

U. S. DEPARTMENT OF AGRICULTURE  
WEATHER BUREAU AND  
BUREAU OF AGRICULTURAL ECONOMICS

In Co-operation with the

# Iowa Weather and Crop Bureau

LETTER OF TRANSMITTAL

His Excellency, Governor \_\_\_\_\_

Sir: I have the honor to acknowledge the receipt of your report of the Iowa Weather and Crop Bureau for the year 1927.

## Annual Report for 1927

Reprint Part XVI of the Twenty-eighth Annual Iowa  
Year Book of Agriculture

Des Moines, Iowa, \_\_\_\_\_

CHARLES D. REED, M. Sc. Agr.

Published by  
THE STATE OF IOWA  
Des Moines

In Co-operation with the

# Iowa Weather and Crop Bureau

Annual Report for 1927

Published by the Iowa State Printing Plant, Des Moines, Iowa, 1928.

CHARLES D. REED, M. S., Act.

THE STATE OF IOWA  
Iowa Station

## HISTORICAL

The Iowa Weather and Crop Bureau was established by an act of the Iowa Legislature in 1887, and was organized for the purpose of collecting and disseminating information regarding the weather and crops of the State. The Bureau was originally organized as the Iowa Weather Bureau, and was later reorganized as the Iowa Weather and Crop Bureau in 1907. The Bureau has since that time been engaged in a continuous effort to collect and disseminate information regarding the weather and crops of the State.

## LETTER OF TRANSMITTAL

HON. JOHN HAMMILL, Governor.

SIR: I have the honor to submit herewith the thirty-eighth annual report of the Iowa Weather and Crop Bureau for the year 1927.

MARK G. THORNBURG,  
Secretary of Agriculture.

Des Moines, Iowa, January 16, 1928.

OFFICE FORCE DECREASED 21 PER CENT  
Charles D. Reed, M. S., Act. Weather and Crop Bureau  
Iowa State Printing Plant, Des Moines, Iowa, 1928.

## HISTORICAL

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. On July 1, 1923, it became a bureau of the State Department of Agriculture by act of the 40th General Assembly.

The object of the Service is to co-operate with Government Bureaus in collecting crop statistics and meteorological data, and more widely disseminate weather forecasts and storms 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. Toward the close of the year, 1919, co-operation in estimating acreage and production of crops was begun with the U. S. Bureau of Markets and Crop Estimates now known as the U. S. Bureau of Agricultural Economics, of which Mr. Leslie M. Carl is Agricultural Statistician for Iowa.

### OFFICE FORCE DECEMBER 31, 1927

Charles D. Reed, M. Sc. Agr., Meteorologist and Director.

J. Earl Cook, Statistician.

Nina Sumption, Stenographer and Clerk.

Mildred T. Cannon, Clerk.

### CO-OPERATING ORGANIZATIONS

*U. S. Weather Bureau*

Fred L. Disterdick, Assistant Meteorologist.

Arthur H. Christensen, Observer.

Warren J. Rice, Assistant Observer.

John H. Aldrich, Minor Observer.

*U. S. Bureau of Agricultural Economics*

*Division of Crop and Livestock Estimates*

Leslie M. Carl, Agricultural Statistician for Iowa.

Alfred C. Brittain, Assistant Agricultural Statistician.

Mildred S. Baldrige, Junior Clerk.

## ANNUAL REPORT, 1927

For convenient reference and comparison with past and future years, this report contains summaries of the weekly, monthly and annual bulletins of the Weather and Crop Bureau of the Iowa Department of Agriculture, in co-operation with the Weather Bureau and the Bureau of Agricultural Economics both of the United States Department of Agriculture, for the year 1927. Parts XVI, XVII and XVIII of the Year Book were prepared by the Weather and Crop Bureau as usual. Part XVII, presenting in extensive tables and maps the agricultural statistics of 1927, gathered by assessors under the direction of the Weather and Crop Bureau will be published in the "Iowa Monthly Crop Report" for June, 1928. Part XVIII of the Year Book, summarizing the statistics of the main crops of Iowa for all years of record, is revised and brought up to date.

Crop acreages within the counties are rather stable. There is no great need for county estimates in advance of the returns from assessors, so advance county estimates will be abandoned till further need arises. Live stock estimates by counties as of date of January 1, 1928, will be published in the "Iowa Monthly Crop Report" of July, 1928. These are based largely upon the live stock reported to the county auditors for taxation which will not become available in time to publish in the 1927 Year Book. Live stock marketed from Iowa and live stock shipped into Iowa during the year, 1927, published in the "Iowa Monthly Crop Report" for January, 1928, will appear elsewhere in the 1927 Year Book.

### *Wealth Produced on Iowa Farms*

Since the estimates published last year, the Agricultural Economics Section, Iowa State College, has taken up these estimates as a regular annual project, with greater available facilities than has the Weather and Crop Bureau, so this Bureau will discontinue such efforts to avoid duplication. In passing it may be said, however, that the College preliminary estimate places the gross agricultural income of Iowa farms in 1927 at \$712,000,000 which is somewhat less than in 1926, due mainly to the low and unprofitable price of hogs which was predicted by this Bureau in the final crop report of 1925.

*Weather Forecasts and Warnings*

Weather forecasts were distributed daily by newspapers and nine radio stations in or near Iowa. No other State has such a wide distribution of forecasts by radio broadcasting stations and probably no other State has so many receiving sets in rural homes—about one for each third farm. The weather was comparatively uneventful. Spring frosts ceased earlier and fall frosts were delayed till later than usual. Opportunities for spectacular distribution of special warnings were limited.

*Climate and Crop Work*

In response to popular demand a set of normal precipitation maps for each month and the year were prepared and published as a feature of the monthly Climatological Data. These maps and a brief discussion of them appear elsewhere in this report.

A set of frost maps also was prepared and these are also included in this report. These show for all portions of the State the average date of last killing frost in spring, the average date of first killing frost in fall and the average number of days between killing frosts, sometimes referred to as the average length of the growing season.

A somewhat technical paper on "Weather and Corn Maturity in Iowa" was prepared for the Monthly Weather Review, Washington, D. C., appearing in the November, 1927, issue. It is reprinted in this report.

The Director attended the meeting of the American Meteorological Society which met as one section of the American Association for the Advancement of Science at Nashville, Tennessee, December 29th-30th. State Section Directors from several states were present and joined in the discussions. The Iowa Director gained many new ideas that will be introduced as opportunity permits.

One of the outstanding papers was read by Mrs. Ross Woods, Co-operative Observer at Palmetto, Tennessee. It appears elsewhere in this report.

**CLIMATOLOGY OF THE YEAR, 1927**

The year 1927, in Iowa, with a mean temperature of 48.8° was 0.8° above normal. The accumulated excess in temperature reached a peak about the middle of April followed by a general deficiency till the close of August. The excess of the first 17 days of September, and the latter portions of October and November offset the deficiency from May to August. December was cold

with two decided cold waves. Extreme temperature readings were conspicuously absent. The growing season between the State average date of last killing frost in spring and the first killing frost in autumn, was 174 days, or 19 days longer than normal. The growing season averaged 44 days longer than last year in the west central district and 22 days longer in the southeast district.

Precipitation averaged 29.35 inches, 2.87 inches below normal. April was the rainiest in 29 years and May was above normal in frequency and amount in the eastern counties which greatly delayed planting. January, June, July, August and November were notably deficient. From Webster and Hardin counties northward, drouth injured corn. Less than 20 inches of rain fell in 1927 in Pottawattamie and portions of adjoining counties and in the vicinity of West Bend in Palo Alto County. The least reported in the State was 18.75 inches at Oakland, though at Omaha it was only 17.66 inches. From Wapello County northeast to Jackson County the rainfall generally exceeded 40 inches, the greatest being 47.54 inches at Maquoketa. Snowfall averaged 17.9 inches, 12.8 inches below normal, ranging from about 35 inches along the northern boundary to less than 10 inches in some southern counties. Rainy days, with 0.01 inch or more of precipitation averaged 94 which is 9 more than usual. Cloudy days averaged 113 or 15 more than usual. Sunshine and wind movement were slightly below normal.

Corn production was below normal and below last year. The yield per acre averaged slightly below normal though very good in the western counties, the quality was the best in three years. The acreage was reduced about 2% by the continuously saturated soil at planting time, mostly in the southeastern counties. The hay and oats crops were good and harvested with little rain.

**BAROMETER:** (Reduced to sea level.) The average pressure of the atmosphere for the year was 30.03 inches. The highest pressure was 31.07 inches at Sioux City on January 14. The lowest pressure was 29.02 inches at Sioux City on May 9. The range of the State was 2.05 inches.

**TEMPERATURE:** The mean temperature for the State was 48.8° or 0.8° above normal. The highest annual mean was 52.9° at Keokuk in Lee county. The lowest annual mean was 44.9° at Sanborn in O'Brien county. The highest temperature reported was 102° at Sigourney in Keokuk county on the 11th and at Humboldt in Humboldt county on the 27th of July. The

lowest temperature reported was  $-27^{\circ}$  at Stockport in Keokuk county on January 15. The range for the State was  $129^{\circ}$ .

**PRECIPITATION:** The average amount of rainfall and melted snow for the year was 29.35 inches, or 2.87 inches less than normal, and 3.72 inches less than the average for 1926. The greatest amount at any station was 47.54 inches at Clinton in Clinton county and the least amount was 18.75 inches at Oakland in Pottawattamie county. The greatest monthly precipitation was 11.94 inches at Clinton in Clinton county in September. The least amount was a trace at Hawarden in Sioux county and Cumberland in Cass county in January and Red Oak in Montgomery county and Thurman in Fremont county in November. The greatest amount in any 24 consecutive hours was 8.71 inches at Clinton in Clinton county, on September 8-9. Measureable precipitation occurred on an average of 94 days, 4 days more than in 1926 and 9 days more than normal.

**SNOWFALL:** The average amount of snowfall was 17.9 inches. The greatest amount reported from any station was 37.4 inches at Mason City in Cerro Gordo county, and the least amount was 6.1 inches at Creston in Union county. The greatest monthly snowfall was 14.0 inches at Decorah in Winneshiek county in December.

**WIND:** The prevailing direction of the wind was from the northwest. The highest velocity reported was 52 miles per hour from the West at Sioux City in Woodbury county, on May 3.

**SUNSHINE AND CLOUDINESS:** The average number of clear days was 160; partly cloudy, 92; cloudy, 113; as against 150 clear; 101 partly cloudy and 114 cloudy days in 1926. The average percentage of the possible amount of sunshine was 56 per cent, or about 3 per cent less than the normal.

## MONTHLY SUMMARIES

### JANUARY

January, 1927, would be considered a mild winter month. The mean temperature for the State averaged  $3.2^{\circ}$  above the normal, due to two abnormally warm periods, the first beginning at the first of the month and lasting twelve days over the western portion of the State and nine over the central and eastern portions; the other period embraced the last six days of the month. During the rest of the month wintry weather prevailed with the temperature below zero on several days but alternating with mild days that mitigated the cold. The temperature excess was quite uniform over each division, but there was a decided contrast between the eastern and western portions, the western portion being much

warmer, which was the case most of 1926. Much lower temperatures were recorded in the extreme east and southeast portions than in any other portion of the State.

There were no severe storms but several days were rather windy. The snow that occurred on the 12th was accompanied by considerable wind, and while it caused some discomfort there was not sufficient snow to produce drifts that interfered with traffic. Light mist occurred on several days with the temperature below freezing, causing a thin coat of ice to form on all objects, that seriously interfered with automobile travel temporarily and resulted in considerable damage to cars. Precipitation was unusually light except at a few points in the extreme eastern portion. Only two stations reported more than an inch and only one station reported a slight excess over the normal. The average for the State was within .05 inch of the low January record and a less amount has been recorded only three times in the last 55 years. The precipitation was practically all snow.

During the coldest weather the ground was generally snow covered, but during the mild weather at the beginning and end of the month it was mostly bare with considerable alternate freezing and thawing which caused much damage to winter grains and grasses in the southern and central portions of the State. Most of the snow that remained at the end of the month was reduced to ice. Roads were in unusually good condition except for brief muddy periods at the beginning of the month; during the last week many roads in the central and southern portions were dusty. The cold weather at the middle of the month produced a good crop of ice from 12 to 16 inches thick which was mostly harvested before the mild weather set in at the end of the month.

**Temperature.** The mean temperature for the State, as shown by the records of 103 stations, was  $21.7^{\circ}$ , or  $3.2^{\circ}$  higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern,  $18.3^{\circ}$ , or  $2.9^{\circ}$  higher than the normal; Central,  $22.3^{\circ}$ , or  $3.5^{\circ}$  higher than the normal; Southern,  $24.6^{\circ}$ , or  $3.2^{\circ}$  higher than the normal. The highest monthly mean was  $26.9^{\circ}$ , at Thurman, and the lowest was  $14.4^{\circ}$ , at Northwood. The highest temperature reported was  $59^{\circ}$ , at Lamoni on the 5th, and the lowest was  $-27^{\circ}$ , at Stockport, on the 15th. The temperature range for the State was  $86^{\circ}$ .

**Precipitation.** The average precipitation for the State, as shown by the records of 109 stations, was 0.29 inch, or 0.79 inch less than the normal. By divisions, the averages were as follows: Northern, 0.25 inch, or 0.69 inch less than the normal, Central, 0.28 inch, or 0.84 inch less than the normal, Southern, 0.35 inch, or 0.82 inch less than the normal. The greatest amount, 1.10 inch occurred at Keokuk, and the least, a trace, occurred at Cumberland. The greatest amount in any 24 consecutive hours, 0.97 inch, occurred at Keokuk, on the 12th-13th.

**Snowfall.** The average snowfall for the State was 3.0 inches, or 3.7 inches less than the normal. The greatest amount reported was 12.6 inches, at Keokuk, and the least was a trace at Carroll and Cumberland. Wescott, the nearest station to Keokuk, was the only other station that had as much as ten inches of snow. The snowfall was quite uniform in each division, but there was a decided contrast in the eastern and western

portions, the heavy amounts being confined to the eastern portion. The ground was snow covered over most of the northern division the entire month, but there were many bare areas at the end of the month. Over the rest of the State there was a snow cover after the storm of the 12th-13th that lasted for a period ranging from one to two weeks. About two-thirds of the State was bare at the end of the month.

*Miscellaneous Phenomena.* Aurora: 14th, 25th. Fog: 7th, 17th, 24th, 25th, 28th, 29th, 31st. Halos (lunar and solar): 11th, 13th, 14th, 15th, 17th, 19th, 20th, 21st, 22d, 23d, 24th, 25th. Haze: 25th. Meteor: 2d. Parhelia: 14th, 15th. Rainbow: 12th. Sleet: 8th, 19th, 20th, 21st, 22d, 23d, 27th, 28th. Winds (strong): 9th, 12th, 14th, 15th, 16th, 17th, 26th.

*Rivers.* Rather high and remarkably uniform stages prevailed on the Mississippi River. The river was frozen the entire month, the ice varying from 12.0 to 16.0 inches. Nearly stationary stages prevailed on the Missouri River at Sioux City, but at Omaha there was a gradual rise from the first until the middle of the 4th week. Moderate stages with very little fluctuation prevailed on all interior rivers. They were frozen most of the month, but the warm weather during the last week caused the ice to become soft and there was considerable floating ice in the southern portion of the State.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %				Wind			Sun- shine  Per cent of possible from interval						
	Mean	Highest	Date	Lowest	Date	Mean			Total movement	Average hourly velocity	Maximum							
						7 a. m.	12 noon!	7 p. m.			Miles		From	Date				
Charles City.....	30.23	31.02	28	29.44	29	88	73	89	56	26	5,805	7.5	29	w.	8	30	+ 2	
Davenport.....	30.25	31.01	28	29.51	29	87	78	82	57	11	5,597	7.5	29	w.	8	30	+ 2	
Des Moines.....	30.23	30.99	28	29.52	29	87	81	84	42	11	5,642	7.6	29	nw.	8	30	+ 2	
Dubuque.....	30.21	31.03	26	29.49	29	87	69	75	42	11	5,315	7.4	27	nw.	8	29	+ 2	
Keokuk.....	30.25	30.95	26	29.54	3	77	63	71	31	15	5,909	7.9	31	nw.	8	30	+ 2	
Sioux City.....	30.39	31.07	14	29.52	14	29	56	60	44	8	9,230	12.4	30	nw.	8	30	+ 2	
Omaha, Neb.....	30.24	31.02	14	29.57	3	79	64	67	38	13	6,203	8.3	31	nw.	8	30	+ 2	
Means and extremes.....	30.24	31.07	14	29.44	29	83	68	73	---	---	---	---	---	---	---	---	---	---
Normals and records.....	30.14	31.07	25th	29.44	29	83	78	---	---	---	---	---	---	---	---	---	---	---
	31.09	1905	1905	28.71	1906	---	---	---	---	---	---	---	---	---	---	---	---	---

!Sioux City. §Dubuque. \*Omaha. †Local mean time. ‡And other dates.

FEBRUARY

February was characterized by unusually mild weather. The month was similar to February, 1926, in regard to temperature, but last February was slightly warmer. There was a difference however in that this year the eastern half of the State was the warmer and last year the reverse condition obtained. At Dubuque the mean temperature was the highest since 1882. There was a decided excess in temperature during the first week and another very warm period from the 20th to 25th, inclusive. There were no periods of wintry weather. The longest time that the temperature remained below normal was three days and the

average total number for the State was six. Zero weather occurred in about two-thirds of the State, embracing practically all the northern division except a small area in the northeast portion along the Mississippi River. The greatest number of days, at any station, with the temperature below zero was three.

The warm weather during the first week caused a rapid thawing and in connection with the heavy rains on the 4th-5th rather serious ice gorges developed on a number of interior streams. It was necessary to break up several gorges with dynamite and damage of a serious nature was averted except at Delhi, on the Maquoketa River. At this point a power dam is under construction, and a coffer dam extending across the river was washed out with considerable destruction of construction equipment. The damage was estimated at about \$25,000. At Avoca a gorge threatened a bridge that was washed away last year but the ice moved out with very little damage. Several gorges developed in the vicinity of Des Moines but they were broken up and about the only damage was from back water that caused some residents of low lying districts to vacate.

Precipitation averaged nearly normal, being least in the northern division and greatest in the southern division. A small area in the south-eastern portion had a marked excess. The precipitation occurred in three well defined periods and about two-thirds was rain. The first period which was all rain occurred on the 4th-5th and during this period more than half of the monthly total occurred; the 2d period entirely snow, occurred on the 13th-14th, and the last, mostly rain, occurred on the 24th-25th. During the rest of the month only light scattered amounts occurred. There were no damaging storms and the wind movement was less than the normal. The snowfall was accompanied by very little wind and consequently very little drifting. Sleet was reported on several days but the amounts were too light to injure trees or wires, and streets and roads were affected very little. The weather was favorable for all out-door occupations. Where building operations were in progress the work was not interrupted and stock in general wintered well, though feed was scarce in many localities.

The mild weather caused the frost to leave the ground rapidly during the first week, but it froze again during the middle of the 3d week and there was another thaw from the 20th to 25th. Dirt roads and some gravel roads were particularly bad following the general precipitation period. After the rain on the 4th-5th some dirt roads in the southern portion were impassable for several days and similar conditions prevailed during the last week.

*Temperature.* The mean temperature for the State, as shown by the records of 102 stations, was 30.6°, or 8.0° higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 27.0°, or 8.6° higher than the normal; Central, 30.9°, or 8.0° higher than the normal; Southern, 33.3, or 7.5° higher than the normal. The highest monthly mean was 36.8°, at Keokuk, and the lowest was 24.2°, at Milford. The highest temperature reported was 65°, at Ottumwa, on the 23d, and the lowest was -17°, at Inwood on the 18th. The temperature range for the State was 82°.

**Precipitation.** The average precipitation for the State, as shown by the records of 111 stations, was 1.15 inches, or 0.05 inch less than the normal. By divisions, the averages were as follows: Northern, 0.77 inch, or 0.29 inch less than the normal; Central, 1.17 inches, or 0.09 inch less than the normal; Southern, 1.51 inches, or 0.22 inch more than the normal. The greatest amount, 3.60 inches, occurred at Washington, and the least, 0.13, occurred at Decorah. The greatest amount in 24 consecutive hours, 2.35 inches, occurred at Washington, on the 4th and 5th.

**Snowfall.** The average snowfall for the State was 4.4 inches, or 2.6 inches less than the normal. The heaviest snowfall reported was 16.5 inches at Estherville, and the least was 1.0 inch at Creston, Fayette, New Hampton and Waverly. The ground was snow covered the entire month at only one station, Estherville, and the average time for the State was a little more than one week. The ground was bare over the entire State at the end of the month, except a very small area in the northwest portion.

**Miscellaneous Phenomena.** Aurora: 24th, 25th. Fog: 2d, 3d, 4th, 5th, 6th, 14th, 15th, 16th, 17th. Halos: (lunar and solar): 6th, 7th, 8th, 9th, 12th, 13th, 14th, 16th, 19th, 20th, 24th. Haze: 16th. Parhelia: 8th, 12th. Sleet: 4th, 5th, 13th, 24th, 25th. Thunderstorms: 4th, 13th, 15th, 23d, 24th. Winds (strong): 1st, 8th, 17th. Birds (migration of): Boone, blue birds, 25th; Des Moines, robins, 21st; blue birds, 24th; Oskaloosa, robins and blue birds 24th; Rock Rapids, robins, 3d.

**Rivers.** Rather high stages prevailed on the Mississippi River. There was a rapid rise following the heavy rains on the 4th-5th and a falling tendency the rest of the month. At Dubuque the average stage was 2.6 feet above the February normal, and the first ice movement began on the 6th south of the bridge but it held north of the bridge till the 23d and the channel was clear on the 23d, except there was a small amount of floating ice till the end of the month. The general break-up occurred

this year two weeks earlier than normal. On interior rivers there was a marked rise following the rains on the 4th-5th, when most of the ice went out. During the rest of the month falling stages prevailed most of the time but there were a few unimportant rises. Moderate stages prevailed on the Missouri River. There were numerous fluctuations at Sioux City due to ice conditions but at Omaha remarkably uniform stages prevailed with a slight rising tendency till the 12th and a gradual fall during the rest of the month.

**The Winter of 1926-1927.** The mean temperature for the three months was 24.7°, which is 3.0° higher than the normal for the State, and 0.3° lower than the mean of 1925-1926. The winter was very similar to last year, December being moderately cold, January rather mild and February unusually mild. The highest temperature reported was 65°, at Ottumwa on February 23d, and the lowest was -27°, at Stockport, on January 15th.

The average monthly precipitation for the State was 0.83 inch, and the average total was 2.50 inches, or 0.92 inch less than the normal. All months were deficient in precipitation, January being decidedly so and within 0.95 inch of the January record. The average snowfall was 13.1 inches, or 6.6 inches less than the normal.

The average number of days with 0.01 inch or more of precipitation was 13, or 3 less than the winter of 1925-1926. The average number of clear days was 37, partly cloudy 21, and cloudy 32, as compared with 32 clear days, 24 partly cloudy and 34 cloudy days during the winter of 1925-1926.

### THE METEOR OF JANUARY 2, 1927

Theodore Grefe Mehl

Des Moines, Iowa, February 22, 1927

On the evening of January 2, 1927, an extremely large and brilliant meteor passed over central and eastern Iowa, and was commented upon by several of the papers over the State. President Morehouse of Drake University suggested that I make a study of this meteor for publication. In this connection I wish to express my sincere thanks to the Des Moines Register, to Mr. C. D. Reed of the United States Weather Bureau, to the Co-operative Observers and Weekly Crop Reporters, to the various papers over the State, and to all those who wrote directly to Drake, giving me the data upon which this study is based. The replies have numbered into the hundreds and after reading, interpreting and classifying these letters I venture to state some conclusions and give a few excerpts.

The most northern report I received was from St. Ansgar, Iowa, about twelve miles from the Minnesota state line. A few observations were made in Minnesota, but of these I have no definite record. Reports came from as far west as Harlan and Sac City, Iowa. A very careful study of these data indicates that the path of the meteor was in the general direction of south, thirty degrees east, over eastern Iowa. It is my theory that the meteor burst at some point a little south of Iowa City, at quite a high altitude. Many people described this bursting as "just like a skyrocket, giving off sparks of every color of the rainbow." At Milton, Iowa, it seemed to break into three or four pieces; and at Oskaloosa "the bursting was not pronounced, rather a dividing." It is probable

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %				Wind				Sunshine Per cent of possible Departure from normal
	Mean	Highest	Date	Lowest	Mean		Lowest	Date	Total movement	Average hourly velocity		Date	
					7 a. m. to 12 noon	7 p. m.				Miles	From		
Charles City	30.08	30.64		29.30	80	90	44	18	4,927	7.5	27	18	54
Davenport	30.07	30.58	28	29.50	88	70	76	19	5,229	7.2	26	18	54
Des Moines	30.07	30.54	28	29.50	88	70	76	19	5,229	7.2	26	18	54
Dubuque	30.05	30.59	28	29.43	79	60	70	35	4,890	7.5	37	sw.	1
Keokuk	30.08	30.50	28	29.55	80	70	67	35	4,003	6.9	30	n.	17
Sioux City	30.10	30.73	8	29.39	76	62	67	34	5,400	8.1	29	n.	24
Omaha, Neb.	30.08	30.68	8	29.45	21	84	68	72	7,941	11.8	47	n.	17
					21	86	66	72	5,529	8.2	38	ne.	17
Means and extremes	30.08				80	65	71						39
		30.73	8	29.30	42			31		8.2			17
Normals and records	30.10		21st		84		76				47	n.	17
		33.07	1915	28.09	1902			13	1880		9.3		43
													50

§Sioux City. \*Davenport. †Des Moines. ‡Local mean time. †And other dates.

that after the bursting a few of the larger pieces continued on paths of their own, one dropping at quite a steep angle in the vicinity of Muscatine, a second passing some thirty-five miles west of Keokuk, and possibly a third going into the region of Burlington. Of these three, the reports concerning the Muscatine fragment seem to be the most definite. From the very wide area over which the general path of the meteor was seen, one might conclude that its flight was at some considerable height. The evening was partly cloudy, and if the meteor had been low, this would have decreased its visibility quite appreciably. The fact that some of the residents of Muscatine reported that the meteor fell in the northwest, and others saw it in the south-east would indicate that a piece of the meteor fell between them, or in the city. However the data is insufficient to state this as a positive conclusion.

The exact time of the flight showed a good deal of variance with different observers, but the mean of the more exact observations is about 6:04 p. m.

This stranger to the earth must have been a very brilliant and beautiful sight to all who were fortunate enough to witness it. I believe the best way to represent the impressions of the observers is to quote descriptive phrases directly from their letters. Because of the large number used credit cannot be given to each individual. It was described at various places as "brighter than any shooting star. It seemed to light up the whole eastern sky, and wasted itself with a seeming burst of bright colors." Another said that "a ball of fire flashed through the heavens, but it was all over before a person realized what had happened," and again "It was like lightning or the flicker of an unusually bright auto light," or yet "like a photographer's flashlight," or "like a bright flash, for an instant nearly as bright as day," and "brilliant with many colors." Another saw a "flash of light, of a greenish cast," and still another called it "one of the brightest lights I remember seeing," or "a long, red streak of fire." Several people spoke of its being "bright enough to cast a shadow," and others, "so brilliant as to light up the sky—a tint of rainbow colors." It was "light enough for a second to read by," and the "most wonderful thing I ever saw," for "all the air seemed to be lighted with the colors of the rainbow." To some it was "like a flash of green lightning," or "it resembled very much a huge diamond" with a "blue color changing to yellow."

Its apparent size was reported as from "six or seven minutes of arc" to "half the size of the moon." It was seen as a "very luminous purple-white fire," or as a "yellow and green light approaching daylight." Another observer said, "It was by far the most brilliant spectacle I ever witnessed," for "it was at first a brilliant orange-red, (a fine example of calcium spectrum) and then turned to a bluish green."

Nearly everyone who attempted to describe the meteor spoke of the "trail of sparks" or the "mammoth tail" or "a streak of light of many colors" or "an incandescent trail" which followed closely after the head of the meteor. Many mentioned the "trail of smoke which remained in the sky." It was called "a streak of light of many colors which lasted several minutes after the meteor had disappeared" and they "could trace its path in the sky for fully thirty minutes afterward." One saw "a white

streak for a few seconds after the light seemed to go out;" for another, "It left a bright wide streak behind it for some time." As seen from Traer, Iowa, the "trail remained intact for a minute or so and then disappeared evenly from both ends toward the center." "The sky was lighted in a streak after it (the meteor) had disappeared." From Milton, Iowa, near the southern end of the flight the "tail of fire lingered a few seconds, faded into what looked like hazy smoke, which stayed until broken by the wind." Another said that the "course was marked for several minutes by minute yellowish stars, forming a band of light which became warped by varying wind currents."

Most of the observers made no mention of noise of any sort, but it was reported at Fort Dodge that there was "a lot of noise from it," and at other places where it was heard it was described as a "swishing" or "hissing" sound.

Judging from the letters which mentioned the velocity, the meteor seemed to be going faster at the southern end of its course than at the northern. This apparent increase was probably due to its nearer approach to the observers. Only two letters mentioned the position of the path exactly enough to permit an altitude determination. At Iowa City the altitude in the east was eighty-five degrees, and from West Branch, ten miles east-by-north, it was seventy-five degrees in the west. This gives an altitude of 28.9 miles over a point 2.6 miles east of Iowa City.

Judging from the wide area from which letters were received, and from the enthusiasm with which they were written, this must have been a very unusual meteor.

### MARCH

Mild weather prevailed during most of March and the usual main characteristics were lacking. The month opened moderately cold the first two days and over most of the State this was the coldest of the month, but on the 3d a protracted period of warm weather set in that continued till the 18th, averaging more than 10° above normal daily and more than 25° above normal on the 15th. A rather cool period prevailed from the 19th to 27th but with an occasional day above normal; the last 4 days were above normal. Most of the frost left the ground during February and the freezing weather during the first three days of March affected only a few inches of the soil. The mild weather that followed caused all frost to leave the ground by the middle of the month.

Precipitation was slightly above normal and rather uniform in all portions of the State. The number of rainy days was within one of the March record and the several periods occurred at frequent intervals throughout the State which resulted in no period of protracted fair weather. There were no severe storms though several marked barometric disturbances passed directly through the State. There were several windy days but no damage of consequence from this source. The principal storm from which damage resulted began on the 18th as rain and terminated over most of the State on the 20th as an ice storm. There was considerable deposit of ice throughout the State, except the northwest portion, but the severe damage was confined to the east-central portion and portions of the area surrounding. The damage was prin-



cipally to overhead wires and poles. The damage to telephone lines was so extensive that a number of places were completely shut out from outside communication for more than 24 hours. Thousands of poles were broken and many miles of wire were out of service, causing an estimated loss of about \$90,000. Many fruit and shade trees were destroyed or badly damaged. Another heavy economic loss, for which no reliable estimate can be made, was due to the especially bad road situation. The frequent rains following the rapidly thawing condition soon produced the worst situation in years. Not only mud roads were affected but many of the better class of the main traveled highways were absolutely impassable for long periods. Many farmers along these roads did a thriving business towing stranded automobiles while in some cases automobiles were abandoned.

The weather was mostly unfavorable from an agricultural standpoint as the soil was too wet generally for plowing and very little out seeding had been accomplished at a few widely scattered points at the end of the month. The warm weather caused all trees to make rapid advancement, and many fruit trees, particularly in the eastern portion of the State, were almost ready to bloom and were in danger of damage from severe freezing weather. Winter grains and grasses had made good growth and winter wheat was in excellent condition. Stock in general were in good condition, but in much of the State feed was scarce and it will be necessary to resort to pastures as soon as possible.

**Temperature.** The mean temperature for the State, as shown by the records of 104 stations, was 39.6°, or 4.9° higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 37.4°, or 5.3° higher than the normal; Central, 39.9°, or 4.8° higher than the normal; Southern, 41.4°, or 4.6° higher than the normal. The highest monthly mean was 44.6°, at Burlington, and the lowest was 34.8°, at Milford. The highest temperature reported was 75°, at Tipton on the 16th, and the lowest was 0°, at Inwood on the 21st. The temperature range for the State was 75°.

**Precipitation.** The average precipitation for the State, as shown by the records of 115 stations, was 1.92 inches, or 0.17 inch greater than the normal. By divisions, the averages were as follows: Northern, 1.51 inches, or 0.05 inch less than the normal; Central, 1.84 inches, or 0.02 inch greater than the normal; Southern, 2.40 inches, or 0.52 inch greater than the normal. The greatest amount, 3.64 inches, occurred at Fairbaird, and the least, 0.62 inch occurred at West Bend. The greatest amount in 24 consecutive hours, 1.93 inches occurred at Riverton on the 21st.

**Snowfall.** The average snowfall for the State was 2.9 inches, or 1.5 inches less than the normal. The greatest amount, 10.6 inches, occurred at Marathon. Mt. Pleasant and Red Oak reported none. Three stations in the central division and two in the southern division reported only traces. As a rule the snowfall was rather moist and there was very little drifting and the ground was snow covered over most of the State less than one week.

**Miscellaneous Phenomena.** Aurora: 24th, 27th. Birds (migration of): Altou, martins, 30th; Belmont, robins, 10th; Boone, Phoebe, 18th; Marathon, robins, 9th; Washta, robins, 8th, martins, 23th. Fog: 5th, 11th,

12th, 13th, 16th, 17th, 18th, 22d, 23d, 27th, 28th, 30th. Hail: 7th, 11th, 12th, 17th, 19th, 20th, 25th. Hales (tonar and solar): 1st, 9th, 15th, 16th, 18th, 22d, 23d, 24th, 27th, 28th. Haze: 11th, 15th, 18th. Ice storm: 19th, 20th. Parhelia: 24th. Rainbow: 13th. Sleet: 7th, 16th, 19th, 20th, 23d, 25th, 31st. Thunderstorms: 5th, 11th, 12th, 16th, 17th, 19th, 20th, 23d, 25th, 31st. Winds (strong): 9th, 15th, 19th, 31st.

**Rivers.** There was a gradual rising tendency on the Mississippi River till the middle of the last week, and a slight fall the remainder of the month. The average was considerably above the normal but the flood stage was not reached, though there was considerable bottom land covered. On the Missouri River nearly stationary stages prevailed except there was a marked fall at Sioux City, when the ice broke up on the 8th, but the fall was very slight below this point. Moderate stages prevailed on the interior rivers with no unusual features.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressures, Inches (Sea Level)				Relative Humidity, %		Wind			Sun- shine				
	Mean	Highest	Date	Lowest	Mean		Total movement	Average hourly velocity	Maximum					
					7 a. m. 11 a. m. 7 p. m.	Lowest			Date		Direction Force			
Charles City.....	30.06	30.44	29.60	29.60	82	80	2	5.0H	7.5	29	15	68	3	
Davenport.....	30.07	30.27	29.48	29.48	77	74	30	4	5.75	8.7	29	21	49	16
Des Moines.....	30.04	30.41	29.51	29.51	81	79	25	18	0.94E	8.1	30	15	51	9
Indianapolis.....	30.04	30.59	29.59	29.59	81	77	17	18	5.27E	7.1	30	18	48	5
Keokuk.....	30.07	30.59	29.51	29.51	81	77	31	30	10.13E	13.0	30	25	45	12
Sioux City.....	30.08	30.72	29.57	29.57	82	81	21	11	0.09E	9.3	30	19	50	5
Omaha, Neb.....	30.01	30.06	29.42	29.42	81	81	23	11	0.09E	8.8	30	15	40	8
Means and extremes.....	30.06	30.72	29.42	29.42	82	81	17	18	.....	8.8	30	15	40	8
Normals and records.....	30.04	30.72	29.42	29.42	81	81	.....	.....	.....	9.0	30	15	40	8
	139.32	1928	29.78	29.42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

(Sioux City, Des Moines. Local mean time.)

#### APRIL

The outstanding feature of the weather during April, 1927, was the persistent rainy weather during most of the first three weeks. The precipitation was much above normal in each division and only twice in April has there been a higher average for the State and never has there been more cloudy and rainy days. The rain set in on the 1st and for three weeks precipitation occurred almost daily in some part of the State with only a few short intervals without rain at all stations. This was very detrimental to farm operations, as the soil was too wet most of the time to plow, except for short periods on well drained land. Oat seeding was much delayed and some land that was intended for corn ground was also to be seeded to other crops. The preparation of corn ground was also much delayed but good progress was made during the last week. Conditions were favorable for winter wheat and nearly all fields were looking well. Pastures and meadows also got a good start.

During most of the first three weeks travel on highways was a very risky undertaking and much travel by automobile was given up. Nearly all dirt roads were absolutely impassable for long periods and many unpaved primary roads were almost as bad during the rainy period. During the last week, conditions rapidly improved and travel was generally practicable. Hail, sleet and thunderstorms occurred on an unusually large number of days but the damage was very slight. A sleet storm on the 20th-21st did some damage to telephone and telegraph wires from Dubuque county westward, the heavy deposit of ice causing wires to break and a few poles were snapped. The principal area with damaging hail occurred from Poweshiek county southeastward to Washington county on the 20th. Windows were broken and roofs damaged. In the vicinity of Crawfordville, Washington county the damage was estimated at about \$20,000. A very unusual thunderstorm occurred at Charles City on April 4th. The darkness was so intense that automobiles were compelled to use lights from 11:45 a. m., till 12:15 p. m., and all stores were compelled to turn on all lights. The condition was described as being as dark as it is on a cloudy night thirty or forty minutes after sunset. The same condition prevailed westward to Mason City and southward to Waterloo.

The temperature for the State averaged slightly above normal, though there was a slight deficiency in the northern division. While the excess for the State was slight, this is the fourth consecutive month in which there has been an excess and the average daily excess since January 1 is more than 4°. Temperature fluctuations were unusually frequent; the warmest period was from the 15th to 19th, though over most of the State the warmest day was the 26th; the coldest period occurred 20th to 25th, and the last general killing frost occurred on the 24th. The frost on the 20th to 23d did considerable damage to small fruit and truck crops but tree fruit generally escaped, though there was some damage to cherry and plum trees that were in full bloom in the southern portion of the State.

An unusually brilliant detonating meteor was observed about 10:35 p. m., on the 16th. A full account of this appears on page 20.

**Temperature.** The mean temperature for the State, as shown by the records of 104 stations, was 49.2°, or 0.3° higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 47.0°, or 0.1° lower than the normal; Central, 49.5°, or 0.3° higher than the normal; Southern, 51.2°, or 0.7° higher than the normal. The highest monthly mean was 53.4°, at Thurman, and the lowest was 45.4°, at Milford. The highest temperature reported was 91°, at Little Sioux, on the 26th, and the lowest was 15°, at Inwood on the 21st. The temperature range for the State was 76°.

**Precipitation.** The average precipitation for the State, as shown by the records of 115 stations, was 4.84 inches, or 1.85 inches greater than the normal. By divisions, the means were as follows: Northern, 4.76 inches, or 1.99 inches greater than the normal; Central, 4.21 inches, or 1.18 inches greater than the normal; Southern, 5.54 inches, or 2.36 inches greater than the normal. The greatest amount, 9.06 inches, occurred at Mount Ayr, and the least 2.09 inches, occurred at Audubon. The greatest

amount in any 24 consecutive hours, 2.52 inches, occurred at Fairfield on the 19th-20th.

**Snowfall.** The average snowfall for the State was 2.6 inches, or 0.7 inch greater than the normal. The snowfall was decidedly the heaviest in the northern division and was heavy over the entire division except a small area in the northeast corner. The heaviest amount reported was 11.0 inches at Sioux Center. Only two stations in the central and southern divisions reported five inches or more. None of the snow remained on the ground as much as two days.

**Miscellaneous Phenomena.** Aurora: 24th. Fog: 2d, 3d, 4th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 15th, 16th, 29th. Hail: 3d, 4th, 10th, 18th, 19th, 20th, 25th, 28th, 29th. Halos (lunar and solar): 4th, 5th, 6th, 10th, 15th, 16th, 18th, 23d, 26th, 28th. Haze: 8th, 9th, 26th. Meteor: 16th. Sleet: 1st, 2d, 3d, 19th, 20th, 21st, 23d. Thunderstorms: 1st, 3d, 4th, 5th, 6th, 9th, 10th, 11th, 12th, 14th, 15th, 16th, 17th, 18th, 19th, 21st, 25th, 26th, 27th, 28th, 29th.

**Rivers.** There was a gradual fall on the Mississippi River in the upper course but there was a slight rise during the latter part of the 3d week in the lower course. The average was considerably above normal, with considerable bottom land overflowed at the first of the month and again during the last decade. There were numerous sudden fluctuations on the Missouri River at Sioux City but further south they diminished and nearly stationary stages prevailed along the southern part of the course. Rather high stages prevailed on interior rivers but flood stages were not reached except on the Des Moines River south of Tracy. At Ottumwa the river was above flood stage five days.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %			Wind				Sun- shine			
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity	Maximum		Per cent of possible Departure from normal			
						7 A. M. 12 noon!	7 P. M.			Miles	From		Date		
Charles City.....	30.01	30.62	23	29.54	4	82.60-83	39	10	6,204	8.6	30.8.	4	46	-12	
Davenport.....	30.01	30.62	23	29.56	4	83.73-78	41	23	7,555	10.5	33.5.	14	38	-20	
Des Moines.....	29.97	30.61	23	29.48	4	83.02-85	32	15	6,938	9.6	35.5w.	25	48	-18	
Dubuque.....	30.00	30.50	23	29.59	4	76.62-82	37	10	5,509	8.1	35.5.	19	42	-15	
Keokuk.....	29.99	30.62	23	29.38	1	84.66-71	33	26	6,810	9.5	35.5w.	19	41	-16	
Sioux City.....	29.98	30.54	21	29.51	4	83.65-65	33	33	8,728	12.2	45.5w.	19	43	-11	
Omaha, Neb.....	29.95	30.54	23	29.49	4	77.60-66	30	27	6,300	8.8	35.5w.	4	46	-12	
Means and extremes.....	29.99	30.64	23	29.38	1	51.61-67	33	30	.....	9.6	.....	.....	44	-14	
Normals and records.....	29.98	.....	9th	29.38	20th	76	37	125	.....	9.9	.....	57.4 n.	25.1h	58	.....
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

!Dubuque. \*Davenport. †Sioux City. ‡Local mean time. †And other dates.

## THE METEOR OF APRIL 16, 1927

C. C. Wylie

State University of Iowa, May 5, 1927

Reports are still being received regarding the brilliant detonating meteor of April 16 which passed over northwestern Iowa. It has been reported by observers as far east as Otley and Hampton and as far south as Creston. The exact path cannot be definitely determined because of conflicting reports. Some of the most careful letters indicate that it was almost overhead at Sioux Center traveling in the direction of Adrian, Minnesota. Most of the observers state that the general direction was from the southwest to the northeast, and one man gives it as north 35° east.

The average of the time given by observers is about 10:33 p. m., with the range from 10:00 to "between 11:00 and 12:00." One man stated definitely that his watch said 10:50.

People in northwestern Iowa heard a rumbling like thunder some time after they saw the light. A man in Alton, Iowa, said he drove forty rods with a horse walking through mud before the noise came to him. Reports from Alton and Inwood state that the explosion was of such force as to rattle the windows. Farther east and south there are fewer reports of noise. At Sac City observers thought they heard a noise and farther away there are definite reports of no sound.

Because of its brilliance the meteor seemed very close to the observers. A man in Alton thought it was falling on top of him. The report from Otley states that it passed over the car and lit in a cornfield 120 feet distant, one from Webster City states that it fell in Fremont township about 10 miles to the northwest one from Clare states it dropped a quarter of a mile away. One man in Little Rock, Iowa, felt the landing of the meteor upon the earth.

There were thirty-eight reports received, fourteen reports of noise, six reports of no noise and the rest made no reference to a noise.

Note: Most of the reports were obtained by the Weather Bureau Office in Des Moines through its co-operative observers and correspondents—C. D. R.

## MAY

May, 1927, temperature averaged slightly below normal but due to several causes the month seemed more disagreeable than the mean temperature would indicate. The principal cause was the fact that the deficiency was due almost entirely to low day-time temperatures. The minimum averaged about normal and there was no unusually cold weather during the month. The other causes were an unusually large number of cloudy, rainy days, deficient sunshine, high humidity and many days with strong winds. The average wind velocity for the State was 1 mile or 11 per cent above the May normal. Most of the deficiency in temperature occurred during two periods extending from the 9th to 16th and from the 26th to the end of the month; the only warm period of consequence occurred from the 20th to 25th. Frost occurred on several days but due to the backward condition of vegetation generally there was not

much damage and over a large portion of the State no frost whatever occurred.

The precipitation averaged only slightly above normal but it occurred at frequent intervals throughout the month. This condition, following a wet month, and a saturated condition of the soil greatly hindered all farm operations, and bottom lands were generally too wet to work. Much corn land in the eastern portion of the State and along the Missouri River was under water and will have to be seeded to other crops or abandoned. There was serious damage from cutworms and many fields had to be replanted. On June 1, only 78 per cent of the corn had been planted which was the least since 1903. Nearly all farm work was about two weeks later than usual and the eastern portion of the State suffered most on account of weather.

There was considerable damage from severe local rain, hail and wind storms. One of the worst rain storms occurred at Dubuque. The sewers were unable to carry off the water, causing basements to become flooded. Large boulders were washed from the hills and paving was damaged. Telephone lines were damaged considerably and at one time there was only one telegraph line in working order out of the city. The damage in Dubuque amounted to about \$35,000. Severe washouts occurred on some small streams the worst being near Ottumwa, on the C., B. & Q. R. R. Many culverts and highway bridges were damaged. Dust storms did a great deal of damage to plants, many cabbage and tomato plants were cut off at the ground by a blast of sand but the soil was generally too wet to drift. Cool weather crops made good progress and pastures and meadows were in excellent shape. The frequent rains kept most unpaved roads in poor condition most of the month.

*Temperature.* The mean temperature for the State, as shown by the records of 105 stations, was 58.4°, or 1.8° lower than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows. Northern, 56.3°, or 2.3° lower than the normal; Central, 58.7°, or 1.7° lower than the normal; Southern, 60.3°, or 1.2° lower than the normal. The highest monthly mean was 61.9°, at Thurman, and the lowest was 54.7°, at Sanborn. The highest temperature reported was 91°, at Denison and Little Sioux on the 17th, and the lowest was 30 degrees at Inwood and Sanborn, on the 5th, and Boone and Earlham on the 12th. The temperature range for the State was 61°.

*Precipitation.* The average precipitation for the State, as shown by the records of 116 stations, was 4.69 inches, or 0.08 inches greater than the normal. By divisions, the averages were as follows: Northern, 5.77 inches, or 1.17 inches greater than the normal; Central, 4.81 inches, or 0.20 inch greater than the normal; Southern, 3.49 inches or 1.13 inches less than the normal. The greatest amount, 9.07 inches, occurred at Independence, and the least, 0.86 inch, occurred at Oakland. The greatest amount in any consecutive hours, 3.50 inches, occurred at Dubuque on the 8th-9th.

*Miscellaneous Phenomena.* Aurora: 4th, 5th. Dust Storms: 2d, 3d, 9th, 14th, 15th, 25th. Fog: 13th, 24th, 28th. Frost: 3d, 4th, 5th, 12th, 15th, 16th. Hail: 2d, 8th, 13th, 14th, 17th, 18th, 20th, 23d, 24th, 27th. Halos

(lunar and solar): 2d, 3d, 4th, 5th, 7th, 9th, 12th, 13th, 15th, 16th, 17th, 24th. Meteor: 25th. Rainbow: 3d, 12th, (lunar) 18th. Thunderstorms: 2d, 7th, 8th, 9th, 13th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, 24th, 25th, 26th, 27th, 28th. Tornado: 23d. Winds (strong): 3d, 4th, 9th, 16th, 14th, 15th, 21st, 23d, 26th, 27th.

*Rivers.* Rather high stages prevailed on all rivers but the flood stage was not reached except on the Missouri south of Sioux City and on the lower Des Moines. There was very little fluctuation on the Mississippi River above Davenport but below there was considerable fluctuation and a rather marked rise during the last ten days of the month and considerable low lands were under water. At Sioux City the highest May stage of record, 16.8 feet, occurred on the 13th, which was the highest stage recorded since July 7, 1905. At Omaha the crest stage was slightly above flood stage. Much bottom land was flooded but timely warnings prevented any serious loss. The only important rise on interior rivers occurred during the middle of the 4th week. Several serious washouts occurred in small streams in the southeastern portion of the State.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %			Wind			Sunshine Per cent of possible (from normal)					
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity		Maximum				
						7 a. m. to noon	7 p. m.				Miles	Feet			
Charles City.....	29.90	30.21	31	29.17	9 80	01 66	28	16	0,523	8.5	28	sw.	9	45	16
Davenport.....	29.86	30.16	31	29.22	9 81	78.75	42	14	0,547	8.5	28	sw.	9	45	16
Des Moines.....	29.84	30.18	31	29.20	9 80	58.00	29	13	0,600	8.5	27	sw.	9	45	16
Dubuque.....	29.84	30.16	31	29.20	9 75	61.05	29	9	5,561	7.5	29	sw.	9	45	16
Keokuk.....	29.87	30.16	31	29.25	9 81	67.67	44	16	0,194	8.2	25	sw.	9	45	16
Sioux City.....	29.85	30.29	31	29.02	9 75	62.61	27	15	11,344	15.2	22	sw.	9	45	16
Omaha, Neb.....	29.84	30.21	31	29.10	9 75	58.54	22	8	7,004	10.2	36	sw.	14	58	8
Means and extremes.....	29.86	30.36	31	29.02	9	79 63 65	12	8	.....	9.7	.....	.....	.....	48	12
Normals and records.....	29.95	.....	4th	.....	7th	77	.....	34	.....	8.7	.....	.....	24th	61	.....
	30.58	1910	29.02	8 75	.....	81	1880	.....	.....	5.4	sw.	1904	.....	.....	.....

\*Dubuque. †Omaha, also Sioux City 9th, 1927. ‡Sioux City. †Local mean time. †And other dates.

JUNE

June, 1927, was disagreeably cool during the greater portion of the month. The first 23 days, with the exception of two brief periods, were continuously below normal, and had it not been for an unusually warm period during the last week the month would have ranked as one of the coolest summer months of record. As it finally ended the month did not average as cool as last June. During the coolest part of the month there was a decided deficiency of sunshine and though the sunshine was almost continuous during the last eight days, the average was below normal. As was the case in May the deficiency in temperature was due mainly to low maxima. The deficiency in temperature was unusually uniform but there was a decided contrast from east to west; over the

eastern portion the deficiency was marked and it diminished to the Missouri River where several stations reported a deficiency of less than 0.5°. Light frost was reported from several stations on the 5th and 15th but no damage resulted.

The precipitation for the State as a whole averaged slightly more than one-half the normal and was unevenly distributed; several stations reported less than half an inch. There were numerous local heavy down-pours. The principal one occurred in the southern portions of Greene and Boone Counties on the 8th, and there are no official data covering the storm. The rainfall was reported from four to thirteen inches and it is evident that it was very heavy as it produced a rise of nearly two feet on the Des Moines River at Des Moines and Beaver Creek reached an unusual height. The principal damage from this storm was to crops though several bridges were destroyed and railway tracks were considerably damaged.

Other locally heavy rainfall occurred in this area on the 19th-20th and also in the vicinity of Storm Lake, Iowa City and Olin. The principal damage in the last named places was due to flooded basements. There was a decided deficiency in rainfall over a rather wide strip running northeastward entirely across the State and at the end of the month a rather severe drouth had developed over much of the area. Due to the prevailing cool weather, crops generally were able to withstand the drouth but the hot, dry and windy period that began on the 23d and continued the rest of the month was telling on some crops. Due to an excess of subsoil moisture corn suffered very little though it had begun to curl in localities, but pastures were falling fast and gardens were very badly injured, potatoes especially. The berry crop, which had been very promising, was badly damaged and many berries were drying on the vines. Most small grain were advanced so that they escaped damage and conditions were ideal for harvest which had begun in portions of the State. Conditions were also favorable for hay harvest.

*Temperature.* The mean temperature for the State, as shown by the records of 104 stations, was 66.4°, or 2.9° lower than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 65.1°, or 2.9° lower than the normal; Central, 66.7°, or 2.9° lower than the normal; Southern 67.4°, or 2.8° lower than the normal. The highest monthly mean was 71.0°, at Thurman, and the lowest was 62.4°, at Postville. The highest temperature reported was 101°, at Inwood, on the 28th, and the lowest was 35°, at Webster City, on the 5th. The temperature range for the State was 66°.

*Precipitation.* The average precipitation for the State, as shown by the records of 115 stations, was 2.42 inches, or 2.11 inches less than the normal. By divisions the averages were as follows: Northern, 2.20 inches, or 2.41 inches less than the normal; Central, 2.13 inches, or 2.33 inches less than the normal; Southern, 2.92 inches, or 1.59 inches less than the normal. The greatest amount, 7.05 inches, occurred at Olin, and the least, 0.55 inch, occurred at Audubon. The greatest amount in 24 consecutive hours, 4.68 inches, occurred at Iowa City on the 21st.

*Miscellaneous Phenomena.* Aurora: 4th. Fog: 3d, 4th, 7th, 16th, 17th,

18th. Frost (light): 5th, 15th. Hail: 4th, 8th, 9th, 10th, 11th, 19th, 20th. Halos (lunar and solar): 5th, 7th, 8th, 9th, 12th, 13th, 16th, 19th, 20th, 24th. Thunderstorms: 1st, 2d, 3d, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, 30th. Winds (high): 9th, 24th, 25th, 27th, 28th, 29th, 30th.

**Rivers.** Except for a few slight rises on the Mississippi River there was a gradual fall throughout the month, with the average stage slightly above normal. Similar conditions prevailed on most interior rivers but unusually heavy rainfall on the 8th caused small streams in Greene and Boone counties to overflow, the greatest damage from high water occurred on Beaver Creek. The locally heavy rain caused a material rise on both the Raccoon and Des Moines Rivers. Locally heavy rains on the Wapsipinicon and Iowa Rivers on the 20th-21st caused marked rises on these rivers. On the Missouri rather high and nearly stationary stages prevailed during the greater part of the month. Breaks in levees south of Omaha caused about 8,000 acres to be inundated.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %				Wind				Sun- shine				
	Mean	Highest	Date	Lowest	Mean				Total movement	Average hourly velocity	Maximum		Year out of 10 possible Departure from normal			
					7 a. m.	12 noon	7 p. m.	Lowest			Date			Miles	From	
Charles City	29.97	30.37	5	29.51	0.78	55	61	34	16	4,900	5.5	33	sw.	21	60	-4
Davenport	29.98	30.31	6	29.54	21.76	55	56	37	25	5,178	7.2	25	sw.	9	64	-4
Des Moines	29.95	30.30	5	29.50	9.77	54	55	35	30	5,808	6.2	40	sw.	24	61	-4
Dubuque	29.96	30.31	5	29.50	31.72	52	55	35	15	4,509	5.4	21	s.	21	61	-4
Kookuk	29.98	30.32	5	29.55	3.78	60	62	40	25	4,730	6.5	38	sw.	12	63	-11
Sioux City	29.94	30.40	5	29.53	24.32	68	66	38	29	9,900	11.7	48	sw.	30	61	+4
Omaha, Neb.	29.94	30.37	5	29.56	9.74	52	49	36	7	5,607	7.9	34	s.	11	57	+1
Means and extremes	29.90	30.40	5	29.50	21	57	55	36	7	7.8	48	sw.	30	61	-4	
Normals and records	29.90	30.40	10th	29.50	5th	79	60	7th	7.6	58	sw.	1917	225	61	0	
		*30.61	1913	29.04	1880	113	1226									

\*Dubuque. †Omaha. ‡Sioux City. †Local mean time.

DISCOIDAL, PEAR-SHAPED AND SPHERICAL HAILSTONES

By W. J. Humphreys, Reprinted from the Bulletin of the American Meteorological Society, August-September, 1926

By fracture and through cohesion, hailstones may and do have many irregular and accidental shapes. The great majority, however, of hailstones have one or the other of three normally produced symmetrical forms: (a) spherical, by far the most common; (b) pear-shaped; (c) discoidal. All these are alike in the essential fact that they consist of alternate accretions of clear and opal ice, gathered in the rain and snow levels, respectively, of the cumulus cloud as they were driven from the one to the other under the opposing forces of gravity and the up-blast of the tempest.

When stones form quite within the ascending portion of a cumulus

cloud they are equally exposed, approximately, on all sides, and therefore assume nearly spherical shapes, which usually they still have on reaching the ground.

However, as they fall towards the ground they are melted, to a greater or less extent, by the relatively warm air through which they pass. Hence those that are not rotating or rotating only about a vertical or nearly vertical axis, are moulded by this melting, when considerable, to approximate streamlike forms, that is, pear shapes, with the bulged end down and the pointed end up.

Finally, if a stone falls from the front, say, of a thunder head and is caught on a sloping outer side of the uprushing column of air, it may be set rapidly rotating about a horizontal axis, just as balls and rings are set spinning on the side of a jet of water or air. This spin would whirl the water to the outer rim, and if maintained, as it would tend to be, through two or three rises and falls between snow and rain levels, would cause the stone also to catch most material on this rim and therefore to become discoidal with concentric rings of alternatingly clear and opal or snowy ice, precisely as from time to time some hailstones are found to be.

In short, it appears probable that hailstones are made spherical by equal exposure on all sides within the body of the uprushing air; discoidal by spinning on the outer side of the rising column; and pear-shaped by streamlike melting while falling through the warm lower air.

JULY

The principal feature of the weather during July was the continuation of a drouth that began in June and affected almost the entire State. There were no unusual temperature conditions; the mean temperature for the State averaged less than one degree below the normal and the deficiency was general except at a few stations in the southwestern and south-central sections. The greatest deficiency occurred in the east-central, northeastern and northwestern portions. The temperature extremes were less than usual and there were no periods of oppressive weather. The longest period of warm weather extended from the 8th to 12th, inclusive, and the coolest period from the 14th to 25th, though there was an occasional day in this period that the temperature was normal or slightly above. During the warmest weather the heat was less oppressive than usual during July, due to a low humidity; and very few, if any, heat prostrations occurred. There were numerous cool nights but none that would be considered cold.

The rainfall averaged slightly more than one-half of the July normal, being least in the northern and greatest in the southern division. There were no general soaking rains and the amounts occurred mostly in the form of light showers at frequent intervals beginning at the first and continuing till the end of the month. There were several well defined periods of precipitation that covered most of the State, but as a rule less than one-half of the State received beneficial showers during the same periods. Much of the rainfall was marked by decided local contrasts and during the periods that indicated rather general beneficial

amounts many points did not receive more than traces. There were but five stations in the State that reported amounts exceeding the normal. The drouth was felt in nearly all portions of the State but the north-central, north-eastern and south-central portions fared the worst. Due to an abundance of subsoil moisture the corn crop in general was able to withstand the drouth till relief came, but there was permanent damage in some of the drier sections and some corn on high lands is very poor. Pastures were badly injured and many were burned bare and the showers were sufficient to revive them in only a few scattered places; meadows also were injured and late potatoes were cut short of growth and will make a poor crop over most of the State. Conditions were favorable for harvesting and threshing; harvesting was completed in nearly all portions of the State and threshing was progressing rapidly and had been finished in some sections. Gardens were badly injured and made very little growth but they were greatly benefited by showers during the middle of the month.

Hailstorms and thunderstorms occurred on an unusually large number of days but generally they were confined to rather limited areas. The hailstorms were light as a rule, but there were several reported that were unusually severe in places and local damage was very heavy. For the State the damage was less than usual in July. Tornadoes were reported on three days and there was some damage from wind squalls.

**Temperature.** The mean temperature for the State, as shown by the records of 103 Stations, was 72.9°, or 0.9° lower than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 70.9°, or 1.9° lower than the normal; Central, 73.3°, or 0.7° lower than the normal; Southern, 74.4°, or 0.2° lower than the normal. The highest monthly mean was 76.2°, at Thurman, and the lowest was 68.1°, at Postville. The highest temperature reported was 102°, at Sigourney on the 11th and Humboldt on the 27th, and the lowest was 45° at Decorah on the 3d, and Corning on the 17th. The temperature range for the State was 57°.

**Precipitation.** The average precipitation for the State, as shown by the records of 114 stations, was 1.96 inches, or 1.89 inches less than the normal. By divisions, the averages were as follows: Northern, 1.63 inches, or 2.16 inches less than the normal; Central, 1.88 inches, or 1.37 inches less than the normal; Southern, 2.36 inches, or 1.54 inches less than the normal. The greatest amount, 4.80 inches, occurred at Mount Ayr, and the least 0.09 inch, occurred at Webster City. The greatest amount in 24 consecutive hours, 2.21 inches, occurred at Keosauqua on the 29th.

**Miscellaneous Phenomena.** Aurora: 12th, 21st, 22d. Fog: 25th. Hail: 6th, 7th, 8th, 9th, 11th, 13th, 18th, 21st, 24th, 27th, 30th. Halos (lunar and solar): 5th, 10th, 13th, 28th. Haze: 13th. Rainbow: 5th. Thunderstorms: All dates except the 2d, 7th, 17th and 26th. Tornadoes: 6th, 8th, 28th. Winds (strong): 4th, 5th, 6th, 12th, 27th, 28th, 31st.

**Rivers.** There was a gradual falling tendency on the Mississippi River till near the end of the third week after which there was a tendency to higher stages but with numerous fluctuations. The average stage was

considerably below normal. There was a general falling tendency on the Missouri River throughout the month though there were several slight rises. The average stage was considerably above normal. On all interior rivers there was a general falling tendency; low stages prevailed the latter part of the month on nearly all small streams.

## PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %				Wind			Sun- shine			
	Mean	Highest	Date	Lowest	Date	Mean		Date	Total movement	Average hourly velocity	Maximum		Per cent of possible precipitation	Departure from normal	
						7 a. m. 12 noon	1 p. m.				Miles From	Date			
Charles City.....	30.00	30.38	3	29.73	12.74	45.38	27	6	3,945	5.3	23 a.	12	81	+ 4	
Davenport.....	29.99	30.34	4	29.69	6.74	46.48	29	16	4,235	5.7	22 nw.	9	63	- 9	
Des Moines.....	29.99	30.30	2	29.73	6.74	42.43	21	11	4,965	6.7	36 sw.	12	76	+ 3	
Dubuque.....	30.00	30.36	4	29.72	6.74	48.50	29	24	4,944	5.4	20 s.	5	70	0	
Keokuk.....	30.01	30.33	4	29.80	14.73	50.63	27	8	3,519	4.7	28 nw.	21	76	- 3	
Sioux City.....	30.00	30.31	23	29.67	16.77	48.48	20	6	7,056	9.5	40 nw.	31	82	+ 11	
Omaha, Neb.....	30.00	30.27	3	29.71	12.71	44.42	26	11	5,196	7.0	33 nw.	16	81	+ 7	
Means and extremes.....	30.00	-----	-----	-----	74	46	18	-----	-----	6.3	-----	-----	-----	76	- 3
	-----	30.38	3	29.67	16	-----	21	11	-----	-----	40 nw.	31	-----	-----	-----
Normals and records.....	29.97	-----	7th	-----	9th	79	57	-----	25th	-----	6.7	-----	13th	74	-----
	*30.47	1892	29.29	1936	-----	-----	513	1894	-----	-----	104 ne.	1906	-----	-----	-----

\*Davenport. †Sioux City. ‡Des Moines. †Omaha. †Local mean time. †And other dates.

**July Storms.** An unusually large number of hailstorms, straight wind squalls and three small tornadoes are listed in the table on page 55 of Climatological Data and there are about 28 others carried over into the next month's report.

This should not mislead the reader into the belief that these storms were unusually severe or prevalent. An experiment was tried this year for the first time in which a commercial news clipping service furnished copious clippings from the newspapers of the State along these lines. So far as possible the news reports were verified by flooding the localities reporting storms, with questionnaires.

Inquiry has been made of the insurance companies as to how their losses in July compared with losses in other Julys. At this writing a good many losses have not yet been adjusted, but it is the opinion of the hail companies that the July losses were slightly greater than normal yet not as great as in some Julys and that the total losses of the season to the close of July were not as large as usual. The hail losses were dotted over the State in many local areas that did not reach a large aggregate. One large windstorm company reported total losses in July, 1927 as \$42,700 compared with the last five-year average of \$97,549 and \$265,000 in July, 1924. This windstorm insurance company, like the hail company, reports that the number of claims is larger than usual but the total losses are less than half as large. This may be partly due to the better insurance coverage of this growing company. The business written by this company has steadily increased for many years and their

risks are well distributed, so the decline in losses in July, 1927 undoubtedly indicates an actual decrease in windstorms.

Really comparable figures over a period of years are not available.

The Weather Bureau is limited greatly in its means of obtaining and summarizing the information, though its increased efforts are reflected in the large storm table published this month in Climatological Data.

### AUGUST

The principal feature of the weather during August, 1927, was the persistence of cool weather almost the entire month. There were but two brief periods in which the temperature was above normal, the last three days of the first week and the last three days of the month. During the rest of the month the temperature went as high as normal on but a few scattered days. The deficiency was about equally divided between low maxima and minima; over the eastern half of the State the minima departed the most from normal and over the western half of the State low maxima were responsible for most of the deficiency. At many times during the month furnace fires were necessary for comfort in homes and the coolness was intensified by humidity considerably below normal. Only twice since 1873 has the mean temperature for August been lower than that of the current year; in 1915 it was 2.0° lower and in 1885 it was 1.6° lower, but in the same period there have been 10 times in which a lower maximum has been recorded and 11 times the minimum has been lower. Frost was reported on the 2d, 9th and 24th. The only damage reported occurred on the 9th. On this date frost occurred in about half the counties in the northern division, but damage was limited to a few small areas in low places on peat soil mostly in the vicinity of Marathon and Clear Lake. Two 45-acre fields of corn were reported killed and several smaller tracts and small patches of potatoes were badly damaged. Another feature of the month's weather was the unusually light wind movement; the average velocity as reported by the regular Weather Bureau stations was 1.1 miles below the average for August and Keokuk reported the least wind movement for any month since records have been available.

The precipitation was below normal over almost the entire state, and occurred at frequent intervals till the 22d, after which there were only a few light and widely scattered showers. As a rule the rainfall occurred as gentle showers and practically all that fell was absorbed by the soil. However, there was a very destructive downpour at Clinton and vicinity that did a great amount of damage by erosion and flooding basements, short circuiting telephone and telegraph cables and washing the surfacing from roads. Damage from hail and squall winds was unusually light.

The weather was favorable for harvesting and threshing and this work was practically completed, but the lack of moisture was causing pastures generally to become bare, and the production of milk was falling off rapidly at the close of the month. The weather was considered too cool for the corn crop to develop normally, but in spite of the cool weather the crop made good progress and the backwardness and unsatisfactory condition at the end of the month were due more to late planting than

an unfavorable season. At the end of the month the crop was in all stages from not yet tasseled to a stage where good seed could be gathered from many fields in the western portion of the State. The warm, dry weather that began on the 29th was very beneficial to corn but very injurious to truck crops in the drier portions of the State.

**Temperature.** The mean temperature for the State, as shown by the records of 103 stations, was 67.9°, or 3.8° lower than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 66.5°, or 3.8° lower than the normal; Central, 67.9°, or 4.0° lower than the normal; Southern, 69.3°, or 3.7° lower than the normal. The highest monthly mean was 71.3°, at Grinnell, and the lowest 64.5°, at Postville. The highest temperature recorded was 99°, at Denison on the 6th, and the lowest was 35° at Estherville on the 9th and Decorah on the 24th. The temperature range for the State was 64°.

**Precipitation.** The average precipitation for the State, as shown by the records of 114 stations, was 2.36 inches, or 1.08 inches less than the normal. By divisions, the averages were as follows: Northern, 1.97 inches, or 1.32 inches less than the normal; Central, 2.88 inches, or 0.65 inch less than the normal; Southern, 2.22 inches, or 1.27 inches less than the normal. The greatest amount, 5.68 inches, occurred at Clinton, and the least, 0.67 inch, occurred at Indianola. The greatest amount in 24 consecutive hours, 4.48 inches, occurred at Clinton on the 7th.

**Miscellaneous Phenomena.** Aurora: 19th, 20th, 21st. Fog: 5th, 7th, 8th, 9th, 14th, 16th, 17th, 18th, 27th, 29th. Frost (light): 2d, 9th, 24th. Hall: 3d, 5th, 6th, 7th, 8th, 10th, 19th, 21st, 28th. Halos (lunar and solar): 5th, 7th, 15th, 24th, 30th. Rainbow: 10th. Thunderstorms: 4th, 5th, 6th, 7th, 8th, 10th, 11th, 12th, 13th, 15th, 16th, 17th, 18th, 19th, 21st, 22d, 23d, 31st.

**Rivers.** Except for a few slight rises there was a gradual fall on the

### PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %		Total movement	Wind		Sun- shine Per cent of possible Dew-point from normal				
	Mean	Highest	Date	Lowest	Date	Mean		Average hourly velocity	Maximum					
									Miles From		Date			
Charles City.....	30.05	30.37	30	29.76	7	81.45	30	3.35	4.5	23 w.	31	75	4	
Davenport.....	30.04	30.34	30	29.79	7	79.51	54	3.0	4.7	24 e.	13	66	4	
Des Moines.....	30.05	30.30	30	29.73	7	82.59	39	3.22	5.2	31 sw.	7	69	3	
Dubuque.....	30.04	30.38	30	29.74	7	79.44	51	3.0	4.2	29 n.	8	69	4	
Keokuk.....	30.04	30.33	30	29.78	12	77.50	56	3.26	5.0	31 w.	26	62	7	
Sioux City.....	30.03	30.36	23	29.76	12	82.38	37	3.14	2.8	44 sw.	8	54	15	
Omaha, Neb.....	30.02	30.30	23	29.73	13	79.54	31	4	4.170	31 d.	8	54	15	
Means and extremes.....	30.04	30.38	30	29.70	7	80.59	55	3.2	5.2	44 sw.	7	65	6	
Normal and records.....	29.97	30.43	24th	29.40	10th	82	61	3.19	5.18	5th	6th	70	7	

§Sioux City. §Omaha. §Des Moines. †Local mean time. †And other dates.

Mississippi River the highest stages being generally on the first and the lowest on the last of the month. The average was nearly normal. Moderate stages prevailed on the Missouri River with numerous fluctuations but they were mostly slight, the greatest being 1.4 feet at Sioux City on the 17th. Low and nearly stationary stages prevailed on all interior rivers; the only rise of consequence was a rise of 1.8 feet on the Raccoon River at Van Meter on the 8th.

#### WHAT MAKES IT THUNDER?

How often that question is asked by inquisitive boys, and Dad's answer is generally something like this, "Run and shut the windows, son, it is going to rain."

It is not easy to go up where it thunders and find out, so Dad nor no one else can be seriously blamed for side stepping the question, but when heavy thunder rattles the windows and jars the house the question involuntarily springs from multitudes of young lips. The United States Weather Bureau has full information about all these things and this is what it says about thunder.

In active "thunder-head" clouds the upward currents of air are so strong that they keep raindrops from falling and often carry them upward some distance. Smaller drops unite to form larger ones but they can not become larger than a quarter of an inch in diameter. They can not fall through still air faster than 24 feet per second nor be carried upward by a current of air rising faster than 24 feet per second without breaking into smaller drops.

When they break into smaller drops there is a separation of the electricity, the drops taking the positive charge and the air the negative charge. This goes on till the positive charge on the raindrops that are being held up becomes very strong while the negative charge is carried away rapidly by the up-rushing stream of air. At intervals from several minutes to a few seconds the charge becomes so strong that it is discharged in the flash of lightning.

As the lightning breaks its way through the air, extremely high temperatures are generated in the narrow channel which it cuts for itself. This expands the air with explosive violence. It is the explosion we hear and call thunder. The rumbling, rolling sound is due to several causes. A lightning flash is often several miles long. The sound of the explosion at the near end reaches our ears first, then the wave arrives from more distant parts at the rate of about a mile in five seconds. If a flash proceeds from directly overhead two miles across the sky we hear the explosion from the near end about 10 seconds sooner than from the far end. Then there are the endless echoes from cloud to cloud and from hills, mountains and even buildings that prolong the roar and rumble.

Retracing our story, thunder can not occur without lightning; the lightning results from an over charge of positive electricity on raindrops that are broken up by a current of air that is rising more than 24 feet per second and it takes a large volume of air at or near the surface of the earth considerably warmer than the air aloft to start an updraft of that speed.

The reader who cares to go further into the details should read

"Physics of the Air," Humphreys pp. 254-339 or Broadcast Talk on Thunderstorms by Dr. G. C. Simpson, D. B., F. R. S. Journal Royal Meteorological Society, London, April, 1927.

#### SEPTEMBER

During the first 17 days of September the temperature was continuously above normal and mid-summer conditions prevailed throughout the State, with the average daily excess in temperature ranging from 12 to 14 degrees. This period was the warmest ever experienced in any September and was the warmest period of the current year. However, the highest observed temperature in the State was only 101°, which has been exceeded in September, 12 times in the preceding 54 years. Neither was the lowest observed temperature, 29°, unusual, for lower temperatures have been observed in 27 of the 54 preceding Septembers. From the 18th till the end of the month there was a decided reaction to colder weather and during this period the temperature was continuously below normal except on the 24th and 25th there was a slight excess in the extreme eastern portion of the State. The average daily deficiency during the last 13 days was almost as great as the excess during the first 17, changing what promised to be the warmest September of record, to one ranking as the 5th warmest since 1873. The protracted heat caused great discomfort both to man and beast but was a great benefit to the corn crop which had been very backward, particularly in the eastern counties, throughout the season. All corn that developed normally was hastened to maturity. At the end of the month the situation was much better than had been expected and the immature corn susceptible to frost injury was no greater than the average of the last five years. Some late corn in portions of the State where moisture was deficient, dried and dried too rapidly and considerable will be chaffy. The heat caused a rather serious situation to dairy interests as the pastures were soon burned bare in most of the State and flies were such a pest that even in portions of the State where pastures were good the milk flow was reduced. In the central portion of the State there was a decided falling off in the milk supply during the first week which spread till almost the entire State was affected and it was necessary to import milk from distant points. In some of the larger centers the milk supply was not sufficient to meet the demand and had not the production of butter been curtailed there would have been a milk famine. With the advent of cooler weather there were general rains which greatly revived pastures and by the end of the month the situation was greatly relieved. Frosts were general over most of the State from the 19th till the 23d, the temperature reaching the freezing point, or lower, at many places, and the deposit of frost was generally heavy but the damage was almost negligible. Only 2% of the corn was touched by frost up to October 1 and by some this was thought to be more beneficial than detrimental.

For the State precipitation was above normal but there was a deficiency in the Southern Division. During the first half of the month precipitation was mostly in the form of showers, some portions of the State receiving copious amounts, and other parts, little or none. This period



was characterized by some unusually heavy local downpours. The first occurred on the 6th and was especially heavy in the vicinity of Northwood, though a number of other stations reported heavy amounts. The most notable case was on the night of the 8th and morning of the 9th and covered most of Clinton, Jackson and Dubuque Counties. At Clinton a fall of 8.71 inches occurred in less than 12 hours, making the greatest daily amount ever recorded at that point; also at Dubuque the total of 5.48 inches is the greatest 24-hour amount of record. There was much damage both in Dubuque and Clinton by washouts of streets, flooded basements and dirt washed from the hills. During the rest of the month rains occurred at frequent intervals and were almost continuous from the 25th, being rather heavy over much of the State. Dirt roads and some that were graveled were in bad shape during the last week and some were impassable. The rains made fall plowing possible over all parts of the State and where the soil had been baked so hard that plowing had been impossible the work was pushed. Winter wheat seeding was proceeding rapidly at the close of the month and in some parts of the State where it had been seeded early it was up and doing well.

**Temperature.** The mean temperature for the State, as shown by the records of 101 stations, was 67.4°, or 3.1° higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 65.2°, or 2.3° higher than the normal; Central, 67.7°, or 3.6° higher than the normal; Southern, 69.2°, or 3.5° higher than the normal. The highest monthly mean was 71.2° at Burlington and the lowest was 63.1° at Northwood. The highest temperature reported was 101°, at Indianola on the 10th, Fayette on the 12th and Fairfield on the 15th and 17th, and the lowest was 29°, at Sanborn on the 20th. The temperature range for the State was 72°.

**Precipitation.** The average precipitation for the State, as shown by the records of 113 stations, was 4.56 inches, or 0.91 inch more than the normal. By divisions, the averages were as follows: Northern, 4.65 inches, or 1.23 inches more than the normal; Central, 5.32 inches, or 1.63 inches more than the normal; Southern, 3.70 inches, or 0.91 inch less than the normal. The greatest amount, 11.95 inches, occurred at Clinton, and the least, 2.03 inches, occurred at Fairfield. The greatest amount in 24 consecutive hours, 8.71 inches, occurred at Clinton on the night and morning of the 8th-9th.

**Snowfall.** Traces of snow were reported at several stations on the 26th and appreciable amounts at three stations in the northwestern portion of the State. The largest amount was 2.0 inches at Alton.

**Miscellaneous Phenomena.** Auroras: 4th. Fog: 7th, 10th, 11th, 17th, 24th, 27th, 28th, 29th. Frost: 19th, 20th, 21st, 23d. Hail: 2d, 3d, 15th, 17th, 29th, 30th. Halos (lunar and solar): 3d, 4th, 9th, 16th, 19th. Haze: 27th. Sleet: 26th. Thunderstorms: 2d, 3d, 4th, 5th, 6th, 7th, 8th, 9th, 12th, 15th, 16th, 17th, 18th, 19th, 25th, 26th, 27th, 28th, 29th, 30th. Tornadoes: 25th. Winds (strong): 9th, 17th, 18th, 24th, 26th.

**Rivers.** The average stage of the Mississippi was nearly normal.

There was a slight, gradual fall during the first week; and after the heavy rains on the 8th-9th there was a marked rise. Following the passing of the crest nearly stationary stages prevailed. On the Missouri River there was a gradual fall till the 26th when a moderate rise occurred at Sioux City and a slight rise down the rest of the course; during the rest of the month nearly stationary stages prevailed. Owing to the dry conditions of the soil the interior rivers showed very little fluctuation; the only rise of consequence occurred on the Raccoon River with a rise of nearly three feet at Van Meter on the 17th, and the Wapipicon overflowed between Clinton and Davenport following the excessive rainfall of the 8th-9th.

## PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %			Wind			Sunshine				
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity	Maximum		Per cent of possible			
						T. a. m.	P. m.			Miles	From		Date		
Charles City.....	29.96	30.30	4	29.29	29.86	59.74	36	2	4,254	5.9	33.0	2	62	0	
Davenport.....	29.95	30.28	4	29.28	29.88	55.04	36	2	4,057	5.6	24.0	17	65	0	
Des Moines.....	29.94	30.27	30	29.25	29.83	52.58	38	19	5,079	7.1	38.5W	14	65	0	
Dubuque.....	29.96	30.30	4	29.27	29.85	56.07	37	2	3,904	5.1	38.5W	17	65	0	
Keokuk.....	29.98	30.24	4	29.41	29.81	55.01	37	2	3,704	5.2	35.6	19	65	0	
Sioux City.....	29.94	30.29	35	29.24	29.85	55.05	37	2	6,796	6.4	38.5W	17	62	0	
Omaha, Neb.....	29.94	30.34	35	29.21	29.90	54.01	39	19	4,888	6.5	31.5W	19	61	0	
Means and extremes.....	29.96	30.34	35	29.29	29	53.56	37	19	.....	6.5	.....	17	66	0	
Normals and records.....	30.02	30.50	.....	29.03	29	53	37	.....	7.2	.....	17.8	63	.....	.....	
					33.67	19.6	59.3	19.7	.....	.....	118	19.1	.....	.....	.....

\*Sioux City. †Des Moines. ‡Omaha. §Davenport. ¶Local mean time.

## HEAVY RAINSTORMS OF SEPTEMBER 8TH-9TH, 1927

By H. Merrill Wills, U. S. Weather Bureau, Dubuque, Iowa

On the night of September 8th-9th, 1927, a very heavy rainstorm occurred about 11 p. m. and a second storm of similar intensity but more prolonged, occurred the following morning. The excessive fall in the first storm lasted from 10:48 p. m. to 11:21 p. m., a period of 33 minutes, during which 1.65 inches fell. In the second shower the excessive rate of fall lasted from 5:49 a. m. to 7:35 a. m., a period of 1 hr., 46 min., during which 3.61 inches was received.

The most intense fall for a period of 5 minutes was in the first shower, from 10:58 p. m. to 11:03 p. m., during which 0.57 inch was recorded. In the first storm 1.00 inch fell in 16 minutes, and in the second, 1.99 was received in 17 minutes. The first shower was the more intense for all periods up to 30 minutes, but for longer periods the second was the more intense, the first only showing a total of 1.75 inches at the end of 1 hour, and 1.76 for the entire storm, while the second showed a fall of 2.30 inches in 1 hour, 3.06 inches in 2 hours, and a total of 3.72 inches for the entire shower. Combining the two storms, it is found that 5.46

inches was recorded in 5 hours, 4 minutes, actual duration of fall, and the combined fall within the 12-hour period amounted to 5.43 inches.

Compared with past rains, it appears that the intensity of the night shower during the heavy 5-minute period mentioned, has only been exceeded by the storms of July and October, 1919. The July, 1919, storm will be remembered as the deluge that cost the lives of five persons at Union Park and two in the city by drowning. The 2-hour fall in the morning storm of September 9th, 3.06 inches, exceeds that in the July, 1919, storm, and in fact, has not been surpassed in a half century but once, namely in July, 1925, when 3.22 inches was received in 2 hours. It is of peculiar significance, in comparing the morning shower with all other rains in recent years, that each one of the six big rains in the last eight years ranged between 3 and 4 inches, the last one ranking second in amount.

The total fall from the two storms combined, 5.48 inches, set a new record for a 24-hour period. The previous record of 5.40 inches has stood for exactly 52 years, having occurred on September 8th-9th, 1875. Other storms that approached these records for 24-hour falls, were as follows: In July, 1896, 4.82 inches; August, 1912, 5.23 inches; September, 1915, 4.79 inches; August, 1918, 5.22 inches. On July 4th-5th, 1876, the records show a fall of 4.55 inches in 2 hours, 5 minutes, and if this is correct, such a downpour in 2 hours has not been duplicated since. That was the storm that flooded Rockdale and drowned forty persons.

The storms of September 8th-9th were both accompanied by vigorous thunder and lightning, but these features were more pronounced in the first storm than in the second. In the first storm the loud, bursting peals of thunder and brilliant flashes of lightning were almost incessant from 10:30 p. m. to 11:30 p. m. At about 1:00 a. m., of the 9th, L. F. Hefner, an Illinois Central freight conductor, while walking on top of a freight car in the lower yards, was killed by lightning. There were also other instances of minor damage by lightning at scattered points about the city.

The water came down from the hill through the waterway streets in torrents, going over the curbs in places, gushing up from the sewers, tearing out manholes, ripping up the paving in parts of West 5th Street and the major part of Central Avenue from 24th to 32d; soon overflowed much of the northeastern portions of the city, filling cellars, washing down debris and mud from the hills to the lower sections, and washing down gardens. Numerous automobiles were caught in the downpour and rushing waters from the hills, and had their electrical connections grounded and were stalled until morning. Street cars were unable to operate during the downpours. Hundreds of telephones were put out of commission as a result of the water and lightning, and electric current supply was cut off in many instances. Telegraph service was not seriously hampered, but trains were greatly delayed on the 9th east of the city, in Grant County, Wisconsin, due to flooded or washed-out tracks, and there were also some delays southward and southeastward. The Cascade division of the C. M. & St. P. suffered the loss of 1,900 feet of track and one bridge, 7 miles west of Bellevue. Fields and country

roads were badly washed and considerable corn was lodged. Although the rains were mostly local in character, 8.71 inches fell at Clinton, Iowa, 56 miles southeast of the city.

The total damage to streets, sewers and other property in the city, and to crops, highways and railroads in the immediate vicinity probably did not exceed \$25,000.

## OCTOBER

The cool, rainy weather that prevailed during the last week of September continued well into October; the rainy condition lasting generally till the middle of the 2d week and the cool weather till near the end of the 3d week. During the first 17 days, except for an occasional day, the temperature was continuously below normal over the western portion of the State and the cool weather continued a couple of days longer over the eastern portion. After a change to warmer occurred, the temperature remained continuously above normal during the rest of the month. After the rain ceased, generally on the 12th, one of the most remarkable periods of so-called "Indian Summer" that ever prevailed over the State set in and no further rain occurred till near the end of the month. Over practically all the State, except a small area along the Mississippi River, the sunshine was 100 per cent of the possible amount for a period of two weeks from the 14th to 27th, inclusive. The extremes in temperature were not pronounced. During the cool period there were no marked departures. During the warm period the departures were pronounced and while no monthly extremes were established there were new records established for high temperatures for the last decade. At Des Moines there were new records for maxima established daily from the 24th to 28th, inclusive. New records for so late in the season were also established on several dates over most of the central and eastern portions of the State. The maximum for the month, however, was well under the record for the State and there has been a higher maximum on 15 previous Octobers but in only three previous months has the minimum for October been higher, the last time being in 1881 when the minimum for the State was 26°.

The first general killing frost occurred on the 14th, though a few stations reported killing frosts on the 8th. In some portions of the State none occurred till the 31st and in portions of Monona, Harrison, Pottawattamie and Buena Vista counties and a few other localities killing frost had not occurred yet. Over a large portion of the State the occurrence of freezing temperatures was no index of killing frosts, for tender vegetation was unharmed by such temperatures and continued green until killed by hard freezes.

The weather was especially favorable for all farm work. The warm, dry weather during the last of the month was particularly favorable for the drying of corn and at the end of the month husking was becoming active in some western and northern counties. For the State about 5 per cent of the husking had been done. The damage to corn from frost was less than usual due to the lateness of killing frost and the favorable drying conditions. Seventy-nine per cent escaped frost damage which is

above the average of the preceding five years. Corn that ordinarily would have been soft became chaffy. The rains the latter part of September and the first part of October put the soil in good condition for plowing, except it was too wet in areas in the extreme southeast portion. There was further seeding of winter grain. Clover hulling which had been much delayed was completed. A short apple crop was harvested under favorable conditions. Roads were in poor shape the first half of the month and good the latter half, but very dusty.

**Temperature.** The mean temperature for the State, as shown by the records of 109 stations, was 55.5°, or 3.6° higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern; 53.3°, or 3.2° higher than the normal; Central, 55.4°, or 3.3° higher than the normal; Southern, 57.7°, or 4.7° higher than the normal. The highest monthly mean was 53.3°, at Keokuk, and the lowest was 50.4°, at Northwood. The highest temperature reported was 91°, at Little Sioux on the 32d, and the lowest was 24°, at Decorah on the 14th. The temperature range for the State was 67°.

**Precipitation.** The average precipitation for the State, as shown by the records of 113 stations, was 3.25 inches, or 0.83 inch more than the normal. By divisions, the averages were as follows: Northern, 1.51 inches, or 0.41 inch less than the normal; Central, 3.56 inches, or 1.81 inches more than the normal; Southern, 4.29 inches, or 1.83 inches more than the normal. The greatest amount, 8.51 inches, occurred at Burlington, and the least, 0.46 inch, occurred at Waasha. The greatest amount in any 24 consecutive hours, 4.91 inches, occurred at Keosauqua on the 1st-2d.

**Snowfall.** Practically no snowfall occurred during the month, trace being reported from but two stations.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Station	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %			Wind			Sub- sidi- ary		
	Mean	Highest	Date	Lowest	Mean			Total movement	Average hourly velocity		Maximum	
					7 a. m. 12 noon	7 p. m.	Lowest				Miles From	Date
Charles City	29.98	30.00	16	29.39	2.90	27.79	26	4,344	5.9	37	27	27
Davenport	29.00	29.35	18	29.59	11.84	27.61	26	4,232	5.7	28	28	28
Des Moines	29.97	30.50	16	29.61	30.82	29.66	26	4,647	6.2	31	28	28
Keokuk	30.01	30.57	18	29.50	2.86	27.66	23	3,797	5.1	30	28	28
Sioux City	29.98	30.38	16	29.45	11.70	29.69	27	4,788	6.4	35	28	28
Omaha, Neb.	29.97	30.30	16	29.34	10.96	27.55	27	5,263	11.1	43	28	28
Means and extremes	29.99	30.40	16	29.45	10	28.50	26	6.7		43	6	28
Normals and records	30.03	31.91	100	30.81	0	25.6	25	8.1		40	0	28
	29.00	29.00	100	29.00	100	100	100					

\*Davenport. †Omaha. ‡Sioux City. ††Local mean time.

**Miscellaneous Phenomena.** Aurora: 21st, 23d, 23d, 24th. Fog: 1st, 3d, 7th, 8th, 14th, 18th, 19th, 29th, 31st. Frost: 4th, 7th, 8th, 9th, 10th, 13th, 14th, 16th, 17th, 18th, 19th, 21st, 30th, 31st. Hail: 2d, 5th, 30th. Halos (lunar and solar): 3d, 10th, 23d, 28th, 31st. Thunderstorms: 1st, 2d, 3d, 5th, 6th, 7th, 8th, 9th, 11th, 28th, 29th, 30th. Winds (strong): 10th, 30th.

**Rivers.** Nearly stationary stages prevailed on the Missouri River throughout the month though there were numerous slight fluctuations and the extreme monthly range at both Sioux City and Omaha was less than one foot. Due to the heavy rainfall over eastern Iowa in the first decade there were numerous fluctuations on the Mississippi River during the first two weeks with a general tendency to higher stages, after which there was a steady fall till the end of the month. Excessive rainfall beginning late on September 30th in extreme southeastern Iowa caused a record rise at Keokuk on the 1st, being 6.3 feet in 24 hours. There were moderate rises on all interior rivers during the first decade and a general fall thereafter with low stages general at the end of the month.

NOVEMBER

Though November averaged 1.1° warmer for the State than usual, the first 19 days were mostly below normal and this deficiency was overcome by a protracted warm period the rest of the month, except in the northwest division and some adjacent territory where the monthly average was below normal. The temperature extremes were well within the November limits but there were numerous fluctuations and rather sudden changes till the 20th. The changes to warmer were more pronounced than those to colder.

There was a decided deficiency in precipitation except in about five counties in the northeastern division and a narrow strip along the Mississippi River from Jackson county southward. After the general precipitation on the 1st there were only a few light, scattered amounts till the 10th. During the rest of the month precipitation occurred at frequent intervals, but excepting the 14th-15th, the amounts were light.

The outstanding feature of the month was the lack of sunshine, which was less than last November. The average for the State, 31%, is the least for any November in the history of the state, and possibly the least for any month. At Des Moines the average was 33% but a slightly smaller per cent was recorded in November, 1906, and in January, 1907 and 1908. The number of clear days was the least and the number of cloudy days was the greatest ever recorded in November. The weather was favorable for all farm work but the excessive cloudiness and high humidity were unfavorable for drying corn. As a result there was some corn that could not be safely cribbed and some down corn was moldy.

Corn picking was interrupted very little and the amount gathered at the end of the month compared favorably with the average and the quality was better than the average. The yield varied greatly, even in the same localities, being poorest in the southeast counties. Plowing was possible except for a short period at the last of the third week and the first part of the fourth. Pastures were green throughout the month

but they were getting very short at the close. Cattle were generally in good condition but hogs were developing the "flu" in many localities. Roads were in good condition, except dirt roads for a few short periods in the first of the third week.

**Temperature.** The mean temperature for the State, as shown by the records of 100 stations, was 37.7°, or 1.1° higher than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 34.1°, or 0.1° lower than the normal; Central, 38.2°, or 1.5° higher than the normal; Southern, 40.7°, or 2.0° higher than normal. The highest monthly mean was 43.8°, at Keokuk, and the lowest was 31.2° at Sioux Center. The highest temperature reported was 81° at Clarinda on the 9th, Thurman on the 10th, and Corning on the 11th, and the lowest was zero at Sanborn on the 18th. The temperature range for State was 81°.

**Precipitation.** The average precipitation for the State, as shown by the records of 110 stations, was 0.87 inch, or 0.69 inch less than the normal. By divisions, the averages were as follows: Northern, 0.59 inch, or 0.53 less than the normal; Central, 0.97 inch, or 0.61 inch less than the normal; Southern, 0.76 inch, or 0.81 inch less than the normal. The greatest amount, 3.61 inches, occurred at Keokuk, and the least, a trace, occurred at Red Oak and Thurman. The greatest amount in any 24 consecutive hours, 1.75 inches, occurred at Oelwein.

**Snowfall.** The average snowfall for the State was 0.5 inch, or 17 inches less than the normal. Less than one inch occurred in about three-fifths of the State, and in most of this area the amount was only a trace and a number of stations in each division reported none. The heaviest amounts occurred in the northeastern and north-central divisions.

**Miscellaneous Phenomena.** Fog: 2d, 7th, 9th, 10th, 11th, 14th, 19th, 20th, 21st, 22d, 24th, 25th, 26th, 27th, 28th. Frost (killing): 2d, 3rd, 5th

Hail: 1st, 9th, 11th. Halos (lunar and solar): 4th, 5th, 30th. Parhelia: 23d. Sleet: 1st, 8th, 14th, 15th, 16th, 17th, 18th, 19th, 21st, 22d, 23d. Thunderstorms: 1st, 11th, 14th, 15th, 28th. Winds (strong): 4th, 5th, 11th, 12th, 13th, 29th.

**Rivers.** There were numerous slight fluctuations on the Mississippi River during the entire month with a slight tendency to higher stages. On the Missouri fluctuations were also numerous but there was a pronounced aggregate fall from the beginning to the end of the month. Low and nearly stationary stages prevailed on all interior rivers.

## DECEMBER

Wintry conditions prevailed during most of December and the month was classed as cold. Except for an occasional day or two the temperature was continuously below normal till the 24th in the western portion and till the 25th in the eastern portion of the State, when a mild period of 5 days set in. This period was followed by a decided change to colder and at the end of the month zero weather was general. By far the coldest portion and area of greatest deficiency occurred over the northwest section and a surrounding area. Several stations in this area showed a deficiency of more than ten degrees while several stations in the extreme eastern and extreme southern portions reported a deficiency of less than three degrees.

The outstanding feature of the month's weather was a severe storm beginning as a light rain on the 5th, turning to sleet and snow, and continuing into the 7th. The storm was what is popularly known as a real "Blizzard," and in many places in the northern and western portions of the State it was regarded as the worst storm of this character ever experienced. During the entire time that snow was falling and for some time after, a strong northwest gale prevailed and no part of the State escaped. The snowfall was heaviest in the northern and western portions and even where the snow was light it drifted badly and caused some trouble. In most of the northern portion the drifting was very bad. Train service was seriously interrupted and many highways were blocked. Telephone, telegraph and electric service experienced a great deal of trouble. Many poles were broken by the wind and the severe cold made repairing broken wires difficult. Much suffering was caused to man and beast by this storm. One death, a school girl on her way home, was reported. The conveyance in which she was traveling was stranded in the snow and in attempting to walk the remaining distance she became exhausted and sank in the snow.

Live stock, unless securely protected, suffered greatly and much snow was blown into buildings through very small openings. Another storm of more than ordinary severity occurred on the 15th, but as it was accompanied by very little snow, it caused very little discomfort. The month closed with another severe storm accompanied by zero weather but fortunately the area of heavy snow was confined to a limited area in the southeast portion, and the principal damage was delayed train schedules and blocked highways.

The precipitation was slightly below normal and the average for each division was practically the same. More than half was in the form of

## PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %		Wind				Sun Shade			
	Mean	Highest	Date	Lowest	Mean		Total movement	Average hourly velocity	Maximum					
					T. B. H. 12 noon	P. M.			Miles Per Hour	Direction				
Charler City.....	30.06	30.06	12	29.84	29.90	70	36	4	5,178	7.2	30	W	11	11
Davenport.....	30.05	30.00	12	29.51	29.84	70	36	13	5,350	7.7	34	W	11	11
Des Moines.....	30.04	30.01	13	29.57	29.81	68	30	4	5,029	7.5	30	W	11	11
Dubuque.....	30.05	30.04	12	29.52	29.80	66	30	15	5,138	7.1	30	W	11	11
Keokuk.....	30.08	30.00	12	29.51	29.80	62	32	4	5,359	8.0	35	W	11	11
Sioux City.....	30.07	30.00	13	29.52	29.82	58	31	30	8,228	11.6	45	W	11	11
Omaha, Neb.....	30.06	30.02	13	29.50	29.70	30	33	15	6,194	8.5	37	W	11	11
Means and extremes.....	30.06	30.06	12	29.51	29.50	30	4			8.4	46	W	11	11
Normals and records.....	30.07	30.07	25	29.73	29.73	67	30			8.2	50	W	11	11
	30.06	30.06	12	29.53	29.53	61	30			8.2	50	W	11	11

\*Sioux City. †Davenport. ‡Omaha. §Keokuk. ¶Local mean time. ††And other data.

rain. After the first week there was very little precipitation till the 27th-28th, when a general storm, mostly rain, occurred. Outdoor work was practicable during the greater portion of the month and corn husking continued in portions of the State. The wind movement was much above the December average and this dried corn rapidly so that which had been too moist to crib could be cribbed safely.

As every snowstorm was accompanied by strong winds most of the fields were bare during the severe weather and winter wheat and clover are likely to have been injured. Stock generally were in good condition and "Hog Flu" diminished after the outbreak attending the blizzard of the 6th-7th. Roads were in unusually good condition for the season.

**Temperature.** The mean temperature for the State, as shown by the records of 101 stations, was 18.7°, or 5.4° lower than the normal. By divisions, approximately three tiers of counties to the division, the means were as follows: Northern, 13.9°, or 7.5° lower than the normal; Central, 19.5°, or 4.7° lower than the normal; Southern, 22.6°, or 3.9° lower than the normal. The highest monthly mean was 26.9°, at Keokuk, and the lowest was 8.8°, at Lake Park. The highest temperature reported was 59°, at Keokuk on the 13th, and the lowest was -22°, at Sanborn on the 8th. The temperature range for the State was 81°.

**Precipitation.** The average precipitation for the State, as shown by the records of 109 stations, was 1.04 inches, or 0.10 inch less than the normal. By divisions, the averages were as follows: Northern, 1.01 inches, or exactly normal; Central, 1.06 inches, or 0.11 inch less than the normal; Southern, 1.03 inches, or 0.19 inch less than the normal. The greatest amount, 2.60 inches, occurred at Fayette, and the least, 0.23 inch, occurred at Cherokee. The greatest amount in any 24 hours, 1.18 inches, occurred at Fairport on the 28th.

**Snowfall.** The average snowfall for the State was 4.4 inches, or 15 inches less than the normal. It was above normal in the northern division and below in the central and southern divisions. The greatest amount, 14.0 inches, occurred at Decorah, and the least, a trace, at Chariton. All snowfall drifted badly and many railroads and highways were blocked, particularly after the severe storm of the 7th. Due to the general drifting of the snow the ground was bare over the central and southern divisions most of the month, and except for short periods winter wheat was unprotected. Over large portions of the northern division the snow cover was continuous from the 3d till the end of the month, while in the south-central section the snow melted soon after falling.

**Miscellaneous Phenomena.** Aurora: 8th, 13th, 15th, 18th. Fog: 2d, 12th, 13th, 14th, 20th, 21st, 22d, 23d, 24th, 25th, 26th, 28th, 29th. Haze (lunar and solar): 1st, 6th, 7th, 8th, 11th, 12th, 15th, 16th, 17th, 18th, 21st, 26th, 30th, 31st. Haze: 24th, 25th, 27th. Parhelia: 16th, 16th, 17th. Sleet: 6th, 7th, 11th, 16th, 25th, 28th, 30th. Thunderstorm: 27th.

**Rivers.** There were numerous fluctuations on the principal rivers with rather wide extremes. The Mississippi River at Dubuque showed a falling tendency till the middle of the 2d week, when a stage of 1.1 feet was recorded and a gradual rise until the 30th, when a stage of 6.3

feet was recorded; at Davenport there was a gradual falling tendency till the 11th, when a stage of 0.5 foot was recorded after which there was a general rising tendency though numerous fluctuations with a maximum stage of 8.4 feet on the 31st. Floating ice was present the 1st week and mostly frozen thereafter. A sharp rise occurred throughout the course beginning on the 25th. At Sioux City the river was open till the 7th and frozen the rest of the month. Nearly stationary stages prevailed till the 15th and rising stages prevailed till the 25th, having reached a maximum stage of 8.5 feet; at Omaha the river was frozen most of the month. Falling stages prevailed till the 10th with a stage of 2.7 feet after which there was a rise till the end of the month with a crest stage of 9.4 feet. Low stages prevailed on all interior rivers with very little fluctuation, and they were generally frozen after the 1st week.

## PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %		Wind			Sun- shine		
	Mean	Highest	Dial	Lowest	Mean		Total movement	Average hourly velocity	Maximum		Per cent of possible duration from normal	
					7 a. m. to noon	7 p. m. to lowest			Miles From	Dates		
Charles City.....	30.12	30.58	30	29.75	28.90	77.88	51	6,190	8.5	30 nw	7	66 + 2
Davenport.....	30.12	30.58	30	29.17	7.80	71.78	39	5,287	8.5	35 SW	7	38 - 5
Des Moines.....	30.12	30.57	30	29.58	28.79	65.69	39	6,150	8.3	35 s.	7	100 + 4
Dubuque.....	30.11	30.63	30	29.23	7.80	71.77	45	5,506	7.5	28 NW	7	37 - 14
Keokuk.....	30.15	30.56	30	29.38	7.76	65.67	33	7,017	9.4	40 w.	7	55 + 10
Sioux City.....	30.18	30.65	30	29.33	28.87	71.79	46	9,841	13.2	46 NW	7	52 + 3
Omaha, Neb.....	30.16	30.61	31	29.36	28.80	69.74	36	7,020	10.2	41 NW	7	62 + 11
Means and extremes.....	30.14	30.65	19	29.17	7	85.69	76	.....	9.8	.....	7	48 + 1
Normals and records.....	30.12	30.78	30	29.07	7	78	77	.....	8.1	.....	24 1/2	47
	.....	31.00	19.7	29.00	19.5	.....	118	1922	.....	58 NW	1907	.....

\*Sioux City. †Dubuque. ‡Keokuk. †Local mean time. †and other dates.

ANNUAL REPORT OF THE

COMPARATIVE DATA FOR THE STATE—ANNUAL

MONTHLY STATE DATA FOR 1907

Month	Barometric Pressure Inches (Sea Level)			Temperature Degrees, F.		Rel. Humid-ity, Per Cent			Precipitation, Inches			No. of Days			Sunshine		Wind				
	Mean	Highest	Lowest	Mean	Range	7 a. m.*	12 noon†	7 p. m.†	Average	Least	Greatest	Days	With or more precipitation	Clear	Partly cloudy	Cloudy	Per cent of the possible amount	Departure from normal	Average hourly velocity	Departure from normal	Prevailing direction
JANUARY	30.34	31.07	29.48	30.11	31.48-28.66	78	83	72	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
FEBRUARY	30.06	30.72	29.30	30.08	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
MARCH	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
APRIL	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
MAY	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
JUNE	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
JULY	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
AUGUST	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
SEPTEMBER	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
OCTOBER	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
NOVEMBER	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
DECEMBER	30.00	30.74	29.30	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
MEAN AND EXTREMES	30.00	31.07	29.14	30.00	31.45-28.71	77	82	71	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.
NORMAL AND DEVIATIONS	30.00	31.00	29.00	30.00	31.00-29.00	75	80	65	75.0	65.0	85.0	10	1	1	1	1	1	0.0	1.0	0.0	SW.

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

Year	Temperature			Precipitation in Inches		
	Mean annual	Highest	Lowest	Annual	Greatest annual	Least annual
1871	50.8	81.0	21.0	41.04	23.34	59.7
1872	50.8	81.0	21.0	41.04	23.34	59.7
1873	50.8	81.0	21.0	41.04	23.34	59.7
1874	50.8	81.0	21.0	41.04	23.34	59.7
1875	50.8	81.0	21.0	41.04	23.34	59.7
1876	50.8	81.0	21.0	41.04	23.34	59.7
1877	50.8	81.0	21.0	41.04	23.34	59.7
1878	50.8	81.0	21.0	41.04	23.34	59.7
1879	50.8	81.0	21.0	41.04	23.34	59.7
1880	50.8	81.0	21.0	41.04	23.34	59.7
1881	50.8	81.0	21.0	41.04	23.34	59.7
1882	50.8	81.0	21.0	41.04	23.34	59.7
1883	50.8	81.0	21.0	41.04	23.34	59.7
1884	50.8	81.0	21.0	41.04	23.34	59.7
1885	50.8	81.0	21.0	41.04	23.34	59.7
1886	50.8	81.0	21.0	41.04	23.34	59.7
1887	50.8	81.0	21.0	41.04	23.34	59.7
1888	50.8	81.0	21.0	41.04	23.34	59.7
1889	50.8	81.0	21.0	41.04	23.34	59.7
1890	50.8	81.0	21.0	41.04	23.34	59.7
1891	50.8	81.0	21.0	41.04	23.34	59.7
1892	50.8	81.0	21.0	41.04	23.34	59.7
1893	50.8	81.0	21.0	41.04	23.34	59.7
1894	50.8	81.0	21.0	41.04	23.34	59.7
1895	50.8	81.0	21.0	41.04	23.34	59.7
1896	50.8	81.0	21.0	41.04	23.34	59.7
1897	50.8	81.0	21.0	41.04	23.34	59.7
1898	50.8	81.0	21.0	41.04	23.34	59.7
1899	50.8	81.0	21.0	41.04	23.34	59.7
1900	50.8	81.0	21.0	41.04	23.34	59.7
1901	50.8	81.0	21.0	41.04	23.34	59.7
1902	50.8	81.0	21.0	41.04	23.34	59.7
1903	50.8	81.0	21.0	41.04	23.34	59.7
1904	50.8	81.0	21.0	41.04	23.34	59.7
1905	50.8	81.0	21.0	41.04	23.34	59.7
1906	50.8	81.0	21.0	41.04	23.34	59.7
1907	50.8	81.0	21.0	41.04	23.34	59.7
1908	50.8	81.0	21.0	41.04	23.34	59.7
1909	50.8	81.0	21.0	41.04	23.34	59.7
1910	50.8	81.0	21.0	41.04	23.34	59.7
1911	50.8	81.0	21.0	41.04	23.34	59.7
1912	50.8	81.0	21.0	41.04	23.34	59.7
1913	50.8	81.0	21.0	41.04	23.34	59.7
1914	50.8	81.0	21.0	41.04	23.34	59.7
1915	50.8	81.0	21.0	41.04	23.34	59.7
1916	50.8	81.0	21.0	41.04	23.34	59.7
1917	50.8	81.0	21.0	41.04	23.34	59.7
1918	50.8	81.0	21.0	41.04	23.34	59.7
1919	50.8	81.0	21.0	41.04	23.34	59.7
1920	50.8	81.0	21.0	41.04	23.34	59.7
1921	50.8	81.0	21.0	41.04	23.34	59.7
1922	50.8	81.0	21.0	41.04	23.34	59.7
1923	50.8	81.0	21.0	41.04	23.34	59.7
1924	50.8	81.0	21.0	41.04	23.34	59.7
1925	50.8	81.0	21.0	41.04	23.34	59.7
1926	50.8	81.0	21.0	41.04	23.34	59.7
1927	50.8	81.0	21.0	41.04	23.34	59.7
1928	50.8	81.0	21.0	41.04	23.34	59.7
1929	50.8	81.0	21.0	41.04	23.34	59.7
1930	50.8	81.0	21.0	41.04	23.34	59.7

\*And other dates.

DATES OF KILLING FROST, 1927

Charles City, Davenport, Des Moines, Dubuque, Keokuk, Sioux City, Omaha, and Marshalltown excluded from averages because of city influences

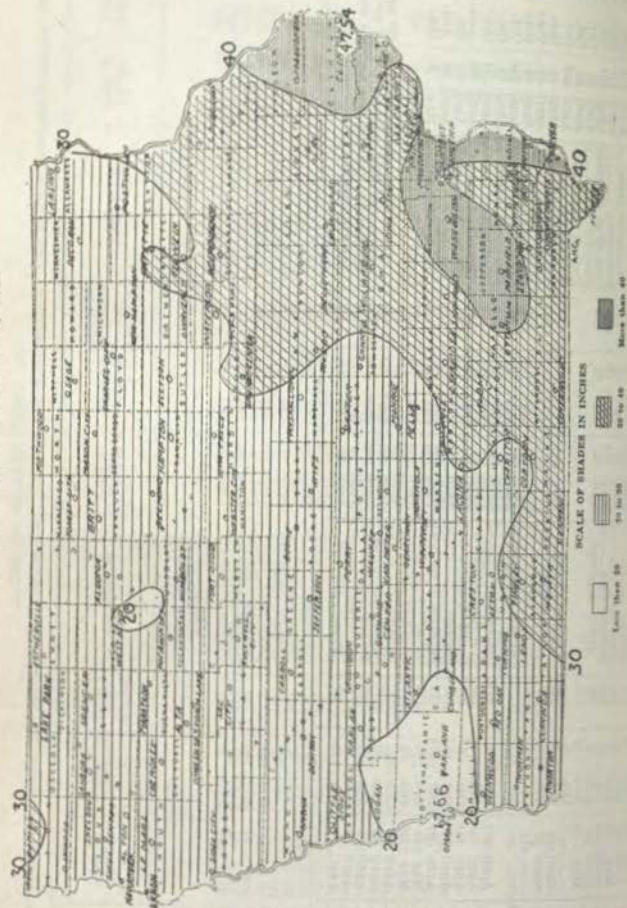
STATIONS	Last in Spring	First in Autumn	Days in Growing Season	STATIONS	Last in Spring	First in Autumn	Days in Growing Season	STATIONS	Last in Spring	First in Autumn	Days in Growing Season
<b>Northwest District</b>				<b>North Central District</b>				<b>Northeast District</b>			
Alta	April 24	Nov. 2	192	Algona	April 24	Oct. 14	173	Decorah	April 24	Oct. 14	173
Alton	April 24	Oct. 14	173	Allison (near)	April 30	Oct. 14	167	Dubuque	April 23	Oct. 14	174
Cherokee	May 5	Sept. 20	128	Belmond	May 5	Oct. 14	169	Payette	April 24	Oct. 14	173
Estherville	April 24	Oct. 13	161	Britt	April 30	Oct. 14	167	Independence	April 24	Oct. 14	173
Inwood	May 5	Oct. 13	161	Charles City	April 24	Oct. 14	174	New Hampton	April 25	Oct. 14	172
Lake Park (near)	April 24	Oct. 9	168	Forest City	April 24	Oct. 14	174	Oelwein	April 23	Oct. 14	174
Le Mars	April 24	Oct. 31	190	Hampton	April 24	Oct. 14	173	Postville (near)	April 30	Oct. 14	167
Pocahontas	April 24	Oct. 14	173	Humboldt	April 24	Oct. 14	167	Waterloo	April 23	Oct. 14	174
Rock Rapids	April 24	Oct. 14	173	Mason City	April 24	Oct. 14	173	Waverly	April 24	Oct. 14	173
Sanborn	May 5	Oct. 4	152	Northwood	April 24	Oct. 14	173	Rural Average	April 24	Oct. 14	173
Rock Rapids	April 24	Oct. 14	173	Osage	April 24	Oct. 14	173	<b>East Central District</b>			
Sheldon	April 24	Sept. 20	149	Rural Average	April 29	Oct. 14	168	Belle Plaine	April 24	Oct. 14	173
Sioux Center	May 5	Sept. 20	138	<b>Central District</b>				Cedar Rapids	April 24	Oct. 14	173
Spencer	May 5	Sept. 20	138	Ames	April 24	Oct. 14	173	Clinton	April 24	Oct. 14	173
Storm Lake	April 24	Nov. 21	192	Baxter	April 24	Oct. 14	173	Davenport	April 23	Oct. 14	174
Washta	April 24	Oct. 14	173	Boone (near)	May 12	Oct. 14	155	Fairport	April 24	Nov. 5	195
West Bend	May 5	Sept. 20	138	Des Moines	April 24	Oct. 14	173	Iowa City	April 24	Oct. 14	173
Rural Average	April 28	Oct. 8	163	Fort Dodge	May 12	Oct. 14	155	Maquoketa (near)	April 24	Oct. 14	173
<b>West Central District</b>				Grinnell	April 24	Oct. 14	173	Olin	April 24	Oct. 8	167
Audubon (near)	April 24	Oct. 13	172	Grundy Center	April 24	Oct. 14	174	Thion (near)	April 24	Oct. 14	173
Carroll	April 24	Oct. 14	173	Iowa Falls	April 23	Oct. 14	174	Williamsburg	April 24	Oct. 16	175
Denison	May 5	Oct. 31	179	Marshalltown	April 24	Oct. 14	173	Rural Average	April 24	Oct. 15	174
Guthrie Center	April 24			Monroe	April 24						

ANNUAL REPORT OF THE

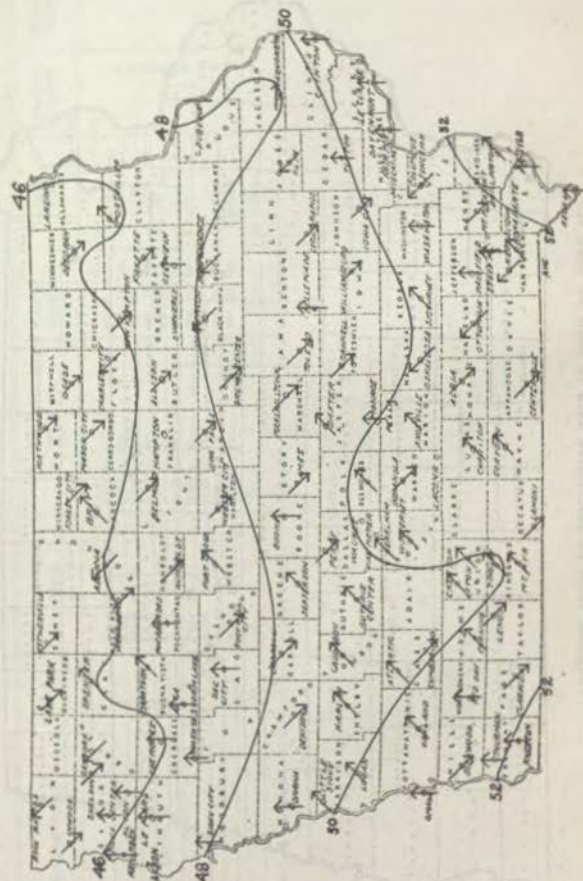
Harlan	April 24	Oct. 14	173	Perry	April 24	Oct. 14	173	<b>Southeast District</b>			
Jefferson	April 24	Oct. 14	173	Toledo	April 24	Oct. 14	173	Bonaparte (near)	April 24	Oct. 14	173
Little Sioux	May 5	Nov. 21	181	Wauke	April 24	Oct. 14	173	Burlington	April 24	Nov. 5	195
Logan	April 24	Oct. 31	190	Webster City	May 12	Oct. 14	155	Columbus Junction	April 24	Oct. 14	173
Osawa	April 24	Nov. 2	192	Rural Average	April 28	Oct. 14	169	Fairfield	April 24	Oct. 8	167
Rockwell City	May 5	Nov. 21	181	<b>South Central District</b>				Keokuk	April 23	Oct. 14	174
Sac City		Oct. 13		Afton	April 24	Nov. 5	195	Keosauqua	April 24	Oct. 14	173
Sioux City	April 24	Oct. 9	168	Albia	April 23	Nov. 2	198	Mt. Pleasant	April 24	Oct. 14	173
Rural Average	April 27	Oct. 22	179	Centerville	April 25	Oct. 14	172	Oskaloosa	April 24	Oct. 14	173
<b>Southwest District</b>				Chariton (near)	April 24	Oct. 14	173	Ottumwa	April 24	Oct. 14	173
Atlantic	April 24	Oct. 31	190	Corydon	April 24	Oct. 14	173	Sigourney (near)	April 24	Oct. 14	173
Clairinda	April 24	Oct. 31	190	Creston	April 24	Oct. 14	173	Stockport (near)	April 24	Oct. 14	173
Corning (near)	April 24	Oct. 31	190	Earlham (near)	May 12	Oct. 14	155	Washington	April 24	Oct. 14	173
Cumberland (near)	April 24	Oct. 31	190	Indianola	April 24	Oct. 14	173	Wescott (near)	April 23		
Glenwood	April 24	Oct. 31	192	Knoxville	April 24	Oct. 14	173	Rural Average	April 24	Oct. 16	175
Lenox	May 12	Oct. 31	172	Lamoni	April 23	Sept. 21	151	State Av., 1927	Apr 30	Oct. 17	174
Oakland	May 12	Oct. 31	172	Mount Ayr	April 24	Sept. 21	150	State Normal	May 3	Oct. 5	155
Red Oak (near)	April 23			Tingley	April 24	Sept. 21	150	†Date of last temperature of 25° or lower in the Spring, or first temperature of 25° or lower in the Autumn (as the case may be) when frost was not reported.			
Riverton (near)	April 22	Oct. 31	192	Winterset	April 24	Nov. 2	192				
Thurman	April 22	Oct. 31	192	Rural Average	April 25	Oct. 14	172				
Omaha, Neb.	April 22	Nov. 6	198								
Rural Average	April 27	Oct. 31	187								

IOWA WEATHER AND CROP BUREAU

TOTAL PRECIPITATION, YEAR, 1927



MEAN ISOTHERMS AND PREVAILING WINDS, YEAR, 1927

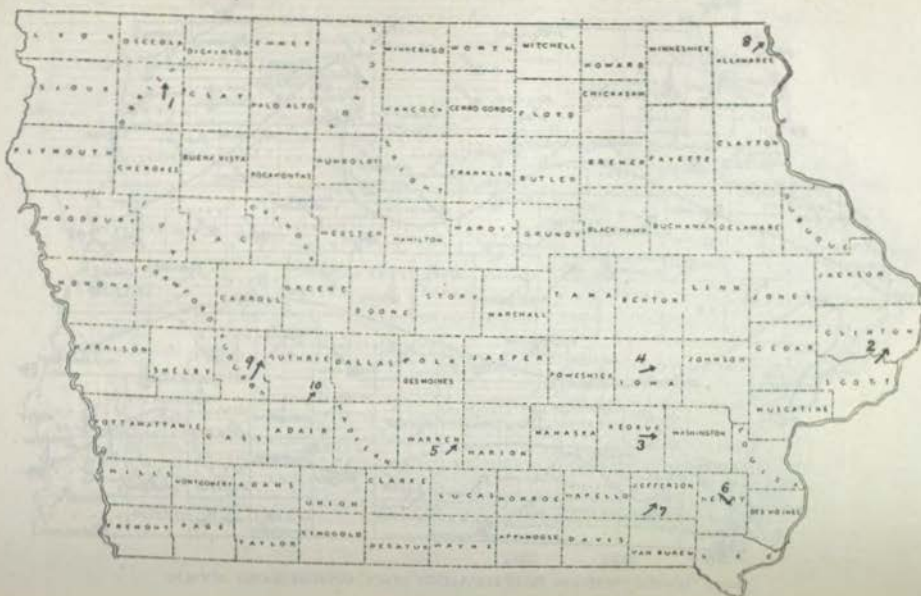


Copyright 1928 by the Iowa Weather and Crop Bureau. All rights reserved.



# TORNADO PATHS IN IOWA DURING THE YEAR 1927

(Figures refer to descriptive data in table on page 49)



## TORNADOES IN IOWA DURING THE YEAR 1927

Nearest Town	Date	Time	Direction	Length of Path	Persons Injured	Persons Killed	Estimated Damage
1. Hartley	May 8	8:00 p. m.	s. to n.	6 miles	5	0	\$ 20,000
2. Dewitt	May 9	4:05 p. m.	sw. to ne.	10 miles	0	0	22,000
3. Keota	May 13	3:00 p. m.	w. to e.	3 miles	0	0	5,000
4. Williamsburg	May 23	6:00 p. m.	sw. to ne.	6 miles	2	0	25,000
5. Milo (Warren Co.)	May 27	4:00 p. m.	sw. to ne.	Short	0	0	6,000
6. Mt. Pleasant	July 6	7:00 p. m.	nw. to se.	Short	12	1	80,000
7. Libertyville	July 28	6:00 p. m.	sw. to ne.	Short	0	0	1,200
8. Lansing	Sept. 22	5:15 p. m.	sw. to ne.	Short	0	0	1,700
9. Audubon	Sept. 22	Noon	sw. to ne.	8 miles	0	0	4,000
10. Menlo	Sept. 29	1:50 p. m.	sw. to ne.	2 miles	0	0	5,000
<b>Total</b>				<b>35 miles</b>	<b>17</b>	<b>1</b>	<b>\$ 167,000</b>

## TORNADOES IN IOWA FOR 10 YEARS, 1918-1927

About 10 tornadoes per year have been Iowa's quota during the last 10 years, during which very accurate statistics have been compiled by the Iowa Weather and Crop Bureau in co-operation with the United States Weather Bureau. The total length of tornado paths averaged 93 miles per year; persons injured, 33; persons killed, 5; and property loss, \$725,848. The years, 1918 and 1925 were outstanding in injury, deaths and damage, while in 1923 there was comparatively little. In 1927 tornadoes were normally frequent but the paths were short and the damage was less than one-fourth the average. (See pages 48 and 49.)

The earliest date of occurrence of a tornado in this period was February 1, 1922, at Monticello, and the latest was October 3, 1925, southwest of Oskaloosa. The 98 tornadoes in the 10 years were distributed among the months as follows: February, 1; March, 3; April, 11; May, 31; June, 25; July, 9; August, 8; September, 8; and October, 2.

For such storms as the time of occurrence is known with some accuracy (and most of the times are known) the hours during which tornadoes have been in progress for the last 10 years have been as follows:

A. M.		P. M.	
12 to 1.....	5	12 to 1.....	2
1 to 2.....	2	1 to 2.....	2
2 to 3.....	3	2 to 3.....	4
3 to 4.....	0	3 to 4.....	11
4 to 5.....	1	4 to 5.....	20
5 to 6.....	1	5 to 6.....	15
6 to 7.....	1	6 to 7.....	15
7 to 8.....	0	7 to 8.....	11
8 to 9.....	0	8 to 9.....	4
9 to 10.....	2	9 to 10.....	2
10 to 11.....	0	10 to 11.....	2
11 to 12.....	1	11 to 12.....	2

The prevailing direction of movement was decidedly from southwest to northeast or west-southwest to east-northeast.

In an average year the chances of a person in Iowa being killed or injured by a tornado are about one in 63,584 and if one lived in Iowa

Year	Number of Tornadoes	Total Length of Path in Miles	Persons Injured	Persons Killed	Estimated Damage
1918.....	12	265	186	20	\$ 2,454,200
1919.....	12	48	0	0	145,000
1920.....	7	24	8	0	195,000
1921.....	9	72	30	4	682,000
1922.....	10	140	9	1	756,000
1923.....	7	6	9	6	95,100
1924.....	7	30	2	1	108,500
1925.....	18	190	58	6	2,224,000
1926.....	8	26	20	2	432,000
1927.....	10	30	17	1	247,000
<b>Total.....</b>	<b>98</b>	<b>933</b>	<b>225</b>	<b>50</b>	<b>\$ 7,258,430</b>
<b>Average.....</b>	<b>10</b>	<b>93</b>	<b>23</b>	<b>5</b>	<b>\$ 725,848</b>

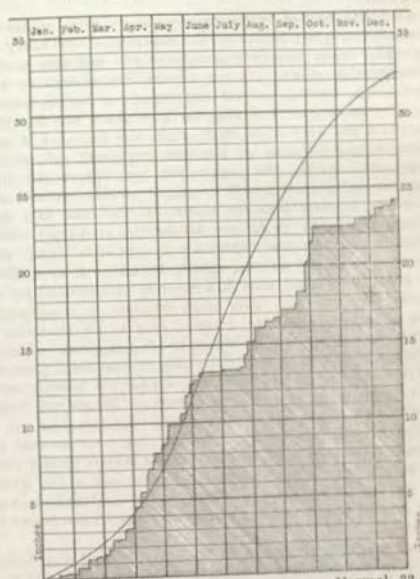
to the age of three score and ten his chances of injury or death by tornadoes would be about one in 910. The chances of being killed in any one year are about one in 485,000 and in 70 years the chances are about one in 69,286. Why worry?

Some of the statistics of the 10-year period, 1918 to 1927, are shown in the table. These do not include damaging wind storms other than tornadoes.

## PRECIPITATION

Des Moines, Iowa

Line bounding shaded area shows accumulated depth in inches, 1927. Smooth curve shows normal.



Total for 1927, 24.07.

Normal, 32.45.

## WEATHER AND CROP REVIEW, 1927

Read by Charles D. Reed at the Annual Agricultural Convention, House Chamber, State House, Des Moines, Iowa, December 14, 1927

The following outstanding features of the crop season of 1927 in Iowa

have been taken from the published reports and files of the Weather and Crop Bureau of the Iowa Department of Agriculture and the Bureau of Agricultural Economics and Weather Bureau of the U. S. Department of Agriculture.

Many persons refer to the season of 1927 as unusually abnormal, but really its abnormality consisted mainly in the absence of extremes. The preceding winter was mild with little snow and the mildness continued into April. May, June, July and August were cool, and established no new records for either high or low temperatures. The State average date of last killing frost was April 26, 7 days earlier than usual and 8 days earlier than in 1926. Four other summers, (June, July and August) since 1873 have been cooler and if we include September, 10 other seasons have been cooler.

Spring work was delayed by the frequent heavy rains of April falling on soil saturated to great depths by the unprecedentedly heavy rains of September, 1926. Corn acreage was reduced 2% and oats acreage 4% because considerable ground did not become dry enough to work till late in June. The haying, harvest and threshing periods were mostly dry and cool. The biggest hay crop in three years was put up in excellent condition and very little small grain was damaged in shock.

Except for belated planting on low and undrained soil, particularly in the southeast counties, the season was not unfavorable for corn. August was too cool but not nearly so cool as in 1915 and the season as a whole was much better than the seasons of 1915 and 1917 and 1924. A warm September made up for the deficiencies of August. Each successive monthly report, except September 1, showed a higher indicated yield of corn per acre and husking reports December 1, after allowances of various kinds were made, showed a yield of 36.5 bushels per acre, of better quality than in 1926. This yield estimate is conservative and probably on a basis of about No. 3 corn. Last year's December 1 estimate was 2.0 bushels too low as shown by the assessors' enumerations and the acreage was slightly too high. The revised total production of corn in 1926 according to assessors was 435,630,000 bushels while the December 1 estimate of the 1927 corn crop is 399,566,000 bushels or a round 400 million. This is 8.3 per cent less than last year, but valued at the December 1 price the total value of the crop is 13 per cent greater. The total value this year is \$275,701,000 or \$31,748,000 greater than last year. The higher price is due to a moderate crop east of the Mississippi River and to the better quality. There is not so much dockage for moisture as in 1925 and 1926. The average farm price per bushel December 1 is 69 cents.

The average moisture content of 60 field samples well distributed over the State, of an average date of about November 10, was 23.1%, ranging from 18.6% in the southwest district to 26.4% in the east central district. About 79% of the corn escaped frost damage which is slightly more than the average of the last five years. The State average date of first killing frost this fall is October 17, 12 days later than usual, so the average growing season between killing frosts was 174 days which is 19 days longer than usual.

The corn surplus area has shifted somewhat this year. For the first time, Nebraska ranks second as a corn state while Illinois drops to third place. Most of the region west of the longitude of Des Moines has an excellent corn crop, the best in several years in many counties. This is more than offset by the short crop to the eastward.

In spite of the 4% reduction in oats acreage, the total production, 196,977,000 bushels is 0.6% greater than the crop of 1926, due to the higher yield per acre of 33.0 bushels. The price December 1, 42 cents per bushel, is 20% higher than last year due to the corn situation. The total value of the crop, based on this price, is \$82,730,000 which is 21% greater than in 1926.

Time and space will not permit a detailed discussion of each of the other crops, but only field corn, sweet corn, pop corn, fruits and vegetables show a decrease in production compared with last year while 12 other crops show an increase. Because of better prices as of December 1 all of the principal crops show increased total values. The total value of all crops not considering livestock or livestock products, based on December 1 prices is placed at \$532,620,000. This is \$52,015,000 greater than the revised estimates of the 1926 crops which is an increase of 10.8%.

Unfortunately, this fine showing is largely wiped out by the disappointing price of hogs since about June 1. At this date it is impossible to give a close estimate of the livestock production and marketings of 1927. Undoubtedly there will be a larger decline in income from hogs than can be made up from other classes of livestock. It is therefore doubtful if the total agricultural transactions of the State in 1927 will be greater than in 1926.

Further details of crops are shown in the table on page 76.

#### Bulletin No. 1, April 12, 1927—

Since January 1 the weather has been mild with less than the usual amount of rain and snow till toward the close of March when rains or snows became frequent and heavy. The ground has been saturated to great depth since the unprecedented rains of last September.

Under these conditions winter wheat, rye, clovers and grasses wintered well generally. Livestock has come through in fair condition except that there was considerable "flu" among hogs. In the northwest counties and horses are a little thin in the northwest counties from lack of roughage due to last spring's drought. Sows that had the "flu" are producing small litters. Healthy sows have produced good litters and in some cases the litters are exceptionally large. A good many horses died in southwest and west central Iowa from "corn stalk disease" or "muddy corn."

The present wet, muddy spring is in striking contrast with the two preceding arid springs with their dust storms and grass failures, Iowa more often suffers from too much than too little moisture in the spring. This has made an elaborate machinery equipment necessary by which the entire spring seeding can be accomplished in a few favorable days in the midst of an otherwise wet and backward season. The drainage is also a great help in such a backward season. With these aids farm work will no doubt soon catch up.

Oats seeding is now about 10 days late, ranging from less than half done in the extreme south to not begun in some extreme northern counties. The seed is poor in a good many counties. Where available, oats of the 1925 crop are better seed and are being used in some cases. Some oats have been "mudded in," some have been broadcast and are sprouting without

being covered; some have been reseeded; while some in the extreme south are up.

Large increases in acreage seeded to sweet clover and alfalfa, mostly with oats, are reported. The need for these increases is emphasized by the hay shortage. For several years the corn acreage in Iowa has been running about 1,000,000 acres greater than 10 years previous, but there is a prevalent feeling that corn production has been overdone and there is now a tendency to reduction. There is, however, considerably less corn back on Iowa farms than a year ago. Soy bean acreage is steadily increasing and will help to provide protein concentrates for livestock for which Iowa spends millions abroad every year. Seed corn tests are generally reported very good, averaging about 92 per cent strong.

Large increases in little chicks are reported throughout the State. These with the pigs and lambs are doing well in spite of the wet, cloudy weather. The mild temperature is favorable.

Fruit buds have not yet advanced to the danger point, though a few warm sunny days would bring them forward rapidly.

#### Bulletin No. 2, April 19, 1927—

Daily rains the past week (except Easter Sunday), made a larger total, 1.9 inches for the State, than the entire month of April, 1926, and nearly three times the normal. In the northwest district which has been very dry for three seasons, the rainfall of the past week averaged nearly three inches and is more than for the first four months of 1926. Sunshine was correspondingly deficient. Cool weather at the beginning of the week was followed by abnormally warm, making the average temperature 55 degrees or 6 degrees above normal.

From the temperature standpoint the season is somewhat in advance of the normal as indicated by perennial plants, trees, and shrubs. Prof. J. H. Paaman, of the Davenport Academy of Science, states that the average of 11 plants is 14 days ahead of last year and 5 days ahead of normal. But because of the excessive rainfall, field work and spring seeding is about two weeks late.

Farm work was practically at a standstill. Only a little work on uplands was possible. Water stood in the fields on the lowlands. Many streams, particularly the upper Des Moines and Little Sioux Rivers, are bank full or overflowing. Many farmers in desperation have tried to do their spring seeding, but the mud sticks to the machinery and rolls up on the disks so corn cultivators have been used more than customary.

Many oats have been broadcast and are germinating without being covered. Oats that were seeded in March and put in well, before the wet weather started, are showing green. In a few favored localities in Henry, Hardin, Hamilton and Greene counties 75 to 85 per cent of the oats is seeded but in many counties scarcely a beginning has been made. Considerable reseeded is being done because of poor seed and poor seeding conditions.

Pastures are going forward rapidly with the warmth and moisture, and are being used in several counties, particularly where hay is short, to the detriment. It is said in some localities, of both pastures and livestock. The wet, cloudy weather was unfavorable for chicks and pigs.

Winter wheat, grasses, clovers and alfalfa are making excellent progress.

Fruit buds are on the point of opening in the south half of the State. Frequent rains have made spraying impracticable.

#### Bulletin No. 3, April 26, 1927—

Abnormally low temperatures were the feature of the week. The mean for the State 42.3 degrees, is 9.7 degrees below normal. Minimum in the 20's were reported throughout the State except the extreme southeast corner on the mornings of the 21st, 22d, 23d and 24th. Temperatures as low as 20 were common in the northern half of the State. The lowest reported was 15 degrees at Inwood, Lyon county in the extreme northwest corner, on the 21st.

Damage was generally confined to blossoms of a few early plums, cherries, peaches, pears, currants and to early garden truck such as radishes, asparagus, rhubarb, etc. Apple blossoms generally were dormant and the buds are believed to be uninjured.

Precipitation was less frequent and good drying winds and considerable sunshine toward the close of the week dried the soil so that the first satisfactory field work of the season was accomplished. A snow and glaze storm covered much of the State on the 20th-21st. In the vicinity of Dubuque the weight of ice and the strong wind broke down telephone poles and wires.

Oats seeding is about 47 per cent finished for the State as a whole. The most advanced region having 90 per cent or more seeded, extends from east Pottawattamie county to north Madison county and thence northeastward to Webster and Hamilton counties and also in Jones county. Areas having less than 10 per cent done, extend from Wayne to Davis and north to Keokuk counties, and from northwest Monona northeast to Dickinson, Emmet, north Kossuth and Winnebago counties. Lowlands intended for oats are still saturated and must of necessity be planted to corn. In well drained soils farmers are more nearly able to exercise their choice of crops. Oats seeding and preparations for corn planting are now two to three weeks late over about half the State.

Pastures and meadows are doing well. Some damage to alfalfa and to very young clover by the recent severe freezes, is reported. The snow of the 20th-21st afforded some protection.

#### Bulletin No. 4, May 3, 1927—

Showers were light and infrequent during the last week, except some heavy rains on the 28th-29th in the south central counties. Sunshine was above normal for the only weekly period this season. Temperatures averaged above normal except April 30, when frosts occurred in some northern counties. Considerable wind aided in drying the soil.

Swift progress was made in oats seeding in most of the State. This work has been mostly completed, except in some wet, backward southeast and south central counties and in the extreme north. Considerable reseeded has been done because of the poor "bin burned" seed and the poor job of disking due to bad soil conditions. There are further reports that intended oats acreage will be diverted to corn, but this will probably not increase the corn acreage much above last year, for farmers generally intended to reduce corn acreage.

By using two disks or gang plows and eight or ten horses per man, farmers have energetically endeavored to catch up with their field work in the few days of favorable weather and soil conditions that are available, not knowing how soon the weather may again become persistently rainy. In Montgomery county a tractor was equipped with lights and kept running day and night. In many fields the soil is turning up in great masses, almost like mud, and too wet to harrow, which will bake into unpulverizable clods if future weather is dry.

At this time the last two seasons all corn ground had been prepared in fine tilth and corn planting was only awaiting a safe date. Not over one-third of the ground is now ready for the planter, though a little planting was done in Harrison county on April 25 and in Wright county on the 29th; also, in Hamilton, Franklin and Madison counties.

Winter wheat is looking well generally and the best is stooling freely. In some places the excessive moisture has given it a yellowish color.

Fruit burst into full bloom during the week over the southern half of the State and northward along the Missouri and Mississippi River as far as Sioux City and Dubuque. The abundance of bloom and the warm sunshine favorable for pollination give promise of an abundant crop. This is fortunate, for the fruit regions of the Ozark Mountains and of eastern Washington were hard hit by the freezes of the preceding week.

Potato planting is well under way in Mitchell, Pottawattamie and some other counties. There is some tendency to increase the acreage planted

to varieties than can be harvested in August to meet the shortage that will probably result from the flooding of the areas of the South that usually furnish a midseason supply of potatoes to this region.

**Bulletin No. 5, May 10, 1927—**

With temperature and sunshine about normal, strong drying winds and little rain till the close of the week, farm work and crops made excellent progress. Heavy rains set in Saturday the 7th, particularly in the northern districts and this will delay field work for a few days. The heaviest rain reported in 24 hours was 3.70 inches at Dubuque, but many reports were mailed before the heavy rain occurred. In most of the State the rain which averaged nearly twice the normal was more beneficial than harmful. This applies especially to the northwest one-fourth of the State where in many counties the surface soil became dry enough so that dust storms were caused by the strong winds on the 2d, 3d and 7th. The rain was also beneficial in softening the great clods that resulted from plowing too wet when about two weeks ago it looked as though the rains would never cease.

All oats seeding ceased with less than the intended acreage. Early oats fields are green and looking fine, later fields show spots and streaks with poor stands and the latest are being aided in germination by the recent rains.

Preparations for corn planting made excellent progress in most of the State and planters were busy. The rains and decided change to colder at the close of the week will retard this work.

Winter wheat, grasses and clovers are making good growth, except that pastures in the northwest counties are being grazed too close because of the hay shortage. Spring wheat is doing well on the small acreage seeded.

Early potatoes are up. Most of the potato planting has been done. Onions and up and doing well in Mitchell county, due to favorable soil and weather conditions. Gardens are doing well.

Fruits in southern Iowa show evidence of good pollination, and little frost damage, except in Mahaska county. In the central counties fruit trees are in full bloom and in the extreme north buds are about to open. The outlook for strawberries is generally good.

**Bulletin No. 6, May 17, 1927—**

Temperatures of the past week were below normal throughout the State with frost in many localities on the morning of the 12th, but little damage. Boone reported a temperature of 30° and Ft. Dodge 32°. Sunshine was much below normal in the eastern and considerable above normal in the western portions of the State.

Light local showers and thunderstorms occurred over much of the State with occasional wind squalls and hailstorms but not much damage. High west to northwest winds were unusually prevalent. These dried the surface soil rapidly, caused dust storms in northwest Iowa and made the fields cloddy in the south central part of the State where the soil was worked when water logged. In some places the wind was so strong as to interfere with field work. The full effect of the damage from erosion by the torrential rains of the 9th are shown in the report from Jasper, Tama and Dubuque counties, where much oats acreage was washed out and is now being plowed up for soy beans or corn. This is causing a shortage of seed corn in limited localities.

The heavy rains of last week in the Dakotas caused the highest water in the Missouri River in about 20 years. Considerable farm land in Iowa adjacent to the river was overflowed this week. Between 50,000 and 100,000 acres are involved.

Corn planting is unusually variable in state of progress. In an area from Mills and southern Harrison counties northeast to Floyd county, half or more of the planting is done, with 90 per cent, the highest, in Greens county. Plymouth and Cherokee counties also are more than half done.

In most of the south central, southeast, east central and northeast districts scarcely a beginning has been made and several counties report none. The same is true from Osceola to Winnebago and adjoining counties. The average for the State is 29 per cent, while the average for the last eight years on May 15 is 52 per cent. Much plowing for corn remains to be done. Early planted cornfields are up.

Oats show a poor stand on at least half of the acreage and in some localities are yellow from excess moisture. Winter wheat looks well generally but is also yellow from excess moisture in some south central counties.

Tree fruits are in full bloom in the northern districts, while in the central and southern districts a good crop is setting on. Though some damage to strawberries by frost is reported the outlook for the crop is generally good.

**Bulletin No. 7, May 24, 1927—**

Frequent, heavy rains in all but the southwest counties and deficient sunshine further delayed corn planting and plowing for corn. Temperatures were below normal in the eastern and above normal in the western portions of the state. The rainfall averaged about twice the normal. Local hail and wind storms caused considerable damage in several counties.

Only 53 per cent of the corn planting has been done. In some south central, north central and most of the eastern counties, comprising one-third of the state, only from 10 to 40 per cent of the planting is done, with much low land not plowed. Some localities actually show less corn planted now than a week ago, due to flooding and erosion. The most advanced region is Mills, Montgomery and Pottawattamie counties where the rainfall has been light and where about 95 per cent of the planting has been done. In many counties early corn shows rows and cultivation has begun in occasional fields. There is considerable demand for quick maturing varieties of seed corn for replanting flooded areas. Unless conditions improve rapidly there will be some idle land.

Oats are improving rapidly and will probably overcome the poor stand except where hopelessly flooded out. Winter and spring wheat have made excellent progress except where too wet.

Grasses, clovers, gardens, fruits, commercial onions and all perennial vegetation made excellent growth. The milk flow shows a marked increase. Strawberries are about to ripen in Van Buren county.

**Bulletin No. 8, May 31, 1927—**

Cool weather prevailed the last week in May with frequent, heavy rains and deficient sunshine over most of the northern and eastern districts of the State where only one or two days of field work were possible.

About three-fourths of the corn planting has been done for the State as a whole, which is the least at this date for many years, probably since 1902. While this work has been practically completed in several southwest and west central counties, some counties in the eastern half of the state have scarcely held their own, the progress made in planting, being nearly offset by damage from flooding, cutworms, erosion, squirrels and rotting of seed, necessitating much replanting. Early planted corn is up to a good stand and considerable has been cultivated. The weeds are getting an unusually good start. Considerable low land is still too wet to plow and will have to be planted to catch crops if used at all. In their desperate efforts to meet the emergency, farmers generally worked long hours on Sunday and Memorial Day where the soil was dry enough to work, and in Iowa county tractors have been equipped with magnetos lights and are running nights as well as days whenever the soil conditions permit.

Oats, winter wheat, spring wheat, rye and barley have made good growth where not drowned out. Rye is headed out and looking fine. Grasses and clovers are luxuriant.

Potatoes, fruits and gardens have made excellent progress. Commercial

tomato plant setting was active this week in Mahaska county and other commercial tomato growing districts. Strawberries are beginning to ripen in the southern counties and there is promise of an abundant crop everywhere.

**Bulletin No. 9, June 7, 1927—**

Corn planting is the latest in 24 years and the condition per cent is the lowest in 35 years as shown by about 1,000 reports, June 1, received by the combined crop reporting service consisting of the Weather Bureau, and Bureau of Agricultural Economics of the U. S. Department of Agriculture and the Iowa Department of Agriculture. Only 78 per cent of the crop had been planted on June 1 as compared with the lowest, about 55 per cent, in 1892; 67 per cent in 1903; and 80 per cent in 1908. Not since 1915 has planting fallen below 90 per cent on June 1. The percentage condition June 1 was 73 and it has never been lower on June 1, except 1892, when it was 70. As recently as 1924 it was 77. Some of the other low years were 1903, 75; 1910 and 1897, 79; 1913, 80; 1906, 84; and 1923, 86.

The lateness of corn is not due to abnormally low temperature in May for the State mean temperatures were lower in 4 of the last 10 years; nor to abnormally heavy May rains for the average for the State is only about 0.1 inch above normal, but to a combination of a number of factors, chief of which is the saturation of the soil to great depths ever since the unprecedented rains of last September, and the wet April. No reservoir was left in the soil for the rains of May which is normally the wettest month of the year for the State as a whole. This is the first May since 1913 that the rainfall has been up to normal. In the northeast portion of the State the rains were excessive, but in the southwest counties rainfall was deficient and more was actually needed. In most of the State sunshine was deficient and in the eastern portion it was decidedly deficient, which kept the surface soil from drying enough for field work. Rainy days were frequent so that there were relatively few days fit for field work.

The past week was too cool and cloudy for corn to make good progress and there were frequent though mostly light showers. In some southeast counties and in Buena Vista and adjoining counties rains were heavy and seriously interfered with field work. In some southwest counties there has been a deficiency in rainfall that is now becoming serious. Some progress was made in planting and replanting corn, but a considerable lowland acreage, possibly 10 per cent, remains too wet to plow. A little of this may yet be planted to short maturing varieties of corn or fodder corn, but most of it will go into soybeans, sudan grass or other catch crops. In several southeast counties less than half of the corn has been planted. Some of the intended oats acreage that could not be seeded because of the rainy weather in April has been put into corn but corn acreage may be reduced about 5 per cent below last year. Cutworms have been unusually destructive the past week.

Other crops are generally doing well except small grains are slightly yellow on low, undrained land.

**Bulletin No. 10, June 14, 1927—**

Considerable sunshine with afternoon temperatures well up in the 80's in most of the State from the 7th to the 10th, inclusive, greatly improved the crop situation. However, on the afternoon and night of the 5th, there were some excessive local downpours of rain with small areas of damaging hail in portions of Boone, Marshall, Hardin, Grundy, Wright and Franklin counties. Small streams overflowed their valleys and washed or drowned out considerable acreages of crops. In most of the State, rains were moderate and beneficial and more rain is needed in the southwest one-fourth of the State. In eastern Iowa the sudden burst of sunshine after weeks of wet, gloomy weather, baked the water-logged soil so that it plowed up cloddy and in some cases germinating corn could not force its

way through the crust that formed. The latter part of the week was too cool for the best growth of corn and other warm weather crops.

Planting and replanting of corn is still in progress in many places in the State and very rapid progress in planting was made in eastern Iowa. Heavy rains Saturday, 10th, in the extreme south central and southeast counties stopped planting. Considerable acreage will be diverted to soybeans, cane and other catch crops. Buckwheat acreage will be increased, particularly in northeast Iowa. The earliest corn has been cultivated twice and perhaps half of the acreage has been cultivated once. In some localities the fields are noticeably weedy. Cutworms have been very destructive, particularly on new sod. The sunshine of the week gave corn a better color.

Winter wheat, oats and barley made good progress except where devastated by floods and local storms. The color improved. Winter wheat is beginning to head in the southern counties.

Alfalfa is being cut in several counties. Red clover is luxuriant and beginning to bloom in localities. Other hay crops are very promising.

Fruits are mostly in good condition, though cherries will not be as plentiful as was expected. Strawberries are on the market plentifully in the southern half of the State and many carloads of commercial strawberries have been shipped out of Lee and Van Buren counties. Bee pasture looks good but it is not known yet whether or not the flow of nectar will be satisfactory. In a good many counties there has been too much moisture and too few sunny days for a good honey crop.

**Bulletin No. 11, June 21, 1927—**

Rain was light and infrequent over most of the State the past week, except some excessive local downpours and hail in the southern part of Greene county and adjoining townships, in portions of Madison and Johnson counties and in a few other limited areas. Temperatures were below normal till toward the close of the week and sunshine was generally deficient. More rain is needed in nearly all portions of the State.

Corn cultivation was pushed rapidly and fields are now generally clean. Planting was rushed in the backward southeastern counties where in some localities, particularly in Lee county, only about half of the planting has been done. In some localities planting has ceased with about 75 per cent of the usual acreage planted. A large amount of replanting has been or is being done on account of cutworms, poor soil conditions or other adversities. In some localities half the acreage has been replanted. Though too cool for best growth, corn, nevertheless, made progress and improved in color. The earliest is nearly knee high in several counties.

Let not the heart of the corn belt be troubled. Iowa is the heart of the corn belt and it has never failed to raise a corn crop. There is no evidence to prove that Iowa ever had a "year without a summer." Exact records for more than half a century show that when the region east of the Alleghenys has an abnormally cool season, Iowa has usually been warm. There were no temperature records in the middle west in the year 1816 when the region east of the Alleghenys is said to have been summerless. The nearest approach to a corn failure in Iowa was in 1894 as a result of heat and drought and not of cold.

A high condition of corn July 1 in Iowa is frequently followed by a yield below normal, for the reason that the high condition usually results from a warm June which is followed 83 per cent of the time by a dry July. A drought in July nearly always reduces the corn yield.

Farmers and business men should not get "panicky." A calamitous forecast of drought, flood, hail, tornadoes and general destruction can be verified somewhere within the boundaries of Iowa most any year. So far the calamities of this kind in 1927 do not approach those up to this date in the year 1918 and there are good reasons for believing that the corn crop of 1927 will be better in quality and quantity than that of 1924. Every effort should be made to conserve the live stock of the State. No one should be tempted by the temporary and unjustifiably high price of corn

to sacrifice his live stock future. The present high price of corn is no more justified than the absurdly low price that prevailed up till a few weeks ago.

Wheat, oats, barley and other cool weather crops made good progress but would be benefited by rain. Heavy rain in Madison, Greene and Johnson counties lodged the small grain.

First cutting of alfalfa has been cured under fairly favorable conditions, though more sunshine would have helped.

#### Bulletin No. 12, June 28, 1927—

Temperatures averaged two degrees below normal the past week with an excess of sunshine and deficient rainfall except in some localities mainly in the eastern portion of the State where heavy local rains are reported. Rain is badly needed in many southwest counties and would be beneficial over most of the State. Afternoon temperatures of 90 or higher occurred at several stations in the western part of the State from Friday to Monday. An unusual feature for this time of the year was the high southerly wind on Friday the 24th, due to an active barometric disturbance, the center of which moved eastward through northern Minnesota. This caused damaging sand and dust storms over much of the State, particularly the north central portion, where the wind was strong enough in some cases to damage fruit and other trees and electric transmission lines.

Corn made the best progress of the season, but still averages 10 days later than normal. It ranges from just planted to two feet high. Rarely has there been such diversity of opinion as to the condition of corn. One living in a section where corn is still being planted can not believe that there are places in the State where corn is actually being laid by. No one person could travel extensively enough to have a complete and comprehensive view of the changes and general condition of the crop in a week. Reliance must be placed in the reports of our experienced reporters who are mostly farmers.

Reports from a special list of 200 farmers well distributed over the State just summarized show the average date of planting corn this year is May 21, which is eight days later than the average of the preceding six years and five days later than 1923, which was the latest of the six. Because the corn crop conditions of 1924 were serious and recent they make a convenient "zero point" from which comparisons can be made. In that year, which was the worst corn year since 1901 in point of yield per acre and the worst of record in point of quality, the average date of planting was May 14; the percentage condition on June 1 was 77 and on July 1, 72. Frequent, heavy rains toward the close of June in 1924 interrupted cultivation and cornfields were very weedy. The average temperature of June this year will probably not be lower than that of June, 1926. This year the fields are generally clean of weeds except in the very backward southeast counties. All in all, the condition of the crop is believed to be better than in 1924.

The sandstorm of the 24th cut the corn leaves badly in fields not recently cultivated in many northern counties. In some cases the entire plant turned black. The heat, drouth and wind on that day in the southwest counties caused the leaves to curl considerably. Though June has been dry and therefore unfavorable for germination and growth of late planted corn, the earlier corn has developed a root system that can easily reach a moisture supply which is abundant at a depth of 18 inches most everywhere in the State.

Oats leaves were injured at the tips by the high wind and sand, yet the general condition of the crop is good. Early oats are headed generally to the north line of the State and late oats as far north as the center of the State.

Winter wheat is all headed and beginning to turn color slightly in some localities as far north as Des Moines but is a little later than normal. Spring wheat is also in good condition. The cool June, with ample mois-

ture in reach of the roots, has helped spring seeded grains to overcome much of the handicap with which they started at seeding time.

The first good hay crop in three years is about to be harvested. The abundant sunshine and strong wind with little rain during the past week were very favorable for cutting and curing alfalfa and sweet clover. Some red clover was also cut.

New home-grown potatoes are on the market in several places in the State and a good crop of tubers is reported as having set on generally. The cool June has been favorable.

#### Bulletin No. 13, July 5, 1927—

Afternoon temperatures high in the 90's prevailed over most of the State till near the close of the week when the weather turned cooler. The highest temperature reported was 101° at Inwood in the extreme northwest county of the State on June 28. The average temperature of the week for the State was 1.3 degrees above normal. Good rains occurred in the extreme western counties on June 29-July 1; elsewhere, showers were light and scattered and huge cracks are opening in the ground for lack of moisture. The drouth is becoming serious in many sections.

Corn made good growth over most of the State, though needing rain badly in many counties. It now averages one foot high with some "knee high" in practically every county except the southeast counties. In large areas half of it is "knee high" and the tallest in a few fields is "shoulder high." For the State as a whole the condition of corn is noticeably better than at this date in 1924. A good rain would be especially valuable to late corn which has not developed sufficient roots to reach the abundant subsoil moisture.

Winter wheat, spring wheat, oats and barley were injured by the intense heat and drouth of the past week. In much of the State these crops are in the critical heading and filling stage when hot, dry weather is detrimental. Winter wheat harvest has begun in Harrison county and will be general in the Missouri River counties in the next few days. Rumors are current of outbreaks of "black stem rust" on winter wheat in the east part of Polk county and a few other localities, but as yet it has not been possible to scientifically identify the disease. Red rust is abundant on all small grain but usually the damage from this disease is not serious.

Considerable hay was cut and cured under ideal conditions of heat, sunshine and wind. Yields are generally very good.

Potatoes, gardens and fruit were considerably damaged by the heat and drouth. Raspberries and blackberries are drying up, currants shriveled somewhat and the strawberry crop in northern Iowa has been considerably shortened.

#### Bulletin No. 14, July 12, 1927—

Hot, dry weather with much sunshine prevailed the past week. Temperatures high in the 90's were general in the afternoon, and the nights were mostly warm. Showers fell in a few localities but in most of the State the upper 18 inches of the soil is very dry. In some of the eastern counties there were severe local hail and windstorms. Tornadoes were reported in Clinton county on July 6 and in Henry county on July 7.

Corn that is deeply rooted, amounting to about one-third of the crop, made excellent progress during the last two hot weeks in spite of the drouth and now averages waist high to shoulder high and has been laid by clean, in good condition, and practically up to normal. About one-third averages knee high, is making fair progress, is clean, and with a good rain would come up rapidly to normal. The remaining third, mostly in the eastern and southern counties, is making slow progress and ranges from three inches to a foot high, with a good many fields weedy and cloddy, and there seems to be little chance of it making more than fodder. The common corn borer (not the European), is causing considerable damage in limited areas.

Reports from more than 1,000 reporters of the combined federal and State crop reporting services, July 1, show the condition of corn then as 72 per cent, indicating a yield of 32 bushels per acre on an acreage two per cent smaller than in 1926, or a total crop of 356,528,000 bushels, compared with a yield in 1924 of 28.0 bushels per acre and a total production of 304,827,876 bushels as reported by assessors. The 1926 crop reported by assessors was 39 bushels per acre and 435,346,691 total bushels. The average total corn crop of the State reported by assessors for the last five years is 427,934,000 bushels, so the outlook on July 1 for total bushels of corn was about 18 per cent below the average production of the last five years and 15 per cent more than in 1924. However, since July 1 there has been a noticeable improvement.

Winter wheat and oats harvest made rapid progress in many southern and western counties under ideal weather conditions. Oats threshing has begun in Pottawattamie county with satisfactory yield and quality. Combines will be used to harvest wheat in Monona county this year. As a rule Iowa weather at harvest time is too precarious to make these machines practicable. Over much of the State, oats have been prematurely ripened by the heat and drouth. Otherwise an excellent crop would have been harvested and even as it is the crop will be fully up to the average. Red rust is unusually prevalent in some southeast counties and there are occasional reports of black stem rust.

Barley is ripening and an increased acreage is reported in places where it was substituted for oats because seed oats were poor. Rye harvest is generally done with good yields. Spring wheat is ripening too rapidly.

With ideal weather for haying, much hay of excellent quality was put up. Due to the scarcity of old hay, considerable oats acreage has been cut for hay. Alfalfa has yielded unusually well and it is selling at a good price.

Sweet clover is affording excellent bee pasture. The dry weather is injuring all fruits. Apples are showing a heavy drop. Gardens are falling. Pastures are becoming brown and bare.

#### Bulletin No. 15, July 19, 1927—

Generous rains fell in about one-third of the area of the State on July 16, exceeding one inch in about 16 southwest and 8 northeast counties. The heaviest reported was at Clarinda, 2.37 inches. The only section not receiving rain was along the Mississippi from Clinton to Des Moines and portions of adjoining counties. Temperatures were about normal and sunshine slightly below normal. Since July 1 the average rainfall for the State is 0.93 inch, which is 33 per cent of normal, but this is more than fell in the entire month of July in the memorable drouth years of 1886 and 1894. More rain is seriously needed in about half the area of the State.

Where moisture has been sufficient corn has made excellent progress. Considerable of the crop shows tassels on nearly the normal date, in the western third of the State, and the earlier fields are beginning to show tassels in the central portion. In the backward southeast counties, the drouth is causing further delay. In dry spots in the central portion, the drouth and heat rolled the leaves considerably. In general the crop shows an excellent dark green color in spite of the many adversities. More than half of the crop has been laid by clean of weeds. As compared with 1924, the advance of the crop and cultivation is fully a week earlier, and the stand averages much better. In 1924 cultivation continued general into the first week in August and fields were mostly weedy with a poor stand due to frequent heavy rains and low temperature.

Winter wheat harvest is nearly finished with very little delay from the rains of the 16th. Threshing is getting under way and early reports show good yield and quality. Early oats are all cut in the southern half of the State and ripening in the north. Reports on oats are variable. In some localities rust has damaged this crop, and the heat and drouth have caused premature ripening.

Spring wheat harvest is under way and the yield and quality appear to be good.

Pastures were much revived in the counties having an inch or more of rain, but in most of the State they are dry enough to burn. Haying has progressed rapidly under ideal conditions for curing and a good crop has been secured. Second cutting of alfalfa is under way but the yield is light due to drouth. New seedings in small grain stubble are suffering seriously for rain.

Early potato vines are mostly dead but the crop of tubers that is being dug is mostly good. Late potatoes have been greatly injured by drouth but might still produce a crop if rain comes soon. Gardens are generally a failure and raspberries and blackberries are drying on the canes.

The honey flow is good in the western counties where the rain has been more plentiful but elsewhere bee pasture has been poor.

#### Bulletin No. 16, July 26, 1927—

Good rains July 21st and 24th covered most of the State though too light to do much good in some northern, extreme western and extreme southern counties. The State average was 0.7 inch, which is 36 per cent of the normal. This brings the State average for July 1st-26th up to 1.65 inches, or about half of the normal. Temperatures of the week averaged 4 degrees below normal, bringing the average for the month down nearly to normal. Sunshine was nearly normal. Hailstorms were numerous and damaging in local areas.

About two-thirds of the corn made good to excellent progress. The very late and poorly established corn, mostly in the eastern and southern counties, is struggling along against great odds and much of it can make only fodder under the most favorable conditions. In western Iowa most of the corn is tasseled though some is shorter than usual at tasseling time, and the earliest fields are beginning to shoot ears at nearly the normal date. The rains of the week have greatly benefited all corn.

Harvest is completed in the south and nearly completed in the central counties, except near the Mississippi River, but is just getting well under way in the northern counties. The weather has been excellent for this work. Winter wheat and oats threshing is well along in the southern and western counties. The yield and quality of winter wheat is mostly good, but reports on oats are variable. More than the usual amount of twine was required to bind the oats, indicating a large crop of straw, but the yield and quality are only fair, probably due to the heat of late June and early July.

First cutting of hay is mostly done except in the northern and eastern counties. Second cutting of clover and third cutting of alfalfa are under way but the yields are mostly light, due to drouth.

Pastures were revived somewhat by the rains but are generally poor in most of the State.

The main potato crop has been seriously injured by the heat and drouth. Late gardening is encouraged by the recent rains. Commercial tomatoes have made fair progress. Pickling will begin in southeast Iowa in about a week. Apples are dropping badly and the crop will be short. Melons promise a fair crop.

#### Bulletin No. 17, August 2, 1927—

Rainfall of the week for the State averaged about half the normal. Good rains, exceeding an inch in many places, occurred in about five extreme southwest counties and from Guthrie county southeast to Wapello, thence northeast to Jones county. About the only area receiving no rain extends from the northern portion of Hamilton county northward over portions of Humboldt, Wright, Kossuth, Hancock, Winnebago, Cerro Gordo and Worth counties and in this area the drouth is becoming serious. Numerous hailstorms occurred in various portions of the State, mostly in the western counties, but as usual the damage will amount to a very small fraction of one per cent of the total crops of the State.



The rainfall of July averaged about half the normal, but there was a large area from Dickinson county to Winnebago and south to Calhoun, Webster and Hamilton counties where the rainfall was only about 30 per cent of the normal; and in several south central and southeast counties it was only about 30 per cent. July temperatures averaged very near the normal and sunshine was above normal. In eight other years out of the 37 of record, similar conditions were followed by an average yield of corn of 33.8 bushels per acre, but in none of these years did corn get off to such a poor start in the spring as this year. Undoubtedly corn has made up considerable of its lateness, for a good many fields in western and central Iowa are reported as "75 per cent silked" on about the normal dates.

Corn made good progress the past week except where too excessively dry. The moderate temperature and very light wind helped corn to stand the drought. With the bulk of the crop now entering the critical tasseling and silking stage, the rainfall of the next two weeks will largely determine the yield. Much corn in the extreme east and southeast counties seems hopeless.

Oats and barley harvest are nearing completion in the northern counties, and threshing is progressing rapidly in many southern and central counties. Oats yields are so far rather disappointing; barley is turning out better; and winter wheat is good in yield and quality. Much red and black rust is reported on oats particularly in the north central and northwest counties.

Pastures have failed to the extent that winter feeding of livestock has become necessary in large areas. The milk flow has been appreciably reduced.

#### Bulletin No. 18, August 9, 1927—

Good rains, measuring from one-half inch to two inches, fell in about one-fourth of the State during the past week. Only about six extreme northeast counties and from Keokuk county southeast to Henry county were practically rainless. In most of the area from Webster county south to Union county and adjacent territory and in portions of Emmet and Kossuth counties and from the east portion of Marshall eastward over most of Linn county and in portions of Scott and Lee counties the rain exceeded an inch and was very beneficial. Severe drought continues in many south central and southeast counties and in some central, north central and northeast counties. As usual, the rains were accompanied by local hailstorms and wind squalls, but the benefits far outweighed the damage.

Four warm days gave corn a great boost where moisture was sufficient, but the week began and ended cool, so the average temperature was 4.1 degrees below normal. Sunshine was also deficient. One-third of the corn is almost completely silked on nearly the normal date with occasional ears in the blister stage, another third is nearly all tasseled with occasional silks showing; while the remaining third, scattered over much of the State but mainly in the southeast and some south central counties, was planted late and has not caught up. Much of this can only make fodder and any ears that form are sure to be frosted. Recent heat and drought caused some firing on the uplands. However, in every way, stand, advancement, color and future prospects, the Iowa corn crop as a whole is in noticeably better condition than at this date in 1924.

Only a little harvesting of oats, spring wheat and barley remains to be done in extreme northern Iowa. Threshing has made rapid progress throughout the State under ideal weather conditions. Black stem rust and red rust have made oats light in many localities so the crop will not be up to average. Barley reports are mostly good. There has been less damage to grain in shock than usual. Because of the scarcity of feed an unusual amount of oats straw has been baled.

Pastures have revived greatly where rains have been normal or above. The lower temperatures and more humid air also aided pastures. Dew

have been heavy and fog has been prevalent in the mornings. In the drier portions of the State the milk flow has been reduced by half.

#### Bulletin No. 19, August 16, 1927—

Good and timely rains covered most of the State during the past week, though some sections, particularly the northern tier of counties, had practically none. Most of the Missouri River counties, the Raccoon River drainage basin and from Marion and Poweshiek counties eastward were well soaked. Temperatures averaged 1.3 degrees below normal and sunshine 6 per cent below normal.

Corn made good progress generally but ranges from all silked and half in roasting ear stage on nearly the normal date in some of the western counties to about one-fifth silked, much that can not make ears, and about four weeks late in some eastern and southeastern counties. Light frost on low spots occurred in several localities in northern Iowa on the morning of August 9. Not to exceed 500 acres of corn were damaged, out of the 16,554,000 acres planted in the State. Such a frost is not unprecedented. Reports of correspondents of the combined Federal and State crop reporting service August 1 indicated a total crop of about 369 million bushels, which is 16 per cent less than the average of the last five years and 18 per cent more than the crop of 1924. The Iowa crop is better than in the other leading corn states, which places the State in a favorable economic situation.

Threshing made excellent progress under favorable weather conditions in most of the State. Even where the rains were heavy they were of short duration and caused little delay to threshing. In many southern counties the work is nearly completed and it is about three-fourths done in many northern counties.

Pastures are reviving rapidly. Third cutting of alfalfa is under way.

Commercial tomatoes are nearly ready for the canneries which are about to start. Sweet corn roasting ears are on the market in abundance. Commercial canning plants will begin on corn in about a week in the western counties and toward the close of the month in the eastern counties.

#### Bulletin No. 20, August 23, 1927—

Rainfall of the week was about normal and well distributed. Since August 1 the State has been well covered with rain at a time when the rain was of the greatest benefit to corn. Only a few local areas are now too dry.

A well defined occurrence of the aurora borealis or northern light was observed over most of the State on the night of the 20th-21st.

Pollination of corn has taken place under ideal conditions in most of the State. However, in a good many eastern and southern counties only about half of the acreage is silked and probably 25 per cent in these counties will not reach the silking stage. The earliest corn, constituting about one-fourth of the crop, mostly in the western counties, is in the advanced roasting ear stage. Recent cool weather has further delayed the crop so that it now averages about two weeks late, but two weeks of warm weather would still do wonders. The temperature of the past week averaged 5.7 degrees below normal, and sunshine was 17 per cent below normal.

Oats and barley threshing made good progress in the northern portion of the State, except in a few localities where delayed by rain. Threshing is practically finished in the central and southern counties.

The rains have put the soil in good condition for fall plowing in most of the State and considerable plowing has been done. If soil and weather conditions continue favorable an increased acreage will be seeded to winter wheat.

Onion harvest is in progress in Mitchell county and early potato digging is about to begin. Recent weather has been favorable for commercial tomatoes and canning is getting under way. Sweet corn harvest for canning is also beginning.

Pastures have revived greatly as a result of the recent cool, showery weather, gardens look better, and all nature shows improvement. There is a fair prospect for a seed crop from second growth clover. Threshing returns from timothy show very good yields in the southern counties but rather poor yields in the Iowa-Poweshiek timothy seed section. Buckwheat has been in full bloom for about 10 days. Most of the acreage in northeast Iowa as usual but this season it was used as a catch crop in a good many other sections where corn failed.

#### Bulletin No. 21, August 30, 1927—

Temperatures were rather low at the beginning of the week, but rose to somewhat above normal toward the close. The average temperature of the week, 66.3 degrees, is 2.3 degrees below normal and one degree higher than last week. There were scattered reports of light frost on low peaty ground in the north central portion of the State on the morning of August 24, but no damage other than delay to the corn crop. Rainfall was mostly light to moderate and confined largely to the counties along the Mississippi and Missouri rivers. Moisture is adequate for corn in most of the State but is needed for some other crops. Sunshine was slightly above normal.

Corn made better progress than the temperature would seem to indicate. For the State as a whole nearly half of the corn has reached or passed the roasting ear stage and the earliest is beginning to dent. The latest and poorest, mostly in the eastern and southern portions of the State, constituting nearly one-fourth of the crop, will probably never make ears. The crop is fully two weeks late, but not so late on this date as in 1924, and much farther advanced than in 1915.

On this date in 1915 a killing frost seriously damaged 10 per cent of the corn in the north central and northeast counties, and the temperature of the preceding week averaged 12 degrees below normal. The earliest general killing frost in Iowa in the last half century was on September 3-5, 1883.

More rain is needed for pastures, potatoes, tomatoes and truck crops generally. Many sections are too dry for fall plowing and preparations for winter wheat seeding. Considerable alfalfa has been seeded recently and this needs rain for germination.

Hog cholera is breaking out in a good many places, mostly in the central and eastern counties.

The onion harvest in Mitchell county shows yields somewhat below expectations, due to the dry weather earlier in the season. Threshing is about completed everywhere in the State, except an occasional stacked job. Threshing weather was unusually favorable this year.

#### Bulletin No. 22, September 6, 1927—

The past week, with an average temperature of 74.1 degrees, was one of the warmest weeks of the crop season of 1927, and 6.2 degrees above normal. Afternoon temperatures were around 90 in most of the State and nights were warm. Sunshine averaged 87 per cent of the possible amount and was 22 per cent above normal. Showers were mostly light and local till the night of September 5th-6th when a storm center developed over Iowa, attended by heavy rains in many northern and western counties and with prospects that the State would be well covered. High wind blew down the corn in Floyd, Lyon and Marshall counties on the 24. Hail damaged corn and buckwheat in Worth county. Much of the State has been too dry for the last ten days.

Reports from about 950 correspondents of the combined Federal and State Crop Reporting Bureaus indicate that with normal weather 28 per cent of the corn will be safe from frost by September 20; 45 per cent by September 30 and, if frost holds off, 68 per cent October 15 and 83 per cent October 31. The average date of first killing frost ranges from September 25 in Osceola county to October 15 in the extreme southeast portion of the

State. The average for the State is October 5. These reports began leaving the farms during the last few days of August. Since then, dry, warm weather has hastened maturity and greatly benefited the crop, except late corn on light soils on hill lands where rain has been badly needed. With the advancement of the last few days the state of maturity is about the same or slightly better than in 1924. The corn has fired considerably on the uplands. The earliest corn, constituting 10 to 20 per cent of the crop, is well dented and the husks are beginning to dry on a little of it. About half of the crop is in the roasting ear or dough stage while one-fourth is struggling along from not yet tasseled to blister stage and is seriously in need of rain in the southeast portion of the State.

Pastures have deteriorated for lack of rain and the milk flow has been greatly reduced from this cause and the attacks of flies. Second crop clover is being cut and is yielding fairly well where moisture is sufficient. Recent dry weather has been favorable for a seed crop from second growth clover. Fourth crop alfalfa is growing well in the Missouri River counties.

Plowing has been delayed or suspended on account of the dry, hard condition of the soil. Considerable winter wheat will probably be seeded between the corn rows for the corn is standing up better than usual, due to the absence of winds to blow it down.

#### Bulletin No. 23, September 13, 1927—

Hot weather, the hottest of the season for the State as a whole, was the leading feature of the week. The average temperature, 79.8 degrees is 13.5 degrees above normal. The highest temperature was 100 degrees at Milo, in Warren county, on the 8th and at Albia, in Monroe county, on the 10th. The mean temperature of the period of two weeks ending September 13 (77.0°) is probably higher than for any similar period in more than half a century, yet for the State no records were broken for extremely high September readings. As recently as September 2d and 4th, 1925, temperatures of 105° were observed at Cedar Rapids and Inwood and the highest September temperature of record in the State is 107° at Bedford, on the 5th in 1913.

Heavy to excessive rains occurred in many eastern counties and in Buena Vista, Worth and near-by counties. At Clinton, Dubuque and Northwood new records were established for greatest rainfall in 24 hours. About three-fourths of the State had rains sufficiently heavy to benefit the crops. In limited areas the rains were sufficiently heavy to damage crops. From Carroll and Audubon counties east to the southern portion of Hardin county and southward as far as Clarke and Lucas counties little or no rain has occurred during the recent heated period and there are localities in other portions of the State that need rain. The worst drought situation is in the northern portion of Story county.

Corn made wonderful progress where moisture was sufficient. Late corn not deeply rooted and considerable other corn in the dry counties above mentioned was injured by the excessive heat, but over most of the State it is probable that corn never made such favorable progress in September. However, similar conditions prevailed in the period September 10th-24th, 1920. About one-half of the crop, for the State as a whole, has reached the denting stage and in some counties three-fourths of the crop has reached that stage. Some is safe from moderate frost and every day of favorable weather will add to the safe corn. The very late corn, which never had much possibilities of making ears, has been practically killed by the recent heat where moisture was deficient, but where moisture is ample it is making a heroic but probably unsuccessful struggle. Seed corn gathering is reported from several localities.

Sweet corn in the large dry central area above mentioned has been hard hit by the heat, and canners in that area will probably soon shut down with much less than the usual pack. However, reports from the canneries in the northeast and southwest portions of the State are favorable. Corn earworms are not troublesome this year in striking contrast with last year.

Tomatoes are on the markets in abundance even in rather dry sections. Tomato canneries are busy with a pack of good quality. Grapes of good quality are abundant though the harvest is later than usual. Peaches in southern Iowa are suffering for rain. Apples are very spotted, the yield varying from very poor to very good. Potatoes have been revived where rain has been plentiful, but the heat has probably not been beneficial.

Pastures have deteriorated over most of the State, making further decrease in the milk flow. New corn is being fed to livestock in many localities. Fourth crop alfalfa is about ready to cut in Harrison county. Hog cholera is prevalent in several northern and eastern counties. A bad outbreak is reported in the north part of Story county.

Fall plowing could not be done with horses on account of the heat, but considerable was done with tractors. Winter wheat seeding is in progress where soil conditions are favorable though it is a little too early for safety from Hessian flies in most of the usual winter wheat counties.

#### Bulletin No. 24, September 20, 1927—

After 20 days with temperatures continuously above normal, the weather turned much cooler on the 18th. No other period of such long sustained high temperatures so late in the season is known, yet no records were broken for high September temperatures for the State as a whole. The past week the average temperature was 72.4 degrees or 8.3 degrees above normal and the highest temperature reported was 100 degrees at Stockport and Chariton on the 15th. A belated report from Fayette shows a maximum of 101 degrees on the 12th which is probably the highest in the State for this heated period, though complete reports will not be received till the close of the month. Light frost was reported in the vicinity of Ames, Des Moines and Chariton on the morning of the 19th but no damage. Frost or freezing temperatures were reported from several stations in northern and western Iowa on the morning of the 20th but the damage, if any, is unknown at this writing.

Rainfall of the week averaged about double the normal. It was excessive in local areas from Cass and Union counties northeast to Dubuque county, but little or none occurred in several southeast counties. Most of the heavy rain was absorbed by the thirsty soil and affected streams but little. In considerable areas the soil was saturated to a depth of 1 or 3 feet.

Corn continued to make excellent progress over most of the State where moisture was sufficient, but in some southeast counties and in a few localities elsewhere, the rains did not come till after the high temperatures had damaged the corn. Where the rains came favorably, even the very late corn made progress that seemed impossible three weeks ago and thereby greatly improved its feed and fodder value, though not adding much to the marketable corn from that source. In some localities 50 to 75 per cent of the crop is now safe from frost, but the bulk of the crop will need about two weeks of favorable weather. A beginning has been made in silo filling and fodder cutting, though it has been too hot for extensive work and the crop is still generally green and continuing to produce food values. Considerable seed corn has been saved and some localities report an adequate supply already. Excessive rains and wind squalls beat the corn down considerably in limited areas.

Plowing with tractors has been active, though it was too hot for horses. Much of the intended acreage of winter wheat was seeded with the soil in good condition for germination.

Pastures have revived greatly where rain has been sufficient though in the drier sections, they are brown and bare. The latter cuttings of alfalfa were light. Clover hulling is in progress. Yields are mostly good though disappointing where it has been excessively dry.

#### Bulletin No. 25, September 27, 1927—

The temperature of the past week averaged 52.6 degrees or 9.1 degrees below normal and nearly 20 degrees colder than the preceding week. Sun-

shine was much below normal and there was considerable rain toward the close of the week with snow flurries at a few places in the northwest counties on the 26th. Last year the first snow flurries were reported on the 24th. Snow flurries occur in September somewhere in the State in about one-fourth of the years. In 1912 they occurred as early as the 17th.

Corn made very slow progress. The recent rains were probably more of a hindrance than a help to corn. Our correspondents made careful inquiry as to the maturity of the corn in their vicinities and their replies as of an average date of about September 25 show that 59 per cent was then safe from frost. This is an improvement of fully 20 per cent over the estimates of September 1 and about the same as on September 25 of the last five years. The per cent of corn that matures without frost damage is falling off at the rate of about one-half of one per cent per year. For each bushel of increase in yield there has been a decrease of 1.9 per cent in the corn that escaped frost damage. This is not due to cooler seasons. In fact, since 1890 there has been a slight but inappreciable upward trend of about 0.01534 degree per year in the mean temperature of the months June, July and August combined for the State of Iowa. No doubt this trend would entirely disappear by including an equal number of years preceding or following.

Numerous local frosts have been reported but so far the damage to corn has amounted to little more than added delay in maturity. Much good seed corn was saved the past week and an abundance of good seed is available for gathering in nearly all sections, though some extreme south-east counties report only 15 to 25 per cent of the crop safe from frost. Sioux county is furthest advanced with 85 to 90 per cent safe. Fodder cutting and silo filling was making good progress till the rains came toward the close of the week. Warm weather during the next few days will improve conditions.

Winter wheat seeding made good progress and the earliest is up and growing well. Pastures are improving rapidly. Potato digging is in progress and yields in the northern counties are good. Tomatoes of excellent quality are unusually abundant. Melon vines have been killed by frost in some localities but the crop has been mostly good.

#### Bulletin No. 26, October 4, 1927—

Another cool, cloudy, rainy week was unfavorable for maturing the corn crop. In some localities the rains amounted to excessive and damaging downpours. The rains loosened the corn roots, and strong winds blew down much of the crop in certain localities. Fields were so wet generally that corn could not be hauled to the silos so this work was nearly at a standstill. A little was cut for fodder. Some of the very late corn has taken on renewed growth which will improve its feeding value but with little chance of reaching maturity. The wet weather is starting the corn to mold where on or near the ground. The outlook is for increased sunshine during the next few days and this will improve conditions.

Nearly all farm work, including plowing, winter wheat seeding, clover hulling and potato digging, was halted by the wet weather. Early wheat fields are green and looking fine. Pastures are improving wonderfully, but the stormy weather has caused a further decline in milk flow.

Sweet corn canning has stopped generally with a pack of good quality in the southwest portion of the State. Tomato canning continues, for as yet no damaging frosts have occurred.

## CROP SEASON WEATHER, 1927, BY WEEKS

Average rainfall, mean temperature and mean sunshine, with departure from the normal, as derived from reports of selected stations.

Week Ending	Rainfall (Inches)		Temperature (Deg. F.)		Sunshine	
	State Average	Departure	Mean	Departure	Per Cent	Departure
April 5.....	1.4	+0.9	43.4	+0.4	29	-27
April 12.....	0.6	0.0	47.9	+1.3	37	-20
April 19.....	1.9	+1.2	53.2	+6.1	39	-25
April 26.....	0.5	-0.3	42.3	-6.7	52	+4
May 3.....	0.4	-0.1	59.5	+4.8	67	+9
May 10.....	1.4	+0.5	56.3	-0.8	67	+9
May 17.....	0.2	-0.8	52.3	-7.4	37	-24
May 24.....	2.1	+1.0	64.2	+2.2	39	-22
May 31.....	1.0	-0.2	56.8	-7.3	45	-18
June 7.....	0.6	-0.6	59.8	-6.3	49	-15
June 14.....	0.8	-0.3	65.3	-3.8	52	-8
June 21.....	0.9	-0.1	66.1	-2.6	52	-8
June 28.....	0.1	-0.9	69.4	-2.0	54	-6
July 5.....	0.2	-0.7	73.9	+1.3	36	+14
July 12.....	0.2	-0.7	75.2	+1.6	34	+11
July 19.....	0.6	-0.2	73.9	-0.2	71	+1
July 26.....	0.7	-0.1	70.4	-4.0	70	+1
August 2.....	0.4	-0.4	72.9	-1.1	80	+7
August 9.....	0.6	-0.2	69.0	-4.4	63	-9
August 16.....	0.7	-0.1	71.0	-1.3	61	-6
August 23.....	0.8	0.0	65.3	-5.7	52	-17
August 30.....	T	-0.8	66.3	-3.3	69	+1
September 6.....	0.0	-0.2	74.1	+0.2	87	+22
September 13.....	0.7	-0.2	79.8	+3.8	78	+15
September 20.....	1.5	+0.7	72.4	+8.3	79	+17
September 27.....	1.2	+0.4	52.6	-9.1	44	-17
October 4.....	2.2	+1.5	53.8	-5.5	74	-46
For season.....	22.3	-1.0	63.3	-1.0	59	-6

T. Not more than 0.05 inch.

## WEEKLY NOTES ON WEATHER AND CROPS IN IOWA

## Week Ending October 11, 1927—

Continued cool, cloudy, rainy weather till about the middle of the week was unfavorable for maturing the corn crop and for all farm work. Sunshine and warmth toward the close of the week improved conditions materially. In the southwest one-fourth of the State corn has made better progress than the weather would indicate. In many western counties the crop is now 95 to 100 per cent safe and the indicated yield is the best in three years. In the eastern third of the State there are localities where not over half of the crop is safe and where one-fourth of the acreage can never make mature ears. Some is only in the roasting ear stage now. This extreme lateness is not due to unusual abnormalities since the usual planting time but to the unprecedented rains of September, 1926, and the rains of April, 1927, which were the heaviest in 29 years. These made the soil too wet for preparations for planting.

Frosts, mostly light, occurred in many localities on the 6th, 7th, 8th and 10th but no important damage occurred. In fact the opinion of our correspondents is divided as to whether the frosts were a detriment or a benefit. A few localities in northwest Iowa report "killing frosts" but with the corn nearly 100 per cent safe. The average date of first killing frost for the State, which is October 5, has been passed without much damage.

There were some further reports of corn damaged by molding where blown over on or near the ground. Fields have been so wet that "hogging" of corn has been less than usual. Hogging wet fields is wasteful. Fields continued generally too wet for corn binders and for silo filling though

this work became brisk toward the close of the week and considerable corn was cut by hand. Much of the crop is now too mature and dry for best fodder or silage.

Winter wheat seeding has gone forward slowly when soil and weather would permit. Most of the acreage is up and growing fine.

Another cutting of alfalfa is contemplated in some sections if the weather permits. Soybean threshing was halted by the rains. A large increase in soybean acreage is reported.

While hog cholera is reported in some localities, the losses are far less than at this time last year. The health of other animals is fairly good. The milk flow continues deficient because of the inclement weather.

## Week Ending October 18, 1927—

Excepting rather heavy rains in the eastern counties at the beginning, not much rain fell in Iowa the past week. Temperatures averaged nearly five degrees below normal with killing frosts over much of the State on the 14th, and in some sections on the 16th and 17th. Toward the close of the week there was much sunshine, higher afternoon temperatures and considerable wind.

Corn made good progress toward maturity. At least 80 per cent was safe when killing frosts came about 10 days later than usual. The most damage occurred in Iowa and Poweshiek counties where it amounted to about 40 per cent. A few localities have escaped frost and in these fodder cutting and silo filling continues with some of the corn still green. Much good seed corn has been saved.

The moisture content of the corn is high and cribbing is generally unsafe, yet husking began in a good many western and northern counties on the 17th and considerable has been snapped for feed, especially in Story county where 10 per cent of the new crop has already been fed. Some machine husking is reported from Floyd county. Early husking returns show considerable chaffy corn. A continuation of the present "Indian summer" weather will dry the corn rapidly and husking will probably become active toward the close of October. As the fields became drier this week "hogging" corn became more active.

Winter wheat seeding continues with the soil in good condition. The wheat that is up is growing fine. The intended increase in acreage has not been prevented by the weather. Much fall plowing was done this week.

Pastures are unusually good, but the milk flow is picking up very slowly. Considerable loss from hog cholera and other swine diseases is reported this week.

## Week Ending October 25, 1927—

"Indian summer" weather this week was ideal for drying the corn and for all fall work on the farm. For 11 consecutive days there has been 100 per cent of sunshine in nearly all portions of the State. The temperatures of the past week averaged nearly 10 degrees above normal and about 5 degrees higher than during the last two weeks in September. Afternoon temperatures in the 80's and occasional light freezes at night have greatly reduced the moisture content of the corn. The immature corn is chaffy but this is far preferable to sour, frosted corn.

Very little corn husking has been done as yet other than that to supply current needs on the farm. At the present rate of drying, cribbing will become active in the next few days though the weather is too warm for most efficient work of hand huskers. Killing frost has not yet visited some extreme south central and southwest counties and a few localities elsewhere. Silo filling and fodder cutting was completed generally.

Clover seed hulling was resumed in many counties the past week and mostly fair to good yields are reported. Some late cutting of alfalfa occurred during the week. Fall plowing was pushed vigorously and the amount done is greater than a year ago. Fence building, manure hauling and preparations for winter made good progress.

Sugar beet harvest is on in dead earnest, with yields fair to good. Recent weather has been favorable for improving the sugar content. Potato

digging has been finished in most of the State with moderate yield and very good quality.

Feeder cattle are scarce and high priced and less cattle feeding than usual is reported. Swine diseases are rather active.

#### Week Ending November 8, 1927—

Temperatures fell steadily during the past week to far below normal the latter part of the week. The lowest temperature was on the morning of the 6th when readings of 12 to 16 degrees were recorded in much of the State. The ground was frozen several inches in some localities. Rainfall was generally light except in some southeast counties. Sunshine was below normal.

Freezes nearly every night dried corn and made husking easier and the seasonable day temperatures were more agreeable for hard work. Husking made good progress generally, though in some localities where the corn is still too moist to crib, only a beginning has been made. In the more advanced northwest counties nearly half of the husking is done. Husking machines are more numerous than heretofore. Yields so far reported range from as little as 12 bushels per acre in the west part of Story county to 60 bushels on a few farms in the western counties. The quality ranges from light and chaffy to excellent and there is a surprisingly small amount of soft sour corn. Complete reports from hundreds of reporters of the combined State and Government crop reporting service show that 79 per cent escaped frost damage, which is about the average of the preceding five years. Even that caught by frost has dried out more than it has soured. There is some complaint of corn heating in the crib, but this complaint is small compared with the last three years.

Winter wheat is generally in good condition for winter, though as usual some is late and not well established. Soil moisture is generally ample. Farms are generally well prepared for winter.

#### Week Ending November 15, 1927—

Very changeable weather was experienced in Iowa the past week, ranging from summer to winter. A decided cold wave swept over the State on Friday and Saturday, the 11th and 12th. Snow was general in the northern portion on the 11th, amounting to more than an inch in some northwest counties and at the same time light rain fell in most of the rest of the State. About two inches of snow covered the northwest counties on the 14th-15th and heavy rains fell in the extreme eastern counties.

Though conditions were not the most favorable for drying the corn the severe freeze made husking easier and this work made fair progress, particularly on the uplands and in the early planted fields. There is still considerable complaint that the corn is too moist to crib safely. Considerable corn was blown down by the strong winds, making machine picking difficult. There is more machine picking than usual.

Yields range from very disappointing to the best in three years. The quality is mostly better than expected. At least, there is not as much soft corn as expected.

Aside from the bad effect on the corn, the precipitation of the week was beneficial to winter grains, pastures and meadows. The ground was getting rather dry in large areas.

While there have been many outbreaks of hog cholera, they have been offset by more general vaccination as compared with a year ago. Serum has been plentiful.

#### Week Ending November 22, 1927—

Rain in southern and snow in northern portions of the State at the close of last week, followed by almost continuously cloudy skies and low temperatures were unfavorable for corn husking, particularly that done with machines.

Corn is still too moist to crib safely in some localities especially on lowlands. Husking is farthest advanced in the northeast counties where

more than three-fourths is done; and from one-half to three-fourths has been done in the State as a whole. Yield and quality is unusually variable.

Fall plowing has ceased because of the frozen soil, with probably more of this work accomplished than usual. Winter wheat is generally in good condition. Pastures are still affording considerable grazing in much of the State.

Considerable "flu" is reported; also large losses from cholera in Buena Vista county. Many outbreaks of cholera have been reported but as a rule prompt action has reduced the losses below those of last year.

#### Week Ending November 29, 1927—

The average temperature for the State of Iowa for the past week was 48.4 degrees or 8.4° above normal. There was considerable snow in the north half of the State on the 23d-24th and light, misting rains elsewhere, except in the extreme southwestern counties.

Corn husking made rather slow progress. Frost left the ground in much of the State, making it difficult to draw wagons and husking machines through the muddy fields. The dampness without much freezing weather made it hard to remove the husks and break the ears from the shanks. In the extreme western counties where there was more sunshine, husking made good progress and is finished on many farms. There is still some complaint that corn is too moist to crib safely, though the situation is better than on the same date the last two years.

Winter wheat is looking fine and made some growth the past week. Plowing was resumed in some of the southern counties. Pastures are still green in much of the State and affording some grazing.

Hog "flu" is reported as serious in many counties, probably as serious as last year.

#### Week Ending December 6, 1927—

Temperature, sunshine and rainfall were all deficient during the past week in Iowa. From two to six inches of snow fell over most of the northern portion of the State on December 3, followed by the first below zero temperatures on the morning of the 4th.

Corn husking was further delayed by the snow and the severe temperatures, though the latter will help to dry out the remnant that is still too moist to husk with ease and crib with safety. More than four-fifths of the husking has been finished, ranging from more than 90 per cent in the extreme northeast and extreme east central counties and in Carroll, Audubon and Adair counties, to little more than half in Lee county. The amount of husking done is greater than at this date last year though slightly less than the 10-year average.

Corn yields range from excellent in the extreme west to very poor in the extreme southeast portions of the State. The quality ranges from excellent to fair. Not much new corn is going to market. Farmers are probably correct in their belief that the corn shortage further east and in some other parts of the world will cause higher prices before another crop is harvested. In some Iowa counties where the crop is short, considerable corn is being shipped in to take care of the live stock saved for breeding while the surplus hogs, cattle and sheep are being marketed rapidly. It looks as though this liquidation of live stock would soon be over for there are not many counties in Iowa where the corn shortage is acute.

Winter wheat and grasses are entering the winter in good condition generally.

MONTHLY PERCENTAGE CONDITIONS OF CROPS AND YIELD  
PER ACRE, 1927.

Crops	April 1	May 1	June 1	July 1	Aug. 1	Sept. 1	Oct. 1	Yield Per Acre
Corn.....			73	72	73	67		36.5 Bu.
Oats.....			90	85	82	77	75	32.0 Bu.
Winter wheat.....	88	90	89	89				32.0 Bu.
Spring wheat.....			88	88	81	80		32.5 Bu.
Barley.....			80	90	90	89		31.5 Bu.
Rye.....	92	92	90	92				31.5 Bu.
Flax seed.....				80	86	85	86	33.0 Bu.
Potatoes.....			85	89	72	70	77	22.0 Bu.
Tame hay.....			91	91	88	86		1.67 Tons
Wild hay.....		93	94	94	91	87		1.27 Tons
Alfalfa.....			90	92	88	87		1.27 Tons
Pastures.....	92	93	96	94	78	73	71	2.40 Tons

## FINAL IOWA CROP REPORT, DECEMBER 1, 1927

The value of Iowa's crops in 1927, based on the December 1 farm price, is estimated at \$537,382,000, compared with \$481,338,000, the revised figure for last year. This is an increase of approximately 11.6 per cent. The largest increases in total farm value were as follows: Corn, \$11,748,000; oats, \$14,219,000; wheat, \$491,000; barley, \$4,994,000; tame hay, \$7,984,000. Some of the smaller crops show decreases, notably potatoes which show a decrease of \$3,542,000, mostly due to a drop in price.

**Corn:** The total production of corn is estimated at 399,566,000 bushels, which is 36,064,000 bushels less than the final revision for 1926, or a decrease of 8.3 per cent. The value of the smaller crop of 1927, based on the December 1 farm price is approximately 13 per cent greater.

About 80 per cent of the acreage intended to be husked had been husked by December 1, or 4 per cent more than last year. Weather conditions in early November were very favorable for husking, but snow and wet weather slowed it up towards the first of December, and some corn was blown down and covered with snow. Much of this blown down corn will be lost, if it cannot be gathered before spring thaws.

The quality of the corn is not up to standard, on an average, though in some sections of the State it is as much as 10 per cent above the 10-year average. It is estimated that about 76 per cent was of merchantable quality on November 1.

**Oats:** The total production of oats in Iowa this year is estimated at 197,076,000 bushels, compared with 195,867,000 bushels last year, an increase of about 0.6 per cent. The acreage harvested this year was about 4 per cent less than last year, but was offset by a higher yield of 23.0 bushels per acre.

**Wheat:** Iowa, in 1927, produced 8,075,000 bushels of winter wheat on 425,000 acres, and 636,000 bushels of spring wheat on 41,000 acres.

**Tame hay:** The year 1927, in Iowa, was exceptionally favorable for the production of tame hay. The final estimate for the state places the production at 5,357,000 tons on 3,203,000 acres, or a yield of 1.67 tons per

acre. The yields and acreage of the different kinds of tame hay are as follows: Clover hay alone, 662,000 acres, 1,115,000 tons; timothy hay alone, 523,000 acres, 680,000 tons; mixed clover and timothy hay, 1,433,000 acres, 2,078,000 tons; alfalfa hay, 340,000 acres, 952,000 tons; grain cut green for hay; 70,000 acres, 112,000 tons; annual legumes, 35,000 acres, 70,000 tons, and all other kinds such as millet, sudan grass, etc., 140,000 acres, 350,000 tons. It is estimated that about 50,000 acres of sweet clover was cut for hay and produced 105,000 tons; this is included in the figures for clover hay alone given above. While the total production of tame hay this year is about 41 per cent greater than last year, the price this year was \$3.00 per ton lower and the total value, based on the December 1 farm price, was only about 13.5 per cent greater.

Production of minor crops was as follows: Sweet potatoes, 270,000 bushels; sorghum syrup, 700,000 gallons; apples, 1,720,000 bushels, of which about 69,000 barrels were the commercial crop; peaches, 65,000 bushels; pears, 41,000 bushels and grapes, 5,329 tons.

Details of the more important crops will be found in the table on the opposite page. Average price, as of December 1, by counties, and the average yield per acre, by counties, will be found on following pages.

IOWA CROPS 1926 AND 1927 COMPARED  
Acreage, Average and Total Yield, Average and Total Value

Table with 11 columns: Crop, 1926 Final Revision (Acres, Average Yield, Total Yield, Average Price Dec. 1, Total Value), December 1, 1927 Estimates\* (Acres, Average Yield, Total Yield, Average Price Dec. 1, Gross Value Per Acre, Total Value). Rows include Corn, Oats, Winter wheat, Spring wheat, Barley, Rye, Flax seed, Timothy seed, Clover seed, Soy beans, Potatoes, Hay ( tame), Hay (wild), Pasture and grazing, Sweet corn, Pop corn, Buckwheat, Fruit crop, Garden truck, and Miscellaneous. Total value for 1926 is \$587,883,000 and for 1927 is \$481,838,000.

\*Subject to revision when assessors' figures become available.

AVERAGE FARM PRICE OF IOWA'S PRINCIPAL CROPS AND PER CENT OF CORN HUSKING DONE DECEMBER 1, 1927, BY COUNTIES

Table with 20 columns: Districts and Counties, Per cent husking done December 1, Corn (Per bushel of 70 lbs. in ear or 56 lbs. shelled, Oats per bushel of 22 lbs., Winter wheat per bushel of 60 lbs., Spring wheat per bushel of 60 lbs., Barley per bushel of 56 lbs., Rye per bushel of 56 lbs., Flax seed per bushel of 56 lbs., Buckwheat per bushel of 45 lbs., Timothy seed per bushel of 45 lbs., Clover seed per bushel of 60 lbs., Pop corn per pound in ear, Soy beans per bushel, \*June hay (loose) per ton of 2,000 lbs., Wild hay (loose) per ton of 2,000 lbs., White potatoes (Irish) per bushel of 60 lbs., Sweet potatoes per bushel of 56 lbs., Apples per bushel of 45 lbs., Sorghum straw, per gallon, Comb in sections, Extruded (less cost of container) in bulk, Honey (Per Lb.). Rows are categorized into Northwest, North Central, and North East districts.





AVERAGE FARM PRICE OF IOWA'S PRINCIPAL CROPS AND PER CENT OF CORN HUSKING DONE DECEMBER 1, 1927, BY COUNTIES—Continued

Districts and Counties	Corn			Honey (Per Lb.)																			
	Percent husking done December 1	Per bushel of 70 lbs. in ear or 50 lbs. shelled	Oats per bushel of 22 lbs.	Winter wheat per bushel of 60 lbs.	Spring wheat per bushel of 60 lbs.	Barley per bushel of 60 lbs.	Rye per bushel of 60 lbs.	Flax seed per bushel of 60 lbs.	Huckwheat per bushel of 48 lbs.	Timothy seed per bushel of 48 lbs.	Clover seed per bushel of 60 lbs.	Pop corn per pound in ear	Soy beans per bushel of 60 lbs.	Tame hay (loose) per ton of 2,000 lbs.	Wild hay (loose) per ton of 2,000 lbs.	White potatoes (Irish) per bushel of 60 lbs.	Sweet potatoes per bushel of 60 lbs.	Apples per bushel of 48 lbs.	Sorghum straw, per gallon	Comb in sections	Extracted (less cost of container)	In bulk	
<b>South Central—</b>																							
Appanoose.....	76	72	50	81	16	70	77	70	79	70	49	30	8	4	48	11	41	17	18	19	14	13	
Clarke.....	86	78	42	120	1	61	56	56	140	150	3	10	10	3	10	10	10	10	10	10	10	10	
Decorah.....	81	70	45	120	1	61	56	56	140	150	3	10	10	3	10	10	10	10	10	10	10	10	
Locust.....	86	70	48	114	65	62	106	106	134	138	2	12	10	2	12	10	10	10	10	10	10	10	
Lyon.....	85	76	41	116	59	57	101	101	124	128	2	12	10	2	12	10	10	10	10	10	10	10	
Mason.....	81	69	47	116	59	57	101	101	124	128	2	12	10	2	12	10	10	10	10	10	10	10	
Monroe.....	80	76	41	120	70	70	100	100	127	130	3	10	10	3	10	10	10	10	10	10	10	10	
Ringgold.....	79	69	40	110	51	51	96	96	120	125	3	10	10	3	10	10	10	10	10	10	10	10	
Union.....	80	67	41	114	57	57	98	98	121	124	3	10	10	3	10	10	10	10	10	10	10	10	
Van Buren.....	86	68	42	117	59	58	102	102	125	128	3	10	10	3	10	10	10	10	10	10	10	10	
Warren.....	76	76	48	127	72	72	107	107	128	131	3	10	10	3	10	10	10	10	10	10	10	10	
Wayne.....	86	76	48	127	72	72	107	107	128	131	3	10	10	3	10	10	10	10	10	10	10	10	
<b>For District.....</b>	<b>82</b>	<b>72</b>	<b>44</b>	<b>119</b>	<b>61</b>	<b>57</b>	<b>108</b>	<b>108</b>	<b>132</b>	<b>136</b>	<b>3</b>	<b>10</b>	<b>10</b>	<b>3</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	
<b>Southeast—</b>																							
David.....	79	79	42	120	81	56	89	89	122	125	3	10	10	3	10	10	10	10	10	10	10	10	
Des Moines.....	80	73	42	120	81	56	89	89	122	125	3	10	10	3	10	10	10	10	10	10	10	10	
Henry.....	87	78	46	117	59	59	100	100	124	128	3	10	10	3	10	10	10	10	10	10	10	10	
Jefferson.....	80	74	45	120	100	100	100	100	126	130	3	10	10	3	10	10	10	10	10	10	10	10	
Keokuk.....	99	75	43	120	100	100	100	100	127	130	3	10	10	3	10	10	10	10	10	10	10	10	
Linn.....	85	76	43	120	100	100	100	100	127	130	3	10	10	3	10	10	10	10	10	10	10	10	
Louisiana.....	79	70	40	120	131	60	82	82	123	126	3	10	10	3	10	10	10	10	10	10	10	10	
Mahaaka.....	82	68	44	110	51	46	90	90	120	123	3	10	10	3	10	10	10	10	10	10	10	10	
Van Buren.....	87	81	54	120	100	100	100	100	127	130	3	10	10	3	10	10	10	10	10	10	10	10	
Washington.....	75	79	44	120	111	70	98	98	122	125	3	10	10	3	10	10	10	10	10	10	10	10	
<b>For District.....</b>	<b>79</b>	<b>70</b>	<b>43</b>	<b>120</b>	<b>81</b>	<b>50</b>	<b>88</b>	<b>88</b>	<b>122</b>	<b>125</b>	<b>3</b>	<b>10</b>	<b>10</b>	<b>3</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	

For State.....  
\*When hay includes alfalfa.

CORN BY STATES\*

State	Acreage Harvested (1,000 Acres)		Yield Per Acre (Bushels)		Production (1,000 Bushels)		Farm Price Per Bushel December 1 (Cents)	
	1926	1927	1926	1927	1926	1927	1926	1927
Maine.....	13	14	35.0	37.0	455	518	100	110
New Hampshire.....	15	15	43.0	41.0	645	615	109	106
Vermont.....	84	84	43.0	39.0	3,612	3,276	96	106
Massachusetts.....	43	46	44.0	41.0	1,980	1,880	115	120
Rhode Island.....	9	10	41.0	38.0	369	380	115	120
Connecticut.....	64	64	42.0	38.0	2,368	2,400	115	120
New York.....	470	493	35.0	34.0	16,450	16,785	80	85
New Jersey.....	186	179	46.0	49.0	8,648	7,190	80	85
Pennsylvania.....	1,394	1,250	41.0	39.5	57,154	50,165	78	91
Ohio.....	3,391	3,376	41.0	32.5	137,231	109,720	69	77
Indiana.....	4,672	4,305	38.0	31.5	177,539	123,458	59	69
Illinois.....	9,235	8,469	35.0	30.0	322,175	254,076	56	71
Michigan.....	1,503	1,418	34.0	37.5	54,102	53,685	73	86
Wisconsin.....	2,110	2,100	34.5	32.5	73,106	68,250	75	84
Iowa.....	4,345	4,172	34.0	30.3	147,662	127,266	56	64
Missouri.....	11,170	10,947	39.0	36.5	435,630	399,566	56	69
North Dakota.....	6,471	5,933	27.2	29.0	176,011	172,637	68	75
South Dakota.....	1,000	959	18.0	25.0	18,162	23,976	68	62
Nebraska.....	4,630	4,655	18.0	29.0	85,940	134,965	58	57
Kansas.....	8,994	8,265	15.5	33.1	139,407	291,446	68	62
Delaware.....	5,560	5,897	11.0	30.0	61,159	176,910	70	61
Virginia.....	138	130	31.0	35.0	4,278	4,730	64	80
Maryland.....	654	615	39.8	44.0	26,049	26,600	64	80
West Virginia.....	1,694	1,520	27.5	29.5	46,585	47,607	85	92
North Carolina.....	480	451	33.0	33.5	16,065	15,100	94	100
South Carolina.....	2,976	2,322	21.0	22.5	62,572	52,695	88	91
Georgia.....	1,423	1,407	15.5	17.0	22,103	25,449	90	90
Florida.....	3,817	3,803	14.5	14.0	55,346	54,502	70	81
Kentucky.....	551	573	14.0	13.0	7,714	7,449	92	97
Tennessee.....	3,069	2,885	23.0	26.0	101,277	75,910	65	89
Alabama.....	3,690	3,944	27.5	24.0	102,232	79,665	66	83
Mississippi.....	2,823	2,906	16.2	16.8	45,785	47,456	70	92
Arkansas.....	1,918	1,918	19.2	17.8	36,806	34,149	82	93
Louisiana.....	2,636	1,935	20.5	19.0	41,528	36,575	80	87
Oklahoma.....	1,127	1,161	17.5	17.5	19,722	20,389	90	90
Texas.....	2,333	3,177	36.0	26.5	81,178	84,190	56	59
Montana.....	359	305	11.0	22.5	3,949	7,168	99	72
Idaho.....	66	76	41.0	41.5	2,706	3,116	90	82
Wyoming.....	176	176	20.0	21.0	3,520	3,696	72	74
Colorado.....	1,406	1,426	7.0	16.0	10,472	22,816	71	68
New Mexico.....	231	166	30.0	15.0	4,423	2,490	57	59
Arizona.....	49	44	28.0	22.0	1,350	1,408	130	115
Nevada.....	18	19	24.0	26.0	422	494	115	110
Utah.....	2	2	24.0	25.0	48	50	130	115
Washington.....	49	43	35.0	37.0	1,715	1,691	96	90
Oregon.....	73	81	33.0	36.0	2,425	2,916	100	96
California.....	77	77	31.5	32.0	2,426	2,464	106	108
<b>United States.....</b>	<b>99,713</b>	<b>96,914</b>	<b>27.0</b>	<b>32.2</b>	<b>2,602,217</b>	<b>2,796,888</b>	<b>64.2</b>	<b>72.3</b>

\*For all purposes, including hogged and siloed, and that cut and fed without removing the ears as well as that husked and snapped for grain. In most States the yield for grain is applied to the total acreage to obtain an equivalent production of "all corn."

## UNITED STATES CROP SUMMARY, 1927

Crop and Year	Acreage	Production			Farm Price, Dec. 1 Per Unit	Total Farm Value Based on December 1 Farm Price
		Per Acre	Total	Unit		
Corn ----- 1926..	99,713,000	27.0	2,602,217,000	Bushels	Cents	\$1,729,457,000
1927..	98,914,000	28.2	2,786,288,000	"	"	2,014,739,000
Winter wheat ----- 1926..	36,967,000	17.0	627,433,000	"	121.2	769,690,900
1927..	37,872,000	14.6	552,384,000	"	116.8	645,000,000
Spring wheat ----- 1926..	19,230,000	10.5	*203,607,000	"	115.7	235,580,000
1927..	20,711,000	15.4	*319,307,000	"	103.2	239,000,000
All wheat ----- 1926..	56,337,000	14.8	831,040,000	"	119.8	995,360,900
1927..	58,583,000	14.9	871,691,000	"	111.8	974,694,900
Oats ----- 1926..	44,177,000	23.2	1,246,848,000	"	39.8	495,360,000
1927..	42,227,000	28.3	1,195,006,000	"	45.0	537,558,000
Barley ----- 1926..	7,970,000	23.2	184,905,000	"	57.5	106,327,000
1927..	9,492,000	28.0	265,577,000	"	67.8	180,127,000
Rye ----- 1926..	3,878,000	11.4	40,705,000	"	83.4	34,000,000
1927..	3,670,000	16.0	58,872,000	"	85.5	49,945,000
Buckwheat ----- 1926..	664,000	18.3	12,076,000	"	88.2	11,181,000
1927..	882,000	19.4	16,182,000	"	89.5	13,538,000
Flax seed* ----- 1926..	2,907,000	6.7	19,335,000	"	194.0	37,510,000
1927..	2,907,000	9.1	26,683,000	"	185.7	49,873,000
Rice ----- 1926..	1,034,000	40.4	41,730,000	"	109.6	45,722,000
1927..	989,000	40.7	40,231,000	"	93.8	37,738,000
Grain sorghum <sup>b,c</sup> ----- 1926..	6,800,000	30.6	137,515,000	"	52.9	74,000,000
1927..	6,733,000	30.4	137,908,000	"	61.6	84,832,000
Cotton ----- 1926..	47,087,000	*182.6	17,977,000	Bales	*10.9	98,738,000
1927..	40,168,000	*152.3	12,789,000	"	*19.6	1,253,000,000
Cotton seed ----- 1926..			7,982,000	Tons	18.68	149,131,000
1927..			5,678,000	"	30.30	298,373,000
Hay, tame ----- 1926..	58,791,000	1.47	86,407,000	"	14.09	1,258,519,000
1927..	61,198,000	1.74	106,219,000	"	11.38	1,266,600,000
Hay, wild ----- 1926..	12,911,000	.74	9,568,000	"	19.05	96,150,000
1927..	14,787,000	1.17	17,293,000	"	6.58	113,814,000
All hay ----- 1926..	71,702,000	1.34	96,065,000	"	13.68	1,314,678,000
1927..	75,985,000	1.63	123,512,000	"	10.69	1,320,324,000
Clover seed ----- 1926..	530,500	1.87	728,000	Bushels	17.71	12,866,000
1927..	1,208,000	1.44	1,738,000	"	15.35	36,439,000
Beans, dry edible <sup>b,c</sup> ----- 1926..	1,649,000	10.5	17,306,000	"	2.93	31,000,000
1927..	1,905,000	10.5	19,872,000	"	2.89	48,732,000
Soy beans <sup>c</sup> ----- 1926..	543,000	11.22	6,094,000	"	1.99	12,105,000
1927..	653,000	12.56	8,163,000	"	1.69	13,325,000

## UNITED STATES CROP SUMMARY, 1927—Continued

Crop and Year	Acreage	Production			Farm Price, Dec. 1 Per Unit	Total Farm Value Based on December 1 Farm Price
		Per Acre	Total	Unit		
Potatoes, white ----- 1926..	3,122,000	113.5	354,328,000	Bushels	Cents	501,017,000
1927..	3,505,000	114.7	402,140,000	"	66.4	387,870,000
Sweet potatoes ----- 1926..	319,000	101.0	32,703,000	"	95.5	78,956,000
1927..	381,000	100.9	38,928,000	"	82.5	77,530,000
Tobacco ----- 1926..	1,056,400	784	1,297,880,000	Lbs.	18.2	280,322,000
1927..	1,619,200	769	1,237,832,000	"	21.5	296,356,000
Sugar beets ----- 1926..	677,000	10.7	7,222,000	Tons	7.61	54,964,000
1927..	722,000	10.7	7,737,000	"	7.78	60,198,000
Sorghum sirup ----- 1926..	387,000	89.3	34,547,000	"	84.2	29,087,000
1927..	386,000	82.6	31,876,000	"	85.6	27,238,000
Apples, total ----- 1926..			246,324,000	Bushels	74.5	178,233,000
1927..			125,455,000	"	138.6	171,078,000
Apples, coml. ----- 1926..			39,119,000	Bbls.	2.14	83,697,000
1927..			25,900,000	"	4.00	103,530,000
Peaches, total ----- 1926..			69,865,000	Bushels	100.0	68,426,000
1927..			45,463,000	"	118.1	50,494,000
Pears, total ----- 1926..			25,349,000	"	88.7	22,309,000
1927..			18,072,000	"	132.2	23,902,000
Grapes, total <sup>b</sup> ----- 1926..			2,423,413	Tons	36.06	61,033,000
1927..			2,464,712	"	27.46	67,677,000
Cabbage ----- 1926..	129,330	8.0	1,034,200	"	17.79	18,396,000
1927..	138,270	8.4	1,162,000	"	15.61	18,382,000
Cantaloupes ----- 1926..	161,600	143	14,308,000	Crates	1.29	18,520,000
1927..	167,380	142	15,272,000	"	1.22	18,611,000
Corn, sweet (canning) ----- 1926..	317,310	2.6	816,000	Tons	12.25	10,800,000
1927..	213,830	1.9	396,800	"	12.13	4,800,000
Cucumbers ----- 1926..	169,260	81	8,855,000	Bushels	1.17	10,360,000
1927..	98,240	85	8,300,000	"	1.14	9,597,000
Onions ----- 1926..	74,300	282	20,945,000	"	.75	15,803,000
1927..	75,440	299	22,576,000	"	.78	17,547,000
Strawberries ----- 1926..	132,480	1,823	277,940,000	Quarts	.17	47,791,000
1927..	188,130	1,819	343,284,000	"	.15	49,886,000
Tomatoes ----- 1926..	372,430	3.7	1,376,800	Tons	31.18	43,998,000
1927..	387,280	4.2	1,621,500	"	27.23	44,156,000
Watermelons ----- 1926..	190,000	350	69,008,000	No.	1146.00	10,156,000
1927..	190,910	316	67,250,000	"	1180.00	10,661,000
Total <sup>1</sup> ----- 1926..	355,657,445					\$7,790,480,000
1927..	355,839,469					8,428,626,000

<sup>1</sup>Including Durum (Production 4 states 43,081,000 bu. 1926; 76,155,000 bu. 1927). <sup>2</sup>Principal producing states. For all purposes. <sup>3</sup>Per pound. <sup>4</sup>Including lima beans. <sup>5</sup>Gathered for grain, new basis. <sup>6</sup>Production is the total for fresh fruit, juice and raisins. <sup>7</sup>Per car of 1,000 melons. <sup>8</sup>Acreage and total value of all crops, including several minor crops not listed in the table.

### IOWA NORMAL PRECIPITATION MAPS MONTHLY AND ANNUAL

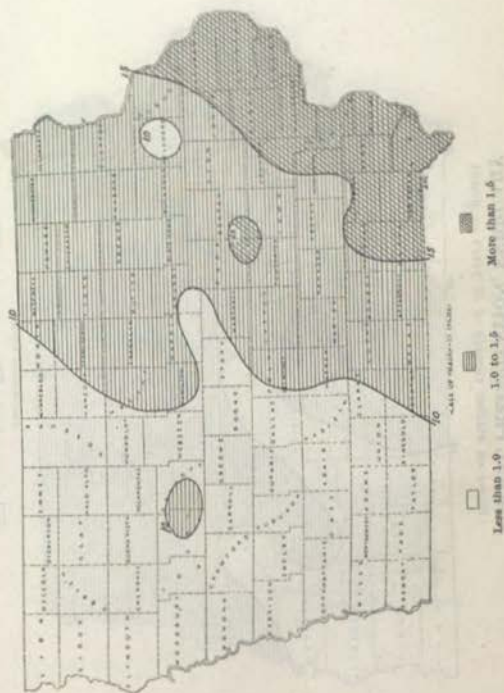
Based on station records of 30 years or more.

Most of the records used were those of stations that had been almost continuously in operation for 30 years or more up to the close of the year, 1920. Some very long and excellent records had been discontinued long before 1920. The oldest continuous record in Iowa is at Muscatine where rainfall observations began January, 1846. Excellent early records were also maintained at Cresco, Fort Madison, Monticello and other places.

In all, the records of 55 stations were used. The average annual rainfall at these 55 stations is 32.39 inches, though the adopted normal for the State for about 110 stations now in operation is 32.22 inches. From south to north the annual rainfall diminishes at an average rate of about 1.00 inch in 50 miles and from east to west 0.92 inch in 50 miles.

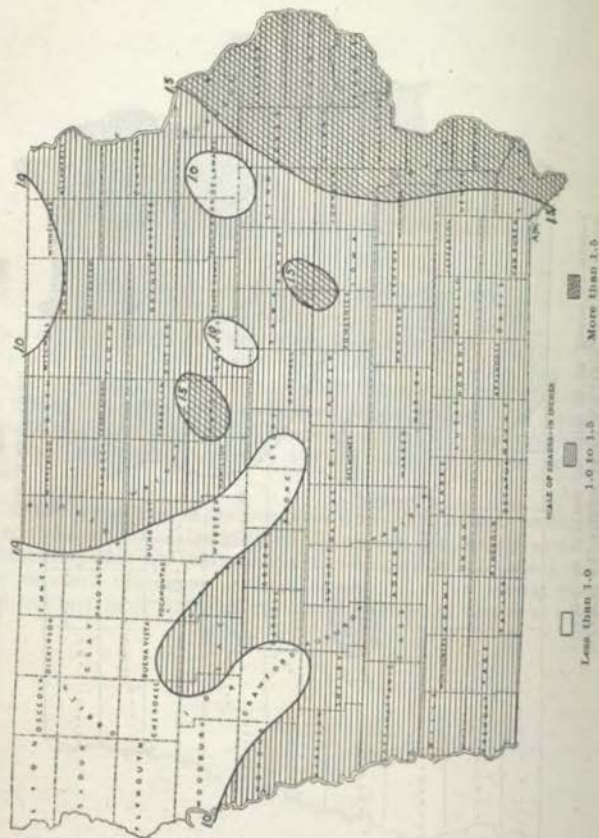
### NORMAL PRECIPITATION, JANUARY

(Based on station records of 30 years or more)



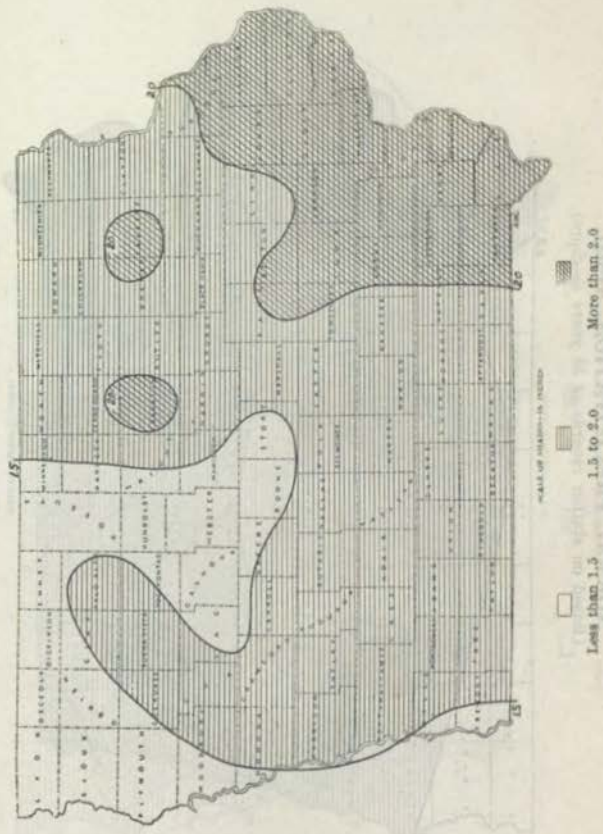
### NORMAL PRECIPITATION, FEBRUARY

(Based on station records of 30 years or more)



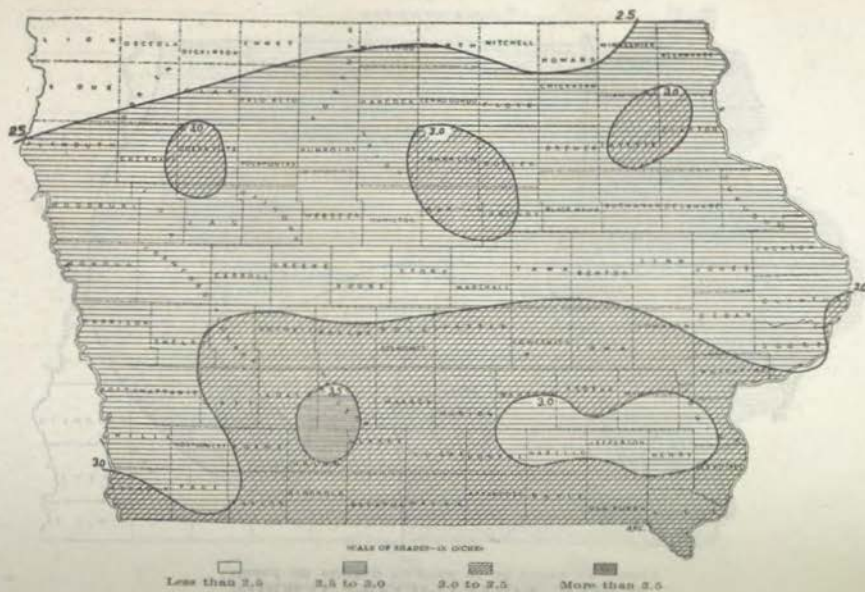
### NORMAL PRECIPITATION, MARCH

(Based on station records of 30 years or more)



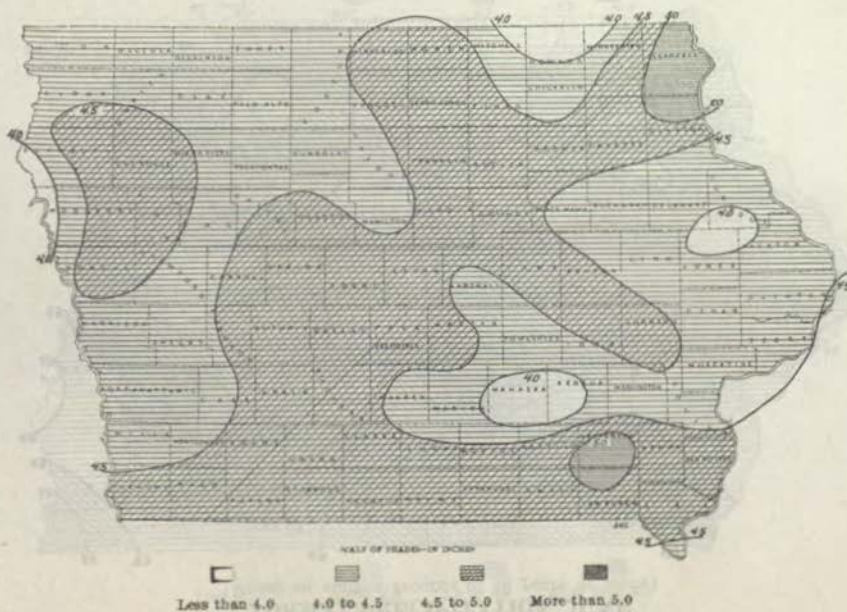
### NORMAL PRECIPITATION, APRIL

(Based on station records of 30 years or more)



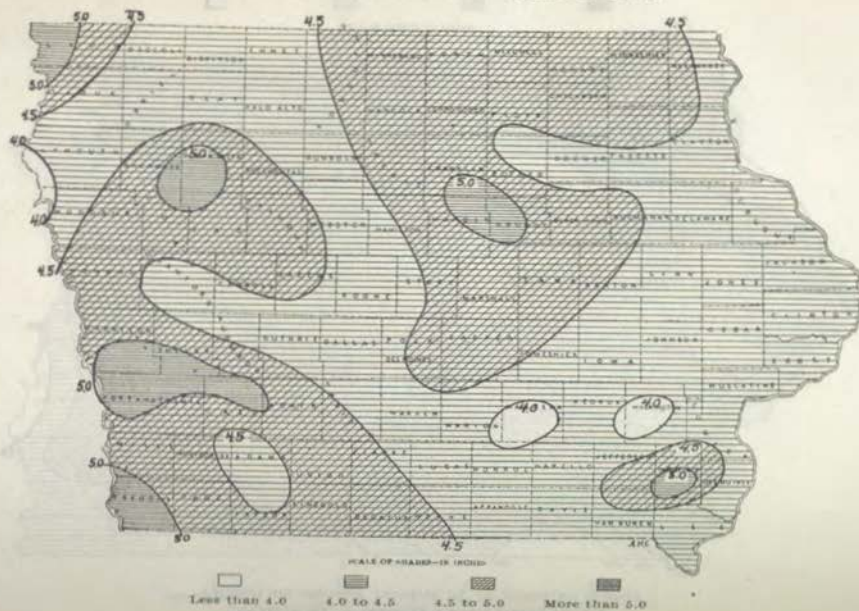
### NORMAL PRECIPITATION, MAY

(Based on station records of 30 years or more)



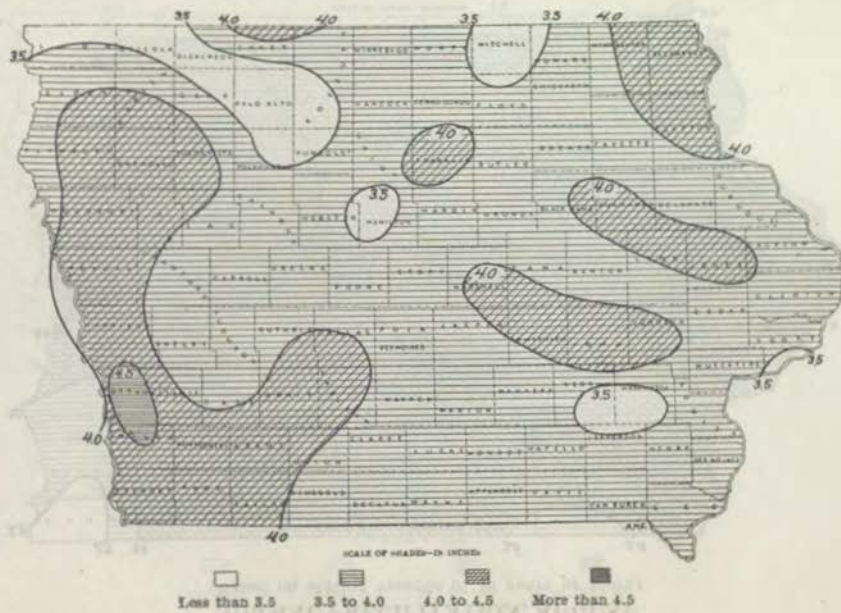
### NORMAL PRECIPITATION, JUNE

(Based on station records of 30 years or more)



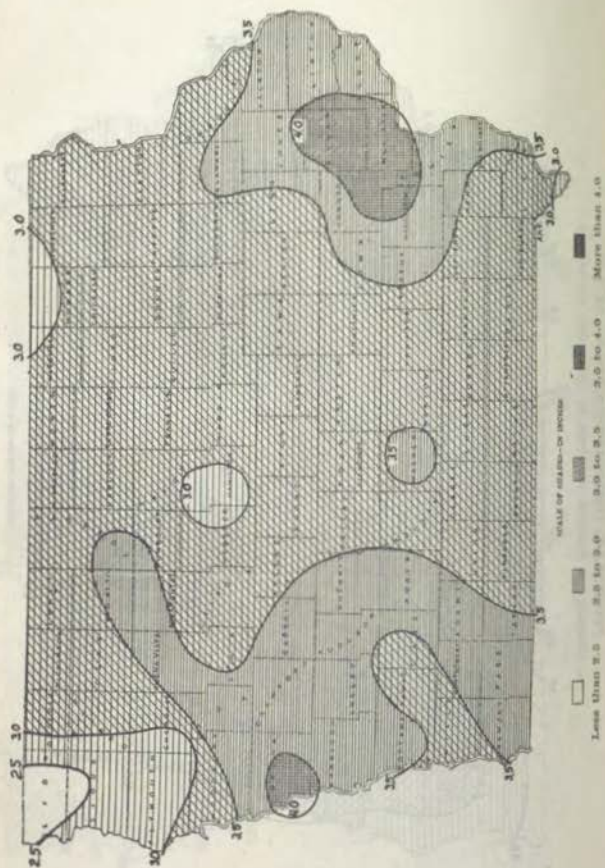
### NORMAL PRECIPITATION, JULY

(Based on station records of 30 years or more)



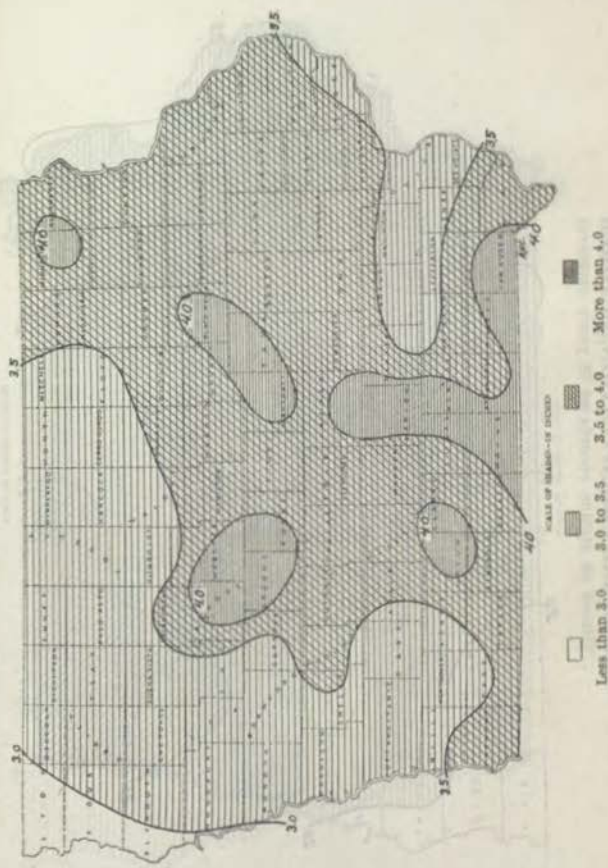
### NORMAL PRECIPITATION, AUGUST

(Based on station records of 30 years or more)



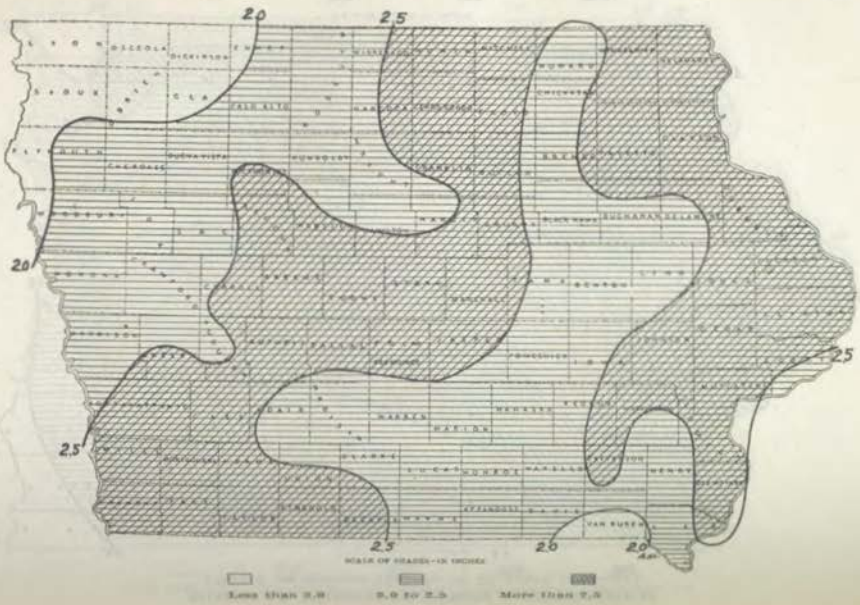
### NORMAL PRECIPITATION, SEPTEMBER

(Based on station records of 30 years or more)



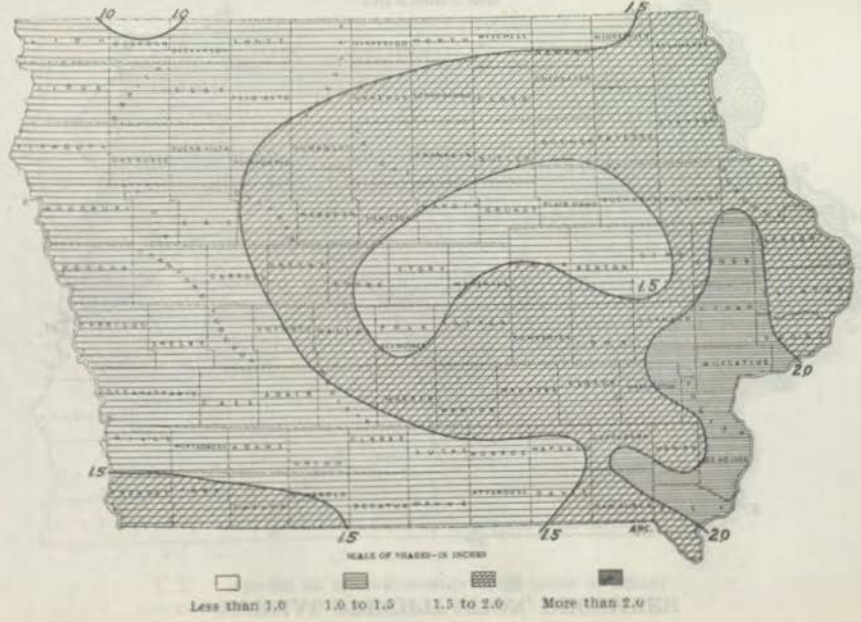
### NORMAL PRECIPITATION, OCTOBER

(Based on station records of 30 years or more)



### NORMAL PRECIPITATION, NOVEMBER

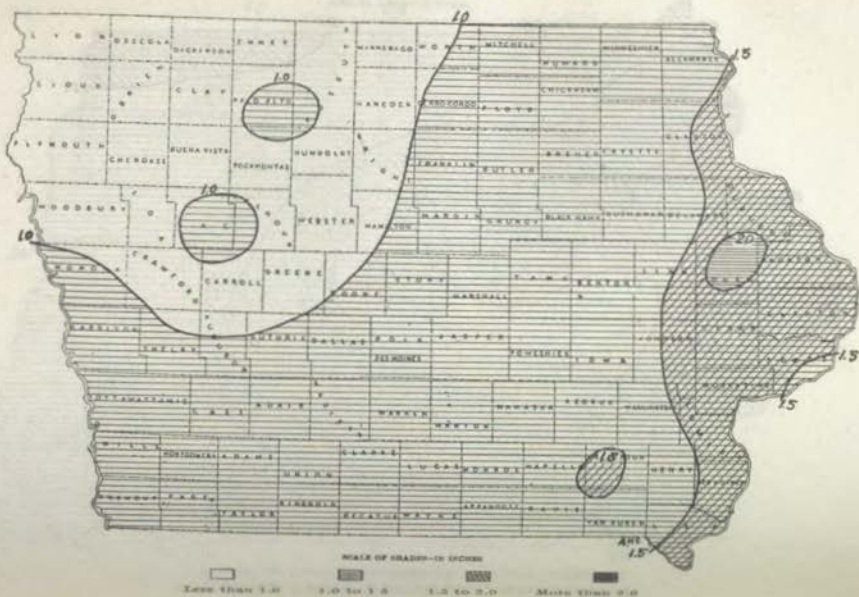
(Based on station records of 30 years or more)





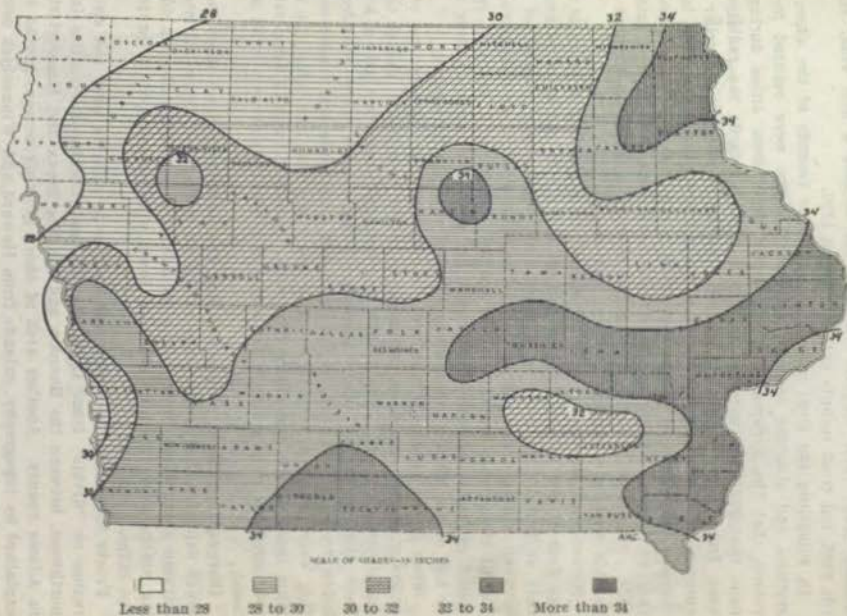
## NORMAL PRECIPITATION, DECEMBER

(Based on station records of 30 years or more)



## NORMAL PRECIPITATION, ANNUAL

(Based on station records of 30 years or more)



## FROST MAPS

State-wide frost records began in Iowa with the year 1893. In cities where first order stations of the United States Weather Bureau are located, frost records began considerably earlier, as follows: Davenport, 1872; Des Moines, 1878; Dubuque, 1874; Keokuk, 1872; Sioux City, 1889; Omaha, Neb., 1873. Charles City did not become a first order station till 1905, but frost records extend back to 1892.

In compiling the frost maps, herewith, the records of the above city stations and also the records for Marshalltown were omitted for the reason that the accumulation of smoke over these cities during the calm that generally prevails on frosty nights, retards the radiation of heat from many artificial sources. Spring frosts cease earlier and autumn frost are delayed till later, in and near the cities, than in the surrounding country. Since the maps were compiled, it is realized that the Cedar Rapids record should have been disregarded prior to 1924. Since that time the station has been in a suburban location comparable with surrounding country stations.

Records of 138 stations were considered in preparing the map of average date of last killing frost in spring, and 135 in the maps of average date of first killing frost in autumn, and the average number of days between killing frosts. Short period records were of course given less weight than long period records nearby. Another 10 years of record would probably improve these maps, yet a careful understanding must be had of the history and surroundings of each station record.

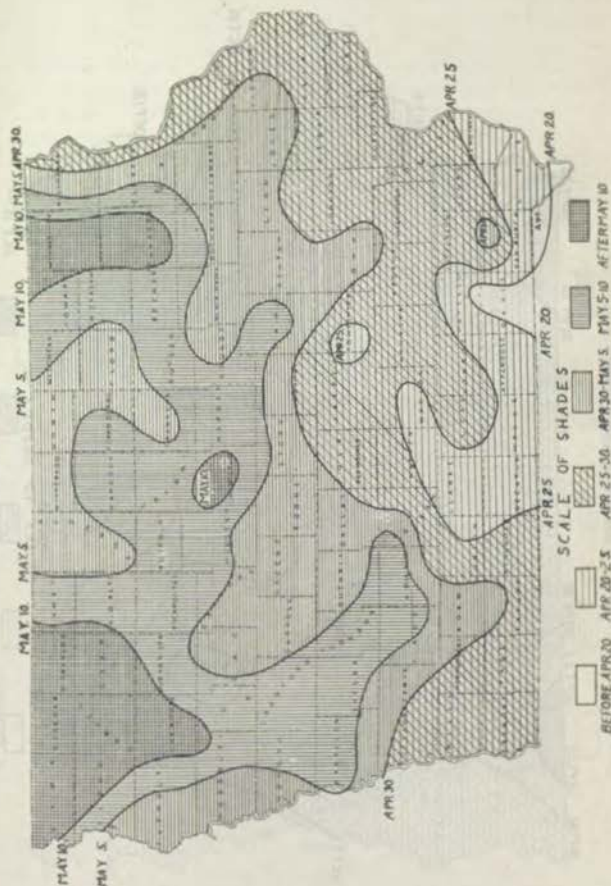
Much of the record is based on the occurrence of temperatures of 32° or lower, rather than upon the actual killing of vegetation, though this is not always desirable. May 9, 1923, was recorded as the last date of killing frost that spring at many stations. Temperatures were considerably below freezing over most of the State, but fruit buds and tender vegetation were damaged very little. The dew point was far below the minimum temperature, very little frost was deposited, freezing temperatures continued for only a few hours and there was considerable wind movement.

Disregarding the city records along the boundary rivers there is still much evidence that frosts cease earlier in spring and delay till later in autumn along these rivers. The records of about 30 stations in adjoining states near the four sides of Iowa were considered in preparing the maps.

Frosts come later in spring and earlier in autumn over the elevated region or "divide" from Lyon, Osceola and Dickinson counties in the northwest, between the Raccoon and the Big Sioux and Missouri rivers, to Adams county. Another area of short growing season, not so easily explained by topography, extends from Howard and Winneshiek counties southward to Iowa county.

## AVERAGE DATE OF LAST KILLING FROST IN SPRING

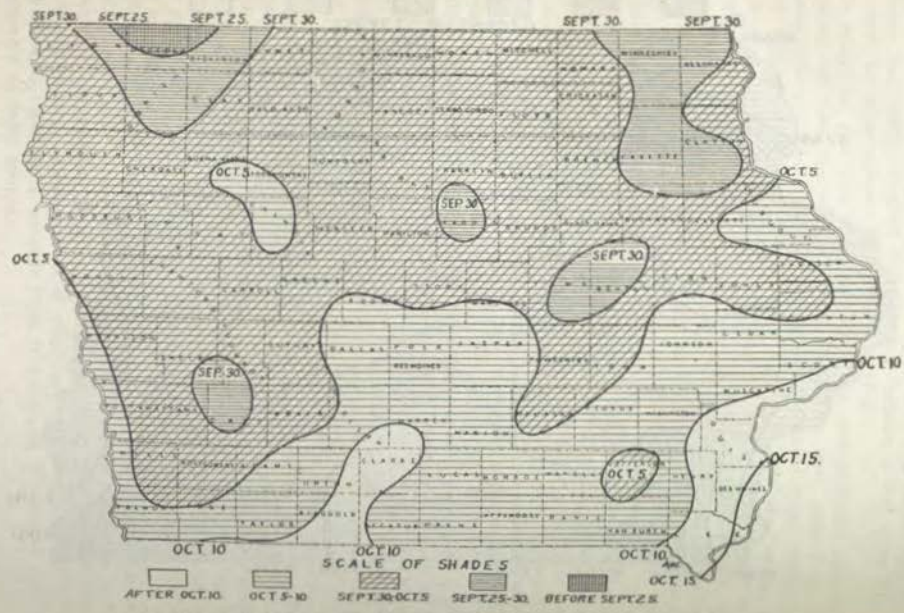
State average, May 3



FAVORABLE DATE OF LAST KILLING FROST IN WISCONSIN

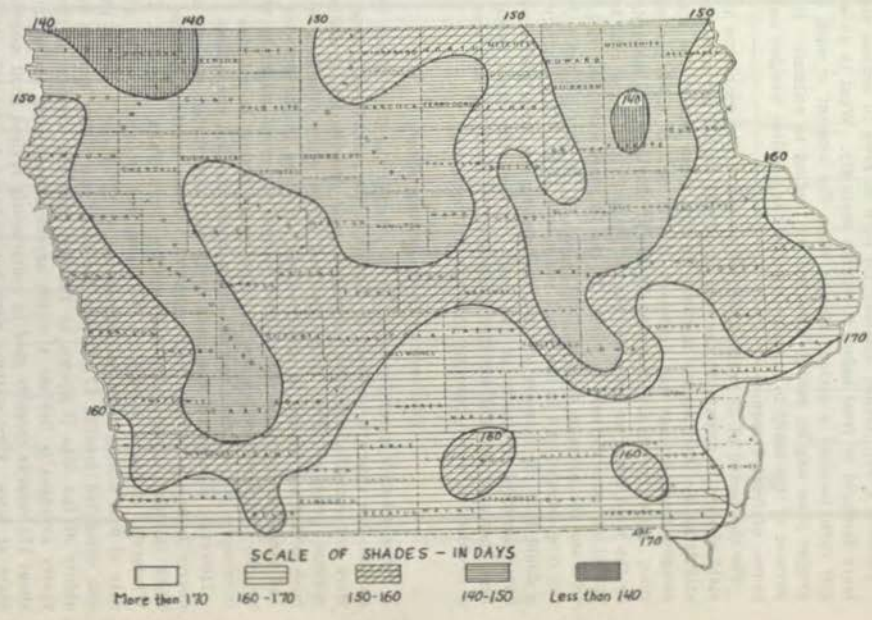
### AVERAGE DATE OF FIRST KILLING FROST IN AUTUMN

State average, October 5



### AVERAGE LENGTH OF GROWING SEASON

Number of days between last killing frost in spring and first killing frost in autumn.



## WEATHER AND CORN MATURITY IN IOWA

By Charles D. Reed,

(Weather Bureau, Des Moines, Iowa, October 26, 1927.)

Reprinted from Monthly Weather Review, Washington, D. C., November, 1927.

There is a well defined tendency for corn in Iowa to become more and more damaged by frost before it reaches maturity. What to do with the soft corn becomes a serious matter when the amount of such corn is greater than can be readily absorbed by feeding to animals. It is the purpose of this study to examine some of the possible weather and other causes of frosted corn.

For the period of 37 years, 1890-1926 inclusive, the long time trend in yield of corn is upward at the rate of 0.28255 bushel per acre per year, calculated by least square method. In the same period the corn that escaped frost damage has decreased at the rate of 0.549 per cent per year. These trends are shown by Figure 1. Dividing the maturity trend by the yield trend we get a decrease in maturity of 1.9 per cent for each bushel per acre increase in yield. In the 10 years 1890-1899, 95% of the corn on the average escaped frost while in the last 10 years 80% of the crop escaped and in the last 5 years only 73%. This scarcely leaves a doubt that the farmers of Iowa by breeding for large yields per acre have sacrificed maturity of the crop. Perhaps the yield might have been increased without sacrificing maturity, if maturity had been made a co-objective, but apparently this has not been done.

*Tendency to Later Autumn Frosts*

Yet a question naturally arises as to whether the first killing frost in autumn has shown a tendency to become earlier. State-wide frost tables were not compiled till 1904 nor can a good distribution of stations be selected prior to 1893. Even the best co-operative observing stations have occasional breaks in their records. Stations in the growing cities and larger towns could not be used because the trend might be vitiated by city influences which are probably more potent in relation to the occurrence of frost than to most other meteorological phenomena.

However, a selection was made of 12 well distributed stations having nearly complete records from 1893-1926. These stations selected were Rock Rapids, Algona, Alta, Mason City, Iowa Falls, Postville, Logan, Winterset, Clarinda, Iowa City, Oskaloosa and Bonaparte. The average date of first killing frost or temperature of 32° F., or lower in autumn was computed for the 12 stations for each year. The general dependability of the data is shown by the fact that the average of these 34 yearly averages is October 4 which agrees closely with the average of about 135 records recently used in constructing revised frost maps of the State of Iowa. City stations were not included in the 135. In a few test years for which State-wide averages are available, the 12-station average differs slightly from the State average as might be expected, yet for the purpose of determining the long time trend it is believed that the 12 stations are as useful as the 100 stations, approximately, that have been maintained.

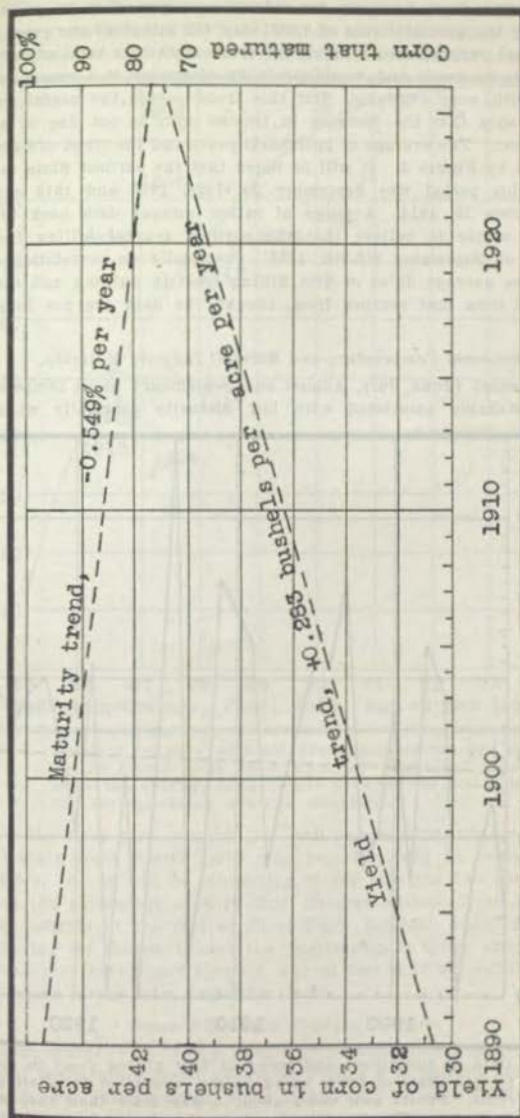


Figure 1. Trend of yield per acre and maturity of corn in Iowa.

The autumn frost tendency for this 34-year period is to grow later at the very inappreciable rate of 0.0361 day (52 minutes) per year. This for practical purposes is negligible for it amounts to a total of only 1.14 days in the 34 years and would probably disappear if a record of sufficient length were available. But this trend serves the useful purpose of reassurance that the increase in frosted corn is not due to earlier autumn frost. The average of individual years and the trend are graphically shown by Figure 2. It will be noted that the earliest State average frost in this period was September 20, 1896, 1916 and 1918 and the latest October 25, 1914. A study of rather meager data back to 1873 leads the writer to believe that the earliest general killing frost in Iowa was on September 8th-9th, 1883. Practically no correlation exists between the average dates of first killing frost in autumn and the percentage of corn that escapes frost, though the data are not here presented.

*Seasonal Temperature and Rainfall Indicate Maturity.*

Low seasonal (June, July, August and September) mean temperatures are unmistakably associated with low maturity especially when the

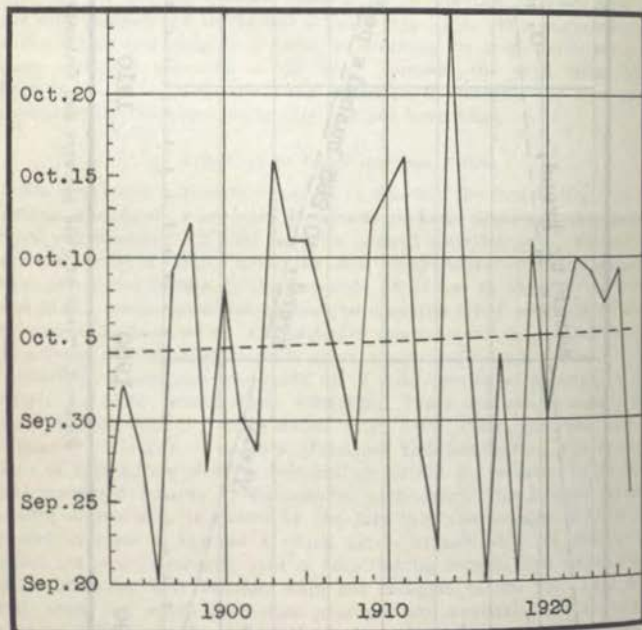


Figure 2. Date of occurrence and trend of first killing frost in autumn for the State of Iowa, based on the records of 12 selected stations. Frosts now come about a day later than they did 34 years ago. The trend is shown by the sloping broken line.

season is also wet; while seasonal mean temperatures of 71° or higher produced a maturity of 92% or higher in all of the 11 occurrences. The temperature-maturity curve, Figure 3, indicates that about 80 per

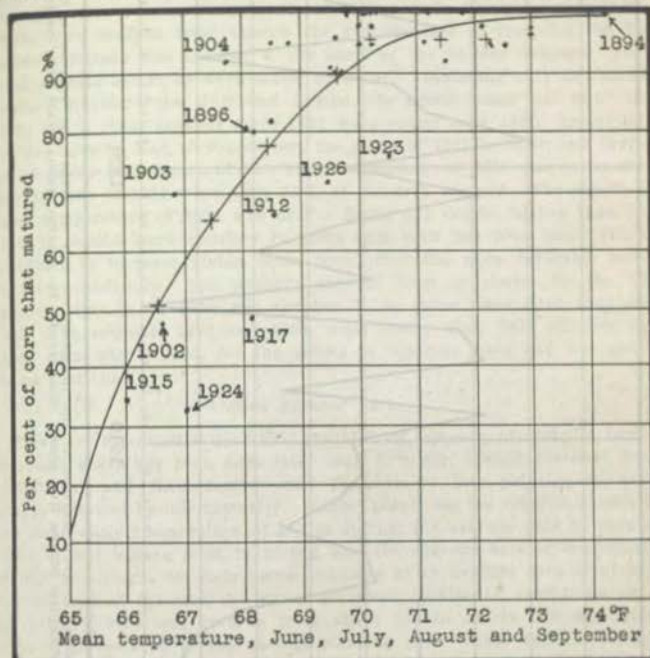


Figure 3. Relation between seasonal mean temperature and corn maturity in Iowa. Dots show data for individual years. Crosses show the average temperature between the whole degrees, and the corresponding average maturity.

cent of the Iowa corn crop of 1927 will escape frost damage. Data on this feature from nearly 1,000 crop reporters will be available about November, 10. It will be interesting to see how the two compare. In general the percentage of corn that matures without frost damage decreases roughly at the rate of about 2½% for each additional inch of rain during the season, though the relationship is better expressed by a more complex curvilinear formula, and at best it is not reliable because temperature is the more important factor.

*Seasons Growing Slightly Warmer.*

Though maturity is closely related to seasonal mean temperature, the seasonal temperature trend shown by Figure 4 is upward and therefore favorable, yet inappreciable, since it amounts to only 0.003° per year

<sup>3</sup>Later: The per cent that escaped frost damage was actually 79.

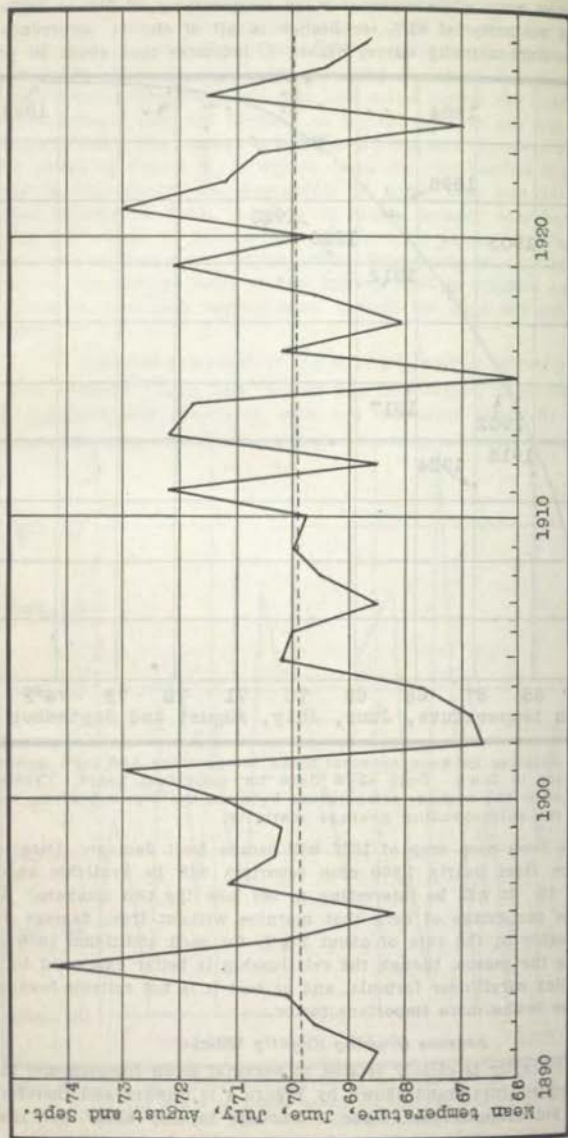


Figure 4. Iowa summers have shown a tendency to grow warmer at the inappreciable rate of 0.003° per year or a total change of 0.1° in 38 years. The sloping broken line shows this trend. In another such period this tendency might disappear.

or a total of only 0.1° in 38 years and would probably disappear in a longer record. Therefore the increase in frosted corn can not be attributed to a tendency to cooler seasons. The coolest season in 38 years was 1915 with a mean temperature of 66.0° and in that year only 35% of the corn escaped frost though the average date of frost for the 12 selected stations was October 4, the same as the 34-year average. Ten other seasons out of 38 were cooler than 1927. Including only the three summer months, June, July and August, the lowest mean was 66.8° in 1915; and 5 other seasons since 1890 were cooler than 1927. Including the five months May to September, the mean of 1927 is 66.6° and there are 10 colder periods out of 38. The frost damage of 1915 was surpassed only by that of 1924 when only 33% of the crop escaped. The seasonal mean temperature of 1924 was 67.0°. Being one degree higher than in 1915, it should have resulted in more safe corn but nine more years of efforts to increase yields, more than offset the more favorable temperature conditions. The average date of frost as shown by the 12 selected stations in 1924 was October 7, or three days later than in 1915. The seasons, 1902 and 1903, were cooler than 1924 but not so much corn was frosted, for the efforts to increase yield had not gone far at that time.

#### *Corn Planted Later.*

There are some indications that the bulk of the corn planting in Iowa in recent years has been done later than formerly, though the data are insufficient and inconclusive; and furthermore late planting is not always followed by low maturity. Kincer points out the relation between the mean daily temperature of 55° in spring, the average date of occurrence of last killing frost in spring, and the average date of beginning of corn planting.<sup>3</sup> No data being available as to average date of planting the bulk of the corn the writer set about making an annual statistical inquiry, receiving returns from about 100 to nearly 300 well distributed farmers as to the date of planting their "main fields." Seven years of these data are now available. There is not much relation between planting and frost date in individual years. For example in 1925 the average date of last killing frost was May 24, the latest in the 35 years of record,<sup>4</sup> and the average date of planting that year was May 10, the earliest of the seven years, while in 1927 the average frost date was April 24 and the planting date was May 21, the latest of the seven years. However, the spring frost date trend shown by Figure 5 is to grow later at the rate of 0.2557 day per year or a total of about 9 days in 35 years and if data were available as to date of planting the bulk of the crop, perhaps these might show a similar trend. The average date of last killing frost in spring for the State of Iowa is May 2 and on this date the State-wide normal temperature is 55.3° which checks closely with Kincer's results.

<sup>3</sup>The average of 167 stations was October 4, but the 12-station averages were used for comparison because the average of the 197 stations was not available in 1915.

<sup>4</sup>Monthly Weather Review May 1, 1919, page 215.

<sup>5</sup>Sections of Iowa were visited by a killing frost May 31, 1889 but it is impossible to strike a satisfactory State average with the data available in that year.

The average date of planting "main fields" of corn in the seven years, 1921-1927, is May 14 and the average temperature of the 7 years on that date is 56.8°. The 46-year normal temperature on May 14 is 60.2°. The difference, 3.4°, may be some indication of the lateness of planting in the last seven years as compared with the average. The normal 54.5° comes about May 6 so the lateness of the last seven years would seem to be about 8 days. As the total lateness of the frost trend is 5 days, there seems to be a coincidence if not a relationship here. Like other weather trends, this tendency to late spring frosts will no doubt soon disappear and in any event its effect on corn maturity is not important.

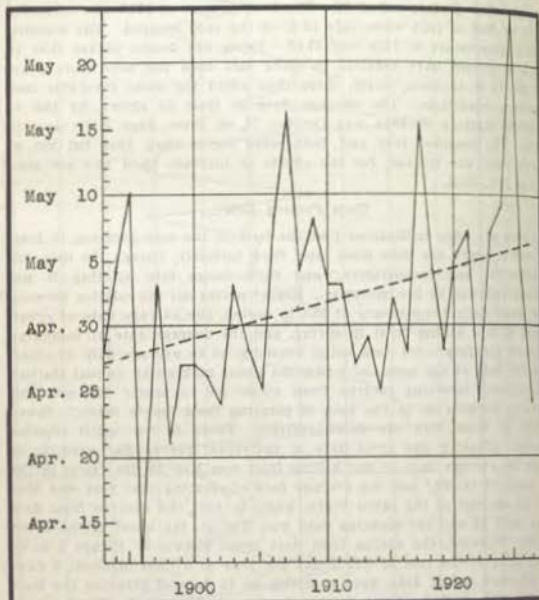


Figure 5. Date of occurrence and trend of last killing frost in spring for the State of Iowa, based on the records of 12 selected stations. Frosts now come about 9 days later than they did 25 years ago. The trend is shown by the sloping broken line. In a longer record this tendency would probably disappear.

While the seven-year period is too short for reliable conclusions, the data seem to indicate that there is a relationship between the mean temperature for 10 days before planting and the date of planting, in which

planting is about 0.3 day later for each degree cooler and that each 0.1 inch of rain in the same period delays planting about 0.5 day. The mean temperature of the month of May for 38 years shows a very slight but inappreciable upward tendency, while the April tendency is about equally downward. Late planting sometimes results from rather remote causes. For example, the late planting in 1927 was mainly caused by the unprecedented rains of September, 1926, which saturated the soil to great depths and by the rains of April which were the heaviest April rains in 29 years, rather than from May weather conditions which were not unusually abnormal. The temperature of the 10-day period preceding the average date of planting May 21, 1927, was 56.3° which is only 0.3° lower than the average of the 7 years. The rainfall in the 10-day period prior to planting was 0.2 inch below normal but the sub-soil was saturated, it had no place to go, and it made the surface soil too wet for field work.

#### *Phosphorus and Maturity.*

Another possible cause of increasing lateness in maturity that has been mentioned by some authors, is the continued removal of available phosphates from the soil by cropping without much effort to replace the phosphates by the use of fertilizers. The value of phosphorus in hastening maturity is well known.

#### *Conclusions.*

Placed in the order of rank it is believed that the causes of the increase in frosted corn are about as follows: (1). Breeding for increased yield. (2). Decrease in available phosphorus in the soil. (3). Later planting due to later frost date and other unfavorable weather conditions. Slight but inappreciable tendencies that should have operated in the direction of improved maturity have been, (1) Later autumn frosts. (2). Upward trend in seasonal temperature and also in the temperature of the month of May.

All weather tendencies will probably disappear when a sufficient length of record has accumulated.

#### DUTIES AND EXPERIENCES OF A CO-OPERATIVE OBSERVER

By Mrs. Ross Woods, Co-operative Observer,  
Palmetto, Tennessee.

Editorial Note: One session of the meeting of the American Meteorological Society held at Nashville, Tennessee, December 26, 1927, was devoted to the Tennessee Weather Service. A number of co-operative weather observers of that State were present. The following outstanding paper read by Mrs. Woods, will be interesting and inspiring to the present and future co-operative observers in Iowa.—C. D. R.

For years it has been my desire to have a convention of the weather observers of our state, that I might meet my fellow co-operatives and exchange experiences with them, but such a convention up to this time has not seemed feasible.

But now two mighty luminaries in the scientific world are in conjunction and with their combined attractive force, are drawing all the earth, great and small, toward them. The American Meteorological So-

ciety, for the first time in its history, and the American Association for the Advancement of Science, for the second time in its history, are met in our capital city. Truly opportunity is at the high tide of the spring tide and my erstwhile dream for years of too little importance to warrant fulfillment, is now a reality.

And now that I have the opportunity to speak, my heart fills so with emotion the words are choked back and with Tennyson I cry, "And I would that I could utter the thoughts that arise in me." That little latticed shed, or instrument shelter, in the yard back home does not seem to me to house mere instruments of wood and metal. Those instruments are a part of my family and as dear to me as some cherished heirloom to another. And why shouldn't I love them when I recall the days that used to be?

My father, R. S. Montgomery, known to his peers as Col. Bob, and to his inferiors as Marse Bob, was one of the earliest observers in the state. In his early twenties he began keeping a diary, a habit he continued the remaining fifty years of his life. Of course the weather furnished as ready a topic for written as for spoken thought and from weather notes in his diary, it was just a step to the daily record of a co-operative observer, which he first undertook to make for the Weather Bureau in 1883, 13 years after the organization of the Weather Bureau as a division of the Signal Service in the regular army and 8 years before it was transferred to the Department of Agriculture.

Our home was in the little village of Palmetto on the extreme western boundary of Bedford County—12½ miles from the county seat. Just across the road from "our house" was "our store" with the U. S. Post Office in the rear. This was no common ordinary store, but an institution of higher learning. My father as truly dispensed knowledge from the front porch of that old store as did the Stoic philosophers from their porch in the market place at Athens. Along about four o'clock of the afternoon, the front porch meeting adjourned to the middle of the pike and there with a pair of opera glasses, swapped from hand to hand and eye to eye, the crowd watched for the coming of the hack which brought the daily mail. And then my father opened up the newspaper and read aloud the news of the outside world. His own weather records compared earlier in the day with his neighbors' observations and with the memory of the oldest inhabitants now met comparison with the outside world.

One glance at the little latticed shed has the power to recall all these scenes of the past—the long ago past, for in 1902 the Rural Free Delivery came up our pike and since every man then could have a newspaper delivered to his own front porch, the mail hack was discontinued, the Post Office was abolished, the Store Porch Forum of the People lost its prestige, the dear old philosopher of the store porch closed his earthly records in 1905 and opened the book of life above. Last of all the store burned, but the weather records and the instruments remained and being entrusted to me were moved into the yard of my new home a few steps farther down the road.

At first I loved them because of my father, later for their own sake or shall I say because through association with my own babies they be-

came almost like one of the children. For more than twenty-two years they have stood in my yard with the pride of their thirty-eight years of unbroken record which

"Through days of sorrow and of mirth  
Through days of death and days of birth  
Through every swift vicissitude  
Of changeful time"

unbroken had stood until last summer I was absent for ten days and not even the most insistent S. O. S. could secure a substitute. Full explanations and sincere apologies were sent to headquarters which were kindly accepted.

Even the fondest mother, however, at times becomes irritated with her children, so I must confess there have been times when I wished I had never seen that shed with its instruments or at least I had never consented to be a co-operative observer. Doubtless this was when I had to arise early, cook the breakfast, get some of the children off to school, see after the ones who were too small to go, look after coops and brooders full of hungry chicks crying for their feed and perform the hundred other odd tasks that confront the farm-wife each morning, while out of the corner of my eye I saw the clock hands moving forward and realized it was almost time for the mail and the monthly record must be made out and sent in today; then it seemed as if even a camel's back couldn't stand that last straw. The sea was too far away for me to wish the shed and its contents sunk in its depths—but winds blow over land as well as sea and we have had some worthy of the name of "cyclone"—possibly I should say "hurricane" or "tornado" to be strict in the choice of names. Once the wind tipped over the shed, but it must have realized it housed government property for it left it lying on the ground.

This matter of recording the direction of the wind caused me to be subpoenaed as a witness in a lawsuit, which grew out of damage claimed for a barn supposed to have burned from sparks of a railroad engine. I was to bring my records and testify as to the direction of the wind on "said day of said burning." But the parties to the suit compromised and I did not have to appear in court. However, this little incident shows the necessity for care and accuracy in recording observations. If one could so far forget his honor as to enter any kind of record in lieu of the proper observation with the excuse, "It doesn't matter anyway," such a record might be the very one requiring accuracy. Twice my records have enabled my neighbors to collect insurance, since they proved that an electrical storm occurred on the days that it was alleged a horse and a barn were struck by lightning.

The co-operative observer of the U. S. Weather Bureau certainly has an opportunity to prove that the initials U. S. stand for *Universal Service*. Once the County Fair Association received the loan of the rain gauge as they had protected their profits with a rain insurance. I would not undertake to say how many times on a winter night I have been summoned to the telephone to answer the question, "Is it cold enough to drain the car?", "Should I put more cover over the potatoes?", etc. Or perhaps in the dry weather after a welcome shower, some one calls to



ask whether the gauge shows rain enough to do the crops any good. Or, maybe, a heavy rain causes a call to settle an argument as to whether more rain fell in the high water of December, 1926, or the high water of April of 1902. Anyone who has tried to operate the question box for an entire neighborhood knows these are only a few of the questions a co-operative observer is called upon to answer.

How very, very often, I have the pleasure of showing a visitor or newcomer the maximum and the minimum thermometers, how they keep their register till I set them, explain the way to measure the rain, of keeping the daily record and noting the direction of the wind and character of the day, all of which must be made out once a month and sent to the Weather Bureau at Nashville. Usually this information calls forth words of appreciation and commendation, but there are some who are wont to ask, "Why do you do all this for nothing?" The easiest reply is: the compensation the Government could allow for this work would be small yet there are many incompetent and irresponsible persons, who would take it for the price, small though it be. But the truest and best reason is deep within my heart and could not be understood by a disinterested listener.

In fancy I stand before the instrument, not at the time I set the thermometer and make my daily record, but this is the hour before bedtime and this is my observation; above me is the sky "that beautiful parchment on which the sun and moon keep their diary." I see it "sometimes gentle, sometimes capricious, sometimes awful, never the same for two moments together, almost human in its passions, almost spiritual in its tenderness, almost divine in its infinity," and I am glad I am numbered even though in a humble way among those who scan the sky.

What an innumerable company, they are extending back to the very edge of time, including astrologers, soothsayers, diviners and what not, who interpreted the will of their gods by the skies.

It would be interesting to follow the development of the science of meteorology down to the present time, but it is enough to say that today we read the open book of the sky, not to determine how we may propitiate angry gods, but how we may serve our fellow men. Through the agency of the Weather Bureau, millions of dollars' worth of crops are annually saved, ships at sea are warned, railroads regulate their shipments and other peace-time activities are aided. During the war, accuracy of firing was aided and propitious times for gas attacks were selected.

Just as truly as we co-operatives have helped to make the U. S. in U. S. Weather Bureau, stand for *universal service* so surely let us make it stand for *united service*. Our part may be small, but if we unite in faithfully, conscientiously doing it, we will make a firm foundation for a grander structure.

I am recalled to the present by the question, "Why do all this for nothing?", and this time I answer, "Is it nothing to have served my country, my fellow men and the future?"

## INDEX

	Pages
Alfalfa, conditions favorable for seeding.....	54
Annual report, administrative.....	5, 6
Assessors' statistics.....	5
Bees.....	62
Beets, sugar.....	71
Birds, migration of.....	12, 16
Carl, Leslie M.....	4
Chappel, Geo. M.....	4
Charts: Frost.....	99, 100, 104, 108
Length of growing season.....	101
Mean isotherms and prevailing winds, 1927.....	47
Normal precipitation.....	85 to 97
Temperature, summer mean, 38 years, 1890-1927.....	106
Total precipitation, 1927.....	46
Total precipitation at Des Moines, 1927.....	51
Tornado tracks, 1927.....	48
Climate and crop work.....	6
Climatology of the year, 1927.....	6, 7, 8
Climatological data, comparative, for 55 years.....	43
Clover seed.....	54, 66, 67, 78
Co-operative observers, duties and experiences.....	109
Co-operating organizations.....	4
Corn: By states.....	81
Condition September 1.....	31
Damage by excessive rains.....	23, 57, 58
Damage by frost.....	31, 65, 66, 71
Damage by hail.....	26, 27, 63, 66
Damage by low temperature.....	65, 66
Damage by snow.....	73
Damage by wet weather.....	69
Damage by wind.....	60
Damage by worms.....	57, 58, 59
Effect of weather on yield.....	74, 75, 102
Hogged down.....	62, 70, 71
Husking.....	35, 37, 71, 72, 73
Maturity and weather.....	102
Molded, rotted.....	69, 70
Per cent matured without frost damage.....	69, 70
Planting progress (replanting).....	55, 56, 57, 58, 59
Seed, testing and gathering.....	67, 68
Silking.....	64, 65
Crops: Acreage and production.....	54, 58, 59, 71, 74, 75, 76
Percentage condition, monthly table.....	74

	Pages
Prices, December 1.....	74, 75, 76, 77
Seeding delayed .....	54, 55, 56
Tabulated summary, 1927.....	76
United States crop summary.....	82, 83
Crop season weather by weeks, table.....	70
Drouth .....	25, 61, 64
Dust storms .....	60
Floods from downpours of rain.....	21, 23, 28, 32, 33, 56
Damage to railways.....	21
For other floods see "Rivers."	
Forecasts and warnings.....	6
By radiophone .....	6
Frosts: Last killing in spring.....	44, 99
First killing in autumn.....	35, 44, 66, 100
Maps .....	98 to 101
Fruits: Early blossoming.....	54
Loss and injury.....	55, 56, 57
Hail (See precipitation.)	
Historical data, Iowa Weather and Crop Bureau.....	4
Honey .....	59, 63
Ice harvest .....	3
Letter of transmittal.....	2
Meteors .....	13, 50
Milk flow reduced.....	64, 65, 67, 68, 71
Oats, damaged by floods, drouth, etc.....	53, 55, 57, 60, 61
Office force .....	4
Pastures: Short .....	62, 65, 67, 68
Plowing, winter and fall.....	36, 67
Potatoes .....	28, 55, 56, 57, 61, 63, 69
Precipitation: Annual chart .....	46
Annual at Des Moines, 1927.....	51
Excessive .....	17, 54, 58, 67
Hail .....	26, 27, 61, 63, 64, 66
Hailstones, discoidal, pear-shaped and spherical.....	24, 25
Normal precipitation, monthly and annual.....	84 to 97
Rainstorms, heavy, September 8th-9th, 1927.....	33, 34, 35
Sleet .....	39, 53
Snow .....	32, 53
Unusually deficient .....	35, 61
Prices .....	76, 77
Reed, Charles D.....	4
Rivers: Floods .....	19, 23, 24, 27
Sage, John R.....	4

	Pages
Soybean acreage increasing.....	54, 58, 59, 71
State data, monthly table.....	42
Swine, losses by cholera and "hog flu".....	40, 53, 66, 71, 72, 73
Temperature: Periods of high.....	31, 66, 67
Periods of low.....	20, 22, 31, 35, 39, 54
Unusually mild .....	8, 10
Summer, 38 years, 1890-1927.....	105-107
Threshing, progress .....	64, 65
Timothy seed .....	77
Tornadoes .....	22, 27
Table and chart, 1927.....	48, 49
In Iowa for 10 years, 1918-1927.....	50
United States Bureau of Agricultural Economics.....	4
United States crop summary.....	82, 83
Wealth produced on Iowa farms.....	5
Weather, by weeks, crop season, 1927 table.....	70
Effect on corn yield.....	74, 75
Weather and Corn Maturity in Iowa.....	102
Weather and crop review.....	51
What makes it thunder?.....	30
Wheat: Injury by Hessian fly.....	68
Injury from other causes.....	57
Wintered well .....	53
Wills, Merrill H.....	33
Winds: Prevailing direction, chart.....	47
Winter of 1926-1927.....	13