Oct. 8
Omaha, Neb.	April 9†	Oct. 8

†Date of last temperature of 32 or lower in the spring or first temperature of 32 or lower in the autumn (as the case may be) when frost was not reported.

MEAN ISOTHERMS AND PREVAILING WINDS, YEAR 1917





CLIMATE AND CROP REVIEWS

January was fair and mild until the 10th, when it was followed by a cold wave, and temperatures of zero and lower occurred in nearly all portions of the State during the next few days. A storm center attended by snow passed over the State on the 20-21st, and was followed by a cold wave with temperatures of 14 to 20° below zero in the northern counties. In the north part of the State, where the snow was heavy, it drifted and interfered seriously with rail traffic. Temperatures of 50 to 60°, the highest of the month, were general on the 28th. General snow on the 30-31st was followed by the most severe cold wave of the winter, which was sweeping southeastward across the State at midnight of the 31st.

February was the driest month of that name since state-wide observations began in 1890, and the coldest since 1905. It was, however, rather a pleasant winter month as there was only one bad storm which occurred on the 4th when the temperature was below zero all day north of Des Moines, and the minimum temperatures ranged from 8° below zero at Keokuk to 28° below zero at Lake Park. The velocity of the wind ranged from 39 miles an hour at Des Moines to 69 miles an hour at Sioux City. Over the greater part of the State these conditions were accompanied by falling snow, which made the worst blizzard for many years. Railroad traffic was suspended for several days on some lines in the northern counties. Although cold the remainder of the month was generally pleasant. Some oats were seeded in Davis County on the 26th.

March opened cold with temperatures of zero or lower in all but the southeastern counties on the 4th and 5th, the lowest being 13° at Lake Park on the 4th. Excepting a warm period, 9-11th, it continued cold till the 19th, after which it was warm. Precipitation, as in the two preceding months, was above normal in the northern, normal in the central, and below normal in the southern division. A severe glaze storm occurred on the 12th from Fort Dodge to Des Moines and east to the Mississippi River, which did $175,000 worth of damage to telephone and telegraph

lines. By the close of the month grass was starting and field work was progressing rapidly in the southern counties. Oats and spring wheat seeding had been completed in a few southeastern counties; potato planting was reported well north in the central division, and sod plowing was being done as far north as Lyon County in the extreme northwest. Winter wheat, timothy, alfalfa, and clover both old and new were seriously winter-killed.

Cold, cloudy and rainy weather prevailed during most of April. More snow fell in the southern counties than in the preceding three months. Vegetation made slow progress. The acreage of oats, potatoes and corn was increased on account of so much winter-killing of winter wheat and meadows.

The temperature and rainfall for May were below normal, only May, 1892, and 1907 being cooler in the 28 years of record. Ice, heavy frost, or freezing temperatures were general during the first week, and frost on or about the 23rd damaged potatoes, corn, garden truck and fruit buds in some localities, particularly in the northeast and east central sections. Small grain made good progress but meadows and pastures were slow so that stock feeding had to be continued in many sections until the close of the month. By the 20th about 75 per cent of the corn had been planted, but frequent rains during the last decade delayed field work and some planting remained to be done at the close of the month, at which time early planted corn was up and was of good stand and color. Apples, plums and cherries were backward, coming into full bloom in the southern counties about the 15th and the northern counties about the 25th.

June was cool and wet, the rainfall being the greatest since 1890. In the central and southern counties many stations had the greatest rainfall of record in June; some had three times the June normal, and 30 to 40 per cent of the annual normal. Excessive rains during the first week, particularly in the south, overflowed lowlands, destroying thousands of acres of crops. Similar conditions prevailed in the northeastern portion of the State on the 23-26th. Much of the overflowed land was replanted to corn toward the close of the month. The last ten days of the month were favorable but at the close corn averaged 10 days to two weeks late.

Cool weather prevailed during the first two decades of July, after which it was warm, with abnormally hot weather the last four days. Precipitation was deficient but mostly well distributed till the last week when the drought accompanied by high temperature and hot winds damaged pastures, potatoes and garden truck. The season was generally favorable for small grain which, by the close of the month, was mostly harvested and some threshed, showing large yields and good quality. Corn was beginning to tassel in all sections on the 31st.

Droughty conditions that prevailed at the close of July were relieved by frequent and quite general showers during the first 12 days of August, followed by a nearly rainless week, after which only occasional local rains occurred. After the 4th, temperatures, especially at night, were generally so low that corn made slow progress and only the earliest fields had reached the roasting ear stage by the close of the month. Late potatoes and truck crops suffered somewhat from lack of moisture and very little fall plowing could be done.

Heavy to killing frost occurred on the 11th of September, in the northern and eastern sections which did considerable damage to corn, potatoes and other late crops. Corn made its best progress between the 13th and 18th, but during most of the month the deficient temperature and sunshine made its progress very slow. At the close of the month less than two-thirds of the crop was safe from any ordinary killing frost, and part of that was susceptible to serious damage by freezing temperatures.

October was 3.1° colder than October, 1895, which has heretofore been the coldest since state-wide records began in 1890. Killing frost occurred in some sections on the 1st, all but the southwest portion on the 6th and in all sections on the 8th. During a cold wave on the 28-30th, the temperature fell nearly to zero in the northern and western counties, the lowest being just zero at Galva. Precipitation was deficient except in a few northeastern and east-central counties, but a general snowstorm on the 28th-29th was remarkably heavy for the season in the northeastern counties. Corn was seriously damaged by the unfavorable conditions; very little of it was cribbed at the close of the month, and that which was cribbed heated so that it had to be dried and sorted; much soft corn in the fields molded.

November was mild and dry, but in spite of favorable conditions for drying, the husked corn, though carefully sorted, heated in the cribs so badly that it had to be spread out to dry. Husking ceased generally the last week of the month with 43 per cent of the crop still in the fields. Because of the cold in October and drought in November winter wheat made slow growth and is not entering the winter in resistant condition.

The mean temperature for December, 14.5°, is the lowest of record. Zero days were the most frequent of record. Sunshine was deficient and also the precipitation except in the northwestern and north-central counties. The ground was snow-covered about 25 days in the extreme northwestern portion of the State, and less than 15 days in the southwestern and east-central counties. Corn husking progressed, and not more than 15 per cent of the crop remained in the fields at the close of the month. Though severe temperatures prevailed for considerable periods, they were preceded and accompanied by porous snow covering, so it is believed that such winter wheat as was well established at the beginning of winter is in good condition.

WEATHER AND CROP BULLETINS

Summaries of Weekly Bulletins issued during the season of 1917, for the weeks ending on dates given:

Bulletin No. 1, April 10, 1917—

The severe drought that prevailed over the central and southern counties during the summer and autumn of 1916 continued in those districts during the whole of the winter, but abundance of moisture, in the form of snow, prevailed in the northern sections. The winter was also unusually cold, which, in connection with dry soil and lack of snow covering in the southern counties was very injurious to winter wheat, alfalfa and clover. At present the indications are not favorable for more than 60 per cent of a crop of winter wheat, and in some localities there will not be more than half of a crop of hay, on account of so much clover being winterkilled. However, with favorable weather—higher temperature and abundance of warm rain—the condition of those crops will improve materially. Some wheat ground has been reseeded already to spring wheat or oats, and if conditions do not improve, more of it will be planted to corn. Oats seeding is nearly finished, early potatoes have been planted and more than the usual acreage of spring wheat has been sown in the southern districts. Over the northern counties, where the snow remained on the ground until near the end of March, farm work is not as far advanced, but the soil is in fine tilth in all sections, and, with favorable weather during the coming week, work will progress rapidly. All live stock wintered well and the spring pig crop is receiving favorable mention. More than the usual amount of gardening has been and will be done. While the ground is dry and cold, and considerable damage has been done to grass and winter grains, yet other conditions are favorable, which, taken in connection with the strong determination of all of our farmers, Iowa, as usual, will be able to feed a large part of the world.

Bulletin No. 2, April 17, 1917—

The week was unseasonably cold and dry, the temperature being below the freezing point on several mornings, and the rainfall was almost nil until the 16th, when light to moderate showers occurred; but the weather was favorable for field work which has progressed rapidly. Seeding of spring wheat, oats, and barley is finished in the southern counties, and from 60 to 70 per cent finished in the northern sections. Later reports show that not only fall wheat, clover and alfalfa were badly winterkilled but also much timothy and blue grass, especially in central and southern districts. Winter wheat and clover is worse than indicated last week, the condition of wheat is now placed as low as 30 to 40 per cent. Many meadows are being plowed up and prepared for corn, the acreage of which will be greatly increased over last year. The acreage of potatoes, oats and spring wheat will also be increased, but the acreage of hay will be reduced. Stock is in good condition and the indications are favorable for a nearly normal pig crop.

Bulletin No. 3, April 24, 1917—

Higher temperatures and copious to heavy showers have been very beneficial to all vegetation, but in some localities, especially in the northwestern and southeastern quarters of the state, the rainfall was sufficient to retard field work somewhat. In the northwestern counties the rainfall ranged from one to more than four inches. Spring-sown grains of all kinds are coming up and show a good stand, and winter wheat has made considerable improvement. Plowing for corn is progressing rapidly with the soil in fine condition. If the weather continues favorable, corn planting will begin in the southeastern counties the latter part of this week, and the corn acreage will be decidedly increased. Much more than the usual amount of potatoes and small garden truck is being planted. Pastures are supplying some feed and grass is beginning to grow rapidly under the effects of warmth and abundant moisture. Fruit is still promising.

Bulletin No. 4, May 1, 1917—

The week was cold, cloudy and wet, there being an average daily deficiency of about 12 degrees in temperature and a large excess of precipitation. Snow fell on the 26th and 28th and freezing temperature was recorded over the greater part of the state on one or two mornings. It was too cold for much growth of vegetation, and the frequent and heavy rains have delayed farm work, though considerable progress was made in some localities in plowing. The rains, however, have been beneficial to small grain and grass and will prove to be of great benefit to all other crops as soon as warm weather comes. Oats, spring wheat and barley are up and show good stand generally. Some early potatoes and garden truck are also up. While winter wheat has made a little growth and shows slight improvement, more fields have been plowed up on account of the poor stand, thereby increasing the prospective corn acreage. Tests show high percentage of germination of seed corn and the quantity is sufficient. A few small patches of corn were planted early in the week in the southern counties. The prospect for a good tree fruit crop is still very promising, but raspberries, blackberries and strawberries were badly winterkilled in a few localities. Early plums and apples are in bloom in the extreme southeastern counties. The first bloom last year was reported on April 25th.

No. 5, May 8, 1917—

The first four days of the week were cold and wet, with heavy snow in nearly all parts of the state on the 3d. The last three days were clear but continued cold, with frost and freezing temperatures in many localities.

Field work was practically impossible and the growth of vegetation is at a standstill. About 25 per cent of the plowing for corn is yet to be done, but with the favorable conditions now prevailing plowing will progress rapidly during the coming week, and corn planting will be rushed in the southern counties. All spring sown small grain is doing nicely and winter wheat has improved some. All tree fruits seem to have escaped damage from the heavy frosts. Reports show serious damage to cane fruits. The cold, wet weather has been hard on young lambs, pigs and chickens.

The secretary of the State Horticultural Society reports condition of fruit on May 1st as follows: "Apples, 79 per cent; pears, 85; American plums, 85; cherries, 74; peaches, less than 5; grapes, 67; red raspberries, 56; black raspberries, 62; blackberries, 60; strawberries, 74 per cent of a full crop. The average condition of all fruits is 67 per cent, or one point below the May average of last year. The condition of apples and cherry trees is 9 per cent better than last year, and the cane fruits and strawberries about 10 per cent lower than a year ago. A severe cutting back of injured canes of raspberries will improve the quality of the fruit. Clear, warm weather for the next ten days will be a large factor in determining the size and quality of the fruit crop in the state."

Bulletin No. 6, May 15, 1917—

The temperature is still considerably below the normal, but the rainfall was light and the week was favorable for farm work, which progressed rapidly. Much corn ground was plowed and corn planting is well started with the soil in excellent tilth. Warmer weather prevailing during the latter part of the week has started growth and all conditions are now promising even though the season is late. Corn planting will be general during the coming week, and with favorable weather the bulk of the crop will be in by the 23d. The increased acreage and the extra amount of plowing to be done will, however, run planting up to the end of the month. The remnant of winter wheat is still improving and all other small grain is looking well. The acreage of corn, spring wheat, oats and potatoes will be larger than last year, but hay will be short. Some alfalfa is being sown with oats, the latter to be cut for hay. Early potatoes are coming up. Pastures continue backward, but are improving. All tree fruits are in full bloom over the southern half of the state, and are promising except possibly late winter apples, the bloom on which appears to be light in some localities.

Bulletin No. 7, May 22, 1917—

The weather was ideal for growth of vegetation and for field work up to Sunday afternoon when general rains set in with much lower temperature. There were, however, damaging wind, hail and electrical storms over the northeast and north central districts on the night of the 16th, which did some damage to crops and property. The temperature was much higher, with maxima up to or near 90 on two or three days. Under such favorable conditions all vegetation made very rapid growth and field work was rushed. About 70 to 75 per cent of a greatly increased corn acreage has been planted, and the early planted corn is up and shows a good stand. Considerable plowing for corn is yet to be done, especially on bottom ground. Winter wheat is stooling nicely and all small grain, grass, potatoes and garden truck made material improvement, and will be still further benefited by the copious to heavy rains at the close of the week, although the cool weather will check the rapid growth. Apples, cherries, plums and strawberries are still promising, but cane fruits and grapes will be short. An increased acreage of sugar beets is reported from some of the north central counties.

Bulletin No. 8, May 29, 1917—

The week was unusually cool, the average temperature being about 8 degrees below the normal. Frost occurred in some localities on two or three nights and ice formed in a few places on the 23d, but the damage was generally light. The heavy rains at the close of the preceding week, together with the showers on the 25th and 26th, delayed work somewhat and prevented the completion of corn planting in the southern districts, but most of the crop is in, and cultivation has begun in the earliest planted fields. The stand is reported to be very good, but cutworms are active on sod ground. All small grain continues in good condition and winter rye is heading in the southern counties. Potatoes, grass, garden truck and most fruits are also in good condition, but the weather is too cool for normal growth.

Bulletin No. 9, June 5, 1917—

Another cool, cloudy and wet week has further retarded field work. The average daily deficiency of temperature was about 7 degrees, and the rainfall was frequent and in many localities excessive, especially over the southern counties. Some damage was done by erosion on hillside plowed ground and flooding lowlands, yet as a whole the prospects are encouraging. All small grain, grass, potatoes and garden stuff are in fine condition. Corn is showing an excellent stand and but little replanting is necessary, and, while the weeds are getting a start, a few days of warm sunshine would enable the farmers to clean the fields. Warm sunshine would also stop the working of cutworms and wire worms which are now unusually active on sod ground.

Following is a summary of reports, showing average condition of crops on June 1st: Corn, 95 per cent; oats, 101; spring wheat, 98; winter wheat, 64; barley, 98; rye, 92; flax, 99; potatoes, 99; tame hay, 84; wild hay, 95; pastures, 90; alfalfa, 88 per cent.

Bulletin No. 10, June 12, 1917—

This has been the most unfavorable week of the season. The temperature was below normal and the rainfall was heavy and, in many localities, excessive, the amounts ranging from two to nearly seven inches. Practically all streams, especially over the southern half of the state, were at or above the flood stage. Hillside land was badly eroded and bottom ground flooded, resulting in much damage to the belated corn crop. Considerable replanting will be necessary and possibly a small percentage of the acreage will be used for some of the catch crops. As a whole, however, the prospect is very promising, and with but a few days of warm sunshine, which now seems probable, the fields will be cultivated and cleaned. The acreage is still much above that of last year. All small grain, grass, alfalfa and potatoes made rapid growth and alfalfa is about ready for the first cutting. In many localities oats are becoming too rank.

The following report of the Secretary of the State Horticultural Society shows the condition of fruit on June 1st: Apples, 80 per cent; pears, 61; American plums, 66; cherries, 71; grapes, 46; red raspberries, 53; black raspberries, 45; blackberries, 42; currants, 73; gooseberries, 77, and strawberries, 66 per cent of a full crop. The average of all fruits is 56 per cent, or three points above the average for June last year. The condition of the apple crop is 2 per cent above the June average for any year since a percentage record has been kept.

Bulletin No. 11, June 19, 1917—

Another cool week has further retarded the growth of corn, but abundance of sunshine and comparatively dry weather has been favorable for field work over the greater part of the state, and has greatly improved the color and general condition of the crop. Bottom grounds, however, are still in bad condition. Much replanting has been done, and more will be done if possible, but a considerable of the original corn acreage, especially

in the southern counties, will be used for sorghum, Sudan grass, millet, etc., and some will probably have to be abandoned. Small grain, grass, potatoes and truck crops are doing well. Rye, early oats, timothy and clover are heading and the first cutting of alfalfa is being cured. Cold rains during the blooming period were injurious to strawberries. Other fruits are reported to be in good condition generally, although high winds have caused apples and pears to fall badly. Frost in the northern counties on the morning of the 15th damaged garden truck, and in some localities on low ground nipped corn and oats.

Bulletin No. 12, June 26, 1917—

The weather during the last seven days was exceptionally favorable for farming operations and the growth of crops. The temperature was about normal and the rainfall was generally light, except in the northern counties, where heavy showers occurred, accompanied in some localities by severe wind squalls which did some damage to crops. Corn cultivation progressed rapidly and most fields are fairly clean. Much replanting was done on late, overflowed bottom lands, but some fields intended for corn will be devoted to catch crops. All small grain continues to do well. Early oats, rye, barley and winter wheat are heading and in southern counties early oats are well filled. First cutting of alfalfa secured in good condition with fair yield. Meadows have improved, but the hay crop will be light. Potatoes and all garden truck are in excellent condition, and a good crop of early potatoes seems to be already assured. The set of apples and other tree fruits is generally good south of central Iowa, but over the northern counties the set is lighter on account of cold, rainy weather during the blooming season. The June drop of apples is not yet over, but is expected to be about normal. The damage to grapes by winterkilling in Pottawattamie county is not as great as was anticipated. A good rain would be very beneficial in the southwestern and south central counties.

Bulletin No. 13, July 3, 1917—

Another week of favorable weather has been very beneficial to the corn crop and for farm work. While the temperature was not above the normal, there were several moderately warm days, and one excessively hot day, which started the corn to growing rapidly. Fine progress was made in cultivating, and most fields are clean. Considerable corn was planted on the late flooded bottom lands in the southern counties, and much of it is up. The crop, as a whole, is a week to ten days later than usual, but is still very promising. All small grain is also late, and there will be very little, if any, winter wheat or rye harvested before the 10th, but the prospect for good yields is excellent. No haying has been done, but some clover is ready to cut in the southern counties. The crop, however, is poor on account of so much of it being winterkilled. Early potatoes are yielding well and all garden truck is in excellent condition. Strawberries and cherries are being harvested with fair yields.

Bulletin No. 14, July 10, 1917—

The weather during the week was almost ideal for farm work. There was a slight deficiency of temperature, and a decided deficiency of rainfall generally, except in a few favored localities, especially in the east central and extreme northwestern counties where heavy showers occurred. The fore part of the week was cool, with the night temperatures near the frost line in the northern districts, but the latter half of the week was much warmer. Corn made rapid growth and much of it has been "laid by." The crop is, however, very uneven in size. Some fields are nearly waist high, while many fields are only a few inches high. All small grain continues in good condition and filling well. The rye harvest has begun in Henry and Des Moines counties, and early oats and winter wheat harvest will become general in the southern counties by the latter part of the coming week. Truck crops are excellent.

The following summary shows the condition of crops on July 1st: Corn, 87 per cent; oats, 102; spring wheat, 99; winter wheat, 80; barley, 98; rye and flax, 94; potatoes, 106; hay, 82; pastures, 98 per cent. Last year on July 1st, the condition was as follows: Corn, 83 per cent; oats, 94; spring wheat, 92; winter wheat, 80; barley, 95; rye, 93; flax, 90; potatoes, 97; hay, 96; pastures, 100 per cent.

The state horticultural society shows condition of fruit as follows: Summer apples, 75 per cent; fall apples, 64; winter apples, 54; pears, 44; American plums, 34; domestic plums, 24; cherries, 62; grapes, 50; red raspberries, 51; black raspberries, 53; blackberries, 47 per cent of a full crop. The average for all fruits is 51 per cent, or 1 per cent higher than the average for July last year. The apple crop promises to be 20 per cent better than it was a year ago, while small fruits will be 20 per cent less.

Bulletin No. 15, July 17, 1917—

Though the average temperature was somewhat below the normal, yet there was sufficient warmth and sunshine during the week to maintain the rapid growth of corn. The moderately cool and dry weather prevailing since the first of the month has been especially favorable for small grain, which is now almost free from rust. The straw is, however, rather short, but the heads are filling well and promise good yields. Early oats, rye, barley and winter wheat harvest is well advanced in southern counties and will begin in central districts the coming week. Haying is progressing in all districts under satisfactory conditions generally, but the crop is light with little or no clover in the southern counties. Although corn made rapid growth, it is still small for the middle of July. However, the fields are clean, the color is good and the crop as a whole is very promising. Early potatoes are being harvested, but the tubers are mostly small and the yield is not quite up to expectations. A good soaking rain is needed for potatoes and pastures and would benefit corn. Considerable damage was done by hail in several localities, especially in Washington and northern Scott counties.

Following is the estimated crop acreage for this year: Corn, 10,242,000 acres; oats, 5,238,500; winter wheat, 133,990; spring wheat, 173,500; barley, 258,800; rye, 35,275; flax, 7,400; potatoes, 98,610; hay, 3,196,000; alfalfa 102,215; pastures, 8,995,300 acres. The acreage last year, as shown by township assessors, was as follows: Corn, 9,479,000 acres; oats, 5,199,269; winter wheat, 296,220; spring wheat, 172,421; barley, 265,048; rye, 36,886; flax, 7,658; potatoes, 88,691; hay, 3,702,855; alfalfa, 142,753; pastures, 9,461,680 acres.

Bulletin No. 16, July 24, 1917—

This has been the most favorable week of the season for rapid growth of corn and harvesting hay and small grain. The temperature was nearly normal and the rainfall was generally deficient, yet there were copious to heavy local showers in many localities, which gave sufficient moisture for present needs in those sections. Corn made very rapid growth. The earliest fields are showing tassels in all parts of the state and the late replanted fields are being "laid by." In the southern and central districts most of the early oats is in shock and the harvest has begun in the northern counties. Late oats and spring wheat harvest has begun in the southern part of the state, and will begin in the central section during the coming week. The conditions have been exceptionally favorable for small grain; the rather cool nights checking ripening and causing the heads to fill well. All small grain will be up to or above the average in quality and yield, but the small acreage of winter wheat will reduce the output of that crop. Rain is needed in most districts for corn, potatoes and pastures, and is urgently needed in some sections, but no serious damage has yet been done. The apple crop is much better in the southwestern counties than in other parts of the state. The indications are favorable for 80 to 95 per cent of the 1915 crop. The early apple harvest will begin in the southwestern counties during the coming week. Grapes in Pottawattamie county promise 20 to 50 per cent of a normal crop.

Bulletin No. 17, July 31, 1917—

Another week with high temperature and abundance of sunshine has been favorable for harvesting and haying, which have progressed rapidly. It was also favorable for the rapid growth of corn, much of which has tasseled. Corn generally is in fine condition, but in some localities where the soil is light and in spots where no rain has fallen the leaves are beginning to roll, showing the need of rain at an early date. The intense heat and lack of moisture is also injuring late potatoes and pastures.

The maximum temperatures were near or above 100 degrees on several days, and the rainfall was practically nil.

Threshing has begun, and early reports indicate good yields and fine quality of small grain. Oats yield from 40 to 100 bushels per acre; winter wheat is yielding better than expected, and barley is running as high as 37 bushels per acre. Unless rain comes soon, corn and potatoes will be seriously injured.

Bulletin No. 18, August 7, 1917 —

Ideal weather prevailed over the greater part of the state for harvesting and threshing, and several copious to heavy showers occurred over the northeastern and southwestern counties, which were very beneficial to corn, late potatoes and pastures. All sections of the state received some rain, which together with the cooler weather checked the deterioration of corn that resulted from the intense heat and hot winds prevailing at the close of last week. The crop is now holding its own even in the driest sections and is in excellent condition in sections where showers have occurred. Threshing is general and progressing rapidly in the southern and central districts and will be general during the coming week in the northern districts. The large yields of all small grains are being maintained by later reports, and the quality of the grain is excellent. More rain is needed at once over the greater portion of the state for corn, potatoes, pastures and garden truck. The hot winds of last week seriously damaged gardens and caused apples to drop badly.

A summary of August 1st reports shows condition of corn on that date to be 92 per cent; pastures, 90; potatoes, 96, and flax, 96.

The secretary of the State Horticultural Society reports condition of fruit as follows: "Summer apples, 65 per cent; fall apples, 59; winter apples, 49; pears, 47; American plums, 43; domestic plums, 22; grapes, 52 per cent of a full crop. The average of all fruits is 44 per cent. There will be twice as many summer apples, one-third more fall apples, but only 9 per cent more winter apples than in 1916. Summer fruits should be utilized as they mature, either dried, canned, made into butter, marmalade or other products. Let no fruit go to waste than can be used for food."

Later.—Telegraphic reports received on the morning of the 7th indicate copious to heavy showers in nearly all parts of the State.

Bulletin No. 19, August 14, 1917—

The past week was characterized by unusually cool nights, and in some sections by heavy local showers. The average daily deficiency of temperature was about 7 degrees, and the average rainfall was somewhat below the normal, although all sections received some moisture and in many localities the amounts exceeded 1.50 inches. The showers interfered with threshing in some districts, and warmer weather is needed for the rapid development of corn, but as a whole the week was favorable for agricultural interests. Corn is still ten days to two weeks late, but otherwise it is in fine condition, and the earliest fields are now in the roasting ear stage. The rains were very beneficial to late potatoes, pastures and garden truck, and in some of the southern counties, where the rainfall was heavy, put the ground in fine condition for fall plowing, which has begun. Threshing is now general in the northern counties and is nearing completion in the southern part of the state. Late reports continue to show large yields and fine quality of all grains, and if final reports maintain the present

estimate, the state will produce more than 225,000,000 bushels of oats, or an increase of about 50,000,000 as compared with last year, and 20,000,000 more than the largest crop ever before produced in the state.

Bulletin No. 20, August 21, 1917—

The average temperature of the past week was nearly normal and the rainfall was much below the seasonal average, there being only a few widely scattered and generally light showers. The weather was, however, ideal for threshing and stacking grain, and the increased warmth was more favorable for corn which made rapid progress toward maturity. The crop is ten days to three weeks late, and with normal weather conditions not more than 50 per cent of it will be out of danger of injury by frost by the end of September. The bulk of the crop will need the greater part of October without killing frost or freezing temperature. With dry, warm weather these estimates will be greatly reduced as to time, but the prospective yield will also be greatly reduced. Dry weather has already greatly reduced the prospective yield over the south central counties. One good, soaking rain and then normal temperature is needed for the best development of the crop. Rain is also badly needed for pastures, late potatoes, new seeding of clover, timothy and alfalfa. Considerable damage has been done in the east central and southeastern counties to young clover and alfalfa by grasshoppers, which seem to be increasing in numbers and spreading over large areas.

Bulletin No. 21, August 28, 1917—

The week was rather cool, and over the greater part of the state was very dry. The nights, especially, were very cool and there were only two or three warm days. Light frost occurred in the extreme nothwest portion of the state on the morning of the 28th, or one day later than last year. The conditions were favorable for threshing and for all outdoor work, but the ground is too dry in most sections for satisfactory plowing, though some of that work is being done. Corn made satisfactory progress considering the cool weather, but the crop is still late, ranging from fields just beginning to tassel to the advanced roasting-ear stage in some of the earliest fields. The outcome of the crop depends on the weather during the next six weeks. Conditions must be much better than normal to insure an average yield. The late potato crop is also in a precarious condition, depending on whether or not sufficient rain comes during the next two weeks. Grasshoppers have cleaned the meadows of all aftermath in many localities in the southern counties. Pasturage is short in most sections and farmers are feeding stock.

Bulletin No. 22, September 4, 1917—

The week was cool, there being an average daily deficiency of about 3 degrees. The nights espcially were very cool, and a trace of frost was observed on low ground in the northern counties on two mornings. The rainfall was very light and poorly distributed until the last day, when moderate to heavy showers occurred in nearly all districts. The rain will be of great benefit for late potatoes, pastures and for softening the ground for fall plowing preparatory to a greatly increased acreage of winter wheat and rye, but is now detrimental for the development of corn, which absolutely needs dry, warm, sunshiny weather to mature the crop before the average date of first killing frost. Reports received from crop correspondents on September 1st show that with normal weather there will be about 27 per cent of the corn crop safe from frost on September 26th; 59 per cent on September 30th; 87 per cent on October 15th, and at least 5 per cent of the corn will not be mature on October 31st. The average condition of corn as compared with the average of past years on September 1st was 84 per cent; pastures, 80; potatoes, 95, and flax, 94. On September 1, 1916, the conditions were as follows: Corn, 83 per cent; potatoes, 58; flax, 88; pastures, 77. The low condition of corn last year was due to droughty conditions over the southern counties, while this year the condition would be excellent if it were not for the fact that the crop is so late.

Bulletin No. 23, September 11, 1917—

Another cool, wet week has further delayed the maturity of the belated corn crop. The average temperature was about 5 degrees below the normal, and in many localities showers were frequent and the rainfall excessive. Frost occurred on the mornings of the 10th and 11th over the northern and eastern parts of the state. Over the southern and eastern districts the showers were accompanied by severe wind squalls, which blew down and tangled corn badly, and by hail, which also did considerable damage. Corn made fairly good progress toward maturity in the western counties, where there was little or no rain and considerable sunshine, but over the greater part of the state there has been but little advancement. Some of the earliest planted corn is beginning to dent, but the bulk of the crop is only in the roasting ear stage and much of it is still in the milk or dough stage. An early killing frost would seriously damage seed corn. The rains, however, were beneficial to pastures, meadows, truck crops and late potatoes and softened the ground for fall plowing, which is now being rushed. Some winter wheat has been sown, and if the conditions are favorable there will be a large increase in the acreage of this crop.

Preliminary estimates made September 1st show the average yield of winter wheat per acre, is 19 bushels; spring wheat, 21; oats, 50; barley, 37; rye, 20; timothy seed, 5 bushels per acre. If these estimates are maintained by final reports, the state will produce about 2,500,000 bushels of winter wheat; 3,600,000 of spring wheat; 260,000,000 of oats, 9,500,000 of barley and 700,000 bushels of rye. The area of timothy cut for seed was only 60 per cent of last year's acreage. Eighty per cent of the threshing was finished on September 1st. Tuesday, September 11, 10:00 a. m.—Telegrams just received from correspondents indicate that the frost has seriously damaged corn and garden truck on low ground in the northeast portion of the state, and that slight damage has occurred in the northwest and southeast portions.

Bulletin No. 24, September 18, 1917—

The week was very favorable for rushing the corn crop toward maturity. The temperature was considerably below the normal on the first day, but since then dry, warm weather has prevailed. The frost on the 11th did considerable damage in the northeastern counties, but the first estimates as to the extent of damage were evidently overdrawn. There is no doubt, however, but what the damage was severe in certain localities, especially along streams and in many low places, but damage was prevented in some of the river and creek valleys by fog, which prevailed on that morning. There was little or no injury on uplands, and while 30 or 40 per cent of the corn in the northeastern counties was frosted, not more than 5 per cent of it will be unmerchantable. The frost also did some damage to late potatoes, garden truck, buckwheat and beans. Silo filling has begun and some corn has been cut for fodder. Canning factories are running to full capacity on sweet corn, which is yielding about three tons per acre. Rapid progress is being made in preparing ground for fall wheat and some wheat has been sown. Fall varieties of apples are being harvested with fairly good yields. More rain would be beneficial for pastures and to keep the ground in condition for plowing.

Bulletin No. 25, September 25, 1917—

The last seven days were fairly favorable for maturing corn, although the nights were too cool for the best results, and rain fell on two days over the northern districts, which had a tendency to retard the drying of the crop. Probably one-half to two-thirds of the crop is now safe from injury by an ordinary killing frost, and with clear, warm weather and drying winds the most of the remainder will be safe in ten days or two weeks, but even with the best of weather at least five per cent of the crop will not mature. Much corn is being cut for fodder or silo and this

work will be rushed during the coming week. Considerable seed corn has been gathered. More than the usual amount of fall plowing is being done in the northern districts, where sufficient rain fell during the week to put the ground in good condition, and considerable fall wheat has been sown, but over the larger part of the southern sections the ground is too dry to plow or germinate the wheat already sown. Potatoes are being dug, with fair to good yields and of good quality. Pasturage is generally short and stock is being fed in some localities. Some second growth clover has been cut for seed, with heads well filled.

Bulletin No. 26, October 2, 1917—

The average temperature for the week was about 2 degrees below the normal, and light to heavy frosts occurred on two or three mornings in practically all parts of the state, the heaviest being in the eastern counties. Corn made fairly good progress considering the cool weather, but fully one-third of the crop is not yet safe from an ordinary killing frost and much more than that would be seriously damaged by freezing temperatures. Not more than 80 or 85 per cent will be safe by October 15th, and from present indications from 5 to 10 per cent of the crop will require all of October and at least 5 per cent is hopeless. The southwestern and west central districts show the best condition and the central district the poorest. However, there is enough of the crop mature in all districts to insure sufficient seed for next year and the seed is now being gathered in large quantities. Much of the late bottom-land corn is being cut for fodder and many silos are being filled. Considerable corn is still in the roasting ear stage and as green as in July. Plowing and seeding of winter wheat and rye has been handicapped in the southern and central districts by dry weather, but over the northern counties there has been a decided increase in the acreage of winter wheat and rye sown. The acreage of clover cut for seed will be much less than the normal, and large areas of last spring's seeding of clover and alfalfa have been destroyed by grasshoppers. Cattle are on feed in many localities on account of shortage of pasturage. Rain is badly needed for pastures, plowing and fall-sown grains, but corn must have dry, warm weather.

Bulletin No. 27, October 9, 1917—

The week was much colder and drier than usual, the temperature being about 7 degrees below the normal, and the rainfall was practically nil. The frost of October 1st was much more damaging over the southeastern counties than was reported last week; the one on the 6th was killing in all parts of the state except over the extreme western and southwestern counties and the hard freeze on the 8th was general in all districts.

About 40 per cent of the corn in the northeastern counties has been seriously damaged, with less injury toward the west and south to the extreme southwestern corner of the state, where the damage probably did not exceed more than 1 to 3 per cent and most of that only slight.

Considering the crop as a whole, about 70 to 75 per cent was fully mature, 10 to 15 per cent was slightly damaged and the remainder will be soft or chaffy, depending on the character of the weather during the next few weeks. The total yield will be greater than last year, and the condition of the crop in the northeastern district is much better than it was in 1915 when killing frost and freezing temperature occurred in that district on August 30th. A great deal more than the usual amount of the crop is in shock or silo on account of the shortage of the hay crop. Much excellent seed corn has been gathered and much more should be selected at once from the best of the frosted fields and properly cared for, as good seed corn will be in demand next spring. Pop corn husking will begin in Ida and Sac counties in about ten days. Both the yield and quality of this crop is good. The yield of potatoes is turning out fairly well, the quality is generally good and the output will be much larger than last year on account of a greatly increased acreage. It is thought that winter apples may have been damaged by the hard freeze on the

8th. Good soaking rains are now needed for fall sown grains, grass lands and for the water supply, then clear, cool weather for drying out the corn.

Notwithstanding the fact that fall grains were badly winter-killed and that the planting season was cold and wet and the summer unusually cool, Iowa has done her share toward feeding the nation and the world.

The small grain crops were exceptionally good; there will be considerably more than the normal amount of corn and the truck crops were excellent.

IOWA CROP REPORT, JUNE 1, 1917.

Following is a summary showing the condition of crops on June 1st, as compared with the average of past years on that date:

Corn, 95 per cent; oats, 101; spring wheat, 98; winter wheat, 64; barley, 98; rye, 92; flax, 99; potatoes, 99; tame hay, 84; wild hay, 95; pastures, 90; alfalfa, 88 per cent. Last year on June 1st the conditions were as follows: Corn, 84 per cent; oats, 98; spring wheat, 96; winter wheat, 78; barley, 97; rye, 92; flax, 92; potatoes, 95; hay, 98; pastures, 102; alfalfa, 93 per cent.

The Secretary of the State Horticultural Society reports the condition of fruit as follows: "Apples, 80 per cent; pears, 61; American plums, 66; Domestica plums, 56; Japanese plums, 51; cherries, 71; grapes, 46; red raspberries, 45; black raspberries, 45; blackberries, 42; currants, 73; gooseberries, 77; strawberries, 66 per cent of a full crop. The average of all fruits is 56 per cent, or three points above the average for June last year. The condition of the apple crop is 2 per cent above the June average for any year since a percentage record has been kept by the Society. Grapes, raspberries and strawberries were injured during the winter in the southern part of the State, where there was no snow covering to protect them."

IOWA CROP REPORT, JULY 1, 1917.

Acreage of Farm Crops and Estimated Condition of Staple Crops.

Reports received July 1st, from township correspondents of the Iowa Weather and Crop Service, show the following results as to the acreage and average condition of staple farm crops:

Corn.—The acreage planted this year, after making allowance for the acreage lost by floods and washing, is 10,242,000 acres, or 866,000 acres more than last year, as shown by Township Assessors. The condition was 87 per cent, or 2 per cent better than on July 1, 1916. The plants are small for the time of the year, but the color is good, the fields are generally clean, and the crop is making rapid advancement.

Oats.—Area seeded, 5,238,500 acres, or 169,366 acres more than last year, and the condition is 8 per cent better than a year ago.

Winter Wheat.—On account of winter-killing, the acreage is reduced from 296,800 acres, as shown by the township assessors' reports to 133,900 acres, and the condition is the same as last year, 80 per cent.

Spring Wheat.—Area sown, 173,500 acres, or an increase of about 2,000 acres over last year, and the condition is 7 per cent better, or 99 per cent. The loss in acreage of wheat, hay, especially clover, and pastures is more than made up in the increase in acreage of corn, oats and potatoes.

Barley.—Acreage sown, 258,800 acres or a decrease of 2,000 acres. The condition is, however, 3 per cent better than last year, when it was 95 per cent.

Rye.—Acreage, 35,275 acres, which is nearly the same as in 1916. The condition is 94 per cent, or one per cent better than last year.

Flax.—Acreage, 7,400, as compared with 7,300 in 1916. Condition, 94, or 4 per cent better than last year.

Potatoes.—Acreage 98,810, increase almost 11,000 acres, and the condition is 106, or 9 per cent better than last year.

Hay.—Acreage of tame and wild hay, 3,196,000, or 432,000 acres less than in 1916. The condition is 83 per cent, or 13 per cent below last year.

Alfalfa.—Acreage, 103,215; decrease, 50,000 acres.

Pastures.—Acreage, 8,995,300; decrease, 400,000 acres; condition, 95 per cent.

Fruit.—The Secretary of the State Horticultural Society reports the condition of fruit on July 1st to be as follows:

Summer apples, 75%; fall apples, 64%; winter apples, 54%; pears, 44%; American plums, 43%; Domestica plums, 24%; Japanese plums, 15%; cherries, 62%; grapes, 50%; red raspberries, 51%; black raspberries, 53%; blackberries, 47%; currants, 56%; gooseberries, 76% of a full crop. The average for all fruits is 51%, or 1% higher than the average for July last year. The apple crop promises to be 20% better than it was a year ago, while the small fruits will be 20% less than they were last year. Insects and fungus diseases about normal. Twig blight more abundant than usual.

IOWA CROP REPORT, AUGUST 1, 1917.

Following is a summary showing the condition of crops on August 1st as compared with the average of past years on that date: Corn, 92 per cent; pastures, 90; potatoes, 96; flax, 96 per cent. Last year on August 1st the condition of corn was 90 per cent; pastures, 91; potatoes, 81; flax, 90 per cent.

Harvesting began about a week later than usual, and as a result there had not been enough threshing done by the close of the month to give a reliable estimate as to the average yield of small grains.

The report of the Secretary of the State Horticultural Society show the condition of fruit on August 1st to have been as follows: Summer apples, 65 per cent; fall apples, 59; winter apples, 49; pears, 47; American plums, 43; domestic plums, 22; Japanese plums, 17; grapes, 52 per cent of a full crop.

The average for all fruits is 44 per cent of a full crop. There will be twice as many summer apples, one-third more fall apples, but only 9 per cent more winter apples than in 1916. There will be a few more pears, though plums and grapes will not be more abundant than they were last year.

Summer fruits should be utilized as they mature, either dried, canned, made into butter, marmalade or other products that can be saved for future use. Let no fruit got to waste than can be used for food.

IOWA CROP REPORT, SEPTEMBER 1, 1917.

Following is a summary showing the condition of crops on September 1st, as compared with the average of past years on that date: Corn, 84 per cent; potatoes, 95; flax, 94; pastures, 80 per cent. On September 1, 1916, the conditions were: Corn, 83; potatoes, 58; flax, 88; pastures, 77 per cent.

Corn is unusually backward. Practically all of the earliest planted fields are only in the roasting ear stage and much of the crop is still in the milk or dough stage.

Preliminary reports indicate the average yield of winter wheat to be 19 bushels per acre; spring wheat, 21; oats, 50; barley, 37; rye, 20; timothy seed, 5 bushels per acre. If these estimates are maintained by final reports the State will produce about 2,500,000 bushels of winter wheat; 3,600,000 of spring wheat; 260,000,000 of oats; 9,500,000 of barley and 700,000 bushels of rye. The area of timothy cut for seed was only 60 per cent of last year's acreage. Eighty per cent of the threshing had been finished on September 1st.

FINAL CROP REPORT OF THE STATE, 1917.

Following is a summary of reports from crop correspondents of the Iowa Weather and Crop Service, showing the average yield per acre and total yields of staple soil products, and the average price at the nearest station, December 1, 1917. This report does not include or take into consideration live stock, poultry or dairy products.

The crop season of 1917 was an exceptional one; most of the crops being produced under great handicaps. The winter of 1916-17 was cold and the precipitation was generally deficient, particularly in the southern portion of the State. The snowfall was about normal in the northern counties, but very deficient in the southern sections until March and April, when in the latter month it exceeded the total amount for the three preceding months. A glaze storm on the night of December 25-26 covered nearly the entire state with a heavy coating of ice; and another on March 12-13 covered the region from the Des Moines to the Mississippi Rivers. April, May, and June were abnormally cold, and April and June were excessively wet. Cold weather continued until July 20th, after which it was hot and relatively dry till August 4th. The remainder of August was cool and the showers were light and scattered. Drought and grasshoppers became serious in some of the south-central and southeastern counties. September was cooler than normal with heavy frosts on the 11th, on the lowlands in the northern and eastern sections; there was, however, a warm period from the 13th to the 18th. Killing frosts occurred in some sections of the State on October 1st, in all but the southwestern portion on the 6th, and throughout the State on the 8th; and the entire month was cold, being the coldest of record, and 3.1 degrees colder than October, 1895, which heretofore held the record. Sunshine was unusually deficient, particularly in the northeast portion where it was less than one-third of the possible amount. November was much warmer and drier than usual with about the normal amount of sunshine.

Considering the various crops in their relation to the weather, some of the outstanding features may be noted as follows: Winter-killing was unusually prevalent, particularly in the central and southern divisions. Wheat, rye, clover, both old and new, timothy, blue grass, lawns, cane fruits and grapes all suffered seriously.

The winterkilling of wheat was due to the following causes: First, the plants were not well established at the beginning of winter. In the central and southern divisions, which include the bulk of the winter wheat acreage, drought, August 16-31, September 13-24, and October 1-14, 1916, delayed plowing, seeding and germination. November was warm with plenty of moisture, and the young plants got a fair start but were not sufficiently strong to resist the rigorous winter that followed. Second, the general glaze storm of Christmas night covered almost the entire area with a smothering coat of ice. Third, the snow covering was absent or generally deficient. In the central portion of the State there was considerable snow covering, but subsequent weather conditions reduced it to an impervious layer of ice equal in smothering properties to a covering of glaze. Where the snow covering was absent the plants were subjected to unusual extremes of temperature. Fourth, drought prevailed throughout the winter. The last three causes were responsible for the winterkilling of grasses.

In the northern portion of the State, where the snow covering was deeper, more porous and continuous, grasses and the small acreage of winter wheat that was sown did not suffer so seriously. The warm and normally moist March and the cool and generally wet spring and early summer were especially favorable for oats, spring wheat and barley, all of which made large yields, barley making a record yield. The yield of winter wheat on the acreage that was considered promising enough to let grow was good.

The corn acreage was greatly increased by plowing up the winterkilled wheat fields and meadows. This, together with the cold, wet, unfavorable spring, started it out about two weeks late. Large areas in the southern portion of the State were washed out or drowned out and replanted, some as late as the closing days of June. The abnormally cool weather of May, June, and the first half of July did not give the corn a chance to catch up. About the only good corn weather of the season occurred from July 20th to August 4th. Two weeks more of good corn corn weather would have matured a phenomenal crop, but a cold and cloudy October caught it unprepared. The yield is good but the quality is unusually poor. November, though much warmer and drier than normal, closed with the crop generally unfit for cribbing. Seed corn gathered since October 8th almost without exception shows very low germination tests. Considerable care will need to be exercised before another planting season to discover the unreliable seed, locate supplies of good seed and effect the proper distribution. Droughty conditions and grasshoppers during August, in some of the south-central and southeastern counties, made the pastures brown and bare. The Iowa Weather and Crop Service was consulted by several cattle men seeking pasturage in more favorable sections of the State to avoid the use of high-priced dry feed or immature corn fodder.

Looking forward to the winter wheat crop of 1918, it should be noted that in certain portions of the State, particularly the south-central and western, plowing, seeding and germination were delayed by dry, hard soil and droughty conditions, and October was too cold, and in some sections grasshoppers kept it eaten down so that the plants are not entering the winter in a resistant condition. There has been a great increase in the acreage sown as compared with the area harvested in 1917, but the acreage is considerably below the normal, and in order that we may have a normal wheat crop next year, it will be necessary to greatly increase the acreage of spring wheat.

The yields and values are as follows:

Corn.—The estimated acreage was 10,242,000 acres, or 763,000 acres more than in 1916; average yield, 40 bushels per acre; total yield, 409,667,000 bushels; average price, 97 cents per bushel; total value, $397,376,990. Fifty-one per cent of the crop was reported to be soft or immature and only 57 per cent had been husked on December 1st.

Oats.—The estimated area harvested was 5,238,500 acres, or about 50,000 acres more than in 1916. Average yield, 46 bushels; total yield, 239,416,200 bushels; average price, 61 cents; total value, $146,043,882.

Spring Wheat.—Area harvested, 173,460 acres; average yield, 18 bushels per acre; total yield, 3,199,820 bushels; price per bushel, $1.94; total value, $6,207,652.

Winter Wheat.—Area harvested, 133,930 acres; average yield per acre, 18 bushels; total yield, 2,397,560; average price, $1.97 per bushel; total value, $4,723,193.

Barley.—Area harvested, 258,775; average yield per acre, 35 bushels, which is a record for the State; total yield, 9,111,590 bushels; average price, $1.15; total value, $10,478,328.

Rye.—Average yield, 20 bushels per acre; total yield, 722,410 bushels; farm price, $1.58; total value, $1,141,408.

Flax Seed.—Average yield, 11 bushels; total yield, 80,810 bushels; total value at $2.87 per bushel, $231,925.

Timothy Seed.—Area harvested, 290,000 acres; average yield, 4.5 bushels; total yield, 1,306,093; total value, at $3.37 per bushel, $4,401,533.

Clover Seed.—Area harvested, 61,560 acres; average yield, 1.5 bushels; value at $14.00 per bushel, $1,292,760.

Potatoes.—Area harvested, 99,610 acres; average yield, 109 bushels; total yield, 10,793,600 bushels; average price, $1.32; total value, $14,247,552.

Hay (Tame).—Average yield, 1.3 tons per acre; total yield, 3,584,400 tons; average price, $18.82 per ton; total value, $67,458,408.

Hay (Wild).—Average yield, 1.2 tons; total yield 636,947 tons; average price, $14.79 per ton; total value, $9,420,446.

Alfalfa.—Area 103,215 acres; average yield, 3.4 tons; total yield, $353,830 tons; average price, $23.40 per ton; total value, $8,279,622.

TABULATED CROP SUMMARY.

	Acres	Average Yield	Average Price	Total Yield	Total Value
Corn	10,242,000	40 Bu.	$ .97	409,667,940	$ 397,376,990
Oats	5,238,500	46 Bu.	.61	239,416,200	146,043,882
Spring Wheat	173,460	18 Bu.	1.94	3,199,820	6,207,652
Winter Wheat	133,930	18 Bu.	1.97	2,397,560	4,723,193
Barley	258,775	35 Bu.	1.15	9,111,590	10,479,328
Rye	35,776	20 Bu.	1.58	722,000	1,141,850
Flax Seed	7,450	11 Bu.	2.87	80,810	231,925
Timothy Seed	290,243	4.5 Bu.	3.37	1,306,093	4,401,533
Clover Seed	61,560	1.5 Bu.	14.00	92,340	1,292,760
Potatoes	99,610	109 Bu.	1.32	10,793,600	14,247,552
Hay (Tame)	2,671,100	1.3 tons	18.82	3,584,400	67,458,408
Hay (Wild)	724,912	1.2 tons	14.79	636,947	9,420,446
Alfalfa	103,215	3.4 tons	23.40	353,830	8,279,622
Pastures and Grazing				Estimated	100,000,000
Ensilage				"	16,666,000
Sweet Corn				"	5,800,000
Pop Corn				"	900,000
Buckwheat				"	200,000
Fruit Crop				"	7,000,000
Garden Truck				"	8,000,000
Miscellaneous				"	12,000,000
Total					$ 822,061,291

The value of soil products for 1916 was $ 397,165,673

IOWA CROPS, 1917.

Counties	Corn	Oats	Winter Wheat	Spring Wheat	Barley
Adair	110,000	37,000	1,000	1,000	2,000
Adams	77,000	22,300	2,400	250	600
Allamakee	42,000	42,300	650	1,200	5,800
Appanoose	44,000	17,000	1,200	50	
Audubon	89,000	37,000	800	2,200	5,300
Benton	142,000	81,000	200	470	8,000
Black Hawk	109,000	57,500	400	230	2,800
Boone	122,000	67,000	1,000	400	900
Bremer	66,000	49,000	130	450	1,200
Buchanan	104,000	64,000	250	300	1,300
Buena Vista	131,000	82,000	60	150	500
Butler	107,000	76,000	60	480	1,170
Calhoun	133,000	100,000	100	150	620
Carroll	123,000	69,000	500	2,500	1,800
Cass	126,000	37,000	3,000	2,900	4,700
Cedar	111,000	38,000	1,000	400	10,300
Cerro Gordo	94,000	70,000	50	400	2,250
Cherokee	130,000	82,000	20	350	2,400
Chickasaw	66,000	60,500	60	1,700	2,250
Clarke	63,000	19,000	1,000		60
Clay	118,000	76,000	100	550	2,900
Clayton	79,000	63,000	1,350	1,000	9,000
Clinton	121,000	44,000	1,700	1,300	8,000
Crawford	107,000	65,000	1,700	10,000	4,400
Dallas	140,000	56,000	3,000	400	450
Davis	53,000	32,000	1,300	50	40
Decatur	69,000	33,000	2,400	50	30
Delaware	91,000	54,300	100	350	7,000
Des Moines	69,000	29,000	2,400	300	150
Dickinson	58,000	47,000	60	650	1,400
Dubuque	66,000	46,000	600	1,000	3,100
Emmet	62,000	54,000		130	800
Fayette	90,000	70,000	200	1,000	4,800
Floyd	88,000	73,000	130	700	1,800
Franklin	115,000	82,500	50	330	2,300
Fremont	150,000	11,400	8,000	750	120
Greene	132,000	65,500	1,100	100	650
Grundy	107,000	74,300	100	170	2,900
Guthrie	132,000	47,500	2,000	1,100	1,100
Hamilton	130,000	91,000	150	200	300
Hancock	104,000	87,000	40	1,000	2,600
Hardin	119,000	70,000	130	800	1,300
Harrison	160,000	25,000	6,500	15,000	1,200
Henry	75,000	29,000	1,100	100	30
Howard	92,000	56,500	150	800	4,400
Humboldt	93,000	66,700	80	200	1,000
Ida	97,000	33,000	90	1,500	2,000
Iowa	96,000	41,500	650	700	1,350
Jackson	62,000	29,000	1,200	1,000	2,300
Jasper	158,000	60,000	2,000	2,000	400
Jefferson	68,000	26,000	1,000	300	50
Johnson	102,000	41,000	600	600	800
Jones	79,000	32,000	300	900	4,700
Keokuk	109,000	46,000	750	1,200	120
Kossuth	175,000	141,000	100	650	500
Lee	56,000	22,000	2,000	50	300
Linn	117,000	56,000	400	700	1,600
Louisa	67,000	27,000	3,000	50	150
Lucas	51,000	19,300	800	120	50
Lyon	131,000	100,000	100	1,600	5,700
Madison	103,000	92,000	2,700	900	1,500
Mahaska	115,000	49,000	1,400	700	280
Marion	100,000	31,000	5,000	1,500	300
Marshall	125,000	60,500	600	600	450
Mills	111,000	23,000	2,000	4,000	600
Mitchell	65,000	82,000	20	1,300	2,700
Monona	135,000	33,000	13,000	13,000	1,600
Monroe	46,000	14,000	800	220	60
Montgomery	100,000	22,500	2,000	2,300	400
Muscatine	76,000	24,000	850	550	5,300
O'Brien	112,000	88,000	140	300	7,000
Osceola	79,000	70,500		100	3,000

NUMBER OF ACRES BY COUNTIES

Counties	Rye	Flax	Potatoes	Tame Hay	Wild Hay	Alfalfa	Pastures
Adair	30		1,150	29,000	2,300	100	108,000
Adams	110		500	25,000	1,400	600	98,000
Allamakee	430	75	1,200	43,000	1,100	15	168,000
Appanoose	150		700	26,000	800	40	109,000
Audubon	30		600	26,000	1,070	1,100	68,000
Benton	450		1,100	40,000	2,000	100	104,000
Black Hawk	1,150		1,900	29,000	7,500	100	90,000
Boone	20		1,700	19,000	7,300	280	73,000
Bremer	330		800	17,000	18,400	60	59,000
Buchanan	700		900	37,000	11,300	15	102,000
Buena Vista	50	60	1,200	32,000	10,400	730	70,000
Butler	900		1,400	21,000	10,440	20	87,000
Calhoun	20	40	540	18,000	4,700	200	54,000
Carroll	30		1,700	26,000	8,400	300	80,000
Cass	110		1,350	33,000	1,100	800	108,500
Cedar	400		940	41,000	150	360	94,000
Cerro Gordo	70	300	1,300	28,000	13,300	90	76,000
Cherokee	30		1,250	23,500	8,000	2,900	75,000
Chickasaw	250	80	700	24,000	14,500		80,000
Clarke	40		250	22,000	60	50	91,000
Clay	100	180	680	22,200	12,900	700	75,700
Clayton	600		1,900	57,000	1,000	80	161,000
Clinton	1,000		1,200	45,000	1,700	200	120,000
Crawford	50		1,600	40,000	5,200	4,400	111,000
Dallas	70		500	18,500	2,800	600	90,000
Davis	500		500	44,000	12	30	127,000
Decatur	200		300	26,000	95	100	113,000
Delaware	2,000		1,000	39,000	5,900	60	109,000
Des Moines	1,200		900	19,000	70	500	78,000
Dickinson	30	450	350	13,000	11,000	1,000	60,000
Dubuque	300		1,900	56,000	730	110	140,000
Emmet	80	215	400	16,500	7,300	75	54,000
Fayette	600		1,300	51,000	10,300	30	140,000
Floyd	420	160	1,300	27,000	4,300	50	69,000
Franklin	100	100	1,400	28,000	9,000	50	80,000
Fremont	300		900	7,000	2,700	6,200	50,000
Greene			500	22,000	6,000	300	72,000
Grundy			2,100	20,000	5,000	30	66,000
Guthrie	30		850	27,000	3,000	350	101,000
Hamilton			750	23,000	6,000	175	69,000
Hancock	100	120	750	23,000	18,500	100	83,000
Hardin	50		800	24,000	5,000	100	69,000
Harrison	80		900	10,400	7,000	8,500	88,000
Henry	325		430	22,000		170	90,000
Howard	140	500	900	28,400	13,300	20	76,000
Humboldt	170	60	400	16,000	6,000	150	43,000
Ida	30		800	21,000	1,900	1,200	87,000
Iowa	220		1,200	24,000	450	140	108,000
Jackson	730		1,250	45,000	1,050	130	173,000
Jasper	150		800	34,000	500	170	123,000
Jefferson	250		700	23,000		30	96,000
Johnson	700		1,100	34,500	425	170	104,000
Jones	450		850	40,000	230	80	98,000
Keokuk	200		640	34,000	50	70	113,000
Kossuth	100	700	1,500	23,000	34,000	275	111,000
Lee	6,300		1,200	32,000		300	159,000
Linn	800		1,700	37,000	2,300	170	117,000
Louisa	1,200		400	14,000	200	140	60,000
Lucas	20		220	24,500	100	90	95,000
Lyon	50		1,800	12,000	9,800	2,000	15,000
Madison	100		600	27,000	1,000	200	131,000
Mahaska	170		650	35,000	270	200	109,000
Marion	70		500	26,000	320	600	114,000
Marshall	20		1,000	31,000	300	300	78,000
Mills	200		1,100	10,000	4,100	7,000	68,000
Mitchell	30	900	2,000	26,200	3,200		70,000
Monona	50		2,400	8,000	13,000	11,000	98,000
Monroe	100		300	20,000	10	60	172,000
Montgomery	100		600	16,000	650	3,000	70,000
Muscatine	2,800		1,460	16,000	460	250	71,500
O'Brien	50	130	1,000	23,000	7,200	1,200	72,000
Osceola	30	160	900	14,000	7,000	175	43,000

IOWA CROPS, 1917.

Counties	Corn	Oats	Winter Wheat	Spring Wheat	Barley
Page	125,000	21,000	7,000	1,400	200
Palo Alto	59,000	64,000	50	150	800
Plymouth	202,000	96,000	1,200	22,000	5,200
Pocahontas	127,000	97,000	180	150	800
Polk	196,000	42,000	9,000	1,400	50
Pottawattamie	223,000	47,000	7,000	5,400	7,200
Poweshiek	118,000	46,000	350	800	1,400
Ringgold	82,000	26,000	1,900	100	100
Sac	130,000	72,000	40	50	3,700
Scott	84,000	39,000	1,200	820	21,500
Shelby	158,000	49,200	800	3,800	8,300
Sioux	159,000	108,000	700	13,000	14,000
Story	146,000	74,000	200	200	50
Tama	135,000	69,500	250	1,900	8,500
Taylor	105,000	27,000	1,600	130	300
Union	70,000	22,000	800	250	140
Van Buren	54,000	21,000	1,200	50	70
Wapello	65,000	22,000	2,000	100	400
Warren	96,000	24,500	7,500	700	300
Washington	97,000	42,000	1,500	300	50
Wayne	72,000	26,000	1,000	200	700
Webster	146,000	110,000	300	1,000	4,400
Winnebago	62,000	52,000		3,000	12,000
Winneshiek	84,000	69,500	300	5,200	2,150
Woodbury	206,000	70,000	2,100	7,300	3,700
Worth	48,000	60,000		2,000	1,400
Wright	121,000	84,000	50	400	
Totals	10,242,000	5,228,500	133,900	175,508	258,775

NUMBER OF ACRES BY COUNTIES—Continued

Counties	Rye	Flax	Potatoes	Tame Hay	Wild Hay	Alfalfa	Pastures
Page	450		500	42,000	1,100	2,000	86,000
Palo Alto	100	800	200	15,000	20,000	210	60,000
Plymouth	600		2,200	20,000	30,000	1,000	110,000
Pocahontas	150	100	650	17,000	11,000	300	50,000
Polk	100		1,100	13,000	7,500	600	81,000
Pottawattamie	300		2,700	20,000	8,400	14,000	130,000
Poweshiek	30		800	26,000	100	140	100,000
Ringgold	270		270	32,000	130	70	69,000
Sac		40	700	23,000	4,000	830	66,000
Scott	1,700		5,500	30,000	1,700	700	77,000
Shelby	150		1,100	30,000	4,000	2,800	90,000
Sioux	50		1,300	17,000	19,000	6,000	75,000
Story	40		250	26,000	2,000	270	98,000
Tama	30		1,200	34,000	1,200	140	127,000
Taylor	250		500	31,000	500	775	106,000
Union	30		630	23,000	400	80	100,000
Van Buren	300		220	31,000		225	135,000
Wapello	200		700	26,000		130	77,000
Warren	190		500	29,000	600	150	140,000
Washington	100		650	25,000		130	112,000
Wayne	70		150	21,000	50	70	97,000
Webster		100	700	21,000	12,500	250	78,000
Winnebago	100	450	820	16,000	22,000	50	55,000
Winneshiek	250	300	1,200	47,000	4,700	25	140,000
Woodbury	160		1,800	17,500	9,500	13,000	105,000
Worth	120	1,000	700	20,500	15,500	30	87,000
Wright	40	60	700	26,000	7,000	80	64,000
Total	35,275	7,420	98,810	2,671,100	324,912	103,215	8,996,300

TABULATED CROP SUMMARY

Counties	Corn		Oats		Spring Wheat		Winter Wheat		Barley	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels
Adair	38	4,180,000	50	1,850,000	16	16,000	15	15,000	45	90,000
Adams	33	2,601,900	43	907,500	21	5,900	16	38,400	41	28,700
Allamakee	37	1,554,000	45	1,905,500	20	26,000	26	16,900	31	179,800
Appanoose	37	1,628,000	58	986,000	18	900	15	18,000		
Audubon	39	3,471,000	34	1,258,000	18	29,600	28	22,400	33	264,000
Benton	41	5,822,000	49	3,969,000	18	8,500	18	3,600	49	220,000
Black Hawk	39	4,251,000	53	2,987,500	27	6,200	24	9,600	39	89,000
Boone	40	4,880,000	42	2,814,000	16	6,400	20	20,000	35	91,000
Bremer	37	2,442,000	44	2,056,000	23	10,300	18	2,500	35	42,000
Buchanan	33	3,432,000	48	3,072,000	17	5,100	21	5,200	37	70,300
Buena Vista	44	5,764,000	47	2,901,000	22	3,300	22	1,320	38	36,100
Butler	34	3,548,000	42	3,192,000	26	12,500	20	1,000	31	36,300
Calhoun	46	6,118,000	44	4,400,000	20	2,000	15	1,500	38	22,800
Carroll	45	5,535,000	41	2,829,000	18	50,400	20	10,000	39	74,100
Cass	39	4,914,000	37	1,369,000	17	49,300	16	48,000	34	159,800
Cedar	48	5,328,000	55	2,090,000	26	10,400	25	25,000	40	408,000
Cerro Gordo	41	3,854,000	45	3,150,000	19	7,600	19	950	30	67,500
Cherokee	46	5,980,000	55	4,510,000	20	7,000	22	440	34	81,600
Chickasaw	23	1,518,000	40	2,420,000	19	32,300	23	1,380	35	78,800
Clarke	39	2,547,000	51	969,000	20	800	14	14,000	30	1,800
Clay	43	4,859,000	41	3,116,000	18	9,900	22	2,200	25	72,500
Clayton	39	5,061,000	46	2,878,000	22	22,000	21	28,400	38	342,000
Clinton	43	5,203,000	49	2,156,000	24	31,200	24	22,800	35	280,000
Crawford	39	6,513,000	35	2,275,000	18	180,000	25	42,500	30	132,000
Dallas	46	6,440,000	53	2,968,000	12	4,800	21	63,000	40	18,000
Davis	34	1,802,000	49	1,568,000	14	700	12	15,600	45	1,800
Decatur	34	2,346,000	49	1,127,000	17	850	14	33,600	40	800
Delaware	31	2,821,000	47	2,561,500	24	8,400	18	1,800	37	259,000
Des Moines	47	3,243,000	43	1,247,000	31	9,300	20	48,000	35	8,300
Dickinson	32	1,856,000	41	2,256,000	16	10,400	15	900	28	49,000
Dubuque	38	2,508,000	45	2,070,000	24	24,000	24	12,000	41	127,100
Emmet	35	2,205,000	41	2,214,000	25	25,000			31	24,800
Fayette	29	2,610,000	46	3,220,000	21	21,000	22	4,400	37	170,000
Floyd	32	2,816,000	39	2,847,000	22	15,400	24	3,100	37	59,200
Franklin	41	4,715,000	48	3,900,000	20	6,600	23	1,150	30	63,000
Fremont	40	6,000,000	38	433,200	13	1,000	17	51,000	38	4,600
Greene	46	6,072,000	45	2,947,500	14	1,400	18	19,800	33	21,400
Grundy	41	4,387,000	44	3,279,000	24	4,100	20	2,000	37	107,300
Guthrie	41	4,592,000	41	1,948,000	16	17,600	14	28,000	28	30,800
Hamilton	45	5,850,000	50	4,550,000	21	4,200	19	2,900	31	9,300
Hancock	38	3,952,000	40	3,480,000	16	25,600	22	880	31	80,600
Hardin	45	5,355,000	49	3,430,000	24	10,000	22	2,900	35	45,500
Harrison	39	6,240,000	39	975,000	16	240,000	18	117,000	32	48,000
Henry	42	3,150,000	52	1,508,000	25	2,500	19	21,000	40	1,400
Howard	23	1,300,000	38	2,147,000	18	15,400	25	3,200	32	140,800
Humboldt	46	4,278,000	47	3,135,000	23	4,600	22	1,760	37	37,000
Ida	47	4,559,000	46	2,438,000	21	32,600	24	2,200	40	120,000
Iowa	45	4,320,000	55	2,282,500	24	16,800	25	2,000	40	54,000
Jackson	45	2,790,000	40	1,160,000	20	20,000	20	1,800	40	92,000
Jasper	40	6,320,000	48	2,880,000	20	40,000	17	11,000	25	10,000
Jefferson	35	2,380,000	38	988,000	22	6,600	15	15,000	35	2,000
Johnson	47	4,794,000	49	2,066,000	24	12,000	22	13,200	37	21,500
Jones	43	3,565,000	52	1,694,000	22	11,000	20	6,000	40	188,000
Keokuk	45	4,906,000	51	2,272,000	23	30,000	21	15,800	33	4,000
Kossuth	43	7,525,000	48	6,768,000	17	9,400	20	2,000	38	19,000
Lee	44	2,464,000	52	1,144,000	15	750	13	26,000	28	8,400
Linn	39	4,563,000	58	3,248,000	26	18,200	15	6,000	46	73,600
Louisa	41	2,747,000	48	756,000	18	900	17	51,000	34	5,100
Lucas	39	1,989,000	58	1,119,000	17	2,000	16	12,800	30	1,500
Lyon	38	4,978,000	53	5,300,000	22	33,000	18	1,800	38	216,800
Madison	34	3,502,000	46	1,472,000	20	18,000	17	46,000	34	52,000
Mahaska	47	5,405,000	51	2,499,000	21	14,700	15	21,000	40	11,200
Marion	43	4,300,000	53	1,643,000	25	37,500	16	80,000	40	12,000
Marshall	43	5,375,000	50	3,025,000	22	13,200	21	10,500	40	17,200
Mills	40	4,440,000	35	805,000	12	48,000	20	40,000	36	21,600
Mitchell	27	1,755,000	39	3,198,000	18	23,400	20	400	32	86,400

FOR THE YEAR 1917.

Counties	Rye		Flax Seed		Potatoes		Hay—Tame		Hay—Wild		Alfalfa	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bush'ls	Bushels per acre	Total Bushels	Tons per acre	Total Tons	Tons per acre	Total Tons	Tons per acre	Total Tons
Adair	15	300			100	115,000	0.9	26,100	1.5	3,300	3.5	350
Adams	24	2,700			56	28,000	0.7	17,500	1.0	1,400	4.0	2,400
Allamakee	19	8,600	10	750	106	526,000	1.8	77,400	1.8	2,200	3.5	50
Appanoose	15	2,250			71	49,700	1.1	39,600	1.0	800	3.0	120
Audubon	20	600			79	51,400	1.0	26,000	1.5	3,000	4.0	4,400
Benton	19	8,600			80	88,000	1.4	56,000	1.0	2,000	1.5	150
Black Hawk	24	27,600			112	179,200	1.4	40,600	1.1	8,300	2.0	200
Boone	17	340			68	115,600	1.2	22,800	1.1	7,900	2.1	900
Bremer	18	9,500			101	171,700	2.0	34,000	1.4	25,700	3.0	180
Buchanan	18	12,600			115	109,200	1.4	51,800	1.4	15,800	3.2	50
Buena Vista	20	1,000	11	660	94	112,800	1.3	28,000	1.3	15,500	3.3	2,400
Butler	21	18,900			105	147,000	2.0	42,000	1.1	11,500	3.0	60
Calhoun	20	400	10	400	73	39,400	1.3	23,400	0.9	4,200	3.5	900
Carroll	19	570			77	207,400	1.2	31,200	1.1	9,200	5.0	2,600
Cass	17	1,870			70	94,500	1.0	33,000	1.2	3,000	2.2	1,900
Cedar	19	7,600			72	67,700	1.5	58,300	1.2	180	2.0	220
Cerro Gordo	14	980	10	3,000	180	184,000	1.6	44,800	1.2	16,000	4.0	300
Cherokee	20	600			110	137,500	1.0	23,500	1.1	8,800	3.5	8,750
Chickasaw	23	5,800	12	960	96	96,500	2.0	48,000	1.5	21,800		
Clarke	18	720			80	20,000	1.1	25,300	1.5	90	2.0	100
Clay	12	1,200	9	1,620	144	92,200	1.1	24,400	1.0	12,200	3.5	2,450
Clayton	19	11,400			122	231,500	1.7	97,000	1.3	1,500	3.0	240
Clinton	18	18,900			99	119,000	1.1	50,500	1.0	1,700	3.0	600
Crawford	22	1,100			158	252,800	1.2	48,000	1.4	7,300	3.5	15,400
Dallas	23	1,600			72	36,000	1.0	18,500	1.1	3,100	4.5	2,700
Davis	25	12,500			60	30,000	1.1	48,400	1.0	12	3.0	90
Decatur	14	2,800			68	13,600	1.7	61,200	0.8	76	2.7	500
Delaware	16	32,000			74	74,000	1.4	54,600	1.3	7,400	4.5	270
Des Moines	20	24,000			120	108,000	1.1	24,000	1.1	1,500	3.4	1,700
Dickinson	19	570	10	4,200	86	90,100	1.4	18,200	1.1	12,800	4.0	4,000
Dubuque	23	6,900			126	239,400	1.4	78,400	0.9	600	3.8	420
Emmet	28	2,240	10	2,150	70	28,000	1.2	19,800	1.0	7,300	3.5	200
Fayette	24	10,400			154	200,000	1.6	81,600	1.1	11,200	4.0	80
Floyd	20	8,400	11	1,760	125	162,500	1.9	51,300	1.2	5,100	2.6	130
Franklin	21	2,100	11	1,100	166	226,800	1.7	47,000	1.4	12,600	3.8	140
Fremont	16	4,800			62	55,800	1.0	7,000	1.7	4,600	3.5	18,600
Greene					96	48,000	1.0	22,000	1.1	6,600	2.0	600
Grundy	28	300			120	252,000	1.1	22,000	1.0	5,000	3.0	100
Guthrie	23	460			73	39,700	1.3	35,100	1.0	3,600	3.0	1,050
Hamilton	30	1,200			70	52,500	1.3	30,000	1.1	6,600	3.2	5,000
Hancock	20	2,000	11	1,650	120	90,000	1.2	28,200	1.0	18,500	3.5	350
Hardin	26	1,300			98	83,300	1.2	31,000	1.0	5,600	3.0	300
Harrison	18	1,800			87	78,300	2.5	26,000	2.5	17,500	4.0	54,000
Henry	18	9,500			117	49,100	1.3	28,600			2.6	450
Howard	18	2,500	10	5,000	91	81,900	1.7	48,300	1.0	13,100	4.0	80
Humboldt	25	4,300	10	600	107	42,800	1.4	22,400	1.0	6,400	2.6	200
Ida	25	500			100	80,000	1.3	27,300	1.2	2,300	3.8	4,600
Iowa	26	5,700			86	103,200	1.2	28,800	1.0	450	4.0	560
Jackson	30	21,600			150	187,500	2.0	90,000	1.5	1,600	4.0	320
Jasper	20	3,400			80	56,000	0.9	39,000	1.2	600	1.8	300
Jefferson	13	2,500			114	79,800	1.1	25,300			3.0	75
Johnson	20	14,000			89	97,900	1.1	38,000	1.0	425	3.0	510
Jones	23	10,300			110	83,500	1.3	52,000	0.8	184	4.0	320
Keokuk	24	4,800			87	55,700	1.2	40,800	1.0	50	4.5	340
Kossuth	30	3,000	10	7,000	135	202,500	1.5	49,500	1.1	37,400	3.0	825
Lee	24	151,000			111	133,000	1.5	48,000			3.5	19,400
Linn	22	21,600			149	149,000	1.1	40,700	0.8	1,800	2.7	400
Louisa	17	18,000			85	34,000	1.2	17,000	1.1	220	3.0	420
Lucas	15	300			94	20,700	1.4	34,300	0.5	50	3.0	150
Lyon	20	1,000			124	223,200	1.5	19,500	1.5	14,700	3.2	6,900
Madison	20	1,000			48	28,800	1.1	30,000	1.0	1,000	2.5	500
Mahaska	21	3,000			90	58,500	1.1	38,500	1.2	450	2.2	400
Marion	26	1,800			100	50,000	1.1	28,600	1.1	330	2.6	1,040
Marshall	24	480			86	86,000	1.0	31,000	0.8	240	2.5	200
Mills	20	2,400			85	96,500	1.0	10,000	1.0	4,100	3.0	21,000
Mitchell	20	600	13	12,500	170	425,000	1.8	47,200	1.2	3,800		

TABULATED CROP SUMMARY

Counties	Corn		Oats		Spring Wheat		Winter Wheat		Barley	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels
Monona	34	5,270,000	30	1,287,000	15	195,000	19	247,000	21	49,350
Monroe	42	1,932,000	60	840,000	19	6,100	20	18,000	43	2,580
Montgomery	40	4,240,000	45	1,013,000	18	50,400	14	42,000	26	14,400
Muscatine	43	3,268,000	53	1,272,000	24	12,400	20	17,000	35	182,000
O'Brien	43	4,816,000	45	3,870,000	18	5,400	20	2,800	32	224,000
Osceola	30	2,370,000	47	3,313,500	21	2,100	----	----	30	90,000
Page	38	4,750,000	49	1,029,000	16	32,400	19	133,000	30	6,000
Palo Alto	38	3,382,000	42	2,688,000	25	3,800	18	900	32	25,600
Plymouth	40	8,080,000	44	4,224,000	17	544,000	22	26,400	30	198,000
Pocahontas	45	5,715,000	46	4,462,000	20	5,000	19	3,400	25	28,000
Polk	43	4,472,000	48	2,016,000	21	29,400	18	162,000	28	1,960
Pottawattamie	40	8,920,000	47	2,209,000	19	102,600	18	126,000	35	252,000
Poweshiek	46	5,428,000	54	2,484,000	22	17,600	20	7,000	40	56,000
Ringgold	35	2,870,000	44	1,144,000	16	1,600	15	28,500	23	2,300
Sac	40	4,800,000	44	3,168,000	18	900	12	480	32	112,000
Scott	50	4,200,000	54	1,404,000	29	24,000	26	31,200	36	774,000
Shelby	39	5,322,000	43	2,128,800	16	60,800	20	16,000	34	282,200
Sioux	45	7,155,000	49	5,292,000	20	280,000	19	13,300	34	476,000
Story	48	7,008,000	45	3,330,000	24	4,800	28	8,400	36	1,800
Tama	40	5,400,000	42	2,268,000	26	49,400	19	4,800	35	297,500
Taylor	33	3,300,000	42	1,134,000	17	2,200	17	27,200	40	12,000
Union	36	2,520,000	50	1,100,000	17	4,200	15	12,000	40	5,600
Van Buren	38	2,052,000	50	1,050,000	18	540	17	20,400	----	----
Wapello	36	2,340,000	45	990,000	12	1,200	16	32,000	41	2,870
Warren	41	3,936,000	50	1,125,000	19	10,830	23	172,500	40	18,400
Washington	32	3,104,000	45	1,890,000	16	4,800	15	22,500	30	9,000
Wayne	36	2,592,000	49	1,274,000	10	2,000	11	11,000	30	1,200
Webster	38	5,548,000	43	4,730,000	17	17,000	15	4,500	38	26,600
Winnebago	35	2,170,000	45	2,385,000	17	51,000	----	----	34	151,300
Winneshiek	36	2,184,000	42	2,919,000	19	68,400	24	7,200	30	360,000
Woodbury	38	7,828,000	43	3,010,000	21	163,800	22	46,200	38	81,700
Worth	37	1,776,000	37	2,220,000	22	44,000	21	4,200	40	148,000
Wright	38	4,598,000	43	3,612,000	18	7,200	16	800	36	50,400
Totals	40	409,667,000	46	239,416,200	18	3,199,820	18	2,397,560	35	9,112,590

FOR THE YEAR 1917—Continued

Counties	Rye		Flax Seed		Potatoes		Hay—Tame		Hay—Wild		Alfalfa	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Tons	Bushels per acre	Total Tons	Bushels per acre	Total Tons
Monona	25	1,250	----	----	118	283,200	2.0	17,800	1.7	23,000	3.4	37,400
Monroe	20	2,000	----	----	100	38,000	1.4	42,000	1.0	10	3.0	150
Montgomery	16	2,600	----	----	84	50,400	0.9	14,400	1.2	800	2.5	7,500
Muscatine	16	44,800	----	----	108	166,000	1.1	17,000	0.9	420	3.0	750
O'Brien	22	1,100	16	2,000	84	84,000	1.4	22,200	1.0	7,200	2.4	2,900
Osceola	23	600	14	2,240	110	99,000	1.5	21,000	1.1	7,700	2.5	450
Page	17	7,650	----	----	50	32,500	1.1	46,200	1.0	1,100	3.7	9,250
Palo Alto	28	5,320	10	5,000	143	71,500	1.5	22,500	1.1	22,000	2.6	550
Plymouth	21	10,500	----	----	111	255,300	1.6	32,000	1.4	22,000	3.1	1,100
Pocahontas	30	4,500	13	1,950	90	58,500	1.3	22,100	1.1	12,100	3.0	600
Polk	22	2,200	----	----	88	96,800	1.2	15,000	1.2	3,000	2.4	1,450
Pottawattamie	27	8,100	----	----	96	259,200	1.4	42,000	1.4	11,760	2.2	44,800
Poweshiek	23	690	----	----	91	72,800	1.4	36,400	1.2	120	2.0	720
Ringgold	15	4,000	----	----	62	18,700	1.0	32,000	1.1	150	3.0	210
Sac	28	560	12	480	133	86,100	1.3	29,900	1.2	5,500	2.8	925
Scott	21	36,750	----	----	117	409,500	1.3	26,000	1.2	2,000	2.8	2,000
Shelby	27	4,000	----	----	88	96,800	0.9	27,000	1.0	4,000	2.0	5,600
Sioux	20	1,000	----	----	106	140,400	1.0	27,200	1.2	18,000	2.7	18,500
Story	30	1,200	----	----	92	23,000	1.3	32,800	0.9	1,800	2.0	540
Tama	22	660	----	----	86	103,200	1.4	47,600	1.1	1,300	4.0	520
Taylor	15	3,750	----	----	95	52,200	1.3	40,300	1.2	700	1.8	1,400
Union	15	450	----	----	61	38,400	1.0	23,000	1.2	540	4.0	220
Van Buren	18	9,000	----	----	61	13,400	1.2	39,600	----	----	3.5	800
Wapello	8	1,600	----	----	67	33,200	1.4	36,400	----	----	2.0	200
Warren	20	3,800	----	----	102	51,000	1.2	34,000	1.0	500	2.5	375
Washington	15	1,500	----	----	90	58,500	1.0	35,000	----	----	3.0	360
Wayne	15	1,050	----	----	107	16,000	1.2	37,200	1.0	50	2.8	200
Webster	20	200	12	1,200	59	41,300	1.7	39,100	1.4	17,500	3.0	1,050
Winnebago	22	2,200	10	4,500	153	115,700	1.6	35,600	1.2	20,400	3.5	175
Winneshiek	23	8,000	8	2,400	101	121,200	2.0	94,000	1.4	6,600	3.0	75
Woodbury	22	3,500	----	----	108	194,400	1.2	21,000	1.7	16,200	3.6	46,800
Worth	27	3,200	11	17,600	100	76,000	2.0	41,000	1.2	18,000	3.0	100
Wright	19	760	14	840	104	72,800	1.5	39,000	1.2	8,400	5.0	400
Totals	20	722,600	11	80,810	109	10,793,600	1.3	2,584,400	1.2	636,947	3.4	353,830

U. S. DEPARTMENT OF AGRICULTURE
WEATHER BUREAU

In Co-operation with the

IOWA WEATHER AND CROP SERVICE

Annual Report for 1918

CHARLES D. REED, M. Sc. Agr.

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LETTER OF TRANSMITTAL.

HON. W. L. HARDING, *Governor.*

SIR: In compliance with the requirements of the law, I have the honor to submit herewith the twenty-ninth annual report of the Iowa Weather and Crop Service for the year 1918.

CHARLES D. REED, *Director.*

Des Moines, Iowa, June 15, 1919.

HISTORICAL DATA.

The Iowa Weather and Crop Service was established by an Act passed by the Twenty-third General Assembly, and approved by the Governor April 25, 1890.

The object of the Service is to cooperate with the U. S. Weather Bureau in collecting crop statistics and meteorological data, and more widely disseminate the weather forecasts and storm and frost warnings for the producers and shippers of perishable products, and to promote general knowledge of meteorological science and the climatology of the State.

In accordance with the Act, on the recommendation of the directors of the State Agricultural Society, J. R. Sage was duly commissioned as director by Governor Boies on June 3, 1890, and General Greeley, then Chief Signal Officer, U. S. Army, detailed Dr. George M. Chappel to serve as assistant director of the State Service. Mr. J. R. Sage resigned as director December 31, 1907, and Dr. George M. Chappel was commissioned on January 1, 1908, as director, and served in that capacity till March 31, 1919 when he resigned and was succeeded by Charles D. Reed.

OFFICE FORCE, DECEMBER 31, 1918.

Charles D. Reed, M. Sc. Agr., Director.
Fred L. Disterdick, Meteorologist and First Assistant.
Ed. W. McGann and Ethel D. Slaght, Assistants.
Ruby C. Sage, Stenographer and Statistician.
Horace C. Burgum, Apprentice.

ANNUAL REPORT, 1918.

For convenient reference and comparison with past and future years, this report contains the summaries of the monthly and weekly bulletins of the Iowa Weather and Crop Service in cooperation with the Weather Bureau of the United States Department of Agriculture for the year 1918.

The regular meterological, climatological and crop statistical work of the Service was maintained at as high a standard of efficiency as possible with the frequent changes in personnel, due to war causes and the lack of trained assistance. The changes in personnel were numerous among the cooperative observers and crop correspondents. Resignations and deaths resulted in closing a few stations.

Increased cost of publication caused considerable curtailment of mailing lists to keep within the appropriation, which has remained the same for more than 20 years. Sixteen thousand copies of the monthly Climatological Reports, and 22,500 copies of the Weather-Crop Bulletins were distributed during the year. Five hundred copies of the monthly reports are distributed each month through the Weather Bureau, U. S. Department of Agriculture, to scientific Institutions and libraries in this and foreign countries.

The daily weather forecasts were distributed by telegraph at the expense of the U. S. Weather Bureau to 78 towns, by franked mail to 1,918 addresses, by rural delivery to 819 addresses, and by free telephone to 131,272 subscribers. Frost warnings are sent, in case of necessity, during the fruit blooming season, to all orchardists in the State who are prepared to use orchard heaters in case of frost or injurious temperatures.

CLIMATOLOGY OF THE YEAR 1918.

The mean temperature, 49.2°, is 1.8° above normal. All months were warmer than normal, except January, April, July and September which were deficient in temperature. The highest temperature, 113°, at Clarinda, on August 4, equaled the 29-year record for the State. The period, July 25 to August 13, was abnormally dry and hot and caused serious damage to the corn crop, particu-

larly over the southwest one-third of the State. The total precipitation averaged 32.78 inches, or 0.81 inch above normal. The precipitation was considerably in excess of normal in the north-central counties and markedly deficient in Pottawattamie and adjoining counties.

The season advanced rapidly in the spring, harvest began about 10 days early and conditions were favorable for all crops till the heat and drouth period above mentioned. Though September was cold, dry and unfavorable for fall seeding, a large acreage of wheat was seeded, and favorable conditions in the other fall months caused wheat and rye to make good growth and enter the winter in excellent condition. Corn was of excellent quality; 90 per cent was husked by December 1 and nearly all by the close of the year. Very little was marketed because of unusually bad roads. Generally favorable weather in all seasons, offset in large measure, the labor shortage, due to the war.

Barometer (reduced to sea level). The average pressure of the atmosphere for the year was 30.01 inches. The highest pressure was 31.07 inches, at Sioux City, on February 21st. The lowest pressure was 29.02 inches, at Charles City, on February 14th. The range for the State was 2.05 inches.

Temperature. The mean temperature for the State was 49.2° or 1.3° above the normal. The highest annual mean was 53.1°, at Keokuk, Lee County. The lowest annual mean was 45.0° at Estherville, Emmet County. The highest temperature reported was 113°, at Clarinda, Knoxville and Shenandoah, on August 4th. The range for the State was 149°.

Precipitation. The average amount of rainfall and melted snow for the year was 32.78 inches, or 0.81 inches more than the normal, and 4.97 inches more than the average for 1917. The greatest amount at any station was 47.53 inches, at Nora Springs, Floyd County, and the least amount was 21.44 inches, at Omaha, Nebr. The greatest monthly precipitation was 11.98 inches, at Gilman, Marshall County, in May. The least amount was a trace, at Harlan in the Central Division in March. The greatest amount in any 24 consecutive hours was 5.37 inches, at Monroe, on June 24th. Measurable precipitation occurred on an average of 92 days, 10 days more than in 1917.

Snowfall. The average amount of snowfall was 33.6 inches. The greatest amount reported from any station was 55.5 inches at Lacona, Warren County, and the least amount was 17.8 inches at Rock Rapids, Lyon County. The greatest monthly snowfall was 27.8 inches at Le Claire, Scott County, in January.

Wind. The prevailing direction of the wind was southwest. The highest velocity reported was 60 miles an hour from the west at Sioux City, Woodbury County, on May 9th.

Sunshine and Cloudiness. The average number of clear days was 173, partly cloudy, 97; cloudy, 95; as against 171 clear; 98 partly cloudy, and 96 cloudy days in 1917. The average percentage of the possible amount of sunshine was 61 or about normal.

MONTHLY SUMMARIES.

JANUARY.

January, 1918, was severely and almost continuously cold—only January, 1912, being colder. The mean temperature of the 62-day period, December 1, 1917 to January 31, 1918, 11.6° is the coldest of the 28 similar periods since statewide records began, and 2.5° colder than the former record period, December, 1892-January, 1893. The deficiencies in temperature for January were greatest in the southeastern and west-central counties. Precipitation, mostly snow, averaged about normal for the State, but was excessive in some of the Mississippi River counties and deficient in portions of Boone, Carroll, Dallas and Guthrie counties and southwest to the boundaries of the State. The ground was snow-covered, continuously over about the eastern one-third of the State, less than 20 days in Crawford, Carroll, Greene and Boone counties, and less than 10 days toward the close of the month over most of Boone county.

The condition of winter wheat has not changed much, being fair in the southeastern counties and varying much in small adjacent areas in other sections. With the prevailing methods of culture, wheat fields were generally blown bare of snow by the winds, though the surrounding country remained snow-covered. About 8 per cent of the corn is still unhusked. Cold and snowy weather impeded rail traffic; and because of the car shortage, little corn was shelled. Live stock is generally reported in good condition, though fed to capacity on the soft corn which has little more than half the usual feeding value.

Pressure. The mean pressure (reduced to sea level) for the State was 30.03 inches. The highest recorded was 30.82 inches, at Sioux City, on the 31st, and the lowest was 29.34, at Dubuque, on the 12th. The monthly range was 1.48 inches.

Temperature. The mean temperature for the State, as shown by the records of 97 stations, was 8.6°, or 9.3° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 5.9°, or 8.7° lower than the normal; Central, 8.9°, or 9.3° lower than the normal; Southern, 11.1°, or 9.8° lower than the normal. The highest monthly mean was 14.2°, at Northboro, and the lowest monthly mean was 2.2° at Estherville. The highest temperature reported was 53°, at Thurman, on the 1st, and at Northboro, on the 24th, and the lowest temperature reported—35° at Washta on the 31st. The temperature range for the State was 88°.

Humidity. The average relative humidity for the State at 7 a. m. was 85 per cent, and at 7 p. m. it was 79 per cent. The mean for the month was 82 per cent, or about 1 per cent more than normal. The highest monthly mean was 88 per cent at Charles City, and the least was 75 at Omaha, Nebr.

Precipitation. The average precipitation for the State, as shown by the records of 102 stations, was 1.02 inches, or 0.03 inch less than the normal. By divisions the averages were as follows: Northern, 1.04 inches, or 0.20 inch more than the normal; Central, 1.10 inches, or 0.01 inch less than the normal; Southern, 0.91 inch, or 0.28 less than the normal. The

greatest amount, 2.79 inches, occurred at Le Claire, and the least, 0.26 inch, at Northboro. The greatest amount an any 24 consecutive hours, 1.00 inch, occurred at Fairfield, on the 6th, and at Nora Springs on the 27th.

Snow. The average snowfall for the state was 11.2 inches, or 4.3 inches above the normal. The greatest amount, 27.8 inches, occurred at Le Claire, and the least, 3.0 inches, at Creston.

Wind. The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 46 miles an hour from the northwest, at Sioux City, on the 23rd.

Sunshine and Cloudiness. The average percentage of the possible amount of sunshine was 53, or about 3 per cent higher than the normal. The percentage of the possible amount at the several regular Weather Bureau stations was as follows: Charles City, 37; Davenport, 55; Des Moines, 57; Dubuque, 60; Keokuk, 52; Omaha, Nebr., 61; Sioux City, 50. Clear days averaged 13; partly cloudy days, 8; cloudy, 10.

Miscellaneous Phenomena. Aurora, observed at Allison and Nora Springs on 30th. Fog, 1st, 3d, 5th, 8th, 10th, 11th, 20th, 22d, 29th, 30th. Hail, 22d, 24th. Halos (lunar or solar), 1st, 4th, 9th, 11th, 12th, 15th, 17th, 18th, 22d, 25th, 29th, 30th, 31st. Haze, 2d, 3d, 4th. Meteor (brilliant), observed at Atlantic, Corning, Corydon, Des Moines, Earlham, Glenwood, Indianola, Lamoni, Mason City, Mt. Ayr, Washta and Winterset on the 22d (see article on page 9 relative thereto). Parhelia, 8th, 9th, 11th, 12th, 16th, 17th, 18th, 26th. Sleet, 1st, 2d, 5th, 23d, 24th, 26th, 30th; at scattered stations.

COMPARATIVE DATA FOR THE STATE—JANUARY.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	19.7	+ 1.8	61	—27	2.03	+0.98	2.46	0.35					
1891	20.0	+ 8.1	58	— 4	1.75	+0.70	2.00	0.61		4	13	7	11
1892	15.2	— 2.6	50	—38	1.09	+0.04	3.13	0.10	6.9	5	16	9	6
1893	9.3	— 8.6	54	—31	0.74	—0.31	3.23	0.13	6.9	6	11	9	11
1894	19.3	+ 1.4	69	—27	1.09	—0.04	2.24	0.21	6.0	5	14	9	8
1895	13.6	— 4.3	68	—31	0.85	—0.20	2.65	0.09	8.7	4	15	7	9
1896	23.4	+ 5.5	68	—20	0.48	—0.57	2.10	T.	7.8	3	18	10	11
1897	17.2	— 0.7	66	—30	2.03	+0.96	6.16	0.15	8.2	7	12	7	12
1898	23.4	+ 5.5	52	—11	1.60	+0.55	5.22	T.	12.6	5	15	6	10
1899	19.8	+ 1.9	68	—34	0.28	—0.77	1.13	T.	1.5	3	15	10	6
1900	25.6	+ 7.7	66	—20	0.53	—0.52	2.47	T.	2.2	3	16	7	8
1901	23.7	+ 5.8	60	—21	0.74	—0.31	2.34	0.08	6.2	4	14	9	8
1902	22.4	+ 4.5	62	—31	0.88	—0.17	2.83	0.19	9.4	4	17	8	6
1903	23.0	+ 5.1	60	—12	0.28	—0.77	1.46	T.	2.0	4	13	7	11
1904	14.0	— 3.9	57	—32	1.18	+0.13	3.68	0.02	6.1	6	12	8	11
1905	11.3	— 6.7	54	—36	0.91	—0.14	1.92	0.12	11.1	5	14	7	10
1906	24.6	+ 6.7	69	—19	1.52	+0.47	4.71	0.28	11.3	5	14	6	11
1907	18.8	+ 0.9	68	—22	1.52	+0.47	5.20	0.50	6.0	7	8	7	16
1908	24.9	+ 7.0	60	—18	0.44	—0.61	1.50	0.06	4.6	2	17	8	6
1909	21.2	+ 3.3	73	—25	1.66	+0.61	3.74	0.41	7.8	6	9	6	16
1910	18.1	— 0.2	56	—35	1.37	+0.52	3.55	0.55	12.0	6	13	7	11
1911	20.2	+ 2.3	66	—35	0.97	—0.08	3.73	0.11	7.3	5	9	8	14
1912	4.2	—13.7	49	—47	0.53	—0.52	1.99	T.	5.5	5	14	7	10
1913	20.9	+ 2.0	67	—25	0.77	—0.28	2.05	0.04	7.2	5	14	9	8
1914	27.8	+ 9.9	64	—10	0.88	—0.17	2.34	0.27	5.1	5	11	8	12
1915	17.5	— 0.4	59	—31	1.63	+0.58	5.13	0.10	7.2	5	13	8	10
1916	17.8	— 0.1	65	—34	2.62	+1.57	6.07	0.85	7.2	10	12	6	13
1917	17.0	— 0.9	60	—28	0.83	—0.22	2.05	0.12	7.2	4	17	8	6
1918	8.6	— 9.3	52	—35	1.02	—0.03	2.79	0.26	11.2	7	13	8	10

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

BRILLIANT METEOR OF JANUARY 22, 1918.

By D. W. Morehouse, Ph. D., Drake University, Des Moines, Iowa.

On January 22, about 6 p. m. central standard time, a very brilliant meteor passed over the western portions of Iowa and Missouri. About thirty observations which seemed to contain definite and reliable information were collected in Iowa, Missouri, Kansas and Nebraska, including notes made by cooperative observers of the Weather Bureau in Iowa. It appears from these data that the meteor moved in a general direction from north to south bearing slightly toward the east; that its path was at a considerable height; and that the place of its disappearance is not far from St. Joseph, Mo. Reports from Mason City, Ia., describe the meteor as very bright and appearing a little west of south. A report from Washta bears the same statement, except that it was then seen in the south. A fragment is reported to have fallen on the farm of Rudolph Peterson, three miles north of Creston, Ia. While the description is scientifically untenable, it has some appearance of genuineness. The statement is that, "It could not be approached for over 24 hours because it was so hot. It was about the size of a bushel basket. The segment (fragment) has the appearance of pumicestone and is apparently porous. There are particles of iron in the stone."

At Lamoni, Ia., the meteor was described as falling in the northwest, followed by several heavy rolls of thunder. At Baxter, it is reported that two falling stars were seen to cross the sky. Rockwell City reports that "The glare from a meteor passing through the sky in the north Tuesday evening frightened a team of horses hitched to a hayrack, causing a runaway." The farthest north from which there is any authentic report of a noise, is Mt. Ayr, Ia. The statement written to me personally from a former student is, "It was first seen coming from the north and west of this immediate vicinity. Just before it vanished from view it seemed to be much redder and looked to be going down. In just about 10 minutes after we saw the meteor we heard a report as though a large shot gun had been discharged at a distance of about a quarter of a mile. Immediately following the report we experienced a shock that rattled our doors and windows. The people of Mt. Ayr also experienced the shock, though not the report. Our first neighbor south also heard the report and felt the shock in about 10 minutes."

From St. Joseph, Mo., the report is that "A small piece of the meteor hit the earth just east of the city limits at the home of Richard Tarwater. It struck in the yard close to the house, according to members of the family, and imbedded itself in the ground." "There was a brilliant light lasting about 30 seconds but no noise," reported Mr. Tarwater. The most southern point reporting the meteor to date, is Coffeyville, Kans., where it is described as "Giving a lurid glare and passing from the west toward the east, striking seemingly just north of town with such force that the windows in the city rattled to such an extent that the people ran out thinking an explosion had occurred." At Richmond, Mo., it was reported that "The vivid white ball of fire traveling across the northern sky appeared to burst high in the air and the fragments were consumed before they reached the earth." Fragments were also reported from Albany, Mo. The usual thin cloud of dust marking the trail of the meteor high in the sky was noted by practically every observer, but none reports any drift showing the movement of the higher air.

FEBRUARY.

February opened severely cold with the ground heavily snow-covered. Most stations reported their lowest temperatures of the winter on either the first or the 4th. Temperatures began to moderate on the 5th; the snow disappeared, except in some northern counties by the 10th; and the remainder of the month was mild, except cold waves, 16th-17th and 19th-21st, with occasional moderate snows that soon disappeared. Temperatures averaged above normal, except in Cass, Black Hawk and Clayton counties. Average daily excesses of 4° or more were reported from Buena Vista, Kossuth, Taylor and Van Buren counties.

On the 8th, a sleet storm, attended by lightning and thunder, covered a belt 100 or more miles wide, extending from southwest to northeast across the State. In portions of this belt a glaze formed, the central and southwestern portions being without snow covering. On the 14th, glaze covered Guthrie, Greene and Dallas counties and northeast nearly to the boundaries of the State, mostly without prior snow covering. The

ground was snow-covered 25 or more days in the extreme north-central and northeast portions, and less than 10 days generally in the southern tier of counties and northward over Clarke, Lucas, Madison, Guthrie, Dallas and Greene counties. Snow covering was general at the close of the month.

Deficiencies of 1 inch or more in precipitation occurred in Kossuth and Fayette counties; while excesses, mostly snow, extended from the southwest to the east-central counties.

Mild weather toward the close of the month improved fuel and transportation conditions and corn began to move. Some corn remains unhusked in the fields. Winter wheat is reported as small but promising in the southeastern and uncertain in the southwestern portions of the State. Large areas that remained ungerminated because of drought last fall, are being watched with great interest.

Pressure. The mean pressure (reduced to sea level) for the State was 30.06 inches. The highest recorded was 31.07 inches, at Sioux City, on the 21st, and the lowest was 29.02 at Charles City on the 14th. The monthly range was 2.05 inches.

Temperature. The mean temperature for the State, as shown by the records of 103 stations, was 23.0°, or 2.5° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 19.3°, or 2.2° higher than the normal; Central, 23.1°, or 2.4° higher than the normal; Southern, 26.7°, or 3.1°, higher than the normal. The highest monthly mean was 29.8° at Keokuk, and the lowest monthly mean was 15.2° at Estherville. The highest temperature reported was 70°, at Clarinda, on the 23d, and the lowest temperature reported was —36°, at Washta, on the 4th. The temperature range for the State was 106°.

Humidity. The average relative humidity for the State at 7:00 a. m. was 82 per cent, and at 7:00 p. m. it was 73 per cent. The mean for the month was 78 per cent, or about 1 per cent lower than the normal. The highest monthly mean was 84 per cent, at Charles City, and the lowest was 71 at Omaha, Nebr.

Precipitation. The average precipitation for the State, as shown by the records of 111 stations, was 0.95 inch, or 0.20 inch less than the normal. By divisions, the averages were as follows: Northern, 0.52 inch, or 0.39 inch less than the normal; Central, 1.13 inches, or 0.07 inch less than the normal; Southern, 1.20 inches, or 0.15 inch less than the normal. The greatest amount, 2.10 inches, occurred at Olin, and the least, 0.09 inch, at Algona. The greatest amount in any 24 consecutive hours, 1.22 inches, occurred at Monroe on the 8th.

Snow. The average snowfall for the State was 6.0 inches, or 1.4 inches less than the normal. The greatest amount, 14.5 inches, occurred at Glenwood, and the least, 0.5 inch at Keokuk.

Wind. The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau station was 51 miles an hour from the northwest at Sioux City on the 25th.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 62, or about 7 per cent more than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 49; Davenport, 63; Des Moines, 59; Dubuque, 64; Keokuk, 61; Sioux City, 73; Omaha, Nebr., 64.

Miscellaneous Phenomena. Aurora, observed at Inwood on the 10th; Allison and Nora Springs on the 12th; and Waukee on the 19th. Birds (migration of), Bedford, blue birds and ducks on the 26th; Corydon, robins on the 7th; Earlham, blue birds and ducks on the 14th. Fog, 6th, 7th, 8th, 9th, 10th, 14th, 17th, 18th, 19th. Hail, 5th, 8th, 14th, 19th. Halo (lunar or solar), 1st, 3d, 4th, 11th, 12th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, 24th. Haze, 18th. Parhelia, 1st, 2d, 19th, 20th. Sleet, 6th, 8th, 14th, 27th. Thunderstorms, 8th, 13th, 25th, 28th.

THE WINTER OF 1917-1918.

The mean temperature for the three winter months was 15.4°, which is 5.4° below the normal for the State, and only 0.5° warmer than the coldest of the 28 winters of record, 1892-93. The highest temperature reported was 70° at Clarinda, Page County, on February 23d. The lowest temperature reported was 40° below zero at Washta, Cherokee County, on December 29th.

The average monthly precipitation for the State was 0.84 inch, and the average total precipitation was 2.53 inches, or 0.89 inch less than the winter normal. The average total snowfall, unmelted, was 23.9 inches, or 3.4 inches more than the normal and 6.5 inches more than the average fall for the winter of 1916-17.

The total number of days with .01 inch or more of precipitation was 18, or 5 more than the average for the winter of 1916-17. The average number of clear days was 37, partly cloudy 24, cloudy 29, as compared with 46 clear, 24 partly cloudy and 20 cloudy days during the winter of 1916-17.

COMPARATIVE DATA FOR THE STATE—FEBRUARY.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With prc. of .01 in. or more	Clear	Partly cloudy	Cloudy
1890	26.0	+ 3.5	67	−24	0.83	−0.32	0.18	0.11	.....				
1891	19.4	− 1.1	70	−31	1.16	+0.01	0.41	0.35	.....	3	12	7	8
1892	28.1	+ 7.6	68	−20	1.20	+0.05	0.18	0.12	5.0	6	6	7	16
1893	16.4	− 4.1	60	−26	1.20	+0.74	0.91	0.06	8.1	6	10	8	10
1894	19.7	− 0.8	60	−19	0.89	−0.26	0.41	T.	8.4	3	16	8	4
1895	16.4	− 4.1	73	−23	0.49	−0.66	1.54	0.02	3.3	4	13	9	6
1896	27.4	+ 6.9	78	−13	0.71	−0.44	2.40	0.04	5.4	4	12	9	8
1897	24.7	+ 4.2	61	−24	0.89	−0.26	1.81	0.22	8.0	5	6	10	12
1898	24.2	+ 3.7	62	−18	1.20	+0.05	2.65	0.10	7.8	5	10	9	9
1899	12.2	− 8.3	75	−40	0.89	−0.26	4.32	0.12	7.1	5	11	10	7
1900	14.8	− 5.7	69	−27	1.30	+0.15	4.57	0.18	9.9	6	10	8	10
1901	17.5	− 3.0	49	−21	1.01	−0.14	2.10	0.12	9.7	4	15	7	6
1902	17.6	− 2.9	62	−21	0.73	−0.42	2.20	0.02	2.6	4	13	8	7
1903	19.8	− 0.7	56	−21	1.18	+0.03	2.25	0.20	7.0	4	13	7	8
1904	14.8	− 5.7	70	−26	0.41	−0.74	1.99	T.	4.5	4	10	9	10
1905	12.8	− 7.7	60	−41	1.57	+0.42	2.97	0.44	15.5	7	14	6	8
1906	23.6	+ 3.1	66	−32	1.29	+0.14	2.91	0.20	6.1	5	14	7	7
1907	23.0	+ 4.5	65	−31	0.71	−0.44	1.95	0.06	4.6	4	14	6	8
1908	24.2	+ 5.8	59	−36	1.89	+0.54	2.05	0.23	8.2	6	12	6	11
1909	26.2	+ 5.7	62	−26	1.54	+0.29	4.72	0.20	7.7	5	11	6	11
1910	17.8	− 2.7	58	−21	0.46	−0.69	2.09	T.	4.0	3	14	8	6
1911	27.3	+ 6.8	71	−13	2.76	+1.61	5.46	0.50	7.0	6	12	6	10
1912	18.1	− 2.4	57	−30	1.21	+0.06	3.25	0.04	11.2	5	10	9	10
1913	20.2	− 0.3	70	−14	0.82	−0.33	2.39	0.07	7.3	4	14	7	7
1914	16.8	− 3.7	59	−29	0.87	−0.28	1.99	0.32	9.2	6	10	9	9
1915	29.1	+ 8.6	62	− 8	2.93	+1.78	5.39	0.43	9.4	9	9	5	14
1916	19.0	− 1.5	62	−32	0.55	−0.60	1.38	0.05	6.0	4	14	8	7
1917	15.2	− 5.3	68	−37	0.96	−0.79	1.19	T.	2.5	3	14	8	6
1918	23.0	+ 2.5	70	−36	0.65	−0.20	2.10	0.09	6.0	5	14	7	7

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

MARCH.

March was abnormally warm, the largest excesses in temperature, 12 degrees daily, being in Crawford County, and the smallest excesses, 7 or 8 degrees, being in the northeastern counties. Frost left the ground early in the month, not having penetrated deeply during the winter. Precipitation was in excess of the normal in the northern tier of counties, but very deficient over the southern half of the State except the extreme southeastern counties. Heavy snow fell in the northeastern part of the State on the 13th-14th. Further south along the Mississippi River this was a heavy rainstorm. Dubuque had 0.84 inch in one hour and 1.65 inches in 24 hours, being the largest amounts in the State for those periods. A glaze storm on the 9th damaged telephone and telegraph wires in the northern part of the State to the amount of $50,000.

At the close of the month the season was two weeks earlier than usual; soil dry but working up in fine condition; seeding of spring wheat and oats completed in the south and progressing rapidly in the north; and the husking of the remnant of the 1917 corn crop was practically finished. The acreage of spring wheat is remarkably large and would be larger but for the shortage of cars in which to ship seed. Fall wheat wintered well, especially in the southeastern counties, but badly needed rain; some that

failed to germinate last fall, germinated in March. The mild, dry weather was especially favorable for the lamb and pig crop.

Pressure. The mean pressure (reduced to sea level) for the State was 30.03 inches. The highest recorded was 30.71 inches, at Sioux City, on the 15th; and the lowest was 29.12 inches, at Des Moines, Ia., and Omaha, Nebr., on the 9th. The monthly range was 1.59 inches.

Temperature. The mean temperature for the State, as shown by the records of 100 stations, was 42.9°, or 9.6° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 40.0°, or 9.5° higher than the normal; Central, 43.1°, or 9.5° higher than the normal; Southern, 45.6°, or 9.7° higher than the normal. The highest monthly mean was 47.8° at Northboro and the lowest monthly mean was 36.8°, at Elkader. The highest temperature reported was 85°, at Denison, on the 19th. The lowest temperature reported was zero, at Sibley, on the 10th.

Humidity. The average relative humidity for the State at 7 a. m. was 74 per cent, and at 7 p. m. it was 51 per cent. The mean for the month was 63 per cent, or about 10 per cent lower than the normal. The highest monthly mean was 72 per cent, at Charles City, and the lowest was 55 at Omaha. Very low humidity prevailed after the 15th. On the 18th at Omaha 8 per cent at 7 p. m., at Des Moines 5 per cent at 2 and 3 p. m., and at Keokuk 14 per cent at noon are respectively the lowest ever observed at those stations.

Precipitation. The average precipitation for the State, as shown by the records of 101 stations, was 0.63 inches, or 1.14 inches less than the normal. By divisions the averages were as follows: Northern, 1.12 inches, or 0.41 inch less than the normal; Central, 0.54 inch, or 1.33 inches less than the normal; Southern, 0.23 inch, or 1.69 inches less than the normal. The greatest amount, 2.12 inches, occurred at Dubuque, and the least, a trace, at Harlan. The greatest amount in any 24 consecutive hours, 1.65 inches, occurred at Dubuque on the 13th-14th.

Snow. The average snowfall for the State was 2.6 inches, or 2.7 inches less than the normal. The greatest amount, 15.5 inches, occurred at Northwood; Burlington, Fort Madison, Lacona and Oskaloosa reported no snow, and 18 stations reported only a trace.

Wind. The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 52 miles an hour from the southwest, this occurring at Keokuk on the 9th.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 73, or about 16 per cent higher than the normal. The per cent of the possible amount at the regular Weather Bureau station was as follows: Charles City, 65; Davenport, 72; Des Moines, 77; Dubuque, 76; Keokuk, 68; Sioux City, 77; Omaha, Nebr., 76.

Miscellaneous Phenomena. Aurora, 7th, 8th, 9th. See special article, page 15. Birds (migration of), Corydon, ducks on the 8th; Earlham, black birds on the 9th; Baxter, robins on the 11th; Boone, robins on the 4th; Nora Springs, wild geese and robins on the 18th, black birds on the 20th, meadow larks on the 22d; Postville, robins on the 11th, blue birds on the 12th; Des Moines, robins on the 4th, wild geese on the 14th and blue birds on the 23d. Fog, 4th, 5th, 6th, 9th, 13th, 14th, 21st, 30th. Glaze, 9th. Hail, 9th, 13th. Halo (lunar or solar), 5th, 9th, 13th, 14th, 22d, 25th, 27th, 28th, 29th. Haze, 12th, 19th, 20th, 21st, 22d. Sleet, 7th, 8th, 9th, 13th, 14th. Thunderstorms, 9th, 13th, 14th, 21st, 22d.

Rivers. The rivers and streams broke up and ran out quietly, in the southern part of the State near the close of February, in the central part about the 6th of March, and in the northern part about the 18th. The breaking up of the upper Missouri River caused stages within about 1.5 feet of flood stage at Iowa points on that river toward the close of the month.

AURORA OF MARCH 7, 1918.

One of the most spectacular displays of the aurora borealis ever observed in this State occurred on the night of March 7th. Newspapers report the display in nearly all portions of the United States and in northern Europe. At Des Moines it became noticeable about 7:20 p. m. in the form of an arch of light in the northern sky at an altitude of about 25°. This rapidly enlarged, became brighter and rose to an altitude of 60° by 8 p. m., the width of the arch being about 20° and extending from the eastern to the western horizons. About this time the flickering streamers of light known as "merry dancers" began to appear; also vivid colors, green predominating in the north and northeast and crimson in the northwest. About 9 p. m. large areas of light appeared in the south and gradually formed a continuous arch of light at an altitude of about 30°, known as the "auroral corona." At 9:30 p. m. the entire heavens were ablaze with hues and shafts of light that rapidly changed into forms of endless variety, the predominating thing being shafts of whiter light that rose from the horizon at nearly all points except a small arc in the south, and converged at a point a little, possibly 10°, southwest of the zenith. About 10:30 p. m. the display began to diminish, but some signs of it remained as late as 1:30 a. m. of the 8th. At times the light of the aurora was nearly equal to that of the full moon. Telegraph service was much troubled by the magnetic effects of the aurora.

Similar descriptions were received from observers in all portions of the State. Mr. J. H. Spencer, Meteorologist, Weather Bureau, Dubuque, Iowa, adds: "Another prominent feature was the many distinct patches or groups of light, resembling thin, whitish clouds. They were most numerous overhead and looked like cirro-stratus clouds of irregular shape. There was a decided contrast between the clear sky and the cloud-like patches. Where there were no patches the stars shone with much brilliancy, but through the cloud-like patches the stars shone only faintly."

Prof. J. L. Tilton, Simpson College, Indianola, Iowa, states that, "Overhead was what appeared to be a faint grayish cloud forming a band about half way across the sky from east to west. This band slowly drifted southward and faded away when across Orion. * * * * * If this was a cloud it seemed related to the aurora in cause. Other bands of a similar character appeared with some degree of regularity, several of them com-

pletely arching the sky from east to west, all traveling slowly, almost imperceptibly, toward the south, some not fading away till within 15 or 20 degrees above the southern horizon. These moving patches and arches were visible all through the evening, even when the white streamers met overhead. For a time three parallel bands were in sight, each requiring half to three-quarters of an hour to move from the zenith to beyond Orion."

COMPARATIVE DATA FOR THE STATE—MARCH.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With prec. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	28.0	— 5.3	75	—34	1.57	—0.20	3.67	0.32	.....	...	...	...	...
1891	26.8	— 6.5	66	—19	2.60	+0.83	4.58	1.33	.....	10	6	8	17
1892	31.9	— 1.4	84	— 6	2.22	+0.45	4.58	0.57	3.9	6	11	8	12
1893	31.8	— 1.5	84	— 8	2.14	+0.37	4.40	0.64	4.0	8	9	11	11
1894	41.0	+ 7.7	84	— 5	2.03	+0.26	4.52	0.26	2.7	6	13	10	8
1895	34.4	+ 1.1	94	—11	0.82	—0.94	2.60	0.22	2.9	4	16	8	7
1896	30.9	— 2.4	81	—12	1.10	—0.67	2.99	0.16	5.4	6	12	9	10
1897	32.0	— 1.3	72	—22	2.39	+0.62	6.16	0.29	5.5	8	9	8	14
1898	37.5	+ 4.2	72	— 2	1.94	+0.17	6.21	0.33	3.7	6	12	9	10
1899	23.0	—10.3	75	—16	1.62	—0.15	5.90	0.37	8.0	6	7	12	12
1900	30.7	— 2.6	81	—13	2.06	+0.29	5.15	0.45	6.6	5	12	9	10
1901	34.2	+ 0.9	76	— 8	2.64	+0.87	5.23	0.70	12.6	7	10	8	12
1902	29.1	+ 5.8	79	—12	1.45	—0.32	4.33	0.13	1.3	7	9	11	11
1903	38.8	+ 5.5	82	6	1.38	—0.39	3.90	0.15	3.9	7	11	7	13
1904	34.8	+ 1.5	78	3	2.18	+0.41	4.57	0.50	4.4	7	8	8	15
1905	41.5	+ 8.2	84	1	2.04	+0.27	3.70	0.39	4.1	7	8	8	15
1906	27.1	— 6.2	63	—14	2.34	+0.57	4.55	0.58	8.9	10	8	7	16
1907	40.6	+ 7.3	92	— 7	1.35	—0.42	5.06	0.23	4.1	6	14	7	10
1908	37.9	+ 4.6	85	— 8	1.58	—0.19	3.74	0.45	1.1	6	13	7	11
1909	32.5	— 0.8	71	—15	1.53	—0.24	5.00	0.28	9.8	6	12	10	9
1910	48.9	+15.6	92	—10	0.17	—1.60	1.32	0.09	T.	1	23	6	2
1911	39.4	+ 6.1	83	2	0.53	—0.84	4.84	T.	1.9	5	16	9	6
1912	24.9	— 8.4	70	—19	2.01	+0.24	5.25	0.60	19.1	7	15	6	10
1913	31.9	— 1.4	78	—23	2.48	+0.71	5.88	0.74	5.3	9	11	10	10
1914	34.7	+ 1.4	78	— 5	1.69	—0.08	3.84	0.28	1.8	7	12	8	11
1915	29.2	— 4.0	61	— 5	0.99	—0.81	2.12	0.17	8.8	5	8	9	14
1916	35.2	+ 1.9	80	—18	1.57	—0.26	5.80	0.23	2.9	6	11	9	11
1917	34.6	+ 1.3	85	—12	1.84	+0.07	4.35	0.57	6.2	6	14	8	9
1918	42.9	+ 9.6	85	6	0.63	—1.14	2.12	0.03	2.6	3	19	7	5

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

APRIL.

April was colder than normal and less than 2° warmer than March. The deficiency accumulated mainly in the last 12 days, being the greatest, 7.6°, in Decatur County.

Precipitation was quite evenly distributed but generally deficient, though there was a slight excess in several of the eastern counties and in Fremont, Page and Taylor Counties. The deficiency was greatest, about 2 inches, in Madison County. A striking feature was the snowstorm of the 19th-21st, which covered the southern and eastern portions of the State, except the extreme southeast counties. In Page, Taylor, Ringgold and Decatur Counties from one to two feet of snow fell, exceeding the total fall of the winter months just preceding. Such a storm is believed to be

unprecedented so late in the season, though a snowstorm of slightly less intensity occurred in south-central Iowa on April 7, 1917.

All vegetation made slow progress. Spring seeded grains depended largely on subsoil moisture till the middle of the month after which temperatures were too low, so that germination was very uneven; some that was seeded more than a month before was scarcely showing green at the end of the month over much of the State. Pears and plums were in full bloom in the southern counties near the close of the month. Field work progressed rapidly with the soil in excellent condition. Eighty-five per cent of the corn ground was made ready for the planter and a little planting was done in the south. Seed corn is generally scarce and of low vitality. Winter wheat, pastures and meadows suffered from drouth, cold and high winds.

Pressure. The mean pressure (reduced to sea level), for the State was 30.01 inches. The highest recorded was 30.78 inches, at Dubuque, on the 9th, and the lowest was 29.23 inches at Charles City, on the 29th. The monthly range was 1.55 inches.

Temperature. The mean temperature for the State, as shown by the records of 106 stations, was 44.8°, or 3.9° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 43.5°, or 3.2° lower than the normal; Central, 45.0°, or 3.9° lower than the normal; Southern 45.9°, or 4.7° lower than the normal. The highest monthly mean was 47.6°, at Northboro, and the lowest was 41.5°, at Decorah. The highest temperature reported was 79°, at Corydon and Fayette, on the 1st, and the lowest was 12° at Lake Park, on the 8th. The temperature range for the State was 67°.

Humidity. The average relative humidity for the State at 7 a. m. was 72 per cent; and at 7 p. m. it was 53 per cent. The mean for the month was 62 per cent, or about 5 per cent below the normal. The highest monthly mean was 74 per cent, at Charles City, and the lowest was 62 per cent, at Sioux City.

Precipitation. The average precipitation for the State, as shown by the records of 113 stations, was 2.32 inches, or 0.54 inch less than the normal. By divisions the averages were as follows: Northern, 1.93 inches, or 0.75 inch less than the normal; Central, 2.31 inches, or 0.55 inch less than the normal; Southern, 2.32 inches, or 0.54 inch less than the normal. The greatest amount, 4.20 inches, occurred at Olin, and the least, 1.01 inches, at Humboldt. The greatest amount in any 24 consecutive hours, 1.80 inches, occurred at Lamoni on the 21st.

Snowfall. The average snowfall for the State was 3.5 inches, or 1.7 inches more than the normal. The averages by divisions were: Northern, 1.0 inch; Central, 2.5 inches; Southern, 7.0 inches. The greatest amount, 24.0 inches, occurred at Bedford.

Wind. The prevailing direction of the wind was from the northeast. The highest velocity reported from a regular Weather Bureau station was at the rate of 59 miles an hour from the northwest at Sioux City on the 29th.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 60, or about normal. The per cent of the possible amount

at the regular Weather Bureau stations was as follows: Charles City, 65; Davenport, 62; Des Moines, 60; Dubuque, 58; Keokuk, 56; Sioux City, 58; Omaha, Nebr., 59. Clear days averaged 12; partly cloudy 8; cloudy, 10.

Rivers. All of the rivers fell almost steadily throughout the month. The Missouri River was rather high at the beginning but became moderate to low. At the close of the month the Mississippi was unusually low for April.

Miscellaneous Phenomena. Aurora, 5th, 10th, 29th, 30th. Fog, 10th, 18th, 22d, 24th, 27th. Hail, Northern Division, 2d, 17th, 28th; Central Division, 2d, 18th, 20th; Southern Division, 2d, 3d, 17th, 19th 20th. At Belmond, moderate hail totaling 0.4 inch in depth occurred on the 17th; no damage. Halo (lunar or solar), 1st, 4th, 5th, 18th, 24th, 25th, 26th, 27th. Haze, 9th, 22d, 25th. Sleet, 2d, 3d, 17th, 18th, 19th, 20th, 21st, 23d, 28th. Thunderstorm, 2d, 3d, 6th, 12th, 13th, 15th, 16th, 17th, 18th, 20th, 21st, 24th, 25th, 27th.

COMPARATIVE DATA FOR THE STATE—APRIL.

YEAR	Temperature				Precipitation					Number of Days		
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	51.8	+3.1	88	2	1.80	−1.06	4.46	0.38	.....	6	14	9	7
1891	50.6	+1.9	93	13	2.15	−0.71	5.06	0.59	.....	8	14	7	9
1892	45.4	−3.3	88	14	4.75	+1.89	8.38	2.43	5.7	9	8	9	13
1893	45.5	−3.2	90	15	4.21	+1.35	8.51	1.24	0.6	10	8	9	13
1894	51.7	+3.0	93	12	3.67	+0.71	0.91	0.55	0.2	9	11	11	8
1895	44.2	+5.5	98	8	2.62	−0.24	5.88	0.28	2.1	5	14	8	8
1896	54.5	+5.8	94	10	5.92	+2.16	9.67	2.35	4.5	11	11	10	9
1897	47.9	−0.8	89	19	5.35	+2.49	9.80	2.22	T.	11	9	9	12
1898	48.1	−0.6	91	14	2.56	−0.30	4.82	0.27	T.	8	13	9	8
1899	48.9	+0.2	89	1	2.40	−0.46	5.76	0.56	2.9	7	12	11	7
1900	52.2	+3.5	89	19	2.67	−0.21	6.61	0.45	0.9	6	12	9	9
1901	49.9	+1.2	92	15	1.79	−1.07	3.47	0.60	2.0	5	14	8	8
1902	48.2	−0.5	96	9	1.71	−1.15	4.15	0.46	T.	5	14	11	5
1903	49.8	+1.1	86	17	2.98	+0.12	6.00	0.74	0.8	9	11	9	10
1904	44.1	−4.6	86	13	3.63	+0.77	8.97	1.52	1.4	7	15	6	9
1905	47.5	−1.2	90	10	3.46	+0.17	5.49	0.63	1.2	8	12	8	10
1906	52.5	+3.8	94	22	2.42	−0.44	5.55	0.35	0.6	8	14	9	7
1907	41.5	−7.2	80	10	1.32	−1.54	3.22	0.24	2.7	6	12	8	10
1908	50.5	+1.8	91	8	2.24	−0.62	4.59	0.67	0.3	8	14	8	8
1909	43.8	−4.9	86	14	4.58	+1.72	9.43	0.83	3.1	12	9	9	12
1910	52.5	+3.8	99	15	1.43	−1.38	4.86	0.10	0.9	7	14	7	9
1911	46.7	−2.0	86	3	3.10	+0.23	6.04	1.35	3.6	9	11	8	11
1912	49.9	+1.2	84	20	2.66	−0.20	5.66	0.78	1.1	8	13	8	9
1913	50.2	+1.5	88	16	3.28	+0.42	7.42	1.12	2.7	9	15	5	10
1914	48.6	−0.1	88	11	2.52	−0.34	5.02	0.37	0.3	8	10	8	12
1915	51.2	+8.5	95	18	1.41	−1.45	4.02	0.06	T.	7	15	10	5
1916	47.1	−1.6	98	11	2.62	−0.24	5.97	1.13	1.1	10	10	9	11
1917	45.5	−3.2	88	17	4.55	+1.69	7.84	2.05	3.8	11	9	7	14
1918	44.8	−3.9	79	12	2.32	−0.54	4.20	1.01	3.5	9	12	8	10

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

MAY.

May averaged warm. From freezing temperatures on the 1st the weather turned suddenly hot with maximum temperatures in the 90's in nearly all portions of the State on the 3d and 4th. High southwest winds

and low humidities during this warm period, caused considerable damage to winter wheat, meadows and pastures in the western part of the State. During a cool period, 10th-13th, frost and ice were reported in many sections. Snow and sleet fell in Dallas, Polk, Madison, Warren and Marion Counties on the 13th. The remainder of the month was generally warm. After the first five days precipitation was plentiful except in the south-central and southwest districts where drouth prevailed till the 21st. Toward the close of the month the rains became heavy to excessive but the soil readily absorbed most of the water.

The hay crop will be generally short due to drouth that prevailed till the 6th; winter wheat yields will be much reduced in southwest districts. Corn planting was done under unusually favorable conditions, and in spite of the defective seed, showed a good stand where up. About five per cent of the acreage remained to be planted when the heavy rains suspended planting toward the close of the month.

Tornadoes were remarkably frequent and severe. On the 8th a small one moved northeastward across the southeast corner of Hamilton county, causing $3,500 damage. On the 9th, one moved from the southwest corner of Chickasaw county northeast into Winneshiek county. An account of this storm, by Mr. H. P. Hardin, Official in Charge, Weather Bureau Office, Charles City, Iowa, begins on page 22. On the same date, one moved from the southwest township in Muscatine county to near the center of Scott county. This storm caused $40,000 damage in Muscatine county and large damage near Eldridge in Scott county, an account of which is given by Mr. J. M. Sherrier, Official in Charge, Weather Bureau Office, Davenport, Iowa, beginning on page 26. A second tornado visited Eldridge on the 19th, causing 2 deaths, 2 injuries and $2,000 damage. The 21st was one of the worst tornado days in the history of Iowa, there being five distinct tornado paths, most of them long, on that day. See article, "The Tornadoes of May 21, 1918," beginning on page 28. On the 31st a tornado moved from the central part of Hancock county northeast to north central Worth county, causing $20,000 damage. The total number of persons killed by tornadoes during the month was 29; total injured, 182; total property damage, $2,453,780.

Pressure. The mean pressure (reduced to sea level) for the State was 29.91 inches. The highest recorded was 30.43 inches, at Dubuque, on the 23d, and the lowest was 29.09, at Des Moines, on the 9th. The monthly range was 1.34 inches.

Temperature. The mean temperature for the State, as shown by the records of 104 stations, was 64.9°, or 4.4° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 62.8°, or 3.8° higher than the normal; Central, 65.3°, or 4.6° higher than the normal; Southern, 66.7°, or 5.0° higher than the normal. The highest monthly mean was 69.0°, at Ottumwa, and the lowest 58.9°, at Estherville. The highest temperature reported was 98° at Creston, on the 9th, and the lowest was 25° at Audubon, Earlham, Fayette and Guthrie Center, on the 1st. The temperature range for the State was 73°.

Humidity. The average relative humidity for the State at 7 a. m. was 75 per cent, and at 7 p. m. it was 57 per cent. The mean for the month, 66 per cent, is about 1 per cent above the normal. The highest monthly mean was 69 per cent, at Davenport, and the lowest was 62 per cent, at Des Moines.

Precipitation. The average precipitation for the State, as shown by the records of 113 stations, was 6.87 inches, or 2.39 inches more than the normal. By divisions the averages were as follows: Northern, 7.24 inches, or 2.76 inches more than the normal; Central, 7.26 inches, or 2.67 inches more than the normal; Southern, 6.11 inches, or 1.47 inches more than the normal. The greatest amount, 11.98 inches, occurred at Gilman, and the least, 2.72 inches, at Glenwood. The greatest amount in 24 consecutive hours, 4.81 inches, occurred at Gilman, on the 24th.

Snowfall. The average snowfall for the State was a trace, or 0.1 inch less than the normal.

Wind. The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 60 miles an hour from the west, at Sioux City, on the 9th.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 66 or about 4 per cent more than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 51; Davenport, 72; Des Moines, 76; Dubuque, 67; Keokuk, 70; Sioux City, 62; Omaha, Nebr., 67.

Miscellaneous Phenomena. Aurora, 16th. Fog, 13th, 14th, 18th, 29th, 30th. Frost, 1st, 11th, 13th, 14th, 20th, 23d. Hail, Northern Division, 6th, 8th, 9th, 17th, 19th, 21st; Central Division, 8th, 9th, 17th, 18th, 19th, 20th, 21st, 22d, 25th, 26th; Southern Division, 8th, 9th, 19th, 21st, 22d, 23d, 24th, 26th, 27th, 28th. See note below. Halo (lunar or solar) 7th, 10th, 11th, 20th, 25th. Sleet, 13th. Thunderstorm, 6th, 7th, 8th, 9th, 10th, 13th, 14th, 15th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st. Tornadoes, 8th, 9th, 19th, 21st, 31st.

Rivers. The rivers were below normal stages till about the middle of the month when the increased rainfall caused about the normal rise approaching the usual early summer maximum. Excepting slight overflows in some of the interior rivers of the eastern part of the State near the close of the month, the stages were generally moderate.

HAILSTORMS OF MAY, 1918.

M. V. Robins.

On the 6th light hail fell in Franklin County, and on the 8th and 9th a number of storms occurred, but on neither date was any serious damage reported, although in Jefferson County and southeast of Sanborn, O'Brien County, large hail fell. Hampton reported hail varying in size from one-fourth inch to one and one-fourth inches in diameter, but little harm resulted except that windows were broken and the soil packed by the stones. Grinnell reported a fall of moderate sized stones that injured tender plants and did considerable damage to greenhouses, and Mt. Pleasant a storm with but little damage. On the 9th hail fell in scattered

areas along the eastern border of the state, Dubuque reporting light hail with but slight damage. In the vicinity of Davenport there was a light fall covering an area about 8 miles in width by 10 in length extending from Rock Island and Moline, Ill., northward and northeastward to Eldridge and Argo, Iowa, and while some of the stones were very large, practically no damage resulted except to fruit blossoms. Burlington, Kingston and Danville reported hail and there was a heavy fall in Lee County, but no damage was reported. Pocahontas, in the northern section, also reported a light fall but no damage except to early garden truck. On the early morning of the 10th near Fairfield some damage resulted from hail that varied in size from hickory nuts to hen's eggs. On the 21st in the southwestern and south-central districts, considerable damage was done in Adams, Taylor, Pottawattamie, Fremont and Ringgold counties. In some places in the last named, hail the size of wrens' eggs drifted to a depth of several feet beating down oats, corn and garden truck. In the other counties in this district rye and other grains were seriously damaged and in places ruined, but fruit seems to have suffered most. In the southwestern part of Pottawattamie County over a considerable area, berries, garden truck and fruit were practically ruined.

COMPARATIVE DATA FOR THE STATE—MAY.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1889	57.7	−2.8	99	26	3.56	−1.01	6.44	1.61	.....	9	10	13	8
1891	58.3	−2.2	94	21	3.18	−1.39	7.10	1.46	.....	8	14	9	8
1892	54.0	−6.5	88	29	8.77	+4.20	12.64	4.87	T.	16	5	9	17
1893	56.6	−3.9	96	26	3.45	−1.12	5.86	1.65	0	9	13	9	9
1894	61.1	+0.6	90	32	1.87	−2.70	4.77	0.33	0	6	17	10	4
1895	61.7	+1.2	104	24	3.19	−1.38	5.79	0.84	0	9	11	12	8
1896	65.5	+5.0	100	34	6.60	+2.12	11.79	3.40	0	12	11	12	8
1897	58.5	−2.0	96	30	1.97	−2.63	3.59	0.21	0	5	16	10	5
1898	59.6	−0.9	92	26	4.67	+0.10	7.82	2.22	0	12	9	10	12
1899	60.2	−0.3	90	27	6.23	+1.66	11.47	3.09	0	13	9	12	10
1900	63.2	+2.7	98	32	3.31	−1.26	6.08	0.96	0	8	14	10	7
1901	60.7	+0.2	95	28	2.35	−2.22	4.57	0.72	0	7	16	9	6
1902	63.8	+3.3	97	25	5.39	+0.82	10.04	0.87	0	13	10	12	9
1903	61.6	+1.1	91	24	8.55	+3.98	15.45	2.88	0	16	9	12	10
1904	59.6	−0.9	93	27	3.78	−0.79	8.15	1.50	0	8	13	10	8
1905	58.3	−2.2	88	28	5.95	+1.28	10.83	2.57	0	14	12	11	8
1906	60.8	+0.3	95	24	3.54	−1.03	10.72	0.89	0	11	13	10	8
1907	53.5	−7.0	86	26	3.48	−1.09	7.68	0.71	1.9	10	11	10	10
1908	59.4	−1.1	93	32	8.34	+3.77	14.33	1.33	0	15	9	11	11
1909	57.9	−2.6	97	18	4.34	−0.23	7.85	1.86	0.1	9	13	12	7
1910	55.4	−5.1	85	18	3.41	−1.16	6.01	1.29	T.	10	15	7	9
1911	64.9	+4.4	98	23	3.26	−0.81	8.73	0.42	0.2	9	16	9	6
1912	62.7	+2.2	97	29	3.33	−1.24	6.41	0.72	0	10	14	11	6
1913	59.4	−1.1	103	30	6.24	+1.67	10.25	3.14	0	13	11	8	12
1914	62.2	+1.7	98	25	3.31	−1.26	6.90	0.33	T.	10	14	11	6
1915	56.1	−4.4	99	25	7.34	+2.77	13.21	3.82	T.	14	9	9	13
1916	59.9	−0.6	94	27	4.99	+0.36	10.44	2.14	T.	12	15	10	8
1917	55.1	−5.4	95	18	3.87	−0.76	7.32	1.69	0.6	10	15	8	8
1918	64.9	+4.4	98	9	6.87	+2.20	11.98	2.72	T.	13	13	11	7

T. indicates an amount too small to measure, or less than .005 inch rainfall, and less than .05 inch snowfall.

TORNADO OF MAY 9, 1918, PEARL ROCK TO CALMAR, IOWA.

By Hal P. Hardin, Observer,.

[Dated: Weather Bureau, Charles City, Iowa, May 25, 1918.]

(75th meridian meantime used herein.)

A tornado passed east of this county, Floyd, during the afternoon of May 9, 1918. The storm had some features which have made it difficult to determine whether there was more than one tornado, or only one storm that zigzagged over a strip 2 miles wide and 54 miles long. A straight line through the middle of the zone showing wreckage runs due SW.-NE. and encounters as many buildings and groves untouched as it does objects destroyed, while the character of the wreckage at points a mile or less from such a median line leaves no doubt that a tornado had visited them.

The writer visited Pearl Rock during the afternoon of the following day, i. e., May 10. There the width of the storm's path of destruction was about 200 yards, and could be defined as such for a distance of 2 miles from southwest to northeast. There was no indication of a whirling wind outside that belt, nor for some distance at either end of it. A number of persons who went through the storm at Pearl Rock and other points have told me that they saw the funnel-shaped cloud, heard a roaring noise as that of a rapidly moving railway train, and witnessed an inward-and-upward movement of objects toward it.

Pleasant Valley. A man who observed the first known formation of the funnel cloud at Lower Pleasant Valley, the point where the storm apparently originated, described to me what he saw, as follows: The weather had been warm, with thundershowers during much of the day. Shortly before 4 p. m. two thunderstorm clouds moved rapidly from the west and the east toward each other; there was vivid lightning with loud thunder, and the heat became oppressive. There had been strong winds during the day, but with the gathering of these clouds the wind ceased until there was no surface air movement. Overhead the clouds seemed to be boiling; in each bank light and dark clouds seemed to be trying to climb over one another. The two banks met over a point about 1 mile northeast of where the observer stood. There was less lightning and thunder than before; the western cloud bank absorbed that bank which had come from the east, all light shades disappeared, and the whole mass turned blue-black in color. There was a roaring noise, and from the point where he judged the lower edges of the clouds had met a downward bulge appeared and quickly developed into the funnel. A twisting, gyral motion was seen in the funnel, and he thought that he had noticed a revolving movement in the whole bulging portion of the cloud, but was not sure of it as he had not thought to look for it at the time. As the cloud started northeastward heavy rain and light hail fell where the observer stood, followed by light rain, high wind and cooler. This man was on an elevated piece of land, and says he could plainly see the funnel for 4 miles, and that it moved straight northeastward toward Pearl Rock. All the damage in that 4-mile stretch is within a belt half a mile wide. There then follows a long reach without a visible trace of the storm; but there, as elsewhere in the storm's track, the greater part of the country is in pasture land and fields on which there are now no crops. There are no trees except along the banks of streams and around farm buildings.

Pearl Rock. Pearl Rock is a cluster of 8 or 10 farm houses at the crossroads forming the boundary lines between four counties—Butler, Floyd, Chickasaw, and Bremer; it is some 8 miles from the neighborhood known as Lower Pleasant Valley and lies northeast of the latter. The storm struck there (Pearl Rock) at 4:20 p. m., killing one woman and causing a property loss in and near the village estimated at $50,000.

Nashua. After leaving Pearl Rock there is a reach where the path of the storm is lost before it struck (4:30 p. m.) the eastern side of the town of Nashua, Chickasaw County, 3 miles northeast of Pearl Rock. I was given practically the same description of the formation of a tornado cloud before the Nashua damage began, as that given by the man at Lower Pleasant Valley. The people who witnessed the gathering of the clouds did not then know that a tornado had visited Pearl Rock and thought that one was originating over them. They had the same weather and subsequent changes as at Lower Pleasant Valley: Saw two thunder clouds meet; heard the same roaring and saw the funnel descend. Along the river bank, and at the apparent end of the storm track from Pearl Rock toward Nashua there is a heavy timber growth. The upper limbs of the trees are stripped of branches, foliage, and so much of their bark that their nakedness is noticeable as far away as the trees can be seen. None of the trees are uprooted or show damage near the ground. If the storm at Nashua was the same one that formed at Lower Pleasant Valley and later struck Pearl Rock, the funnel was receding into the cloud when it passed over those trees, and had lost its identity when the cloud approached Nashua.

In eastern Nashua and near by, one man was killed and about $100,000 worth of property, mainly farm buildings and stock, was destroyed. The time is generally placed at 4:30 p. m.

New Hampton. From Nashua the storm's track lies northeastward to New Hampton, in Chickasaw County and 18 miles from Nashua. The time it struck New Hampton is placed at 5 p. m. Between the two towns the destruction of property was great in localities, with no trace of the storm at other points within the reputed 2-mile width of its path. One woman was killed 6 miles southwest of New Hampton, one man on a farm a mile north of where the woman was killed, and a boy 1 mile south of the town. The property loss in and near New Hampton is estimated at $160,000, mostly in farm buildings and stock; the loss in the town was only a few thousand.

Calmar. From New Hampton the storm track lies northeastward to Calmar, in Winneshiek County, 25 miles from New Hampton and 54 miles from Lower Pleasant Valley. The postmaster at Calmar places the time of the storm's arrival at 5:30 p. m. Two people were killed in the town and one on a farm 1½ miles east of town. The property loss is estimated at between $200,000 and $250,000, mainly in farm buildings and stock. The

path of the storm is reported as 1 mile wide and 15 miles long at Calmar. Between Calmar and New Hampton there are the same breaks in the continuity of the track and lack of evidence to sustain its reputed width, as exist between New Hampton and Nashua, and Nashua and Pearl Rock. At points between Nashua and Calmar there are communities within short distances from the reputed storm track where only black, threatening clouds were seen.

General character of weather along path.

Over the entire length of the track wherever there is trace of the storm in fallen trees, poles, and wrecked buildings the fall of objects was toward the north on the southeast side of the track and toward the south on the northwest side, except that some groves and buildings appear to have been uprooted or torn to pieces and then dropped in a confused heap. Probably the latter distributions occurred in the center of the vortex; owing to the predominance of open fields, one can not locate the exact center of the track.

All along the line reports agree that fresh winds and thundershowers occurred previous to the storm; that its approach was heralded by sharp lightning, loud thunder, tumbling light and dark clouds which changed to blue-black with pendent funnel; that a roaring noise was heard; that still air and excessive heat immediately preceded the blow which whirled around the funnel; that rain and hail accompanied the blow and light rain and falling temperature followed it. No damaging hail is reported.

If the same storm was concerned throughout, it progressed northeastward 54 miles in 1 hour and 30 minutes, a little better than ordinary automobile time. Its actual path was between 200 and 400 yards in width, but it seems to have ranged over a course 2 miles wide, in much the same way as a sailing vessel tacks over a wide course when beating to windward.

Injuries to population along route.

There were 8 lives lost, about 20 people injured, and about $500,000 worth of property destroyed. All but two of the people killed were on farms, and all but a small portion of the property loss was in farm buildings and stock.

The dead lost their lives in the following ways:

Mrs. A. C. Carpenter, Pearl Rock: Struck by flying board while in the yard, unreasoningly refusing to enter the cellar under the house as her companion wished her to do. Results proved that she would have been safe in the cellar.

Mr. Roy Husband, near Nashua: Struck on head by falling cement block while in the cellar under building which was wrecked. The cellar was filled with wreckage; there were five others in it and all were more or less injured, but none have since died.

Mrs. Alice Dowd, six miles southwest of New Hampton: Manner of death unknown. Eighty-four years old and alone in building. Body found within foundation of barn, which had been blown away, badly broken and bruised. That she was killed while within the home nearby was established through a piece of the frame of her dead son's picture which she still retained in hand. The picture had hung in the living room, and when she felt the house going she probably tried to save it.

Mr. Albert Smith, five miles southwest of New Hampton: Struck on the head by a block from the chimney when the house was demolished. Wife and child with him escaped with bruises.

Theo. Krueger, Jr., one mile south of New Hampton: Killed by falling barn in which he had just placed horses. He and his father were bringing school children home in a wagon. When they saw the storm approaching they drove into a farmyard and sent the children into the cellar under the house. They then drove the team into the barn. The father remained outside; when the storm struck him he clung to an apple tree and escaped with bruises.

Mr. and Mrs. Peter Anderson, Calmar: Killed when their house fell to pieces and the wreckage of other buildings was piled on its ruins.

That more lives were not lost is partly because the storm did not cross the crowded parts of the few towns that it touched; and partly because its slow forward movement gave people time to seek cellars and other relatively safe places after they saw it approaching. Some such reported instances in illustration, follow:

Miss Vera Deisler, teacher at the Pearl Rock school, formed her pupils in a chain of clasped hands and led them to a hedge to which they all clung with the strength of desperation until the storm passed. The school building was scattered far and wide.

At one schoolhouse, totally wrecked, it is claimed that the change in time, daylight saving, probably saved many little children from death or injury. School had been dismissed for the day long enough for the children to have reached their homes. Under normal time they would have been in the building.

At another schoolhouse they were having a picnic in celebration of the end of the term. It was filled with women and children. When the storm was seen approaching they fled to a nearby farmhouse cellar. The house over the cellar was completely blown away, but not one of the thirty occupants of the cellar was injured.

East of Nashua there is a group of Piersons, father and sons, on adjoining farms. All took to cellars, and while some of the houses went away no one was hurt. Mr. E. D. Pierson, his wife and five children went into the cellar. Before they realized that their house had been hit they were looking up into the very heart of the tornado, which was trying to lift them out of their refuge. By clinging to each other and to the wall of the cellar they managed to stay on the floor till the storm passed.

Some children alone at their home remained in the yard until they saw a neighboring place going, then took to their cellar. The house and outbuildings were wrecked, but when the parents returned they found the children safe.

But the cellar under a building is not always a safe refuge. In the above accounts, it is related that one man was killed and others injured by falling débris while in such a cellar. Some of the reported instances where the cellar was unsafe were:

Mr. Cecil Gray, near New Hampton, would not risk the cellar because it was shallow. He, his wife and child clung to some lilac bushes and escaped. The house tumbled into the cellar and the wreckage caught fire.

Mrs. McGrath, near Nashua, led her children into a plowed field where all lay in furrows with safety. Had they gone into their cellar they would probably have been killed, as the house collapsed and fell into the cellar.

Mr. Strawson, near Nashua, had a new modernly constructed home, one of the best farm buildings in this section of rich farms. Before going into the basement he took the precaution to throw water on the furnace fire to guard against that possible danger, thinking the basement otherwise safe. When the storm began tearing the house to pieces he and his family huddled

together in the northwest corner. Suddenly a section of the roof dropped over them, one edge resting on the foundation wall, and at the same time the rest of the basement was filled with wreckage and their section of roof was piled high with it. But for the lucky falling of that piece of roof all would have been killed.

Evidently the safe cellar is one located far enough away from buildings to be reasonably safe from falling wreckage and having a sod roof.

Some reported tornado freaks:

Mr. Smith, fishing from a boat on the Cedar River near Nashua, was thrown from the boat. He clung to some bushes and was whipped about by the wind until his arms were nearly torn from his shoulders, but saved his life. The boat was broken up.

A family caught in a plowed field lay the storm out in furrows. There was a dog with them. As the cloud approached, the dog was seen to be desperately trying to dig himself into the ground. When the cloud was over them the suction was so great that the people had all they could do to stay in the furrows and did not see what happened to the dog. After the storm he was gone. The next day he limped into the farmyard, footsore and exhausted; much of his hair was gone and the remnant twisted or on end. Those people think that the dog was sucked up into the cloud and dropped a long way from home.

That this explanation of the dog's appearance and long absence is not improbable is evidenced by the mud deposited on buildings and other objects struck by the storm. This mud had been picked up from wet plowed land and carried along, possibly many miles. Also, along the path of the storm dead chickens were found, their bodies crushed flat and entrails protruding. It is claimed that a strong man could not throw a full-grown hen against the ground hard enough to produce that result. Apparently the storm picked them up and then threw them down with great force.

A large silo at Pearl Rock had its staves pushed in, but not broken. The roof was merely pushed partly off. The silo had a small quantity of ensilage in it. The staves were raised off the bottom boards some 10 to 18 inches. There are the usual number of rod-iron hoops on the silo. None of these broke.

The Cedar Valley Electric Co. has a power circuit of large copper wire on poles along the road through Nashua and Pearl Rock. In places the poles were torn out of the ground, the wire pulled from the poles and twisted into every possible shape, whole spans of it being compressed into two or three-foot lengths. The company estimated their loss in material to be $6,000. None of the recovered wire can be used again and much of it has not yet been located.

TORNADO OF MAY 9, 1918, AT ELDRIDGE, IOWA.

By Julius M. Sherrier, Meteorologist.

(Dated: Weather Bureau, Davenport, Iowa, May 13, 1918)

At 6:00 p. m. May 9, 1918, normal central time, when a cyclone of marked intensity was central near Dubuque, a highly destructive tornado appeared about 3½ miles southwest of Eldridge, Scott County, Iowa, and moved northeastward through the northern portion of the town, disappearing at a point about four miles to the northeastward of that place.

Frequent thundershowers had occurred at Davenport during the day, with hail from 5:10 p. m. to 5:25 p. m., but nothing unusual in the cumulonimbus cloud formations was at any time observed at the Weather Bureau office, nine miles to the southward of the tornado's track. The appearance of the pendant cloud at Eldridge has been variously described as resembling a funnel, a question mark and a column of nearly uniform diameter. Most observers agree that where it approached the ground the cloud was greatly enlarged and intensely black, resembling smoke arising from burning crude oil or asphaltum. With a progressive motion of about 50 or 60 miles per hour, the pendant cloud appeared to approach the town of Eldridge in a rather leisurely manner and was deliberately viewed by a considerable number of persons, some of whom were miles away on either side of the track. As it reached a group of buildings, the structures were suddenly hidden from view, as if by a dense smoke screen, and boards and other debris were to be seen a few moments later emerging from the lighter portions of the cloud column at great elevations above the ground. One careful observer stated that he and his grown daughter had estimated the funnel or column to be about half a mile in length. The noise of the oncoming tornado seemed to some like the roar of an enormous conflagration, and to others like an approaching express train moving at its highest speed, with an additional whistling sound like that of escaping steam.

Trees on the northern side of the storm track were found to be lying towards the southwest and south; those on the southern side towards the northeast, north and northwest, while in the middle of the path of greatest destruction there was no regular arrangement of trees and other wreckage.

The path of the tornado was about 600 feet wide and nearly eight miles long, the greatest damage occurring within a strip about 450 yards in width and about four miles in length, terminating at the northeast corner of the town of Eldridge. At a farm about three miles northeast of Eldridge the barn was unroofed and some other outbuildings were wrecked, after which the pendant cloud gradually lifted and disappeared.

Dwellings and all outbuildings on four farms to the southwest of Eldridge were totally destroyed. On two other farms the outbuildings were wrecked and the farm buildings badly damaged. Five houses and a small church within the town were blown down, while a number of other houses were damaged to a considerable extent. The money value of the buildings, household effects and farm implements destroyed in the country has been reliably estimated at $36,200, and the amount of loss in the town has been placed at $25,100. Considering the severity of the storm, the loss of live stock was remarkably light and will hardly exceed $2,000. About a dozen head of cattle, a team of horses, some hogs, and a considerable number of suckling pigs were killed or badly injured. The total amount of damage has been placed, therefore, at $63,300. No corn was up and the damage to other crops were almost negligible, with the possible exception of fruit trees which were in blossom at the time, but for which no estimate of loss can be given.

Eleven persons were injured more or less seriously, and eleven others sustained such slight injuries as cuts, sprains, bruises, nervous shock, etc. Mrs. John Priester, one of those injured died on May 14th, but all others are expected to recover.

Freakish performances were not missing in the case of the Eldridge storm. A fully grown horse, said to weigh about 1500 pounds, was picked up by the wind and carried a distance that has been reported as 250 feet.

without the animal's having been injured in the least. At the farm of Mr. W. H. Wilford, a barn that had sheltered a herd of cattle was blown away leaving the terrified but unharmed animals standing on the floor or platform of the building. The cows were milked shortly after the storm had passed. Within the town, a garage was carried away and scattered over the surrounding country, while the automobile it had contained was left without a scratch upon its paint and with its windshield unbroken. A frail lattice for vines or flowers was left standing in the center of the path of greatest destruction. A pigeon is reported to have been blown against a tree with such force that its beak was driven firmly into the wood the dead bird remaining suspended in that manner for several days.

Between five p. m. and six p. m., normal central time, hail occurred throughout an area about ten miles in length and about eight miles in width, extending from the cities of Rock Island and Moline, Ill., northward and northeastward to Eldridge and Argo, Iowa. Notwithstanding the large size of the hail stones, some of which were fully 0.8 inch in diameter, there was no serious loss reported from this cause.

TORNADOES OF MAY 21, 1918.

By Charles D. Reed, Meteorologist.

(75th meridian mean time used herein.)

Remarkable tornado activity was manifested in five distinct and widely separate paths on May 21. The locations of these paths are shown on the chart on page 37. As usual, the damage was intermittent and more or less zigzag along these paths but reports from practically every township and in many cases every section crossed, show by the time of occurrence and the description, the unmistakable progressive motion and continuous indentity of each tornado, and each one at all stages showed the characteristic funnel shape cloud, rotary winds and position of debris:

1. Tornado, Denison to Stanhope.

The earliest tornado started about 2:15 p. m. a few miles southwest of Denison, Crawford county (see storm track No. V on chart, page 37.) moving in a general east-northeasterly direction, passing north of Denison and south of West Side in Crawford county, south of Arcadia, north of Carroll and south of Lanesboro, Carroll county, between Adaza and Churdan in Greene county, entering the southwest corner of Webster county and moving almost due eastward through the south tier of townships south of Harcourt and moving into Hamilton county just north of Stanhope and disappearing north of Stratford about 4:30 p. m. The total length of the path of the storm was about 69 miles and its total duration 2 hours and 15 minutes. Its average rate of progress was about 31 miles per hour. The average width of the path of greatest destruction was 2475 feet or 165 feet less than a half mile. It was widest, 2½ miles, near Harcourt. Over the first half the path averaged about 800 feet wide and over the last half 4450 feet. There were places near the beginning and toward the end where there were occasional skips in the path of destruction, but over most of its course the destruction was complete.

In the vicinity of Denison there was one death, Emmet Eling, four injuries and property damage totaling $75,000. At West Side one person was injured and property damage about $12,000. In the vicinity of Arcadia and Carroll in Carroll county there were two deaths, Joseph Brinks and baby son, 8 persons severely injured and property damage probably exceeding $100,000. North of Glidden there were no deaths nor injuries but property damage was about $20,000.

In the northwest part of Greene county there were two deaths, Everett Roberts and J. G. Zeanor, 20 were injured and the property loss was about $75,000.

In Webster county there was one death, C. J. Anderson, 2 seriously injured and property damage $100,000. In the southwest part of Hamilton county there were no deaths or injuries and the property damage was about $10,000.

2. Tornado, Berkley to Wellsburg.

Great destruction attended another tornado on this eventful day, due to the fact that it passed through the southeast portion of the town of Boone where among other things it demolished the shops of the Chicago and Northwestern Railway. This storm originated a few miles northeast of Berkley in Marcy township, Boone county, about 3:45 p. m. It pursued a somewhat sinuous course in a general northeasterly direction. (See storm track No. VI, on chart, page 37.) In passing through Marcy and Worth township, 12 persons were injured and $21,230 worth of property lost. The storm then turned northward toward Boone, then eastward as it struck the southeast portion of the town, then northeastward again. Inside the city limits of Boone 9 people were killed and 55 injured. Those killed were:

James Bills
Charles Kilborn
Mrs. Frank (Frenchie) Roberts
Earnest Lindquist
Albert Daniels
Mrs. Albert Daniels.
Mikie Knezivik
Severed Larson
Nic Karasiles.

The property damage was conservatively placed at $500,000.

Mr. A. E. Reid of Boone, kindly furnished the following notes of his observation of the storm:

I stood at Ninth and Story streets looking directly south on Story and first noticed a large wind cloud very low and moving rapidly east; higher up and to the north of this cloud were other apparent wind clouds moving rapidly west, and between these other clouds were describing a comparatively slow circular movement. This was the only sign I actually observed of any whirl. Being informed by a train dispatcher that a tornado was bound our way from towards Moingona, I realized for the first time what I was looking at. I then went to my office on the second floor of the Northwestern freight house and we watched the storm from the south windows as it moved northeastward. By this time the clouds were very dense and rushing apparently right on the ground and there was a continuous roar

like multiplied Niagaras until the Northwestern shops were struck, when the roar was combined with a tremendous rending and crashing and in appearance was like a fountain of debris in the air. As soon as the storm passed the shops I went to the street where a downfall of oak leaves was in progress; these had evidently been carried from the woods to the south by the storm.

My wife, who was at home on South Story street, tells me that there was continuous brilliant lightning in the cloud and tha shorly preceding and during the passage, there was an intense hot wave.

I am not positive as to the exact duration of the storm, but it seemed to me to be not over five minutes from the time I first saw the clouds to the south until they had passed through the shops to the east.

Mr. Reid had a self-recording barometer or barograph at his residence a little less than half a mile from the storm. This showed an abrupt fall of .20 inch in a 40-minute period just before 7 a. m., then a rise of .10 inch to 10 a. m., then a gradual fall of .05 inch till 2 p. m., then an increasingly rapid fall of .15 inch in the two hours just preceding the storm, after which it rose quite steadily .25 inch by midnight.

The storm passed on northeastward through Boone county, the northwest corner of Story county, the southeast corner of Hamilton county, diagonally across Hardin county and disappeared in the northwest part of Grundy county near Wellsburg about 5:15 p. m. The total path was about 67 miles in length. Its greatest breadth was 2½ miles near Hubbard. However, eyewitnesses state that there was more than one tornado in this vicinity at the time and R. R. Swallum who was watching the storm says he saw at least five. Its average breadth was a slightly more than one-half mile. The total duration was 1 hour and 30 minutes and the average rate of progress was about 45 miles per hour.

In Des Moines township outside the city limits of Boone 2 persons were injured and the property loss was $74,000. In Jackson township one person was injured and the property loss was $2500. In the northwest part of Story county near Story City there was considerable damage but it has been impossible to obtain estimates.

In the southeast corner of Hamilton county, at Ellsworth, 2 persons were injured and the property loss was $6,000. In the vicinity of Radcliffe, Hardin county, 6 persons were injured and the property loss was $5,000. Near Hubbard the damage was $85,250 but there were no injuries nor deaths. In the vicinity of Eldora the property loss was $150,000, one person seriously injured and 9 slightly, but no deaths. Near Steamboat Rock H. J. Finster was killed, one person was injured and the property loss was about $8,000. In the northwest part of Grundy county, near Wellsburg, there were no deaths or injuries but the property loss was about $15,000. The total deaths in this storm were 10; injured, 91; damage, $897,980.

3. Tornado, Prairie City to Tama.

Starting from a few miles south of Prairie City, Jasper county about 3 p. m., a tornado dipped down at intervals along a northeasterly course diagonally across this county and headed for Tama, Tama county, but turned abruptly eastward, passed south of the town and soon disappeared. (See storm track No. VII, page 37. The chief damage was done in the town of Newton, where it amounted to $200,000. One George Reid, lost

his life and one person was injured. Immediately after passing Newton the storm lifted but dipped down again in Kellogg, where the damage was $2,000, and in Hickory Grove, the northeast township in Jasper county, where the damage amounted to $100,000, but no one was killed or injured. In Tama county the damage was of a minor nature, being confined to roofs, chimneys and sheds. Part of the damage resulted from hail stones which varied from one inch to the enormous size of 6½ inches in diameter. No satisfactory estimate of the damage can be made. In this storm there was one death, one serious injury and $350,000 property damage. The storm traveled slowly, a total of only 41 miles in 2 hours.

4. Tornadoes in Clayton County.

About 6 p. m. a tornado originated near Wood and moved northeastward near Elkport, crossing the Mississippi at Guttenberg and continuing to the vicinity of Baraboo, Wis., a total distance of about 100 miles in 2 hours, or an average of 50 miles per hour. The damage in Iowa was about $30,000. Eight persons were injured; none killed. Rumors have been received that the early stages of this storm appeared in the northwest part of Linn county near Walker, but confirmation is lacking. About 7 to 7:30 p. m. another tornado moved in a path parallel with the first, passing about 2 miles northwest of Elkport and about a mile into the south central part of Garnavillo township. The path was about 10 miles long and the total damage was about $3,000. (See storm tracks Nos. VIII and IX, page 37.)

Mr. J. H. Spencer, Official in Charge Weather Bureau Office, Dubuque, Iowa, obtained the following interesting description of the storm from Mr. W. H. Landschultz of Dubuque:

I happened to be at Elkport during the late afternoon and night of May 21st. At 5 p. m. the atmosphere was hot and close. It was so bad, in fact, that I thought something was going to happen, and remarked to a fellow traveler, "This feels like tornado weather." At about 6 p. m. the alarm was given that a tornado was approaching. I rushed out of the hotel, and off to the southwest a roaring, whirling funnel cloud was plainly visible, moving northeast. It was a terrible and awe-inspiring sight. The funnel cloud was of inky blackness and extended downward to the ground, but would occasionally rise. As it passed by it was about one and one-half miles away at the nearest point. The air where we stood was entirely calm, but the clouds between us and the funnel cloud were rushing pell-mell toward the funnel.

Little or no rain fell in advance of the tornado, and remarkable to state, I saw the funnel cloud for 15 to 20 minutes before it was finally obscured by the heavy rain that followed it. We saw an object within the funnel cloud that looked like the roof of a house or barn. It remained in the air but was carried up and down.

The weather did not cool off after the tornado to the southward passed by. It remained hot and close and at about 7:30 p. m. another tornado passed about two miles north of Elkport. We did not see its funnel cloud.

On the 22d I crossed the path of the first tornado and witnessed the destruction it had wrought. Trees two to three feet in diameter were torn up b ythe roots and carried a long distance. The tranks of other reees were still standing, but completely stripped of branches and bark. Farm buildings were destroyed. Woven wire fences were moved bodily for many yards. A steel binder was picked up from a field and dashed to pieces in

the road along which we passed. Some farm animals were killed. A few people were injured but no one killed in this immediate vicinity. As I passed along the road I could see the path of the storm for miles each way, so great had been the destruction. The path was about half a mile wide at the widest points, but not nearly so wide at the points of greatest destruction.

The newspaper accounts of the tornadoes of May 21st were in no wise exaggerated. After having witnessed one at close quarters I am convinced that no meteorological phenomenon is so terrifying and of such destructive force. Fortunately they are not of common occurrence.

The Postmaster at Guttenberg, Iowa, reports the arrival of the storm there at 6:30 p. m.

A funnel cloud seemed to travel slowly from southeast to northwest and was attended by a heavy rumbling noise. Color was dark slate. Lightning all around. Only a little rain occurred before the storm struck—heavy after. Hail did not amount to much. Storm was a whirl and it threw wreckage 150 feet up along the hillside. Path in Guttenberg was about two city blocks wide and about eight city blocks long, then it crossed the Mississippi into Wisconsin. No one was killed but three were injured. Houses were unroofed, barns and other buildings were wrecked and some were blown across the river into Wisconsin. Estimated property loss about $20,000.

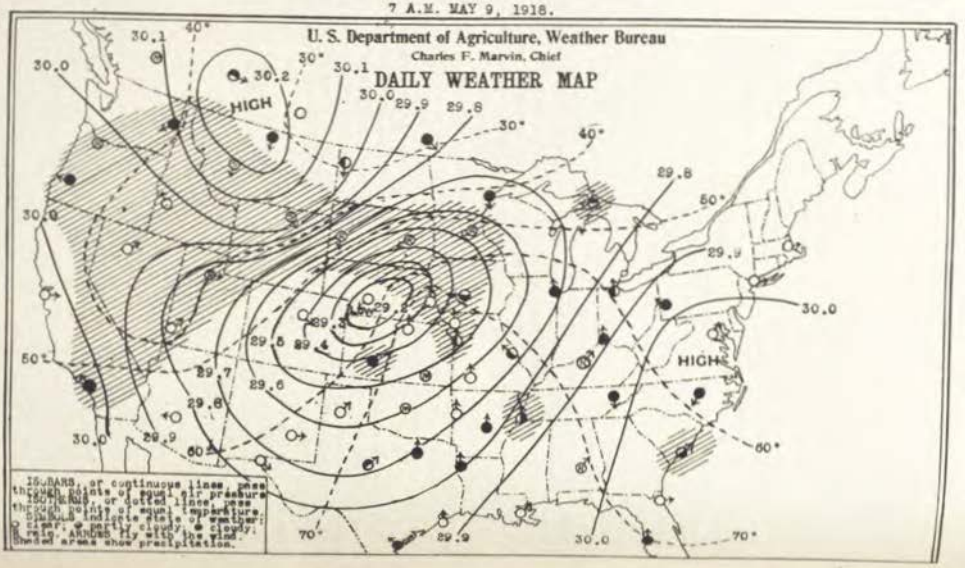
Later: Reports from Walker, in the northwest part of Linn county, show that about 6:45 p. m. May 21, a tornado moved east-northeast through that town, causing the death of Mrs. Wm. Ossman, the serious injury of two others, and property damage amounting to $52,000. Some reporters place the damage considerably higher.

Weather Conditions Favorable for Tornadoes.

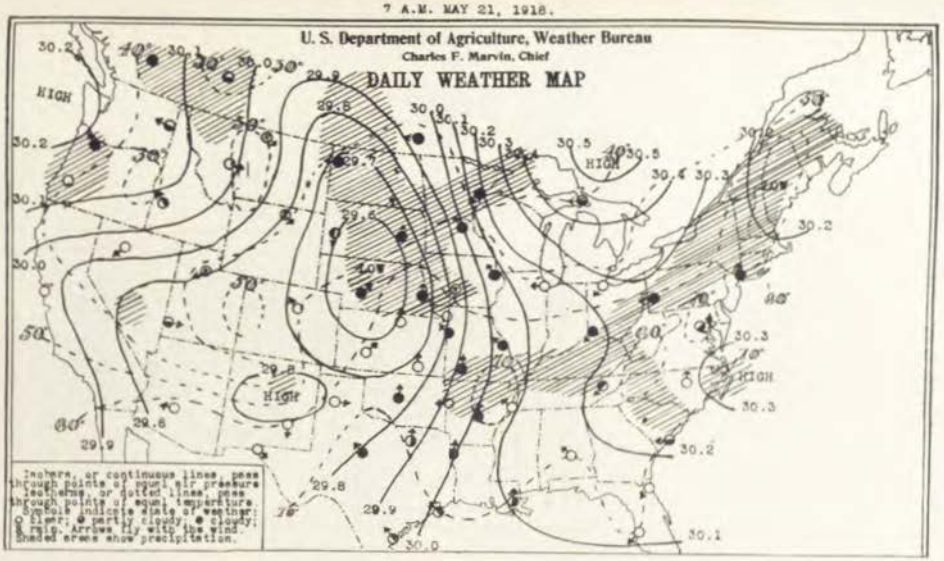
Attention is invited to a copy of the daily weather map of the United States Weather Bureau on page 34 showing the general weather conditions prevailing at 7 A. M. May 9, 1918. An area of low barometer or general storm center was located in central Nebraska, the lowest barometer reading being 29.18 inches at North Platte. The barometric gradient or slope was steep from the Mississippi River across Iowa to eastern Nebraska, amounting to .40 inch in 500 miles. As usual in such cases, warm, southern, moisture laden air was being transported northward over Iowa in tremendous volumes. Intervals of sunshine warmed the air rapidly at the surface. From around 60 degrees in the morning the temperature rose about 30 degrees by early afternoon, which set up strong by the proximity of the general storm center. Towering cumulo-nimbus convectional (up and down) currents, the up-currents being greatly aided clouds here and there over the State raised their heads and in some cases a large part of their bodies into the rapidly moving, wintry, westerly winds aloft that had not had time to be warmed by the springtime sunshine caught and radiated by the ground. Where these conditions were most pronounced tornado vortices formed. By 7 p. m. of the 9th the general storm center was crossing the Mississippi River at almost the identical time and place that the tornadoes occurred in Clayton county. By the next morning the general storm center had moved to a point in Canada northeast of Lake Huron and the danger of further tornadoes was over till a similar set of conditions could be pieced together in the meteorological kaleidoscope.

In this case there was not long to wait, for May 21 was one of the worst tornado days in the history of Iowa. The weather map of 7 a. m. that date on page 35 shows a general storm center with a barometer reading of 29.62 inch at Valentine, Neb. The barometric gradient or slope across Iowa from the Mississippi River to extreme eastern Nebraska was .50 inch in 400 miles, showing considerable more energy than the map of May 9. Much the same temperature, moisture, wind and cloud conditions prevailed, only that, if anything, the summits of the cumulo-nimbus clouds rose higher. The great cloud mountains in which the Boone and Newton tornadoes were generated were plainly visible at Des Moines. In this case the general storm center took a wide detour. At 7 p. m. it was near the northwest corner of Minnesota and by the next morning it was north of Lake Superior.

7 A.M. MAY 9, 1918.



7 A.M. MAY 21, 1918.



TORNADOES IN IOWA DURING THE YEAR, 1918.

Storm No.*	Nearest Towns	Date	Hours	Storm Moved From	Length of path, miles	Persons killed	Persons injured	Estimated damage
I	Randall to Ellsworth	May 8	3.30 p.	S. W. to N. E.	4	0	0	$ 3,500
II	Pearl Rock to Calmar	May 9	4—5.30 p.	S. W. to N. E.	54	8	20	500,000
III	Conesville to Eldridge	May 9	6.10 p. to 7 p.	S. W. to N. E.	42	1	12	103,300
IV	Eldridge	May 10	6 p.	S. W. to N. E.	½	2	2	2,000
V	Denison to Stanhope	May 21	2.15 p. to 4.30 p.	W.—S. W. to E.—N. E.	69	6	35	495,000
VI	Berkley to Wellsburg	May 21	3.45 p. to 3.15 p.	S. W. to N. E.	67	10	91	897,980
VII	Prairie City to Tama	May 21	3—5 p.	S. W. to N. E.	41	1	1	350,000
VIII	Wood, Iowa, to Baraboo, Wis.	May 21	6—8 p.	S. W. to N. E.	†12	†0	†8	†30,000
IX	Elkport to Garnavillo	May 21	7 p.	S. W. to N. E.	10	0	0	3,000
	Walker	May 21	6.45 p.	W.—S. W. to E.—N. E.	3	1	3	52,000
X	Britt to Silver Lake	May 31	2—4 p.	S. W. to N. E.	32	0	8	20,000
XI	Weston	July 14	9.30 p.	N. W. to S. E.	¼	0	0	600
				Totals	335	29	182	$2,454,380

*Roman numerals refer to storm track on accompanying chart. †In Iowa, only.

TORNADO PATHS IN IOWA DURING THE YEAR, 1918.
(Numerals Refer to Descriptive Data in Accompanying Table.)

JUNE

Temperatures averaged about 5 degrees in excess of the normal in the southwestern and about 1 degree below normal in the northeastern counties. The period 10th-16th was notably warm. On the 16th, many stations reported temperatures of 100 degrees or higher and broke their June records. During the period, 2d-5th, excessive rains occurred from Webster and Hamilton, southeast to Poweshiek and Johnson counties, causing unusual overflows in the watersheds involved. Precipitation was very deficient in several southwestern counties. A severe hailstorm occurred in portions of Polk, Marion and Mahaska counties on the 27th.

Crops made excellent progress, except oats which were prematurely ripened by the hot weather in the southwestern portion of the State; early potatoes also were injured. Corn was far advanced and some laid by at the close of the month. Rye harvest began in the southern counties about the 25th, and oats toward the close of the month.

Pressure. The mean pressure (reduced to sea level) for the State was 29.93 inches. The highest recorded was 30.33 inches, at Sioux City, on the 7th, and the lowest was 29.56 at Sioux City on the 1st. The monthly range was 0.77 inch.

Temperature. The mean temperature for the State, as shown by the records of stations, was 70.8°, or 1.7° higher than normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 68.7°, or 1.1° higher than the normal; Central 70.6°, or 1.3° higher than the normal; Southern, 73.1°, or 2.8° higher than the normal. The highest monthly mean was 76.4°, at Thurman, in the extreme southwestern part of the State, and the lowest was 65.7° at Postville, in the extreme northeast. The highest temperature reported was 105° at Omaha, Nebr., on the 16th and the lowest was 38°, at West Bend, on the 2d. The temperature range for the State was 67°.

Humidity. The average relative humidity for the State at 7 a. m. was 77 per cent, and at 7 p. m. it was 60 per cent. The mean for the month was 69 per cent, or normal. The highest monthly mean was 74 per cent, at Charles City, and the lowest was 66 per cent, at Sioux City.

Precipitation. The average precipitation for the State, as shown by the records of 111 stations, was 5.29 inches, or 0.91 inch more than the normal. By divisions the averages were as follows: Northern, 4.89 inches, or 0.46 of an inch more than the normal; Central, 6.49 inches or 2.17 inches more than the normal; Southern, 4.50 inches, or 0.11 of an inch more than the normal. The greatest amount, 10.19 inches, occurred at Monroe, and the least, 1.55 inches at Audubon. The greatest amount in 24 consecutive hours, 5.37 inches, occurred at Monroe, on the 24th.

Wind. The prevailing direction of the wind was from the southeast. The highest velocity reported from a regular Weather Bureau station was 45 miles an hour, from the northeast, at Sioux City, on the 24th.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 69, or about 1 per cent more than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 57; Davenport, 67; Des Moines, 76; Dubuque, 64; Keokuk, 67; Sioux City, 74; Omaha, Neb., 80.

Miscellaneous Phenomena. Aurora, 9th, 11th. Fog, dense, 4th, 6th, 25th, 26th, 28th. Hail, Northern Division, 3d, 6th, 14th, 29th, 27th, 30th; Central Division, 3d, 5th, 27th; Southern Division, 1st, 2d, 3d, 4th, 5th, 24th, 27th, 28th. The hailstorms of June will be more fully covered in our report for July. Halos (solar), 1st, 2d, 7th, 9th, 11th, 22d. Thunderstorms, all days except 7th, 8th, 11th, 12th, 15th, 21st, 22d, 23d. Rainbow, 5th, 29th.

Rivers. Moderate stages prevailed in the Missouri River but the flood stage was not reached, nor was the flood stage reached on the Mississippi except near Keokuk, where flood conditions prevailed from the 10th to the 14th, inclusive, due to the heavy discharge of the Skunk, Iowa and Des Moines Rivers; above Burlington moderate stages prevailed but a great deal of bottom land was flooded and some crops destroyed. In the interior of the State rivers and small streams were overflowed for a considerable period due to an unusually heavy fall of rain on the 3d and 4th, in the central counties. At Boone the Des Moines River reached a stage of 23.2 feet on the 5th, which is within 2.2 feet of the highest of record and 6.2 feet above the flood stage. The principal damage was to crops and bridges but there was some damage to other property, and train movements for a time were demoralized.

COMPARATIVE DATA FOR THE STATE—JUNE.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With prc. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	72.7	+ 3.6	106	44	7.76	+3.28	16.53	1.57	.....	11	12	10	8
1891	69.1	0.0	99	37	5.39	+1.01	19.88	1.68	.....	11	8	10	12
1892	69.2	+ 0.1	102	42	5.19	+0.81	14.16	0.67	.....	10	12	11	7
1893	71.2	+ 2.1	100	40	3.91	−0.47	7.56	1.36	.....	8	15	11	4
1894	73.2	+ 4.1	104	34	2.67	−1.71	6.29	0.57	.....	7	16	10	4
1895	69.7	+ 0.6	102	34	4.32	−0.06	9.26	0.98	.....	10	11	11	8
1896	69.1	0.0	100	40	3.11	−1.27	7.80	0.81	.....	9	12	13	5
1897	69.1	0.0	102	29	3.81	−0.57	9.28	1.03	.....	10	10	12	8
1898	71.4	+ 2.3	99	42	4.72	+0.34	12.48	1.90	.....	9	13	10	7
1899	76.7	+ 1.6	100	47	5.04	+0.66	11.99	1.10	.....	10	12	13	5
1900	69.7	+ 0.6	102	38	3.98	−0.40	12.35	0.67	.....	5	17	10	3
1901	72.3	+ 3.2	106	39	3.71	−0.67	7.84	1.05	.....	9	15	11	4
1902	65.2	− 3.9	97	32	7.16	+2.78	16.04	1.46	.....	14	8	11	11
1903	64.6	− 4.5	96	30	2.86	−1.52	6.64	0.75	.....	10	13	10	7
1904	67.1	− 2.9	94	35	3.45	−0.93	8.25	0.44	.....	7	13	10	7
1905	69.9	+ 0.8	100	36	5.53	+1.15	11.89	1.80	.....	10	12	11	7
1906	67.9	− 1.2	99	37	3.92	−0.46	8.27	1.48	.....	8	15	10	5
1907	66.5	− 2.6	98	36	5.35	+0.97	9.33	2.07	.....	11	14	9	7
1908	67.1	− 2.0	94	35	5.66	+1.28	11.88	1.77	.....	13	11	10	8
1909	69.1	0.0	96	40	6.41	+2.03	13.30	2.89	.....	13	12	10	8
1910	69.5	+ 0.4	105	33	1.59	−2.79	5.51	0.65	.....	7	18	7	5
1911	75.7	+ 6.6	108	36	1.82	−2.56	6.28	0.06	.....	5	20	8	2
1912	66.2	− 2.9	101	34	2.74	−1.64	5.71	0.78	.....	7	15	9	6
1913	71.5	+ 2.4	102	33	3.21	−1.07	8.05	0.74	.....	7	19	8	3
1914	72.2	+ 3.1	101	40	5.57	+1.19	13.24	1.17	.....	13	12	14	4
1915	63.1	− 4.0	91	31	4.16	−0.22	9.99	1.72	.....	11	12	12	6
1916	64.5	− 4.6	96	38	3.71	−0.67	7.96	1.41	.....	10	13	11	6
1917	66.0	− 3.1	100	32	6.65	+2.27	13.82	3.04	.....	12	13	10	7
1918	70.8	+ 1.7	104	38	5.29	+0.91	10.19	1.55	.....	11	16	10	4

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

JULY.

Temperatures averaged slightly below normal in all but the southwest counties where there was a slight excess, the largest excess being 3.6 degrees at Corning. Comparatively cool weather prevailed on the 1st, 6th-13th and 29th-31st. The warmest period over most of the State was the 24th-28th, though many stations in the north reported their highest temperatures about the 20th. Three general rain periods, 4th-7th, 14th-15th and 22d-26th resulted in deficient totals, except in the north two tiers of counties and from Marshall southeast to Muscatine and Scott counties. In the central counties of the southern tier, the deficiency approached 4 inches. Excessive rains occurred in the north-eastern counties on the 25th-26th, which, together with high winds, beat down the corn and oats badly and delayed harvest. Otherwise harvest progressed rapidly, with unusually good conditions for labor and curing of the shocked grain. Threshing was well under way in the south half of the State the last of the month. Yields and quality of small grains were generally good.

On July 14, about 9:30 p. m. a small tornado moved from a mile and a half northwest of Weston, Pottawattamie county, to a half mile west of that town, causing $600 worth of damage.

Pressure. The mean pressure (reduced to sea level) for the State was 30.02 inches. The highest pressure recorded was 30.31 inches, at Dubuque on the 12th, and the lowest was 29.65 at Sioux City on the 3d. The monthly range was 0.66 of an inch.

Temperature. The mean temperature for the State, as shown by the records of 100 stations, was 73.1°, or 1.0° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 71.2° or 1.5° lower than the normal; Central, 73.0° or 1.3° lower than the normal; Southern, 75.0°, or 0.2° lower than the normal. The highest monthly mean was 78.0° at Corning, and the lowest was 68.6°, at Postville. The highest temperature reported was 105°, at Clarinda, on the 28th; the lowest was 40°, at Audubon, on the 1st. The temperature range for the State was 65°.

Humidity. The average relative humidity for the State at 7 a. m. was 77 per cent, and at 7 p. m. it was 56 per cent. The mean for the State was 66 per cent, or 1 per cent lower than the normal. The highest monthly mean was 74 per cent, at Sioux City, and the lowest was 58 per cent at Omaha, Nebr.

Precipitation. The average precipitation for the State, as shown by the records of 108 stations, was 3.17 inches, or 0.79 inch less than the normal. By divisions the averages were as follows: Northern, 4.57 inches, or 0.69 inch more than the normal; Central, 3.00 inches, or 0.96 inch less than the normal; Southern, 1.93 inches, or 2.09 inches less than the normal. The greatest amount, 8.05 inches, occurred at Postville, and the least 0.26 of an inch at Albia. The greatest amount in 24 consecutive hours, 3.62 inches, occurred at Charles City on the 25th and 26th.

Wind. The prevailing direction of the wind was from the southeast. The highest velocity reported from a regular Weather Bureau station was 41 miles an hour, from the south, at Sioux City, on the 3d.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 72, or 2 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 65; Davenport, 73; Des Moines, 78; Dubuque, 74; Keokuk, 80; Sioux City, 64; Omaha, Nebr., 71.

Miscellaneous Phenomena. Aurora, 10th. Fog, 5th, 6th, 15th, 16th, 17th, 25th. Hail, Northern Division, 22d, 25th, 26th; Southern Division, 27th, 28th. Halo (lunar 22d; solar 1st, 14th, 16th, 17th, 27th). Rainbow (lunar), at Grinnell on the 25th. Thunderstorms, 2d, 3d, 4th, 5th, 6th, 7th, 9th, 14th, 15th, 19th, 21st, 22d, 23d, 24th, 25th, 26th, 27th, 28th, 29th, 31st. Tornado, 14th.

Rivers. The principal rivers fell steadily during the month except when affected temporarily by heavy rainfall. Moderate stages for July prevailed on the Missouri and low stages on the Mississippi. None of the streams in the interior of the State were overflowed and low stages prevailed generally.

COMPARATIVE DATA FOR THE STATE—JULY.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1880	75.6	+ 1.5	110	45	1.98	−1.58	5.00	0.37		5	18	8	5
1881	68.5	− 5.6	99	41	4.23	+0.26	8.20	1.07		8	13	10	8
1882	73.0	− 1.1	104	38	5.29	+1.32	12.86	1.71		9	16	10	5
1883	75.9	+ 0.9	102	47	3.33	−0.63	8.84	1.49		7	19	10	2
1884	76.4	+ 2.3	109	39	0.63	−3.33	3.50	T		3	22	8	1
1885	72.1	− 2.0	104	35	3.40	−0.56	16.10	0.45		7	15	12	4
1886	73.6	− 0.5	104	42	6.50	+2.94	12.67	1.61		9	14	11	6
1887	75.8	+ 1.5	100	42	3.26	−0.70	7.93	1.03		6	18	10	3
1888	73.4	− 0.7	102	42	2.98	−0.98	12.88	0.55		7	19	9	3
1889	72.1	− 1.0	101	38	3.07	−0.89	8.66	0.42		7	16	10	5
1900	78.4	+ 6.7	102	37	6.15	+2.19	18.45	1.80		9	16	10	5
1901	82.4	+ 8.3	113	46	2.34	−1.62	5.97	0.27		5	21	9	1
1902	73.1	− 1.0	99	41	8.67	+4.71	13.57	4.82		13	14	10	7
1903	72.9	− 1.2	100	40	4.83	+0.87	12.72	0.94		9	17	9	5
1904	70.6	− 3.5	100	38	4.41	+0.45	11.97	1.28		10	16	9	6
1905	70.6	− 3.5	102	40	2.91	−1.05	7.08	0.69		9	14	10	7
1906	70.9	− 3.2	102	42	3.04	−0.92	7.05	0.93		8	18	10	3
1907	73.7	− 0.4	102	41	7.27	+3.31	13.06	3.97		13	16	11	4
1908	72.0	− 1.1	100	42	3.66	−0.30	9.21	0.70		8	16	10	5
1909	72.3	− 1.8	102	46	4.77	+0.81	12.20	1.21		10	15	8	8
1910	74.3	+ 0.4	108	43	1.86	−2.10	5.69	0.12		7	19	8	4
1911	75.5	+ 1.4	111	38	2.27	−1.09	6.62	0.68		7	18	10	3
1912	74.6	+ 0.5	103	38	3.71	−0.25	7.56	1.17		10	17	10	4
1913	76.1	+ 2.0	108	45	1.83	−2.14	6.23	T		5	21	8	2
1914	70.6	− 3.5	100	43	2.57	−1.69	6.51	0.44		5	20	8	3
1915	69.5	− 4.6	92	40	8.32	+4.26	15.83	3.68		14	10	12	9
1916	79.7	+ 5.6	105	48	1.78	−2.18	6.87	0.10		5	23	7	1
1917	74.3	+ 0.2	106	38	2.27	−1.69	6.16	0.23		7	21	8	2
1918	73.1	− 1.0	105	46	3.17	−0.79	8.05	0.39		8	19	8	4

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

AUGUST.

On August 4th-5th high temperature records, covering periods of 40 to 46 years at some stations, were broken. The highest reported was 113° at Clarinda, Knoxville and Shenandoah on the 4th, which equals the absolute maximum for the State that occurred at Sigourney on July 22, 1901. The monthly mean for the State, 76.0°, though 4.2° above normal, was exceeded in August, 1900, 1909 and 1913. The excess in temperature was greatest, 8.0°, in Adams county where the greatest damage to corn occurred. Precipitation was deficient from the Missouri River eastward over the central counties extending in a narrow belt to the middle Mississippi. The deficiency exceeded 3 inches in Monona, Fremont and Webster Counties; and in the extreme southwest counties from March 1 to August 31 is more than 50% of the normal.

The corn crop had been somewhat injured by drouth prior to August in the southwest one-third of the State and was in poor condition to withstand the withering heat, strong southerly winds and low humidity which were at a climax August 4-6 and were somewhat damaging in localities till general showers came about the middle of the month. As a whole, the crop deteriorated 11 per cent or about 35,000,000 bushels. In Adams County where the worst damage is reported, the crop will be only 20 per

cent of the normal. Much livestock was sold in the southwest counties because of shortage of feed and that which remained was on winter feed throughout the month. Excessive rains with unusually severe electrical storms in the north and east-central counties on the 16th-17th damaged shocked grain and delayed threshing.

Pressure. The mean pressure (reduced to sea level) for the State was 29.93 inches. The highest recorded was 30.30 inches, at Dubuque, on the 19th, and the lowest was 29.58 inches, at Sioux City, on the 5th. The monthly range was 0.72 of an inch.

Temperature. The mean temperature for the State, as shown by the records of 102 stations, was 76.0°, or 4.2° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 72.8°, or 2.4 higher than the normal; Central, 76.1°, or 4.4° higher than the normal; Southern, 79.1°, or 5.9° higher than the normal. The highest monthly mean was 80.8°, at Clarinda, Keokuk, Thurman and Omaha, Nebr., and the lowest was 70.0°, at Forest City. The highest temperature recorded was 113°, at Clarinda, Knoxville and Shenandoah, on the 4th, and the lowest was 38°, at Sibley, on the 30th. The temperature range for the State was 75°.

Precipitation. The average precipitation for the State, as shown by the normal. By divisions the averages were as follows: Northern, 4.32 records of 112 stations, was 3.61 inches, 0.07 of an inch less than the inches, or 0.84 of an inch more than the normal; Central, 3.97 inches, or 0.80 of an inch less than the normal; Southern, 3.55 inches, or 0.23 of an inch less than the normal. The greatest amount 8.38 inches, occurred at Centerville, and the least, 0.54 of an inch, at Thurman. The greatest amount in 24 hours 5.22 inches, occurred at Dubuque on the 16th-17th.

Humidity. The average relative humidity for the State at 7 a. m. was 77 per cent, and at 7 p. m. it was 58 per cent. The mean for the month was 67 per cent, or 4 per cent lower than the normal. The highest monthly mean was 76 per cent, at Charles City, and the lowest was 56 per cent, at Omaha, Nebr.

Wind. The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 51 miles an hour, from the south, at Sioux City, on the 15th.

Sunshine. The average per cent of the possible amount of sunshine was 68, or 3 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 63; Davenport, 69; Des Moines, 62; Dubuque, 66; Keokuk, 76; Sioux City, 68; Omaha, Nebr., 70.

Miscellaneous Phenomena. Aurora, 17th, 24th, 25th, 26th and 31st. Fog, 9th, 14th, 16th, 24th, 27th and 28th. Frost, (light): 31st, at Mt. Ayr. Hail: 14th, 17th, 22d, 29th and 30th. Halo, Solar: 27th. Rainbow: 22d. Thunderstorms. All days except 5th, 9th, 24th, 25th, 26th, 27th and 31st.

Rivers. Moderate stages prevailed on the Missouri River, with a general falling tendency the greater portion of the month; on the Mississippi low stages prevailed, with a falling tendency, until the 17th, when a sharp rise, due to unusually heavy rainfall over the northeastern portion of the

State, occurred. Crest stages occurred at Dubuque on the 18th, at Davenport on the 19th and at Keokuk on the 21st. At the end of the month low stages were general on the Mississippi. The interior rivers were low except for brief periods.

COMPARATIVE DATA FOR THE STATE—AUGUST.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With prec. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	68.4	— 3.4	102	36	3.41	—0.27	6.44	1.02	.....	8	15	10	6
1891	69.1	— 2.7	106	34	4.24	—0.56	13.02	1.23	.....	8	13	12	6
1892	71.4	— 0.4	102	40	2.24	—1.54	4.69	0.65	.....	5	18	9	4
1893	69.4	— 2.4	101	39	2.32	—1.26	6.22	0.40	.....	5	19	9	3
1894	74.6	+ 2.8	108	38	1.58	—2.10	4.53	T.	.....	4	21	8	2
1895	71.9	+ 0.1	103	37	4.43	+0.75	10.63	0.67	.....	7	17	9	5
1896	71.7	— 0.1	104	34	3.52	—0.16	12.35	0.86	.....	8	15	11	5
1897	68.9	— 2.9	104	35	1.86	—1.82	4.98	0.47	.....	6	15	11	5
1898	71.2	— 0.6	103	40	3.44	—0.24	16.55	0.58	.....	6	17	9	5
1899	74.4	+ 2.6	100	41	3.68	0.00	10.45	1.12	.....	7	17	10	4
1900	77.4	+ 5.6	103	44	4.65	+0.97	10.43	1.20	.....	6	18	10	3
1901	73.8	+ 2.0	105	40	1.29	—2.39	4.46	T.	.....	5	20	9	2
1902	69.1	— 2.7	98	37	6.58	+2.90	15.47	1.57	.....	11	11	11	9
1903	69.1	— 2.7	101	41	6.04	+2.96	17.74	2.55	.....	11	12	10	9
1904	69.1	— 2.7	97	35	3.43	—0.25	6.75	0.66	.....	7	17	8	6
1905	74.3	+ 2.5	104	44	4.05	+0.37	8.47	1.04	.....	9	16	9	6
1906	74.1	+ 2.3	103	33	3.95	+0.27	10.51	0.92	.....	9	17	9	5
1907	71.1	— 0.7	99	37	4.33	+0.65	9.67	1.05	.....	9	17	9	5
1908	70.0	— 1.8	101	38	4.77	+1.09	10.55	1.35	.....	9	17	9	5
1909	76.1	+ 4.3	103	53	1.81	—1.87	8.21	T.	.....	5	21	8	2
1910	71.9	+ 0.1	104	36	3.88	+0.20	11.22	0.37	.....	8	15	10	6
1911	71.7	— 0.1	107	34	5.02	+0.36	9.47	0.44	.....	9	16	10	5
1912	71.0	— 0.8	101	40	3.78	+0.10	7.90	0.89	.....	10	15	10	6
1913	76.6	+ 4.8	108	40	2.68	—1.00	7.13	0.48	.....	6	17	10	4
1914	73.7	+ 1.9	103	40	2.19	—1.49	4.90	0.47	.....	7	17	10	4
1915	66.9	— 5.9	91	30	2.81	—0.87	9.04	0.27	.....	8	16	8	7
1916	74.0	+ 2.2	106	35	2.58	—1.10	6.23	0.49	.....	7	18	9	4
1917	69.4	— 2.4	102	31	2.29	—1.39	6.31	0.70	.....	7	19	8	4
1918	76.0	+ 4.2	113	38	3.61	—0.07	8.38	0.54	.....	8	16	10	5

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

SEPTEMBER.

September mean temperature, 58.6°, is the lowest of 29 Septembers, except 1896, which was only 0.1° cooler. The deficiency in temperature was greatest, 8°, in the extreme northeast portion and least, 2.6°, in Adams County. The temperature was normal or higher on very few days. During the coolest period, 18th-21st, heavy to killing frosts covered all sections of the State except a distance of about 50 miles west of the Mississippi River, and frosts reached most of the east-central counties on the 27th. Precipitation was deficient except in Floyd and surrounding counties where heavy rains on the 10th caused a monthly excess; also in Wapello and adjacent counties where heavy rains fell on the 2d and 4th.

Due to the great damage by frost last year, the seed corn available for planting this season was limited largely to the earlier varieties. This, together with a favorable season, left little corn subject to damage by the early frosts. That planted after the June floods suffered most.

The garden vegetable season was shortened about three weeks. The dry weather favored the maturing of corn but interfered considerably with the seeding and germination of wheat and rye. Where the moisture was sufficient these crops were up and growing nicely at the close of the month.

Pressure. The mean pressure (reduced to sea level) for the State was 30.09 inches. The highest recorded was 30.51 inches at Dubuque, on the 10th, and the lowest was 29.70 at Davenport, on the 14th. The monthly range was 0.81 inch.

Temperature. The mean temperature for the State, as shown by the records of 96 stations was 58.6°, or 4.8° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 56.7°, or 5.1° lower than the normal; Central, 58.5°, or 5.0° lower than the normal; Southern, 60.5° or 4.5° lower than the normal. The highest monthly mean was 62.4°, at Omaha, Nebr., and the lowest 54.6°, at Postville. The highest temperature reported was 93° at Omaha, Nebr., on the 18th, and the lowest, 21° at Denison, on the 21st. The temperature range for the State was 73°.

Humidity. The average relative humidity for the State at 7 a. m. was 79 per cent and at 7 p. m. 58 per cent. The mean for the month was 68 per cent, which is 6 per cent below normal. The highest monthly mean was 83 per cent at Charles City, and the lowest was 69 per cent at Omaha, Nebr.

Precipitation. The average precipitation for the State, as shown by the records of 108 stations, was 1.87 inches, or 1.49 inches below the normal. By divisions the averages were as follows: Northern, 1.83 inches, or 1.22 inches less than the normal; Central, 1.46 inches, or 2.00 inches less than the normal; Southern, 2.32 inches, or 1.24 inches less than the normal. The greatest amount, 4.62, occurred at Keosauqua, and the least, 0.48 inch, at Cumberland. The greatest amount in 24 consecutive hours 2.82 inches, occurred at Keosauqua, on the 2d.

Wind. The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 34 miles an hour from the northwest at Sioux City, on the 11th, and at Des Moines from the southwest, on the 17th.

Sunshine. The average per cent of the possible amount of sunshine was 63, which is normal. The per cent of the possible amount at regular Weather Bureau stations was as follows: Charles City, 61; Davenport, 56; Des Moines, 60; Dubuque, 55; Keokuk, 75; Sioux City, 65; Omaha, Nebr., 68.

Miscellaneous Phenomena. Aurora, 1st, 21st, 29th, 30th. Fog, dense, 8th, 11th, 12th, 14th, 25th, 27th. Frost, killing, Northern Division, 12th, 16th, 17th, 18th, 19th, 20th, 21st; Central Division, 17th, 18th, 20th, 21st, 27th; Southern Division, 17th, 20th, 21st. Hail, 10th, 11th, 18th, 19th, 20th. Halo (lunar or solar) 17th. Thunderstorms, 1st, 2d, 9th, 10th, 11th, 12th, 14th, 15th, 17th, 18th, 19th, 24th, 25th.

COMPARATIVE DATA FOR THE STATE—SEPTEMBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pr'p., .01 in. or more	Clear	Partly cloudy	Cloudy
1890	59.2	— 4.1	96	23	2.97	—0.39	4.85	1.36	.....	7	13	10	7
1891	67.5	+ 3.9	104	28	1.33	—2.06	3.60	0.13	.....	4	20	7	3
1892	64.7	+ 1.3	99	29	1.53	—1.83	4.15	0.16	.....	4	16	8	6
1893	64.7	+ 1.2	102	18	2.54	—1.02	5.49	0.74	.....	4	20	6	4
1894	65.1	+ 1.7	100	26	3.57	+0.21	7.43	0.67	.....	8	15	10	5
1895	60.8	— 2.4	103	21	5.03	+1.63	7.43	0.85	.....	5	18	8	4
1896	58.5	— 4.9	95	22	4.09	+0.73	9.96	1.82	.....	10	11	9	10
1897	70.9	+ 7.5	106	30	2.04	—1.32	5.88	0.09	.....	4	23	5	2
1898	65.3	+ 1.9	99	29	2.69	—0.67	8.45	0.41	.....	7	16	9	5
1899	62.5	— 0.9	104	15	6.93	+2.43	4.32	T.	.....	4	16	9	5
1900	64.4	+ 1.0	99	26	4.98	+1.62	8.82	2.48	.....	9	15	8	7
1901	63.3	— 0.1	102	26	4.77	+1.41	13.62	1.71	.....	9	12	9	8
1902	59.1	— 4.3	88	23	4.35	+0.99	10.41	1.65	.....	9	15	6	9
1903	60.8	— 2.6	94	28	3.81	+0.45	8.79	1.42	.....	10	14	6	10
1904	64.9	+ 0.6	94	30	2.78	—0.58	8.23	0.19	.....	7	13	8	9
1905	65.8	+ 2.4	96	36	3.81	+0.45	13.18	0.50	.....	8	14	8	8
1906	67.2	+ 3.8	100	27	4.16	+0.80	11.10	0.64	.....	8	16	8	6
1907	62.8	— 0.6	98	25	2.75	—1.61	6.06	1.28	.....	8	15	9	6
1908	67.9	+ 4.5	98	30	1.20	—2.16	3.46	0.25	.....	3	21	6	3
1909	62.4	— 1.0	94	30	3.58	+0.22	7.34	1.39	.....	9	14	8	8
1910	63.2	— 0.2	99	30	3.59	+0.23	7.43	1.18	.....	9	14	7	9
1911	65.8	+ 2.4	103	31	5.12	+1.76	15.73	1.19	.....	10	11	9	10
1912	62.1	— 1.3	104	24	3.98	+0.62	10.12	0.28	.....	11	12	8	10
1913	64.5	+ 1.1	107	19	3.31	—0.05	7.44	0.45	.....	9	15	8	7
1914	64.5	+ 1.1	99	30	7.88	+4.52	16.24	2.48	.....	10	16	7	7
1915	63.7	+ 0.3	91	30	6.03	+2.67	12.45	2.88	.....	11	11	8	11
1916	62.5	— 0.9	98	21	2.80	+0.53	9.71	1.43	.....	7	17	8	5
1917	62.6	— 0.8	97	28	2.90	—0.46	8.68	0.39	.....	7	15	7	8
1918	58.6	— 4.8	93	29	1.87	—1.49	4.62	0.48	.....	6	16	8	6

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

OCTOBER.

October was generally warm and pleasant, but with cool periods on the 1st, 24th-26th, and 30th-31st. From the 8th to the 17th the weather was unusually warm. The first killing frost of the season occurred in the extreme eastern counties on the 27th, the rest of the State having had killing frosts in September. Precipitation was well distributed both as to time and area but slightly below normal till a storm center of marked intensity crossed the State from south to north on the 27th, causing heavy to excessive rains, 26th-28th. In the northwest part of the State the precipitation on the 26th was largely in the form of snow.

Corn dried out rapidly and husking and cribbing began early and progressed rapidly. A largely increased acreage of winter wheat in the winter wheat sections of the State made excellent growth. Potato digging was finished and the crop is generally small.

An unusually brilliant aurora was observed during the night of the 8th-9th at Oskaloosa and some other stations.

Pressure. The mean pressure (reduced to sea level) for the State was 30.03 inches. The highest recorded was 30.44 inches, at Dubuque, on the 3d, and lowest was 29.17 inches at Des Moines, on the 27th. The monthly range was 1.27 inches.

Temperature. The mean temperature for the State, as shown by the records of 100 stations, was 55.1°, or 4.3°, higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 52.8°, or 3.8° higher than the normal; Central, 55.5°, or 4.6° higher than the normal; Southern, 57.0°, or 4.4° higher than the normal. The highest monthly mean was 59.0°, at Afton, and the lowest was 50.2° at Northwood. The highest temperature reported was 93°, at Shenandoah, on the 12th; the lowest was 21°, at Sibley, on the 29th. The temperature range for the State was 72°.

Humidity. The average relative humidity for the State at 7 a. m. was 82 per cent, and at 7 p. m. it was 63 per cent. The mean for the month was 72 per cent, or 1 per cent greater than the normal. The highest monthly mean was 78 per cent, at Charles City, and the lowest was 69 per cent at Omaha, Nebr. At Des Moines, the remarkably low humidity of 10 per cent was observed at 1:45 P. M. of the 16th.

Precipitation. The average precipitation for the State, as shown by the records of 110 stations, was 3.64 inches, or 1.18 inches greater than the normal. By divisions the averages were as follows: Northern, 3.34 inches, or 1.00 inch greater than the normal; Central, 3.71 inches, or 1.22 inches greater than the normal; Southern, 3.87 inches, or 1.33 inches greater than the normal. The greatest amount, 7.56 inches, occurred at Thurman, and the least, 1.36 inches, occurred at Mt. Pleasant. The greatest amount in 24 consecutive hours, 3.27 inches, occurred at Boone on the 27th.

Snow. General snow occurred in the northwest portion of the State on the 26th and at its maximum totaled 6 inches over a belt extending from Monona and Woodbury counties to Dickinson and Emmet counties. The snow was soon melted by the heavy rain that followed.

Wind. The prevailing direction of the wind was south. The highest velocity reported from a regular Weather Bureau station was 37 miles per hour, from the south, at Keokuk, on the 27th.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 52, or 9 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 48; Davenport, 45; Des Moines, 50; Dubuque, 57; Keokuk, 61; Sioux City, 53; Omaha, Nebr., 47.

Miscellaneous Phenomena. Aurora, 8th, 9th, 12th, 16th. Fog, 1st, 2d, 9th, 12th. Halos, Solar, 2d, 9th, 17th, 24th. Halos, Lunar, 15th, 16th, 17th, 21st, 24th. Rainbow, 8th. Sleet, 25th, 26th, 27th, 30th, 31st. Smoke, 17th. Thunderstorms, 7th, 8th, 27th, 28th. Killing Frosts, Northern Division, 3d, 25th, 30th; Central Division, 14th, 25th, 26th, 28th, 31st; Southern Division, 28th.

COMPARATIVE DATA FOR THE STATE—OCTOBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With prec. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	49.2	— 1.6	86	16	3.48	+1.02	0.82	1.59	.....	7	11	11	9
1891	50.0	— 0.8	92	19	2.77	+0.31	0.53	0.85	.....	6	18	7	6
1892	54.5	+ 3.7	96	14	1.55	—0.91	2.58	0.00	0.0	4	21	6	4
1893	52.4	+ 1.6	94	10	1.28	—1.18	4.56	0.02	0.0	4	16	9	6
1894	51.7	+ 0.9	90	20	2.67	+0.21	5.25	0.03	0.2	8	14	8	9
1895	46.0	— 4.8	88	4	0.47	—1.99	1.58	0.00	T.	2	19	8	4
1896	47.9	— 2.9	88	12	3.13	+0.67	5.66	1.51	T.	5	18	6	7
1897	56.8	+ 6.0	97	12	1.14	—1.32	2.30	0.03	0.0	4	17	8	6
1898	47.5	— 3.3	88	17	3.56	+1.10	5.75	1.27	3.6	8	7	9	15
1899	56.7	+ 5.9	95	17	1.73	—0.73	4.64	0.15	0.0	5	17	8	6
1900	59.3	+ 8.5	99	21	3.91	+1.45	8.00	1.39	0.0	7	16	7	8
1901	54.2	+ 3.4	88	20	1.98	—0.48	4.23	0.45	T.	6	17	7	7
1902	52.5	+ 1.7	83	29	2.54	+0.08	6.66	0.38	T.	5	16	8	7
1903	52.2	+ 1.4	90	16	1.95	—0.51	4.50	0.32	0.9	5	19	6	6
1904	53.1	+ 2.3	96	16	1.67	—0.79	4.43	0.14	T.	6	15	8	8
1905	49.2	— 1.6	95	16	3.40	+0.94	5.36	1.20	1.6	8	16	6	9
1906	50.5	— 0.3	87	7	1.96	—0.50	4.25	0.56	0.1	6	14	7	10
1907	50.4	— 0.4	85	10	1.50	—0.96	3.71	0.30	0.0	5	20	5	6
1908	51.1	+ 0.3	89	17	3.38	+0.92	8.83	0.58	2.6	8	16	6	9
1909	49.7	— 1.1	97	10	2.22	—0.24	4.70	0.48	T.	6	16	6	9
1910	55.2	+ 4.4	93	10	0.77	—1.69	1.73	T.	0.1	4	21	4	6
1911	48.7	— 2.1	87	14	3.34	+0.88	7.03	0.73	0.6	10	12	8	11
1912	52.3	+ 1.4	92	16	2.98	+0.52	5.77	1.03	T.	6	21	3	7
1913	49.2	— 1.6	89	—2	3.03	+0.57	7.29	0.35	1.2	9	15	8	8
1914	55.9	+ 5.1	88	14	3.23	+0.77	6.64	0.74	T.	9	16	6	9
1915	54.4	+ 3.6	86	19	1.31	—1.15	3.25	T.	T.	5	19	6	6
1916	50.9	+ 0.1	92	6	2.09	—0.46	4.53	0.29	2.0	8	16	7	8
1917	42.9	— 7.9	85	0	1.41	—1.05	4.09	0.15	2.2	6	10	11	10
1918	55.1	+ 4.3	93	21	2.64	+1.18	7.56	1.36	0.8	7	13	7	11

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

NOVEMBER.

Mild temperature prevailed particularly from the 2d to the 19th, though cool, 23d-26th. Precipitation was well distributed both as to time and area, and was above normal in all but the east-central and some extreme northeast counties and portions of Boone, Dallas and Adair counties. Most of the precipitation occurred in the heavy rain and snow storm of Thanksgiving Day, the 28th. Part of the snow lay on the ground at the close of the month, except in the northwest.

Corn husking progressed rapidly, 91 per cent being finished; yield slightly below normal; quality, excellent, only 4 per cent being soft. There was abundant moisture and warmth for winter wheat which made good growth and is entering the winter in excellent condition, 95 per cent having become well established. Because of labor shortage, less than the usual amount of fall plowing was done.

Pressure. The mean pressure (reduced to sea level) for the State was 30.04 inches. The highest recorded was 30.70 inches, at Sioux City, on the 23d, and the lowest was 29.03 inches, at Davenport, on the 28th. The monthly range was 1.67 inches.

Temperature. The mean temperature for the State, as shown by the records of 102 stations was 39.9°, or 4.9° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 38.1°, or 5.3° higher than the normal; Central, 40.0°, or 4.9° higher than the normal; Southern, 41.5°, or 4.4° higher than the normal. The highest monthly mean was 43.8°, at Keokuk, and the lowest was 36.0°, at Mason City and Sibley. The highest temperature recorded was 76° at Bloomfield, Fairfield, Keosauqua, Ottumwa, Stockport and Washington, on the 6th, and the lowest, zero, at Mason City, on the 25th. The temperature range for the State was 76°.

Humidity. The average relative humidity for the State at 7 a. m. was 84 per cent and at 7 p. m. 71 per cent. The mean for the month was 78 per cent, which is 4 per cent above the normal. The highest mean was 84 per cent at Charles City, and the lowest, 74 per cent, at Dubuque and Keokuk.

Precipitation. The average precipitation for the State, as shown by the records of 109 stations, was 2.11 inches, or 0.60 inch above the normal. By divisions the averages were as follows: Northern, 2.36 inches, or 0.95 inch greater than the normal; Central, 1.84 inches, or 0.31 inch greater than the normal; Southern, 2.13 inches, or 0.55 inch greater than the normal. The greatest amount, 5.10 inches, occurred at Northwood, and the least, 0.70 inch, at Cedar Rapids. The greatest amount in 24 consecutive hours, 2.07 inches, occurred at Sibley on the 16th.

Snowfall. The average fall for the State was 4.4 inches, which is 1.9 inches more than the normal. The heaviest fall was 9.5 inches at Fayette. Practically the entire fall of snow occurred on the 27th and 28th when one of the largest November snows on record occurred over a large portion of the State. The snowfall was light over the northwest and southeast portions, a few stations reporting only traces.

Wind. The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was at the rate of 49 miles per hour, from the northwest, at Sioux City, on the 17th.

Sunshine. The average per cent of the possible amount of sunshine was 52, or 4 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 44; Davenport, 49; Des Moines, 51; Dubuque, 55; Keokuk, 59; Sioux City, 50; Omaha, Nebr., 53. There was an unusual period of almost continuous cloudiness 15th-23d.

Miscellaneous Phenomena. Aurora, 10th, 11th, 29th, 30th. Fog, dense, 2d, 3d, 4th, 5th, 7th, 10th, 15th, 16th, 17th, 26th. Hail, 7th, 16th, 18th, 21st. Halo, lunar, 12th. Halo, solar, 2d, 12th. Rainbow, 16th. Sleet, 17th, 20th, 21st, 27th, 28th. Thunderstorms, 3d, 6th, 8th, 16th, 17th, 18th.

COMPARATIVE DATA FOR THE STATE—NOVEMBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre..01 in. or more	Clear	Partly cloudy	Cloudy
1880	28.6	+ 2.6	78	— 2	1.46	—0.05	3.55	0.71	.....	3	15	8	7
1881	30.5	— 4.5	84	—24	1.79	+0.19	2.64	0.06	.....	7	10	8	12
1882	32.3	— 1.7	70	— 3	1.30	—0.41	2.16	0.05	1.8	4	11	8	11
1883	34.0	— 1.0	86	—13	1.17	—0.34	2.56	0.05	4.6	4	16	8	6
1884	32.7	— 2.3	72	— 5	0.02	—0.59	2.42	T.	0.4	4	9	11	10
1885	34.3	— 0.7	86	—12	1.51	0.00	3.61	0.45	4.9	6	9	8	13
1886	29.6	— 5.4	82	—15	1.83	+0.32	4.51	0.16	2.9	6	9	8	13
1887	34.3	— 0.7	81	—19	0.66	—0.85	2.24	T.	1.2	5	12	8	10
1888	32.2	— 2.8	78	—17	1.50	—0.01	2.61	0.33	8.7	6	14	8	8
1889	43.9	+ 8.9	86	— 8	1.20	—0.31	2.97	0.13	0.5	5	12	8	10
1900	33.5	— 1.5	79	— 6	1.06	—0.45	3.35	T.	3.7	6	12	7	11
1901	35.8	+ 0.8	77	— 2	0.86	—0.65	2.30	0.20	2.6	3	18	6	6
1902	41.2	+ 6.2	78	— 4	2.53	+0.62	4.19	0.16	1.8	7	9	7	14
1903	34.2	— 0.8	76	— 5	0.52	—0.99	1.74	T.	1.1	3	13	8	9
19 4	41.0	+ 6.0	80	— 4	0.15	—1.36	0.50	0.00	0.5	1	29	6	4
1905	38.4	+ 3.4	70	—12	2.84	+1.33	5.30	0.90	0.6	5	16	7	7
1906	35.4	+ 0.4	76	— 5	2.03	+0.52	3.80	0.35	4.4	8	9	7	14
1907	36.7	+ 1.7	68	— 4	1.03	—0.48	2.27	0.05	0.9	4	17	6	7
1908	39.5	+ 4.3	78	— 5	1.56	+0.05	3.31	0.21	1.4	5	14	7	9
1909	42.4	+ 7.4	84	— 3	5.39	+3.88	11.48	2.07	6.8	10	10	7	13
1910	33.4	— 1.6	76	— 5	0.34	—1.17	1.03	T.	0.7	3	13	9	8
1911	29.9	— 5.1	79	— 8	1.42	—0.09	4.99	0.11	1.6	6	11	8	11
1912	40.1	+ 5.1	77	— 6	0.98	—0.53	2.38	0.00	T.	2	18	8	4
1913	44.1	+ 9.1	78	16	1.18	—0.33	2.49	0.20	0.4	6	11	7	12
1914	41.6	+ 6.6	80	— 1	0.22	—1.29	0.95	0.00	T.	2	19	6	5
1915	40.2	+ 5.2	83	— 5	1.94	+0.43	4.86	0.30	1.2	6	11	10	9
1916	37.3	+ 3.3	80	— 8	1.61	+0.10	3.05	0.05	3.6	5	16	6	8
1917	40.7	+ 5.7	77	3	0.28	—1.23	1.02	T.	1.4	3	14	6	10
1918	39.9	+ 4.9	76	1	2.11	+0.60	5.10	0.70	4.4	7	13	5	12

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .05 inch snowfall.

DECEMBER.

This was the warmest December in the 29 years state-wide records have been compiled and was in striking contrast with December, 1917, which was the coldest. The excess in temperature was rather evenly distributed over the State and averaged 8.8 degrees. Precipitation was evenly distributed and slightly above normal, the largest excesses being in the southeast counties, particularly portions of Mahaska, Louisa and Van Buren. Deficiencies occurred in the west-central counties and northeast to the Mississippi River.

Frost left the ground early in the month. The mild weather with precipitation above normal through the fall put roads in the worst condition in many years. As they were practically impassible for heavy traffic, comparatively little corn or other farm produce was marketed. Aside from this, outdoor occupations made unusual progress; fall plowing which had been delayed by labor shortage was brought up to or above normal, continuing in the north till the 21st, and in the south till the 24th; and corn husking was practically finished. Winter wheat made good growth and was pastured some in the southwest to check over-growth. Heavy snow covered the southeastern part of the state on the 24th, amounting to a foot or more in several counties. The ground was not frozen when the growing wheat was covered with this heavy snow blanket. While this is generally believed to be a favorable condition, some adverse opinion has been expressed. If the snow remains porous and does not become converted into an impervious ice sheet by thawing, harm can scarcely result. Fruit buds, though slightly swelled in the south, are believed to be generally safe. Dandelions bloomed in the extreme southeast. Fuel and feed were saved. Livestock subsisted out of doors and was in good condition generally, except hogs which were widely afflicted with influenza, which caused thinness but little mortality. A cold wave preceded by general snow was sweeping southeastward over the State at the close of the month.

Pressure. The mean pressure (reduced to sea level) for the State was 30.04 inches. The highest recorded was 30.51 inches, at Dubuque, on the 18th and at Sioux City on the 23d, and the lowest was 29.29 inches at Sioux City on the 9th. The monthly range was 1.22 inches.

Temperature. The mean temperature for the State, as shown by the means of 98 stations, was 32.7°, or 8.8° higher than the normal. By divisions, three tiers of counties to the division, the mean temperatures were as follows: Northern, 30.5°, or 9.3° higher than the normal; Central, 32.8°, or 8.7° higher than the normal; Southern, 34.7°, or 8.3° higher than the normal. The highest monthly mean was 37.8° at Keokuk, and the lowest monthly mean was 28.9° at Postville. The highest temperature reported was 68° at Columbus Junction on the 8th, and the lowest temperature reported was—7°, at Maquoketa, on the 26th, and at Thurman on the 25th, the range for the State being 75°.

Humidity. The average relative humidity for the State at 7 a. m. was 86 per cent, and at 7 p. m. it was 79 per cent. The mean for the month was 82 per cent, or about 2 per cent above normal. The highest monthly mean was 89 per cent at Charles City, and the lowest reported was 78 per cent, at Keokuk and at Omaha, Nebr.

Precipitation. The average precipitation for the State, as shown by the records of 105 stations, was 1.30 inches, or 0.08 inch more than the normal. By divisions, the averages were as follows: Northern, 1.11 inches, or 0.04 inch more than the normal; Central, 1.24 inches, or 0.01 inch less than the normal; Southern, 1.55 inches, or 0.08 inch more than the normal. The greatest amount, 3.30 inches, occurred at Oskaloosa, and the least, 0.37 inch at LeMars. The greatest amount in any 24 consecutive hours, 1.55 inches, occurred at Oskaloosa, on the 24th.

Snow. The average snowfall for the state was 5.1 inches, or 1.1 inches below normal. The greatest amount, 16.3 inches, occurred at Columbus Junction, and the least, a trace, at 5 stations.

Wind. The prevailing direction of the wind was from the northwest. The highest velocity reported was at the rate of 49 miles an hour from the northwest, at Sioux City, on the 31st.

Sunshine and Cloudiness. The average per cent of the possible amount of sunshine was 38 per cent, or about 10 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 23; Davenport, 34; Des Moines, 40; Dubuque, 34; Keokuk, 54; Sioux City, 41; and Omaha, Nebr., 40 per cent. The average number of clear days was 9; partly cloudy, 8; cloudy, 14.

Miscellaneous Phenomena. Aurora, 2d, 7th, 8th, 25th, 29th, 31st. Fog, 1st, 8th, 9th, 10th, 12th, 13th, 14th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 29th, 30th. Hail, 1st, 30th. Halos (lunar or solar), 1st, 2d, 7th, 15th, 16th, 17th, 19th, 25th, 31st. Parhelia, 31st. Sleet, 1st, 30th. Thunderstorms, 2d, 8th, 9th.

COMPARATIVE DATA FOR THE STATE—DECEMBER.

YEAR	Temperature				Precipitation					Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. .01 in. or more	Clear	Partly cloudy	Cloudy
1890	29.1	+ 5.2	72	—18	0.45	—0.77	1.40	0.00	......	3	17	7	7
1891	32.3	+ 8.4	72	—14	2.41	+1.19	4.50	1.21	......	6	14	9	8
1892	18.9	— 5.0	68	—29	1.65	+0.43	3.04	0.29	10.9	8	9	8	14
1893	22.0	— 1.9	70	—21	1.31	+0.09	2.80	0.46	7.6	7	10	9	12
1894	30.1	+ 6.2	73	—17	0.95	—0.27	1.75	0.25	1.3	3	15	6	10
1895	25.4	+ 1.5	63	—16	1.63	+0.41	5.74	0.00	4.1	5	11	9	11
1896	30.8	+ 6.9	70	—10	0.65	—0.57	1.79	T.	1.6	4	10	8	13
1897	18.0	— 5.9	60	—25	1.65	+0.43	3.22	0.61	15.9	6	11	7	13
1898	18.1	— 5.8	60	—25	0.48	—0.74	1.70	T.	3.9	3	15	8	8
1899	22.6	— 1.3	75	—19	1.61	+0.39	4.28	0.10	4.3	5	12	9	10
1900	26.9	+ 3.0	63	—10	0.45	—0.77	2.70	T.	2.4	4	13	6	12
1901	20.5	— 3.4	64	—31	0.93	—0.29	2.75	0.05	5.4	6	10	9	12
1902	20.1	— 3.8	59	—20	2.23	+1.01	5.51	0.67	12.9	8	9	6	16
1903	19.6	— 4.3	58	—27	0.41	—0.81	1.96	T.	3.7	4	11	9	11
1904	23.4	— 0.5	67	—19	1.44	+0.22	3.68	0.06	12.3	5	12	7	12
1905	27.0	+ 3.1	62	—11	0.52	—0.70	1.69	T.	4.2	3	19	6	6
1906	25.7	+ 1.8	65	— 9	1.43	+0.21	2.81	0.37	1.4	6	11	7	13
1907	28.8	+ 4.9	62	— 9	1.00	—0.22	2.28	0.05	4.7	5	10	7	14
1908	27.2	+ 3.3	67	—17	0.57	—0.65	2.07	0.05	3.8	3	15	8	8
1909	15.1	— 8.8	60	—26	2.18	+0.96	6.10	0.89	13.7	11	10	5	16
1910	23.4	— 0.5	57	—14	0.37	—0.85	1.39	0.01	3.0	3	15	7	9
1911	27.9	+ 4.0	60	—24	2.57	+1.35	4.43	0.62	12.6	7	13	6	12
1912	29.2	+ 5.3	64	—13	0.74	—0.48	1.75	0.19	1.1	3	18	7	6
1913	32.0	+ 8.1	65	—13	1.02	—0.20	4.73	0.00	1.3	4	15	5	11
1914	15.7	— 8.2	63	—31	1.30	+0.80	2.24	0.57	11.1	9	10	6	15
1915	25.0	+ 1.1	56	—10	0.69	—0.53	1.70	T.	4.6	5	11	8	12
1916	18.7	— 5.2	67	—25	1.04	—0.18	2.00	0.35	6.7	6	15	8	8
1917	14.5	— 9.4	62	—40	0.56	—0.66	1.70	0.14	6.7	6	10	9	12
1918	32.7	+ 8.8	68	— 7	1.30	+0.08	3.30	0.37	5.1	8	9	8	14

T. indicates an amount too small to measure, or less than .005 inch precipitation and less than .05 inch snowfall.

MONTHLY STATE DATA FOR 1918.

Month	Barometric Pressure, Inches (Sea level).					Temperature, Degrees, F.				Relative Humidity %		Precipitation, Inches.					Number of Days.				Sunshine.		Wind.	
	Mean.	Highest.	Date.	Lowest.	Date.	Mean.	Departure from normal.	Highest.	Lowest.	Mean. (7 a.m. + 7 p.m. / 2)	Departure from normal.	Average.	Departure from normal.	Greatest.	Least.	Snowfall.	.01 inch or more precipitation.	Clear.	Partly cloudy.	Cloudy.	Per cent of the possible amount.	Departure from normal.	Average hourly velocity.	Prevailing direction.
January	30.03	30.82	21	29.34	12	8.6	—9.3	53	—35	82	+1	1.02	—0.03	2.79	0.26	11.2	7	13	8	10	53	+3	9.6	NW.
February	30.06	31.07	21	29.02	14	23.0	+2.5	70	—36	78	—1	0.95	—0.20	2.10	0.09	6.0	5	14	7	7	62	+7	9.3	SW.
March	30.03	30.71	15	29.12	9	42.9	+9.6	85	8	63	—10	0.63	—1.14	2.12	T.	2.6	3	19	7	5	73	+10	9.1	SW.
April	30.01	30.78	9	29.23	29	44.8	—3.9	79	12	62	—5	2.32	—0.54	4.29	1.01	3.5	9	12	8	10	60	0	9.6	NE.
May	29.91	30.43	23	29.09	9	64.9	+4.4	98	25	66	+1	6.87	+2.30	11.98	2.72	T.	12	13	11	7	66	+4	10.0	SW.
June	29.93	30.33	7	29.56	1	70.8	+1.7	104	38	69	0	5.29	+0.91	10.19	1.55	0	11	16	10	4	69	+1	7.5	SE.
July	30.02	30.31	12	29.65	3	73.1	—1.0	105	40	66	—1	3.17	—0.79	8.05	0.26	0	8	19	8	4	72	—2	6.3	SE.
August	29.98	30.30	19	29.58	5	76.0	+4.2	113	38	67	—4	3.61	—0.07	8.38	0.34	0	8	16	10	5	68	—3	6.7	SW.
September	30.09	30.51	10	29.70	14	58.6	—4.8	93	29	68	—6	1.87	—1.49	4.62	0.48	0	6	16	8	6	63	0	6.3	NW.
October	30.03	30.44	3	29.17	27	55.1	+4.3	93	23	72	+1	3.64	+1.18	7.56	1.30	0.8	7	13	7	11	52	—9	7.6	S.
November	30.04	30.70	23	29.03	28	39.9	+4.9	76	0	78	+4	2.11	+0.60	5.10	0.70	4.4	7	13	5	12	52	—4	8.9	NW.
December	30.04	30.51	18	29.29	9	32.7	+8.8	68	—7	82	+2	1.30	+0.08	3.30	0.37	5.1	8	9	8	14	38	—10	7.9	NW.
Means and extremes	30.01	31.07		29.02		49.2	+1.8	113	—36	71	—2	32.78	+0.81	11.98	0.09	33.6	92	172	97	95	61	0	8.2	SW.

COMPARATIVE DATA FOR THE STATE—Annual.

Year.	Temperature: Mean annual.	Highest.	Date.	Lowest.	Date.	Precipitation in Inches: Annual.	Greatest annual.	Least annual.	Av. snowfall.
1890...	48.9	110	July 13.....	−27	January 22.....	31.30	45.74	16.00	.....
1891...	47.3	106	August 9.....	−31	February 4.....	32.90	49.05	23.48	.....
1892...	46.6	104	July 11.....	−38	January 10.....	36.58	48.77	24.78	34.2
1893...	45.7	102	July* 13.....	−36	January 14.....	27.59	33.27	19.19	32.2
1894...	49.7	109	July 26.....	−32	January 25.....	31.94	39.81	15.65	19.1
1895...	47.2	104	May 28.....	−33	February 1.....	36.77	55.25	18.57	26.0
1896...	48.6	104	July 3.....	−20	January 4.....	37.23	51.60	28.68	32.6
1897...	47.8	106	July* 25.....	−30	January 25.....	26.98	36.18	20.21	38.8
1898...	47.7	103	August 29.....	−35	December 31.....	31.34	55.47	19.51	46.3
1899...	47.3	104	September 6.....	−40	February 11.....	28.68	42.06	21.79	33.4
1900...	49.3	103	August 3.....	−27	February 15.....	35.05	47.33	25.05	35.9
1901...	49.0	113	July 22.....	−31	December 15.....	24.41	37.69	16.35	38.5
1902...	47.7	98	July 30.....	−31	January 27.....	43.82	58.80	29.14	38.0
1903...	47.2	101	August 24.....	−27	December 12.....	35.39	50.53	20.41	39.4
1904...	46.3	100	July 17.....	−32	January 27.....	28.51	38.93	19.34	29.2
1905...	47.3	104	August 11.....	−41	February* 2.....	36.56	52.26	24.66	38.3
1906...	48.4	102	July 23.....	−32	February 10.....	31.60	44.34	20.63	32.8
1907...	47.4	102	July 5.....	−31	February 5.....	31.61	43.90	19.93	24.0
1908...	49.5	101	August 3.....	−18	January 20.....	35.26	49.98	24.11	32.7
1909...	47.4	103	August* 15.....	−26	February* 15.....	40.01	58.48	27.20	49.0
1910...	48.6	108	July 16.....	−35	January 7.....	19.87	27.99	12.11	23.4
1911...	49.5	111	July* 3.....	−35	January 3.....	31.37	46.77	19.74	35.3
1912...	46.4	104	September 8.....	−47	January 12.....	28.89	33.13	15.25	39.5
1913...	49.7	108	July* 16.....	−35	January 8.....	29.95	45.18	20.31	25.4
1914...	49.1	109	July 12.....	−31	December 26.....	31.93	44.11	23.29	27.5
1915...	47.8	99	May 14.....	−32	January 28.....	39.53	51.15	27.29	31.3
1916...	47.2	106	August 4.....	−34	January 13.....	28.90	46.34	22.48	29.5
1917...	44.8	106	July 30.....	−40	December 29.....	27.81	36.00	20.78	32.4
1918...	49.2	113	August 4.....	−36	February 4.....	32.78	47.53	25.02	33.4

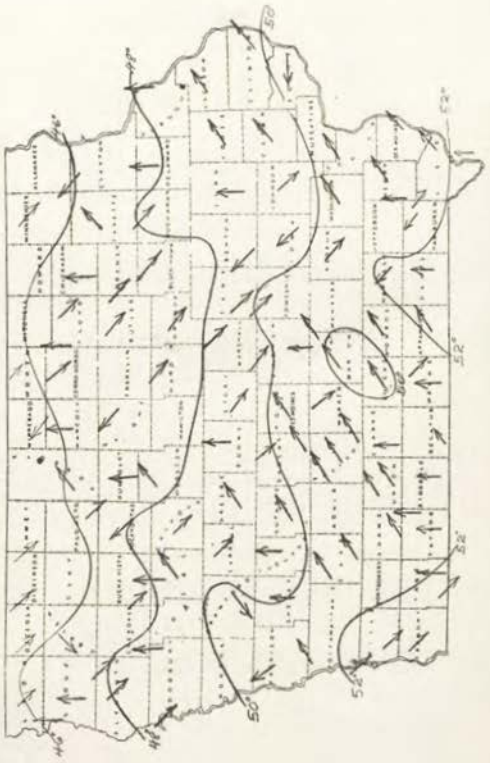
*And other dates.

DATES OF KILLING FROSTS, 1918.

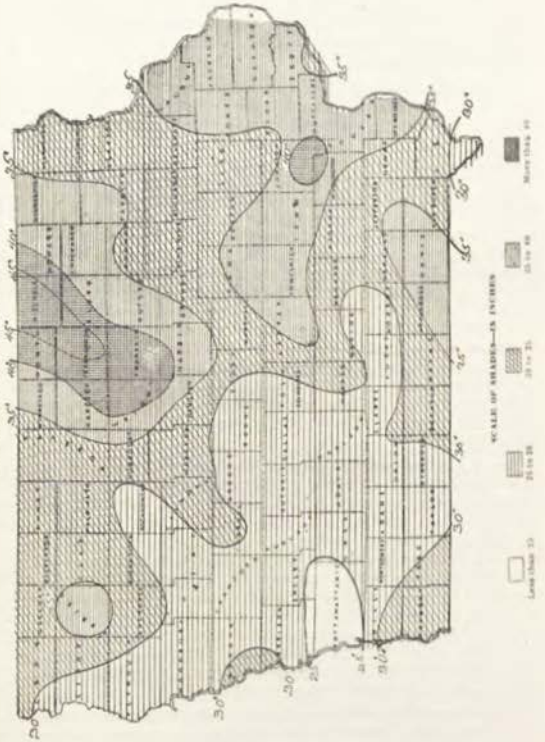
STATIONS.	Killing Frosts: Last in Spring.	First in Autumn.
Northern Division—		
Algona	May 11	Sept. 18
Allison	May 10	Sept. 23
Alta	May 11	Sept. 23
Alton	Apr. 30	Sept. 18
Belmond	May 14	Sept. 23
Britt	May 13	Sept. 21
Charles City	May 13	Sept. 21
Chester	May 13	Sept. 21
Decorah	May 13	Sept. 21
Fatherville	May 10	Sept. 18
Fayette City	May 12	Sept. 21
Forest	May 12	Sept. 21
Hutchinson	May 10	Sept. 18
Iowood	May 10	Sept. 18
Lake Park	May 10	Sept. 18
LeMars	May 13	Sept. 21
Mason City	Apr. 30	Sept. 21
New Hampton	May 13	Sept. 21
Nora Springs	May 13	Sept. 21
Northwood	May 13	Sept. 21
Osage Farms	May 13	Sept. 21
Postville	May 13	Sept. 21
Rock Rapids	Apr. 30	Sept. 18
Sanborn	May 10	Sept. 18
Shell Rock	May 13	Sept. 21
Story City	May 10	Sept. 18
Storm Lake	Apr. 30	Sept. 20
Washta	May 10	Sept. 20
Waverly	May 13	Sept. 21
West Bend	May 10	Sept. 18
Central Division—		
Ames	May 11	Sept. 20
Anderson	May 13	Sept. 21
Baxter	Apr. 30	Sept. 21
Belle Plaine	May 13	Sept. 21
Boone	Apr. 30	Sept. 21
Carroll	May 10	Sept. 20
Cedar Rapids	May 13	Sept. 21
Clinton	May 13	Oct. 1
Davenport	Apr. 30	Oct. 1
Delaware	May 13	Oct. 1
Denison	May 10	Sept. 20
Des Moines	Apr. 30	Sept. 21
Dubuque	Apr. 30	Oct. 1
Fort Dodge	Apr. 30	Sept. 21
Grinnell	May 1	Sept. 21
Grundy Center	May 13	Sept. 21
Guthrie Center	May 13	Sept. 21
Hyrum	May 13	Sept. 21
Independence	May 13	Sept. 21
Iowa City	May 13	Sept. 21
Iowa Falls	May 10	Sept. 20
Jefferson	Apr. 30	Sept. 21
Little Sioux	Apr. 30	Sept. 21
Logan	Apr. 30	Sept. 21
Manchester	May 13	Sept. 21
Marshalltown	May 13	Sept. 21
Monroe	May 13	Oct. 1
Olin	May 13	Sept. 21
Ottawa	May 13	Sept. 21
Perry	May 10	Sept. 20
Rockwell City	Apr. 30	Sept. 20
Sac City	Apr. 30	Sept. 21
Sioux City	Apr. 30	Sept. 21
Tipton	May 13	Sept. 21
Toledo	May 13	Sept. 20
Waterloo	May 13	Sept. 21
Waukee	May 13	Sept. 21
Webster City	May 13	Sept. 21
Williamsburg	May 13	Sept. 21
Southern Division—		
Afton	Apr. 22	Sept. 20
Albia	Apr. 22	Sept. 20
Albion	Apr. 22	Sept. 20
Alberton	May 11	Sept. 20
Atlantic	Apr. 22	Sept. 20
Bedford	Apr. 22	Sept. 21
Bloomfield	Apr. 22	Sept. 21
Bonaparte	Apr. 22	Nov. 1
Burlington	Apr. 22	Sept. 21
Centerville	Apr. 22	Sept. 21
Chariton	May 11	Sept. 20
Clarinda	May 11	Oct. 1
Columbia Junction	May 11	Sept. 20
Corning	May 11	Sept. 20
Corydon	May 11	Sept. 20
Creston	May 11	Sept. 20
Cumberland	May 11	Sept. 20
Earlham	May 13	Sept. 20
Fairfield	Apr. 22	Sept. 20
Farmington	May 13	Sept. 20
Greenfield	Apr. 22	Sept. 20
Indianola	Apr. 22	Sept. 20
Keokuk	May 11	Sept. 20
Knoxville	May 11	Sept. 20
Lamoni	Apr. 22	Sept. 20
Leon	Apr. 22	Sept. 20
Lenox	May 11	Sept. 20
Mt. Pleasant	Apr. 22	Oct. 1
Murray	Apr. 22	Sept. 20
Northboro	Apr. 22	Sept. 20
Onawa	Apr. 22	Sept. 21
Osceola	May 11	Sept. 20
Ottumwa	May 11	Sept. 20
Pella	May 1	Sept. 21
St. Charles	Apr. 22	Sept. 21
Shenandoah	May 11	Sept. 20
Sigourney	May 11	Sept. 20
Thurman	May 11	Sept. 20
Washington	May 11	Sept. 20
Winterset	Apr. 22	Sept. 20
Omaha, Nebr.	Apr. 30	Oct. 1

†Date of last temperature of 32 or lower in the spring, or first temperature of 32 or lower in the autumn (as the case may be), when frost was not reported.

MEAN ISOTHERMS AND PREVAILING WINDS, YEAR 1918.



TOTAL PRECIPITATION, YEAR 1918.



CLIMATE AND CROP REVIEW.

The winter of 1917-18 was one of the coldest, averaging 5.4° below normal and only 0.5° warmer than 1892-93, the coldest of record. Snowfall averaged 3.4 inches more than the normal and because of the continuous cold weather and the absence of sleet and rain the snow covering was generally porous and continuous, except in some west and southwest counties. Winter wheat, except where seeded in corn fields, was generally blown bare of snow.

March was abnormally warm with deficient precipitation, except in the northern tier of counties. Frost left the ground early in the month; the soil worked up in fine condition; seeding of spring wheat and oats was completed in the south and made rapid progress in the north portions; and husking of the 1917 corn crop which had been delayed by the soft condition of the corn and by the severity of the winter, was about finished. Winter wheat came through the winter in good condition, especially in the southeast counties. Some that had apparently not germinated in the fall of 1917, germinated in March, and though there was considerable difference of opinion among the farmers and others as to whether this would make a crop, it is known that in many instances it did make a crop of 15 to 25 bushels per acre. The drouth of March continued till the middle of April, except scattered showers or snows during the first week. The drouth, high winds and low humidity killed some of the winter wheat and much of the young clover, timothy and alfalfa. On March 18, a number of stations reported the lowest relative humidity ever recorded. At Des Moines it was 5 per cent at 2 and 3 p. m. A large acreage of winter wheat, hay and pasture land was plowed up. Considerable early spring wheat was drilled in with the winter wheat where the stand was thin and patchy.

Iowa's hay and pasture land was decreased by about three quarters of a million acres, the acreage of other crops, mainly corn, spring wheat and barley, being correspondingly increased. The acreage of spring wheat would have been much larger if sufficient cars had been available to transport the seed. The dry weather of the early spring and the cold weather of April made germination of spring grains very irregular. They depended largely upon subsoil moisture till the middle of April. Warmer weather with copious showers toward the close of April improved grains; some that had been seeded six weeks previously had just begun to show green at the end of the month. A heavy snowstorm extended across the State from southwest to northeast on April 19th-21st. In Taylor County this snow accumulated to the unusual depth of 2 feet or more, exceeding the total fall of the winter months preceding.

Favorable weather offset the unfavorable labor conditions. Spring work progressed rapidly. Eighty-five per cent of the corn ground was ready for the planter and a little planting had been done by the close of April. Seed corn was scarce and of very low vitality due to the lateness of the crop and the damaging frosts in 1917. Unprecedented efforts of county agents and farmers in seed testing, and cautious delay in planting most of the acreage after the ground was warm and the weather fit, resulted in a good stand of corn.

Violent temperature fluctuations, from freezing to 95°, May 1st to 4th, with high southwest winds and low humidities, did further damage to winter wheat and grasses. Tornadoes May 9th and 21st covered considerable areas but did little damage to crops. Soil and weather conditions in May were very favorable for germination and growth of corn.

Heavy rains the first week in June caused considerable damage to corn by erosion and overflow, from Webster and Hamilton Counties southeast to Poweshiek and Johnson Counties. Replanting from this cause was probably not greater than usual for the State as a whole, but because of the large acreage of spring plowed sod, the cut worm damage and consequent replanting from this cause was unusual. This replanted corn was about all that was caught by the early frosts, September 18-21. The soft corn which is 4 per cent of the crop, is a fairly good indication of the extent of this replanting. Seventeen counties, mostly in the southwest, reported no appreciable amount of soft corn, while the northeast counties reported considerable.

Reports from many hundred crop correspondents on July 1, showed the average condition of corn to be 105 per cent, which has been exceeded but once in 29 years. A hot period about the middle of June with record high temperatures on the 16th was believed to have prematurely ripened oats in the southwestern one-fourth of the State. Such a period is not considered good for any small grain, yet all small grains finally shows yields above normal. Smut affected spring wheat seriously.

Harvest came on about a week earlier than normal and continued through July under conditions unusually favorable for labor and curing shocked grain, except in the northeast and north-central counties where heavy rains caused delay and damaged the shocked grain.

During July a marked deficiency in rainfall began to be felt over the south-central and southwest counties, causing the pastures to fall and upland corn to begin firing. The average condition of corn on August 1 was 101 per cent. In the next eight days, record breaking high temperatures with drouth, damaged corn throughout the southwest one-third of the State, amounting to a disaster in some of the southwest counties. In Adams County where the heat and drouth were greatest, the average yield of corn is only 7 bushels per acre, approaching the record low yield of 5 bushels per acre in Page county in the historic drouth of 1894. Roughly it may be said that Iowa's corn crop was damaged $5,000,000 per day during this eight-day period. Though it is difficult to assign a damage value to particular days, it seems probable that the damage on three days August 4-6, at the climax, was approximately $10,000,000 per day. To save the crop, much of it was cut for fodder and silage. Live stock was put on winter feed in the damaged area as early as the latter days of July and many hogs and cattle were shipped to regions where feed was more plentiful. In the northern and eastern portions, the corn crop was bountiful, the largest average yield being 51 bushels per acre in Cedar County.

Profiting from the anxiety and tremendous effort in obtaining good seed corn last spring, farmers have this fall saved a large supply, in most instances enough for two years, and it is believed that the quality is

excellent, though no extensive tests have yet been made and much will depend on the care used in storing this seed.

Sweet corn yielded well, outside of the drouthy section, but suffered unusual damage from the corn ear worm, *Heliothus obsoleta*, for which, as yet, entomologists have discovered no remedy within the bounds of economy.

A determined campaign to increase the acreage seeded to winter wheat this fall has brought about large results in the sections of the State where the crop is usually grown, but not much extension to new territory. It is impossible at this time to state what the acreage is, but it is probably somewhat less than the million-acre goal set. The crop is entering the winter in unusually good condition, 95 per cent of the acreage having made good to rank growth and become well established. Four per cent has germinated but made little showing above ground, and only one per cent has apparently not germinated.

With all of its vicissitudes the crop season of 1918 finally resulted in the usual large cash balance for the State.

Bulletin No. 1, April 9, 1918—

The first half of the past winter was severely and continuously cold, with a good snow covering. March and the latter part of February were mild. Frost was out of the ground early in March, not having penetrated as deeply as usual during the winter. At the close of March the season was about two weeks earlier than normal; farm work was well advanced; soil in fine condition; seeding of spring wheat and oats completed in the south and progressing rapidly in the north. Most of the 1917 corn crop remaining unhusked in the fields was husked during March though a little was left to be done in the early days of April. Wheat wintered well, especially in the southeast, where moisture was abundant. Some wheat that failed to germinate last fall, germinated in March. During the past two weeks winter wheat has suffered from drouth in all but the southeast section where the rainfall has generally exceeded one inch. In considerable areas over the southwestern and west-central portions, the rainfall has been very deficient and winter wheat has been plowed up or cross drilled with early spring wheat. In Adams and Jasper counties the water supply is failing.

A remarkably large acreage of spring wheat has been seeded. In many counties nearly every farm has a small piece of wheat seeded through patriotic motives and regarded as experimental in those sections where it has not been hitherto raised. A much larger acreage would have been devoted to wheat if cars had been available to ship in the seed. Oats seeding is nearing completion in the north, about the usual area having been seeded. Barley seeding is well under way.

Meadows and pastures generally wintered well, but are badly needing rain.

Dry soil has retarded or prevented germination of small grain in all but the southeast portion. Good rains occurred in nearly all sections Friday night and Saturday. More than the usual amount of gardening and potato planting has been done.

Plowing for corn is well advanced. Seed corn testing and seed distribution have been proceeding rapidly during the last few weeks.

Live stock is in good condition, except in some sections where roughage has been short. The mild, dry weather has been especially favorable for the pig and lamb crop.

Bulletin No. 2, April 16, 1918—

Cold, dry, sunshiny weather prevailed the fore part of the week with freezing temperatures or frosts in all portions of the state each night till the night of the 12th-14th. Several stations reported temperatures below 20, the lowest being 14 at Audubon. The average daily deficiency in temperature for the State was about 2 degrees. Ice one-half inch thick was reported on the 8th, 9th and 10th.

The cold weather was due to an area of high barometric pressure that persisted over the Great Lakes. The outflowing winds from this were as usual east to northeast over Iowa. Generally such winds are accompanied by considerable cloudiness, but in this instance sunshine prevailed.

The temperature began to moderate Sunday, the 14th, due to the approach of a large general storm that formed in Nevada Saturday. Showers were quite general over the state Monday and Monday night.

Spring seeded grains have not in general germinated except where sufficient moisture came up from the subsoil; germination is, therefore, uneven. Where sufficient moisture is present spring wheat and pastures are beginning to look green. In some of the northern tier of counties, the moisture in the soil derived from the heavy snows of March has brought pastures along sufficiently for grazing. Winter wheat with all other vegetation has ben nearly at a standstill, the rain of the 6th serving only to keep it alive. Barley seeding is well davanced in the central portion and progressing rapidly in the north. A largely increased acreage of onions is being seeded, particularly in the northeastern and Mississippi river counties. Corn acreage will be reduced in some counties through scarcity of reliable seed, small grains, mostly wheat, having taken its place.

The dry weather has been specially favorable for manure hauling, plowing, disking and harrowing for corn; also for soft corn in cribs. Farm labor and horse power have been utilized to good advantage during the favorable weather and are ample so far in most sections.

Bulletin No. 3, April 23, 1918—

The week opened warm but soon became abnormally cold, the average daily deficiency in temperature being about 6 degrees. Copious precipitation occurred in the southern tier of counties except Lee, and northward over the Central District. Rains of agricultural importance occurred in nearly all other sections of the state except some of the northwestern and west-central counties where more moisture is badly needed, particularly in Buena Vista and Woodbury counties. A striking feature was the snowstorm of the 19th-21st, which covered the southern and eastern portions of the state, amounting to 20 inches in Decatur and Ringgold counties, and 6 inches in the central portion of the state. Such a storm is unprecedented so late in the season, though a snowstorm of only slightly less intensity occurred in south central Iowa on April 7, 1917. In Adams, Union, Wayne and Jasper counties a drouth of several months was effectually broken.

The warmth and moisture of the early part of the week germinated most of the oats, the remaining ungerminated wheat in the north, and some of the barley. The freezing and snow are not believed to have caused any damage other than a delay of several days.

Pears and plums are in full bloom in the southern counties. Plowing for corn is well advanced and a few warm days would start the planters in the southern counties. Unless unusually favorable conditions of warmth, sunshine and moisture follow soon the hay crop will be short. The seriousness of the seed corn situation has become more apparent in some of the counties where testing has been thorough.

Bulletin No. 4, April 30, 1918—

Cold and generally cloudy weather prevailed during the past week, the average daily deficiency in temperature being about 8 degrees. Freezing temperature occurred in all but the southern counties and the highest temperatures were generally about 65 degrees. The rainfall was well distributed and generally sufficient, though about two-thirds of the normal. The heaviest rains were in the northern and northwestern portions of the State where the need was greatest.

All vegetation has been nearly at a standstill. Oats and wheat seeded more than a month ago are scarcely beginning to show green over much of the State and some of the later seeding is just sprouting. Though the season was considered two weeks early at the beginning of April, it is scarcely up to normal at the close. However, small grain that has germinated has rooted well, winter wheat has begun to stool in the southeastern counties, and normally warm and moist weather would bring these crops along vigorously.

Few rainy days and cool weather have favored field work which has progressed more rapidly than in any spring in recent years. The labor supply, which is known to be much shorter than usual, has been used to remarkably good advantage. About 85 per cent of the corn ground is ready for planting and only warm, sunny days are needed to start the planters briskly. In fact, a little planting has been done in the southern counties and a few scattered reports of planting have been received from as far north as Greene and Pocahontas counties. However, the scarcity and low vitality of seed corn will keep cautious farmers from taking the risk of planting till the ground is warm.

Pastures and hay lands have suffered seriously from the cold, dry spring.

Fruit trees are in full bloom in the south and beginning to bloom in the central portions of the state.

Bulletin No. 5, May 7, 1918—

Freezing temperatures prevailed on May 1st, ice one-eighth inch thick being reported in the southeastern counties. This was followed by a decided change to warmer with maximum temperatures above 90 degrees in the northern half of the state on the 3d and generally on the 4th, the highest reported being 95 at Forest City on the 3d. The change was like going from the 20th of April to the middle of July in four days.

The warmth caused a marked improvement in all vegetation except where too dry. Strong southwest winds and low humidity caused considerable injury to pastures and meadows in many sections. In Jackson and Madison counties winter wheat has been killed by the drouth and will be plowed up and planted to corn. Good rains fell Monday, the 6th, in south and east portions of the state.

Oats, spring wheat, rye and barley show general improvement, the fields being green and plants about three inches high.

Corn planting is progressing rapidly in the south and beginning in the north with soil in excellent condition generally.

Gardens are badly needing rain; potatoes planted six weeks ago are just beginning to come up in the central portion of the state.

Apples, plums and cherries are in full bloom in the central and southern portions of the state and beginning to bloom in the north. The fruit prospect is considered good. No material damage seems to have resulted from the freezing on May 1st.

Bulletin No. 6, May 14, 1918—

Heavy rains occurred in the northeastern part of the state, but as the soil was dry and receptive, it absorbed most of the rain. Over much of the central and southwestern districts the deficiency in rainfall has become serious. Temperatures in the nineties prevailed in the north and west portions on the 8th and 9th followed by cooler with frost and ice in many sections on the morning of the 13th and snow and sleet in the central district. The temperature averaged about normal. Shifting gales on the 9th caused minor damage to buildings and trees and serious drying effects in the southwest portion. Tornadoes in the late afternoon of the 9th caused serious damage, several deaths and many injuries in Bremer, Chickasaw, Winneshiek, Hamilton and Scott counties. The property loss will total nearly $1,000,000. The damage to crops was small. Hail was reported in many northern and eastern counties but the damage is not believed to have been great.

Corn planting is 75 per cent completed in the southern counties where the early planting is up, showing a good stand and cultivation has begun in a few localities. In some of the northeastern and north-central counties planting is just beginning, while in the northwest it is well advanced. Small grain, pastures and meadows are doing well in all but the central and southwest districts where rain is badly needed. Much winter wheat is being plowed up in Taylor county. The first crop of alfalfa and probably all hay will be short in these districts.

Bulletin No. 7, May 21, 1918—

Rain was abundant in the north and east portions of the state but very deficient in the southwest. Temperatures were high, averaging about 7 degrees above normal. Frosts on the mornings of the 13th and 14th damaged fruit in some northern counties and nipped the early potatoes. Sunshine averaged nearly 20 per cent above normal. Hail in many sections on the 19th did but little damage. High, drying, southerly winds on the 15th and 16th damaged pastures and meadows in the western half of the state, which was generally dry upon that date. Oats were also damaged on the sandy, north-central uplands where sand or dust storms occurred. In some localities in the southwest, cattle have been taken from the brown, bare pastures and are being fed expensive hay. The hay crop will be short in all but the eastern counties and almost an entire failure in the southwest.

Small grains have made excellent progress in the east and north and are in fair condition in the southwest, except winter wheat.

Corn planting is nearly finished in the south and two-thirds done in the north. Considerable replanting has been necessary, due to poor seed and the ravages of cut and wire worms, particularly on sod. In general, ideal soil and weather conditions, combined with the skill of the Iowa farmer, have made the best of the weak seed corn and a good crop is now in prospect.

Telegraphic reports Tuesday morning show good rains in the southwest portion of the state, but these will be too late to save the hay crop.

Bulletin No. 8, May 28, 1918—

Copious to excessive rains occurred in all but the extreme northeast counties. No section is lacking moisture. Most of this has been soaked up and retained by the soil as shown by the tile drains which are not running full. In some of the central and southeast counties the excesses eroded the hillsides and flooded the lowlands. In Jasper and Poweshiek counties between five and six inches of rain fell and considerable live stock, mostly sheep, were drowned. The area damaged is comparatively small.

On Tuesday afternoon, May 21st, a series of tornadoes occurred in Crawford, Carroll, Greene, Boone, Webster and Hardin counties, causing much damage to property, many injuries and several deaths. Hail damaged crops slightly in many sections and seriously in some southwestern counties.

Temperatures were about normal in the north and west and about 1 degrees above normal in the southeast. Sunshine was slightly deficient.

The drouth is broken in the west and southwest counties, but too late for the hay crop; pastures are improving rapidly. Small grains are all making good progress and becoming too rank in some of the southeastern counties. Winter wheat is heading in the southeast and shooting in the central counties. Cutworm damage to corn, particularly on sod, is unusually prevalent in all sections and will necessitate much replanting; otherwise the stand is remarkably good as a result of diligent seed testing, and unusually favorable soil and weather conditions. Cultivation and late planting have been delayed by rain; weeds are getting a good start in some sections.

Strawberries promise a good crop and are beginning to ripen in the southeast.

Bulletin No. 9, June 4, 1918—

Ideal growing weather prevailed. The rainfall averaged about an inch from Linn county northward and eastward, while in the upper Des Moines watershed and in some counties in the west central and south central districts it averaged more than 4 inches. In some sections rain fell practically every day. Temperatures averaged about 4 degrees above normal. Sunshine was deficient in the northern districts, but averaged about normal. The season is about 10 days earlier than at this time last year.

Crops in general are in unusually good condition, though cultivation of corn has been delayed by wet weather. Field work was possible on but one or two days and in some sections not at all; so the weeds are getting a good start. Replanting fields taken by cutworms and washed out or drowned out by heavy rains has also been delayed. A small percentage of first planting remains to be done. A few days of dry, warm weather will permit cultivation and put this crop in excellent condition. It is reported to be a foot high in Scott county.

Spring wheat, oats and rye are beginning to head at normal height in the southern districts. Hay and pastures show marked improvement, but the rains came too late to make a full hay crop in the central and southwestern districts. Clover is in full bloom in the southwest, but short. The first cutting of alfalfa has begun and home-grown strawberries are on the market in the southern districts.

Bulletin No. 10, June 11, 1918—

Excessive rains towards the close of last week and continuing in some sections till the 6th, caused much damage by overflow and erosion, particularly in central tiers of counties, extending from the Missouri nearly to the Mississippi; also in some of the south central counties. In the Skunk, Iowa and Cedar valleys, many bridges were washed out, the damage running into the hundreds of thousands of dollars. The Des Moines and Raccoon also overflowed to some extent. The crop damage in about fifteen central counties is estimated at about 5 per cent. Toward the close of the week, the weather became more favorable, cultivation of corn was pushed rapidly on the uplands, and preparations were made on the lowlands for replanting to corn or seeding to millet and buckwheat. Hail is reported from many localities, but the total area damaged is relatively small.

The abundant moisture, followed by warmth and sunshine, caused all vegetation to make excellent growth. A few more days of warm, dry weather will permit the weeds to be cleared from the corn. Corn prospects are generally very good and far ahead of this time last year; oats in some cases are too rank; winter wheat, rye and oats are heading in all sections of the state, and spring wheat north to the central districts; winter wheat shows improvement in the southwest. The first crop of alfalfa is being cut in the southern and west central districts and clover in the south. Strawberries are all gone in the southwest and being picked rapidly in the central districts, the crop being generally good.

Bulletin No. 11, June 18, 1918—

Hot, dry, sunshiny weather prevailed. A wide belt extending from the northwestern to the southeastern portions of the state had scarcely a trace of rain. The southwest one-fourth of the state had the most rain and there it was generally less than one-half inch. Temperatures averaged about 7 degrees above normal and sunshine about 25 per cent above normal.

Most all crops, particularly corn, made wonderful progress. Early corn is knee high in the north and will be ready to lay by at the close of the week in some south central counties. The hot, dry weather has been excellent for weed killing, which has progressed rapidly, and fields are now mostly clean, having been cultivated generally twice and in the south three times. The crop is about a week ahead of the average and two or three weeks ahead of last year. Small grains are heading well in most sections, though short. The hot weather has checked the tendency to rankness in some sections. Wheat rust is reported in the southwestern counties. Harvest will be about a week earlier than normal. Winter wheat harvest will begin in a day or two in the extreme southeast counties, in the central counties by the 24th, and in the northeast by July 1st. Spring wheat harvest will begin in the southern counties about July 3d and in the north about July 20th. Oats, south, July 1st; north, July 15th. Rye, south, June 23d; north, July 5th. Barley, south, July 1st; north, July 15th.

First crop alfalfa has been harvested in unusually fine condition; yield fair to good. Clover cutting in progress; yield good in southeast; poor in west.

Potatoes have made a good growth, but the heat has caused tip burn in some sections and rain would be highly beneficial. The crop has been laid by in some southern counties.

Strawberries passed rapidly with poor to good yield; raspberries are very promising; cherries will be a fair crop.

Bulletin No. 12, June 25, 1918—

Cooler weather with less than normal sunshine checked the premature ripening of small grain and permitted the heads to fill nicely in nearly all sections. Winter wheat harvest has begun in the southern tier of counties, and will extend over all but the northern one-third of the state during the coming week. Rust has damaged this crop somewhat in the west-central and southwest counties. Spring wheat harvest will begin in the extreme southwest July 1st and reach the central counties about July 9th. Estimated harvest dates of other crops remain about the same as last week.

Infrequent showers were favorable for cultivation of corn which proceeded rapidly in all but a few counties in the north-central district, the fields now being generally clean. The prospects for this crop are now excellent except relatively small replanted areas which are just coming up in some localities.

In the north-central sugar beet district, the fields of this crop are generally weedy.

Gardens, potatoes and pastures have suffered from drouth and heat in some localities in the western half of the state, but good rains Monday will relieve these conditions somewhat. Home-raised new potatoes are being used considerably in the southern half of the state.

The cherry crop is generally disappointing. Raspberries are beginning to ripen and the prospects are generally good.

Bulletin No. 13, July 2, 1918—

In general crop prospects are unusually good. Cool weather prevailed with temperatures averaging about 2 degrees below normal. Rains were ample and well distributed, except the southwest district where there is a marked deficiency. Corn cultivation and haying were delayed by frequent rains in the eastern half of the state. Corn is being laid by in nearly all sections with the crop in excellent condition. Considerable clover hay was spoiled in curing. The crop is heavy in the eastern and light in the western counties.

The cool, cloudy, moist weather has been favorable for small grains which are filling well and promise large yields, except early oats which in some places are heading short and were prematurely ripened by the hot weather about three weeks ago. Harvest has been beneficially delayed to later dates than at first estimated. Winter wheat harvest has advanced slowly northward during the week to the third tier of counties, will become general in the middle of the state by the 9th, and will reach the north line about the 15th. Oats harvest now extends from Fremont to Henry counties and will reach the northern part of the state about the 12th-15th. Spring wheat harvest is beginning in the extreme south this week and will reach the middle of the state agout the 16th. Rye harvest is completed in the south, is beginning in the middle and will reach the north about the 10th. Barley harvest is beginning in the south, will extend from Taylor to Jackson counties by the 9th and reach the north by the 16th.

A severe hailstorm June 27th, damaged crops about 60 per cent in about eight townships in southeastern Polk, northern Marion and southern Jasper counties. Damaging hail occurred in several other counties on this date.

Grasshoppers are damaging all crops, particularly pastures in the southwestern counties. Some pastures are brown and bare and stock is being fed.

Bulletin No. 14, July 9, 1918—

The week opened hot with temperatures above 90, but turned cool and cloudy. The deficiency in temperature averaged about 2 degrees. Frequent and heavy rains in the northern and eastern portions of the State delayed harvesting and haying and caused oats to lodge badly in some sections. Scab and rust attacked spring wheat in some counties. Drouth and grasshoppers continue to damage all crops in the southwest and west central counties. Corn is far advanced, being mostly laid by and beginning to tassel in all sections. Harvest is in full progress in the central portion of the state and beginning in the north. Threshing has begun in Fremont county. Indications are that the yield of spring wheat, winter wheat and barley will be good; that of oats, fair, but considerably below last year.

Bulletin No. 15, July 16, 1918—

Cool, dry weather prevailed till near the close of the week, when good rains occurred in the northern and light showers in the southern portions of the state. Temperatures averaged about 6 degrees below normal in the eastern and about 1 degree below in the westren portions. Sunshine was much above normal, except the extreme western and northern counties. The drouth in the southwestern part of the state is becoming serious.

Conditions were ideal for using labor and horse power to the best possible advantage in haying and harvesting. Though put to a supreme test, farmers have been able to cope with the difficult labor situation. In some cases business men have gone out from the towns to help in the late afternoon and evening. Winter wheat and early oats harvest is completed in the southern districts and beginning along the north line. Uneven germination due to lack of moisture last fall has caused winter wheat to ripen unevenly. Spring wheat harvest is in full progress in the central and western districts and will begin in the north central and northeast districts about the 23d-25th. Rye harvest is completed except in the north central district. Barley harvest is completed in the southern and central districts and is in full progress in the northern districts. Oats threshing began in Van Buren county on the 12th, yielding 48 bushels per acre; and in Pottawattamie county on the 13th, yielding 41 bushels. In Davis county winter wheat yielded 31 bushels. Second crop alfalfa is ready to cut. Much other hay of excellent quality has been harvested.

Corn made good progress except in the southwest district, is tasseling rapidly in most sections, and silking in some. Unless a good soaking rain comes soon the crop will be seriously damaged in the southwest district where the leaves rolled badly during the past week with comparatively moderate temperatures.

Pastures are generally short in the southwestern third of the state and are brown and bare in the extreme southwest counties, where on many farms stock has been fed for the past three weeks and much live stock is being sold to avoid using expensive feed.

Bulletin No. 16, July 23, 1918—

Ideal weather for harvesting, haying, threshing and most crops, prevailed in nearly all parts of the state. The week opened cool and cloudy, but became sunny and hot with maximum temperatures above 90 Friday to Monday afternoons. The highest reported was 100 at Boone and Clarinda. Temperatures averaged slightly above normal. Infrequent rains have favored harvesting and haying, yet the moisture has been generally sufficient. The drouth in the extreme southwest counties was broken by good rains on the 17th. More rain is badly needed in Cass and Adams counties and eastward over Warren and Lucas counties, where corn rolled considerably toward the close of the week. Corn is generally in good condition, tasseling and silking in the central and north and earing well in the south. Grasshoppers have injured corn and late oats in Sac county and southward to Adams county; and farmers are combating them with dozers and poison.

Harvest is finished in the south except some late fields, and threshing is in full progress. Yields are generally good and quality excellent. In Scott county one field of wheat yielded 55 bushels per acre. While oats yields are good, no phenomenally heavy yields like last year have been reported. Scab has seriously affected spring wheat in many sections and "barley stripe" is common. Very little black stem rust is reported.

The hot weather at intervals through the season has reduced the early potato crop to considerably below normal; blight is prevalent. Gardens are needing rain. Homegrown tomatoes are on the market in the central portion of the state.

Bulletin No. 17, July 30, 1918—

Hot weather prevailed with maximum temperatures above 90 degrees nearly every day. The highest reported was 105 dgrees at Clarinda on the 28th. Temperatures averaged about 5 degrees above normal. Rainfall was heavy to excessive in the northern districts and very deficient in the central, south central and southwest districts. High winds and hail occurred in some northern counties.

The rains delayed harvesting in the north and together with the high wind caused oats to lodge so that many fields can be cut only one way. Considerable of the late oats and spring wheat remains to be cut in the northeastern district, where in places the fields are too wet for the binders. The yield of spring wheat in Blackhawk county has been reduced 50 per cent by rust. Threshing is progressing in all but the northeast district. Yields are generally good.

Corn has made good progress except in the southwest one-fourth of the state, where extreme heat and serious drouth have caused it to fire on thin uplands. In other sections corn is earing well and promises an unusually large crop. Strong winds blew the corn down badly in the northern districts, but it is generally straightening up. In general the crop is two or three weeks ahead of last year. Early sweet corn is being used in the north.

Pastures have failed in the southwest and live stock has been put on winter feed. Potatoes and garden truck in this section have been damaged by drouth. Home grown tomatoes are on the market in nearly all sections.

Bulletin No. 18, August 6, 1918—

Abnormally cool weather weather with a minimum temperature of 46 in Delaware county on July 31st was followed by intense heat in the south half of the state. At Pella the temperature range was 65 degrees, from 47 on July 31st to 112 on August 4th. The highest temperature was reported as 113 at Clarinda on the 4th, equaling the highest ever recorded in the state. In the southwest one-fourth of the state, high temperature records of 40 to 46 years were broken. Rainfall of agricultural importance was confined to about 15 counties in the northeastern part of the state. The southwest part, which has been deficient in rainfall for several weeks, suffered seriously from three days of intense heat and the strong southerly winds of Monday, August 5th. Corn has been injured 50 per cent or more in many southwest counties, and, unless rain comes soon, it will be nearly a total loss. In the northern and eastern portions, prospects for corn were never better. The crop has advanced rapidly, roasting ears are reported in all sections and the earliest has begun to dent.

Threshing is 50 to 75 per cent completed in the southern half of the state and in full progress in the north. Yields are generally good to excellent and quality good. Wheat is being hauled to market direct from the machines. Blight and aphis are seriously affecting late potatoes which will not yield as well as has been indicated. Garden truck is suffering for rain except in the northeast district and is practically a failure in the southwest.

Pasture and new seedings of clover and other grasses have failed generally in the south and west. Plowing, in preparation for a large acreage of winter wheat, has begun in many sections.

Bulletin No. 19, August 13, 1918—

Hot weather continued in nearly all parts of the state except on the 8th and 9th when cooler weather prevailed. The mean temperature averaged about 8 degrees above normal. Most stations had temperatures of 100 or higher on one or more

days. Good rains occurred in the northwest portion early in the week, but drouth continued in the south half of the state till somewhat relieved by rains Saturday evening and Sunday; more rain is badly needed. Hot winds again prevailed on Monday, the 12th. The zone of damage to corn spread northward and has a rather sharply defined northern boundary extending through the northern portions of the counties from Harrison on the west to Scott on the east. The damage south of this line approximates 25,000,000 bushels valued at $40,000,000 and will increase daily as long as the hot winds and drouth continue. Many fields look as though they had suffered from a killing frost. Efforts are being made to save the remnant of the crop by cutting and shocking, filling silos or turning in livestock. In the north half of the state prospects are excellent.

Pastures, gardens, potatoes and new seedings of timothy and clover are a failure in the drouth-stricken area and stock water has failed in many places.

Shock threshing and stacking progressed rapidly except in the north-central and northwest districts where delayed by heavy rains early in the week, which caused molding in the shock where the grain was weedy. Fall plowing is progressing where there is sufficient moisture.

Bulletin No. 20, August 20, 1918—

Rain occurred in all portions of the state, but amounted to less than an inch in the extreme western and south central counties, and in Sac, Calhoun, Humboldt, Webster, Boone and Blackhawk counties. Heavy local rains occurred Friday and Saturday, and in the northeastern one-fourth of the state the rains were excessive and damaging in many places. The largest weekly amount was 6.31 inches at Nora Springs. Temperatures were near 100 degrees in all sections Tuesday afternoon and in the south half on Friday, though on the latter day the maximum varied from 71 at Decorah in the northeast to 102 at Clarinda in the southwest.

Wet weather delayed threshing. Shocked grain was damaged in the northeast. Only a small percentage of threshing remains to be done in the south half of the state. Reports of yields continue good, particularly in the north.

Corn made good progress where not injured beyond recovery by the heat and drouth of the preceding two weeks. The rains are helping it to fill; the earliest is denting; and the crop is practically assured. In Johnson county the 90-day varieties are being snapped for hogs. In many south central and southwest counties, upland corn is a failure; bottom land corn will yield only about 25 bushels; and silos are being filled early to make the most of a bad situation. A large number of silos have been built this year.

The rains have softened the ground in most sections so that plowing is progressing and a large acreage of fall wheat and rye is indicated. Tomatoes, cucumbers, sweet corn, potatoes and pastures were greatly benefited by the rains, though potatoes will be a light crop in the southern half of the state. Apples are dropping badly.

Bulletin No. 21, August 27, 1918—

Though temperatures averaged about 6 degrees above normal with maxima above 90 on two or three days, no such extreme, scorching temperatures occurred as during the preceding three weeks. Nearly all portions of the state had showers and some portions heavy local rains. In the north central counties the amounts were between one and two inches, while portions of Mahaska, Marion, Monroe and Wapello counties had from two or over three inches, accompanied by severe electrical storms and considerable damage by lightning.

Thrashing, which has been delayed by heavy rains in the northern part of the state for more than two weeks, was resumed towards the close of this week. Sprouting and molding of shocked grain is reported from many counties. Fall plowing and preparation for seeding an increased acreage of winter wheat has made good progress where moisture was sufficient.

Pastures, potatoes, gardens and the supply of stock water have improved materially in the south central counties. The rains have been inadequate in most southwest counties.

Corn has made excellent progress over the northern and eastern counties where some of it is already safe from injury from frost. Some of the replanted lowland corn in the central and north central counties will make only fodder and silage. While the corn in the south central and southwest counties shows improvement in appearance, nothing can restore the damage done to the commercial crop. Cutting for fodder and silage is under way about a month earlier than usual in the damaged area.

Bulletin No. 22, September 3, 1918—

Heavy rains occurred in the southeast and portions of the east central and south central districts also in Hardin county. Over most of the western and northern districts the rain was very light or nil. Temperatures about 85 in the north and slightly above 90 in the south occurred on the afternoon of August 27th, after which the weather was generally cool, especially at night. The lowest temperature reported was 39 at Washta on the morning of the 31st. Traces of frost were reported in the south central counties on the mornings of the 30th and 31st.

Corn is advancing rapidly to maturity. More than half of the crop is already safe from frost in the northwest counties. By September 20th, 83 per cent of the crop will be safe in the northwest and 62 per cent in the east central districts, averaging 75 per cent for the state. By September 30th, 95 per cent will be safe in the northwest and 80 per cent in the east central, with 88 per cent for the state. By October 10th, which is about the average date of the first killing frost, 95 per cent will be safe. Though the east central counties are the latest, they are not far from normal. Silo filling is progressing in the south and has been finished in a few localities.

Shock thrashing is practically finished, except in the northern districts, where delayed by the wet weather early in August. Stacks are generally in the "sweat" and not fit to thrash. Cutting of wild hay and third-crop alfalfa is in progress. Potatoes will be less than a normal crop, and are very poor in the southwest. Pastures are improving as a result of recent rains and more moderate temperatures. A large acreage of winter grain is assured in the region of havy rain, where the soil is working up in excellent condition.

Bulletin No. 23, September 10, 1918—

Rains, mostly light, occurred in all portions of the state. Much of that reported by correspondents fell at the close of last week. More than one inch occurred in some of the south central counties. Temperatures were generally low, averaging about six degrees below normal. The lowest reported was 35 at Washta on the 6th. Light frosts were reported in Floyd county on the morning of the 5th. The highest temperatures were generally between 80 and 87 on Sunday the 8th. Sunshine was generally deficient.

Corn made satisfactory progress in spite of the cool weather. Silo filling is about completed in the southwest where corn was prematurely ripened and is beginning in the north and east. Much is being cut for fodder. Considerable seed corn is being saved.

Plowing for winter wheat has progressed rapidly, though dry soil has made it difficult in the central and western counties. Seeding has begun in Adams, Mills, Lee and Scott counties. Much will be sown in corn ground in the southwest, from which it has been possible to remove the silage and fodder earlier than usual. Potatoes are a poor crop generally. Blight has been quite prevalent, and rot has attacked them in the northern counties where the soil has been excessively wet. Sorghum grinding has begun in Keokuk county. An excellent third crop of alfalfa and second crop of clover is being secured in the southeast counties. Pastures are in unusually good condition in the eastern one-third of the state, but stock is being fed from the cornfields in the southwest. Considerable shock thrashing remains to be done in the north.

Note: Because of a shortage of funds, due to increased cost of printing, it will be necessary to suspend the publication of this bulletin for the season. Correspondents are requested to continue reporting till October 7th. Postal card summaries will be issued if conditions warrant.

Bulletin No. 24, September 17, 1918—

Generous rains occurred in the northeast one-third of the state, the heaviest, nearly three inches, being reported in Floyd county. Cool, cloudy weather pre-

vailed, the deficiency in temperature averaging about 5 degrees and ranging from 1 degree in the southwest to 7 degrees in the northeast. Frost occurred in the northwest counties on the 12th and 16th. The lowest temperature reported was 22 degrees at Primghar.

Two weeks of abnormally cool weather and deficient sunshine have retarded the maturing of corn in most sections. Probably not more than 60 per cent of the crop is now safe from frost. Cutting of fodder and silage is progressing rapidly. Plowing is under way in all but the southwest and west central sections where the soil is so dry that only tractors can handle it and then it can not be reduced to a seed bed for winter wheat. Seeding of winter wheat has made good progress where moisture is sufficient and some is already up in Lee county.

Shock thrashing is about finished, but considerable unthrashed grain remains in stacks. Sorghum factories, though working to capacity, are unable to take care of the crop. The second crop of clover harvest has been delayed in the northeast by the heavy rains. In much of the eastern part of the state, pastures are green like spring, while in the southwest and west-central districts stock has subsistd on corn fodder the past six weeks.

Bulletin No. 25, September 24, 1918—

Abnormally low temperatures with an average daily deficiency of about 11 degrees, were accompanied by killing frost in the northwest counties on the 18th, and throughout the state on the 19th, 20th and 21st, except a distance of two or three counties west of the Mississippi River, where the frosts were light. The lowest temperature reported was 22 degrees on the 20th at Washta, Cherokee county. Ice formed in a number of places.

Dry weather favored the maturing of corn which proceeded rapidly so that 86 per cent is now safe from frost. Of the remaining 14 per cent, less than half or about 5 per cent of the total crop was seriously damaged by frost and this will be readily absorbed by feeding on the farms, so that the commercial crop of corn is practically uninfluenced by frost. With normally warm and dry weather during the next two weeks the damage as compared with last year would be negligible.

Potatoes and sugar beets were not appreciably damaged by the frost. Sweet corn was damaged slightly, but not enough to stop the canneries. Tomatoes, sweet potatoes and minor garden crops were generally killed.

The dry weather has seriously retarded the seeding and germination of winter wheat in the central and western portions of the State. Where moisture is sufficient, wheat is up and growing nicely.

IOWA CROP REPORT, JUNE 1, 1918.

Following is a summary showing the condition of crops on June 1, as compared with the average of past years on that date:

Corn, 98 per cent; oats, 101; spring wheat, 102; winter wheat, 91; barley, 101; rye, 97; flax, 98; potatoes, 101; tame hay, 86; wild hay, 91; pastures, 90; alfalfa, 95; sweet corn, 98; pop corn, 98 per cent.

The secretary of the State Horticultural Society reports the condition of fruit as follows:

Apples, 67 per cent; pears, 35; American plums, 58; Domestica plums, 40; Japanese plums, 36; cherries, 50; peaches, less than 5; grapes, 59; red raspberries, 62; black raspberries, 64; blackberries, 67; currants, 72; gooseberries, 75, and strawberries, 73 per cent of a full crop. The average of all fruits is 54 per cent, or 16 per cent below the average for the month of May, and 2 per cent below the estimate of June 1, last year, and 1½ per cent above the ten-year average.

IOWA CROP REPORT, JULY 1, 1918.

Reports received July 1, from township correspondents of the Iowa Weather and Crop Service, show the following results as to the acreage and average condition of staple farm crops:

Corn.—The acreage planted this year, after making allowances for the acreage loss by floods and washings, is 10,337,700 or 33,000 less than last year, as shown by Township Assessors. The condition was 105 per cent, or 18 per cent better than on July 1, 1917. The stand is remarkably good, considering the low vitality of the seed. This is probably due to the untiring efforts of the County Agricultural Agents and farmers in seed testing, together with unusually favorable weather and soil conditions at planting time. The crop is far advanced.

Oats.—Area seeded, 5,426,500 or 16,500 acres more than last year. Condition, 97 per cent, is 5 per cent less than last year.

Spring Wheat.—Area seeded, 580,400 acres, or an increase of 415,600 acres over last year. Condition, 101 per cent, or 2 per cent better than last year. The increase in acreage is a patriotic response of the farmers to the appeal of the State Council of Defense made through the County Agents.

Winter Wheat.—Acreage to be harvested, 197,270, or 46,172 acres more than in 1917. Condition, 92 per cent or 12 per cent better than last year.

Barley.—Acreage seeded, 340,100, increase 34,700 acres. Condition, 100 per cent, 2 per cent better than last year.

Rye.—Acreage, 50,040 which is 1636 more than last year. Condition, 96, or 2 per cent better than last year.

Flax.—Acreage, 8,687 as compared with 8,384 in 1917. Condition, 95 or 1 per cent better than last year.

Potatoes.—Acreage, 97,210 a decrease of about 3,000 acres. Condition, 97 per cent, or 9 per cent lower than last year.

Hay.—Acreage of tame and wild hay, 2,994,200, or 291,900 acres less than in 1917. Condition, 88 per cent, or 5 per cent better than last year.
Alfalfa.—Acreage, 116,040, increase, 870 acres.

Pastures.—Acreage, 9,080,400; decrease, 415,900 acres. Condition, 92 per cent, or 3 per cent below last year.

Fruit.—The Secretary of the State Horticultural Society reports the condition of fruit on July 1, as follows: "Summer apples, 32 per cent; fall apples, 36 per cent; winter apples, 38 per cent; cherries, 38 per cent; pears, 14 per cent; American plums, 37 per cent; Domestica plums, 18 per cent; Japanese plums, 9 per cent; grapes, 49 per cent; red raspberries, 60 per cent; black raspberries, 68 per cent; blackberries, 70 per cent; currants, 65 per cent; gooseberries, 70 per cent of a full crop. The average for all fruits is 48 per cent, or 9 per cent below the last 5-year average. The indications are that there will be about half as many apples and plums as last year, and about the same quantity of grapes and raspberries as in 1917."

IOWA CROP REPORT, AUGUST 1, 1918.

The condition of crops on August 1, as compared with the average of past years on that date, was as follows: Corn, 101 per cent; pastures, 89; potatoes, 86; and flax 97. Last year on August 1, the condition of corn was 92 per cent; pastures, 90; potatoes, 96; and flax, 96.

Preliminary reports show the average yield of winter wheat to be about 21 bushels per acre; spring wheat, 18; early oats, 42; late oats, 43; barley, 32; rye, 19; tame hay, 1.2 tons; and wild hay also 1.2 tons. Threshing reports received up to August 1 were mostly from the south half of the State. If final returns maintain these averages, the State will produce about 4,143,000 bushels of winter wheat; spring wheat, 9,447,000; oats, 234,876,000; barley, 10,883,000; rye, 951,000 bushels; and 3,593,000 tons of hay.

The Secretary of the State Horticultural Society reports the condition of fruit on August 1 as follows: Summer apples, 26 per cent; fall apples, 27; winter apples, 29; pears, 18; American plums, 23; domestic plums, 13; Japanese plums, 5; grapes, 52 per cent of a full crop. The percentage of crop on the eight leading varieties of commercial apples is as follows: Duchess, 26 per cent; Wealthy, 24; Grimes Golden, 32; Jonathan, 30; Winesap, 19; Ben Davis, 25; Northwestern Greening, 29; and Willow Twig, 31. There will be about half as many apples and plums, and the same quantity of grapes as were harvested last year, should normal conditions prevail until crops are gathered for market or storage.

IOWA CROP REPORT, SEPTEMBER 1, 1918.

Following is a summary showing the condition of crops on September 1, as compared with the average of past years on that date: Corn, 90 per cent; potatoes, 78; flax, 95; pastures, 85; On September 1, 1917, the conditions were: Corn, 84; potatoes, 95; flax, 94; and pastures, 80 per cent.

Hot winds and drouth seriously damaged corn in the southwest one-third of the State during the first half of August, so that the average condition September 1, was 11 per cent lower than on August 1. The total production will be about 350,000,000 bushels, or nearly 17,000,000 bushels above the ten-year average.

Preliminary reports indicate the average yield of winter wheat to be 21 bushels per acre; spring wheat, 19; oats, 43; barley, 31; rye, 18; and timothy seed, 4.6. If these estimates are maintained by final reports, the State will produce about 4,143,000 bushels of winter wheat, 11,028,000 of spring wheat; 237,640,000 of oats; 10,679,000 of barley, and 900,000 bushels of rye. The area of timothy cut for seed was 73 per cent of last year's acreage. Eighty per cent of the threshing had been finished on September 1, which is about 10 per cent above the normal.

FINAL CROP REPORT OF THE STATE, 1918.

Following is a summary of reports from crop correspondents of the Iowa Weather and Crop Service showing the average yield per acre and total yields of staple soil products, and the average price at the nearest station, December 1, 1918. This report does not include or take into consideration live stock, poultry or dairy products:

Corn.—The estimated acreage was 10,337,700, or 33,000 acres less than in 1917; average yield, 34.5 bushels per acre; total yield, 356,677,000 bushels; average price, $1.23 per bushel; total value, $438,712,710. Only 4 per cent of the crop was reported to be soft or immature and 91 per cent had been husked on December 1st. The crop this year is being referred to as "disappointing," yet the yield is only 2.0 bushels per acre below the average of the last 10 years and the total crop, 356,677,000 bushels has been exceeded but four times in 29 years. The quality is excellent and the feeding value of the 1918 crop is much greater than that of the 1917 crop bushel for bushel.

Oats.—The estimated area harvested was 5,426,500 acres, or about 16,500 acres more than in 1917. Average yield, 40.2 bushels; total yield, 217,592,500 bushels; average price, 64 cents; total value, $140,043,200.

Spring Wheat.—Area harvested, 580,400 acres, or about 415,600 acres more than in 1917; average yield 18.2 bushels per acre; total yield, 10,584,600 bushels; price per bushel, $1.99; total value, $21,063,354.

Winter Wheat.—Area harvested, 197,270 acres; average yield per acre, 19.9 bushels; total yield 3,920,810; average price, $2.02 per bushel; total value, $7,920,036.

Barley.—Area harvested, 340,100 acres; average yield per acre, 31.3 bushels; total yield, 10,649,200 bushels; average price, 89c per bushel; total value, $9,477,788.

Rye.—Area harvested, 50,040 acres; average yield, 18.1 bushels; total yield, 905,850; price per bushel, $1.48; total value, $1,340,658.

Flax Seed.—Average yield, 10.1 bushels; total yield, 87,450 bushels; total value, at $3.26 per bushel, $285,087.

Timothy Seed.—Area harvested, 156,750 acres; average yield, 4.3 bushels; total yield, 673,025; total value, at $4.27 per bushel, $2,873,817.

Clover Seed.—Area harvested, 23,480 acres; average yield, 1.5 bushels; total value, at $19.74 per bushel, $695,243.

Potatoes.—Area harvested, 97,210 acres; average yield, 76.1 bushels; total yield, 7,391,750 bushels; average price, $1.32; total value, $9,761,070.

Hay (Tame.)—Average yield, 1.3 tons per acre; total yield, 3,357,100 tons; average price, $19.57 per ton; total value, $65,697,448.

Hay (Wild).—Average yield, 1.2 tons; total yield, 594,580 tons; average price, $16.00; total value, $9,513,280.

Alfalfa.—Area harvested, 116,040 acres; average yield, 2.8 tons; total yiled, 328,110 tons; average price, $23.93 per ton; total value; $7,875,602.

TABULATED CROP SUMMARY.

Crop	Acres	Average Yield	Average Price	Total Yield	Total Value
Corn	10,337,700	34.5 Bu.	$ 1.23	356,677,000	$ 438,712,710
Oats	5,426,500	40.1 Bu.	.64	217,592,500	140,043,200
Spring Wheat	580,400	18.2 Bu.	1.99	10,584,600	21,063,354
Winter Wheat	197,270	19.9 Bu.	2.02	3,929,810	7,939,036
Barley	340,100	31.3 Bu.	.89	10,649,200	9,477,788
Rye	50,040	18.1 Bu.	1.48	905,850	1,340,658
Flax Seed	8,687	10.1 Bu.	3.26	87,450	285,087
Timothy Seed	156,750	4.3 Bu.	4.27	673,025	2,873,817
Clover Seed	23,480	1.5 Bu.	19.74	35,220	695,243
Potatoes	97,210	76.1 Bu.	1.32	7,394,750	9,761,070
Hay (Tame)	2,502,620	1.3 tons	19.57	3,257,100	65,697,448
Hay (Wild)	491,590	1.2 tons	16.00	594,580	9,513,280
Alfalfa	116,040	2.8 tons	23.93	329,110	7,875,602
Pasture and Grazing (Estim'd)					99,000,000
Ensilage (Estimated)		3.0 tons	15.00		20,000,000
Sweet Corn (Estimated)					6,000,000
Pop Corn (Estimated)	18,805	19.5 Bu.	4.16	366,700	1,525,472
Buckwheat (Estimated)	16,000	15.3 Bu.	1.70	244,800	416,160
Fruit Crop (Estimated)					6,000,000
Garden Truck (Estimated)					8,500,000
Sugar Beets for Manufacture (Estimated) (Estimated)	7,000	10.0 tons	9.00	70,000	630,000
Miscellaneous (Estimated)					11,500,000
Total					$ 859,830,915
Total value of soil products for 1917 was					$ 822,061,291

IOWA CROPS, 1918, ESTIMATED NUMBER OF ACRES BY COUNTIES.

Counties	Corn	Oats	Spring Wheat	Winter Wheat	Barley	Rye	Flax	Potatoes	Tame Hay	Wild Hay	Alfalfa	Pastures
Adair	120,000	39,300	3,000	1,000	4,200	40		820	25,200	1,500	70	117,700
Adams	82,100	26,900	1,900	1,600	1,200	210		480	18,500	1,440	490	88,000
Allamakee	45,100	37,100	8,700	1,000	7,500	450	20	1,090	48,800	1,020	50	160,000
Appanoose	50,100	21,400	1,000	1,700	100	320		290	30,600	720	50	120,000
Audubon	91,600	37,500	5,000	900	8,500	30		780	25,000	1,980	1,040	72,600
Benton	147,300	85,800	2,000	200	8,000	900		1,100	31,800	2,090	70	96,600
Black Hawk	102,900	64,100	1,000	400	4,300	1,900	5	1,610	24,600	7,500	30	87,500
Boone	131,900	70,400	2,000	700	1,000	50		520	16,600	5,900	220	69,300
Bremer	69,700	47,800	2,000	200	1,300	480		1,320	15,000	19,500	30	69,800
Buchanan	104,900	63,300	3,500	200	2,800	970	20	1,000	27,000	10,520	10	108,800
Buena Vista	135,700	88,000	2,000	150	1,000	40	30	1,050	18,800	7,520	760	65,300
Butler	96,500	75,000	3,600	50	1,100	1,090		2,340	26,800	8,960	10	71,500
Calhoun	138,500	101,400	1,000	50	900	30	30	650	16,500	3,610	270	50,900
Carroll	120,300	66,800	8,600	500	2,300	20	15	1,660	22,700	6,480	450	115,200
Cass	129,200	39,600	7,100	3,000	10,000	230		1,120	24,400	1,240	550	104,100
Cedar	110,100	38,800	1,700	200	13,000	560		1,220	39,300	140	70	115,800
Cerro Gordo	98,200	73,900	3,000	50	2,100	100	90	1,290	28,700	9,970	120	74,300
Cherokee	124,900	78,400	1,200	50	2,400	40		950	22,700	7,900	2,290	78,800
Chickasaw	59,800	69,000	6,200		2,500	430	105	910	21,500	11,220	10	82,500
Clarke	64,200	25,700	2,000	2,300	200	110		290	21,600	30	30	97,400
Clay	116,500	78,000	1,100	130	2,700	260	405	680	20,300	13,720	650	74,800
Clayton	74,000	63,000	11,900	2,500	12,000	500		1,050	6,100	1,200	50	157,000
Clinton	110,800	45,000	9,300	8,000	19,000	1,690		930	48,200	1,590	100	131,400
Crawford	150,100	66,000	29,000	3,400	4,500	160		1,420	40,900	5,240	4,130	110,800
Dallas	139,500	60,400	1,200	12,000	1,200	80		530	16,400	2,390	350	79,600
Davis	59,700	22,500	1,500	2,500	150	650		590	43,200		40	133,400
Decatur	72,000	25,600	1,500	3,500	100	720		300	25,900	130	140	103,300
Delaware	87,100	59,600	2,300	90	8,800	1,540		1,120	33,300	5,270	60	112,900
Des Moines	65,700	27,200	1,200	5,000	300	2,110		720	18,300	70	240	79,700
Dickinson	65,600	45,600	4,700	100	1,400	20	600	580	12,800	12,050	210	53,400
Dubuque	67,300	51,500	9,200	500	4,400	300		2,110	52,800	600	90	144,600
Emmet	71,800	54,900	1,500	50	1,400	130	440	490	16,000	8,350	110	49,000
Fayette	88,000	73,000	7,800	200	8,700	200	20	1,230	53,600	10,255	40	141,500
Floyd	89,300	70,200	3,000	50	2,100	720	115	1,250	31,900	4,190	20	68,000
Franklin	113,600	84,300	2,000	50	2,500	120	10	1,520	28,400	8,460	100	40,500
Fremont	130,100	13,100	2,000	7,200	300	340		590	5,800	2,230	7,650	52,600
Greene	136,700	70,000	2,000	900	700	20		570	19,700	5,050	110	72,600
Grundy	106,300	71,800	1,200	100	3,000	40		1,630	23,300	5,520	30	70,000
Guthrie	116,400	46,400	3,900	1,000	1,500	20	5	630	21,700	3,320	280	100,000
Hamilton	129,400	88,700	1,000	400	1,000	20	19	720	21,300	6,100	150	89,200
Hancock	108,300	88,900	5,800	50	3,000	310	460	1,050	23,900	21,800	110	78,800
Hardin	109,000	71,500	3,300	50	2,500	100		940	26,200	5,360	110	72,200

IOWA CROPS, 1918, ESTIMATED NUMBER OF ACRES BY COUNTIES—Continued.

Counties	Corn	Oats	Spring Wheat	Winter Wheat	Barley	Rye	Flax	Potatoes	Tame Hay	Wild Hay	Alfalfa	Pastures
Harrison	153,300	30,300	30,000	4,300	2,600	250	----------	950	6,200	6,530	11,600	91,400
Henry	77,000	32,800	1,500	2,200	200	1,160	----------	300	25,800	10	90	92,800
Howard	54,500	56,300	2,200	200	4,900	310	295	930	35,500	11,930	10	83,400
Humboldt	95,800	66,000	1,700	150	1,800	30	75	500	16,900	5,700	210	41,000
Ida	99,600	51,700	6,700	----------	3,500	20	12	640	21,000	1,320	1,900	111,700
Iowa	96,500	49,100	3,300	800	2,000	1,600	----------	1,140	23,300	400	20	89,800
Jackson	58,500	29,100	3,300	1,600	2,600	760	----------	1,280	52,900	750	60	22,400
Jasper	159,900	65,200	12,000	2,000	800	150	15	800	29,400	500	100	115,500
Jefferson	68,200	30,900	1,600	2,000	200	710	----------	300	28,400	----------	20	93,200
Johnson	106,700	51,500	2,400	1,000	2,100	1,320	----------	1,030	28,810	550	60	113,900
Jones	72,700	37,200	5,400	500	6,400	655	----------	700	44,800	220	20	122,800
Keokuk	111,100	40,300	10,500	1,400	300	410	----------	770	35,700	40	40	120,700
Kossuth	184,400	142,600	3,700	100	3,700	100	1,560	1,800	30,900	29,340	250	114,600
Lee	59,900	24,500	1,600	2,700	500	7,630	----------	1,220	28,600	----------	220	128,200
Linn	118,200	59,200	8,000	200	3,300	670	----------	1,460	40,100	2,060	140	112,300
Louisa	65,800	25,500	1,000	7,800	----------	2,280	----------	420	15,700	150	50	70,600
Lucas	62,400	25,300	1,600	2,400	100	470	----------	440	23,200	110	60	97,800
Lyon	129,600	102,600	6,400	100	12,000	20	20	1,650	11,700	9,440	2,620	159,000
Madison	105,800	35,100	2,100	4,400	2,800	130	----------	1,040	19,500	1,460	160	122,700
Mahaska	122,900	47,500	4,300	3,200	700	420	----------	1,670	25,000	280	120	111,300
Marion	99,800	36,500	5,500	6,500	900	290	----------	440	18,800	420	110	130,700
Marshall	127,200	67,400	4,100	700	1,000	50	----------	810	26,900	440	80	85,800
Mills	108,700	18,800	7,900	3,200	1,100	160	----------	910	7,100	4,150	6,870	58,000
Mitchell	67,500	77,500	6,500	50	3,200	50	730	2,440	30,200	3,300	10	66,000
Monona	139,000	28,500	29,000	25,000	2,000	90	----------	1,250	6,800	11,800	11,260	90,200
Monroe	53,200	14,800	2,200	3,000	100	470	40	270	25,400	20	20	103,900
Montgomery	109,000	28,100	6,600	4,900	800	350	----------	640	15,300	750	2,990	77,900
Muscatine	78,400	33,500	3,600	1,600	7,600	2,540	----------	1,410	29,300	610	220	78,800
O'Brien	125,500	81,000	1,600	50	7,300	20	10	1,160	22,400	6,770	1,690	71,500
Osceola	83,700	58,600	1,500	----------	2,600	60	195	870	12,300	5,650	130	36,200
Page	124,500	25,500	2,000	12,000	400	440	----------	540	20,700	1,180	3,090	100,400
Palo Alto	100,800	68,100	3,600	50	600	300	420	630	13,400	18,000	190	58,300
Plymouth	190,800	95,700	65,000	500	5,000	300	5	1,520	29,310	22,580	10,460	103,500
Pocahontas	132,400	101,400	2,000	50	1,000	270	115	840	17,900	8,800	190	53,500
Polk	111,400	46,700	6,000	5,200	200	550	----------	1,100	17,200	3,000	370	70,800
Pottawattamie	219,900	64,800	12,000	1,900	12,000	510	----------	2,090	24,500	6,600	12,660	127,300
Poweshiek	123,100	50,900	3,700	400	2,300	100	----------	780	23,200	100	60	91,900
Ringgold	87,800	31,300	1,100	1,700	200	350	----------	270	30,400	160	30	112,500
Sac	129,100	81,400	2,600	50	2,900	10	20	740	23,700	4,080	450	57,900
Scott	75,700	28,400	5,600	1,600	22,000	2,270	----------	4,160	28,500	1,780	610	81,100
Shelby	128,000	47,600	14,000	300	10,000	80	----------	1,110	29,800	3,820	3,570	94,000
Sioux	176,500	97,200	21,000	500	15,000	50	----------	1,250	16,000	14,020	4,470	77,400

Story	142,000	67,900	2,000	300	100	30	5	190	21,500	2,730	90	60,100
Tama	134,300	77,300	15,000	300	10,000	220	----------	1,240	30,900	1,100	60	116,800
Taylor	102,100	33,000	1,500	3,000	300	340	----------	560	21,000	740	600	103,900
Union	73,800	27,000	1,400	1,200	600	60	----------	740	19,700	710	70	90,500
Van Buren	56,200	23,400	1,200	2,000	100	1,130	----------	160	29,300	30	190	113,800
Wapello	65,100	23,900	1,500	3,500	300	430	----------	970	24,800	10	170	96,000
Warren	101,000	32,000	3,300	10,000	600	410	----------	540	24,800	640	230	118,700
Washington	104,900	43,700	1,200	1,200	400	150	10	520	13,400	10	60	105,800
Wayne	90,600	32,900	1,200	1,000	100	140	----------	20	20,700	50	20	100,000
Webster	156,800	118,900	4,500	500	1,200	40	30	270	30,400	160	30	75,200
Winnebago	67,000	50,700	10,000	----------	4,100	----------	810	1,340	18,800	20,080	30	52,400
Winneshiek	77,200	67,000	15,000	600	12,000	330	190	1,310	54,000	4,570	20	138,300
Woodbury	200,500	72,000	25,000	5,200	2,900	70	15	1,550	17,000	8,970	15,530	103,100
Worth	53,400	60,200	8,000	50	3,500	140	1,520	740	29,600	15,420	80	61,800
Wright	112,800	81,700	1,000	100	1,600	40	215	710	24,700	6,840	100	65,100
	10,337,700	5,428,500	580,400	197,270	340,100	59,040	8,687	97,210	2,502,620	491,590	116,040	9,080,400

TABULATED CROP SUMMARY FOR THE YEAR 1918.—PART I

Counties	Corn		Oats		Spring Wheat		Winter Wheat		Barley	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels
Adair	14	1,680,000	28	1,100,500	14	42,000	15	15,000	26	109,200
Adams	7	575,000	27	726,500	14	28,600	15	24,000	20	34,000
Allamakee	46	2,075,000	41	1,521,100	21	182,700	16	16,000	27	302,500
Appanoose	28	1,403,000	41	877,400	20	20,000	20	34,000	25	2,500
Audubon	29	2,656,000	32	1,280,000	16	80,000	18	16,200	30	235,000
Benton	43	6,334,000	44	3,775,000	16	32,000	18	3,600	34	272,000
Black Hawk	38	3,910,000	44	2,820,400	18	18,000	22	8,800	35	150,500
Boone	35	4,616,000	43	3,027,200	16	32,000	18	12,600	34	34,000
Bremer	38	2,307,000	39	1,864,000	18	36,000	18	3,600	32	41,600
Buchanan	38	3,980,000	42	2,654,400	17	59,500	20	4,000	38	106,400
Buena Vista	43	5,835,000	47	4,130,000	22	44,000	25	3,900	33	33,000
Butler	38	3,629,000	35	2,625,000	12	43,200	16	800	24	28,800
Calhoun	40	5,540,000	45	4,563,000	22	22,000	18	900	40	36,000
Carroll	38	4,571,000	42	2,805,600	19	163,400	26	13,000	36	82,800
Cass	12	1,559,000	28	1,108,800	14	99,400	16	48,000	20	200,000
Cedar	51	5,615,000	50	1,940,000	18	20,000	22	4,600	35	455,000
Cerro Gordo	39	3,830,000	40	2,056,000	16	48,000	15	750	25	52,500
Cherokee	44	5,496,000	47	3,684,800	23	1,100	22	1,100	37	88,800
Chickasaw	30	1,704,000	45	3,105,000	16	99,200			30	75,000
Clarke	24	1,541,000	34	873,800	17	34,000	16	36,800	35	7,000
Clay	42	4,805,000	47	3,666,000	17	18,700	20	2,000	34	91,800
Clayton	43	3,182,000	38	2,394,000	24	285,600	19	47,500	37	444,000
Clinton	44	4,875,000	43	1,960,800	18	167,400	19	152,000	33	330,000
Crawford	28	4,203,000	40	2,640,000	21	609,000	26	88,400	32	144,000
Dallas	29	4,046,000	46	2,778,400	18	21,600	21	252,000	35	42,000
Davis	34	2,023,000	46	1,035,000	19	28,500	21	52,500	32	2,200
Decatur	18	1,296,000	36	921,600	17	17,000	18	63,000	15	1,500
Delaware	30	2,613,000	42	2,563,200	15	34,500	20	1,800	25	220,000
Des Moines	50	3,285,000	44	1,196,800	21	25,200	24	120,000	28	8,400
Dickinson	37	2,427,000	41	1,869,600	15	90,500	20	2,000	33	46,200
Dubuque	42	2,827,000	43	2,214,500	21	193,200	20	10,000	38	167,200
Emmet	41	2,944,000	45	2,470,500	16	24,000	20	1,000	35	49,000
Fayette	40	3,520,000	47	3,431,000	20	152,000	25	5,000	33	287,000
Floyd	38	3,393,000	36	2,527,200	16	48,000	19	950	32	67,200
Franklin	35	3,976,000	42	3,540,600	17	34,000	20	1,000	26	65,000
Fremont	21	2,733,000	25	327,500	13	26,000	20	144,000	20	6,000
Greene	37	5,068,000	37	2,590,000	14	28,000	14	12,600	35	24,500
Grundy	36	3,827,000	37	2,656,600	13	15,600	16	1,600	32	96,000
Guthrie	26	2,870,000	31	1,438,400	16	62,400	20	20,000	25	37,500
Hamilton	34	4,400,000	40	3,548,000	17	17,000	14	5,600	29	29,000
Hancock	36	3,899,000	44	3,905,600	17	98,600	12	600	34	102,000
Hardin	37	4,033,000	42	3,063,000	16	52,800	16	800	30	75,000
Harrison	18	2,759,000	34	1,020,200	16	480,000	18	77,400	16	41,600
Henry	45	3,465,000	47	1,541,600	20	30,000	25	55,000	34	6,800
Howard	23	1,254,000	25	1,407,500	15	33,000	21	4,200	19	92,100
Humboldt	42	4,024,000	47	3,102,000	19	32,300	19	2,850	35	63,000
Ida	35	3,486,000	43	2,223,100	21	140,700	24	960	30	105,000
Iowa	33	3,184,000	37	1,816,700	18	59,400	20	16,000	29	58,000
Jackson	48	2,808,000	42	1,222,200	18	59,400	18	28,800	29	75,400
Jasper	41	6,556,000	42	2,738,400	20	240,000	21	42,000	29	23,200
Jefferson	42	2,864,000	45	1,260,500	18	28,800	19	38,000	36	7,200
Johnson	48	5,122,000	46	2,369,000	19	45,600	24	24,000	37	56,700
Jones	45	3,272,000	40	1,488,000	15	81,000	18	9,000	30	193,000
Keokuk	43	4,777,000	41	1,652,000	20	210,000	25	35,000	32	9,600
Kossuth	39	7,192,000	42	5,989,200	18	66,600	12	1,200	35	129,500
Lee	41	2,446,000	39	955,500	21	33,600	23	62,100	27	12,500
Linn	42	4,964,000	52	3,078,400	19	152,000	17	3,400	35	115,500
Louisa	45	2,961,000	45	1,147,500	15	15,000	24	187,200		
Lucas	30	1,872,000	39	986,700	18	28,800	24	57,600	32	3,200
Lyon	42	5,443,000	43	44,100	20	128,000	20	2,000	33	396,000
Madison	16	1,693,000	36	1,263,600	14	29,400	19	83,600	26	42,500
Mahaska	36	3,424,000	47	2,232,500	17	73,100	20	66,000	35	24,500
Marion	31	3,094,000	42	1,533,000	18	99,000	18	117,000	31	27,900
Marshall	45	5,597,000	42	2,859,800	17	69,700	16	13,300	38	38,000
Mills	18	1,957,000	24	451,200	13	102,700	14	44,800	20	22,000
Mitchell	37	473,000	49	3,797,500	19	123,500	20	1,000	31	99,200
Monona	30	4,170,000	39	1,111,500	19	561,000	21	525,000	32	64,000
Monroe	29	1,543,000	43	626,400	20	44,000	21	63,000	30	3,000
Montgomery	17	1,700,000	30	8,400	15	99,000	16	78,400	30	24,000
Muscatine	43	3,371,000	40	1,340,000	18	64,800	25	40,000	26	197,600
O'Brien	45	5,648,000	43	3,483,000	19	30,400	21	1,000	34	248,200

TABULATED CROP SUMMARY FOR THE YEAR 1918—PART I—Continued.

Counties	Corn		Oats		Spring Wheat		Winter Wheat		Barley	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Tons per acre	Total Tons
Osceola	41	3,432,000	47	2,754,200	17	15,500			37	96,200
Page	17	2,116,000	28	714,000	13	26,000	18	216,000	16	6,400
Palo Alto	45	4,536,000	42	2,860,200	11	39,600	15	800	33	21,000
Plymouth	37	7,059,000	35	3,349,500	18	1,170,000	22	11,000	31	155,000
Pocahontas	40	5,296,000	44	4,461,600	16	32,000	22	1,100	35	35,000
Polk	37	4,122,000	47	2,194,900	20	120,000	20	104,000	30	6,000
Pottawattamie	21	4,618,000	34	2,203,200	16	192,000	18	34,200	29	348,000
Poweshiek	39	4,801,000	42	2,137,800	16	59,200	19	7,600	38	87,400
Ringgold	17	1,493,000	35	1,005,500	15	16,500	18	30,600	20	4,000
Sac	38	4,906,000	52	4,232,800	22	57,200	22	1,100	38	110,200
Scott	50	3,785,000	48	1,363,200	21	117,600	24	36,000	35	1,015,000
Shelby	21	2,688,000	32	1,523,000	22	308,000	15	4,500	32	320,000
Sioux	42	7,413,000	44	4,276,800	19	209,000	19	9,500	33	495,000
Story	36	5,112,000	41	2,783,900	16	32,000	21	6,300	40	4,000
Tama	45	6,044,000	44	3,401,200	19	285,000	19	5,700	33	330,000
Taylor	18	1,838,000	28	924,000	15	22,500	16	48,000	22	6,600
Union	21	1,330,000	35	94,500	15	21,000	14	16,800	18	10,800
Van Buren	39	2,102,000	39	922,600	18	21,600	22	44,000	30	3,000
Wapello	32	2,083,000	41	979,900	22	33,000	23	80,500	35	10,500
Warren	27	2,727,000	40	1,304,000	17	56,100	20	200,000	30	23,400
Washington	45	4,720,000	40	1,748,000	20	24,000	19	12,800	33	13,200
Wayne	24	2,174,000	39	1,283,100	16	19,200	18	18,000	15	1,500
Webster	38	5,168,000	45	5,350,500	21	94,500	22	11,000	26	45,200
Winnebago	46	3,082,000	44	2,230,800	15	150,000	16	300	33	135,300
Winneshiek	40	3,088,000	40	2,680,000	21	315,000	21	12,600	30	360,000
Woodbury	37	7,418,000	38	2,736,000	18	450,000	18	90,600	25	72,500
Worth	35	1,869,000	39	2,347,800	22	176,000	18	900	32	112,000
Wright	37	4,174,000	39	3,186,300	18	18,000	13	1,500	33	82,800
	34.5	356,677,000	40.1	217,592,500	18.2	10,584,600	19.9	2,920,810	31.3	10,649,200

TABULATED CROP SUMMARY FOR THE YEAR 1918.—PART II

Counties	Rye		Flax Seed		Potatoes		Hay—Tame		Hay—Wild		Alfalfa	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Tons per acre	Total Tons	Tons per acre	Total Tons	Tons per acre	Total Tons
Adair	10	400	....	.....	17	13,900	0.5	12,600	0.5	780	1.5	100
Adams	18	3,780	....	.....	42	20,200	0.4	7,400	0.5	720	1.8	880
Allamakee	18	8,100	12	240	97	105,700	2.0	97,600	1.5	1,530	2.0	100
Appanoose	20	6,400	....	.....	70	20,320	1.0	20,600	1.2	860	1.2	60
Audubon	22	660	....	.....	73	56,900	0.8	20,000	1.1	2,180	2.5	2,700
Benton	20	18,000	....	.....	70	77,000	1.6	56,000	1.5	2,000	3.0	210
Black Hawk	12	22,800	12	60	75	120,800	1.2	29,500	1.0	7,500	3.0	90
Boone	25	1,700	....	.....	53	27,600	1.0	16,600	0.8	4,720	2.2	480
Bremer	19	9,100	....	.....	92	121,400	1.7	18,000	1.1	21,450	3.0	90
Buchanan	19	17,290	12	240	116	116,000	1.5	35,000	1.2	12,640	3.0	30
Buena Vista	20	800	12	360	62	65,100	1.2	22,000	1.3	9,780	2.8	730
Butler	15	15,000	....	.....	60	140,400	1.2	32,200	1.1	9,860	3.0	30
Calhoun	20	600	12	360	47	30,600	1.3	21,400	1.0	3,600	2.5	680
Carroll	20	400	12	180	75	124,500	1.2	27,200	1.2	7,780	4.0	1,800
Cass	9	2,070	....	.....	20	22,400	0.5	12,200	0.5	620	1.5	820
Cedar	23	18,400	....	.....	78	95,900	1.8	70,700	1.8	250	4.0	380
Cerro Gordo	31	3,100	12	1,080	109	140,600	1.6	45,900	1.2	11,970	5.0	600
Cherokee	20	800	....	.....	108	102,600	1.4	31,800	1.0	7,900	3.0	6,900
Chickasaw	20	8,600	12	1,200	115	104,600	1.8	56,700	1.5	16,840	3.0	30
Clarke	17	1,870	....	.....	90	26,100	0.8	17,300	1.0	20	1.5	40
Clay	....	.....	10	4,050	90	44,200	1.5	30,400	1.5	20,580	3.0	2,280
Clayton	21	10,500	....	.....	72	75,600	1.5	9,200	1.5	1,890	3.0	150
Clinton	19	32,110	....	.....	64	59,500	1.4	67,500	1.5	2,380	3.6	360
Crawford	23	3,680	....	.....	61	86,600	1.5	61,400	1.2	6,290	2.8	11,560
Dallas	20	1,600	....	.....	41	21,700	1.3	21,300	1.3	3,110	2.7	940
Davis	12	7,920	....	.....	79	46,600	1.3	56,200	....	....	....	....
Decatur	12	8,640	....	.....	72	12,600	0.7	18,700	0.8	90	1.5	210
Delaware	20	30,800	....	.....	50	56,000	0.8	26,600	1.5	7,900	3.0	180
Des Moines	21	44,300	....	.....	100	72,000	1.4	25,600	1.4	100	3.0	720
Dickinson	16	220	9	5,400	95	55,100	1.6	20,500	1.1	13,260	3.0	630
Dubuque	19	5,700	....	.....	85	179,400	1.2	68,000	1.4	8,400	3.0	270
Emmet	23	2,990	13	5,700	85	40,200	1.3	20,900	1.2	10,023	3.0	260
Fayette	22	8,580	5	160	92	113,300	1.8	96,500	1.2	12,240	3.0	120
Floyd	17	12,240	5	580	103	128,800	1.7	54,200	0.9	3,770	3.0	60
Franklin	15	1,800	12	120	89	135,300	1.5	57,600	1.1	9,310	3.0	300
Fremont	15	5,100	....	.....	32	18,900	1.2	7,000	1.5	3,340	2.2	24,480
Greene	20	600	....	.....	51	29,100	1.0	19,700	0.8	4,050	2.5	2,750
Grundy	22	880	....	.....	51	83,100	1.5	34,800	1.0	5,520	3.0	90
Guthrie	18	360	12	60	36	22,700	1.0	21,700	1.1	3,650	2.8	780
Hamilton	22	440	11	110	58	41,800	1.0	21,300	1.0	6,100	3.0	450
Hancock	25	7,750	11	5,060	125	131,250	1.3	31,100	1.2	26,160	2.0	330
Hardin	25	1,500	....	.....	55	51,700	1.4	26,700	1.0	5,360	5.0	550
Harrison	25	8,750	....	.....	53	50,400	1.0	6,200	1.6	10,450	2.8	32,480
Henry	18	20,880	....	.....	89	26,700	2.0	51,600	2.0	20	3.0	270
Howard	16	4,960	8	2,360	70	65,100	1.5	53,200	1.0	11,930	3.0	30
Humboldt	25	750	12	900	95	47,500	1.1	18,600	0.9	5,130	2.2	460
Ida	20	600	12	140	53	40,300	1.4	29,400	1.1	1,450	2.7	4,320
Iowa	20	32,000	....	.....	52	59,300	1.6	37,300	0.5	300	2.0	60
Jackson	19	14,440	....	.....	150	192,000	1.5	79,400	1.5	1,120	2.5	150
Jasper	45	6,750	12	180	64	51,200	1.2	35,300	1.5	7,500	4.0	400
Jefferson	14	9,940	....	.....	101	39,400	1.9	54,000	....	....	3.2	60
Johnson	20	26,400	....	.....	76	78,300	1.6	62,100	1.6	550	3.0	180
Jones	19	6,500	....	.....	85	67,150	2.0	89,600	2.0	440	3.2	60
Keokuk	19	7,800	....	.....	78	60,100	1.7	60,700	1.7	70	3.2	130
Kossuth	25	2,500	9	14,040	92	165,600	1.4	43,300	1.0	29,340	3.0	750
Lee	18	127,340	....	.....	84	102,500	1.4	40,000	....	....	2.7	630
Linn	23	15,410	....	.....	62	90,500	1.3	52,100	1.2	2,470	3.0	420
Louisa	17	38,760	....	.....	112	47,000	1.5	25,600	1.4	210	5.0	250
Lucas	18	8,460	....	.....	52	22,900	1.1	25,500	1.0	110	3.0	180
Lyon	10	200	14	280	107	176,600	1.4	16,400	1.3	12,270	2.7	7,070
Madison	18	2,340	....	.....	42	43,700	0.8	15,600	0.8	1,170	2.2	250
Mahaska	16	6,720	....	.....	82	136,900	1.4	35,000	1.5	420	3.0	260
Marion	23	4,600	....	.....	64	28,200	1.0	18,800	1.0	420	3.0	330
Marshall	23	1,380	....	.....	78	63,200	1.4	37,700	1.3	570	3.0	240
Mills	21	3,360	....	.....	50	45,500	1.2	8,500	1.0	4,150	2.5	17,180
Mitchell	20	1,000	16	11,680	152	270,900	1.8	54,400	1.1	2,630	3.0	30
Monona	25	2,250	....	.....	62	77,500	1.2	8,200	1.3	15,540	3.0	32,780
Monroe	18	8,460	12	480	70	18,900	0.8	20,300	1.0	20	3.0	60
Montgomery	18	6,300	....	.....	42	26,900	0.7	10,700	1.1	820	2.3	6,880
Muscatine	13	33,020	....	.....	55	77,600	1.5	30,400	1.1	670	4.2	950
O'Brien	10	200	10	100	90	104,400	1.5	33,000	1.2	8,120	4.2	7,100

TABULATED CROP SUMMARY FOR THE YEAR 1918—PART II—Continued.

Counties	Rye		Flax Seed		Potatoes		Hay—Tame		Hay—Wild		Alfalfa	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Tons per acre	Total Tons	Tons per acre	Total Tons	Tons per acre	Total Tons
Osceola	10	600	10	1,950	130	112,100	1.7	20,900	1.3	9,600	5.0	650
Page	18	7,920	....	.....	26	14,000	0.7	14,500	0.8	1,960	1.9	5,580
Palo Alto	24	7,200	7	2,940	62	39,100	1.0	13,400	1.0	18,000	3.2	610
Plymouth	25	6,000	....	.....	86	130,700	1.5	30,500	1.4	21,650	3.0	21,380
Pocahontas	25	6,750	12	1,380	57	47,300	1.1	19,700	0.9	7,220	2.6	380
Polk	20	11,000	....	.....	58	65,800	1.2	30,600	1.0	3,000	2.6	960
Pottawattamie	15	7,650	....	.....	51	106,800	1.1	27,000	1.1	7,200	2.4	30,380
Poweshiek	20	2,000	....	.....	60	46,800	1.7	39,400	1.2	120	2.0	130
Ringgold	14	4,900	....	.....	55	14,800	0.6	18,200	1.2	190	1.2	40
Sac	20	200	....	.....	54	40,000	1.3	30,800	1.5	6,040	2.7	1,220
Scott	20	45,400	....	.....	86	257,800	1.3	21,300	1.3	2,310	3.0	2,200
Shelby	28	2,240	....	.....	40	44,400	0.5	14,900	1.0	3,820	2.5	8,920
Sioux	....	.....	....	.....	120	150,000	1.7	27,200	1.4	19,630	2.8	13,520
Story	28	840	12	60	87	16,500	1.1	33,600	0.7	1,910	2.6	220
Tama	25	5,500	....	.....	60	74,400	1.4	43,200	1.4	1,540	3.0	180
Taylor	10	3,400	....	.....	27	15,100	1.0	21,000	....	270	2.0	600
Union	27	1,620	....	.....	39	28,000	0.7	13,800	1.0	710	1.6	130
Van Buren	16	18,080	....	.....	66	10,600	1.2	35,200	1.5	40	2.2	420
Wapello	23	9,890	....	.....	54	52,400	0.9	22,300	1.5	20	2.2	370
Warren	20	8,200	....	.....	43	23,200	1.1	27,300	2.5	1,000	3.0	690
Washington	18	5,760	10	120	90	46,800	1.5	20,100	1.7	20	2.1	190
Wayne	18	2,520	....	.....	57	1,700	0.9	27,600	1.0	50	2.5	50
Webster	25	1,000	14	420	49	49,500	1.4	29,800	1.3	11,460	1.5	630
Winnebago	25	500	12	9,720	118	158,100	1.7	32,000	1.3	25,100	4.0	120
Winneshiek	23	7,590	12	2,280	121	158,500	1.9	102,600	1.5	8,860	2.6	40
Woodbury	19	1,330	12	180	73	11,300	1.7	28,900	1.1	10,870	3.3	51,250
Worth	18	1,400	7	10,640	128	102,100	1.5	44,400	1.6	15,420	3.0	240
Wright	18	720	12	2,580	88	62,500	1.7	42,000	1.4	9,580	3.1	310
	18.1	905,850	10.1	87,450	76.1	7,304,750	1.3	3,357,100	1.2	504,580	2.8	229,110