

U. S. DEPARTMENT OF AGRICULTURE  
WEATHER BUREAU AND  
BUREAU OF CROP ESTIMATES

In Co-operation with the

**IOWA WEATHER AND CROP SERVICE**

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**Annual Report for 1919**

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**CHARLES D. REED, M. Sc. Agr.**

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Published by  
THE STATE OF IOWA  
Des Moines

LETTER OF TRANSMITTAL.

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

SIR: In compliance with the requirements of the law, I have the honor to submit herewith the thirtieth annual report of the Iowa Weather and Crop Service for the year 1919.

CHARLES D. REED, *Director.*

Des Moines, Iowa, January 20, 1920.

## HISTORICAL DATA.

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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 co-operate 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 until March 31, 1918, when he resigned and was succeeded by Charles D. Reed.

### OFFICE FORCE, DECEMBER 31, 1919.

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

## IMPORTANT ANNOUNCEMENT.

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In order to improve the accuracy and more completely cover the field of the official crop reports for Iowa, avoid duplication of effort and render the greatest possible service to the agricultural interests of the State, the crop reporting work of the State and Federal Departments of Agriculture has been combined and hereafter joint State and Federal crop reports will be issued monthly or as required, from Des Moines.

Telegraphic reports of crops in other states and for the United States as a whole will be received from Washington. This information will be made available to every farmer in the State through official bulletins and the daily, weekly and agricultural press. Plans are also under way to obtain and disseminate more complete data regarding live stock production.

Nearly 3,500 persons, mostly farmers, are making regular reports when required concerning crop and live stock conditions in Iowa. These reports are handled by expert statisticians and are supplemented by special reports from trained field agents who spend most of their time in the field making personal observations. No other organization, public or private, is better equipped for the work of reporting on crop conditions and prospects than the combination above described.

## ANNUAL REPORT, 1919.

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 co-operation with the Weather Bureau of the United States Department of Agriculture for the year 1919.

Late in the year 1919 co-operation with the Federal Government was extended to include the Bureau of Crop Estimates, U. S. Department of Agriculture, through its Iowa Field Agent, Mr. Frank S. Pinney, in the collection of acreage, condition, yield and other crop statistics. The revised acreage table and final tabulated crop summary herein published are the result of this co-operative effort.

The effect of the weather on crops will, as heretofore, be published in co-operation with the United States Weather Bureau.

The regular meteorological, climatological and crop statistical work was maintained with more completeness and efficiency than in 1918, though the general condition of unrest among the people caused many persons to cease co-operation with this service and more than usual difficulty was experienced in finding co-operative observers.

Publications were distributed as follows: Monthly Climatological Data, about 17,000 copies; Weekly Weather-Crop Bulletins, about 20,000; Daily Weather Forecast Cards, to 1,514 addresses; and Rural Delivery Slips to 814 addresses. Five hundred copies of the monthly reports are distributed each month through the United States Department of Agriculture Weather Bureau to scientific institutions and libraries in this and foreign countries.

Daily weather forecasts were distributed by telegraph at the expense of the U. S. Weather Bureau to 82 towns. From these towns the forecasts are made available by free telephone to 132,544 subscribers, largely rural.

Frost warnings are sent when necessary during the fruit blooming season to all orchardists in the State prepared to use orchard heaters and who make application in advance for the service.

Increased transportation by automobile and motor truck has created a great demand for information as to the condition of roads.

From April 1st to September 30th, daily rainfall reports are telegraphed at the expense of the U. S. Weather Bureau from 26 Iowa towns to the central station at Des Moines. Many local and long-distance calls are answered as to desirable detours to avoid wet areas. A special Highway Weather Service was begun late in the year by the U. S. Weather Bureau Office in Charles City.

## CLIMATOLOGY OF THE YEAR 1919.

The mean temperature,  $48.6^{\circ}$ , is  $1.2^{\circ}$  above normal. January, February, March, June, July and September were above normal; the other months below. The highest temperature recorded was  $104^{\circ}$  at Webster City on July 30th and Keosauqua on July 31st. The lowest was  $-36^{\circ}$  at Thurman, on December 10th. The period, December 1, 1918, to March 31, 1919, was milder than any other similar period of record; and the period, February 1st to April 30th, was wetter. The total precipitation averaged 36.76 inches, or 4.79 inches above normal.

Spring work was backward; grasses and winter grains made luxuriant growth. Wheat was seriously damaged by high temperatures and high humidities in June. Harvest and threshing were early. Potatoes were practically a failure, due to hot, dry weather August 14th to September 17th. Corn husking was delayed by wet weather in the latter part of September and October.

*Barometer (reduced to sea level).* The average pressure of the atmosphere for the year was 30.04 inches. The highest pressure was 30.98 inches, at Keokuk, on December 10th. The lowest pressure was 28.96 inches, at Omaha, Neb., on February 13th. The range for the State was 2.02 inches.

*Temperature.* The mean temperature for the State was  $48.6^{\circ}$  or  $1.2^{\circ}$  above the normal. The highest annual mean was  $53.2^{\circ}$ , at Keokuk, Lee County. The lowest annual mean was  $45.3^{\circ}$ , at Britt, Hancock County, and in Clayton County near Postville. The highest temperature reported was  $104^{\circ}$ , at Webster City on July 30th and Keosauqua on July 31st. The lowest temperature reported was  $-36^{\circ}$  at Thurman, Fremont County, on December 10th. The range for the State was  $140^{\circ}$ .

*Precipitation.* The average amount of rainfall and melted snow for the year was 36.76 inches, or 4.79 inches more than the normal, and 3.98 inches more than the average for 1918. The greatest amount at any station was 48.16 inches, at Creston, Union County, and the least amount was 26.88 inches, at Britt, Hancock County. The greatest monthly precipitation was 12.25 inches, at Alta, Buena Vista County, in June. The least amount was a trace, at several stations in January. The greatest amount in any 24 consecutive hours was 5.52, at Grinnell, on September 30th.

Measurable precipitation occurred on an average of 95 days, 3 days more than in 1918 and 10 days more than normal.

*Snowfall.* The average amount of snowfall was 26.6 inches. The greatest amount reported from any station was 44.5 inches at Sioux Center, Sioux County, and the least amount was 7.1 inches at Keokuk, Lee County. The greatest monthly snowfall was 18.0 inches at Sibley, Osceola County, in February.

*Wind.* The prevailing direction of the wind was from the southeast. The highest velocity reported was 63 miles an hour from the southwest at Keokuk, Lee County, on November 10th.

*Sunshine and Cloudiness.* The average number of clear days was 169; partly cloudy, 94; cloudy, 102; as against 173 clear; 97 partly cloudy, and 95 cloudy days in 1918. The average percentage of the possible amount of sunshine was 59 or about 2 per cent less than the normal.

## MONTHLY SUMMARIES.

### JANUARY.

The mean temperature, 26.8°, is the highest of the 30 Januarys of state-wide record, the excess in temperature being about 14 degrees in Emmet county in the north and about 4 degrees in Wayne county in the south. The first five days were severely cold with temperatures as much as 30 degrees below normal; the last 16 days were remarkably mild, several days being more than 20 degrees above normal.

This was the driest January of record. Most of the precipitation occurred in the snowstorm that was in progress at the close of the preceding month, though small, scattered amounts occurred, 4th-7th and 20th-23d. The number of clear days, 20, is the greatest record in January. The snow covering disappeared in the Missouri slope counties by about the 8th but persisted till the 21st-24th over a belt extending from Keokuk and Washington counties northeast over Clayton and Dubuque counties. The ground was not deeply frozen at any time, and during the last week very little frost remained in the ground, plowing was done, shrubs were set out and dandelions bloomed and formed their white seed balls. Buds were much swelled and some fear is entertained for their safety. Maple sap ran for a few days. Winter wheat is believed to be in good condition, though there were some adverse reports of heaving due to alternate freezing and thawing. Practically no ice has been harvested. Brisk marketing early in the month was prevented by bad roads after the 15th. Building was unusually active for January.

*Pressure.* The mean pressure (reduced to sea level) for the state was 30.10 inches. The highest recorded was 30.65 inches, at Omaha, Neb., and Sioux City, on the 3d, and the lowest was 29.68 at Sioux City on the 24th. The monthly range was 0.97 inch.

*Temperature.* The mean temperature for the state, as shown by the records of 102 stations, was 26.8°, or 8.9° higher than the normal. By divisions, three tiers of counties to the division, the means were as fol-

lows: Northern, 25.2°, or 10.6° higher than the normal; Central, 27.0°, or 8.8° higher than the normal; Southern, 28.2°, or 7.3° higher than the normal. The highest monthly mean was 31.9° at Omaha, Neb., and the lowest monthly mean was 22.4°, at Northwood. The highest temperature reported was 64°, at Centerville, on the 19th, and the lowest temperature reported was -32° at Maquoketa on the 4th. The temperature range for the State was 96°.

*Humidity.* The average relative humidity for the State at 7 a. m. was 86 per cent, and at 7 p. m. it was 76 per cent. The mean for the month was 81 per cent, or about 1 per cent lower than the normal. The highest monthly mean was 87 per cent, at Charles City, and the lowest was 78 per cent, at Keokuk.

*Precipitation.* The average precipitation for the state, as shown by the records of 110 stations, was 0.24 inch, or .81 inch less than the normal. By divisions the averages were as follows: Northern, 0.31 inch, or 0.53 inch less than the normal; Central, 0.22 inch or 0.89 inch less than the normal; Southern, 0.19 inch, or 1.00 inch less than the normal. The greatest amount, 0.86 inch occurred at Nora Springs, and the least, a trace at Chariton, Mt. Pleasant, Olin, Tipton, Stockport and Winterset. The greatest amount in any 24 consecutive hours, 0.62 inch, occurred at Nora Springs on the 1st.

*Snow.* The average snowfall for the state was 2.8 inches or 4.1 inches below the normal. The greatest amount, 12.2 inches, occurred at Lansing, and the least, a trace at six stations.

*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 42 miles per hour from the northwest at Sioux City, on the 4th.

*Sunshine and Cloudiness.* The average percentage of the possible amount of sunshine was 68, or 18 per cent higher than the normal. The percentage of the possible amount at the several regular Weather Bureau stations was as follows: Charles City, 55; Davenport, 64; Des Moines, 73; Dubuque, 64; Keokuk, 76; Sioux City, 75; Omaha, Neb., 71. Clear days average 20; partly cloudy 5, and cloudy 6.

*Miscellaneous Phenomena.* Aurora, 1st, 3d, 4th. Fog, dense, 11th, 12th, 15th, 18th, 19th, 20th, 21st, 22d, 23d, 24th, 27th. Halo, lunar: 6th, 9th, 10th, 11th, 13th, 16th, 18th. Halo, solar: 1st, 2d, 8th, 11th, 17th, 18th. Parhelia: 1st, 2d, 8th, 13th.

## COMPARATIVE DATA FOR THE STATE—JANUARY.

YEAR	Temperature				Precipitation				Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre- cip., or in, or more	Clear	Partly cloudy
1890	19.7	+ 1.8	61	-27	2.03	+0.08	3.46	0.35	-----	-----	4	13
1891	26.0	+ 8.1	58	-4	1.75	+0.70	3.99	0.61	-----	-----	5	16
1892	15.3	-2.6	76	-38	1.09	+0.04	3.13	0.10	6.9	-----	6	11
1893	9.3	-8.6	54	-34	0.74	-0.31	3.20	0.13	6.9	-----	6	11
1894	19.3	+ 1.4	69	-37	1.09	+0.04	2.24	0.31	6.0	-----	5	14
1895	13.6	-4.3	68	-31	0.85	-0.20	2.65	0.09	8.7	-----	4	15
1896	23.4	+ 5.5	68	-20	0.48	-0.57	2.10	T.	2.8	-----	10	10
1897	17.2	-0.7	60	-30	2.01	+0.96	6.16	0.15	8.2	-----	7	12
1898	23.4	+ 5.5	62	-11	1.60	+0.55	5.32	T.	12.6	-----	5	15
1899	19.8	+ 1.9	68	-34	0.28	-0.77	1.15	T.	1.5	-----	3	15
1900	25.6	+ 7.7	66	-20	0.53	-0.52	2.47	T.	2.3	-----	3	16
1901	23.7	+ 5.8	60	-21	0.74	-0.31	2.34	0.04	6.2	-----	4	14
1902	22.4	+ 4.5	63	-31	0.88	-0.17	2.83	0.19	9.4	-----	4	13
1903	23.0	+ 5.1	60	-12	0.28	-0.77	1.46	T.	2.0	-----	6	12
1904	14.0	-3.9	57	-32	1.18	+0.13	3.68	0.02	6.1	-----	7	14
1905	11.2	-6.7	56	-30	0.91	-0.14	1.82	0.12	11.1	-----	5	14
1906	24.6	+ 6.7	69	-19	1.52	+0.47	4.71	0.28	11.3	-----	7	8
1907	18.8	-0.9	68	-22	1.52	+0.47	5.39	0.10	6.0	-----	2	17
1908	24.9	+ 7.0	69	-18	0.44	-0.01	1.50	0.06	4.6	-----	6	9
1909	21.2	+ 3.3	72	-25	1.66	+0.61	3.74	0.41	7.8	-----	6	13
1910	18.1	+ 0.2	56	-35	1.57	+0.52	3.15	0.55	12.6	-----	6	13
1911	20.2	+ 2.3	66	-35	0.97	-0.08	1.73	T.	7.3	-----	5	9
1912	4.2	-13.7	49	-47	0.53	-0.52	1.90	T.	5.5	-----	5	14
1913	20.9	+ 3.0	62	-25	0.77	-0.28	2.05	0.04	7.2	-----	5	11
1914	27.8	+ 9.9	64	-19	0.88	-0.17	2.34	0.27	5.1	-----	5	13
1915	17.5	-0.4	59	-32	1.63	+0.53	3.15	0.10	7.3	-----	10	12
1916	17.8	-0.1	63	-34	2.62	+1.57	6.07	0.85	7.2	-----	4	17
1917	17.0	-0.9	60	-28	0.83	-0.22	2.07	0.17	7.2	-----	2	20
1918	26.8	+ 8.9	64	-32	0.24	-0.81	0.86	T.	2.8	-----	2	20

T Indicates an amount too small to measure, or less than .005 inch precipitation, and less than .06 inch snowfall.

## FEBRUARY.

Mild weather prevailed, except cold periods, 4th-9th and 24th-28th. No severely cold weather occurred; below zero temperatures were infrequent and were not reported at all in the southeastern counties. Temperature excesses of 5 to 8 degrees occurred in the southern tiers of counties but in the northern tier the temperature was nearly normal.

Precipitation was in excess of the normal, except the extreme southeast corner of the State, and was generally well distributed as to frequency and area. A heavy rain, generally exceeding one inch, occurred on the 13th-14th, turning to snow. Snowfall ranged from approximately 5 inches in Harrison, Greene, Boone, Clinton and Keokuk counties, to 18 inches in Osceola County. The ground was snow-covered less than five days in some of the extreme southern and eastern counties and about 25 days in Emmet and Dickinson Counties in the northwest. During a general storm that was moving eastward over this part of the country, on the 13th-14th, a copious deposit of dust or sediment occurred, which from its peculiar reddish color and crystalline structure, as revealed by microscopic examination, is believed to have been transported from the far west.

The mild, moist winter is believed to have brought winter wheat, rye and grasses through in good condition. Fruit buds, though abnormally swelled, are believed safe, except possibly peaches in the south. In the

southern and eastern counties, the ice harvest was the smallest in years and a large quantity has been shipped in from the north. The roads were generally bad.

**Pressure.** The mean pressure (reduced to sea level) for the State was 30.00 inches. The highest recorded was 30.61 inches, at Dubuque, on the 19th, and the lowest was 28.96, at Omaha, Neb., on the 13th. The monthly range was 1.65 inches.

**Temperature.** The mean temperature for the State, as shown by the records of 97 stations, was 24.9°, or 4.4° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 20.7°, or 3.6° higher than the normal; Central, 25.3°, or 4.6° higher than the normal; Southern, 28.8°, or 5.2° higher than the normal. The highest monthly mean was 31.4°, at Keokuk and Burlington, and the lowest monthly mean was 16.2°, at Sibley. The highest temperature reported was 65°, at Fairfield and Ottumwa, on the 11th, and the lowest reported was -16°, at Spencer, on the 9th. The temperature range for the State was 81°.

**Humidity.** The average relative humidity for the State at 7:00 a. m. was 86 per cent, and at 7:00 p. m. it was 76 per cent. The mean for the month was 81 per cent, or about 1 per cent higher than the normal. The highest monthly mean was 87 per cent, at Charles City, and the lowest was 77, at Omaha, Neb.

**Precipitation.** The average precipitation for the State, as shown by the records of 102 stations, was 2.42 inches, or 1.27 inches more than the normal. By divisions, the averages were as follows: Northern, 2.37 inches, or 1.46 inches more than the normal; Central, 2.50 inches, or 1.30 inches more than the normal; Southern, 2.40 inches, or 1.05 inches more than the normal. The greatest amount, 4.12 inches, occurred at Nora Springs, and the least, 1.09 inches, at Lansing. The greatest amount in any 24 consecutive hours, 2.10 inches, occurred at Glenwood on the 13th.

**Snow.** The average snowfall for the State was 9.9 inches, or 2.5 inches more than the normal. The greatest amount, 18.0 inches, occurred at Sibley, and the least, 3.8 inches, at Logan.

**Wind.** The prevailing direction of the wind was from the northwest. The highest velocity reported from a regular Weather Bureau station was 43 miles an hour from the west at Keokuk on the 28th.

**Sunshine and Cloudiness.** The average per cent of the possible amount of sunshine was 51, or about 5 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 46; Davenport, 46; Des Moines, 46; Dubuque, 52; Keokuk, 58; Sioux City, 57; Omaha, Neb., 49.

**Miscellaneous Phenomena.** Aurora, observed at Atlantic on the 6th; Nora Springs on the 21st; and Alta, Oskaloosa and Pella on the 28th. Dust, (red) 13th, 14th. Fog, 5th, 12th. Hail, 2d, 3d, 12th, 13th. Halo, (lunar or solar) 6th, 12th, 16th, 19th, 25th, 27th. Sleet, 2d, 3d, 12th, 13th, 18th, 20th, 28th. Thunderstorm, 3d, 13th.

## COMPARATIVE DATA FOR THE STATE—FEBRUARY.

COMPARATIVE DATA FOR THE YEAR 1919														
YEAR	Temperature					Precipitation				Number of Days				
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre-.01	Clear	Partly cloudy	Cloudy	
										in. or more				
1890.....	26.0	+ 5.5	67	-24	0.83	-0.32	2.18	0.11	-----	3	13	7	8	
1891.....	19.4	+ 1.1	70	-31	1.16	+0.01	2.41	0.55	5.0	6	6	7	8	
1892.....	28.1	+ 7.6	68	-20	1.20	+0.05	2.15	0.12	5.0	6	10	8	10	
1893.....	16.4	- 4.1	60	-23	1.39	-0.24	2.91	0.06	8.1	3	16	8	4	
1894.....	19.7	+ 0.8	60	-19	0.89	-0.26	2.41	T. 8.4	3	16	8	10	10	
1895.....	16.4	- 4.1	73	-33	0.49	-0.66	1.34	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	-0.29	1.81	0.22	8.0	5	6	10	12	
1898.....	24.2	+ 3.7	62	-18	1.20	+0.05	3.05	0.10	7.8	5	10	9	9	
1899.....	12.8	- 8.3	75	-40	0.89	-0.29	4.32	0.12	7.1	5	11	10	7	
1900.....	14.8	- 5.7	60	-27	1.30	+0.15	4.57	0.18	9.9	3	10	8	10	
1901.....	17.5	- 3.0	49	-21	1.01	-0.14	3.00	0.12	9.7	4	15	7	5	
1902.....	17.6	- 2.9	62	-21	0.73	-0.42	2.39	0.02	2.6	4	13	8	7	
1903.....	19.8	- 0.7	56	-21	1.18	+0.03	3.25	0.30	7.9	4	13	7	8	
1904.....	14.8	- 5.7	70	-26	0.41	-0.74	1.99	T. 4.5	4	10	9	10	10	
1905.....	22.8	+ 7.7	69	-41	1.57	+0.42	2.97	0.44	15.5	7	14	6	8	
1906.....	23.6	+ 3.1	63	-32	1.29	+0.14	2.91	0.20	6.1	5	14	7	7	
1907.....	25.0	+ 4.5	65	-31	0.71	-0.44	1.95	0.06	4.6	4	14	6	8	
1908.....	24.3	+ 3.8	59	-16	1.09	+0.54	3.95	0.23	8.9	6	12	6	11	
1909.....	20.2	+ 5.7	62	-29	1.54	+0.89	4.72	0.30	7.7	5	11	6	11	
1910.....	17.8	- 2.7	68	-21	0.46	-0.69	2.09	T. 4.0	3	14	8	6	6	
1911.....	27.3	+ 6.8	71	-13	2.76	+0.61	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	-24	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	0.82	9.2	6	10	9	9	
1915.....	29.1	+ 8.6	62	- 8	2.63	+1.78	5.39	0.48	9.4	9	9	5	14	
1916.....	19.0	- 1.5	62	-32	0.55	-0.60	1.33	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	6	
1918.....	23.0	+ 2.5	70	-36	0.95	-0.20	2.10	0.09	6.9	5	14	7	7	
1919.....	24.9	+ 4.4	65	-16	2.42	+1.27	4.12	1.09	9.9	8	11	5	12	

T Indicates an amount too small to measure, or less than .005 inch precipitation, and less than .06 inch snowfall.

## THE WINTER OF 1918-1919.

The mean temperature for the three winter months was 28.1°, which is 7.3° above the normal for the State, and 2.1° warmer than the warmest of the 29 winters of record, 1907-8. The highest temperature reported was 68° at Columbus Junction, Louisa County, on December 8. The lowest temperature reported was 32° below zero at Maquoketa, Jackson County, on January 4.

The average monthly precipitation for the State was 1.32 inches, and the average total precipitation was 3.95 inches, or 0.53 inch more than the winter normal. The average total snowfall, unmelted, was 17.9 inches, or 2.6 inches less than the normal and 6.0 inches less than the average fall for the winter of 1917-18.

The total number of days with .01 inch or more of precipitation was 18, or the same as the average for the winter of 1917-18. The average number of clear days was 40, partly cloudy, 18, cloudy, 32, as compared with 37 clear, 24 partly cloudy and 29 cloudy days during the winter of 1917-18.

## MARCH.

March came in with a cold wave and temperatures of zero or lower at nearly all stations, but temperatures were generally above normal after the

10th, and the mean temperature was above normal at all stations, the greatest excess being about 6° from southern Harrison County southeast to Page County. The mean temperature, December to March, inclusive, was 30.4°, or 6.5° higher than the normal and 1.4° warmer than the warmest similar period heretofore (1907-8) in 29 years. The ground was not frozen deeply at any time and plowing was done at intervals in each of the winter months.

Snow occurred at most stations on the 4th or 6th-7th and heavy rains 14th-16th. The total precipitation was slightly below the normal from the middle-western counties northeast to the north-central counties; also in the extreme northeast and southeast. An excess of over 2 inches occurred in Polk, Warren, and the southern portions of Marion and Mahaska Counties.

The ground was snow-covered in nearly all portions of the State during the prevalence of zero temperatures at the beginning of the month. In the Big Sioux Valley and east through the northern two tiers of counties and from Polk and Warren Counties northeast to the Mississippi River the snow covering continued from 7 to 10 days.

The soil was more than usually moist throughout the winter, but dried rapidly after March 16. Seeding was half finished at the close of the month and beginning in the central counties. Winter wheat never looked better. Rye, grasses, clover, alfalfa and fruits were in very good condition. Very little winter-killing was reported.

About 6 p. m. of the 15th a tornado occurred at Toronto, Iowa, causing damage to buildings estimated at \$2,000. About 3:30 p. m. of that date a small tornado moved from southwest to northeast between Des Moines and Fort Des Moines, damaging residences, barns and out-buildings about \$3,000.

Sleet globules falling at Oskaloosa on the morning of the 4th had a pinkish tint due to dust particles washed from the air by the raindrops before they became frozen. Microscopic examination of the dust indicated that it was of Rocky Mountain origin, having been transported by a large general storm that passed eastward over the state on the 3d-4th.

**Pressure.** The mean pressure (reduced to sea level) for the State was 30.17 inches. The highest recorded was 30.80 inches, at Charles City, on the 21st; and the lowest was 29.47 inches, at Sioux City, on the 14th. The monthly range was 1.33 inches.

**Temperature.** The mean temperature for the State, as shown by the records of 103 stations, was 37.5°, or 4.2° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 34.7°, or 4.3° higher than the normal; Central, 37.6°; or 4.0° higher than the normal; Southern, 40.2°, or 4.3° higher than the normal. The highest monthly mean was 43.0°, at Keokuk, and the lowest monthly mean was 30.6°, at Sibley. The highest temperature reported was 78°, at Thurman, on the 19th. The lowest temperature reported was -11°, at Inwood on the 1st.

**Humidity.** The average relative humidity for the State at 7 a. m. was 83 per cent, and at 7 p. m. it was 68 per cent. The mean for the month was 76 per cent, or about 2 per cent higher than the normal. The highest monthly mean was 80 per cent, at Charles City, and the lowest was 71 at Keokuk.

**Precipitation.** The average precipitation for the State, as shown by the records of 109 stations, was 2.33 inches, or 0.56 inch more than the normal. By divisions the averages were as follows: Northern, 1.58 inches, or 0.05 inch more than the normal; Central, 2.44 inches, or 0.57 inch more than the normal; Southern, 2.98 inches, or 1.06 inches more than the normal. The greatest amount, 5.40 inches, occurred at Lacona, and the least, 0.81 inch at Spencer. The greatest amount in any 24 consecutive hours, 3.50 inches, occurred at Muscatine on the 16th.

**Snow.** The average snowfall for the State was 1.1 inches, or 4.2 inches less than the normal. The greatest amount, 5.5 inches occurred at Rock Rapids. Fourteen stations reported no snow, and 20 stations reported only a trace.

**Wind.** The prevailing direction of the wind was from the southeast. The highest velocity reported from a regular Weather Bureau station was at the rate of 45 miles an hour from the southeast, this occurring at Sioux City on the 14th.

**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, 54; Des Moines, 62; Dubuque, 63; Keokuk, 67; Sioux City, 60; Omaha, Neb., 62.

**Rivers.** Stages above normal prevailed in most of the interior rivers of the State during the winter, which was so mild that in the central and southern portions the rivers remained open much of the time and there was no well-defined spring breakup. Heavy rains, March 14-16, caused marked rises in all of the rivers. The smaller streams of the eastern parts of the State overflowed and caused some damage by washouts and interfering with railway traffic. Three persons were drowned near Waukon, Allamakee County, while crossing what had been a dry run before the storm. The Des Moines River at Des Moines reached a crest stage of 8.4 feet, 8.6 feet below flood stage, on the 19th, but about 50 miles down stream where the drainage area received heavier rains the flood stage was reached. At Ottumwa it rose 8.8 feet to a crest stage of 13.2 feet, 3.2 feet above flood stage, on the 18th. Moderate crests passed down the boundary rivers between the 19th and 24th.

**Miscellaneous Phenomena.** Aurora, 1st, 5th, 8th, 12th, 19th, 20th, 21st, 27th, 28th, 31st. Birds: (migration of) Corydon, robins and bluebirds on the 10th; Earlham, bluebirds on the 9th, robins and meadow larks on the 13th, wild geese and ducks on the 13th; Murray, robins and bluebirds on the 8th; Boone, robins on the 11th, bluebirds on the 12th; Whitten, robins on the 10th; Nora Springs, robins and meadow larks on the 23d; Pocahontas, robins, meadow larks and wild ducks on the 13th and 14th; Postville, bluebirds on the 12th, robins on the 15th, blackbirds, on the 16th; Sanborn,

robins on the 15th. Corona, 9th, 12th. Dust, (red) 4th. Fog, 8th, 9th, 13th, 14th, 15th, 20th, 25th, 30th. Hail, 4th, 9th, 14th, 15th. Halo, (lunar or solar) 6th. Parbelia, 6th, 17th. Sleet, 4th, 6th, 7th, 8th, 10th, 15th, 26th. Thunderstorms, 4th, 14th, 15th, 16th, 25th, 29th, 30th. Tornadoes, 15th.

COMPARATIVE DATA FOR THE STATE—MARCH.

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.....	28.0	-5.3	75	-24	1.57	-0.20	3.67	0.32	-----	-----	-----	-----	-----
1891.....	26.8	-6.5	66	-19	2.60	+0.33	4.58	1.53	-----	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	0.83	-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	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	5.25	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	1.38	-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	65	-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	0.00	T.	1	23	6	2
1911.....	39.4	+6.1	83	-2	0.93	-0.84	4.84	T.	1.9	5	16	9	8
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	-5	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.....	34.6	+1.3	85	-12	1.84	+0.07	4.35	0.57	6.2	6	14	8	9
1918.....	42.9	+9.6	85	-0	0.63	-1.14	2.12	0.03	2.6	3	19	7	5
1919.....	37.5	+4.2	78	-11	2.33	+0.56	5.40	0.81	1.1	6	15	8	8

T indicates an amount too small to measure, or less than .006 inch precipitation, and less than .05 inch snowfall.

## APRIL.

For the State as a whole, April temperature was nearly normal, though deficiencies approximating 2° occurred from Union County northeast through Dallas to southern Hardin County and from Webster northeast to Worth, while excesses in the eastern portion were greatest (about 2 degrees) in Linn County. Temperatures, 5th-7th, the warmest period, were 10 to 18 degrees above normal, while during a cold period, 24th-26th, they were about as much below normal with readings low in the twenties and heavy to killing frosts in nearly all sections. Fortunately, nothing was far enough advanced to be seriously damaged except fruit in Scott and possibly some nearby counties.

Showers were frequent and heavy. The average number of rainy days, 14, exceeds the previous April record which was 12 in 1909; while the amount of precipitation has been exceeded only in 1896 and 1897. Rain

fell some place in the State every day except the 25th. Downpours on the 23d damaged roads and railways and eroded and flooded fields in portions of Shelby, Audubon, Guthrie, Carroll and Greene Counties. Heavy rains occurred in many sections on the 7th and 9th. Precipitation was above normal in all but Lee and Des Moines Counties, the greatest excesses, 5 to nearly 7 inches, being in Adair and Cass counties.

A small tornado struck about two miles south of Grandmead, Clinton County, on the afternoon of the 23d, but damage was confined to trees and small buildings. The Omaha tornado of the 6th seems to have done no material damage after crossing the Missouri river.

Field work was greatly delayed by the frequent rains and wet soil, not more than 5 or 6 days being suitable. Not more than 60 per cent of the intended oats acreage had been seeded up to the close of the month and much that was seeded before the heavy rains set in on the 7th lay uncovered on the ground and thus germinated without the possibility of disking or harrowing. Considerable of the pledged and intended spring wheat acreage could not be seeded and will be devoted to other crops, mostly corn. Winter wheat stood freely, made rank growth and was a foot high and beginning to joint in the southern counties. It was feared that the rank growth would cause it to lodge and that the indicated excess of straw would reduce the yield of grain. Pasturing and clipping with mowers was resorted to in some localities. Only about 40 per cent of the spring plowing was done and practically no corn planting. Blooming of fruit trees was beneficially retarded, though in the southern tier of counties the blossoms opened and received the first spray. The wet, cloudy weather was detrimental to the pig crop. Sunshine averaged 44 per cent of the possible amount or 16 per cent below normal.

**Pressure.** The mean pressure, (reduced to sea level), for the State was 29.97 inches. The highest recorded was 30.66 inches, at Sioux City on the 24th, and the lowest was 29.23 inches at Omaha, Nebr., on the 6th. The monthly range was 1.43 inches.

**Temperature.** The mean temperature for the State, as shown by the records of 103 stations, was 48.4°, or 0.3° lower than normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 46.5°, or 0.2° lower than the normal; Central, 48.7° or 0.2° lower than the normal; Southern, 50.0°, or 0.6° lower than the normal. The highest monthly mean was 52.9° at Keokuk, and the lowest was 43.3°, at Northwood. The highest temperature reported was 81°, at Fairfield on the 6th, and the lowest was 20° at Fayette, Maquoketa and Earlham, on the 1st. The temperature range for the State was 61°.

**Humidity.** The average relative humidity for the State at 7 a. m. was 81 per cent; and at 7 p. m. it was 66 per cent. The mean for the month was 74 per cent, or about 7 per cent above the normal. The highest monthly mean was 78 per cent at Omaha, Nebr., and the lowest was 65 per cent, at Dubuque.

**Precipitation.** The average precipitation for the State, as shown by the records of 103 stations, was 4.78 inches, or 1.92 inches more than the

normal. By divisions the averages were as follows: Northern, 4.32 inches, or 1.64 inches more than the normal; Central, 4.81 inches, or 1.95 inches more than the normal; Southern, 5.22 inches, or 2.17 inches more than the normal. The greatest amount, 9.00 inches, occurred at Cumberland, and the least, 1.94 inches, at Keokuk. The greatest amount in any 24 consecutive hours, 3.05 inches, occurred at Greenfield, on the 21st-22d.

**Snow.** The average snowfall for the State was 0.7 inch, or 1.1 inches less than the normal. The averages by divisions were: Northern, 1.6 inches; Central, 0.5 inch; Southern, a trace. The greatest amount, 9.0 inches, occurred at Sioux Center.

**Wind.** The prevailing direction of the wind was from the southeast. The highest velocity reported from a regular Weather Bureau station was at the rate of 45 miles an hour from the northwest at Sioux City on the 5th.

**Sunshine and Cloudiness.** The average per cent of the possible amount of sunshine was 44, or about 16 per cent below normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 39; Davenport, 44; Des Moines, 48; Dubuque, 46; Keokuk, 52; Sioux City, 35; Omaha, Neb., 41. Clear days averaged, 8; partly cloudy, 8; cloudy, 14.

**Miscellaneous Phenomena.** Aurora, 15th, 18th, 22d. Birds, (Migration of): Earliham, mocking birds, 21st, whippoorwills, 22d, wrens, 28th. Corona, 5th. Fog, 2d, 3d, 4th, 5th, 29th, 30th. Halo, (lunar or solar): 2d, 4th, 5th, 6th, 7th, 9th, 10th, 12th, 16th, 18th, 21st, 22d, 23d. Hall, 2d, 5th, 6th, 7th, 9th, 10th, 12th, 16th, 21st, 22d, 23d. Sleet: 8th, 9th, 10th, 15th, 16th, Thunderstorms, 1st, 2d, 3d, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 13th, 14th, 15th, 16th, 21st, 22d, 23d, 24th, 28th, 29th. Tornado, 6th, 23d.

**Rivers.** River stages were generally above normal throughout the month. The Missouri touching Iowa did not closely approach flood stage. The Mississippi did not reach flood stage above Le Claire, though in Dubuque cellars of some wholesale houses were flooded when a stage of 16.6 feet was reached on the 22d-23d. Damage was averted by preventive measures taken on warnings given 10 days in advance by the Dubuque Weather Bureau Office. The highest stage at Clinton, 15.4 feet on the 24th was 0.6 foot below flood stage. At Muscatine the highest stage, 15.8 feet on the 26th, was 0.2 foot below flood stage. At Le Claire the highest stage, 10.7 feet, 0.7 foot above flood stage, was reached on the 29th, and a dam that is being constructed to improve navigation was damaged. Keokuk passed the flood stage, 14 feet, on the 21st and reached a stage of 16.2 on the 27th-28th. There was considerable overflow of both the Des Moines and Mississippi rivers in that vicinity.

Interior rivers, though high, were generally below flood stage except the Des Moines River from Ottumwa to the mouth. Flood stages (10 feet or higher) prevailed at Ottumwa, 24th-27th, with a crest stage of 12.0 feet on the 26th.

**Wettest Period.** More precipitation fell and more days were rainy in the period February 1-April 30 in Iowa than in any other similar period in the 30 years since statewide records have been compiled; 9.53 inches

falling on 28 days, or 3.75 inches and 9 days above the respective normals. The precipitation is 165 per cent of the normal. The year 1897 has held the record heretofore with 8.63 inches and 24 rainy days.

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
1800	51.8	+3.1	88	2	1.80	-1.06	4.48	0.38	-----	6	14	9	7
1801	50.6	+1.9	93	13	3.15	-0.71	5.06	0.59	-----	8	14	9	9
1802	48.4	-3.3	88	14	4.75	+1.80	8.38	2.43	5.7	9	8	9	13
1803	45.5	-3.2	90	15	4.21	+1.35	8.51	1.24	6.0	10	8	9	13
1804	51.7	+3.0	93	12	3.07	+0.21	6.91	0.55	0.2	9	11	11	8
1805	54.2	+5.5	98	8	2.02	-0.34	5.88	0.28	2.1	5	14	8	8
1806	54.5	+5.8	94	19	5.02	+2.16	9.67	2.38	4.5	11	11	10	9
1807	47.9	-0.8	89	19	5.35	+2.49	9.86	2.22	T.	11	9	9	12
1808	48.1	-0.6	91	14	2.56	-0.30	4.82	0.27	T.	8	13	9	9
1809	48.9	+0.2	89	1	2.40	-0.46	5.76	0.56	2.0	7	12	11	7
1810	52.2	+3.5	89	19	2.67	-0.19	6.02	0.43	0.9	6	12	9	9
1811	49.9	+1.2	92	15	1.79	-1.07	3.47	0.66	2.0	5	14	8	8
1812	48.2	-0.5	96	9	1.71	-1.15	4.15	0.40	T.	5	14	11	5
1813	49.8	+1.1	86	17	2.98	+0.12	6.00	0.74	0.8	9	11	9	10
1814	44.1	-4.6	86	13	3.63	+0.77	8.97	1.52	1.4	7	15	6	9
1815	47.5	-1.2	90	10	3.08	+0.17	5.49	0.63	1.2	8	12	8	10
1816	52.5	+3.8	94	22	1.42	-0.44	5.53	0.53	0.6	8	14	9	7
1817	41.5	-7.2	80	10	1.32	-1.54	3.22	0.24	2.7	6	12	8	10
1818	50.5	+1.9	91	8	2.24	-0.02	4.50	0.67	0.3	8	14	8	8
1819	43.8	-4.9	86	14	4.58	+1.72	9.43	0.83	3.1	12	9	9	12
1820	52.5	+3.8	99	15	1.48	-1.38	4.86	0.10	3.0	7	14	7	9
1821	45.7	-2.0	88	3	3.09	+0.23	6.94	1.33	2.6	9	11	8	11
1822	49.9	+1.2	84	20	2.66	-0.20	5.68	0.78	1.1	8	13	8	9
1823	50.2	+1.5	88	16	3.28	+0.42	7.43	1.12	2.7	9	15	5	18
1824	48.6	-0.1	88	11	2.52	-0.34	5.63	0.37	0.3	8	10	8	12
1825	57.2	+8.5	96	18	1.41	-1.45	4.02	0.06	T.	7	15	10	5
1826	47.1	-1.6	90	11	2.62	-0.34	5.82	1.13	1.1	10	10	9	11
1827	45.5	-3.2	88	17	4.55	+1.29	7.84	2.06	3.8	11	9	7	14
1828	44.8	-3.9	79	12	2.32	-0.54	4.39	1.01	3.5	9	12	8	10
1829	45.4	-0.9	82	29	4.79	+2.22	8.00	3.54	8.7	34	8	8	34

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .06 inch snowfall.

## MAY.

Cool weather prevailed till the 26th when it turned warm. Temperatures in the 90's occurred at many stations on the 30th. Mean temperatures were below the normal at all stations but Clarinda which had a slight excess. Frosts or freezes were general on the 2d and occasional light frosts were reported up to the 18th.

The precipitation was below normal, except from Appanoose east to Lee and northeast to Jones and Jackson counties. The rainy period that prevailed through April continued till May 6 when it culminated in a general downpour. The saturated condition of the soil prevented, or greatly retarded, spring plowing and corn planting during the comparatively rainless week that followed, so that by the 15th only 40 per cent of the corn had been planted. Heavy rains on the 19th in the southern division caused further delay. By the close of the month, 95 per cent of the corn planting had been completed—about the same as last year—the stand was

good, about 80 per cent of the crop showed the rows across the field, and cultivation was making good progress in the drier counties. The cold, cloudy, rainy weather of the first week prevented proper pollination of cherries and plums thereby greatly reducing the crop. Pastures, clover, timothy and alfalfa are in the best condition for several years, except where injured beyond recovery by drouth and grasshoppers in the southwest portion last season. Winter wheat made rapid growth and became so rank generally as to be subject to damage by lodging.

Tornadoes occurred on the 3d, 6th and 31st. See page 20.

**Pressure.** The mean pressure (reduced to sea level) for the State was 29.95 inches. The highest recorded was 30.35 inches, at Dubuque, on the 5th, and the lowest was 29.53, at Sioux City, on the 31st. The monthly range was 0.82 inch.

**Temperature.** The mean temperature for the State, as shown by the records of 104 stations, was 58.2°, or 2.3° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 57.2°, or 1.8° lower than the normal; Central, 58.2°, or 2.5° lower than the normal; Southern, 59.1°, or 2.6° lower than the normal. The highest monthly mean was 61.6°, at Omaha, Nebr., and the lowest was 55.1°, at Postville. The highest temperature recorded was 93° at Cedar Rapids, on the 30th, and the lowest was 30°, at Decorah, Elkader, Fayette and Mason City, on the 2d. The temperature range for the state was 63°.

**Humidity.** The average relative humidity for the State at 7 a. m., was 79 per cent, and at 7 p. m. it was 58 per cent. The mean for the month, 68 per cent, is about normal. The highest monthly mean was 72 per cent, at Keokuk, and the lowest was 62 per cent, at Des Moines.

**Precipitation.** The average precipitation for the State, as shown by the records of 110 stations, was 3.11 inches, or 1.46 inches less than the normal. By divisions the averages were as follows: Northern, 4.19 inches, or 1.99 inches less than the normal; Central, 2.97 inches, or 1.62 inches less than the normal; Southern, 3.87 inches, or 0.77 inch less than the normal. The greatest amount, 7.14 inches, occurred at Maquoketa, and the least 0.73 inch, at Fort Dodge. The greatest amount in 24 consecutive hours, 3.90 inches, occurred at Olin on the 3d.

**Snowfall.** The only snow reported was traces, at Dubuque and Perry.

**Wind.** The prevailing direction of the wind was from the southeast. The average velocity was 7.5 miles per hour, or 1.2 miles less than the normal. The highest velocity reported from a regular Weather Bureau station was at the rate of 40 miles an hour from the northwest at Sioux City, on the 6th.

**Sunshine and Cloudiness.** The average per cent of the possible amount of sunshine was 59 or about 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, 59; Davenport, 51; Des Moines, 61; Dubuque, 62; Keokuk, 63; Sioux City, 52; Omaha, Nebr., 65.

*Miscellaneous Phenomena.* Aurora, 1st, 2d, 3d, 4th, 5th, 12th, 16th, 24th. Fog, 3d, 14th, 15th, 24th, 25th. Frost, 1st, 2d, 5th, 6th, 9th, 10th, 11th, 16th, 17th, 18th. Hail, 3d, 4th, 5th, 15th, 19th. Halo, (lunar or solar). 1st, 2d, 4th, 7th, 10th, 11th, 12th, 13th, 17th, 18th, 23d, 25th, 27th. Thunderstorm, 2d, 3d, 4th, 5th, 6th, 7th, 14th, 15th, 18th, 19th, 26th, 30th, 31st. Rain-bow, 17th, 19th.

*Rivers.* Flood stages prevailed on the Mississippi River below Le Claire during the first part of the month with a crest stage of 17.4 feet at Keokuk on the 8th; then falling to below the flood stage after the 12th. On the Missouri, moderate stages prevailed with but slight fluctuations. Moderately high stages prevailed on the interior rivers during the first part of the month due to heavy rains, but the flood stage was not reached except on the Des Moines River below Ottumwa.

*Tornadoes.* On May 3, between 4.30 p. m. and 5.20 p. m., a well defined tornado formed about 5 miles southwest of Linn Grove, Buena Vista county, moved northeastward, passing a short distance northeast of Sioux Rapids and turned slightly toward the north into Clay county where it dissipated. Numerous sets of farm buildings in its course were demolished and the steel rails and wooden cross ties of the recently constructed bridge of the Minneapolis and St. Louis Railroad across the Little Sioux River near Sioux Rapids, were torn from the 90-foot wooden trestle, leaving it otherwise almost undamaged. The path of the storm at the widest was 400 feet and its total length about 12 miles. The total damage is about \$25,000. Between 6:00 p. m. and 6:30 p. m. of the same day, about 20 miles to the east in Pocahontas county, another tornado moved across the north-west corner of Marshall township into the south-central portion of Swan Lake township south of the town of Laurens. The path was 75 to 200 feet wide and  $4\frac{1}{2}$  miles long. Practically nothing was left standing in its path; total damage \$15,000. On the same day between 6:45 p. m. and 7 p. m. another tornado moved east-northeast from just south of Ulmer, Sac county, through the village of Grant City, where it destroyed six houses, a church and a school house, damaged four other houses, and uprooted large trees. It disappeared about three miles northeast of Grant City. The width of the path was about 200 feet and the length about six miles; total damage about \$10,000. On May 6 a short tornado occurred south of Harvey, Marion county, and another near Langworthy, Jones county, but the damage was immaterial. On the 31st there was slight evidence of a tornado at Walcott, Scott county.

## 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
1890.....	57.7	-2.8	90	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	+4.30	12.64	4.87	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	6
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	3.09	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.....	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	+1.38	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	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	1.96	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	3.33	-1.24	6.41	0.72	0	10	14	11	6
1913.....	59.4	-1.1	102	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	0.30	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	4.93	+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
1918.....	64.9	+4.4	98	9	6.87	+2.30	11.98	2.72	T.	13	13	11	7
1919.....	58.2	-2.5	96	30	3.11	-1.46	7.14	0.73	T.	9	13	11	7

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

## JUNE.

The first eight days of June were cool followed by an 18-day period of unusually warm weather with cooler toward the close. All stations had an excess of temperature, the greatest being about 4 degrees in the eastern counties.

Heavy general rains, 1st-8th, were followed by more intermittent local rains which nearly ceased after the 24th. Many heavy local rains occurred in the central and north portions on the 10th and 20th. Nearly all stations reported precipitation above normal for the month, though there were some deficiencies reported in the extreme southwest and southeast counties. In portions of Buena Vista and Tama counties the precipitation was between 7 and 8 inches above the normal. A tornado in Chickasaw county, 7:30 to 8 p. m. of the 23d, caused damage totaling about \$60,000. About 6:25 p. m. on the same date near Riceville, Marshall county, a tornado caused about \$5,000 damage. This storm was remarkable in that it made a complete loop and crossed its own path nearly all within sections 2 and 12 of Douglas Township, as vouched for by many eye witnesses.

During a severe thunderstorm in and north of Dubuque, 8:40 to 10:30 p. m., June 23d, roads and bridges were destroyed, basements flooded and

street railway traffic stopped. The damage in Dubuque county amounted to about \$25,000.

Hail was less prevalent than usual in June. The most important was about 3 p. m. of the 27th, in Prussia and Summerset Townships in Adair County where \$100,000 damage was reported. The June hail table will appear in a later issue.

The unusually prolonged hot spell, and the high humidity of the first part of the warm period were exceptionally favorable for diseases of small grains such as scab, red rust, smut and blight. Not much black stem rust was reported. Winter wheat which had been very promising since December deteriorated greatly and was prematurely ripened. Half or more of the kernels in the heads became shrunken or diseased. This was somewhat offset by the unusually good stand. Harvest was well advanced in the south and beginning in the central counties at the close of the month. Spring wheat was similarly affected and oats did not fill well. Corn made unusual progress and the dry weather toward the close permitted cultivation so that the fields became fairly clean.

**Pressure.** The mean pressure (reduced to sea level) for the State was 30.01 inches. The highest recorded was 30.30 inches at Davenport, on the 13th, and the lowest was 29.66 inches, at Charles City, on the 23d. The monthly range was 0.64 inch.

**Temperature.** The mean temperature for the State, as shown by the records of 99 stations, was 71.9°, or 2.8° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 70.3°, or 2.7° higher than the normal; Central, 72.1°, or 2.8° higher than the normal; Southern, 73.2°, or 2.9° higher than the normal. The highest monthly mean was 75.8°, at Burlington and Keokuk, and the lowest was 68.4° at Britt. The highest temperature reported was 98° at Omaha, Nebraska, on the 23d, and the lowest was 41°, at Chariton, on the 4th. The temperature range for the State was 57°.

**Humidity.** The average relative humidity for the State at 7 a. m. was 55 per cent, and at 7 p. m. it was 68 per cent. The mean for the month was 76 per cent, or 6 per cent above the normal. The highest monthly mean was 82 per cent at Charles City, and the lowest was 72 per cent, at Keokuk.

**Precipitation.** The average precipitation for the State, as shown by the records of 105 stations, was 6.13 inches, or 1.75 inches more than the normal. By divisions the averages were as follows. Northern, 7.18 inches, or 2.75 inches more than the normal; Central, 5.92 inches or 1.60 inches more than the normal; Southern, 5.29 inches, or 0.90 of an inch more than the normal. The greatest amount, 12.25 inches, occurred at Alta, and the least, 1.82 inches, at Keosauqua. The greatest amount in 24 consecutive hours, 5.10 inches, occurred at Sac City, on the 10th.

**Wind.** The prevailing direction of the wind was from the southeast. The highest velocity reported from a regular Weather Bureau station was 42 miles an hour, from the northwest, at Omaha, Nebraska, on the 25th.

**Sunshine and Cloudiness.** The average per cent of the possible amount of sunshine was 60, or about 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, 53; Davenport, 64; Des Moines, 54; Dubuque, 65; Keokuk, 79; Sioux City, 38; Omaha, Nebr., 65.

**Miscellaneous Phenomena.** Aurora, 1st, 4th, 25th. Fog, 7th, 8th, 10th, 16th, 18th, 22d, 23d, 30th. Hail, 3d, 6th, 9th, 10th, 13th, 19th, 21st, 23d, 26th. Halos (lunar or solar), 8th. Rainbows, 1st, 5th, 6th, 9th, 10th, 11th, 12th, 13th, 16th. Thunderstorms, all days during the month except on the 25th, 26th, 28th, 29th. Tornadoes, 23d, at 8:00 p. m., New Hampton; and at 6:25 p. m., Riceville.

**Rivers.** Flood stages were not reached on any of the boundary rivers during the month and the stages were generally below normal. On the interior river high stages prevailed during the greater portion of the first half of the month due to general excessive rains; the Des Moines River was above flood stage at Ottumwa from the 4th to the 8th, inclusive, and was within 2.1 feet of the flood stage at Boone.

COMPARATIVE DATA FOR THE STATE—JUNE.

YEAR	Temperature				Precipitation				Number of Days				
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. of in. or more	Clear	Partly cloudy	Cloudy
1890.....	72.7	+ 3.6	106	44	7.76	+3.38	16.53	1.67	-----	11	12	10	8
1891.....	69.1	- 0.0	99	37	5.39	+1.01	19.88	1.08	-----	11	8	10	11
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	7.89	0.81	-----	9	12	13	5
1897.....	69.1	- 0.0	103	29	3.81	-0.57	9.38	1.03	-----	10	10	12	8
1898.....	71.4	+ 2.3	99	42	4.72	+0.34	12.48	1.20	-----	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	12.35	0.67	-----	5	17	10	3
1901.....	72.3	+ 3.2	106	30	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	95	30	2.86	-1.52	6.04	0.75	-----	10	13	10	7
1904.....	67.1	- 2.0	94	35	3.45	-0.93	8.35	0.44	-----	7	13	10	7
1905.....	69.9	+ 0.8	100	36	5.53	+1.15	14.89	1.80	-----	10	12	11	7
1906.....	67.9	- 1.2	99	37	3.92	-0.46	8.27	1.48	-----	8	15	10	6
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	6.09	+1.28	11.88	1.77	-----	13	12	10	8
1909.....	69.1	- 0.0	96	40	6.41	+2.03	15.30	2.80	-----	12	12	10	8
1910.....	69.5	+ 0.4	106	33	1.99	-2.39	5.51	0.05	-----	7	18	7	2
1911.....	75.7	+ 6.6	108	30	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	7
1914.....	72.4	+ 3.1	101	40	5.57	+1.19	12.24	1.17	-----	12	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	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	35	5.29	+0.91	10.19	1.55	-----	11	16	10	4
1919.....	71.9	+ 2.8	98	41	6.13	+1.75	12.25	1.82	-----	13	13	12	6

T indicates an amount too small to measure, or less than .006 inch precipitation, and less than .06 inch snowfall.

## JULY.

July was warmer than the normal and the excess was uniform throughout the State, ranging from 3.5° in the southern division to 3.1° in the

northern division. There were no cool periods and the temperature was normal, or below, on very few days. The hottest part of the month occurred during the last week and values of 100°, or slightly above, were recorded at places in all divisions.

The precipitation was deficient and unevenly distributed, ranging from less than half an inch in Butler County to nearly 8.00 inches at Dubuque. Most of the precipitation occurred during the first half of the month and was generally ample for all needs; after the 15th of the month a dry period set in that prevailed till the 31st. The dry weather in connection with the high temperature and strong winds that prevailed during the last week of the month had a very injurious effect on all vegetation and when relieved by showers on the 31st corn was beginning to fire over much of the State, particularly in the central and some southwest counties. There were no severe wind storms during the month but one of the most severe rainstorms of record occurred at Dubuque, on the 9th, 1.20 inches falling in 10 minutes and 2.70 inches fell in one hour. Seven persons lost their lives by being drowned and a number severely injured. The property loss was approximated at \$125,000.00. See page 26.

**Pressure.** The mean pressure (reduced to sea level) for the State was 29.98 inches. The highest pressure recorded was 30.24 inches at Dubuque on the 8th, and the lowest was 29.61 at Sioux City on the 26th. The monthly range was 0.62 inch.

**Temperature.** The mean temperature for the State, as shown by the records of 99 stations, was 77.4°, or 3.2° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 75.8°, or 3.1° higher than the normal, Central, 77.6°, or 3.3° higher than the normal; Southern, 78.7°, or 3.5° higher than the normal. The highest monthly mean was 81.8° at Omaha, Nebraska, and the lowest was 72.4° at Postville. The highest temperature reported was 104° at Webster City on the 30th and Keosauqua on the 31st; the lowest was 41 at Waverly on the 16th. The temperature range for the State was 63°.

**Humidity.** The average relative humidity for the State at 7 a. m. was 75 per cent, and at 7 p. m. it was 52 per cent. The mean for the State was 64 per cent, or 4 per cent lower than the normal. The highest monthly mean was 66 per cent at Dubuque and Sioux City, and the lowest was 61 per cent at Omaha, Nebr.

**Precipitation.** The average precipitation for the State, as shown by the records of 105 stations, was 2.86 inches, or 1.10 inches less than the normal. By divisions the averages were as follows: Northern, 3.36 inches, or 0.52 inch less than the normal; Central, 2.42 inches, or 1.56 inches less than the normal; Southern, 2.79, or 1.23 inches less than the normal. The greatest amount, 7.82 inches, occurred at Dubuque, and the least, 0.39 of an inch at Allison. The greatest amount in 24 consecutive hours, 4.12 inches, occurred at Le Mars on the 13th.

**Wind.** The prevailing direction of the wind was from the southwest. The highest velocity reported from a regular Weather Bureau Station was 38 miles an hour, from the west, at Sioux City on the 13th.

**Sunshine and Cloudiness.** The average per cent of the possible amount of sunshine was 82, 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 85; Davenport 85; Des Moines 79; Dubuque 83; Keokuk 90; Sioux City 70; Omaha, Neb. 84.

**Miscellaneous Phenomena.** Aurora, 19th. Fog, 11th, 14th, 20th, 24th. Hail, Northern Division 9th, 11th; Central Division 8th, 9th, 13th; Southern Division, 7th, 9th, 10th, 31st. Halo (Lunar or Solar), 8th. Rainbow, 31st. Thunderstorms, 2nd, 3rd, 4th, 5th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 20th, 21st, 24th, 27th, 28th, 29th, 30th, 31st.

**Rivers.** Moderate stages prevailed on the Missouri River and after the first there was a gradual tendency to lower stages; on the Mississippi River good boating stages prevailed throughout the month, and except a slight freshet that occurred after the 4th at Dubuque and later at points farther down the river, the tendency was to lower stages and the lowest stages occurred generally on the last day of the month. On the interior rivers low stages prevailed.

COMPARATIVE DATA FOR THE STATE—JULY.

YEAR	Temperature				Precipitation				Number of Days			
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With per. of in. or more	Clear	Partly cloudy
1890	75.6	+ 1.5	110	45	1.98	-1.98	5.00	0.37	-----	3	18	8
1891	68.5	- 5.6	99	41	4.22	+0.26	8.20	1.67	-----	5	13	13
1892	73.0	- 1.1	104	38	5.29	+1.33	12.85	1.71	-----	9	16	10
1893	73.0	- 1.1	104	47	3.33	-0.63	8.84	1.49	-----	7	19	10
1894	75.4	+ 2.3	109	39	0.63	-3.33	3.50	T.	-----	3	22	8
1895	72.1	- 2.0	104	35	3.40	-0.56	10.19	0.45	-----	9	14	11
1896	73.6	- 0.5	104	42	6.90	+2.94	12.07	1.01	-----	6	18	10
1897	75.6	+ 1.5	106	42	3.26	-0.70	7.60	1.01	-----	7	19	9
1898	73.4	- 0.7	102	42	2.98	-0.98	12.88	0.55	-----	9	16	10
1899	73.1	- 1.0	101	38	3.07	-0.89	8.05	0.42	-----	7	16	10
1900	73.4	- 0.7	102	37	6.15	+2.19	18.45	1.80	-----	8	21	9
1901	82.4	+ 8.3	113	46	2.24	-1.62	5.97	0.27	-----	13	14	10
1902	73.1	- 1.0	99	41	8.67	+4.71	13.57	4.32	-----	9	17	9
1903	72.9	- 1.2	100	40	4.53	+0.87	12.72	0.94	-----	10	16	9
1904	70.6	- 3.5	100	38	4.41	+0.45	11.97	1.28	-----	9	14	10
1905	70.6	- 3.5	102	40	2.91	-1.05	7.08	0.69	-----	8	18	10
1906	70.9	- 3.2	102	43	3.04	-0.92	7.05	0.29	-----	13	19	11
1907	73.7	- 0.4	102	41	7.27	+3.31	13.66	3.97	-----	8	16	10
1908	73.0	- 1.1	100	42	8.05	+0.89	9.21	0.70	-----	10	15	8
1909	72.8	- 1.3	102	46	4.77	-0.81	12.20	1.20	-----	7	17	10
1910	74.5	+ 0.4	108	43	1.86	-2.19	6.69	0.12	-----	5	21	8
1911	75.5	+ 1.4	111	38	2.27	-1.69	6.62	0.08	-----	6	20	8
1912	74.6	+ 0.5	103	38	3.71	-0.25	7.55	1.17	-----	5	21	8
1913	70.1	- 2.0	106	45	1.82	-2.14	6.33	T.	-----	14	10	12
1914	76.6	+ 2.5	109	43	2.37	-1.09	6.50	0.44	-----	5	23	7
1915	70.6	- 3.5	102	40	8.32	+4.36	15.83	3.68	-----	5	23	7
1916	79.7	+ 5.6	105	48	1.78	-2.18	6.87	0.10	-----	8	19	8
1917	74.3	+ 0.2	106	38	2.27	-1.69	6.06	0.23	-----	6	22	8
1918	73.1	- 1.0	105	40	3.17	-0.79	8.05	0.30	-----	6	22	8
1919	77.4	+3.3	104	41	2.96	-1.10	7.82	0.39	-----			

T indicates an amount too small to measure, or less than .005 inch precipitation, and less than .06 inch snowfall.

# INTENSE RAIN STORM AND FRESHET, DUBUQUE, IOWA, JULY, 9, 1919

J. H. Spencer.

(75th Meridian Mean Time Used Herein.)

The rain storm of July 9, 1919, was the worst at this station since July 4, 1876, when 40 persons were drowned at Rockdale, on the outskirts of Dubuque. In the storm of July 9 seven persons were drowned in freshets caused by the torrential rains and great damage resulted to streets in all portions of the city lying below the bluffs. Although three houses were struck by lightning, thunder and lightning were rather less severe than in some of the storms of the past eight years; damage from lightning was slight, probably due to the heavy rainfall, which prevented serious fires. Wind velocity was light, and therefore the crop damage was comparatively small, except on flooded lowland, where they were ruined.

At no time during the hours that preceded the period of heaviest rainfall was there much indication of a severe storm, although the weather in the morning quickly changed to warm and sultry. Rain began as a light thundershower from 11:25 a. m. to 11:55 a. m. Rain began again at 12:15 p. m. and was moderately heavy until 2:50 p. m. Then followed the great downpour of 2.64 inches from 2:51 p. m. to 3:36 p. m. Hourly amounts for the entire storm were as follows:

11 a. m. to noon	.06
Noon to 1 p. m.	.44
1 p. m. to 2 p. m.	.34
2 p. m. to 3 p. m.	.80
3 p. m. to 4 p. m.	2.23
After 4 p. m.	.01
Total	3.87 inches

Rainfall was excessive from 2:51 p. m. until 3:36 p. m., and accumulated amounts were as follows for this period:

5 minutes	.17	30 minutes	2.16
10 "	.51	"	2.40
15 "	1.17	40 "	2.51
20 "	1.71	45 "	2.64
25 "	1.91		

The following are the greatest amounts during the entire storm in—

5 minutes	.80	30 minutes	2.23
12 "	1.20	One hour	2.70
15 "	1.52	Two hours	3.03

Union Park, a pleasure resort on the outskirts of the city to the north-west, is a narrow valley only a few hundred feet wide in places, with steep hills on either side. Running through the valley is a creek, which is practically dry except during wet periods. During the period of excessive rainfall on July 9th this creek became a raging torrent many feet deep, overflowing its banks, and destroying park property of all kinds. A number of picnickers took shelter from the rain in a pavilion near the creek. The rising waters quickly flooded the building and finally swept it away, precipitating its occupants into the freshet. In spite of heroic deeds upon the part of the park employees and others, five persons were drowned here or elsewhere in the park. They were: Mrs. Chris Wagner, age 38; Blanche Wagner, age 10; Edmund Wagner, age 3; Sarah Sezer, age 6;

Herbert Ricke, age 4. Property loss at Union Park is estimated at from \$10,000 to \$15,000.

Another tragedy occurred on 32d street, near Heim's brick yard. Mrs. George Kennicker and two small children attempted to cross the street and the woman and one child were swept by the torrent of water into the Bee Branch sewer and drowned. The dead child is Ruth Brose, age 3. The other child was carried over the mouth of the sewer and escaped, but with serious injuries.

The damage to waterway streets and to many streets on the level below the bluffs was surprisingly great. Kaufman Avenue was completely ruined and also West Locust Street between Jackson School and Mt. St. Joseph College. Julian Avenue and Dodge Street were badly damaged. Much of the brick paving on 8th street for several blocks above Bluff was stripped off and thousands of brick carried down by the water to the business section of the city. The wood block paving for several blocks on Couler Avenue above 18th Street was carried away and the avenue over this area was a wreck after the storm. Some of the streets below Main, particularly from the Carr, Ryder & Adams Co. factory northward to the Brunswick-Balke-Collender Co. factory, were covered with water during the height of the storm; water in large areas was 2 to 3 feet deep. Hundreds of cellars were flooded and some were completely filled with water and mud, the water reaching to the first floor in many instances. These are only typical instances of the damage by the storm. Few sections of the city from Eagle Point and the Brunswick-Balke-Collender Co. factory on the north to Dodge Street and the lumber yards on the south—a distance of about four miles—escaped damage.

City officials estimate that the streets of the city were probably damaged to the extent of \$75,000 to \$100,000. This may be correct, because many thousands of dollars will be required to clean and repair the streets, while some are beyond repair and will have to be replaced. There are hundreds of individual losses, relatively small.

About 20 small bridges in Dubuque County were damaged or destroyed, causing a loss of nearly \$25,000. Total damage from the storm was approximately \$125,000. This includes damage to city streets, county roads and bridges, at Union Park, and to homes and factories.

Incidental to the storm of July 9, 1919, it is worthy of note that during the past nine years (1911 to 1919, inclusive) there have been seven storms in which more than 3.00 inches of rain within 24 consecutive hours fell, or more storms of similar intensity than occurred during the 29-year period from 1882 to 1910, inclusive, which gave only six. On the other hand, during the eight-year period from 1874 to 1881, there were nine storms that gave more than 3.00 inches of rain within 24 consecutive hours.

The following table gives the dates of all storms at Dubuque from 1874 to 1919, inclusive, in which 3.00 inches or more of rain fell within 24 consecutive hours:

September 18-19, 1874	3.70 inches
September 8-9, 1875	5.40 "
July 4-5, 1876	4.55 "
September 5, 1876	3.40 "
July 6-7, 1879	3.39 "
June 8-4, 1880	3.03 "
September 25, 1880	3.38 "
July 10, 1881	3.42 "
September 26, 1881	4.01 "
August 22-24, 1885	3.38 "
May 9-10, 1890	3.18 "
June 2-3, 1890	3.04 "
June 16, 1892	3.48 "
July 26, 1895	4.52 "
September 13-14, 1900	3.25 "
August 10-11, 1911	3.75 "
August 18-19, 1912	5.23 "
August 31-September 1, 1914	3.18 "
September 14-15, 1914	3.38 "
September 25-26, 1915	4.79 "
August 16-17, 1918	5.22 "
July 9, 1919	3.87 "

The following table gives the heaviest rainfall in periods of 5 minutes, 10 minutes, 15 minutes, 30 minutes, one hour, and two hours for a number of storms. It shows how much heavier was the rainfall on July 9, 1919, within a one hour period, than during any storm at Dubuque in recent years:

Storm of—	In 5 Min.	In 10 Min.	In 15 Min.	In 30 Min.	In 1 Hr.	In 2 Hrs.	In 24 Hrs.
August 10-11, 1911	.32	.52	.62	.81	1.12	1.97	3.76
August 18-19, 1912	.50	.71	.94	1.46	1.96	2.62	5.23
August 31-September 1, 1914	.41	.72	1.03	1.30	1.98	1.96	3.18
September 14-15, 1914	.34	.51	.53	.73	.86	1.25	3.38
September 25-26, 1915	.34	.46	.53	.68	1.27	2.23	4.79
August 16-17, 1918	.35	.62	.79	1.37	2.10	2.96	5.22
July 9, 1919	.80	1.20	1.52	2.23	2.70	3.03	3.87

From the record of "Excessive" precipitation at Dubuque the following data are taken: On July 4, 1876, 4.55 inches fell in two hours, five minutes. On July 7, 1891, 1.87 inches fell in 27 minutes. On August 18, 1912, 1.81 inches fell in 43 minutes. On August 31, 1914, 1.23 inches fell in 20 minutes. On September 26, 1915, 2.57 inches fell in two hours, 27 minutes. On August 16-17, 1918, 2.48 inches fell in one hour, 18 minutes. On July 9, 1919, 2.65 inches fell in 45 minutes.

#### AUGUST.

August was a pleasant month with the temperature near the normal. There were no protracted hot spells and after a short period of hot weather during the first week, the rest of the month was generally below the normal. Temperatures exceeding 100° occurred at only a few stations and after the first week the maxima were below 90° over most of the State. The lowest temperature of the month occurred on the last day over practically the entire State and three stations reported light frost. The weather was favorable for the maturing of crops, harvesting and threshing but too dry for plowing and seeding and meadows and pastures were suffering for rain and turning brown at the close of the month, except in a few small areas.

Like July, the precipitation was deficient, except a few small areas, the principal one being a narrow strip in the east-central district, and the distribution uneven. Most of the precipitation occurred during the first half of the month and was sufficient to assure a good corn crop, there being no heavy downpours and all was taken up by the soil.

A small tornado occurred in Butler County on the afternoon of the 4th. It originated several miles north of Dumont and moved southeast striking the edge of Bristow, the length of the path being less than ten miles and the width varying from about 20 feet to more than 1,000 feet. No lives were lost but there was considerable property damage, the buildings and live stock damage being about 12,000 and the loss to crops about \$25,000. A severe wind and hail storm occurred on the morning of the 6th in Blackhawk County, in the extreme eastern portion. A number of barns were blown down and in one 17 head of stock were killed by the hay loft falling in; wind towers were bent to the ground, trees uprooted and broken off by the wind and considerable corn was stripped by the hail.

**Pressure.** The mean pressure (reduced to sea level) for the State was 29.97 inches. The highest recorded was 30.31 inches, at Dubuque, on the 10th, and the lowest was 29.59 inches, at Sioux City, on the 3d. The monthly range was 0.72 of an inch.

**Temperature.** The mean temperature for the State, as shown by the records of 104 stations, was 71.5°, or 0.3° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 70.3°, or 0.1° lower than the normal; Central, 71.5°, or 0.2° lower than the normal; Southern, 72.8°, or 0.4° lower than the normal. The highest monthly mean was 75.0°, at Omaha, Nebr., and the lowest was 67.8°, at Postville. The highest temperature recorded was 103° at Clarinda on the 6th, and the lowest was 38°, at Inwood, Rock Rapids and Washta, on the 31st. The temperature range for the State was 65°.

**Precipitation.** The average precipitation for the State, as shown by the records of 111 stations, was 2.59 inches, or 1.09 inches less than the normal. By divisions the averages were as follows: Northern, 2.30 inches, or 1.18 inches less than the normal; Central, 2.98 inches, or 0.79 of an inch less than the normal; Southern, 2.50 inches, or 1.28 inches less than the normal. The greatest amount, 5.72 inches, occurred at Maquoketa, and the least, 0.97 inch, at Sioux Center. The greatest amount in 24 hours, 2.98 inches, occurred at Cedar Rapids, on the 5th.

**Humidity.** The average relative humidity for the State at 7 a. m. was 80 per cent, and at 7 p. m. it was 56 per cent. The mean for the month was 68 per cent, or 4 per cent lower than the normal. The highest monthly mean was 71 per cent, at Charles City, and the lowest was 64 per cent, at Keokuk.

**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 38 miles an hour, from the west, at Sioux City, on the 3d.

**Sunshine.** The average per cent of the possible amount of sunshine was 77, or 6 per cent more than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 85; Davenport, 70; Des Moines, 72; Dubuque, 83; Keokuk, 84; Sioux City, 71; Omaha, Neb., 73.

**Miscellaneous Phenomena.** Aurora, 18th. Fog, 5th, 6th. Frost (light), 31st, at Alton, Fayette and Rock Rapids. Hail, 4th, 5th, 6th, 12th, 24th.

Halo (solar), 13th. Haze, 11th, 19th, 22d, 23d, 24th, 25th, 26th, 27th, 28th, 29th. Thunderstorms, all days except 8th, 10th, 11th, 18th, 22d, 27th, 28th, 29th, 31st. Tornado, 4th.

*Rivers.* Moderate stages prevailed on the Mississippi and Missouri Rivers, and except a few slight rises, fell steadily throughout the month; on the interior rivers low stages, with a general falling tendency, prevailed.

#### COMPARATIVE DATA FOR THE STATE—AUGUST.

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	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	+0.66	13.02	1.23		8	13	12	6
1892	71.4	- 0.4	102	40	2.24	-1.44	4.69	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	74.6	+ 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	12.25	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	10.55	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	1.26		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	6.64	+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	101	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	33	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	3.32	-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	0.08		6	17	10	4
1914	73.7	+ 1.9	103	40	2.19	-1.49	4.90	0.42		7	17	10	4
1915	65.9	- 5.9	91	30	2.81	-0.87	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	0.70		7	19	8	4
1918	76.0	+ 4.2	113	38	3.61	-0.07	8.38	0.54		8	16	10	5
1919	71.5	- 0.3	103	38	2.59	-1.09	5.72	0.97		7	19	9	4

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

#### SEPTEMBER.

Warm, dry, sunshiny weather prevailed till the 17th when heavy to excessive rains set in, followed by a clear, cool period, 22d-27th, and then by heavy, general rains, 28th-30th. Temperatures in the 90's occurred at most stations between the 6th and 10th. Light to heavy frosts with temperatures near freezing occurred in the northwest counties, 23d-25th.

Drouth prevailed in the south and central divisions from about August 14 to September 17, while in the north division rains were generally about normal in amount and frequency after September 2d. Excessive rains occurred at a number of stations on the 18th-19th and 30th. In the west part of Davenport on the 30th, storm drains were not large enough to carry off the water. Basements over a large tract were flooded, street car traffic was seriously impeded, numerous washouts occurred along the line of the Clin-

ton, Davenport & Muscatine Railway, and interurban communication with Muscatine was suspended during the entire day. At Muscatine the damage to bridges, roadways, basements, stocks of goods, houses and household goods is placed at \$200,000.

Corn matured and dried rapidly till the rains set in, and about 85 per cent was safe from frost at the close of the month. Silo filling and fodder cutting progressed rapidly. The hard, dry condition of the soil made plowing almost impossible till the 17th. Then the rains came gently, steadily and copiously for the next three or four days, saturating the soil to a great depth. Plowing and winter wheat seeding were pushed rapidly 22d-27th. It is probable that the winter wheat acreage will be reduced to a pre-war basis or about one-third that seeded in the fall of 1918. Pastures recovered from the drouth rapidly. Live stock, which has been fed, began to subsist on pastures toward the end of the month. Stock water and wells which had failed in many places in the south part of the State were replenished. The rains came too late for potatoes which are a poor crop, generally. Many farms have not raised enough for their own use.

*Pressure.* The mean pressure (reduced to sea level) for the State was 30.00 inches. The highest recorded was 30.33 inches at Dubuque, on the 4th, and the lowest was 29.33 at Davenport, on the 19th. The monthly range was 1.00 inch.

*Temperature.* The mean temperature for the State, as shown by the records of 100 stations was 67.5°, or 4.1° higher than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 65.4°, or 3.6° higher than the normal; Central, 67.6°, or 4.1° higher than the normal; Southern, 69.4°, or 4.4° higher than the normal. The highest monthly mean was 71.3°, at Northboro, and the lowest, 60.4°, at Northwood. The highest temperature reported was 99° at Maquoketa, on the 7th, Knoxville, on the 9th, and Clarinda on the 10th; and the lowest was 33° at Inwood on the 25th. The temperature range for the State was 66°.

*Humidity.* The average relative humidity for the State at 7:00 a. m. was 82 per cent and at 7:00 p. m. was 61 per cent. The mean for the month was 72 per cent, which is 2 per cent below normal. The highest monthly mean was 76 per cent at Charles City, and the lowest was 66 per cent at Keokuk.

*Precipitation.* The average precipitation for the State, as shown by the records of 108 stations, was 5.34 inches, or 1.98 inches above the normal. By divisions, the averages were as follows. Northern, 3.58 inches, or .53 inch more than the normal; Central, 6.01 inches, or 2.55 inches more than the normal; Southern, 6.43 inches, or 2.87 inches more than the normal. The greatest amount, 11.82 inches, occurred at Grinnell and Corning, and the least, 1.49 inches at Forest City. The greatest amount in 24 consecutive hours, 5.52 inches, occurred at Grinnell, on the 30th.

*Wind.* The prevailing direction of the wind was from the south. The highest velocity reported from a regular Weather Bureau Station was at the rate of 45 miles an hour from the south at Sioux City, on the 26th.

**Sunshine.** The average per cent of the possible amount of sunshine was 65, which is 2 per cent above normal. The per cent of the possible amount at regular Weather Bureau Stations was as follows: Charles City, 60; Davenport, 67; Des Moines, 62; Dubuque, 64; Keokuk, 80; Sioux City, 59; Omaha, Neb., 60.

**Miscellaneous Phenomena.** Aurora, 1st, 2d, 15th, 19th, 20th, 23d, 24th, 25th, 26th, 30th. Fog, dense, 10th, 15th, 16th, 18th, 19th, 23d, 24th, 28th, 30th. Frost, heavy: Northern Division, 25th. Light: Northern Division, 12th, 20th, 22d, 23d, 24th, 25th, 26th. Central Division, 12th. Hail, 20th. Halo (Lunar or solar): 1st, 12th, 16th. Rainbow, 20th, 21st. Thunderstorms, 2d, 3d, 9th, 10th, 13th, 16th, 17th, 18th, 19th, 20th, 21st, 25th, 27th, 28th, 29th, 30th.

**Rivers.** Though many heavy rains occurred, beginning the 17th, the rate at which they fell was generally slow, and as the ground was very dry from more than a month of drouth, little of the rain reached the streams as a rule till the 30th, and no large rises in the streams had occurred up to the close of the month. The largest rise was 3.9 feet at Van Meter on the Racoon in the five-day period ending the 22d. This rise was quite noticeable at Ottumwa on the Des Moines, where it amounted to 3.3 feet in the four-day period ending on the 22d. On the Mississippi and Missouri Rivers rather low stages prevailed.

## COMPARATIVE DATA FOR THE STATE—SEPTEMBER.

YEAR	Temperature					Precipitation				Number of Days		
	Mean	Departure	Highest	Lowest	Total	Departure	Greatest	Least	Snowfall	With pre. in. or more	Clear	Partly cloudy
1880	59.3	-4.1	92	22	2.97	-0.39	4.85	1.86	-----	7	13	10
1881	67.3	+3.9	104	28	1.33	-2.03	3.09	0.13	-----	4	20	7
1882	64.7	+1.3	99	29	1.53	-1.83	4.15	0.16	-----	4	16	8
1883	64.7	+1.3	102	18	2.34	-1.02	5.49	0.74	-----	4	20	6
1884	65.1	+1.7	100	26	3.57	+0.21	7.43	0.67	-----	8	15	10
1885	66.8	+3.4	103	22	3.03	-0.33	7.43	0.85	-----	5	18	8
1886	58.5	-4.9	95	22	4.09	+0.73	9.90	1.53	-----	10	11	9
1887	70.9	+7.5	100	30	2.04	-1.32	5.88	0.00	-----	4	23	5
1888	65.3	+1.9	99	29	2.69	-0.67	8.45	0.41	-----	7	16	9
1889	62.5	-0.9	104	15	0.93	-2.43	4.32	T.	-----	4	16	9
1890	64.4	+1.0	99	29	4.98	+1.62	8.82	2.48	-----	9	15	8
1891	63.3	-0.1	102	29	4.77	+1.41	13.62	1.71	-----	9	13	9
1892	59.1	-4.3	88	23	4.35	+0.99	10.41	1.65	-----	9	15	6
1893	69.8	+2.6	94	28	3.81	+0.45	8.79	1.42	-----	10	14	6
1894	64.0	+0.6	94	30	2.78	-0.58	8.33	0.09	-----	7	13	8
1895	65.8	+2.4	96	36	3.81	+0.45	13.18	0.50	-----	8	14	8
1896	67.2	+3.8	100	27	4.16	+0.80	11.10	0.64	-----	8	15	6
1897	62.8	-0.6	98	25	2.75	-1.61	6.06	1.38	-----	3	21	6
1898	67.9	+4.5	98	20	1.30	-2.16	3.46	0.25	-----	3	21	6
1899	65.4	-1.0	94	30	3.53	+0.22	7.34	1.89	-----	9	14	8
1900	63.2	-0.2	99	30	3.59	+0.23	7.43	1.18	-----	9	14	7
1901	65.8	+2.4	103	32	5.12	+1.76	13.73	1.19	-----	10	11	9
1902	62.1	-1.3	104	24	8.98	+0.62	10.12	0.28	-----	11	12	10
1903	64.5	+1.1	107	19	3.31	-0.05	7.44	0.00	-----	9	15	8
1904	64.5	+1.1	99	20	7.88	+4.52	15.24	2.48	-----	10	16	7
1905	63.7	+0.3	91	30	6.03	+3.67	12.45	2.88	-----	11	11	8
1906	62.5	-0.9	98	21	3.89	+0.53	9.71	1.45	-----	7	17	8
1907	62.0	-0.8	97	29	3.90	-0.46	8.68	0.89	-----	7	18	7
1908	58.6	-4.5	93	30	1.87	-1.49	4.63	0.48	-----	6	16	8
1909	67.5	+4.1	99	35	5.34	+1.98	11.82	1.49	-----	8	16	6

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

## OCTOBER.

The mean temperature for October averaged slightly below the normal for the State, but the departures varied greatly with a deficiency of nearly four degrees along the extreme western counties and an excess of nearly three degrees over a large portion of the southeastern and east-central sections. Killing frosts occurred during the month over the entire State, the date varying from the 10th and 11th over most of the western and central portions until as late as the 31st at points along the Mississippi River.

The precipitation was above the normal, though very unevenly distributed, varying from less than half an inch in Sioux County to nearly nine inches in Delaware County, but the time of occurrence was nearly uniform throughout the month over the entire State. Rainy days averaged 10 and equaled the frequency of October, 1911, which has held the record since the State-wide records have been kept; and the largest monthly total, 8.65 inches, has been exceeded only in October, 1908, when a fall of 8.83 inches was recorded. Another unusual downpour occurred at Dubuque on the 4th. See special article, page 35.

The month was generally favorable for pastures and the seeding and germination of winter wheat but too wet for corn husking, and this condi-

dition in connection with the large number of cloudy days and deficient sunshine delayed the drying of corn so that at the end of the month very little had been cribbed. Winter wheat in the early sown fields is up to a good stand but the acreage has been greatly reduced. Notwithstanding the frequent rains, the roads were in bad condition for but short periods, but over a large portion of the eastern half of the State it was impossible to haul full loads of corn from the fields the greater part of the month.

**Pressure.** The mean pressure (reduced to sea level) for the State was 30.03 inches. The highest recorded was 30.45 inches, at Sioux City, on the 10th, and the lowest was 29.39 inches at Omaha, Nebr., on the 8th. The monthly range was 1.06 inches.

**Temperature.** The mean temperature for the State, as shown by the records of 101 stations, was 50.7°, or 0.1° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 47.6°, or 1.4° lower than the normal; Central, 51.3°, or 0.4° higher than the normal; Southern, 53.2°, or 0.6° higher than the normal. The highest monthly mean was 56.5°, at Keokuk, and the lowest was 43.8°, at Rock Rapids. The highest temperature reported was 89°, at Nora Springs, Carroll and Clarinda, on the 2d; the lowest was 8°, at Inwood, on the 28th. The temperature range for the State was 81°.

**Humidity.** The average relative humidity for the State at 7 A. M. was 85 per cent, and at 7 P. M. it was 70 per cent. The mean for the month was 78 per cent, or 6 per cent greater than the normal. The highest monthly mean was 81 per cent at Davenport, and the lowest was 74 per cent at Omaha, Nebr. The lowest observed was 30 per cent at Sioux City on the 7th.

**Precipitation.** The average precipitation for the State, as shown by the records of 110 stations was 3.02 inches, or 0.56 inch greater than the normal. By divisions the averages were as follows: Northern, 2.30 inches, or 0.04 inch less than the normal; Central, 3.99 inches, or 1.56 inches greater than the normal; Southern, 2.77 inches, or 0.23 inch greater than the normal. The greatest amount, 8.65 inches, occurred at Delaware, and the least, 0.45 inch, occurred at Sioux Center. The greatest amount in 24 consecutive hours, 3.85 inches, occurred at Grundy Center, on the 4th.

**Snow.** Light snow occurred in the northwest portion of the State on the 16th, 24th, 25th, 26th and 27th, and at its maximum totaled 1.9, at Storm Lake. The snow was soon melted.

**Wind.** The prevailing direction of the wind was south. The highest velocity reported from a regular Weather Bureau station was 40 miles per hour, from the northwest, at Sioux City on the 9th.

**Sunshine and Cloudiness.** The average per cent of the possible amount of sunshine was 49, or 13 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 42; Davenport, 51; Des Moines, 51; Dubuque, 51; Keokuk, 62; Sioux City, 42; Omaha, Nebr., 49.

**Miscellaneous Phenomena.** Aurora, 1st, 2d, 3d, 15th, 22d, 23d, 26th, 29th, 31st. Fog, 1st, 4th, 9th, 12th, 13th, 14th, 17th, 20th, 23d, 24th, 25th, 26th.

27th, 28th, 29th, 30th. Frost, killing, Northern Division—10th, 11th, 12th, 16th, 17th, 19th, 21st, 23d, 24th, 25th, 26th, 27th, 28th, 29th, 31st; Central Division—10th, 11th, 12th, 16th, 17th, 18th, 20th, 21st, 22d, 25th, 26th, 28th, 29th, 31st; Southern Division—11th, 12th, 16th, 17th, 21st, 26th, 28th, 29th. Hail, 3d, 24th. Halos (Lunar or Solar), 4th, 11th. Rainbow, 4th, 18th, 19th. Sleet 26th. Thunderstorms, 1st, 2d, 3d, 4th, 5th, 8th, 9th, 10th, 15th, 16th, 18th, 19th, 20th, 21st, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st.

**Rivers.** A moderate rise occurred on the Missouri River on the 2d and after the passing of the crest the stage remained nearly stationary the rest of the month. On the Mississippi and interior rivers a sharp rise occurred during the first week, due to heavy rain over most eastern and north-central sections, after which falling stages were the rule.

## COMPARATIVE DATA FOR THE STATE—OCTOBER.

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.....	49.2	- 1.6	86	16	3.48	+1.02	6.82	1.59	-----	7	11	11	9
1891.....	50.0	- 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	0.00	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	1.38	0.00	T.	2	19	8	4
1896.....	47.9	- 2.9	88	12	3.13	+0.67	5.05	1.51	T.	5	18	6	7
1897.....	56.8	+ 6.0	97	12	1.14	-1.32	3.30	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	1.20	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.....	53.5	+ 2.7	83	20	2.54	+0.08	6.66	0.28	T.	5	16	8	7
1903.....	52.2	+ 1.4	90	16	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	1.50	-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.....	52.2	+ 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	1.31	-1.15	3.25	-T.	T.	5	19	6	6
1916.....	50.9	+ 0.1	92	6	2.00	-0.46	4.33	0.20	2.0	8	16	7	8
1917.....	42.9	- 7.9	85	0	1.41	-1.05	4.00	0.15	2.2	6	10	11	10
1918.....	55.1	+ 4.3	93	21	3.64	+1.18	7.56	1.36	0.8	7	13	7	11
1919.....	50.7	- 0.1	89	8	3.02	+0.56	8.65	0.45	T.	10	11	8	12

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

## INTENSE RAINSTORM OF OCTOBER 4, 1919, AT DUBUQUE

By James H. Spencer, Meteorologist.

Weather Bureau, Dubuque, Iowa, October 20, 1919.

On October 4th Dubuque was again visited, for the second time during 1919, by a rainstorm of great intensity. The fall within an hour (2.66 inches) has been exceeded since the beginning of record 46 years ago, only

by the storm of July 9, 1919, and probably by the storm of July 4-5, 1876. The storm of October 4th gave a total of 3.38 inches, as compared to a total of 3.87 inches on July 9th. Rainfall was not remarkable on either date for "total" amount, but for intensity of fall within an hour.

During the week preceding the storm of October 4th the weather was continuously unsettled, with thunder showers every day. The week beginning September 28, 1919, in fact, was the wettest "first week in October" on record at this station, utterly spoiling the Fall Festival then in progress at Dubuque.

The great downpour occurred between 3:13 P. M. and 4:39 P. M., 90th meridian time, and was preceded by and followed by light rain. Rainfall was excessive from 3:18 P. M. until 4:38 P. M., and accumulated amounts during this period were as follows:

	Inches.		Inches.
5 minutes	.15	35 minutes	2.18
10 "	.35	40 "	2.33
15 "	.70	45 "	2.44
20 "	1.27	50 "	2.54
25 "	1.63	60 "	2.66
30 "	1.98	80 "	2.97

The following table gives the greatest amount of rainfall in 5, 10, 15, 30, 45, 60 and 120 minutes during the storm of October 4th, as compared to the storm of July 9, 1919:

Greatest amount in—	Storm of July 9th. Inches.	Storm of Oct. 4th. Inches.
5 minutes	.80	.59
10 "	1.20	.96
15 "	1.52	1.35
30 "	2.23	2.06
45 "	2.64	2.43
One Hour	2.70	2.66
Two Hours	3.03	3.06

The storm of October 4th was more local in character than that of July 9th, and the area of heavy rainfall did not extend to Union Park, where great damage resulted on July 9th. Intense rainfall, however, fell over the entire city, causing great damage to brick pavements on water-way streets. The effects of the storm within the city limits were practically a repetition of what occurred on July 9th.

The brick surface of Eighth, a steep water-way street, was again ripped off for several blocks. Seventeenth and Twenty-second streets experienced similar damage, as on Eighth, though much less steep. Seventeenth was not much damaged on July 9th. Kaufmann avenue was in process of repaving due to damage from the storm of July 9th, and much of the new work was ruined as before, causing heavy loss to the contractor. East of Clay and north of Sixteenth, a flat, residential section two or more blocks wide and more than a mile long, became a temporary lake during the storm and scores of cellars in this section were flooded and considerable property damaged.

There was other damage of a less serious nature in various parts of the city. The bathing beach property at Eagle Point, for instance, was much damaged for the third time this season. Losses outside the city were not

heavy. Four small county bridges were damaged or destroyed by freshets, the loss amounting to about \$3,000.

The total loss from this storm is estimated at about \$60,000, at least two-thirds of which amount was to city streets. Fortunately, in this storm no lives were lost, as on July 9th.

## NOVEMBER.

Excepting a small area extending from Page northeast to Madison counties, temperatures averaged below normal, the average daily deficiency being 1.4 degrees. Cold waves occurred on the 11th-12th and 25th-26th, and a warm period from about the 15th to the 24th. On the 13th a temperature of -12 observed at Alton is the lowest November temperature in Iowa since 1905.

Precipitation was evenly distributed and considerably above normal in all sections, resulting mostly from two storm periods, 9th-10th and 27th-29th. In the first period appreciable snow covered the northwest half of the State and in the second all portions were covered heavily, except the Mississippi River counties where it was light.

Wet fields and rainy days continued to delay corn husking till after the 10th when cold, drying weather permitted rapid progress and improved the roads so that much corn was marketed. Southwest gales on the 10th blew down much corn in the eastern half of the State. Considerable of this in the south-central and southeast counties was covered by snow toward the close of the month. Due to the high cost of husking, which averaged 8 cents per bushel, nearly 8 per cent of the corn was "hogged down" this year. At the close of November, 11 per cent of the corn remained unhusked as compared with 9 per cent in 1918.

Winter wheat entered the winter in good condition, 92 per cent of the acreage seeded having become well established. The severe temperatures of the month and the glaze storm of the 28th-29th were preceded by ample snow covering. Wires were damaged by the glaze in the Mississippi River counties.

**Pressure.** The mean pressure (reduced to sea level) for the State was 30.11 inches. The highest recorded was 30.74 inches, at Sioux City, on the 27th, and the lowest was 29.09 inches, at Dubuque, on the 29th. The monthly range was 1.65 inches.

**Temperature.** The mean temperature for the State, as shown by the records of 98 stations was 33.6°, or 1.4° lower than the normal. By divisions, three tiers of counties to the division, the means were as follows: Northern, 30.5°, or 2.3° lower than the normal; Central, 33.9°, or 1.2° lower than the normal; Southern, 36.5, or 0.6° lower than the normal. The highest monthly mean was 39.3°, at Keokuk, and the lowest was 23.1°, at Rock Rapids. The highest temperature recorded was 68° at Creston on the 1st, Lamoni on the 3d, and Harlan on the 16th, and the lowest, -12° at Alton, on the 13th. The temperature range for the State was 80°.

**Humidity.** The average relative humidity for the State at 7 a. m. was 82 per cent and at 7 p. m., 69 per cent. The mean for the month was 76 per cent, which is about normal. The highest mean was 82 per cent at Charles City, and the lowest, 72 per cent, at Keokuk.

**Precipitation.** The average precipitation for the State, as shown by the records of 104 stations, was 3.40 inches, or 1.89 inches above the normal. By divisions the averages were as follows: Northern, 3.15 inches, or 1.74 inches greater than the normal; Central, 3.39 inches, or 1.86 inches greater than the normal; Southern, 3.66 inches, or 2.08 inches greater than the normal. The greatest amount, 6.22 inches, occurred at Indianola, and the least, 1.97 inches, at Storm Lake. The greatest amount in 24 consecutive hours, 3.85 inches, occurred at Thurman, on the 9th.

**Snowfall.** The average fall for the State was 6.3 inches, which is 3.8 inches more than the normal. The heaviest fall was 17.0 inches at Harlan. Practically the entire fall of snow occurred on the 27th, 28th and 29th, when one of the largest November snows on record occurred over a large portion of the State. The snowfall was light over the extreme east-central and southeast portions, a few stations reporting less than 1.0 inch.

**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 63 miles an hour, from the southwest, at Keokuk on the 10th. This is the highest of record in this State in November.

**Sunshine.** The average per cent of the possible amount of sunshine was 47, or 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, 36; Davenport, 52; Des Moines, 50; Dubuque, 49; Keokuk, 51; Sioux City, 41; Omaha, Nebr., 48.

**Miscellaneous Phenomena.** Aurora 11th, 29th. Fog, dense, 2d, 7th, 8th, 9th, 21st, 29th. Halo, lunar, 4th, 18th, 29th. Halo, solar, 2d, 12th, 16th, 17th, 18th, 24th. Meteor, 2d. Sleet, 10th, 27th, 28th, 29th. Thunderstorms, 6th, 8th, 9th, 10th, 18th, 24th, 25th.

**Rivers.** Heavy rains, 9th-10th, caused sharp rises in the Mississippi and the interior rivers of the State, amounting to 5 to 7 feet in the latter. At Ottumwa, on the Des Moines river, the crest stage, 8.8 feet, is within 1.2 feet of the flood stage.

## 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
1890	38.6	+ 3.6	78	- 2	1.46	-0.05	3.55	0.71	-----	8	15	8	7
1891	39.5	- 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	86	-13	1.17	-0.34	2.56	0.05	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.	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	79	4	2.13	+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
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	5.30	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	68	- 4	1.03	-0.48	2.27	0.05	0.9	4	17	6	7
1908	39.3	+ 4.3	80	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	10	1.18	-0.33	3.49	0.20	0.4	6	11	7	12
1914	41.0	+ 6.0	80	4	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	3.65	0.05	3.6	5	16	6	8
1917	40.7	+ 5.7	77	3	0.28	-1.23	1.02	T.	1.4	8	14	6	10
1918	39.9	+ 4.9	76	0	2.11	+0.60	5.10	0.70	4.4	7	13	5	12
1919	33.6	- 1.4	68	-12	3.40	+1.89	6.22	1.97	6.3	8	11	7	12

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

## DECEMBER.

Wintry weather was the outstanding feature. Though not the coldest December for the State as a whole, stations in the eastern half, having records that began since 1876, established new records for low mean temperature. The first three weeks of the month were colder than any other similar period of record. A well-defined cold wave occurred on the 12th-13th and another was sweeping southward across the State on the 31st. December 10th was severely cold. In the morning of that date local areas in Hardin, Grundy, Poweshiek, Dallas, Fremont and Taylor counties experienced temperatures of 30° below zero or lower, which have never before been recorded so early in the winter.

Precipitation, mainly snow, was general on the 1st, and 6th-9th, and scattered on a few other dates. It was well distributed, but below normal, at all stations except Earlham. Under the snow covering, the ground froze but a few inches and where the snow was a foot or more deep it scarcely froze at all, in spite of the low temperature. The snow covering was continuous throughout the State, except the southern tier of counties and along the Mississippi river south of Davenport, where the ground became bare toward the close of the month. From Pottawattamie and

Shelby counties east-northeast over Polk county, from 12 to 20 inches of snow lay on the ground from the 9th to the 20th.

Grasses and winter grains were well protected during the severe temperatures. Drifting snow delayed transportation by rail and automobile during the first half of the month. During the last week the snow melted rapidly. Live stock were permitted to graze in the cornfields. Corn husking and shelling and fodder shredding were resumed, though shelling and marketing were limited by car shortage, the elevators being filled to capacity.

#### PRESSURE.

The mean pressure (reduced to sea level) for the State was 30.22 inches. The highest recorded was 30.98 inches, at Keokuk, on the 10th, and the lowest was 29.56 inches at Davenport on the 12th. The monthly range was 1.42 inches.

#### TEMPERATURE.

The mean temperature for the state, as shown by the records of 98 stations, was 15.0, or 8.9° lower than the normal. By divisions, three tiers of counties to the division, the mean temperatures were as follows: Northern, 12.4° or 8.8° lower than the normal; Central, 14.8° or 9.3° lower than the normal; Southern, 17.9°, or 8.5° lower than the normal. The highest monthly mean was 22.3°, at Keokuk, and the lowest monthly mean was 10.1°, at New Hampton. The highest temperature reported was 52° at Lamoni, on the 30th, and the lowest temperature reported was -36°, at Thurman, on the 10th, the range for the State being 88°.

#### HUMIDITY.

The average relative humidity for the State at 7 a. m. was 86 per cent, and at 7 p. m. it was 81 per cent. The mean for the month was 84 per cent, or about 3 per cent above normal. The highest monthly mean was 90 per cent, at Charles City, and the lowest mean was 82 per cent, at Des Moines.

#### PRECIPITATION.

The average precipitation for the State, as shown by the records of 109 stations, was 0.54 inch, or 0.68 inch less than the normal. By divisions, the averages were as follows: Northern, 0.46 inch, or 0.61 inch less than the normal; Central, 0.58 inch, or 0.67 inch less than the normal; Southern, 0.54 inch, or 0.68 inch less than the normal. The greatest amount, 1.55 inches, occurred at Earlham, and the least, 0.08 inch, at Albia. The greatest amount in any 24 consecutive hours, 0.70 inch, occurred at Waverly, on the 9th.

#### SNOW.

The average snowfall for the State was 5.8 inches, or 0.4 inch below normal. The greatest amount, 16.0 inches, occurred at Earlham, and the least, 0.5 inch, at Keokuk.

#### WIND.

The prevailing direction of the wind was from the northwest. The highest velocity was at the rate of 36 miles an hour from the northwest, at Sioux City, on the 12th.

#### SUNSHINE AND CLOUDINESS.

The average percentage of the possible amount of sunshine was 4 per cent, or about 8 per cent less than the normal. The per cent of the possible amount at the regular Weather Bureau stations was as follows: Charles City, 33; Davenport, 38; Des Moines, 37; Dubuque, 38; Keokuk, 48; Sioux City, 47; and Omaha, Neb., 47 per cent. The average number of clear days was 11; partly cloudy, 7; cloudy, 13.

#### MISCELLANEOUS PHENOMENA.

Aurora: 29th.

Fog; dense: 19th, 20th, 21st, 22d, 23d, 24th, 25th, 26th, 28th.

Halos, lunar and solar: 1st, 5th, 7th, 9th, 10th, 11th, 12th, 16th, 29th, 30th.

Sleet: 5th, 6th, 9th, 19th, 28th.

#### 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	1.05	+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	-0.57	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	+0.06	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	0.10	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	1.39	+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	-0.60	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
1919.....	15.0	- 8.9	52	-36	0.54	-0.68	1.55	0.08	5.8	4	11	7	13

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

## MONTHLY STATE DATA FOR 1919.

Month.	Barometric Pressure, Inches (Sea Level).			Temperature, Degrees, F.			Relative Humidity, Per Cent.			Precipitation, Inches.			Number of Days.			Sun- shine.	Wind.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	Mean.	Highest.	Lowest.	Date.	Mean.	Highest.	Lowest.	7 a. m.*	12 noon.*	7 p. m.*	Departure from normal.†	Lowest.	Average.	Departure from normal.	Greatest.		Least.	Snowfall.	With .01 inch or more precipitation.	Clear.	Partly cloudy.	Cloudy.	Per cent of the pos- sible amount.	Departure from normal.	Average hourly velocity.	Departure from normal.	Prevailing direction.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												

\*Local mean time. †Normal central time. \*7 a. m. and 7 p. m. observations only.

## COMPARATIVE DATA FOR THE STATE—Annual.

Year.	Temperature.				Precipitation in Inches.			
	Mean annual.	Highest.	Lowest.	Date.	Annual.	Greatest annual.	Least annual.	Av. snowfall.
1890.	48.0	110	—27	July 13.	31.30	45.74	16.00	—
1891.	47.3	106	—31	August 9.	32.90	49.05	23.48	—
1892.	46.6	104	—38	July 11.	36.58	48.77	24.78	34.2
1893.	45.7	102	—36	July* 13.	27.59	33.27	19.19	37.2
1894.	49.7	109	—37	July 26.	21.94	29.81	15.65	19.2
1895.	47.2	104	—33	May 28.	26.77	35.25	18.57	26.0
1896.	48.6	104	—20	July 3.	37.23	51.60	28.68	22.6
1897.	47.8	106	—30	July* 23.	26.98	36.18	20.21	38.8
1898.	47.7	103	—25	August 20.	31.34	55.47	19.51	40.3
1899.	47.3	104	—40	September 6.	28.68	42.06	21.79	23.4
1900.	49.3	103	—27	August 8.	35.05	47.33	25.05	25.8
1901.	49.0	113	—31	July 22.	24.41	37.69	16.35	38.5
1902.	47.7	98	—31	July 30.	43.82	58.80	20.14	28.0
1903.	47.2	101	—27	August 24.	35.39	50.53	26.41	19.4
1904.	46.3	100	—32	July 17.	28.51	38.93	19.34	29.2
1905.	47.2	104	—41	August 11.	36.56	52.26	24.66	38.3
1906.	48.4	102	—32	July 21.	31.60	44.34	20.63	32.8
1907.	47.4	102	—31	July 5.	31.61	43.90	19.93	24.0
1908.	49.5	101	—18	August 3.	35.26	49.98	24.11	22.7
1909.	47.4	103	—26	August* 15.	40.01	53.48	27.20	49.0
1910.	48.6	108	—35	July 16.	19.87	27.99	12.11	23.4
1911.	49.5	111	—35	July* 2.	31.37	46.77	19.74	35.3
1912.	46.4	104	—47	September 8.	28.89	33.13	15.25	39.5
1913.	49.7	108	—25	July* 16.	29.95	45.18	20.31	25.4
1914.	49.1	109	—31	July 12.	31.93	44.11	23.30	27.5
1915.	47.8	99	—32	May 14.	30.53	51.15	27.29	31.3
1916.	47.2	106	—34	August 4.	28.90	46.34	22.48	29.5
1917.	44.8	106	—40	July 30.	27.81	36.00	20.78	32.4
1918.	49.2	113	—36	August 4.	32.78	47.53	25.08	33.4
1919.	48.6	104	—36	July 30, 31.	36.76	48.16	26.88	26.6

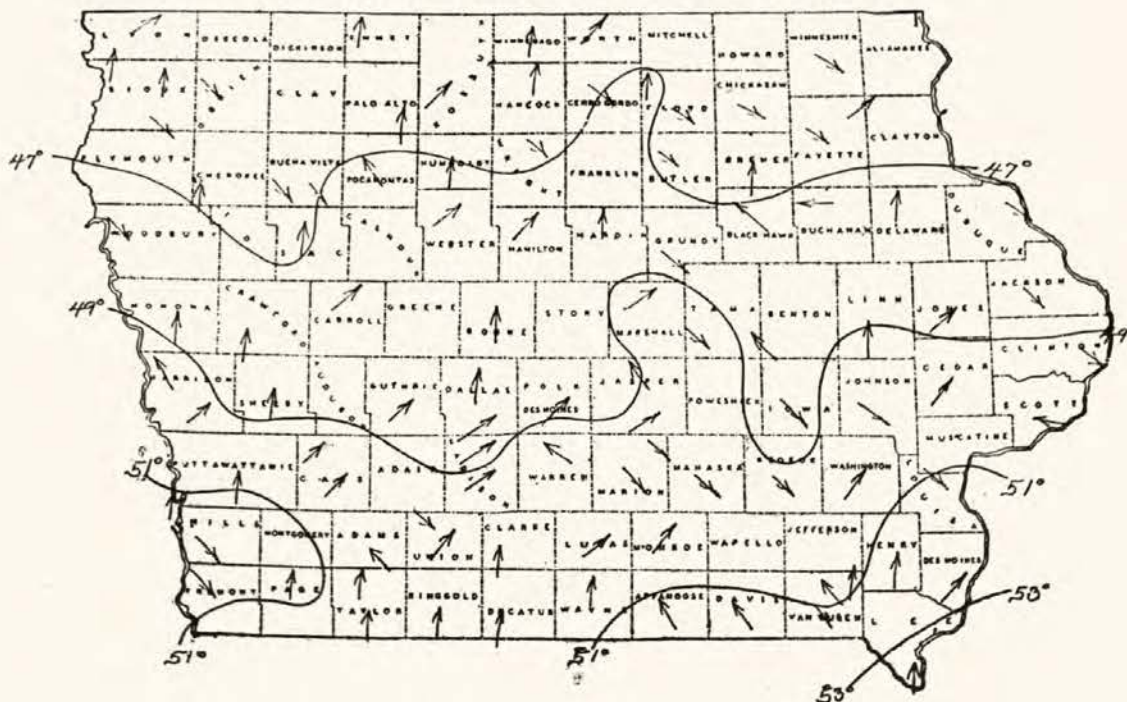
\*And other dates.

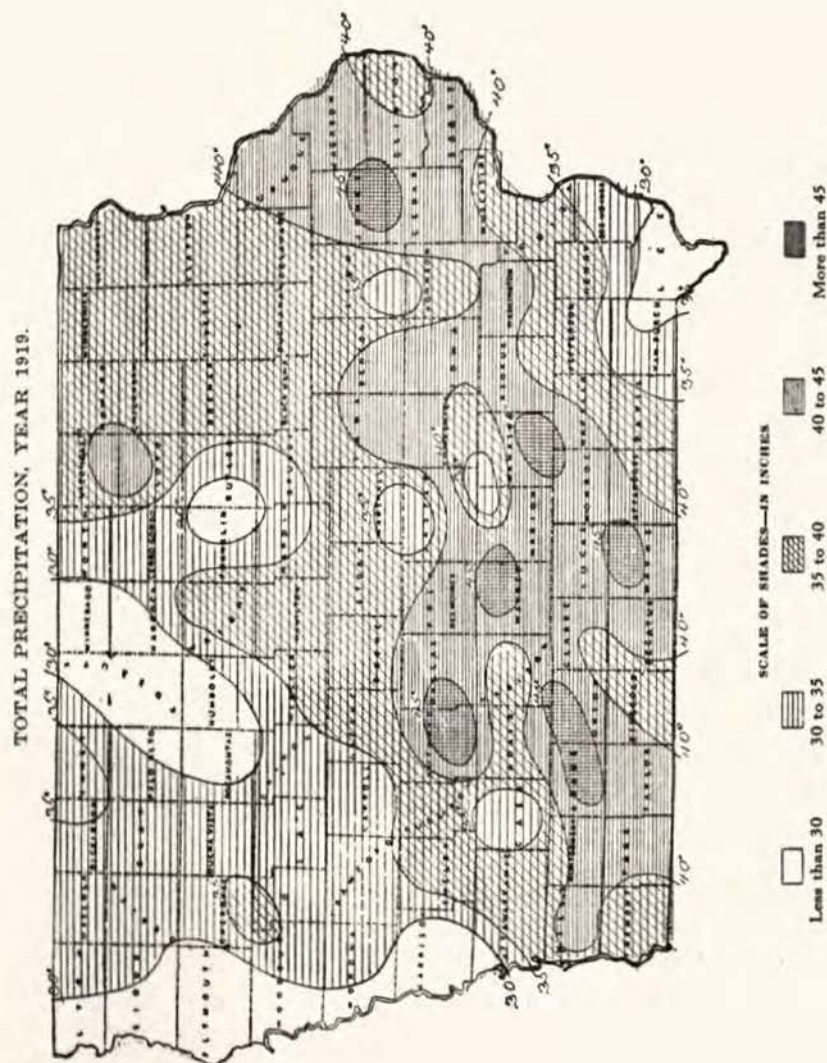
DATE OF KILLING FROSTS, 1919.

STATIONS.	Killing Frosts.		STATIONS.	Killing Frosts.		STATIONS.	Killing Frosts.	
	Last in Spring.	First in Autumn.		Last in Spring.	First in Autumn.		Last in Spring.	First in Autumn.
Northern Division--			Central Division--			Southern Division--		
Algona	Apr. 26†	Oct. 10	Ames	Apr. 27†	Oct. 11	Afton	Apr. 26†	Oct. 11†
Allison	Apr. 26†	Oct. 11	Audubon	Apr. 26†	Oct. 11	Albia	Apr. 26†	Oct. 12
Alta	Apr. 25†	Oct. 10	Baxter	Apr. 25†	Oct. 11	Allerton	Apr. 26	Oct. 11
Alton	May 2†	Oct. 10	Belle Plaine	Apr. 26	Oct. 11	Atlantic	Apr. 26†	Oct. 10†
Belmond	Apr. 26†	Oct. 11	Boone	Apr. 26	Oct. 10	Bedford	May 2†	Oct. 11†
Britt	May 2†	Oct. 11	Carroll	Apr. 26†	Oct. 10†	Bloomfield	Apr. 26†	Oct. 11
Charles City	Apr. 28	Oct. 11	Cedar Rapids	Apr. 26	Oct. 11†	Bonaparte	Apr. 26†	Oct. 11†
Decorah	May 2†	Oct. 11	Clinton	Apr. 25†	Oct. 17	Burlington	Apr. 25†	Oct. 17
Elkader	May 2†	Oct. 11	Davenport	Apr. 25	Oct. 17	Centerville	Apr. 26†	Oct. 10†
Estherville	May 2†	Oct. 10	Delaware	Apr. 26†	Oct. 11†	Chariton	Apr. 26†	Oct. 11†
Fayette	May 2†	Oct. 11	Denison	Apr. 26†	Oct. 10†	Clarinda	Apr. 25†	Oct. 11
Forest City	May 2†	Oct. 11	Des Moines	Apr. 26	Oct. 17	Columbus Junction	Apr. 25	Oct. 11
Humboldt	May 2†	Oct. 11	Dubuque	Apr. 25†	Oct. 28	Corning	Apr. 26†	Oct. 11†
Inwood	Apr. 26†	Oct. 10†	Fort Dodge	Apr. 26†	Oct. 11†	Corydon	Apr. 26	Oct. 11†
Le Mars		Oct. 10	Grinnell		Oct. 11	Creston	Apr. 26†	Oct. 11†
Mason City	May 2†	Oct. 10	Grundy Center	Apr. 18†	Oct. 11†	Earlham	May 2†	Oct. 11
New Hampton	May 2†	Oct. 11	Guthrie Center	Apr. 26†	Oct. 11†	Fairfield	Apr. 26†	Oct. 11
Nora Springs	Apr. 26	Oct. 11	Harlan	Apr. 26†	Oct. 10†	Glenwood	Apr. 24†	Oct. 10†
Northwood	May 2†		Independence	Apr. 26†	Oct. 11†	Greenfield	Apr. 25†	
Pocahontas	May 2†	Oct. 11†	Iowa City	Apr. 26	Oct. 11	Indianola	Apr. 26†	Oct. 11
Postville	May 2†	Oct. 11†	Iowa Falls	May 2†	Oct. 11†	Keokuk	Apr. 26	Oct. 28
Rock Rapids	May 6†	Oct. 10	Jefferson	May 2†	Oct. 11	Keosauqua	Apr. 26†	Oct. 11†
Sanborn	Apr. 26†	Oct. 10†	Little Sioux	Apr. 24†	Oct. 10†	Knoxville	Apr. 26†	Oct. 11†
Sibley	Apr. 26†		Logan	Apr. 24†	Oct. 10†	Lamoni	Apr. 26†	Oct. 11†
Sioux Center	Apr. 26†	Oct. 10†	Maquoketa	Apr. 26†	Oct. 11	Lenox	Apr. 26†	Oct. 11†
Spencer	May 2†	Oct. 10†	Marshalltown	Apr. 26†	Oct. 11	Mt. Ayr	Apr. 26†	Oct. 11
Storm Lake	Apr. 25†	Oct. 10†	Monroe	Apr. 26†	Oct. 11	Mt. Pleasant	Apr. 26	Oct. 11
Washita	May 2†	Oct. 10†	Olin	Apr. 26†	Oct. 11†	Murray	Apr. 26†	Oct. 11
Waverly	Apr. 26†	Oct. 11	Onawa	Apr. 24†	Oct. 10†	Northboro	Apr. 24†	
West Bend	Apr. 26†	Oct. 10†	Perry	Apr. 26†	Oct. 11	Oakland	Apr. 25†	Oct. 10†
			Rockwell City	Apr. 26†	Oct. 11†	Oskaloosa	Apr. 26	Oct. 11
			Sac City	Apr. 26†	Oct. 10†	Ottumwa	Apr. 25†	Oct. 9†
			Sioux City	Apr. 24†	Oct. 11	Pella	Apr. 26†	Oct. 11
			Tipton	May 18†	Oct. 11†	Shenandoah	Apr. 26†	
			Toledo	Apr. 26†	Oct. 11	Sigourney	Apr. 26	Oct. 11
			Waterloo	May 2†	Oct. 11†	Stockport	Apr. 26†	Oct. 11†
			Waukegan	Apr. 26	Oct. 11	Thurman	Apr. 24†	Oct. 11†
			Webster City	May 2†	Oct. 11†	Washington	Apr. 26	Oct. 11
			Williamsburg	Apr. 26†	Oct. 11†	Winterset	Apr. 26	Oct. 11
						Omaha, Nebr.	Apr. 24†	Oct. 14

†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 1919.





## WEATHER AND CROP REVIEW

All reference in this publication to the effect of weather on crops, is the result of co-operation between the United States Weather Bureau and the Iowa Weather and Crop Service.

The mildest winter in 29 years preceded the 1919 crop season in Iowa. The mean temperature of December to March, inclusive, was 30.4 degrees, or 6.5 degrees higher than the normal and 1.4 degrees warmer than the warmest similar period heretofore (1907-8) in 29 years. Plowing was done at intervals in each of the winter months. Very little ice was harvested. The soil was saturated the previous autumn and continued unusually moist through the winter. Fruit buds swelled abnormally but all came through the winter safely except peaches which advanced so far that they were seriously injured by later freezes.

Winter wheat, which entered the winter in excellent condition, was snow-covered during periods of critical temperature, and the mild, moist winter brought it through to April 1 with a percentage condition of 101, the highest of record. Heavy snow on December 24, 1918, amounting to a foot or more in several counties, covered the wheat growing luxuriantly out of the unfrozen ground. This was thought by some to be unfavorable, but it is worth while to remember that no damage resulted. A study of winter-killing of winter wheat during the last 20 years shows that a warm, moist February, or even a cold February with ample, porous, snow covering preceding periods of severe temperature, insures the survival of the winter wheat on a large per cent of the acreage seeded.

After March 16, the soil dried rapidly and seeding made good progress till April 2, after which frequent heavy showers greatly delayed field work, not more than 5 or 6 days being suitable for field work during the month of April. More precipitation fell and more days were rainy in the period February 1 to April 30 in Iowa than in any other similar period in 30 years since State-wide records have been compiled; 9.53 inches falling on 28 days, or 3.75 inches and 9 days above the respective normals. The year 1897 has held the record heretofore with 8.63 inches and 24 rainy days. Not more than 60 per cent of the intended oats acreage had been seeded up to the close of April and much that was seeded prior to April 7 lay uncovered on the ground and thus germinated without the possibility of disking or harrowing. Considerable of the pledged and intended spring wheat acreage could not be seeded. Winter wheat stood freely, made rank growth and was a foot high and beginning to joint in the southern counties by April 30. Pasturing and clipping with mowers was resorted to in some localities to arrest the rank growth of the wheat. Only about 40 per cent of the spring plowing was done in April and practically no corn planting. Farm work averaged 2 weeks later than normal. Deficient sunshine with temperature slightly below normal beneficially retarded the opening of fruit buds.

Rainy weather continued till May 6 when it culminated in a general downpour, followed by 8 days of good weather, but the saturated condition of the soil prevented or greatly retarded field work. By the 15th

only 40 per cent of the corn had been planted, and by the 31st 95 per cent. At the close of the month 80 per cent of the corn showed rows, and cultivation was making good progress in the drier counties. The cold, cloudy, rainy weather of the first week in May prevented proper pollination of cherries and plums and greatly reduced the crop. Pastures, clover, timothy and alfalfa were in the best condition for several years, except where injured beyond recovery by drouth and grasshoppers in the southwest portion of the State last season.

Warm, humid weather, June 9-26, caught both winter and spring wheat at a very critical stage and caused an untold amount of damage. Prior to this period winter wheat promised an unprecedented yield, but this unfavorable period reduced the average yield to 17.4 bushels, perhaps half what it might have been. This is 3.2 bushels below the average of the last 10 years and the lowest yield in that period, but by no means the lowest of record and would not have been considered so disappointing if earlier indications had not raised high hopes. Spring wheat suffered worst, being not only blighted and dried up but also being seriously attacked by "scab" and other plant diseases. The greatest damage was in northwest Iowa where a large acreage was not cut, except to remove the straw so that the tame grass for which it had been a nurse crop, might have a chance to grow. Much of the spring wheat was unfit for milling and was used for chicken feed. The average yield, 9.5 bushels is, with one exception, the lowest in 30 years. In 1904 the average yield was 9.1 bushels. Oats, though getting a bad start in the spring, yielded 34.6 bushels, or only 2 bushels less than the 10-year average. The weather was ideal for harvesting.

Corn made wonderful progress after June 8. All but the late planted was laid by early in July. Dry, hot weather toward the close of July caused the corn to fire in the southwest counties and on sandy uplands in other portions of the State, but the handsome yields reported at the close of the season indicate that the abundant moisture stored in the subsoil the previous winter and spring must have come to the aid of the corn in time of need.

Haying came on early but was generally neglected for corn cultivation. The quality of the hay crop was thus somewhat reduced and the second crop of clover from which seed is ordinarily expected, gave disappointing yields, due to its late start and the dry weather of the latter part of July.

While the rainfall of August was somewhat deficient, it was pretty well distributed as to frequency and area and corn improved steadily in condition so that on September 1, the percentage condition was 96 which has not been equalled but once. Drouth prevailed in the central and southern portions of the State from August 14 to September 17, but corn seemed to draw on a reserve supply of moisture, though the less deeply rooted garden truck suffered seriously. Corn matured and dried rapidly during September till heavy rains and cooler weather occurred toward the close of the month. Light to heavy frosts with temperatures near freezing occurred in the northwest counties September 23-25, but no damage was reported.

Potatoes deteriorated rapidly after the middle of July and the September rains came too late for them to rally. The average yield, 43 bushels per acre, is among the lower records, though not the lowest. Scarcely a county in Iowa produced enough potatoes for its own use and many were shipped in.

Cloudy, rainy weather in October delayed the drying and maturing of corn so that at the close of the month very little had been cribbed. What had promised an early harvest of the corn crop developed into a late unfavorable season. November was not very favorable either, so that on December 1, 11 per cent of the corn remained in the field as compared with 9 per cent in 1918. Most of the unhusked corn is in the southern half of the State and unfortunately much of it was blown down on the ground by the windstorm of November 10 and was covered by deep snow in late November and early December. Nearly 8 per cent of the corn was "hogged down." The average price per bushel paid for husking was 8 cents.

General frosts and freezing temperature held off till October 11. Only 2 per cent of the corn, that which was late planted or replanted, was soft or immature.

The season was generally unfavorable for sugar beets. Rainy weather late in May and early in June interfered with planting, thinning and weeding the beets, so that about 2,000 acres were abandoned. Much of the remaining acreage was of necessity planted late to the smaller, more rapidly maturing varieties which reduced the tonnage produced. Deficient precipitation in the beet raising counties of the north-central portion of the State in August arrested growth. In order to get sugar into the beets it is necessary to have moderate frost followed by sunny days. The first frost, October 11, destroyed 75 per cent of the foliage. The cloudy, rainy days that prevailed from late September through October induced new growth instead of maturity, so there was very little chance for the development of sugar. The output of sugar was only about two-thirds that of last year, though the acreage harvested was somewhat larger.

Dry, hard soil till the rains of late September, delayed the seeding of winter wheat till an unusually late date, yet on 92 per cent of the acreage seeded the wheat made good growth and became well established; 7 per cent germinated but made very little showing above ground; and only 1 per cent did not germinate up to the beginning of winter. A generous snow covering toward the close of November preceded a glaze storm that otherwise might have proved disastrous to the wheat, and it is believed to be entering the winter in very good condition. The percentage condition reported by the U. S. Bureau of Crop Estimates on December 1 in this State was 91. Preliminary estimates of the acreage seeded in the fall of 1919 place it at 453,000 as compared with 954,000 in the fall of 1918, or about 48 per cent.

#### Bulletin No. 1, April 8, 1919—

The winter of 1918-19 was the mildest of the 29 winters since the Iowa Weather and Crop Service was organized and averaged 2.1 degrees warmer than the record winter of 1907-08. Heavy rains in October and November

saturated the soil, and though January was deficient in precipitation, the soil continued more than usually moist till the last 10 days of March when it dried rapidly. At no time was the ground deeply frozen. Plowing was done at intervals in each of the winter months. More than the usual amount of plowing was done last fall. Seeding was about half finished in the southern tier of counties by the close of March and beginning in the central counties. The mild, moist winter was exceptionally favorable for winter wheat, rye, grasses, clover and alfalfa. Very little winterkilling is reported. Peach buds were abnormally advanced by the warm weather of January and will be nearly a failure in the southern counties.

The past week was warm, averaging about 5 degrees warmer than normal, and ranging from as low as 23 in the north on the 1st to 86 in the south on the 6th. Showers were abundant and sunshine was slightly deficient. Field work progressed rapidly except in the northeast where the soil is too wet. In most sections spring wheat seeding is completed or nearing completion and the acreage will probably not quite equal that of last year. Oats seeding is advancing rapidly. Plowing for corn is beginning. All vegetation made rapid progress; grass in pastures and lawns is green. The outlook for a hay crop is promising. Winter wheat never looked better on this date.

Live stock wintered well generally, though the spring pig crop is slightly disappointing as to size and strength of litters due to effects of influenza on brood sows and to lack of supplementary feeds. The lamb crop is unusually large and fine.

As a whole, the crop outlook is highly satisfactory.

The Secretary of the State Horticultural Society reports the condition of fruit on April 1st as follows:

"Apples, 90 per cent; pears, 60; Americana plums, 94; Domestic plums, 79; Japanese plums, 69; cherries, 88; peaches, 43; grapes, 91; red raspberries, 56; black raspberries, 88; blackberries, 84; currants, 90; gooseberries, 94; strawberries, 82 per cent of perfect condition. The average for all fruits is 81 per cent, or five points above normal for April, on a 15-year average. Conditions are favorable for a good fruit crop this year from the present outlook based on the condition of the plants and fruit buds."

#### Bulletin No. 2, April 15, 1910—

Rainy, cloudy weather with from 15 to 30 per cent of the possible sunshine characterized the weather of the week. Light snows occurred from Monona county northward. Temperatures averaged about 6 degrees below normal in the Missouri River counties, about normal in the northeast and 2 to 5 degrees above normal in southeast. The range was from slightly below 32 to about 69.

Three or four days of showery weather stopped field work generally, except in the southeast counties where the showers were light. Not more than half the intended acreage has been seeded to oats in the central districts and much less in the north. In many cases the oats have been sowed but there has been no opportunity to cover them. The acreage will be somewhat reduced unless favorable weather comes soon. Spring wheat and oats are up and show good stands in the south. Winter wheat made excellent progress; in fact, it is reported as too rank in several southern counties and is beginning to stem abnormally early in some localities. Meadows and pastures are starting nicely. As rough feed is scarce, pasturing has begun in some localities and will become general in about two weeks, if warm, sunny weather hastens growth.

While some gardening has been done, this work is being delayed beyond the usual time. Early potatoes are up in the southeast counties.

Early gathered and carefully stored seed corn is testing well, as usual, though there are about the usual number of complaints from those who failed to take due care.

#### Bulletin No. 3, April 22, 1910—

Cold, wet, unfavorable weather continued till about Thursday, the 17th, when it became warm and sunny, the soil dried rapidly and field operations were pushed Friday afternoon, Saturday and Monday after suspension for about two weeks in nearly all sections. Temperatures averaged 1 to 2 degrees below normal. Frost or freezing temperature occurred on several mornings. Sunshine was somewhat deficient. Early seeded oats are up in all parts of the state, but a large acreage remains to be seeded in the central and north portions and some even in the south. The difference of three weeks between the earliest and the latest seeded fields will probably cause wide variation in the maturity and harvest time of this crop. In many localities, where the seed lay on top of the ground, with no opportunity to disk or harrow it in, has already germinated and no further labor can be put upon it. Poor stands may result in some localities. Spring wheat is up and shows a good stand where seeded before the rains, and is showing green in some sections. The wet weather has probably reduced the acreage somewhat below that intended in the central and northern portions, as it is now too late. The condition of winter wheat, rye, grasses, pastures, meadows and fruit continues excellent. Delayed plowing will cause much late corn planting. Cherries, pears and plums are in bloom in the southern counties.

Adverse reports on the pig crop continue. Reports on colts are favorable.

Telegraphic reports, Tuesday morning, show that general rains occurred the night of the 21st-23d. This will cause further delay.

#### Bulletin No. 4, April 29, 1910—

Further delay in field work resulted from the general rains of Tuesday and Wednesday, 22d and 23d; Thursday, Friday and Saturday were generally fair and permitted out-door work, but rain came again Sunday and Monday. Excessive rains the morning of the 23d in Audubon, southern Carroll and eastern Shelby counties caused much damage to fields by erosion and flooding and to bridges, roads and railways. Sunshine was generally deficient, except a slight excess in the northeast counties. Temperature deficiencies averaged about 4 degrees. Freezing temperatures were general on the mornings of the 24th, 25th and 26th, and ice formed. Fruit damage was local and unimportant except in Scott county where the damage was serious. Only a small portion of the fruit buds were open in the central and northern portions and the bulk of the crop is believed to be safe. The first spraying is generally finished in the southern counties.

Early seeded oats are about 2 inches high, but are yellow in many localities, due to excessive moisture. Some oat seeding remains to be done. The unfavorable weather will turn some of intended acreage of spring wheat and oats to corn and barley. Winter wheat is 6 inches to one foot high in the southern districts, stooling generally, and showing the second joint in the extreme southeast. Spring plowing is not more than half completed and corn planting will be late. Live stock has been put on pasture about a week earlier than usual.

#### Bulletin No. 5, May 6, 1910—

Remarkably cloudy, cool, wet weather with rain on nearly every day in most sections and heavy downpours in some of the southern and eastern counties, made field work generally impossible, though progress was made in some northern counties where the rains were lighter and less frequent.

Deficiencies in temperature averaged 6 degrees, being the largest in the east-central portion; sunshine deficiency averaged 34 per cent, there being as little as 16 per cent of the possible amount at Davenport; and rainfall averaged 0.66 inch in excess of the normal.

Farm work is two weeks behind. On May 1st not more than 40 per cent of the customary amount of spring plowing had been done and scarcely a beginning had been made in planting corn whereas a considerable portion of the intended acreage is normally planted in the southern counties by that time. The condition of winter wheat, May 1st, was 109 per cent, and

less than 1 per cent of the acreage seeded last fall will be plowed up or abandoned from any cause. The condition of spring wheat was 98, and of tame hay, 101. Frosts on the morning of May 24, though heavy in some localities, were not generally damaging. Severe thunderstorms on the 2d-3d were attended by hail in small areas in Clay, Greene, Guthrie, Hardin, Marion, Marshall, Polk, Wayne and Winnebago counties. Crops were not far enough advanced to be damaged. Tornadoes were reported near Cornell, Clay county, and Grant City, Sac county.

Fruit spraying has been prevented by the daily rains. Early apples, plums and cherries are blooming profusely in the central counties and beginning to bloom nearly to the north line. The cloudy, cool weather is unfavorable for pollination, particularly of cherries.

The secretary of the State Horticultural Society reports the condition of fruit on May 1st as follows:

"Apples, 71 per cent; pears, 72; Americana plums 81; Domestica plums, 70; Japanese plums, 50; cherries, 83; peaches, 4; grapes, 85; red raspberries, 82; black raspberries, 84; blackberries, 85; currants, 83; gooseberries, 86; strawberries, 81 per cent of perfect condition. The average for all fruits is 72 per cent, which is 2 points above the average for May and a decline of 9 points during the month of April."

#### Bulletin No. 6, May 13, 1919—

Field work was resumed generally on the 9th and 10th. After a month of frequent, heavy showers, the rainy period came to a close with the general rain of May 6th. More rain has fallen and more days have been rainy since February 1st than in any other similar period in the 30 years of state-wide records in Iowa. Hailstorms occurred in Appanoose, Decatur, Johnson, Monroe, Warren, Wayne and Winneshiek counties on the 6th. In Wayne county the stones were three-fourths inch in diameter and caused slight damage. Sunshine averaged about normal being 16 per cent above normal at Dubuque and 14 per cent below normal at Sioux City. Temperatures, though higher at the beginning and ending of the week averaged 4 degrees below normal.

Corn planting became general on the 12th, wherever the ground was dry enough. The greatest progress was made in the Missouri and Big Sioux watersheds where 80 to 95 per cent of the spring plowing is done and corn planting is making rapid progress. In the lower Des Moines valley, the lowlands are under water or very wet, only the uplands have been plowed, and a bare beginning has been made in corn planting.

Small grains made good progress and their condition is excellent, except in a few localities where winter wheat is lodging on rich soil and turning yellow on saturated lowlands. The crop measures about 25 inches high in some fields in Ringgold county and is beginning to head in some counties. Rye is heading in several counties.

Fruit prospects continue good; the weather has been favorable for spraying and blooming has reached the north line.

Pastures and hay prospects were never better at this time of year. Alfalfa will be cut this month in Fremont county.

#### Bulletin No. 7, May 20, 1919—

Weather conditions of the past week were the most favorable of the season for farm work. Abundant sunshine and fresh winds dried the soil rapidly. Though too cool for the best growth of vegetation and for warming the soil, horses and men were able to work rapidly and put in long days.

Corn planting is 75 to 90 per cent done in the northeast counties where many farmers have finished, early corn is up, germination good, and rows showing. For the state as a whole 50 to 60 per cent of the planting is done. In the lower Des Moines valley probably not more than 40 per cent is planted and much plowing remains to be done. Showers Sunday night and

Monday forenoon relieved the baked condition of the soil resulting from the long wet period, made plowing easier, softened the clods which are unusually numerous and benefited grasses.

Winter wheat has been improved by the dry weather, the complaints of rankness, lodging and yellowness having diminished materially. Considerable heading is reported in the southern counties. Other small grains are in excellent condition. Grass would be improved by warm showers. Alfalfa is nearly ready to cut in Scott county.

Cherries and plums are dropping badly in many sections due to the heavy frosts and cloudy, wet weather the first days of May. Apple and small fruit prospects continue good.

#### Bulletin No. 8, May 27, 1919—

Except over the southeast and portions of the east-central and south-central districts, where the rain occurred on several days, the weather conditions for farm work during the past week were the most favorable of the season and over the greater portion of the state were carried on without interruption. Plant growth was retarded by cool conditions in south-eastern, and the districts to the north and west and over much of the western and central districts by the soil being too dry and hard.

Corn planting was pushed and over much of the northern and western districts it is practically completed; over the southeastern districts it is from 60 to 75 per cent completed. The early planted corn is coming up over the entire state and a good stand is shown except where the soil is too dry for proper germination and in some very wet fields. Cultivation of corn has started over many sections and will soon be general.

The condition of winter wheat and other small grain continues good, though many winter wheat fields are too rank and some fields are showing yellow on account of too much moisture and some rust has appeared in a few isolated fields. Winter wheat and rye are starting to head in a few fields as far north as the northern counties in the central division. Pastures and meadows in general continue in excellent condition but showers would be beneficial over most of the western, central and northern portions of the state and warmer weather is necessary for plant growth.

The prospect for an apple and berry crop is encouraging, but the cherry and plum crop will not be as good as expected.

#### Bulletin No. 9, June 3, 1919—

Warm, sunshiny weather followed by copious rains beginning Saturday and continuing Tuesday morning made ideal conditions for field work and crop progress. Temperatures averaged 4 degrees above normal. This was the first week since April 8th with temperatures above the seasonal normal. On May 30th, 90 degrees or higher was reached at many places for the first time this season.

Rank growth of winter wheat and rye has been checked by three weeks of relatively dry weather, yet some of the rankest was lodged by heavy rains and local wind squalls. Winter wheat is well headed out in the south and beginning to head in the north. There are some reports of rust. Rye is well headed in all sections and beginning to turn slightly in places.

Less than 5 per cent of the corn crop remains to be planted; probably 80 per cent shows the rows across the fields and a good stand; cultivation has begun in all sections and in the northeast the second cultivation has begun in a few fields. Though late, the crop is rapidly catching up and ten days of warm weather would bring it up to normal. Damage from cut worms and wire worms will necessitate some replanting as usual, but the amount will be much less than last year.

Oats, spring wheat and barley are making good progress. Some alfalfa has been cut in the southwest and cutting will become general in the southern half of the state this week. The crop is the largest in years. Clover and timothy are very promising and pastures excellent.

**Bulletin No. 10, June 10, 1919—**

Rains continued almost daily till Saturday and set in again Monday in the western portion of the state. Temperatures averaged 4 degrees below normal, the greatest deficiency approximating 7 degrees in the west. Sunshine averaged 23 per cent below normal.

Field work was practically suspended till toward the close of the week. Corn fields in some localities are becoming grassy, particularly in the south central district where very little cultivation has been possible. The crop has not suffered seriously and a few days of dry, sunny weather would make its condition excellent.

Winter wheat is in bloom in the south and heading rapidly in the north. It has lodged considerably on rich land. Rye also has lodged slightly. Oats and spring wheat have made good growth, though the former shows yellowness from poor culture due to heavy rains at seeding time.

Alfalfa cutting has been delayed by the heavy rains and some that was cut in the southwest has been damaged as it lay on the ground.

**Bulletin No. 11, June 17, 1919—**

High temperatures both day and night, resembling July conditions, advanced all crops rapidly. The temperature averaged 6 degrees above normal. Sunshine averaged 6 per cent below normal, ranging from 33 per cent below at Sioux City to 15 per cent above at Keokuk. Though rains were quite general up to the 12th, after that date they were mostly light and local; and in most sections of the state corn cultivation proceeded rapidly beginning Friday or Saturday. The progress of the crop is unusually variable, ranging from not yet planted on wet bottom lands in some southern counties, to half cultivated the second time on uplands in other sections. In Madison county corn is reported to be 8 to 10 inches high, though the average for the state would be about half that height. In general the fields are rather weedy, but a few days of warm, dry weather would speedily correct this. The heavy rains drowned and eroded corn and other fields quite seriously and the plants are yellow from excessive moisture in many sections.

Winter wheat is nearly all headed out and generally in bloom; rye is filling and turning; oats are beginning to head in all but the northern counties. Spring wheat is beginning to head as far north as the central portion of the state. The winter grains have lodged considerably and there are a number of reports of red rust on winter wheat in the southern counties, but in general the condition of the crop is good.

Alfalfa cutting has been delayed 10 days by wet weather. Red clover is in bloom and ready to cut in the central and southern counties, and will be cut as soon as there is favorable weather for hay making. This work is crowding in upon the corn plowing unusually early.

A large crop of fine strawberries is being gathered, though there is some complaint of rotting, due to rains. Other small fruits promise well, but tree fruits are dropping badly and cherries and plums are a failure in some sections. Grapes are blooming freely. Potatoes are blooming and prospects are good, except a few reports of rotting where the soil is too wet.

**Bulletin No. 12, June 24, 1919—**

Hot weather with numerous local showers and sunshine about normal pushed corn rapidly, though unfavorable for oats. The temperature averaged 8 degrees above normal and was above 90 generally on several afternoons. In the unusual effort to clean up the weedy corn fields many horses were overcome with heat and died. The earliest corn is knee high and some will be laid by within a week. Fields are now generally clean except in a few localities in the northern part of the state where cultivation has been delayed by excessive rains. Some fields have been cultivated the third time. The progress of the crop now averages up to normal for this date. Worms, thought by some to be army worms, have been very destructive to corn, grain and particularly alfalfa, in small areas in the southern half of the

state, but prompt remedial measures were taken by the farmers with the advice of county agents and the state entomologist and the worms are generally under control.

Winter wheat and rye are ripening, and harvesting will begin in a week or ten days in the southeast counties. Oats are in fair condition. The leaves of the plant show a reddish discoloration shading to a brown, dead condition at the tip. This is believed to be a disease of bacterial origin that will not cause serious reduction in yield. Though red leaf rust has attacked grains generally, the more destructive black stem rust has appeared in but few localities.

Potatoes are generally in good condition and in some localities new potatoes are large enough to use.

**Bulletin No. 13, July 1, 1919—**

Hot, dry weather continued in most sections until Thursday afternoon when it became much cooler. A few localities in the north and west portions were visited by excessive showers and destructive wind squalls on the 25th and 26th and a tornado in Chickasaw county on the 23d caused general damage amounting to about \$60,000, but not much damage to crops. Sunshine averaged 80 per cent which is about 9 per cent above normal.

Conditions were favorable for corn which made wonderful progress and much will be "laid by" by the 5th. Fields are generally clean. The tallest is waist high. The hot period of 18 days, June 9th to 26th, with high humidity during the first half of the period, has been very unfavorable for small grains. Scab, smut, leaf rust, blight and in a few localities, black stem rust, flourished. The yield and quality of the small grains have thus been greatly reduced. Harvest of winter wheat and rye has begun as far north as the central counties and is nearly completed in a few counties of the southern tier.

Damage to alfalfa, grass and small grain by army worms and variegated cutworms has been great in limited areas, but they have about run their course and are entering the ground.

An unusually heavy crop of timothy and clover hay is being harvested. Pastures are in excellent condition. Early potatoes are a good crop and are being used, but late potatoes are showing the effects of the dry, hot weather and are badly needing rain in the southwest counties.

**Bulletin No. 14, July 8, 1919—**

Seasonable weather during the past week advanced corn rapidly and the bulk of the crop is laid by with the fields fairly clean. Winter wheat, rye and hay harvest progressed rapidly. Though winter wheat was unusually promising from December to early June, the hot weather of the past month has caused serious deterioration through blight and scab. Not more than half of the kernels in the heads are plump and well filled. Though this is partly offset by the large number and size of the shocks, the yield per acre will scarcely be up to normal. The few early thrashing reports are disappointing. Spring wheat is similarly affected, and oats are blighting badly. Early oats harvest will begin this week. Showers that covered most of the state on the 4th and 5th were beneficial to corn, truck crops and pastures and did not cause serious delay or damage in haying and harvest.

The condition of the berry crop has improved slightly during the month and the percentage on red and black raspberries is the highest reported for July 1st in the last 20 years.

**Bulletin No. 15, July 15, 1919—**

Rains covered all portions of the state during the week and were generally beneficial except where excessive downpours occurred. These were mostly in the northwest, south-central and east-central portions, but also in limited areas in other portions. The most intense rainstorm in 45 years occurred at Dubuque on the 9th, causing seven deaths and \$100,000 damage.

Harvest was delayed in the areas of heavy rain. Winter wheat, early oats, rye and barley harvest are about completed. Spring wheat and late oats harvest is beginning. Haying has progressed rapidly. The second crop of alfalfa is being cut in the southwest. Threshing is beginning north to the central counties. Winter wheat yields of 15 to 18 bushels are reported, testing 58 pounds per bushel. Many fields of spring wheat are not worth cutting, due mostly to scab and blight. Corn made excellent progress; it is beginning to tassel in all sections and is somewhat in advance of the normal development, particularly in the northern counties. Truck and potatoes which have suffered from drouth, were greatly benefited by the rains of the week.

**Bulletin No. 16, July 22, 1910—**

Corn averages well along in its most critical period—the tasseling and silking period, though unusually variable in its development in some sections. With normal temperature and rainfall during the next 20 days this crop will be practically assured. It would be benefited by rain now in all sections, particularly in the central and southern counties.

Early thrashing returns show winter wheat yields of 10 to 35 bushels per acre, weighing 57 to 58 pounds per bushel. The average yield will not be far from that of the last 10 years. Spring wheat ranges from a considerable acreage not worth harvesting to possibly 15 or 20 bushels per acre, averaging not more than half of the 16-bushel normal on the acreage seeded. This crop is the poorest in the western counties, which have heretofore been the heaviest wheat producers in the state. Oats are light in yield and quality and the average will be considerably under that of the last 10 years which is 37 bushels.

Excellent weather for haying has resulted in a large crop of excellent quality. Second crop alfalfa is being cut and shows good yields. The quality is much superior to that of the first crop due to better weather for curing. More than the usual acreage of timothy is being cut or reserved for seed and a large crop is expected.

Potatoes, both early and late have suffered seriously from lack of rain; also garden truck.

**Bulletin No. 17, July 29, 1910—**

The hot, dry weather of the past week was ideal for finishing the harvest, curing grain in the shock, thrashing and stacking. Temperatures were near or above 100 degrees at many stations, 26th-28th. The mean temperature for the state, 82 degrees, is the highest of the season and 7 degrees above normal. Thrashing of winter wheat goes very slowly on account of the excess of straw. Early thrashing reports indicate that the yield will be about normal, but the quality is not very good. Spring wheat returns continue poor; oats light weight and less than normal yield. Corn is beginning to need rain in all sections, but in spite of the drouth which has prevailed in most sections of the state for the last two weeks, the corn appears to be holding its own remarkably well. The hot strong winds of the 25th, 26th and 27th caused the corn to curl in some localities, but there are very few reports of firing. It is problematical what the effects of the heat will be on pollenization. Such weather conditions tend to scorch the silk and render it unresponsive to the pollen and also to kill the pollen. At this time there is nothing to indicate that the yield will be reduced below the normal, though it is quite certain that a "bumper crop" cannot be expected. Local showers that covered a small portion of the state Sunday afternoon and night will be of great benefit. Pastures and truck crops are seriously needing rain over most of the state.

**Bulletin No. 18, Aug 5, 1910—**

Much needed rains fell in all portions of the state during the week. These with much cooler weather on the 1st and 3d afforded corn an opportunity to recover from the scorching of the previous two weeks which had become serious in about one-third of the state. Upland corn in some sec-

tions was too far gone to recover. Late planted lowland corn also suffered, mainly due to the poor resistant conditions of the soil resulting from saturation for a long period earlier in the season.

Hundreds of reports from township crop reporters show the average condition of corn on August 1st to be 93 per cent or 5 per cent better than the average of the last 10 years. The best corn is in the Mississippi river counties from Scott northward, where the condition ranges from 100 to 106 per cent. Similar conditions prevail in Fayette, Bremer, Mitchell, Mahaska, Sioux, Ida, Crawford, Shelby, Cass and Guthrie counties. In Blackhawk, Monroe and Kossuth the condition is less than 80 per cent.

Pastures averaged 95 per cent, or 11 per cent better than the 10-year average; potatoes 72, or 8 per cent poorer than the 10-year average.

Winter wheat yields, from 435 reports, average 18.5 bushels per acre, or 2.4 bushels below the 10-year average and considerably under standard weight; spring wheat, 445 reports, 10.2 bushels or 5.7 below the 10-year average, and of such poor quality that much cannot be milled; early oats, 523 reports, 33.3 bushels and 3.3 below the normal; late oats, 466 reports, 33 bushels; barley, 255 reports, 24.9 bushels; rye, 209 reports, 16 bushels; tame hay, 582 reports, 1.8 tons; wild hay, 1.4 tons.

The secretary of the State Horticultural Society reports the condition of fruit on August 1st as follows:

Summer apples, 55 per cent; fall apples, 44; winter apples, 27; pears, 17; Americana plums, 15; Domestic plums, 13; Japanese plums, 9; grapes, 80 per cent of a full crop. The average of all fruits is 32.5 per cent. The average of apples for the last 10 years is 46 per cent which is 4 per cent higher than the crop this year. The failure of the Americana plums has reduced the general average of fruits this year 25 per cent below the average of the last ten years on this crop. Grapes are more promising, being 13 per cent above the 10-year average of this crop. Apples in commercial orchards that have been sprayed, will be a fair crop of good quality, while those from farm orchards that have not been cared for will be poor and scarcely marketable on account of scab and worm injury.

**Bulletin No. 19, August 12, 1910—**

Good rains in nearly all portions of the state improved the condition of corn and pastures, but delayed thrashing and slightly injured shocked grain where the wind blew the caps off the shocks. In some of the southwest counties corn has fired seriously and the rain came too late to fully restore it, but only a small per cent of the total area of the state was thus affected. The crop is unusually variable in development, ranging from that which is just beginning to shoot to that which is well past the roasting ear stage and beginning to dent. Generally the ears have filled well, are heavy and beginning to hang down. In many localities it is believed the soil moisture is sufficient to insure the crop without further rain, but normal rainfall during the remainder of August would no doubt be beneficial. In Chickasaw county it is reported that the crop will be safe from frost on September 1st.

Thrashing is about two-thirds done in the southern and one-third done in the northern counties. The later thrashing returns are not reassuring.

The rains put the soil in good condition for plowing which was begun in many sections preparatory to seeding winter wheat.

The hot, dry summer seems to have injured potatoes beyond recovery, though some remarkable recoveries late in the season are on record and it is too soon to pronounce this crop a failure.

Considerable damage from hail and wind is reported in Clayton county.

**Bulletin No. 20, August 19, 1910—**

Good rains with moderate temperature and abundant sunshine were favorable for all growing crops. Corn made excellent progress. The ears are filling well, much has reached the denting stage, and the husks are be-

ginning to dry. Some is already fit to gather for seed. Indications are that the yield will be above normal.

Thrashing has progressed rapidly in spite of occasional delay by rain. In some localities thrashing is completed.

A fine third crop of alfalfa is being harvested. The yield and quality is as good as the second crop.

Fall plowing has made good progress, the rains having put the soil in good condition for this work.

Preparation of the ground for winter wheat is well along in some sections. The indications are that the acreage seeded to this crop will be considerably reduced.

#### Bulletin No. 21, August 26, 1919—

Rain was generally deficient, except in Winneshiek, Scott and adjoining counties and in a few central and south-central counties, where moderate rains occurred. Many of the northwest, west-central and east-central counties had no rain. Temperatures averaged about normal and ranged from about 90 on the afternoons of the 21st and 22d to well down in the 50's on several nights. Sunshine averaged 5 per cent above normal, being much above normal in the Mississippi river counties and somewhat below normal in the western part of the state.

Corn continued to make good progress and is maturing rapidly in most sections. New corn is being fed to hogs in some localities and "hogging down" is about to begin. Silo filling will begin in some of the northern counties within a week. The crop is generally earlier than normal and with favorable weather the bulk of it will soon be safe from frost. Old corn is being marketed briskly in some sections, which is a possible indication of confidence in the new crop.

Shock threshing is nearly finished, but considerable stack threshing remains to be done. A considerable acreage of spring wheat in the western counties that was not cut at harvest time has since been cut and removed from the land so that the tame grasses seeded therewith can grow. In many cases this wheat has been threshed and the yields realized were sufficient to cover the expense of harvesting and threshing.

Fall plowing is progressing where moisture is sufficient, and even in dry, hard soil, where tractors are available, but the dry soil is breaking up in hard clods.

Preparation for seeding winter wheat has been delayed by dry soil over most of the heavier winter wheat producing counties. Reports of decrease in the intended acreage of this crop are numerous.

Potatoes are regarded as a failure in many sections of the state. Pastures and truck crops are needing rain.

Sugar beets are affected by rust in Wright county. The plum crop is poor. Apples in sprayed orchards are yielding well.

#### Bulletin No. 22, September 2, 1919—

Dry, cool weather prevailed with night temperatures low in the 40's. Light frost was reported in the lowlands near Pocahontas on the morning of August 31st, and a minimum temperature of 38 at Inwood during the night of the 29th-30th. The mean temperature for the state, 66 degrees, is 3 degrees below normal. This is the first week since the week ending June 10th, with the mean temperature below normal. Scattered showers occurred in the southwest and extreme northeast and north portions, but less than half the area of the state received rain.

Corn is maturing rapidly but more rain and higher temperature during the last two weeks would have increased the yield. Silo filling is about to begin in many localities.

Pastures have failed in many sections due to dry weather and live stock is being fed green corn fodder and hay. Considerable hog cholera is reported.

Third crop alfalfa is yielding well and being put up in fine condition. Threshing made good progress.

Potatoes continued to deteriorate, due to dry weather, and unless rain comes soon much of the acreage will be practically a total failure.

Sorghum is ripe and ready to cut well in advance of probable frost.

The soil is so dry that fall plowing has been possible only by the use of tractors in most districts this week.

Preparation for seeding winter wheat is almost at a standstill due to dry soil, though seeding will begin soon in Scott county. A decided decrease in the acreage seeded is now indicated.

#### Bulletin No. 23, Sept. 9, 1919—

Hot and mostly dry weather with strong southerly winds hastened the corn toward maturity, but injured pastures, potatoes, tomatoes, sweet corn and minor truck crops. Temperatures in the 90's were general on several afternoons, particularly Monday, the highest being 97 at Burlington.

Reports from township correspondents, September 1st, show the average condition of corn to be 96 per cent, which is 12 per cent above the 10-year average. In 1912, when the largest crop of record, 45.8 bushels, was raised, the percentage condition on September 1st was only 95, but this was due to the fact that the crop was late; and only 66 per cent escaped serious frost injury. This year our correspondents estimate that 70 per cent of the crop will be safe if killing frost holds off till September 20th; 84 per cent October 1st, and 95 per cent, October 15th. It is believed that the yield will be about 42 bushels per acre, an unusually large percentage of which will be sound and marketable, with normal weather. Reports indicate that Iowa will easily head the list of corn-producing states this year. Silo filling is progressing rapidly in the central and northern portions and some corn has been cut for fodder.

Up to September 1st the average of all reported yields of winter wheat was 18 bushels; spring wheat, 10; oats, 34; barley, 25; rye, 15; timothy seed, 4.6.

Eighty-nine per cent of the threshing was done on September 1st, which is 17 per cent more than normal. Much of the grain is being stored on the farms, as cars are not available in which to ship it. The condition of pastures is 90 per cent, or about 5 per cent above normal; potatoes, 60 per cent or 10 per cent below normal.

Except in the northwest part of the state where showers were sufficient to moisten the ground to the necessary depth, fall plowing and preparation for winter wheat seeding have made little or no progress. Unless rain comes soon, seeding will be delayed beyond the usual time. Reports continue to indicate a large reduction in the acreage of both fall wheat and rye.

Canning factories began operations generally during the last 10 days. Sweet corn yield is being reduced by hot, dry winds. The corn ear worm is less troublesome this year. Tomatoes are considerably less than a normal crop, due to drouth.

Sorghum cutting is in progress, but not much grinding has been done. The acreage is less than last year. The acreage of buckwheat is believed to have been reduced also. Turnips are generally a failure.

Considerable second crop clover is being cut for seed, but the yield is generally disappointing and in many cases not as large as from the first cutting.

#### Bulletin No. 24, Sept. 16, 1919—

The week opened hot in the south and central districts with temperatures above 95 degrees on the 9th at many stations. Lower temperatures followed, reaching low in the 40's on the morning of the 13th, with light frost on the lowlands in the vicinity of Grundy Center and Iowa Falls. Drouth continued, except heavy rains in the northeast counties Tuesday

afternoon and night and light showers through the week in the northwest. The drouth is becoming serious in the central and southern districts. In the south-central counties, wells are failing, stock water is scarce and pastures are dried up.

Corn has dried rapidly. Silo filling and fodder shocking are nearing completion in the north. Late corn that did not reach the denting stage before the drouth set in three weeks ago, has deteriorated appreciably. Considerable corn that was reported in good condition has matured and dried too rapidly so that it will be loose on the cob.

Potatoes have suffered greatly from drouth and large quantities will have to be shipped into the state. Some counties that normally produce a large export crop will not have enough for home use.

Winter wheat seeding and fall plowing have been almost impossible in the southern two-thirds of the state due to the hard, dry condition of the soil.

Spring seeding of timothy and clover and fall seeding of alfalfa are seriously needing rain. Reports on the yield of clover seed from the second cutting continue favorable. The yield of hay from the second cutting of clover and the third cutting of alfalfa has been somewhat reduced by the drouth.

Considerable numbers of cattle and sheep are being shipped into the state to consume the large corn crop, though feeders are hesitating somewhat. Less than the usual number of sows will be bred this fall. The tendency is toward reduced production in all agricultural lines as a reaction from the strenuous efforts in war-time production.

#### Bulletin No. 25, Sept. 23, 1910—

Copious rains on several days relieved the long drouth in the central and south portions of the state. The average precipitation this week was the heaviest of the season. Over a belt extending from southwest to northeast across the state it amounted to from four to more than six inches. In the extreme northwest the amounts were small. The rain came gently and steadily and soaked the soil to an unusual depth. Very little ran off into the streams.

Fall plowing and winter wheat seeding which have awaited the rains are being rushed. Though late, considerable winter wheat and rye will yet be seeded. The acreage will be much less than last year.

Silo filling and fodder cutting are nearing completion in the north and west portions of the state and are making good progress elsewhere, though somewhat delayed by rainy weather.

The earlier planted corn, comprising 75 per cent of the crop, is now safe from frost. Many fields had dried, before the rain came, till they had the appearance of being killed by frost. Much seed corn of excellent quality was saved this week.

Temperatures ranged from slightly above 90 at a few stations on the afternoon of the 16th and 19th to 36 with light frost at Inwood in the extreme northwest on the morning of the 22d.

Potatoes are being dug in the north, but late varieties are still growing in some counties and it is believed that the recent rains may benefit them slightly. The crop is generally poor. Shipments into several towns are selling for \$2 per bushel or slightly above.

Pastures, young and newly seeded grasses, alfalfa and truck crops were greatly benefited by the rains and warm weather. The corn ear worm is reported as serious on both sweet and field corn in Pottawattamie county.

The apple crop amounts to practically nothing except in sprayed orchards which are yielding a fair crop. Grapes are plentiful and of good quality. Sorghum making is progressing rapidly.

#### Bulletin No. 26, Sept. 30, 1910—

Good rains beginning Saturday night, 27th, in the southwest and central portions of the state and extending over the rest of the state up to Tuesday

morning, have greatly benefited pastures, put the soil in good condition for fall plowing and permitted winter wheat seeding which is being pushed rapidly, though late. The acreage will probably be reduced to a pre-war basis.

Corn matured and dried rapidly during the dry weather that prevailed up to Saturday. Husking of the early varieties has already begun in the northern half of the state. Cribbing will become general by October 10th-15th, which is considerably earlier than usual. Light frost occurred in several northwest counties from the 22d to 25th, and heavy frost on the 25th nipped the corn leaves and killed tender garden truck in the extreme northwest.

Canning factories are drawing their operations to a close. The corn ear worm became so serious toward the close of the season that the cost of production was greatly increased.

Commercial apples of the earlier varieties are being harvested in the southwest counties. The vineyards of Pottawattamie county have produced well and a crop of excellent quality has been gathered.

The honey crop is good and the demand strong.

As a whole the crop season has been very favorable. Temperatures were generally above normal, but without extremes of heat. Rainfall, though not ideally distributed as to time and place has evidently been generally satisfactory to King Corn, who has prospered greatly, but as usual his prosperity has been somewhat at the expense of the small grains and potatoes. Spring wheat and potatoes are poor crops. The hay crop is excellent. Fruit, where well cared for, has given good returns.

#### CROP SEASON WEATHER, 1910, BY WEEKS.

Total rainfall, mean temperature and mean sunshine with departures from the normal.

Week ending	Rainfall (Inches)		Temperature (Deg. Fahr.)		Sunshine	
	Total	Departure	Mean	Departure	Percent	Departure
April 29	0.8	0.0	49	-8		
May 6	1.7	+0.7	51	-6	55	-3
May 13	0.4	-0.5	54	-4	63	0
May 20	0.6	-0.5	58	-3	69	+1
May 27	0.2	-0.7	60	-3	55	-7
June 3	2.1	+1.1	69	+4	60	-4
June 10	2.1	+1.1	64	-4	44	-23
June 17	0.9	-0.3	77	+6	63	-6
June 24	0.7	-0.4	78	+8	61	-7
July 1	0.2	-0.9	74	+1	80	+4
July 8	0.7	-0.2	77	+3	78	+4
July 15	1.6	+0.7	78	+3	66	-4
July 22	0.3	-0.3	74	0	92	+13
July 29	0.1	-0.8	82	+7	89	+15
August 5	1.1	+0.2	78	+4	78	+4
August 12	0.8	0.0	74	0	74	+2
August 19	0.5	0.0	73	0	81	+10
August 26	0.3	-0.2	72	+1	76	+3
September 2	0.1	-0.6	66	-8	81	+13
September 9	0.3	-0.5	75	+8	73	+10
September 16	0.4	-0.4	69	+4	72	+9
September 23	2.1	+2.5	67	+4	85	-7
September 30	1.6	+0.9	62	+5	67	+6

+, excess; -, deficiency.

#### IOWA CROP REPORT, MAY 1, 1919.

Reports to the Iowa Weather and Crop Service from township correspondents shows the condition of winter wheat to be 109 per cent, and less than 1 per cent of the acreage seeded last fall will be plowed up or abandoned for any cause; spring wheat, 98; tame hay, 101. Practically

no corn planting and only about 40 per cent of the spring plowing had been done. Farm work was about 2 weeks later than normal.

#### IOWA CROP REPORT, JUNE 1, 1919.

Following is a summary showing the percentage condition of crops on June 1.

Corn, 95 per cent; oats, 98; spring wheat, 99; winter wheat, 107; barley, 98; rye, 101; flax, 98; potatoes, 97; tame hay, 102; wild hay, 100; pastures, 105; alfalfa, 102; sweet corn, 97; pop corn, 96 per cent.

On May 15 only 40 per cent of the corn planting was done for the State as a whole. In the drier counties, Shelby, Calhoun and Pocahontas, 70 per cent, or more had been completed, while from Jackson southwest to Washington, thence westward to Union Counties only 5 to 20 per cent was planted. Heavy rains on the 19th further retarded field work in the southern division so that only 80 per cent of the corn planting had been done up to the close of the month in Lucas county, but in Black Hawk, Calhoun, Humboldt, Fremont and Page counties planting was finished, and for the State as a whole 95 per cent was done on June 1.

The secretary of the State Horticultural Society reports the condition of fruit on June 1 as follows: "Apples, 66 per cent; pears, 45; Americana plums, 49; Domestica plums, 44; Japanese plums, 34; cherries, 54; peaches, 3; grapes, 82; red raspberries, 84; black raspberries, 85; blackberries, 82; currants, 72; gooseberries, 78; strawberries, 90 per cent of a full crop. The average for all fruits is 62, a decline of 10 points since May 1."

#### IOWA CROP REPORT, JULY 1, 1919.

Reports from township correspondents showed the following average condition of crops on July 1: Corn, 94 per cent; oats, 92; spring wheat, 90; winter wheat, 91; barley, 93; rye, 95; flax, 90; potatoes, 94; tame hay, 103; wild hay, 100; pastures, 106; alfalfa, 101; sweet corn, 96; pop corn, 96 per cent. The decline in winter wheat since June 1 is 16 per cent, yet it is about the 10-year average. Spring wheat is 4 per cent below the 10-year average. Corn is 2 per cent above the 10-year average. The condition of tame hay is 3 per cent higher than before reported in the last 10 years.

Delay on the part of the township assessors in making their returns of the acreage of the various crops in 1918, makes it impossible to complete the acreage estimates of the Iowa Weather and Crop Service for the crops of 1919, in time for publication in this issue, but they will appear in the July report.

The secretary of the state horticultural society reports the condition of fruit on July 1 as follows: "Summer apples, 54 per cent; fall apples, 50; winter apples, 40; pears, 16; Americana plums, 24; Domestica plums, 18; Japanese plums, 17; cherries, 58; grapes, 85; red raspberries, 90; black raspberries, 91; blackberries, 83; currants, 73; gooseberries, 80 per cent of a full crop. The average for all fruit is 47 per cent or one point below the ten-year average for July, but is 15 points below that of last month, the decline being caused by the heavy drop of apples, pears and plums. The condition of the berry crop has improved slightly during the month

and the percentage on red and black raspberries is the highest reported for July 1 in the last 20 years."

#### IOWA CROP REPORT, AUGUST 1, 1919.

The condition of crops on August 1 was as follows: Corn, 93 per cent, or 5 per cent better than the average of the last 10 years; pastures, 95 per cent, or 11 per cent better than the 10-year average; potatoes, 72, or 8 per cent poorer than the 10-year average.

Early thrashing reports, mainly from the central and southern parts of the State, show the average yield of winter wheat to be 18.5 bushels per acre, or 2.4 bushels below the 10-year average and considerably under standard weight; spring wheat, 10.2 bushels, or 5.7 bushels below the 10-year average and of such poor quality that much can not be milled; early oats, 33.3 bushels, or 3.3 bushels below normal; late oats, 33.0 bushels; barley, 24.9 bushels; rye, 16.0 bushels.

The yield of tame hay is reported as 1.8 tons per acre; wild hay, 1.4 tons.

The secretary of the State Horticultural Society reports the condition of fruit on August 1 as follows:

Summer apples, 55 per cent; fall apples, 44; winter apples, 27; pears, 17; Americana plums, 15; Domestica plums, 13; Japanese plums, 9; grapes, 80 per cent of a full crop. The average of all fruits is 32.5 per cent. The average of apples for the last 10 years is 46 per cent which is 4 per cent higher than the crop of this year. The failure of the Americana plums has reduced the general average of fruits this year 25 per cent below the average of the last 10 years on this crop. Grapes are more promising, being 13 per cent above the 10-year average of this crop. Apples in commercial orchards that have been sprayed, will be a fair crop of good quality, while those from farm orchards that have not been cared for will be poor and scarcely marketable on account of scab and worm injury.

#### IOWA CROP REPORT, SEPTEMBER 1, 1919.

Reports from township correspondents, September 1, show the average condition of corn to be 96 per cent, which is 12 per cent above the 10-year average. It is believed that the yield will be about 42 bushels per acre, which would mean a crop of about 416,000,000 bushels, an unusually large percentage of which will be sound and marketable, with normal weather. Iowa will easily head the list of corn-producing states this year.

Up to September 1 the average of all reported yields of winter wheat was 18 bushels; spring wheat, 10; oats, 34; barley, 25; rye, 15; timothy seed, 4.6. Eighty-nine per cent of the thrashing had been done up to September 1 which is 17 per cent more than normal. Much of the grain is being stored on the farm, as cars are not available in which to ship it. The condition of pastures is 90 per cent, or about 5 per cent above normal; potatoes, 60 per cent or 10 per cent below normal.

#### FINAL CROP REPORT OF THE STATE, 1919.

Beginning with this, the final crop report for 1919, the Iowa Weather and Crop Service as a State organization and the U. S. Bureau of Crop Estimates as a Federal organization working in Iowa, have combined all

data to make one harmonized report of acreage and yield. This has necessitated a revision of the county and total acreages of some of the crops published by the Iowa Weather and Crop Service earlier in the season. For this reason comparisons with previous years' acreages of the various crops is impracticable this year. The prices here quoted were compiled by the Iowa Weather and Crop Service independently. This report does not include or take into consideration live stock, poultry or dairy products.

**Corn.**—The estimated acreage was 10,000,000; average yield, 41.6 bushels per acre; total yield, 416,622,000 bushels; average price, \$1.17 per bushel; total value, \$487,447,000. Only 2 per cent of the crop was reported to be soft or immature and 89 per cent had been husked on December 1. The total bushels of sound corn in Iowa this year are the greatest of record. The quality is generally excellent.

**Oats.**—The estimated area harvested was 5,670,000 acres. Average yield, 34.6 bushels; total yield, 196,391,500 bushels; average price, 64 cents; total value, \$125,690,560.

**Spring Wheat.**—Area harvested, 750,000 acres; average yield, 9.5 bushels per acre; total yield, 7,145,300 bushels; price per bushel, \$1.89; total value, \$13,504,617.

**Winter Wheat.**—Area harvested, 950,000 acres; average yield per acre, 17.4 bushels; total yield, 16,508,000; average price, \$1.98 per bushel; total value, \$32,687,028.

**Barley.**—Area harvested, 315,000 acres; average yield per acre, 25.5 bushels; total yield, 8,022,800 bushels; average price, \$1.11 per bushel; total value, \$8,905,308.

**Rye.**—Area harvested, 70,000 acres; average yield, 15.9 bushels; total yield, 1,110,050; price per bushel, \$1.33; total value, \$1,476,366.

**Flax Seed.**—Average yield, 9.5 bushels; total yield, 152,275 bushels; total value at \$3.90 per bushel, \$593,872.

**Timothy Seed.**—Area harvested, 200,000 acres; average yield, 4.5 bushels; total yield, 900,000 bushels; total value, at \$4.91 per bushel, \$4,419,000.

**Clover Seed.**—Area harvested, 60,000 acres; average yield, 1.4 bushels; total value at \$24.92 per bushel, \$2,093,280.

**Potatoes.**—Area harvested, 115,000 acres; average yield, 43 bushels; total yield, 4,942,110 bushels; average price, 1.94; total value, \$9,587,693.

**Hay (Tame).**—Average yield, 1.6 tons per acre; total yield, 4,957,370 tons; average price, \$18.37 per ton; total value, \$91,066,887.

**Hay (Wild).**—Average yield, 1.3 tons; total yield, 631,693 tons; average price, \$16.48; total value, \$10,410,301.

**Alfalfa.**—Area harvested, 148,000 acres; average yield, 3.2 tons; total yield, 477,314 tons; average price, \$23.09 per ton; total value, \$11,021,180.

IOWA CROPS, 1919, ESTIMATED NUMBER OF ACRES BY COUNTIES.

	Corn	Oats	Spring Wheat	Winter Wheat	Barley	Rye	Flax	Potatoes	Tame Hay	Wild Hay	Alfalfa	Pastures
Adair	117,100	42,600	10,000	14,200	5,020	140	---	810	20,800	1,670	110	121,300
Adams	77,300	26,900	4,700	21,900	1,320	150	---	500	20,100	1,770	420	101,100
Adams	43,000	40,000	7,300	1,200	6,200	500	50	1,270	25,700	1,230	30	179,100
Adams	50,000	25,500	2,800	17,600	30	800	---	350	41,800	---	50	131,700
Adams	119,000	38,800	6,200	4,200	8,000	20	---	820	22,200	1,490	1,200	119,100
Adams	145,100	94,100	6,200	1,800	7,440	1,110	---	1,030	39,400	8,020	110	184,800
Adams	105,500	70,500	1,000	1,000	5,490	80	20	1,030	22,900	7,270	60	96,000
Adams	131,100	78,400	3,800	2,100	1,170	1,170	---	450	29,300	20,300	70	86,000
Adams	66,700	53,400	3,800	200	1,980	1,100	20	1,470	20,200	12,000	40	79,000
Adams	100,300	70,000	4,500	800	4,750	1,540	60	1,070	25,800	7,100	700	116,700
Adams	125,400	95,100	2,800	300	1,050	1,410	10	1,130	22,800	10,000	20	92,000
Adams	103,300	81,800	3,800	600	1,730	1,230	20	1,520	20,900	8,000	200	56,000
Adams	146,200	101,200	2,100	200	810	30	---	540	20,500	6,480	300	83,100
Adams	117,100	66,400	10,800	2,700	2,100	300	---	970	24,800	800	600	104,300
Adams	126,700	43,700	13,500	27,200	9,520	670	---	800	45,700	130	110	107,800
Adams	108,500	40,500	4,800	8,100	3,540	100	200	1,420	20,500	8,300	140	84,700
Adams	128,600	76,800	6,100	50	3,540	100	---	1,190	27,000	7,000	2,730	84,700
Adams	63,000	61,000	1,000	50	2,820	510	350	1,350	33,000	13,400	---	90,500
Adams	111,300	83,800	1,800	19,300	1,750	150	---	220	29,700	80	120	113,100
Adams	60,400	23,200	1,800	2,000	9,800	680	---	910	29,500	11,400	520	77,800
Adams	111,300	83,400	8,400	2,000	10,350	2,000	---	2,040	66,700	1,150	60	184,700
Adams	110,200	45,300	8,500	5,300	3,140	230	---	960	55,800	1,450	130	160,400
Adams	126,000	64,500	31,300	1,600	3,140	230	---	1,530	48,100	4,940	5,100	122,400
Adams	136,000	60,200	5,500	28,600	820	260	---	370	20,800	1,900	600	91,300
Adams	99,800	60,200	2,300	10,200	120	1,340	---	520	51,100	80	60	156,900
Adams	72,200	34,000	5,100	28,200	40	1,330	---	840	33,900	220	170	132,800
Adams	86,500	38,000	1,000	500	9,000	1,330	---	1,190	40,000	5,840	40	117,800
Adams	66,900	28,300	1,500	500	2,210	2,210	---	1,000	35,400	80	320	83,800
Adams	64,900	50,700	4,000	19,500	380	750	---	610	13,700	11,620	220	82,200
Adams	67,500	49,800	7,300	600	1,850	230	---	2,370	59,400	600	70	152,200
Adams	69,500	58,000	1,500	500	5,140	400	---	1,580	16,400	5,200	130	56,700
Adams	92,100	74,300	5,600	500	2,040	400	---	1,630	59,900	11,000	20	155,900
Adams	79,700	74,300	7,000	50	7,770	450	---	1,790	34,100	4,200	60	75,200
Adams	114,300	84,800	3,900	43,200	2,060	910	---	1,680	32,900	7,680	30	55,500
Adams	123,100	14,700	3,300	100	3,340	550	---	400	9,600	2,550	9,650	69,200
Adams	144,000	74,500	5,300	2,800	850	50	---	500	22,000	4,240	70	82,800
Adams	105,600	78,000	8,400	1,200	3,250	40	---	2,000	23,200	7,200	20	65,300
Adams	114,800	48,800	9,200	7,100	1,460	130	---	450	24,400	8,320	800	114,400
Adams	135,000	88,500	4,200	600	1,550	50	---	1,160	22,700	4,800	100	75,200
Adams	98,900	89,300	5,200	100	3,400	300	---	1,500	26,000	21,200	110	79,400
Adams	109,700	75,600	1,800	300	3,850	90	---	970	23,000	4,800	120	78,200

	Corn	Oats	Spring Wheat	Winter Wheat	Barley	Rye	Flax	Potatoes	Timothy Hay	Wild Hay	Alfalfa	Pastures
Harrison.....	145,520	49,000	37,400	14,500	1,900	340		1,040	9,000	6,480	16,450	95,200
Henry.....	69,400	32,800	1,600	11,100	210	1,320		1,380	25,300	11,780	70	105,100
Howard.....	47,300	60,500	5,500	1,150	4,000	680	1,520	1,540	35,300	5,560	210	79,700
Ida.....	81,100	68,300	4,000	400	2,600	1,000	30	1,370	19,400	1,740	1,580	45,800
Iowa.....	86,100	54,800	6,800	5,000	2,600	540		1,370	24,500	1,430	30	69,400
Jackson.....	97,300	84,000	7,800	1,000	3,300	290		1,440	38,000	1,430	20	135,000
Jasper.....	146,600	61,900	15,200	10,800	1,020	320		900	88,200	1,640	110	145,600
Jessie.....	66,600	30,600	1,500	10,000	1,110	200		1,440	43,800	560	50	101,200
Johnson.....	104,000	46,200	4,200	6,000	1,700	1,300		1,080	48,500	180	100	131,500
Jones.....	76,800	42,400	1,000	8,500	4,720	400		2,830	41,100	10	60	141,700
Kearney.....	124,400	103,300	10,900	8,500	6,770	250	2,790	2,830	34,800	27,430	270	130,100
Kenneth.....	122,300	66,500	7,600	15,100	480	10,000		1,970	47,600	2,900	160	125,000
Lea.....	122,300	66,500	7,600	15,100	480	10,000		2,330	27,300	70	70	143,400
Lincoln.....	64,400	25,600	500	24,300	3,320	2,140		2,330	12,800	8,230	30	85,600
Louis.....	187,700	105,000	6,900	24,300	5,080	230	40	2,330	34,100	200	70	143,400
Lucas.....	187,700	105,000	6,900	24,300	5,080	230		2,330	34,100	200	70	143,400
Lyon.....	113,900	44,100	4,300	28,100	3,000	340		1,970	47,600	180	110	143,400
Madison.....	90,400	34,600	9,700	29,400	620	360		2,330	12,800	8,230	30	85,600
Manly.....	111,700	62,800	5,500	25,000	780	170		1,970	47,600	180	110	143,400
Marshall.....	100,700	54,300	9,000	25,000	1,050	320		2,330	12,800	8,230	30	85,600
Mills.....	180,500	27,900	7,100	25,000	2,650	90		2,330	12,800	8,230	30	85,600
Mitchell.....	180,500	27,900	7,100	25,000	2,650	90		2,330	12,800	8,230	30	85,600
Monona.....	65,100	24,100	4,200	21,000	1,000	300		1,150	9,300	3,720	20	85,600
Montgomery.....	81,000	33,000	1,000	12,000	3,720	30		1,150	9,300	3,720	20	85,600
Muscatine.....	182,100	72,300	2,800	12,000	4,720	8,670		1,150	9,300	3,720	20	85,600
Nemaha.....	103,600	27,000	7,300	21,000	1,350	300		1,150	9,300	3,720	20	85,600
Osceola.....	112,400	80,700	7,300	21,000	1,350	300		1,150	9,300	3,720	20	85,600
Pale Alto.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Pennock.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Pocahontas.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Polk.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Pottawattomie.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Pottawattomie.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Ringgold.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Sac.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Scott.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Shellsburg.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600
Sioux.....	101,300	91,300	6,700	1,100	4,660	130		1,150	9,300	3,720	20	85,600

Story.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Taylor.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Union.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Van Buren.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Wapello.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Washington.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Wayne.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Webster.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Winnebago.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Winnebago.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Winnebago.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Winnebago.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Worth.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Wright.....	141,000	72,200	2,800	4,000	90	130	60	2,150	34,000	2,710	230	79,200
Total.....	10,000,000	5,670,000	750,000	960,000	315,000	70,000	15,000	115,000	2,002,000	478,000	148,000	10,225,000

TABULATED CROP SUMMARY FOR THE YEAR 1919.—PART I

County	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	40	4,684,000	33	1,405,800	10	100,000	17	241,400	21	105,420
Adams	34	2,628,000	37	966,300	9	42,300	16	350,400	31	40,400
Alfalfa	50	2,150,000	39	1,560,000	10	73,000	18	21,000	29	179,000
Appanoose	37	1,860,000	30	765,000	8	22,400	15	284,000	22	600
Arundel	46	5,474,000	31	1,474,600	11	96,800	18	67,200	24	240,000
Benton	43	6,153,000	32	3,011,300	15	98,000	23	41,000	29	179,500
Black Hawk	32	3,376,000	37	2,608,500	15	54,000	17	17,000	24	159,215
Boone	44	5,768,000	40	3,130,000	12	60,000	15	31,500	30	35,100
Bremer	36	2,395,000	33	1,762,300	13	49,400	20	4,000	25	49,000
Buchanan	36	3,611,000	37	2,612,300	16	72,000	18	3,600	30	142,500
Bureau Vista	42	5,267,000	37	3,318,700	9	35,200	16	4,800	27	28,500
Butler	30	3,099,000	29	2,372,300	12	45,600	10	950	25	43,250
Calhoun	48	7,018,000	42	4,250,400	7	14,700	15	9,000	28	23,680
Carroll	47	4,162,000	39	2,589,000	8	86,400	16	43,200	30	64,800
Cass	43	5,448,000	35	1,529,500	9	121,500	17	462,400	27	257,040
Clayton	45	5,118,000	38	1,539,000	13	59,800	22	178,200	23	236,900
Cerro Gordo	38	3,374,000	38	2,304,000	10	61,000	19	753	26	74,300
Cherokee	50	6,430,000	38	2,184,400	8	11,200	10	3,000	29	69,680
Chickasaw	35	2,305,000	28	1,586,000	9	59,400	14	703	19	53,500
Clarke	32	1,992,000	28	649,600	8	14,400	16	316,800	25	3,200
Clay	42	4,676,000	37	3,065,800	7	9,800	18	2,600	25	45,500
Clinton	43	5,671,000	35	2,184,000	16	134,400	22	44,000	33	254,800
Crawford	47	5,172,000	35	1,090,500	12	102,000	22	121,900	25	267,000
Dallas	42	5,897,000	34	2,193,000	8	250,400	10	25,600	27	84,780
Davis	48	6,048,000	37	2,227,400	10	55,000	19	543,400	20	16,400
Deatur	37	2,213,000	33	1,300,200	6	13,800	18	163,200	18	2,160
Delaware	33	2,383,000	38	884,000	5	8,000	16	451,200	18	720
Des Moines	41	4,654,000	37	1,708,000	14	71,400	19	1,450	16	1,450
Dickinson	43	5,077,000	28	1,722,400	11	70,000	19	876,500	19	876,500
Dubuque	40	2,506,000	33	1,673,100	8	32,000	10	25,600	25	46,250
Emmet	48	3,240,000	29	1,444,200	14	102,200	18	10,800	30	102,800
Fayette	32	1,904,000	35	2,030,000	8	12,000	10	22	44,880	
Floyd	44	4,654,000	35	2,663,500	9	49,600	20	10,700	27	309,700
Franklin	38	3,029,000	32	2,154,700	11	77,000	19	1,200	24	1,200
Fremont	33	3,769,000	38	2,798,400	12	28,800	15	1,500	24	80,160
Greene	42	5,170,000	34	499,800	9	35,100	17	724,400	29	9,280
Grundy	43	6,192,000	38	2,831,000	8	42,400	14	89,200	30	25,500
Guthrie	38	4,013,000	34	2,032,000	12	40,800	20	24,000	28	91,000
Hamilton	30	4,469,000	31	1,650,200	11	101,200	19	184,900	27	18,500
Hancock	45	6,075,000	41	2,828,000	12	88,000	18	12,000	24	37,200
Hardin	37	3,650,000	35	1,325,500	9	47,700	12	1,200	25	85,000
Harrison	41	4,498,000	35	2,646,000	10	28,000	17	5,100	27	91,290
Henry	29	5,587,000	34	1,996,000	9	338,800	16	232,000	27	52,730
Herrick	43	2,915,000	33	1,082,400	10	16,000	18	199,800	25	5,250
Humboldt	30	1,841,000	37	1,813,700	9	86,000	15	6,000	22	12,600
Iowa	40	2,644,000	38	2,921,600	9	56,000	15	68,000	28	75,000
Ida	46	3,961,000	40	2,192,000	12	76,400	14	1,400	26	75,920
Jackson	46	4,503,000	35	1,685,600	12	25,000	21	105,000	27	77,220
Jasper	44	2,895,000	38	1,224,000	12	93,000	18	28,800	35	89,140
Jefferson	45	6,137,000	32	1,106,800	9	163,800	18	194,400	35	29,530
Johnson	35	2,821,000	38	1,838,000	9	88,000	16	125,600	18	1,680
Jones	45	4,680,000	37	1,709,400	15	63,000	21	134,400	25	42,640
Keokuk	43	4,799,000	34	1,352,300	9	98,100	17	144,500	25	6,750
Kossuth	39	6,802,000	34	5,212,300	9	66,000	10	2,000	25	118,000
Lake	32	2,065,000	32	708,000	10	19,000	19	843,800	23	8,460
Lamar	46	4,626,000	36	2,394,000	15	117,000	18	30,000	25	25,000
Lauda	44	2,834,000	36	867,600	10	8,000	20	440,000	25	2,000
Lucas	36	2,041,000	35	692,500	9	24,800	15	862,750	27	2,430
Lyon	45	5,976,000	38	3,800,000	6	35,400	14	2,800	25	149,500
Madison	41	3,596,000	40	1,186,100	10	42,000	19	723,900	30	91,000
Mahaska	46	4,359,000	39	1,397,000	11	99,000	19	277,400	35	18,800
Marion	41	1,706,000	36	1,238,000	9	3,200	21	7,000	25	1,000
Marshall	46	5,138,000	35	2,443,000	10	80,000	22	103,400	30	23,400
Mills	40	4,292,000	31	598,300	8	76,800	15	369,000	25	25,250
Mitchell	42	2,549,000	38	95,000	13	92,300	15	1,500	26	69,900
Monroe	37	3,823,000	34	949,600	9	305,800	14	284,000	22	27,730
Monroe	40	4,517,000	39	412,500	12	42,000	18	266,700	25	1,680
Montgomery	41	3,817,000	34	819,400	6	60,000	17	561,000	27	26,190
Muscatine	43	3,509,000	33	788,700	11	42,900	23	289,800	19	89,880

TABULATED CROP SUMMARY FOR THE YEAR 1919—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	Bushels per acre	Total Bushels
O'Brien	44	5,029,000	39	3,877,400	10	28,000	12	2,600	26	183,140
Osceola	30	2,956,000	35	2,530,500	7	21,700	19	1,900	26	88,400
Page	32	3,997,000	35	3,087,000	10	748,000	13	1,018,800	23	8,740
Palo Alto	34	3,822,000	35	2,824,500	8	26,400	11	1,100	35	31,500
Plymouth	46	8,800,000	33	3,012,900	7	309,000	15	16,500	24	109,440
Pocahontas	40	5,384,000	36	3,747,000	9	25,200	14	2,800	29	35,670
Polk	46	4,706,000	35	1,606,500	9	121,500	21	568,300	19	5,480
Pottawattamie	40	8,124,000	39	1,681,300	13	307,000	15	545,000	26	296,880
Poweshiek	35	3,919,000	35	1,915,000	14	93,800	19	30,400	28	93,700
Ringgold	46	2,916,000	28	884,000	12	12,600	11	244,300	22	4,400
Sac	46	5,364,000	38	3,226,300	8	12,000	14	9,800	25	78,500
Scott	48	3,720,000	30	738,000	13	94,900	24	455,000	19	276,500
Shelby	42	5,069,000	35	1,836,000	8	12,000	15	18,000	27	307,000
Sioux	42	5,519,000	38	2,662,300	9	157,500	12	7,200	28	448,400
Story	42	5,922,000	34	2,667,200	10	88,000	16	64,000	29	2,610
Tama	41	5,306,000	33	2,577,300	11	96,800	17	22,100	25	213,000
Taylor	40	3,782,000	35	1,137,600	7	11,200	15	68,000	24	2,100
Union	33	2,274,000	32	959,800	8	12,000	15	287,000	22	26,400
Van Buren	44	3,184,000	29	801,000	9	10,800	17	214,200	24	1,920
Wapello	40	2,428,000	29	646,700	8	25,000	17	392,100	25	7,500
Washington	40	3,304,000	30	1,696,000	8	57,000	17	924,800	20	19,800
Wayne	44	4,690,000	29	1,383,300	13	44,900	17	107,100	25	9,000
Webster	34	2,445,000	30	1,071,000	7	14,000	15	266,500	24	1,680
Winnebago	44	6,657,000	40	4,636,000	11	77,000	17	2,500	30	26,200
Winnebago	44	2,596,000	34	826,500	8	100,800	13	2,600	19	126,840
Winnebago	48	4,186,000	33	2,448,000	9	117,000	18	3,600	27	292,170
Woodbury	41	7,590,000	33	2,948,600	7	212,800	14	59,600	35	43,420
Worth	37	1,902,000	30	1,632,000	8	77,000	10	1,000	28	8,660
Wright	41	4,768,000	37	8,281,000	14	78,600	17	6,900	28	85,440
	41.6	418,622,000	34.6	196,391,500	9.5	7,145,300	17.4	16,568,000	25.3	8,022,800

## TABULATED CROP SUMMARY FOR THE YEAR 1919.—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	17	2,380			38	30,780	1.7	35,360	1.2	2,004	2.0	220
Adams	16	2,400			39	18,000	1.7	30,150	1.4	2,478	2.5	1,660
Adams	17	8,500	9.5	478	50	93,500	1.7	80,500	1.6	1,938	3.1	62
Appanoose	14	11,200			32	11,200	1.4	37,800	1.6	1,844	3.1	155
Audubon	17	340			25	20,500	1.6	35,520	1.2	1,788	3.1	3,720
Benton	17	18,870			30	30,000	1.6	63,040	1.0	2,030	3.1	341
Black Hawk	19	62,700	9.5	190	40	64,900	2.0	45,200	1.2	9,824	3.1	181
Boone	19	1,520	9.5	950	36	16,200	1.7	45,500	1.1	1,707	2.0	600
Bremont	16	17,000	9.5	190	26	38,220	1.8	38,300	1.4	28,504	3.1	217
Buchanan	19	23,200	9.5	96	36	38,520	1.9	54,730	1.6	19,200	3.1	124
Buena Vista	17	6,970	9.5	570	40	45,200	1.7	38,900	1.4	10,024	3.0	2,100
Butler	15	18,450	9.5	95	30	45,600	1.7	45,580	1.1	11,560	2.5	50
Calhoun	18	1,350	9.5	190	35	18,900	1.6	33,440	1.1	3,399	3.5	919
Carroll	15	450			30	97,530	1.7	61,850	1.4	9,920	3.1	1,068
Cass	16	6,120			30	22,100	1.6	39,650	1.2	1,982	2.3	1,350
Cedar	19	12,780			33	27,620	2.0	91,400	1.5	195	4.0	440
Cerro Gordo	17	1,700	10.0	2,000	53	75,290	1.6	48,800	1.2	9,960	3.1	484
Cherokee	17	850	9.5	95	52	61,880	2.1	55,700	1.5	11,850	2.5	6,325
Chickasaw	16	8,500	9.5	8,325	50	27,600	1.5	49,500	1.4	18,740	3.0	560
Clarke	18	3,680			30	6,600	1.3	37,310	1.4	130	3.0	360
Clay	17	2,550	9.5	3,610	38	64,580	1.5	35,250	1.2	13,680	3.1	1,612
Clayton	18	12,240			38	77,520	2.0	133,400	1.5	1,735	3.1	186
Clinton	19	30,710			34	81,700	1.8	83,700	1.2	1,740	3.0	360
Crawford	18	3,980			59	85,680	1.8	82,080	1.5	7,410	2.9	14,700
Dallas	16	3,800			36	3,800	1.8	37,440	2.0	2,380	3.1	1,980
Davis	14	15,700			44	23,820	1.6	81,700	1.6	48	1.8	90
Decatur	12	15,900			44	80,960	1.2	40,320	1.0	230	3.5	505
Delaware	15	33,150			27	30,240	1.7	68,000	1.2	6,900	3.1	124
Des Moines	14	69,680			52	52,000	1.6	85,560	2.0	40	4.0	1,980
Dickinson	16	1,450	10.0	7,500	50	21,800	1.6	21,800	1.5	12,500	2.5	1,200
Dubuque	19	5,320			40	94,800	1.6	95,040	0.8	430	3.0	210
Emmet	15	6,000	10.0	7,300	34	19,720	1.4	22,900	1.0	5,200	3.0	360
Fayette	18	8,640	9.5	790	42	68,400	2.0	119,000	1.1	12,100	3.1	92
Floyd	15	13,850	9.5	4,085	40	68,800	1.5	51,150	1.5	8,890	3.1	138
Franklin	15	3,750	9.5	805	30	50,400	1.6	52,640	1.1	5,435	3.1	62
Fremont	19	11,020			47	21,620	1.7	16,320	2.0	5,100	2.2	30,880
Greene	18	900	9.5	190	28	14,000	1.4	33,640	1.2	5,088	2.0	140
Grundy	21	840	9.5	190	42	80,530	1.5	34,800	1.0	7,230	3.1	62
Guthrie	20	2,900			32	14,400	1.7	45,280	1.5	4,980	2.5	750
Hamilton	18	900	9.5	335	35	63,800	1.7	47,070	1.2	5,668	3.1	495
Hancock	14	2,300	8.0	830	53	32,500	1.5	32,500	0.0	21,300	2.5	2,580
Hardin	15	1,350	9.5	285	35	33,950	1.5	42,900	1.0	4,800	3.1	372
Harrison	19	6,400			50	52,000	1.8	16,200	1.3	8,424	2.8	45,000
Henry	12	15,900			52	19,700	1.7	30,320			3.0	210
Howard	19	9,120	10.0	15,000	40	45,200	1.5	53,800	1.0	11,780	3.1	81
Humboldt	20	2,900	9.5	830	51	32,500	0.9	5,004	2.8	608		
Ia	16	900	9.5	285	50	68,500	1.8	44,100	1.2	2,262	2.8	5,204
Iowa	16	8,100			39	63,430	2.0	70,000	1.6	688	3.1	62
Jackson	16	14,720			45	64,800	2.0	120,400	1.6	2,362	4.0	820
Jasper	16	5,120			37	19,440	1.7	62,000	1.8	822	2.8	308
Jefferson	11	10,600			50	30,000	1.5	57,800			3.1	158
Johnson	14	25,000			40	57,600	1.7	74,460			3.0	300
Jones	18	5,070			40	43,200	2.0	97,000	1.0	180	4.0	340
Keokuk	16	7,350			50	41,000	1.9	78,000	1.6	16	4.8	125
Kossuth	19	4,640	10.0	27,900	50	141,800	1.2	47,060	1.0	27,420	2.0	540
Lee	15	150,000			50	79,800	1.7	59,100	1.6	48	3.8	950
Linn	19	21,600			45	88,650	1.6	76,190	1.5	3,360	2.5	500
Louis	15	88,100			45	38,700	1.5	39,250	1.6	228	4.0	440
Lucas	15	8,450			30	4,000	1.4	38,080	1.0	70	3.1	217
Lyon	16	900	9.5	880	68	158,440	1.8	24,840	1.2	10,428	2.8	8,400
Madison	19	6,270			28	15,780	1.6	35,040	1.2	1,478	2.7	594
Mahaska	17	5,550			41	61,880	1.4	41,300	1.4	4,308	3.1	372
Marion	16	8,440			31	11,780	1.8	50,220	1.5	435	3.8	455
Marshall	18	3,000			40	35,300	1.8	58,320	1.0	300	3.5	70
Mills	16	5,120			40	46,400	1.5	13,950	1.5	5,580	3.0	31,300
Mitchell	20	1,800	9.5	11,400	60	309,000	1.8	95,340	2.0	7,040		
Monona	12	4,600	9.5	285	40	120,000	1.5	15,400	1.7	16,720	2.4	49,368
Monroe	16	11,040			38	8,700	1.2	84,300	1.6	94	3.0	1130
Montgomery	18	12,000			49	81,300	1.5	27,300	1.0	600	3.0	11,400
Muscatine	15	50,550			45	62,100	1.6	40,100	1.6	848	2.8	1,120

## TABULATED CROP SUMMARY FOR THE YEAR 1919—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
O'Brien	17	680	9.5	1,425	45	61,650	1.8	42,060	1.8	8,957	4.1	5,190
Osceola	15	450	9.5	3,800	40	47,300	1.5	25,050	1.5	9,045	3.1	832
Page	18	15,480			49	31,850	1.7	47,310	1.1	847	3.1	13,710
Palo Alto	16	5,280	10.0	13,500	34	32,980	1.2	20,520	1.2	22,560	3.0	360
Plymouth	17	2,940	9.5	190	50	108,000	1.6	39,530	1.6	20,790	3.6	44,350
Pocahontas	17	14,110	8.0	240	37	37,000	1.7	26,550	1.8	12,135	3.1	387
Polk	20	8,000	9.5	96	34	91,800	1.6	33,120	1.4	4,270	1.6	769
Pottawattamie	20	11,800			40	28,400	1.9	52,000	1.8	8,480	3.8	68,000
Poweshiek	16	2,500			43	36,120	1.9	57,380	1.6	128	3.1	310
Ringgold	12	6,480			43	11,610	1.4	42,680	1.2	95	2.2	44
Sac	16	920	9.5	190	50	78,850	1.5	61,760	1.6	5,045	3.1	1,430
Scott	17	42,500			38	124,920	1.5	58,680	1.2	2,004	2.6	2,900
Shelby	16	640			30	31,800	1.2	36,480	1.7	5,907	2.0	5,680
Sioux	17	1,020	9.5	280	70	146,300	1.8	36,540	2.0	27,900	2.7	16,308
Story	18	2,340	9.5	670	45	6,750	1.5	44,250	1.6	4,384	2.6	572
Tama	18	5,400			37	78,850	1.5	61,760	1.6	5,045	3.1	1,430
Taylor	15	10,800			45	24,750	1.7	53,720	1.0	770	3.1	2,045
Union	13	8,250			30	21,300	1.2	22,560	1.5	1,035	2.5	100
Van Buren	12	26,100	9.5	95	41	9,030	1.4	55,020	1.6	16	2.7	702
Wapello	12	11,640			33	21,450	1.7	49,960			2.5	275
Warren	14	7,700			13	15,900	1.8	37,180	1.3	613	3.1	713
Washington	15	4,300			22	15,640	1.7	67,400	1.0	82	1.1	138
Wayne	12	8,520			34	4,760	1.3	58,700	1.6	96	3.0	340
Webster	18	540	9.5	190	40	33,600	1.8	47,700	1.8	13,603	2.9	1,972
Winnebago	16	640	9.8	14,700	47	77,080	1.9	39,190	2.0	37,400	2.7	125
Winnesaukee	20	8,600	8.0	6,400	47	77,440	1.6	92,530	1.3	5,006	3.1	31
Woodbury	18	7,550			50	36,000	1.9	34,010	1.0	15,000	3.1	78,800
Worth	16	4,320	8.5	17,425	40	47,300	1.5	46,080	1.0	13,370	3.1	134
Wright	17	1,890	10.0	2,300	50	35,500	1.4	40,800	1.1	5,258	3.8	245
Total	15.9	1,110,060	9.5	152,275	43.0	4,942,110	1.6	4,657,870	1.5	631,698	3.1	477,314

## TABULATED CROP SUMMARY, 1919.

Crop	Acres	Average Yield	Average Price	Total Yield	Total Value
Corn	10,000,000	41.6 bu.	\$ 1.17	416,022,000	\$487,447,740
Oats	5,070,000	34.6 "	.64	190,391,500	123,691,560
Spring Wheat	750,000	9.5 "	1.80	7,145,300	13,544,617
Winter Wheat	580,000	17.4 "	1.08	10,508,000	33,887,028
Barley	315,000	25.5 "	1.11	8,025,000	8,903,808
Rye	70,000	15.9 "	1.83	1,110,050	1,470,300
Flax Seed	16,000	9.5 "	3.90	152,275	599,872
Timothy Seed	200,000	4.5 "	4.01	900,000	4,419,000
Clover Seed	60,000	1.4 "	24.92	84,000	2,097,280
Potatoes	115,000	42.0 "	1.94	4,945,110	9,587,063
Hay (Tame)	2,992,000	1.6 tons	15.37	4,967,370	91,066,887
Hay (Wild)	478,000	1.3 "	16.48	631,000	10,410,301
Alfalfa	148,000	3.2 "	23.09	477,314	11,091,180
Pasture and Grazing (estimated)				10,000,000	20,000,000
Emulsage (estimated)					
Sweet Corn (commercial crop)	40,000	8.0 "	13.50	120,000	1,620,000
Pop Corn (estimated)	29,300	24.9 bu.	3.79	729,570	3,766,070
Buckwheat (estimated)	7,000	14.0 "	1.65	98,000	191,100
Fruit Crop (estimated)					7,000,000
Garden Crops (estimated)					8,000,000
Sugar Beets for manufacture (estimated)	8,000	8.0 tons	9.00	64,000	575,000
Miscellaneous (estimated)					11,000,000
Total					\$950,096,002

## WINTER WHEAT AND RYE

Preliminary Estimate of Acreage Seeded in the Fall of 1919, and the Percentage Condition, December 1, 1919.

Counties	Winter Wheat		Rye		Counties	Winter Wheat		Rye	
	Condition	Acres	Condition	Acres		Condition	Acres	Condition	Acres
District No. 1—					Jasper	96	5,400	95	250
Buena Vista	95	200	90	320	Marshall	88	3,100	94	134
Cherokee	94	10	90	40	Polk	90	10,100	92	332
Clay	97	140	98	130	Poweshiek	87	640	94	120
Dickinson	95	90	95	80	Story	95	1,200	92	110
Emmet	95	90	90	310	Tama	95	1,040	96	230
Lyon	94	100	90	50	Webster	93	370	90	20
O'Brien	93	110	95	30	For District	92	37,800	92	1,540
Oscola	93	30	93	20	District No. 6—				
Palo Alto	94	50	95	250	Benton	97	1,200	95	850
Plymouth	93	780	92	90	Cedar	96	4,800	95	520
Pocahontas	90	90	85	640	Clinton	97	3,970	95	1,610
Sioux	88	400	90	50	Iowa	97	2,950	96	420
For District	93	1,910	92	2,000	Jackson	96	960	96	710
District No. 2—					Johnson	97	2,500	96	1,380
Butler	95	30	93	950	Jones	98	400	96	300
Cerro Gordo	96	40	93	80	Linn	94	720	96	1,080
Floyd	94	30	90	700	Muscatine	94	8,440	90	2,600
Franklin	90	400	94	190	Scott	95	10,880	95	1,920
Hancock	93	50	89	150	For District	96	36,800	95	11,450
Humboldt	95	320	87	80	District No. 7—				
Kossuth	95	100	89	220	Adair	88	4,690	95	110
Mitchell	90	70	92	70	Adams	88	9,200	95	120
Winnebago	94	10	90	210	Cass	92	14,690	92	220
Worth	93	70	90	90	Fremont	90	21,300	95	450
Wright	96	70	90	90	Mills	91	9,310	95	250
For District	94	1,120	91	2,740	Montgomery	92	16,900	94	520
District No. 3—					Pago	90	22,040	95	600
Allamakee	99	1,080	99	380	Pottawattamie	92	14,950	93	400
Black Hawk	95	700	85	2,540	Taylor	90	12,210	96	560
Bremer	98	140	97	850	For District	90	125,490	94	3,350
Buchanan	95	100	92	1,190	District No. 8—				
Chickasaw	96	30	92	580	Appanoose	90	8,800	95	620
Clayton	98	1,900	97	820	Clarke	90	9,100	92	130
Delaware	97	220	94	1,620	Decatur	93	14,100	94	1,000
Dubuque	98	390	97	220	Lucas	85	12,150	90	180
Fayette	95	440	96	370	Madison	91	14,100	94	260
Howard	92	110	95	370	Marion	85	13,280	90	260
Winnebago	97	170	97	880	Monroe	84	9,840	90	530
For District	96	5,220	95	8,780	Ringgold	88	6,690	91	420
District No. 4—					Union	90	5,870	93	190
Audubon	90	2,100	94	20	Warren	91	22,850	93	490
Calhoun	95	300	93	50	Wayne	95	7,700	95	350
Carroll	93	1,080	92	20	For District	89	124,540	92	4,350
Crawford	98	1,200	90	170	District No. 9—				
Greene	96	1,820	90	40	Davis	95	4,300	96	1,000
Guthrie	87	3,480	95	110	Des Moines	90	11,200	95	2,880
Harrison	95	10,440	94	260	Henry	90	4,440	93	1,000
Ida	95	90	92	40	Jefferson	90	4,510	95	740
Monona	92	14,700	93	150	Keokuk	93	4,250	93	380
Sac	94	280	90	50	Lee	94	14,480	96	7,700
Shelby	97	750	95	30	Louis	95	9,900	93	1,950
Woodbury	90	5,600	90	330	Mahaska	90	5,900	92	270
For District	94	41,740	94	1,290	Van Buren	92	7,300	98	1,080
District No. 5—					Wapello	98	13,380	90	710
Boone	93	1,260	90	60	Washington	90	2,900	94	220
Dallas	98	13,730	98	150	For District	92	33,290	94	13,530
Grundy	89	480	89	30	For the state	91	458,000	94	54,000
Hamilton	95	330	90	40					
Hardin	90	150	90	70					

## VALUE OF OFFICIAL CROP REPORTS.

1. Farmers are benefited by official crop reports both directly and indirectly; directly by being kept informed of crop prospects and prices outside of their own immediate districts, and indirectly because the disinterested and unprejudiced official reports tend to prevent the circulation of false or misleading reports by speculators who are interested in controlling or manipulating prices. Without the steady influence of official reports, these speculators would issue so many conflicting and misleading reports that it would be impossible for anyone, without great expense, to form an accurate estimate of crop conditions and prospects. The farmer would be left almost entirely at the mercy of the speculator.

2. Violent fluctuations in prices are the speculator's paradise; they widen the gulf between producer and consumer and the speculator takes the cream. Farmers suffer most from such conditions for they are not so well organized as other lines of business, nor are they in position to take advantage of fluctuations in market prices. Official crop reports steady prices and lessen the cost of distribution by diminishing speculators' profits. The farmer who reads the official estimates and forecasts as they are issued, can judge for himself what the crop prospects are, as well as the probable prices, so that he can decide intelligently how and when to market his products. Even the farmer who does not keep posted is indirectly benefited by the check which official estimates place upon fluctuations emanating from false reports. Buyers must have a larger margin of profit to protect themselves against wide fluctuations in price.

3. Refusal of the farmer to give crop information to the State and Government does not prevent buyers and speculators from knowing the condition of the crop. The latter have systems of their own for collecting information and it is assumed they would like to see official crop reports abolished. They have traveling agents and correspondents throughout the United States who keep them posted and they are advised of important influences and tendencies in acreages and production far in advance of what the farmer would be if unaided by the official crop reporting service.

4. Feeder stock, cattle, sheep and hogs are more intelligently distributed by the farmers among themselves and through terminal markets, if county figures on crop production are available. The importance of this is shown by the fact that about 80 per cent of Iowa's soil products go to market in the form of meat and dairy products. This service has been frequently called upon for such information in recent years, particularly when as in 1918 a portion of the State had almost a corn failure. When pastures fail this service is consulted as to the nearest available pasture. It is intended, so far as appropriations will permit, to furnish farmers with up-to-the-minute information on live stock, as to the visible supply, probable movements to markets, extent of breeding, etc.

5. Railroads use official crop reports in distributing cars for transporting farm products. Cars must be kept continuously in motion and travel no unnecessary miles. Marketing is sometimes brought to a standstill by car shortage. Accurate county and district crop reports reduce this provoking situation to the minimum.

6. Manufacturers and distributors of farm machinery and other commodities essential to farmers, can more intelligently and prudently purchase raw materials and plan their output and distribution when fully advised as to crop prospects in the various sections of the country through accurate, official reports. In this way distribution can be most economically done. Faulty distribution, resulting in long holding in stock or unnecessary transportation, adds to the cost, and the farmer "pays the freight." By avoiding heavy losses from improper distribution, the manufacturers can afford to sell on better terms with resulting benefit to farmers.

7. Banks and financial institutions use current official live stock and crop data in providing funds for financing the growing, storage, marketing and movement of farm products.

8. Wise legislation affecting farmers' interests cannot be enacted without accurate, detailed and up-to-date agricultural statistics. Official crop reports supply this information.

9. When farmers' organizations lay out a program of action, the first need that confronts them is accurate, unbiased records of agricultural production. The best obtainable information is in the official crop reports. These can be made better, that is, more detailed, more inclusive, by the earnest co-operation of these organizations with the official crop reporting service.

10. Such grain and produce buyers as are earnestly striving to render intelligent service to their communities in return for reasonable profits, welcome dependable official crop reports. The steadying influence these reports have upon the market, makes it safe for them to handle farm products on a narrower margin which means higher prices to the farmer. Where they are dealing on a straight market and unbiased by speculative transactions they are enabled by intelligent use of the reports, to advise their farmer patrons in marketing matters, to their mutual advantage. Through years of experience in cleaning, handling, storing, transporting and marketing farm products, these men acquire a fund of experience that is of value to the community.

11. Finally, whenever a farmer furnishes careful, conscientious information for an official crop report, he is helping himself, his brother farmers, his community as a whole, and his State, and is doing his bit to assist his city cousins in their struggle against the high cost of living.

#### NOTES FROM THE DECEMBER 1 CROP REPORT.

About 60 per cent of farm lands to be plowed was completed December 1.

The wages of male farm labor in Iowa during 1919 were as follows: Average rate per month when hired by the year with board, \$55.65, without board, \$71.43; average wage per day for day labor for harvest work with board, \$4.46, without board, \$5.20; average wage per day for day labor for other than harvest work with board, \$3.46, without board, \$4.24.

The average number of cords of firewood burned per farm, 1919, is estimated at 9 cords, with an average price of \$5.91.