U. S. DEPARTMENT OF AGRICULTURE
WEATHER BUREAU

IN CO-OPERATION WITH THE

Iowa Weather and Crop Service

ANNUAL REPORT FOR 1913

GEO. M. CHAPPEL, Director

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LETTER OF TRANSMITTAL

To His Excellency George W. Clarke,

Governor of Iowa.

Sir: In compliance with the requirements of the law, I have the honor to submit herewith the twenty-fourth annual report of the Iowa Weather and Crop Service for the year 1913.

I have the honor also to submit an article pertaining to Fungus Diseases in Iowa for the year 1913, by Doctor L. H. Pammel and Charlotte M. King, which I respectfully ask to have printed and embodied in this report for future reference.

Very respectfully,

Geo. M. Chappel,
Director.

ANNUAL REPORT, 1913

The data contained in this report have been compiled from the monthly and weekly bulletins issued by the Iowa Weather and Crop Service, in co-operation with the Weather Bureau of the U. S. Department of Agriculture. In this condensed form the matter will be especially valuable and convenient for reference and comparison in future years, and that is the special purpose of this compilation.

Reports have been received regularly each month from 116 co-operative meteorological stations and from the U. S. Weather Bureau stations at Des Moines, Davenport, Dubuque, Charles City, Keokuk and Sioux City, Iowa, and Omaha, Nebr.

An effort has been made to secure at least one reliable crop correspondent in each township in the State, but while this has not as yet been attained, there are about 1,400 such correspondents who make reports on the acreage, condition, average yield and average price of staple crops during the season.

The instrumental equipment has been kept up to a high standard, new thermometers, rain gages and instrument shelters being issued to co-operative observers to replace worn out or defective instruments or equipment whenever necessary.

There have been distributed during the year 20,450 copies of the Monthly Reports of the Iowa Weather and Crop Service, and 40,000 copes of the Weekly Weather Crop Bulletins.

The daily weather forecasts were distributed by telegraph at the expense of the U. S. Weather Bureau to 70 towns, by mail to 2,439 addresses, by rural delivery to 1,444 addresses, and by free telephone to 103,156 subscribers.

Special frost warnings were sent during the fruit blooming season to all orchardists in the State, who were prepared to use orchard heaters in case of frost or injurious temperatures.

In addition to the regular monthly crop reports a special report was made each month during the growing season showing the condition and probable output of apples. This report was made in co-operation with the Horticultural Department, Iowa Experiment Station, and will be continued on a larger scale during the season of 1914.

CLIMATOLOGY OF THE YEAR 1913

The year 1913, as a whole, was the warmest year since 1894, which had the same mean temperature as the year just closed, and with one exception, 1901, the three summer months gave the highest average temperature for a like period on record. The months of June, July, August and the first week of September were excessively hot, and the first week of September broke all former records for high temperatures for that season of the year. The temperature was above the normal every month of the year, except March, May and October, the greatest excess being in November and December. November was the warmest month of that name on record and December almost equalled the record for that month in 1891. The precipitation was less than the normal for the year and for all months except March, April, May and October, when there was a slight excess. The summer months were exceptionally dry in the southern half of the State, and July gave less rainfall than any other month of that name except 1894. The high temperature and the long, severe drought that prevailed during the summer were damaging to the corn, potatoes, pasturage and the water supply, especially in the southern half of the State, where the effects of the drought were the worst since the summer of 1894.

BAROMETER (reduced to sea level). The average pressure of the atmosphere for the year 1913 was 30.04 inches. The highest pressure observed was 30.70 inches, at Keokuk, Lee County, on October 31st; the lowest pressure observed was 28.86 inches, at Charles City, Floyd County, on March 14th. The range for the State was 1.84 inches.

TEMPERATURE.—The mean temperature for the State was 49.7°, or 2.2° higher than the normal. The highest annual mean was 54.1°, at Keokuk, Lee County. The lowest annual mean was 45.6°, at Estherville, Emmet County, Northwood, Worth County, and Sibley, Osceola County. The highest temperature reported was 108°, at several stations on various dates during the summer. The lowest temperature reported was —25°, at Council Bluffs, Pottawattamie County, and at Thurman, Fremont County, on January 8th. The range for the State was 133°.

PRECIPITATION.—The average amount of rainfall and melted snow for the year was 29.95 inches, or 2.70 inches less than the normal, and 1.06 inches more than the averages in 1912. The greatest amount at any station was 45.18 inches, at Corning, Adams County, and the least amount was 20.31 inches, at Sioux City, Woodbury County. The greatest monthly precipitation was 10.25 inches, at Britt, Hancock County, in May. There was no precipitation at Lake Park, Dickinson County, and at Rock Rapids, Lyon County, in December. The greatest amount in any 24 consecutive hours was 5.25 inches, at Grinnell, Poweshiek County, on June 7th.

SNOWFALL.—The average amount of snowfall was 25.4 inches. The greatest amount reported from any station was 49.7 inches at Northwood, Worth

County, and the least amount was 10.0 inches, at Britt, Hancock County. The greatest monthly snowfall was 28.0 inches, at Inwood, Lyon County, in April. Measurable precipitation occurred on an average of 86 days. This is 2 more than for 1912.

WIND.—The prevailing direction of the wind was south. The highest velocity reported was 54 miles an hour from the east, at Sioux City, on May 13th, and from the northwest at the same station, on November 7th.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 182; partly cloudy, 89; cloudy, 94, as against 181 clear days, 91 partly cloudy days and 89 cloudy days in 1912. More than the normal amount of sunshine was experienced.

MONTHLY SUMMARIES

JANUARY.

January was an unusually mild and pleasant month, and favorable for all out-door operations and for live stock. The temperature was above and the precipitation below the normal. There was no bad storms and but little snow. The only cold period of importance was from the 5th to the 14th, inclusive, when the minimum temperature was below zero on several days; the coldest day at most stations being the 12th. From the 15th to the 30th, the temperature was moderate, and scarcely any snow fell after the 7th. A cold wave with temperature below zero passed over the state on the last day of the month. During the prevalence of the lowest temperature, in the first half of the month, the ground was generally well covered with snow, but after the 15th, the surface was mostly bare. So far as can be ascertained no material damage has been caused to fall wheat and rye, or to fruit buds.

TEMPERATURE.—The monthly mean temperature for the State, as shown by the records of 115 stations, was 20.9°, or 1.6° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 17.5°, or 1.3° higher than the normal; Central, 21.1°, or 1.9° higher than the normal; Southern, 24.2°, or 1.8° higher than normal. The highest monthly mean was 28.2°, at Keokuk, Lee County; and the lowest monthly mean, 13.8°, at Forest City, Winnebago County. The highest temperature reported was 62°, at Bedford, Taylor County, on the 25th; the lowest temperature reported was —25°, at Council Bluffs, Pottawattamie County, and at Thurman, Fremont County, on the 8th. The average monthly maximum was 53°, and the average monthly minimum was —14°. The greatest daily range was 51°, at Inwood, Lyon County. The average of the greatest daily ranges was 40°.

PRECIPITATION.—The average precipitation for the State, as shown by the records of 121 stations, was 0.77 inch, or 0.28 inch less than the normal. By sections the averages were as follows: Northern, 0.41 inch, or 0.41 inch less than the normal; Central, 0.90 inch, or 0.20 inch less than the normal; Southern, 0.99 inch, or 0.25 inch less than the normal. The greatest amount, 2.05 inches, occurred at Grinnell, Poweshiek County, and the least, 0.04 inch, at LeMars, Plymouth County. The greatest amount in any 24 consecutive hours, 1.08 inches, occurred at Grinnell, Poweshiek County, on the 22d-23d. Measurable precipitation occurred on an average of 5 days.

SNOW.—The average snowfall for the State was 7.2 inches. By sections the averages were as follows: Northern, 4.6 inches; Central, 8.6 inches; Southern, 8.3 inches. The greatest amount, 17.5 inches, occurred at Earlham, Madison County.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 14; partly cloudy, 9; cloudy, 8. The duration of sunshine was above the normal, the percentage of the possible amount being 56 at Charles City; 55 at Davenport; 73 at Des Moines; 48 at Dubuque; 56 at Keokuk; and 66 at Sioux City.

WIND.—Northwest winds prevailed. The highest velocity reported was at the rate of 48 miles an hour from the northwest, at Sioux City, Woodbury County, on the 16th.

JANUARY NORMALS FOR IOWA, 1890-1913.

Normal temperature for January, 19.2°.
Warmest January, 1891, with mean temperature of 26.0°.
Coldest January, 1912, with mean temperature of 4.2°.
Normal precipitation for January, 1.06 inches.
Wettest January, 1890, with total precipitation of 2.03 inches.
Driest January, 1899, and 1903, with total precipitation of 0.28 inch.
Average depth of snowfall for January, 7.0 inches (1893 to 1913).
Greatest snowfall in January, 12.6 inches in 1898 and 1910.
Average number of days with .01 inch or more of precipitation, 5.
Prevailing direction of wind, northwest.
Average number of clear days, 13; partly cloudy, 8; cloudy, 10.

OBSERVERS' REMARKS.

ALTA.—*David E. Hadden.* January, 1913, was remarkably mild and pleasant; one of the warmest on record. Very little snow fell, and the roads were as dry and smooth as in early autumn.

AMANA.—*Conrad Schadt.* January was extraordinarily mild and dry. The mean temperature was 7.1° above and the precipitation 0.47 inch below the normal.

BELMOND.—*Geo. P. Hardwick.* Excessive cloudiness, but light precipitation. The temperature was below zero on 12 days, yet January was an exceptionally warm month. Ice on the river pond was 22 inches thick at the end of the month. Westerly winds have prevailed during the last three months.

BONAPARTE.—*B. R. Vale.* A mild, dry and pleasant month. Temperature down to zero only twice. Had 8.2 inches of snow, but it all disappeared on the 16th.

CHARLES CITY.—*U. S. Weather Bureau.* The greatest depth of snow on the ground was 4.5 inches on the 6th. During the latter half of the month the ground was practically bare of snow.

CLINTON.—*A. E. Reid.* The ice harvest began on the 16th, but was stopped on the 23d on account of rain making the ice dangerous. It was resumed on the 29th and continued during the remainder of the month. The ice is of excellent quality and averages 12 to 15 inches thick.

DAVENPORT.—*U. S. Weather Bureau.* The Mississippi river became closed by ice during the forenoon of the 14th, but opened after midnight of the 14th-15th. It became closed again during the night of January 31st-February 1st.

DUBUQUE.—*U. S. Weather Bureau.* The winter to date (February 1st) has been mild and open, with no severe cold waves or winter storms. The temperature during the first half of January was slightly below the normal, but was decidedly above the normal during the latter half. Ice in the river channel at Dubuque, where frozen, varied from about 4 to 8 inches. Between wing dams it was 10 to 12 inches thick. The ice harvest began on the 25th. Open places in the river have been numerous this winter. The maximum stage for the month was 4.3 feet on the 11th, and the minimum, 3.1 feet on the 29th.

FOREST CITY.—*J. A. Peters.* January was a fine winter month, with very little snow and no severe storms.

IOWA FALLS.—*J. B. Parmelee.* An unusually fine month. No bad storms. No sleighing. Good roads all of the month.

KEOKUK.—*U. S. Weather Bureau.* As a rule the temperature has been mild, there being an average daily excess of 4.8° for the month. There was a cold spell from the 4th to the 14th, inclusive, snow and sleet falling during that time. The greatest depth of snow on the ground being 4.0 inches from the 7th to the 9th, but the ground was bare after the 14th. It has been a favorable month for the work of the Mississippi River Power Co., and work has progressed rapidly; there being only a few days when the temperature hindered cement work. The river was closed by ice from the 11th to the 16th, but since the latter date the river has been open below the dam. During the cold spell, ice 11 inches thick was harvested from still water.

KEOSAUQUA.—*J. H. Landes.* A mild winter month; fine for feeding stock and for all out-door work. Roads good. No ice put up in this vicinity.

MOUNT AYR.—*Alex Maxwell.* January was a beautiful winter month, with no storms and only 0.55 inch of precipitation; too dry for wheat to do its best. All kinds of stock doing well and feed plentiful. No ice harvested yet.

SIOUX CITY.—*U. S. Weather Bureau.* Clear skies and moderate temperature prevailed through the major portion of the month of January; the average temperature being 3.7° above the normal. There was 40 per cent less than the normal precipitation, and it all fell as snow from the 3d to the 7th, with scarcely noticeable flurries at intervals during the latter part of the month. There was an excess of 14 per cent in the amount of sunshine. River stages rose slowly during the month. They were about normal at lower end of district, but unusually low at the upper end. There was shore ice throughout the month with channel frozen over in a few places.

STOCKPORT.—*C. L. Beswick.* An excellent winter month for out-door work and for live stock. No bad storms. Abundance of feed. Stock generally in better condition than usual at this time of the year.

FEBRUARY.

Like the three preceding months, February was unusually pleasant, and for a winter month, fairly mild. There was no bad storms, and prior to

the 21st but little snow. The weather during the first and second decades was exceptionally pleasant, although the temperature was below zero in nearly all parts of the state on one or more days. The first was the coldest day during that period, but at most stations the lowest temperature for the month was recorded on the 24th. Another cold wave passed over the state on the last day of the month. From the 14th to the 21st the temperature was notably high; the maximum readings for the month being recorded on the 17th, 18th or 19th.

Practically all the precipitation came during the last eight days, and especially on the 21st and 22d, and from the 25th to the 27th. There were, however, light scattered snow flurries on the 4th and 16th, but at many stations the amounts were inappreciable. The snow that fell after the 20th was beneficial to fall sown grains, which were, prior to the 20th, dry and brown.

TEMPERATURE.—The monthly mean temperature for the State, as shown by the records of 118 stations, was 20.2°, or 1.0° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 16.9°, or 0.7° higher than the normal; Central, 20.4°, or 0.8° higher than the normal; Southern, 23.3°, or 1.5° higher than the normal. The highest monthly mean was 26.4°, at Centerville, Appanoose County; and the lowest monthly mean, 14.2°, at Rock Rapids, Lyon County. The highest temperature reported was 70°, at Bedford, Taylor County, on the 18th; the lowest temperature reported was —24°, at Nora Springs, Floyd County, on the 24th. The average monthly maximum was 62°, and the average monthly minimum was —12°. The greatest daily range was 49°, at Osage, Mitchell County. The average of the greatest daily ranges was 41°.

PRECIPITATION.—The average precipitation for the State, as shown by the records of 125 stations, was 0.82 inch, or 0.24 inch less than the normal. By sections the averages were as follows: Northern, 0.63 inch, or 0.31 inch less than the normal; Central, 0.80 inch, or 0.28 inch less than the normal; Southern, 1.04 inches, or 0.11 inch less than the normal. The greatest amount, 2.39 inches, occurred at Keokuk, Lee County, and the least, 0.07 inch, at Alton, Sioux County. The greatest amount in any 24 consecutive hours, 0.99 inch, occurred at Keokuk, Lee County, on the 21st. Measurable precipitation occurred on an average of 4 days.

SNOW.—The average snowfall for the State was 7.3 inches. By sections the averages were as follows: Northern, 6.4 inches; Central, 7.2 inches; Southern, 8.4 inches. The greatest amount, 15.7 inches, occurred at Northwood, Worth County, and the least, 0.5 inch, at Clarinda, Page County.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 14; partly cloudy, 7; cloudy, 7. The duration of sunshine was longer than the normal, the percentage of the possible amount being 67 at Charles City; 67 at Davenport; 64 at Des Moines; 69 at Dubuque; 53 at Keokuk; and 68 at Sioux City.

WIND.—Northwest winds prevailed. The highest velocity reported was at the rate of 36 miles an hour from the northwest, at Sioux City, Woodbury County, on the 10th.

FEBRUARY NORMALS FOR IOWA, 1890-1913.

Normal temperature for February, 20.6°.
Warmest February, 1892, with mean temperature of 28.1°.
Coldest February, 1899, with mean temperature of 12.2°.
Normal February precipitation, 1.10 inches.
Wettest February, 1911, with total precipitation of 2.76 inches.
Driest February, 1904, with total precipitation of 0.41 inches.
Average depth of snowfall, 1.3 inches (1892 to 1913 inclusive).
Greatest snowfall in February, 15.5 inches in 1905.
Least snowfall in February, 2.6 inches in 1902.
Average number of days with 0.01 inch or more precipitation, 5.
Prevailing direction of wind, northwest.
Average number of clear days, 12; partly cloudy, 8; cloudy, 8.

OBSERVERS' REMARKS.

ALTA.—*David E. Hadden.* February, 1913, was warm and pleasant with the exception of the last week, when a heavy snowstorm occurred and colder weather followed.

AMANA.—*C. Schadt.* February was a fine month with nearly normal temperature. The roads were good during the first and second, and the sleighing was fine during the last decade.

BAXTER.—*W. R. Vandike.* February was a pleasant month, with roads dry and dusty during the first and second decades. Five inches of snow fell on the 21st, and most of it remained on the ground until the end of the month. The weather was cold but pleasant after the 21st.

BEDFORD.—*E. E. Healy.* Some wheat was sown, a few gardens were made and many hens were set during the warm weather.

BELLE PLAINE.—*O. C. Burrows.* The first real sleighing of the winter came during the last week of the month. Pleasant weather prevailed throughout the month. The ground is frozen to the depth of two to three feet.

CHARITON.—*C. C. Burr.* The temperature was above the normal for the month, but it was 9° below zero on the 1st and 28th. Live stock has done well and feed is plentiful.

CHARLES CITY.—*U. S. Weather Bureau.* The first 20 days of the month were remarkably pleasant, only a trace of rain falling on the 16th. As the ground was bare of snow the frost penetrated to the depth of 6 feet, which is the greatest depth on record at the City Cemetery.

CLINTON.—*A. E. Reid.* The bulk of the ice crop was harvested by the 13th. The ice was of excellent quality and by the end of the season was 18 inches thick.

CORYDON.—*May C. Miller.* Ducks were observed flying northward on the 16th.

COUNCIL BLUFFS.—*B. W. Crossley.* Before the snow fell on the 20th the ground was deeply cracked, and winter wheat looked dry.

DAVENPORT.—*U. S. Weather Bureau.* There was no appreciable amount of precipitation from the 1st to the 19th. The snowfall of the 25th-26th, 8.3 inches, was the heaviest of the present season. The Mississippi remained frozen during the month throughout the Davenport river district.

DUBUQUE.—*U. S. Weather Bureau.* All but 0.14 inch of the total monthly precipitation occurred in the storm of the 21st-22d. Only a trace was recorded during the first 20 days. The snow, sleet, and rain storm of the 21st-22d was the worst of the winter to date, but it was not of exceptional severity. Trains on all railroads were delayed somewhat. All Chicago wires of the Western Union and Postal companies were out of commission for several days, due to the severity of the storm farther east and south. The snow did not drift much and made excellent sleighing. The average thickness of the ice for the month at Dubuque was about 14 inches. Toward the close of the month it was becoming rotten and unsafe to measure.

FOREST CITY.—*J. A. Peters.* With the exception of the snowstorm on the 21st the month was very fine.

GREENFIELD.—*Frank A. Ward.* Fine weather prevailed all the month except during the last week, which was stormy.

KEOKUK.—*U. S. Weather Bureau.* Winter wheat is reported to be in excellent condition, and will be further benefited by the present snow covering. The construction work of the Mississippi River Power Co. has been interrupted on only a few days, and the work is rapidly approaching completion. The ice in the river has been held by the Power Company's dam north of the station, and only shore ice was present south, which melted by the 18th, forming again during the last week.

KEOSAUQUA.—*J. H. Landes.* February came with a temperature 4° below zero and went out with a temperature of 5° below zero, with 9 inches of snow on the ground. It was, however, an exceptionally fine winter month.

MOUNT AYR.—*Alex. Maxwell.* The snow of the last week has been fine for winter wheat. The weather during the first three weeks was exceptionally pleasant, and the roads fine, but dusty.

NORTHWOOD.—*J. M. Darby.* February was a fine month. Winter wheat is now under a blanket of snow, but it was brown and the ground was dry prior to the snowstorm on the 20th.

SIOUX CITY.—*U. S. Weather Bureau.* Except for light snow on the 6th, precipitation was confined to the last decade. Snow remained on the ground after the 19th; the greatest depth was 5.7 inches on the 22d.

WAUKEE.—*Samuel F. Foft.* The first half of the month was pleasant, with good roads, but the latter half was somewhat cloudy and changeable, ending with ground covered with snow, which will be beneficial for fall grain and meadows.

MARCH.

March was cold, wet and changeable, with frequent high winds, and in many localities destructive wind storms. The most marked characteristics of the month were the low temperatures recorded on the 2d and the wind storms on the evening of the 23d.

The temperature was below zero on the morning of the 2d in all parts of the state, and at nearly all stations it was the lowest reading for the winter, and at many stations the lowest on record for the month of March. The minimum temperatures on that date ranged from —4° at Burlington to —23° at Inwood. The temperature was also below zero in many localities on the 1st, and at a few stations in the northern counties on the 6th. The 18th, 19th and the last three days were moderately warm.

The precipitation was fairly well distributed throughout the month, although the amounts were small until the 13th and mostly in the form of snow, but from the 12th to the 25th precipitation was frequent, and at times, heavy, especially between the 13th and 15th. The last five days of the month were generally clear and moderately warm and the soil dried rapidly.

As a whole, the month was unfavorable for farm operations. The soil was wet and cold and practically no field work was done until the last three or four days, when a little plowing and seeding was accomplished. Fall sown grains, clover, grasses and fruits were, however, in fine condition, with scarcely any indications of winter killing.

TEMPERATURE.—The monthly mean temperature for the state, as shown by the records of 115 stations, was 31.9°, or 2.1° lower than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 28.9°, or 2.3° lower than the normal; Central, 32.3°, or 1.9° lower than the normal; Southern, 34.5°, or 2.2° lower than the normal. The highest monthly mean was 37.0°, at Keokuk, Lee County; and the lowest monthly mean, 26.2°, at Forest City, Winnebago County. The highest temperature reported was 78°, at Mount Pleasant, Henry County, on the 30th; the lowest temperature reported was —23°, at Inwood, Lyon County, on the 2d. The average monthly maximum was 65°, and the average monthly minimum was —14°. The greatest daily range was 61°, at Inwood, Lyon County. The average of the greatest daily range was 43°.

PRECIPITATION.—The average precipitation for the state, as shown by the records of 121 stations, was 2.48 inches, or 0.56 inch more than the normal. By sections the averages were as follows: Northern, 2.42 inches, or 0.69 inch more than the normal; Central, 2.58 inches, or 0.60 inch more than the normal; Southern, 2.43 inches, or 0.38 inch more than the normal. The greatest amount, 5.88 inches, occurred at Marshalltown, Marshall County, and the least, 0.74 inch, at Rock Rapids, Lyon County. The greatest amount in any 24 consecutive hours, 2.54 inches, occurred at Nora Springs, Floyd County, on the 13th and 14th. Measurable precipitation occurred on an average of 9 days.

SNOW.—The average snowfall for the State was 5.3 inches. By sections the averages were as follows: Northern, 6.2 inches; Central, 5.2 inches; Southern, 4.5 inches. The greatest amount, 14.5 inches, occurred at Charles City, Floyd County; and the least, a trace, at Cumberland, Cass County, and at Keokuk, Lee County.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 11; partly cloudy, 10; cloudy, 10. The duration of sunshine was below the

normal, the percentage of the possible amount being 59 at Charles City; 65 at Davenport; 62 at Des Moines; 51 at Dubuque; 56 at Keokuk; and 55 at Sioux City.

WIND.—Northwest winds prevailed. The highest velocity reported was at the rate of 53 miles an hour from the northwest, at Sioux City, Woodbury County, on the 1st.

MARCH NORMALS FOR IOWA, 1890-1913.

Normal temperature for March, 34.2°.
Warmest March, 1910, with mean temperature at 48.9°.
Coldest March, 1899, with mean temperature of 23.0°.
Normal March precipitation, 1.76 inches.
Wettest March, 1901, with total precipitation of 2.64 inches.
Driest March, 1910, with total precipitation of 0.17 inch.
Average depth of snowfall, 5.4 inches (1892 to 1913, inclusive).
Least snowfall in March, trace, in 1910.
Average number of days with 0.01 inch or more of precipitation, 6.
Prevailing direction of wind, northwest.
Average number of clear days, 12; partly cloudy, 8; cloudy, 11.

OBSERVERS' REMARKS.

ALTA.—*David E. Hadden.* March was cool with frequent light snows and rains. Severe wind squall accompanied by sharp lightning and hail did some damage to farm buildings south of Alta on evening of the 23d.

AMANA.—*Conrad Schadt.* There was a terrific wind storm, with lightning, thunder and rainfall about 10 p. m. on the 23d.

ATLANTIC.—*Thos. H. Whitney.* An unfavorable month for outdoor work. At close of month no progress had been made in farming operations.

BELLE PLAINE.—*O. C. Burrows.* March was very stormy and changeable, with high winds. It was, by far, the most disagreeable month of the winter season. Owing to frost and frequent rains and snows it has been impossible to get in the fields for spring work.

BELMOND.—*Geo. P. Hardwick.* March came in with the only real blizzard of the winter. Brisk to high winds prevailed the greater part of the time, and a tornado or high wind was reported northwest of Belmond on the evening of the 23d, which blew down some buildings and windmills.

BRITT.—*L. M. Goodman.* On the evening of the 23d there was lightning and thunder during a heavy fog which was followed by rain, hail and high winds. A small tornado passed 6 or 7 miles south of here. A A deposit of yellow mud fell with the rain.

CHARITON.—*C. C. Burr.* March was the worst month of the winter and the hardest on stock. Frequent snows and high winds prevailed. Soil is in fine tilth, and oats sowing will begin on April 1st. Feed is plentiful.

CLINTON.—*A. E. Reid.* Reports indicate that a tornado cloud passed high over Clinton between 11 p. m. and midnight of the 23d.

CORYDON.—*May C. Miller.* Bluebirds appeared on the 8th, and robins on the 9th. On the 23d a very hard wind prevailed all day, increasing to a gale at 9 p. m., accompanied by thunder and lightning and hail. Some trees were blown down and some sheds were unroofed.

DAVENPORT.—*U. S. Weather Bureau.* The precipitation during and immediately preceding the violent wind and thunderstorm of the night of March 23d-24th, a report of which will be found on another page of this report, caused a sharp rise in the Mississippi which was already rather high. At Clinton, Iowa, the highest stage was 12.5 feet, on the 26th and 27th, or 3.5 feet below flood stage; at Le Clair, Iowa, the highest reading was 8.0 feet, on the 27th, which was 2.0 feet below the flood stage. At Davenport, the highest stage was 12.9 feet, at 6:00 p. m. of the 27th, or 2.1 feet below the flood stage. The crest of the rise passed Muscatine, Iowa, on the 28th, where the stage was 14.6 feet, or 1.4 feet below the flood stage. No damage of any consequence resulted from the high water in the Davenport river district.

DUBUQUE.—*U. S. Weather Bureau.* The temperature conditions were excellent during the month, as there were no periods sufficiently warm to force vegetation. The minimum of the 2d (—10°), was the lowest at this station in March, except —12° on March 2, 1890. The ice moved down stream at Dubuque on the 13th, and at Prairie du Chien, Wis., and Lansing, Iowa, during the week following.

EARLHAM.—*Geo. Phillips.* Sod plowing began on the last day of the month, with some frost still in the ground.

FAYETTE.—*R. Z. Latimer.* Ice broke up and went out of the river on the 8th. Robins were plentiful on the 10th.

FOREST CITY.—*J. A. Peters.* Frost not all out of the ground at the close of the month. No seeding or field work done.

HARLAN.—*C. A. Reynolds.* At 7 p. m. a tornado began about four miles south of town, passing east of the city about one and one-half miles and extending northeastward about 15 miles. Much damage done to property.

INWOOD.—*F. B. Hanson.* Some wheat was sown, but very little field work was done during March.

IOWA CITY.—*Prof. Arthur G. Smith* Ice went out of the Iowa River on the 14th. On the 23d there was a light drizzle throughout the day, with heavy thunderstorm in the evening, and heavy wind at 11 p. m.

KEOKUK.—*U. S. Weather Bureau.* The month began very cold, the temperature reaching 7 below zero on the moring of the 2d, which was the lowest temperature recorded during any March in the past 42 years. Robins appeared on the 8th. At the close of the month the ground is frozen a few inches below the surface, and no plowing or oats seeding have been done. Streams are generally bank full, and the Mississippi is within 2 feet of the flood stage.

NORTHWOOD.—*Chas. H. Dwelle.* A severe wind storm did much damage to buildings on several farms near here, between 8 p. m. and 9 p. m., March 23d. The storm was general over this section of the state.

SIOUX CITY.—*U. S. Weather Bureau.* The average hourly velocity of the wind, 16.2 miles per hour, has been exceeded but once since 1889. Velocities of 30 miles or more per hour occurred on 16 days. River stages were unusually low at this point except during the last three days of the month. There was a rise of 5.6 feet on the 29th, but the crest passed on that day and stages fell slowly thereafter. The shore ice began breaking here on the 10th, and floating ice passed till the 31st.

REPORT ON THE TORNADO AT OMAHA, NEB., OF MARCH 23, 1913.

By L. A. Welch, Local Forecaster, U. S. Weather Bureau.

The tornado that passed through the city of Omaha, on the evening of Easter Sunday, March 23, 1913, was undoubtedly the most destructive to life and property that ever occurred in the Missouri Valley, and probably one of the most destructive in the history of the country. The storm, attended by the pendant, funnel-shaped cloud, first struck the city at its extreme southwest limit, point northeast across the western and northern portions of the city to Cut Off Lake, which is located near the Missouri River and in the extreme northeast portion of the city. The length of the tornado path, between the points named being about five miles, and its width, in the line of destruction across the city, varied from about one-fifth to one-fourth of a mile. The length of time consumed in the passage of the tornado across the city cannot be exactly ascertained, but it is believed to be about 13 minutes. The funnel cloud passed 40th and Farnum Streets at 5:49 p. m. and 24th and Lake Streets at 5:55 p. m., having traveled slightly more than two miles during that interval. The distribution of the wreckage and debris leaves unmistakable evidence of rotary winds, and the presence of a whirl in the cloud at the points in the path where the greatest violence was shown and the greatest destruction occurred; this was particularly the case at the Sacred Heart Convent, at 36th and Burt Streets, in Bemis Park, and at 24th and Lake Streets. At other points along the path, in the more open places, the wreckage and debris lay in a general direction coincident with the path, this is from the southwest to the northeast. A terrific grinding, roaring noise that was distinctly heard several blocks distant from the path accompanied the storm.

The total number of persons killed in Omaha was 94; this includes those instantly killed, and those whose deaths resulted from injuries received. The number of persons seriously and slightly injured will run into the hundreds. The greatest number of persons killed in any locality was in the vicinity of 24th and Lake Streets; that section being the most thickly populated, and the houses there being of poorer construction were generally completely demolished. The number of animals killed was 33 horses, four cows and five mules. The number of houses completely demolished was 600, and 1,129 were partially destroyed or badly damaged. The estimated property loss, including homes, furniture, personal property, wiring, poles, street cars, trees, fences, etc., is about three and one-half million dollars.

The following meteorological conditions were noted in connection with the passage of the storm, it being borne in mind that this station for which the data are given, is southeast of, and about one and one-fourth miles distant from the nearest point within the path of the tornado. The barometer which had begun to fall on the 22d, continued to fall steadily during the day up to the moment of the passage of the storm, at which time the lowest pressure was recorded, then the pressure began to increase rapidly with marked fluctuations in its movement upward. At 7 a. m. the pressure was 28.51 inches; at noon, 28.36; at 4 p. m. 28.17 and the lowest pressure, 27.93, was recorded as the tornado passed, and at 7 p. m. it had increased to 28.12. At 7 a. m. the temperature was 40 degrees, and continued rising until 4 p. m. when the minimum for the day, 68 degrees, occurred. The sky was overcast from the early morning with stratocumulus clouds, until the middle of the afternoon when for an hour or so it was only partly obscured. About 4:30 p. m. the sky again became overcast, and grew more and more threatening and ominous in appearance until the terrible storm, aproaching from the southwest, burst upon the city. At 5:10 p. m. distant thunder was heard, and rain began to fall which continued until 7:35 p. m., falling heavily at intervals, small hail mingling with the rain from 5:40 p. m. to 5:50 p. m. The prevailing wind for several hours preceding the storm was from the south, but for a period of 15 minutes before the storm struck it became very changeable, with increasing velocity, and blew from all directions, but the general direction maintained during the passage of the tornado was from the southwest. The extreme velocity of the wind recorded at the station during the storm was 34 miles an hour, occurring at 6:17 p. m.

As a further description of the meteorological elements accompanying the tornado, I include herein the notes of the observations made by Prof. A. E. Schmitt, a member of the faculty of Creighton University, who kindly furnished them for my information, and as the university from which his observations were made is located at 25th and California streets, or within eight blocks of the tornado path it is thought that his observations would add to the value of this report. Professor Schmitt says:

"My attention was first called to the gathering of a storm at 4:30 p. m. when the cirrus sheet, which was spreading across the sky from west to east, obscured the sun. By 5 o'clock two-thirds of the sky were covered by the cirrus, and a few scattered fractocumuli were scudding at a moderate altitude from southwest to northeast. At about 5:10 a light rain began to fall, and after this there was considerable play of lightning among the clouds and an almost constant light rumble of thunnder. There were, however, as far as I saw, no passages of lightning between clouds and earth at any time before the tornado passed. At approximately 5:30 the clouds had lifted from the horizon everywhere, except for a very short stretch in the southwest. This last fact, the peculiar color of the clouds—a muddy buff—and the time of day led me to suspect somewhat the approach of a tornado, but as the wind had shown no signs of veering, as I thought it should, and the season was so early for a storm of this character, I abandoned the idea, and returned to my desk. A

and pelting of light hail at my windows, and the flickering of the electric light brought me out once more. And there was the funnel-shaped cloud coming down the hill southwest of us at about 40th street. I looked at my watch—it was just 5:49. In front the funnel was sharply defined even to the very ground and its circulation, counter-clockwise, upward and extremely violent, was easily discernible. On either side, however, and in the rear, rolling clouds of dust and vapor hid the outlines of the funnel. I timed the forward progress of the funnel cloud after it had passed California street and found it to be approximately 400 feet per 16 seconds. It was just 5:49 when I first saw the cloud at about 40th and Farnum and it was 5:55 when it crossed 24th street. It moved on much more deliberately than I had expected, the lower extremity dragging considerably behind the rest of the cloud. It was rather dark immediately in front of the funnel, but surprisingly light outside the path. The clouds quarter of an hour or so later the pronounced strengthening of the wind, above us hung low, and rushed by at great speed, but showed no gyratory motion. Immediately behind the storm the sky was clear up to the cirrus sheet. Above the funnel the cumulo-nimbus was banked mountain high, much higher than I have ever seen it after the passage of a severe thunderstorm. Before long streamers of mist hung down almost to the ground. At the same time the clouds over Council Bluffs had a similar appearance."

STORMS IN IOWA ON MARCH 23, 1913.

During the evening of Easter Sunday, March 23, 1913, several tornadoes moved from Nebraska across the Missouri River into Iowa. In a preliminary report on the general weather conditions that prevailed in Nebraska during the month of March, the Section Director, U. S. Weather Bureau, Lincoln, Neb., says:

"There was a rather rapid procession of warm and cool periods, due to the movement of energetic cyclones eastward, with the center near this section. On the 23d one of these was central over southeastern Nebraska in the late afternoon, and between 5 and 6 p. m. Several distinct tornadoes formed and moved northeastward across the eastern part of the state. One moved from about four miles south of Douglas, Otoe County, to the Missouri River near Rock Bluff, a distance of about forty miles. In its course it destroyed the small town of Berlin and some forty farm buildings. Another moved from near Papillion, in Sarpy County, northeastward across Douglass County, to the Missouri River just north of Omaha. It passed through Omaha and Ralston and did a large amount of damage. A third moved from a point south of Mead, Saunders County, northeastward to the Missouri River just south of De Soto. It destroyed the small town of Yutan, and a large number of farm buildings. A fourth moved from near Craig, in Burt County, northeastward to the Missouri River, and destroyed several farm houses."

The storm that devastated such a large part of the city of Omaha, a report of which is given in preceding article, crossed the Missouri River just north of Council Bluffs, moving northeastward through Pottawattamie County, and over southeastern Harrison, Shelby, Carroll, Greene, southern Webster, Hamilton, northwestern Hardin, Franklin, Bremer, Fayette, southeastern Winnebago, northeastern Clayton and Allamakee. Another storm which originated near Bellevue, Neb., crossed the river near Lake Manawa, just south of Council Bluffs, and moved northeastward up Mosquito Creek, and west of Harlan, Shelby County. The storm that passed through Berlin, Neb., and Mills County, Iowa, crossed the river south of Pacific Junction and moved northeastward over Mills and Pottawattamie Counties, and east of Harlan, Shelby County. A fourth storm, or the Yutan, Neb., tornado, crossed the river near De Soto on the Nebraska side into Harrison County, Iowa, near California Junction, thence northeastward across the county. Another tornado is reported from Burt County, Neb., which may have crossed the river north of Tekamah, Neb., into Monona County, Iowa, but if so it was too high to have caused much, if any damage. While all of these storms were undoubtedly typical tornadoes in Nebraska, most of the manifestations on this side of the river indicated, over the larger part of these courses, straight line squalls. The storms that passed north of Council Bluffs, over Lake Manawa and through Mills County, did, however, show tornadic characteristics through a part of their course, but it is believed that after passing through Shelby County the funnel clouds did not reach the earth, although the tornado roar was heard up in the clouds all along the storm track to the northeastern part of the state. Not only was the roar heard along the main course of the storms, but it attended many local storms in various parts of the state, indicating a violent disturbance above the earth. The several storms crossed the river within a few moments of each other. The Omaha storm struck the Iowa side about 6 p. m. and the Manawa and Mills County storms about 6:15 p. m., and the disturbance passed off over the Mississippi River about midnight. During those hours, severe, and in many places destructive, wind squalls occurred in all parts of the state except the nothwestern counties. As said before, the storms in Mills, Pottawattamie, Shelby and eastern Harrison Counties were undoubtedly of a true tornadic character, and in those counties the damage done was great. In Pottawattamie County there were 17 people killed at Council Bluffs, 2 at Weston, 2 at Gilliat, and 3 at Neola. In Mills County there were 5 killed near Glenwood, and in Harrison County there were 2 killed at Logan and 2 at Beebetown, making a total of 33 killed, and there were more than 100 injured. The property loss in the state is estimated to be more than one million dollars.

The morning weather map of March 23d showed a well defined area of low barometric pressure over Colorado, moving east or a little north of east. The center of this disturbance crossed the Missouri River, north of Omaha a few minutes after the passage of the tornado. Over Iowa the atmospheric pressure decreased all day, or until after the passage of the storm center, which crossed the Missouri River about 6 p. m. and the Mississippi River about midnight. The temperature was moderately low

during the forenoon but rising slowly until about 4 p. m. when it began rising rapidly, attaining a maximum at Des Moines of 66 degrees at 8:30 p. m. Rapid changes in cloudiness were observed from 4:30 p. m. to 8 p. m., accompanied by increasing wind velocity, falling barometer, and rapidly rising temperature. Just preceding the passage eastward of the storm center, severe thunderstorms occurred attended by rain and wind squalls. At many places in the state heavy hail accompanied the rain. Near Weston, Pottawattamie County, some of the hail stones were 3 to 6 inches in circumference.

STORM OF MARCH 23, 1913.

J. M. Sherier, Local Forecaster,
U. S. Weather Bureau.

Davenport, Iowa, April 3, 1913.

At 11:30 p. m. of March 23, 1913, this section was visited by the most destructive wind storm of recent years. The barometer, which had been falling steadily during the preceding 36 hours, reached its lowest point, 29.43 inches, reduced to sea level, at midnight of the 23d-24th. The temperature had risen from 34 degrees at 7 a. m. to 66 degrees at about 11 p. m. and the conditions were oppressive during the evening and before 11:25 p. m., notwithstanding the fact that the wind increased after sunset and frequently exceeded a rate of 30 miles per hour after 7:30 p. m. Clouds had covered the sky until nearly 8 p. m., with rain from during night a. m. to 1:25 p. m. and a light thunderstorm from 4:44 p. m. to 7:23 p. m. Party cloudy weather prevailed from 8 p. m. to 9 p. m., after which time it was again generally cloudy. At 10 p. m. heavy stratus clouds were observed coming from the southwest which overspread all except the southern third of the sky by the time the opposite horizon had been reached. In addition to their progressive motion from the southwest, there was a tumultuous movement on the part of the swiftly moving facto-stratus clouds that suggested the wave motion of a large body of water. Until 10:45 p. m. a remarkably even border was maintained along the southern edge of the field of lower clouds, beyond which only occasional fracto-cumulus clouds were seen to go. South of this border, and especially in the vicinity of the moon, the light cirro-stratus clouds had a greenish-yellow color, resembling that of cheese. Shortly after 11:00 p. m., the sky became entirely overcast; but there was at no time any formation that indicated the presence of a vortex, though the pitching motion, already mentioned, was particularly marked between 11:30 p. m. and midnight. At 11:25 p. m., the wind suddenly increased in force, reaching an extreme velocity of 60 miles per hour 5 minutes later and maintaining an average velocity of 48 miles per hour from 11:26 p. m. to 11:31 p. m., after which time the rate of movement decreased. A second furious squall began at 12:05 a. m. of the 24th and lasted until 12:30 a. m., with an extreme velocity of 42 miles per hour

at 12:07 a. m. When the wind was highest it appeared to come in a rapid succession of gusts and to have an unusual upward force, causing in houses of ordinary construction a vibration similar to that imparted to a vessel by the motion of its screw. At the time of the highest velocity, the wind was fairly steady from the southwest and was at all times from some point in the quadrant from south to west. All wreckage, so far as observations extend, was carried to the eastward of its original position. Light rain began at 11:10 p. m., and ended after midnight of the 23d-24th. A heavy dash of rain occurred from 11:35 p. m. to 11:42 p. m. and was mixed with hail, ranging in size from about 0.2 inch to 0.4 inch in diameter, from 11:40 to 11:42. On account of the danger of freezing temperature, the tipping bucket had been removed from the self-registering rain gauge and the exact rate of rainfall could not be determined. The total precipitation between 7 p. m. of the 23d and 7 a. m. of the 24th, however, was but 0.12 inch. The first thunder was heard at 11:35 p. m. of the 23d and the last thunder occurred about 1:00 a. m. of the 24th. The lightning was most vivid about 11:45 p. m., but not especially close. Aside from the roar of the wind and the hissing of the rain and hail, no unusual noises were noticed.

On the morning of the 24th it was found that all surfaces upon which the rain had dried contained a light deposit of soil which appeared to be yellow clay and which was unlike the surface soil in this vicinity. In the depressions of the metal roof of the Masonic Temple, a building 5 stories in height, the deposit of mud was so thick that it curled along the edges of the tiny puddles as the water evaporated. Numerous reports of the same muddy rain water had been received from Rock Island and Moline, Ill.

In the western portion of the city, three large iron smoke stacks at the plant of the Corn Products Refining Company were blown down, causing a loss of about $5,000. The Davenport Locomotive Works also lost three smoke stacks and it will cost approximately $3,500 to repair the damage at that factory. Two large smoke stacks were blown down at the wheel and wagon works of Messrs. French & Hecht, a few blocks east of the station, damaging the roof of one of the buildings. The roof of the elevator shaft was also twisted from its position by the wind, without being carried away. The actual property loss at that point was about $5,000, but the factory was forced to close and the loss incident to the suspension of operations will be several times the amount already named. The tin roof of the building occupied by the Peter Lamp Iron Company, in the center of the business district, was torn away, causing a loss of about $1,000. Two large plate-glass windows in the New Putnam building, valued at $400, were demolished; and in various portions of the city smaller windows were blown in, chimneys were thrown down and roofs were damaged to some extent. Farm houses and outbuildings were damaged or destroyed at numerous places throughout the surrounding country; and, in some instances, stock was killed. The total damage in this locality is estimated to be about $30,000. On account of the sheltering bluffs to the southward, no serious loss occurred in the cities of Rock Island and Moline, Ill. Telegraph and telephone wires were

prostrated in all directions, however, and it was late in the forenoon of the 24th before communication with outside points could be resumed.

Miss Lulu Ellison was killed near Erie, Ill., a small town about 25 miles northeast of Davenport, when the house in which she was asleep collapsed. Mr. Harry Brown, of Davenport, was struck by flying boards and injured, though not seriously.

APRIL.

With the exception of the five days from the 7th to the 11th, inclusive, when precipitation was almost continuous, April was a pleasant month, and favorable for farm operations. The period of precipitation was remarkable not only for its long duration, which in many localities was unprecedented, but for one of the heaviest snowstorms on record in the west central and northwestern counties on the 9th and 10th. Some snow fell in nearly all parts of the State during the storm, but the amounts were small over the eastern and southern counties. In the area of the heavy snowfall considerable damage was caused to trees, and in Sioux City, where more than 20 inches fell, street car service had to be suspended for 36 hours, and telephone and lighting service were badly demoralized. Some of the snow remained on the ground for four days. Another remarkable feature of the month was the tornado which passed over Douglass Township in Madison County on the evening of the 2d

Notwithstanding the fact that there were many cold nights, the average temperature for the month was 1.7° above the normal. Freezing temperatures occurred in all parts of the State on one or more nights, and were unseasonably low between the 26th and 28th. The 30th was generally the warmest day, when the maximum temperatures were 80° or higher.

There was an average of 0.46 inch more than the normal precipitation and the most of it came from the 7th to the 11th, inclusive, but scattered showers occurred from the 2d to the 4th and from the 18th to the 24th inclusive.

Owing to the wet weather during the first 11 days of the month farm work was delayed, but by the close of the month practically all of the seeding of small grain was finished, early potatoes were planted and much ground was prepared for corn. Grasses and winter wheat and rye were in fine condition, and fruit trees were showing abundance of bloom in southern, and beginning to blossom in northern counties.

TEMPERATURE.—The monthly mean temperature for the State, as shown by the records of 113 stations, was 50.2°, or 1.7° higher than the normal for Iowa. By section the mean temperatures were as follows: Northern, 48.2°, or 1.4° higher than the normal; Central 50.6°, or 2.1° higher than the normal; Southern, 51.9°, or 1.6° higher than the normal. The highest monthly mean was 54.4°, at Northboro, Page County; and the lowest monthly mean, 45.4°, at Rock Rapids, Lyon County. The highest temperature reported was 88°, at 5 stations, on the 30th; the lowest temperature reported was 16°, at Washta, Cherokee County, on the 12th. The average monthly maximum was 84°, and the average monthly minimum was 27°. The greatest daily range was 51°, at Elkader, Clayton County. The average of the greatest daily ranges was 40°.

PRECIPITATION.—The average precipitation for the State, as shown by the records of 120 stations, was 3.29 inches, or 0.46 inch greater than the normal. By sections the averages were as follows: Northern, 3.77 inches, or 1.30 inches greater than the normal; Central, 2.91 inches, or 0.04 inch greater than the normal; Southern, 3.20 inches, or 0.66 inch greater than the normal. The greatest amount, 7.43 inches, occurred at Inwood, Lyon County, and the least, 1.12 inches, at Cedar Rapids, Linn County. The greatest amount in any 24 consecutive hours, 3.08 inches, occurred at Sioux City, Woodbury County, on the 9th and 10th. Measurable precipitation occurred on an average of 9 days.

SNOW.—The average snowfall for the State was 2.9 inches. By sections the averages were as follows: Northern, 6.0 inches; Central, 2.4 inches; Southern, 0.2 inch. The greatest amount, 25.0 inches, occurred at Inwood, Lyon County; no snowfall occurred in the extreme southern part of the State.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 15; Partly cloudy, 5; cloudy, 10. The duration of sunshine was above the normal, the percentage of the possible amount being 70 at Charles City; 71 at Davenport; 68 at Des Moines, 64 at Dubuque; 62 at Keokuk; and 64 at Sioux City.

WIND.—South winds prevailed. The highest velocity reported was at the rate of 50 miles an hour from the south, at Sioux City, Woodbury County, on the 30th.

APRIL NORMALS FOR IOWA, 1890-1913.

Normal temperature for April, 49.1°.
Warmest April, 1896, with mean temperature of 54.5°.
Coldest April, 1907, with mean temperature of 41.5°.
Normal April precipitation, 2.95 inches.
Wettest April, 1897, with total precipation of 5.35 inches.
Driest April, 1907, with total precipitation of 1.32 inches.
Average depth of snowfall in April, 2.0 inches (1892 to 1913, inclusive).
Greatest snowfall in April, 6.0 inches in 1893.
Least snowfall in April, trace, in 1897, 1898 and 1902.
Average number of days with 0.01 inch or more of precipitation, 8.
Prevailing direction of wind, northwest.
Average number of clear days, 12; partly cloudy, 9; cloudy, 9.

OBSERVERS' REMARKS.

AFTON.—*N. W. Rowell.* With the exception of the 5 days from the 7th to the 11th inclusive when rain was almost continuous, April was a fine month. The rain was beneficial notwithstanding it delayed spring work. At the end of the month, leaves on the trees are large enough to cast a shadow.

ALBIA.—*J. I. Chenoweth.* The first fruit bloom appeared on the 23d, and leaf buds on maple trees are opening on the 30th.

ALTA.—*David E. Hadden.* The first half of April was cool and wet with a heavy, wet snowstorm on the 9th. The latter half of the month was warm, and the ground is in good condition.

ATLANTIC.—*Thos. H. Whitney.* The first ten days were rainy and cold but the balance of the month was favorable for farm operations and the growth of vegetation, although cool. At the close of the month the season was about two weeks late. Meadows and pastures are in good condition. Fruit uninjured by frost and general outlook is good.

BELLE PLAINE.—*O. C. Burrows.* The first decade of the month was cold and wet with snow on the 7th and 8th. The last two decades were dry with warm days and some cool nights. Freezing temperature on the 27th did little damage.

CHARLES CITY.—*U. S. Weather Bureau.* Cool, cloudy and wet weather prevailed during the first 11 days of the month; copious rains falling on every day except the 5th and 6th. During the remainder of the month fair weather generally prevailed, and as the ground was in fine condition much plowing for corn and seeding of oats was done. At the close of the month seeding was completed. All tree and cane fruits were in fine growing condition.

DAVENPORT.—*U. S. Weather Bureau.* The weather was notably warm from the 1st to the 3d, the 16th to the 18th, and on the 22d, 23d, and 30th. The temperature was continuously below the normal from the 6th to the 13th, and from the 25th to the 28th. Showers were frequent from the 2d to the 11th, with rain, sleet and snow on the 7th, but only .01 inch of precipitation occurred after the 11th. Good stages of water in the Mississippi prevailed throughout the Davenport district, with the highest gauge readings about the middle of the month. The maximum stages and dates of occurrence were as follows: Clinton, Iowa, 11.2 feet, on the 17th and 18th; Le Claire, 6.7 feet, on the 17th and 18th; Davenport, 10.4 feet, on the 17th and 18th; Muscatine, 12.3 feet on the 1st.

DUBUQUE.—*U. S. Weather Bureau.* The last three weeks were rainless and rather disagreeable, owing to the wind and dust. It was one of the longest periods without rain in April in 40 years. Early fruit was in bloom at the close of the month, and other trees were becoming green. Fruit is blooming very profusely. At the end of the month the ground had become hard and dry, and rain was needed. There were no damaging frosts during the month. The highest stage of the Mississippi River at Dubuque was 12.5 feet on the 15th, and the lowest was 8.8 feet on the 6th.

POCAHONTAS.—*F. E. Hronek.* Seeding is not quite done, but plowing and disking for corn is in progress, with ground in fair shape. Grass and small grain doing well.

STOCKPORT.—*C. L. Beswick.* Only .01 inch of rain since the 11th of the month, and as a result the ground is getting dry and oats and grass need moisture. A large acreage is ready for corn but none planted yet. Stock is on pasture.

WAUKEE.—*Samuel F. Foft.* The latter half of the month was good for farm work, but there were several heavy frosts with freezing temperatures on the 25th and 27th but no damage was done. Seeding is all done and corn planting will begin in a few days. Meadows, pastures and fall wheat are in good condition. Fruit trees are in bloom and most all trees are in leaf.

WEST BEND.—*Phil Dorweiler.* The first ten days of the month were unfavorable and backward but at the end of the month seeding was nearly completed. Box elder and lilacs were in leaf on the 20th, and soft maple on the 29th.

TORNADO IN MADISON COUNTY.

About 6 p. m. of April 2, 1913, a severe, but fortunately not very destructive, tornado passed over a part of Douglass Township in Madison County, Iowa. That the loss of property was small is due only to the fact that the storm path was almost entirely along the timber bordering on North River. Only two farm buildings were in the path of the storm, those of Jerome Griffith and R. F. Bush, the latter residing on the old Carter farm in section three. The tornado formed just after a severe rain and hail storm. The Bush and Griffith homes are situated on a high ridge of land, giving an excellent view to the southwest where the storm formed. The absence of dust, owing to the heavy downpour of rain which previously passed over the township, the clear sunlight and the position of the Griffith and Bush places gave an opportunity to study tornadic phenomena that is seldom afforded. The storm formed between the Chas. Howell farm and the mouth of the Howerton Creek on North River. It swept in a northeasterly direction, the funnel extending from 1000 to 2000 feet skyward, and the small end trailing on the ground. Owing to the clearness of the sky the funnel-shaped cloud was visible for a distance of 10 to 15 miles, and the roar was sufficient to attract the attention of everybody within a few miles of the storm path, and was even heard in Winterset, a distance of six or eight miles. Jerome Griffith and his brother stood in the doorway of their storm cave, and watched the storm approach until it began to tear up trees within 20 rods of their position and then sought shelter in the cave until the disturbance passed over. Mr. Griffith watched the tornado cross over a field of fodder. Describing it, he says: "The shocks of fodder could easily be seen darting up the funnel cloud like pins to a horseshoe magnet. I saw objects leave the crater near the top. Those that fell in front were picked up a second time." The Griffith smoke house was carried away but the work bench which was placed against one side of the smoke house was not moved. Neither were several empty tin cans which were on top of the work bench. The chicken house was blown away and some of the chickens were carried a distance of six miles. The weather boarding was stripped from one side of the house and the porch was torn away, but the balance of the house was not damaged. At the Bush farm the barn was destroyed and every tree in the orchard uprooted. The storm

continued for a mile beyond the Griffith farm but struck no more buildings. The width of the storm track was from 10 to 60 rods in width and about five miles in length. That the property loss was not greater was due only to the fact that there were no more buildings in its path and the two sets of buildings struck did not receive the full force of the storm.—*The Madisonian.*

MAY.

May, 1913, is generally considered by the public as having been a cold month, but the records show that the mean temperature was only 0.7° below the normal. The close approximation to the normal is, however, due to the fact that at the beginning and close of the month there were short periods of unusually high temperatures, which nearly balanced the low temperatures during most of the remainder of the month. The 29th was at some stations the warmest day in May on record; the maximum ranging from 90° to 102° over the southern half of the state. The 6th, 10th and 11th were the coldest days of the month, when the minimum readings were near or slightly below the freezing point over the northern half of the State.

Showers were frequent, and in many cases heavy; the average monthly amount being 6.24 inches, or 1.74 inches greater than the normal. Rain fell at some place in the State on every day of the month, and as a result plowing and corn planting were delayed until the 27th. Much corn was, however, planted during the last few days, and about 85 per cent of the crop was in at the close of the month. The frequent and heavy rains were of great benefit to pastures and meadows, and a heavy hay crop is assured. Late in the afternoon of the 14th a small tornado occurred at Council Bluffs, passing over much of the same territory as the Easter tornado did. The damage was slight compared to that of the storm on the evening of March 23d last.

Temperature.—The monthly mean temperature for the State, as shown by the records of 111 stations, was 59.4°, or 0.7° lower than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 57.0°, or 1.5° lower than the normal; Central, 59.5° or 0.7° lower than the normal; Southern, 61.6°, or just the normal. The highest monthly mean was 63.4°, at Keokuk, Lee County; and the lowest monthly mean, 54.6°, at Rock Rapids, Lyon County. The highest temperature reported was 102°, at Onawa, Monona County, on the 29th; the lowest temperature reported was 30°, at 3 stations, on the 2d, 6th and 10th. The average monthly maximum was 92°, and the average monthly minimum was 35°. The greatest daily range was 45°, at Sigourney, Keokuk County. The average of the greatest daily ranges was 36°.

Precipitation.—The average precipitation for the State as shown by the records of 118 stations, was 6.24 inches, or 1.74 inches greater than the normal. By sections the averages were as follows: Northern, 6.50 inches, or 1.95 inches greater than the normal; Central, 6.59 inches, or 2.12 inches greater than the normal; Southern, 5.63 inches, or 1.16 inches greater than the normal. The greatest amount, 10.25 inches, occurred at Britt, Hancock County, and the least, 3.14 inches, at Lamoni, Decatur

County. The greatest amount in any 24 consecutive hours, 3.42 inches, occurred at Thurman, Fremont County, on the 20th. Measurable precipitation occurred on an average of 13 days.

Sunshine and Cloudiness.—The average number of clear days was 11; partly cloudy, 8; cloudy, 12. The duration of sunshine was less than the normal, the percentage of the possible amount being 57 at Charles City; 70 at Davenport; 58 at Des Moines, 51 at Dubuque; 59 at Keokuk; and 48 at Sioux City.

Wind.—Southeast winds prevailed. The highest velocity reported was at the rate of 54 miles an hour from the east, at Sioux City, Woodbury County, on the 13th.

MAY NORMALS FOR IOWA, 1890-1913.

Normal temperature for May, 59.8°.
Warmest May, 1896, with mean temperature of 65.5°.
Coldest May, 1907, with mean temperature of 53.5°.
Normal May precipitation, 4.55 inches.
Wettest May, 1892, with total precipitation of 8.77 inches.
Driest May, 1894, with total precipitation of 1.87 inches.
Average number of days with 0.01 inch or more of precipitation, 10.
Prevailing direction of wind, southeast.
Average number of clear days, 12; partly cloudy, 10; cloudy, 9.

OBSERVERS' REMARKS.

Albia.—*J. I. Chenoweth.* Corn planting badly delayed on account of too much rain, and there is considerable yet to be planted. Early planted corn is up and shows a 90 per cent stand.

Alta.—*David E. Hadden.* May was cool, wet and cloudy, and corn planting was retarded in consequence of wet fields until the closing week of the month. A severe wind squall on the morning of the 13th, did some damage to buildings and trees.

Amana.—*C. Schadt.* May was cool and rainy but a number of very warm, even hot days brought the temperature a little above the normal. The rainfall was 2.82 inches in excess of the normal and made up the deficiency that had existed. Water in wells had become low but is plentiful now. In spite of the lateness of the season crops that are planted are loking promising.

Atlantic.—*Thos. H. Whitney.* May brought ample rainfall, but cool and cloudy weather most of the month. Plowing and the corn planting were greatly delayed but other crops made good progress. The closing days were hot and corn sprouted quickly, but not more than 75 per cent planted.

Burlington.—*M. E. Poppe, Jr.* Hail stones four to nine inches in circumference fell on the 15th.

Chariton.—*C. C. Burr.* Low temperature prevailed until the last week of the month. Corn planting was delayed greatly, and there is a small acreage yet to plant.

CRESTON.—*O. J. Colby.* Five periods of heavy rains delayed farm and garden work. Some corn not yet planted.

DAVENPORT.—*U. S. Weather Bureau.* Good stages of water prevailed throughout the Davenport river district, with the following readings on the 31st, which were in all cases the highest of the month: Clinton, 9.0 feet; LeClaire, 5.3; Davenport, 8.6; Muscatine, 10.0 feet.

DUBUQUE.—*U. S. Weather Bureau.* The month was cold and wet. Corn planting was delayed, and not much of the crop was in the ground on the 26th. After that date the weather turned warm and dry, and the bulk of the crop was planted by the close of the month. Aside from corn, the month was favorable for crops. Fruit went through the spring undamaged by frost. Hay and pasturage made an exceptionally fine growth. Several damaging thunderstorms occurred. There were no floods during the month, but the rivers remained at a moderately high stage. The maximum stage at Dubuque was 9.9 feet on the 31st, minimum stage, 6.8 feet on the 19th.

FOREST CITY.—*J. A. Peters.* May, 1913, brought more rain than ever before recorded in May. Farm work retarded very much on account of the heavy rains. About 90 per cent of the corn is planted and the first planting just coming up.

GRINNELL.—*D. W. Brainard.* The month was remarkable for both low and high temperatures and also for its abnormal rainfall.

INWOOD.—*F. B. Hanson.* The month was characterized by much weather that was unfavorable to field work. Frequent and long continued rains prevented field work to such an extent that much corn is yet to be planted at the end of the month.

JUNE.

June, 1913, was characterized by low temperatures during the first half of the month, and especially during the second week; almost continuously high temperatures during the latter half; a deficiency of rainfall; an excess of sunshine and the small number of damaging wind, hail and electrical storms. Unseasonably cool weather prevailed from the 7th to the 12th, inclusive. The previous low temperature record was equalled at many stations, and at some the temperature was lower than ever before recorded in June. Frost occurred on low ground in many localities on two or three nights, but no serious damage was done, although the upper leaves of corn were frozen and in some places tender garden truck was cut down. After the 12th the temperature was almost continuously above the normal; the highest readings being recorded from the 14th to the 20th, and from the 26th to the close of the month, when the maximum readings were generally above 90°, and up to 100° at several stations on the 29th.

The average rainfall was 3.31 inches or 1.21 inches less than the normal. Except from Pocahontas County westward to Woodbury and Plymouth Counties, there was generally sufficient moisture to keep vegetation growing rapidly, but over the area mentioned the rainfall was very light,

with long intervals between showers. From the 20th to the 25th, inclusive, showers were frequent and the ranifall heavy over the southern and east central districts. The showers on the night of the 24th were, in many localities, accompanied by wind squalls, which lodged and tangled small grain badly.

As a whole, however, the month was exceptionally favorable for the agriculturist. Corn probably never made more rapid growth between the last planting and the end of June than it did this year. Many fields were knee to waist high and much of the crop has been laid by in the southern counties by the close of the month. Fall sown grains were ripe and the harvest had begun, in the southern part of the state, with every indication of good yields. Much clover and alfalfa hay had been put up in fine condition. Pasturage continued good, and the general crop conditions were excellent.

TEMPERATURE.—The monthly mean temperature for the state, as shown by the records of 105 stations, was 71.5°, or 2.7° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 70.3°, or 2.9° higher than the normal; Central, 71.7°, or 2.7° higher than the normal; Southern, 72.4°, or 2.4° higher than the normal. The highest monthly mean was 74.8°, at Keokuk, Lee County, and at Onawa, Monona County; and the lowest monthly mean, 68.4°, at Estherville, Emmet County. The highest temperature reported was 102°, at Clinton, Clinton County, on the 29th; the lowest temperature reported was 33°, at Elkader, Clayton County, on the 9th and at Mason City, Cerro Gordo County, on the 10th. The average monthly maximum was 96°, and the average monthly minimum was 39°. The greatest daily range was 47°, at Alton, Sioux County. The average of the greatest daily ranges was 35°.

PRECIPITATION.—The average precipitation for the state, as shown by the records of 114 stations, was 3.31 inches, or 1.21 inches less than the normal. By sections the averages were as follows: Northern, 2.24 inches, or 2.33 inches less than the normal; Central, 3.17 inches, or 1.20 inches less than the normal; Southern, 4.51 inches, or 0.11 inch less than the normal. The greatest amount, 8.95 inches, occurred at Lacona, Warren County, and the least, 0.74 inch, at Alta (near), Buena Vista County. The greatest amount in any 24 consecutive hours, 5.25 inches, occurred at Grinnell, Poweshiek County, on the 7th. Measurable precipitation occurred on an average of 7 days.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 19; partly cloudy, 8; cloudy, 3. The duration of sunshine was much above the normal, the percentage of the possible amount being 84 at Charles City; 79 at Davenport; 81 at Des Moines; 79 at Dubuque; 78 at Keokuk; and 81 at Sioux City.

WIND.—Southwest winds prevailed. The highest velocity reported was at the rate of 49 miles an hour from the east, at Sioux City, Woodbury County on the 15th.

JUNE NORMALS FOR IOWA—1890-1913.

Normal temperature for June, 69.5°.
Warmest June, 1911, with a mean temperature of 75.7°.
Coolest June, 1903, with a mean temperature of 64.6°.
Normal precipitation for June, 4.33 inches.
Wettest June, 1890, with total preciptation of 7.76 inches.
Driest June, 1911, with total precipitation of 1.82 inches.
Average number of days with 0.01 inch or more precipitation, 9.
Prevailing direction of wind, southeast.
Average number of clear days 14; partly cloudy, 10; cloudy, 6.

OBSERVERS' REMARKS.

AFTON.—*N. W. Rowell.* As a whole this has been a fine June. Crops have grown rapidly and are in good condition.

ALTA.—*David E. Hadden.* June was a very dry month, and the small grain crop was needing rain badly at the close of the month. The last 15 days were hot.

AMANA.—*Conrad Schadt.* The temperature ranged from 38° on the 9th and 10th to 96° on the 17th and 29th. The second half of the month was almost unbearably hot. Crops have been doing well.

AMES.—*E. L. Scales.* The frost on the 8th and 9th turned the top leaves of corn brown but did not kill anything.

ATLANTIC.—*Thos. H. Whitney.* After the cold spell of the 8th to 12th, during which hoar frost was reported on lowlands on two or three nights, the weather prevailed clear and hot. The rain of the 20th was sufficient for present needs and corn made exceptional progress and recovered lost time. Small grain is in excellent condition.

BELMOND.—*Geo. P. Hardwick.* The first ten days were cool, but high temperature, brisk to high south winds, with bright sunshine advanced corn rapidly during the latter half of the month. Grain and grass is short. More rain is needed on sandy lands. Apples are falling badly.

BONAPARTE.—*B. R. Vale.* The second week was very cold, but otherwise June was a favorable month.

CHARITON.—*C. C. Burr.* The month was one of extremes. Frost occurred on three nights during the second week, then intense heat that forced the corn to wonderful growth. Clover crop saved. Wheat being cut. Oats about ripe, and quite an area of corn yet to cultivate.

CHARLES CITY.—*U. S. Weather Bureau.* The most marked features of the month were, the badly distributed rains; the absence of severe thunderstorms, and the high temperatures that prevailed from the 14th to 19th, inclusive, and from the 26th to the close of the month.

DAVENPORT.—*U. S. Weather Bureau.* The month was remarkable for its range of temperature of 58°, which is the greatest for June in the history of this station. The minimum temperature of 39°, on the 8th, is the lowest on record for June, with a single exception of June 4th, 1889, when the same reading was recorded. Light frost occurred on the

8th and 9th. The tips of corn blades were killed and extremely tender vegetation, such as cucumbers, beans, etc., were in some instances wholly destroyed. The cool wave began on the 7th and lasted until the 12th. With the exception of the 21st, 22d, and 23d, the temperature was continuously above the normal from the 14th to the 30th, with maximum readings of 97° on both the 28th and 29th. A maximum temperature of above 90° was recorded on every day from the 15th to the 20th, and from the 26th to the 30th, inclusive, a total of 11 days. The heated spell ended with a thunderstorm, accompanied by hail on the afternoon of the 30th, when the temperature fell from 92° to 71° within 30 minutes. River stages in the Davenport district averaged about 5 feet lower at the close of June than those which prevailed at the beginning of the month. While the Mississippi is lower than usual at this season, there is still sufficient water for navigation purposes.

DUBUQUE.—*U. S. Weather Bureau.* A cold spell prevailed from the 7th to the 12th, inclusive. A reading of 40° was recorded on the 8th, which equals the lowest temperature ever recorded in June by the Weather Bureau at this station, and the record dates back 40 years. The latter half of the month was almost continuously above the normal. There were eight days with a temperature of 90° or over. One fatality due to excessive heat occurred on the 28th. There was a total deficiency of 2.63 inches of rainfall during the month. This is the fourth consecutive "dry" June at this station, the average rainfall for the four Junes being only about one-half the normal. Corn planting was very late this year, owing to the cold, wet weather in May. Nevertheless, the hot weather during the latter half of June forced corn forward so rapidly that at the close of the month the crop was not much behind the normal; it is a fine stand, and free from weeds. Oats, potatoes, garden truck, etc., made excellent progress during the month, and crop prospects in general are fine. Rivers: There was no "June rise" this year in the rivers of the Dubuque river district. The rivers fell almost continuously from the beginning until the end of the month. The maximum stage was 10.3 feet on the 3d, and the minimum, 4.8 feet on the 30th.

GRINNELL.—*D. W. Brainard.* The month presents some remarkable features. There were 20 clear days, most of them having 100 per cent of sunshine, and but two real cloudy days, yet nearly nine inches of rain fell. The hottest and coldest days were only eight days apart. The storm of the 6th was the worst known here since the "Grinnell" tornado.

INWOOD.—*F. B. Hanson.* Uniformly high temperatures during the latter half of the month and well distributed showers have forced all vegetation to rapid growth. A large percentage of the corn is now up to the normal. Haying begun. Severe wind and electrical storm on the 2d did considerable damage to buildings in some localities.

KEOSAUQUA.—*J. H. Landes.* The latter half of the month, with the exception of a few days, was extremely hot. Fine weather for the cultivation of corn and taking care of the clover harvest, etc. Wheat harvest is in progress at the close of the month, with a good crop.

MONROE.—*J. A. Dibel.* Four-fifths of the corn laid by. Most of the clover hay is in stack or barn. Fall wheat and rye, rank, and nearly ready to cut. Berry crop, good.

NORTHBORO.—*J. M. Darby.* A fine month for work. Corn is small for the time of year, but is clean and growing fast. Winter wheat harvest just begun, and the yield promises to be the best for years. Hay is a good crop and is being put up in fine condition.

PELLA.—*John Ver Steeg.* Corn has made exceptionally rapid growth since the 14th, and is about up to the average of past years. Oats headed short, but filling well.

SIOUX CITY.—*U. S. Weather Bureau.* The precipitation was very light, being only 53 per cent of the lowest previous June rainfall. The month was free from storms of all kinds. Conditions have been excellent for corn growth, but small grain has suffered for lack of rain and straw is very short in many fields. River stages have been moderately high since the 4th, the nearest approach to flood stage being at Running Water on the 21st, with a reading of 1.7 feet below that mark. A secondary rise occurred on the 26th-29th, but is receding slowly. These increased stages were caused by general rains over the Dakotas.

STOCKPORT.—*C. L. Beswick.* Rain and wind on the 24th lodged oats badly. Clover all cut and corn well cleaned out.

WAUKEE.—*Samuel F. Foft.* The month ends with all crops in fine condition. Corn is very even, of good stand and clean. Oats heading. Winter wheat in head. Haying in progress, and good crop, mostly clover. Some corn laid by. Small grain promising. Good crop of small fruits, and fair crop of cherries.

JULY.

With the exception of 1901 and 1894, the month was the warmest July since state-wide observations began in 1890; and it was also the driest since 1894. The average temperature was 76.1°, which is 2.7° above the normal, and 0.3° and 6.3° below the mean monthly temperature of July, 1894 and 1901, respectively.

While the precipitation was deficient, the average total rainfall for the state was almost three times as much as in 1894, when the average was only 0.63 inch. This, together with the fact that during the four months, April to July, inclusive, of this year, there was 6.40 inches more rainfall than was recorded for the same period in 1894, will explain why the present drought has not been as injurious as the one of that year.

The temperature was generally above the normal except from the 10th to the 12th, and 19th to 25th inclusive; the 16th, 29th and 30th, being the warmest days, when the maximum readings were up to or above 100° in the southern and nearly up to that mark in the northern counties. All of the precipitation came in the form of showers, which were extremely local and widely scattered except on the 11th and 23d when they were quite general in character. The counties south and east of Polk suffered the most from the drought, the average rainfall in that section being only about 0.25° inch and several stations within that area recorded

only a trace for the entire month. Over the southwest quarter and practically all of the north half of the state, there was sufficient moisture to keep corn in fine condition, but at the close of the month pastures, potatoes and gardens were in need of rain. In the southeastern counties pastures were brown, corn was seriously injured and water for stock was getting scarce. The dry, hot weather was, however, favorable for haying, harvesting and threshing, and the hay and grain crop were secured in good condition.

TEMPERATURE.—The monthly mean temperature for the State, as shown by the records of 105 stations, was 76.1°, or 2.7° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 73.5°, or 1.4° higher than the normal; Central, 76.6°, or 2.9° higher than the normal; Southern 76.1°, or 2.7° higher than the normal. The highest monthly mean was 80.1°, at Northboro, Page County; and the lowest monthly mean, 70.4°, at Northwood, Worth County. The highest temperature reported was 108°, at 3 stations, on the 16th or 29th; the lowest temperature reported was 45°, at Washta, Cherokee County, on the 10th. The average monthly maximum was 101°, and the average monthly minimum was 52°. The greatest daily range was 43°, at Pacific Junction, Mills County. The average of the greatest daily ranges was 35°.

PRECIPITATION.—The average precipitation for the State, as shown by the records of 117 stations, was 1.82 inches, or 2.62 inches less than the normal. By sections the averages were as follows: Northern, 3.09 inches, or 1.19 inches less than the normal; Central, 1.58 inches, or 2.93 inches less than the normal; Southern, 0.79 inch, or 3.75 inches less than the normal. The greatest amount, 6.23 inches, occurred at Lansing, Allamakee County, and the least, a trace, at Fort Madison, Lee county, and Ottumwa, Wapello county. The greatest amount in any 24 consecutive hours, 2.60 inches, occurred at Clarinda, Page County, on the 7th. Measurable precipitation occurred on an average of 5 days.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 21; partly cloudy, 8; cloudy, 2. The duration of sunshine was much above the normal, the percentage of the possible amount being 86 at Charles City; 87 at Davenport; 88 at Des Moines, 80 at Dubuque; 80 at Keokuk; and 81 at Sioux City.

WIND.—Southwest winds prevailed. The highest velocity reported was at the rate of 44 miles an hour from the northwest, at Sioux City, Woodbury County, on the 4th.

JULY NORMALS FOR IOWA. 1890-1913.

Normal temperature for July, 73.7°.
Warmest July, 1901, with mean temperature of 82.4°.
Coolest July, 1891, with mean temperature of 68.5°.
Normal July precipitation, 3.87 inches.
Wettest July, 1902, with total precipitation of 8.67 inches.

Driest July, 1894, with total precipitation of 0.63 inch.
Average number of days with 0.01 inch or more of precipitation, 8.
Prevailing direction of wind, southwest.
Average number of clear days, 17; partly cloudy, 10; cloudy, 4.

OBSERVERS' REMARKS.

ALTA.—*David E. Hadden.* July, 1913, was hot and rather dry. Rain was badly needed at the close of the month.

AMANA.—*Conrad Schadt.* The month was favorable for harvesting small grain, which turned out very good. Rain is needed for growing crops.

ALANTIC.—*Thos. H. Whitney.* Small grain and hay were harvested in ideal weather, and yield of grain is fully up to average. Hay crop is the best for two years. Hot and dry weather, however, has been severe on pastures, and while corn has stood the drought very well, rain is now badly needed.

BELLE PLAINE.—*O. C. Burrows.* Exceptionally dry, with warm days and cool nights. Corn firing some at close of month. Hog cholera spreading; some herds wiped out.

BELMOND.—*Geo. P. Hardwick.* All late maturing crops and pastures need rain badly. Too dry for corn to pollinate perfectly.

BOONE.—*Carl F. Henning.* Meteor visible for half an hour in the northwest, about 8 o'clock p. m. on the 21st.

BRITT.—*L. M. Goodman.* July was a month of high temperatures, many clear days and sufficient moisture for growing crops. The corn crop has made remarkable development during the month.

CHARITON.—*C. C. Burr.* The month was favorable for all harvest work, and threshing has been rushed the last week. All vegetation is suffering for rain, and corn has sustained serious injury and pastures are brown.

CLINTON.—*A. E. Reid.* A severe electric and hail storm occurred on the 18th, but was confined to the city, where about $1,000 damage was done to glass in green houses and city lights.

DAVENPORT.—*U. S. Weather Bureau.* The extremely high temperatures of this month were exceeded by those of July, 1901, and 1911, only. There were three days on which the thermometer was 100°, with a maximum for the month of 102.2°, on the 29th, and 14 days on which the highest readings was above 90°. In addition to the extreme heat, the precipitation was the least on record at this station, the total rainfall amounting to 0.18 inch, or less than the mean normal for two days. The only other months of July which approached this in point of dryness were those of 1886 and 1894, when the rainfall was 0.43 inch and 0.44 inch respectively. On account of copious rains during June, vegetation withstood the drought remarkably well, but all growing staple crops had been injured to some extent at the close of the month, while small gardens were practically ruined. In places the earth was badly cracked; and in even small garden plots, where the best cultivation is the rule, the ground had become so hard that it was difficult to use small implements to advantage.

Owing to abundant rains over the upper portion of the watershed, good stages were maintained in the Mississippi, the gauge readings in the Davenport district at the end of the month average more than a foot higher than at the close of June.

DUBUQUE.—*U. S. Weather Bureau.* The hot, dry weather did not affect the crops unfavorably, but at the end of the month corn, potatoes and all garden truck needed rain. The dry weather of the month was favorable for the harvesting of small grain, and the crop is large and exceptionally fine.

A good stage of water was maintained throughout the month in the Mississippi river from Dubuque northward, and navigation benefited thereby. The highest stage at Dubuque was 7.2 feet on the 24th, and the lowest, 4.3 feet on the 6th.

FOREST CITY.—*J. A. Peters.* Corn in tassel at end of month and harvesting finished. Pastures in fair condition.

INWOOD.—*F. B. Hanson.* A splendid month for farm operations. All crops are good except spring wheat, which rusted badly. At close of month rain is needed for corn, potatoes, pastures, wells and gardens. Hog cholera raging near this locality.

IOWA CITY.—*Prof. Arthur G. Smith.* A very large meteor was observed in the northwest, on the evening of the 18th. The trail was visible for 15 minutes.

MASON CITY.—*Dr. Roy F. DeSart.* Unusually bright meteor in west about 8:20 p. m. on 20th. Visible for five or ten minutes.

AUGUST.

The month was characterized by an excess of temperature, and deficiency of rainfall, but these features were more pronounced in the southern than in the northern part of the state. While the northern section had an excess of 3.4° in temperature, and a deficiency of 0.61 inch in rainfall, the southern section had an excess of 6.4° in temperature and a deficiency of 2.13 inches in precipitation. And these departures were still more marked in the southwestern counties where it was the warmest August on record, and one of the driest. The heat was almost continuous throughout the month, and on numerous days the maximum temperature readings were near or above 100°. At Northboro, Page County, the maximum temperature was 90° or higher on 29 days of the month, and was 100° or higher on 16 days.

The precipitation all came in local showers which were poorly distributed geographically, and throughout the month. Thurman, in Fremont County, received only 0.08 inch, while Winterest, in Madison County, recorded 7.13 inches, and in Pocahontas, Palo Alto, Clay and Dickinson Counties, the monthly amounts ranged from 5.00 inches to 6.99 inches. Most of the rain came on the night of the 10th-11th, accompanied by heavy thunder and severe wind squalls, which caused much damage to crops. Corn, throughout much of the central district, was blown down and uprooted. The second and only other storm of importance occurred

over the northern counties on the night of the 17-18th. This storm was also attended by heavy rain and high winds and did considerable damage to corn within the area covered. Light and widely scattered showers occurred between the 4th and 9th, the 13th and on the 19th and 20th, but dry weather and intense sunshine prevailed during the last decade of the month.

Except in some of the northern counties, all vegetation suffered by the absence of moisture and the long continued high temperatures. At the close of the month, pastures were brown, late potatoes were practically a failure, and corn was daily deteriorating. Wells were failing and small streams were dry in the southern part of the state, and in many localities stock was being fed as in winter. Fruits also suffered. Apples and grapes are small and apples are dropping from the trees. The ground was too dry and hard to permit much if any fall plowing to be done, and if conditions do not improve soon the acreage of fall sown grains will be greatly reduced.

TEMPERATURE.—The monthly mean temperature for the state, as shown by the records of 108 stations, was 76.6°, or 4.8° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 73.7°, or 3.4° higher than the normal; Central, 76.5°, or 4.6° higher than the normal; Southern, 79.7°, or 6.4° higher than the normal. The highest monthly mean was 82.5°, at Northboro, Page County; and the lowest monthly mean, 70.6°, at Elma, Howard County. The highest temperature reported was 108°, at Clarinda, Page County, on the 8th and 31st, and at Northboro, Page County, on the 8th; the lowest temperature reported was 40°, at 3 stations, on the 29th. The average monthly maximum was 100°, and the average monthly minimum was 47°. The greatest daily range was 54°, at Thurman, Fremont County. The average of the greatest daily ranges was 40°.

PRECIPITATION.—The average precipitation for the state, as shown by the records of 117 stations, was 2.68 inches, or 1.31 inches less than the normal. By sections the averages were as follows: Northern, 2.91 inches, or 0.61 inch less than the normal; Central, 2.85 inches, or 1.20 inches less than the normal; Southern, 2.27 inches, or 2.13 inches less than the normal. The greatest amount, 7.13 inches, occurred at Winterset, Madison County, and the least, 0.08 inch, at Thurman, Fremont County The greatest amount in any 24 consecutive hours, 3.90 inches, occurred at Winterset, Madison County, on the 18th. Measurable precipitation occurred on an average of 6 days.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 17; partly cloudy, 10; cloudy, 4. The duration of sunshine was above the normal, the percentage of the possible amount being 80 at Charles City; 68 at Davenport; 79 at Des Moines, 60 at Dubuque, 76 at Keokuk, and 69 at Sioux City.

WIND.—Southeast winds prevailed. The highest velocity reported was at the rate of 51 miles an hour from the west, at Sioux City, Woodbury County, on the 9th.

AUGUST NORMALS FOR IOWA, 1890-1913.

Normal temperature for August, 71.9°.
Warmest August, 1900, with mean temperature of 77.4°.
Coolest August, 1890, with mean temperature of 68.4°.
Normal August precipitation, 3.58 inches.
Wettest August, 1903, with total precipitation of 6.64 inches.
Driest August, 1901, with total precipitation of 1.29 inches.
Average number of days with .01 inch or more of precipitation, 7.
Prevailing direction of wind, south.
Average number of clear days, 17; partly cloudy, 9; cloudy, 5.

OBSERVERS' REMARKS.

AFTON—*N. W. Rowell.* The month was the warmest August on record at this station.

ALTA—*David E. Hadden.* August, 1913, was hot and very dry. No rain fell during the last decade of the month, and vegetation was suffering.

AMANA—*Conrad Schadt.* August was very hot and dry, and all growing crops suffered from the effect of the drought. Some pastures are almost dried out. During the night of the 9th a large barn was struck by lightning and burned. A large quantity of hay and grain was destroyed and 23 horses perished.

ATLANTIC—*Thos. H. Whitney.* August was a very hot, dry month. The drought has been severe on all vegetation and especially on corn and late potatoes. Showers have occurred in the vicinity several times during the month, but the rain of August 11th (1.34 inches) is the only one of consequence at this station since June 21st.

AUDUBON—*Geo. E. Kellogg.* The wet spell near the middle of the month saved the corn crop from complete failure. The condition is about up to the average at the close of the month. Threshing nearly done and the yield of small grains is good.

BELLE PLAINE—*O. C. Burrows.* The rains on the 10th and 11th were beneficial to late corn and potatoes. Early corn is practically out of the way of frost at close of month, and late corn is maturing rapidly. Rain is badly needed for pastures and fall plowing.

BELMOND—*Geo. P. Hardwick.* High temperatures and frequent showers prevailed, but not sufficient rain for growing crops or for plowing. Corn is maintaining its color and vitality well for such a drought. Cutting corn for fodder has begun and cutting for ensilage will begin soon. Stock is being fed corn as substitute for pasturage.

BONAPARTE—*B. R. Vale.* August was a hot, dry month with many days of hot wind from the southwest. Corn is badly injured.

CHARITON—*C. C. Burr.* The month will be noted for high temperatures and one continued drought. The rain that fell vanished at once and the drought continues. Farmers are feeding their stock, and water is very scarce. Corn will not make more than 50 per cent of a crop.

CORYDON—*May C. Miller.* This was the hottest August in the 19 years' history of this station. The pastures are brown and water is very scarce. Corn has probably been injured 50 per cent.

DUBUQUE—*U. S. Weather Bureau.* The temperature was excessive during the third week, but was about normal the rest of the month. A severe electrical storm occurred on the afternoon of the 17th which did a great deal of damage to buildings and crops in certain localities. Peter J. Meyer, a farmer living at Holy Cross, was killed by lightning, and one residence and at least seven barns with their contents were burned. In some places corn was badly beaten down by the rain, but in the county as a whole the beneficial effects of the rainfall exceeded the damage many times over. Much damage was done in the city.

All rivers in the Dubuque district fell steadily during the month. At Dubuque the Mississippi river fell from 6.2 feet on the 1st to 3.6 feet on the 31st; average monthly stage 4.9 feet. There was no scarcity of water either for navigation or for mills and power plants.

DAVENPORT—*U. S. Weather Bureau.* All previous high temperature records were broken on the 8th, 15th and 16th, when the thermometer registered 100.6°, 99.3°, and 99.7°, respectively. The highest reading for August in former years being 98.5°, in 1894.

In the Davenport river district the Mississippi fell about 2 feet during the month, but the stages were at all times sufficient for the purposes of navigation.

ELMA—*H. A. Moore.* It has been rather dry for late potatoes, but corn is doing well.

FOREST CITY—*J. A. Peters.* Corn requires all of September to fully mature, notwithstanding the fact that August was exceptionally favorable for its growth. Pastures need rain and the ground is a little too dry for plowing.

GRAND MEADOW (POSTVILLE P. O.)—*F. L. Williams.* The month was favorable for corn and pastures. Threshing is well advanced and grain is turning out well and of good quality.

GRINNELL—*D. W. Brainard.* The month was probably the hottest and dryest August ever recorded at this station. The temperature was above 100° on three and above 90° on 17 days.

INWOOD—*F. B. Hanson.* This has been the warmest month of the year, and the precipitation has been deficient. The conditions were, however, favorable for harvesting and threshing, but a little severe on corn, pastures and potatoes. Corn is maturing rapidly and is two weeks early.

KEOSAUQUA—*J. H. Landes.* In spite of the fact that 3.80 inches of rain fell during the month, corn and pastures were much damaged by the drought and excessive heat. The rains or showers were more or less local and failed to bring the relief hoped for.

MONROE—*J. A. Dibel.* Corn was injured considerably on August 10th by the wind and rain blowing it down badly. It is now too dry to do any fall plowing and pastures are drying up. Water is scarce. Many hogs are dying.

NORTHBORO—*J. M. Darby.* The month was very dry with several days of hot winds. Corn will not make more than 40 per cent of a crop. Only a little plowing done for fall wheat. Clover for seed the best for years and yields two to four and one-half bushels per acre. Late potatoes will be a failure, and apples will be a poor crop.

NORTHWOOD—*Chas. H. Dwelle.* Corn is making the best crop in years and is in excellent condition. Small grain is making fair yields and is of good quality.

WAUKEE—*Samuel F. Foft.* Corn is maturing nicely, but is down badly and will be damaged some.

SEPTEMBER.

September, 1913, will go on record as having the hottest week of any September on record, and with one exception the earliest general killing frost and freezing temperatures. The first seven days of the month were excessively hot; the daily maximum temperatures being 100° or higher every day over the southern and considerably above 90° in the northern counties. After the 7th the temperature was generally below the normal with light frost over the northern counties on the 13th, and a killing frost and freezing temperatures in all parts of the State on the 22d. In 1890 killing frost was quite general over the State on September 13th, the earliest on record since the establishment of the Weather Service.

The first week of the month was also excessively dry, there being only a few light and widely scattered showers, but after the 7th showers were frequent and fairly well distributed so the average monthly amount was only 0.10 inch below the normal.

The hot, dry weather early in the month forced corn to maturity prematurely, but it caused the crop to escape the more serious damage of the killing frost and freezing temperatures on the 22d. The frost was general and freezing temperatures occurred in practically all parts of the State, but the bulk of the corn crop was far enough advanced to escape injury, and the small percentage that did not was damaged but slightly. The rains during the second and third decades of the month revived pasturage, replenished the water supply and put the ground in excellent condition for fall plowing and seeding, and much of that work was done.

TEMPERATURE.—The monthly mean temperature for the State, as shown by the records of 109 stations, was 64.5°, or 0.8° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 62.8°, or 0.7° higher than the normal; Central, 64.4°, or 0.8 higher than the normal; Southern, 66.2°, or 0.7° higher than the normal. The highest monthly mean was 67.9°, at Onawa, Monona County; and the lowest monthly mean, 60.6°, at Elma, Howard County. The highest temperature reported was 107°, at Bedford, Taylor County, on the 5th; the lowest temperature reported was 19°, at Rock Rapids, Lyon County, on the 22d. The average monthly maximum was 100°, and the average monthly minimum was 27°. The greatest daily range was 53°, at Bloomfield, Davis County. The average of the greatest daily ranges was 38°.

PRECIPITATION.—The average precipitation for the State, as shown by the records of 117 stations, was 3.31 inches, or 0.10 inch less than the normal. By sections the averages were as follows: Northern, 3.35 inches, or 0.06 inch less than the normal; Central, 3.57 inches, or 0.33 inch greater than the normal; Southern, 3.01 inches, or 0.56 inch less than the normal. The greatest amount, 7.44 inches, occurred at Clarinda, Page County, and the least, 0.45 inch, at Rock Rapids, Lyon County. The greatest amount in any 24 consecutive hours, 3.90 inches, occurred at Clarinda, Page County, on the 10th and 11th. Measurable precipitation occurred on an average of 9 days.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 15; partly cloudy, 8; cloudy, 7. The duration of sunshine was slightly above the normal, the percentage of the possible amount being 69 at Charles City; 65 at Davenport; 70 at Des Moines; 60 at Dubuque; 62 at Keokuk; and 68 at Sioux City.

WIND.—Southeast winds prevailed. The highest velocity reported was at the rate of 42 miles an hour from the northwest, at Sioux City, Woodbury County, on the 20th.

SEPTEMBER NORMALS FOR IOWA, 1890-1913.

Normal temperature for September, 64.1°.
Warmest September, 1897, with mean temperature of 70.9°.
Coolest September, 1896, with mean temperature of 58.5°.
Normal September precipitation, 3.15 inches.
Wettest September, 1911, with total precipitation of 5.12 inches.
Driest September, 1899, with total precipitation of 0.93 inch.
A trace of snow fell in the State during September, 1900, 1911, and 1912.
Average number of days with 0.01 inch or more precipitation, 7.
Prevailing direction of wind, south.
Average number of clear days, 15; partly cloudy, 8; cloudy, 7.

OBSERVERS' REMARKS.

ALTA.—*David E. Hadden.* The first eight days of the month were very hot, and the maximum temperature of the year, 101°, was recorded on the 5th. The first killing frost occurred on the 22d, but corn was matured and little or no damage done. The last week of the month was wet and cool.

ALTON.—*W. S. Slagle.* Light frost was observed on the 12th and 21st and the first killing frost occurred on the 22d, with a temperature of 20°.

AMANA.—*Conrad Schadt.* The first week in September was unseasonably hot. The remainder of the month was cool and pleasant. The first killing frost occurred on the 22d.

ATLANTIC.—*Thos. H. Whitney.* The first seven days of the month gave a continuation of the excessive heat and drought of the previous month, and corn was rushed to maturity. Balance of month was cool and rainy, and at the close pastures had made fine growth and winter wheat was sprouting under favorable weather conditions. More rain will be needed to replenish wells and streams before freezing weather sets in.

BELLE PLAINE.—*O. C. Burrows.* The intense heat and drought during the first week of the month forced corn to rapid maturity. The rains that followed were of little benefit to this crop, and freezing temperature on the 22d did but slight damage. At the close of the month the ground is in good condition for fall plowing and considerable progress has been made with this work.

BELMOND.—*Geo. P. Hardwick.* Corn was mostly matured when the first killing frost occurred on the 22d. Normal rains have revived pastures.

CHARLES CITY.—*U. S. Weather Bureau.* The marked feature of the month was the high temperature that prevailed from the 1st to the 7th, inclusive. The highest, 98° on the 5th, is one degree higher than the highest previously recorded in any September for the past 23 years. The close of the month was marked by a destructive thunderstorm, during which several large barns in the country were struck by lightning and burned with their contents.

CHARITON.—*C. C. Burr.* The heat of the first week of September withered and killed the corn. The first frost occurred on the 22d, and was accompanied by a severe freeze, the temperature being down to 23°. The soil is still too dry to work and seeding is greatly delayed.

CORYDON.—*May C. Miller.* The first week of the month gave the hottest September weather on record at this station, and observations have been recorded for 20 years. The weather is still dry and water for stock is scarce. More than the usual amount of corn is cut.

DAVENPORT.—*U. S. Weather Bureau.* Only 0.08 inch of rain fell during the first 15 days and the drought had again become serious. Good showers occurred on the 16th and the rainfall during the latter half of the month was nearly normal.

Nearly stationary stages in the Mississippi prevailed throughout the Davenport river district. The depth of water being sufficient for the purposes of navigation.

DUBUQUE.—*U. S. Weather Bureau.* The first week of the month, with a mean temperature of 80.3°, was the hottest week ever recorded here in September; the maximum being 97.2° or 0.2° higher than previously recorded here in September. Aside from the first week, the temperature was generally below the normal, and several Septembers have been warmer as a whole. Considerable damage was done to property during a thunderstorm on the night of the 7th and 8th. Two residences were struck in the city and took fire, but the loss was small. A barn at Table Mound was struck and burned to the ground, with its contents; the loss being several thousand dollars. No material damage was done to staple crops by the frost on the 22d, but tender vegetation was killed in some localities.

The Mississippi river changed but little during the month; the average stage at Dubuque being 3.4 feet.

INWOOD.—*F. B. Hanson.* The hottest part of the year occurred the first week of September and the earliest killing frost on record at this station was recorded on the 22d. Showers have been light and scattered and of little benefit. No fall grain sown.

NORA SPRINGS.—*Arthur Betts.* The 22d brought the first killing frost since April 28th, making a frostless period of 146 days.

PELLA.—*John H. Ver Steeg.* The killing frost on the 22d was the worst September frost since September 10, 1876. Corn was well along toward maturity, except late maturing varieties such as Johnson County White which was still in milk stage.

STOCKPORT.—*C. L. Beswick.* Corn was practically matured before the frost of the 22d; the unprecedented hot spell of the first decade burned the corn dry before the frost

OCTOBER.

The principal features of the month were the marked contrasts between the two halves of the month, and the unusually cold weather that prevailed on the last two days. The fore part of the month was generally warm and pleasant, although showers were frequent between the 4th and 10th, while the last 15 days were cold and inclement. As a whole the month was colder than usual, and had more than the average precipitation as well as an excess of snowfall. The average temperature, 49.2°, is 2.7° below the normal for the State, and many of the monthly minimum temperatures were lower than ever before recorded in October; the lowest being 2° below zero at Inwood on the 30th.

The average precipitation for the State was 0.68 inch more than the normal, but the departures were generally small except over the south-central counties where the monthly precipitation ranged from four to more than seven inches. The first snow of the season occurred on the 19th, and on several other days thereafter there were falls in some parts of the State; the greatest amounts occurring on the 28th and 29th.

No general storms of importance were reported, but a very severe hail storm of local character occurred in the vicinity of Mount Ayr, Ringgold County, on the 9th. Some of the hail stones were as large as walnuts and many windows were broken.

As a whole, the month was favorable to agricultural interests. The rains were beneficial to grass and fall grains and facilitated plowing. Corn husking began between the 15th and 23d, and by the close of the month much of the crop was in the crib.

TEMPERATURE.—The monthly mean temperature for the state, as shown by the records of 108 stations, was 49.2°, or 2.7° lower than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 47.1°, or 3.0° lower than the normal; Central, 49.4°, or 2.4° lower than the normal; Southern, 51.2°, or 2.6° lower than the normal. The highest monthly mean (full record) was 53.6°, at Ottumwa, Wapello County; and the lowest monthly mean, 43.0°, at Rock Rapids, Lyon County. The highest temperature reported was 89°, at 3 stations, on the 9th and 14th; the lowest temperature reported was —2°, at Inwood, Lyon County, on the 30th. The average monthly maximum was 83°, and the average monthly minimum was 14°. The greatest daily range was 49°, at Alton, Sioux County, and at Inwood, Lyon County. The average of the greatest daily ranges was 38°.

PRECIPITATION.—The average precipitation for the state, as shown by the records of 115 stations, was 3.03 inches, or 0.68 inch greater than the normal. By sections the averages were as follows: Northern, 2.46 inches, or 0.19 inch greater than the normal; Central, 3.00 inches, or 0.56 inch greater than the normal; Southern, 3.63 inches, or 1.28 inches greater than the normal. The greatest amount, 7.29 inches, occurred at Corydon, Wayne County, and the least, 0.35 inch, at Alton, Sioux County. The greatest amount in any 24 consecutive hours, 2.57 inches, occurred at Corydon, Wayne County, on the 5th. Measurable precipitation occurred on an average of 9 days.

SNOW.—The average snowfall for the state was 1.2 inches. By sections the averages were as follows: Northern, 2.0 inches; Central, 1.2 inches; Southern, 0.5 inch. The greatest amount, 6.8 inches, occurred at Northwood, Worth County; at a few stations none whatever occurred.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 15; partly cloudy, 8; cloudy, 8. The duration of sunshine was slightly below the normal, the percentage of the possible amount being 65 at Charles City; 54 at Davenport; 69 at Des Moines; 50 at Dubuque; 49 at Keokuk; and 56 at Sioux City.

WIND.—Northwest winds prevailed. The highest velocity reported was at the rate of 42 miles an hour from the south, at Sioux City, Woodbury County, on the 9th.

OCTOBER NORMALS FOR IOWA, 1890-1913.

Normal temperature for October, 51.7°.
Warmest October, 1900, with mean temperature of 59.3°.
Coldest October, 1895, with mean temperature of 46.0°.
Normal precipitation for October, 2.35 inches.
Wettest October, 1900, with total precipitation of 3.91 inches.
Driest October, 1895, with total precipitation of 0.47 inch.
Normal snowfall for October, 0.5 inch (1892 to 1913, inclusive).
Average snowfall for October, 1913, 1.2 inches.
Greatest snowfall in October, 3.6 inches in 1898.
Average number of days with 0.01 inch or more precipitation, 6.
Prevailing direction of wind, northwest.
Average number of clear days, 16; partly cloudy, 7; cloudy, 8.

OBSERVERS' REMARKS.

ALTA.—*David E. Hadden.* The first decade of October, 1913, was warm and wet; the remainder of the month being pleasant but cooler than normal. The minimum temperature of 11° was the lowest, with one exception, 1895, for October in 25 years.

ALTON.—*W. S. Slagle.* October was a nice, dry month to mature, dry out and pick corn, but wells and streams need water.

AMANA.—*C. Schadt.* The weather during the month was generally unpleasant, wet, cold and not favorable to good health.

BELLE PLAINE.—*O. C. Burrows.* First decade of the month was warm, but the second and third decades were cold with unusually low morning temperatures on the 21st and 31st. Frequent rains delayed corn harvest but were beneficial to pastures and water supply.

BELMOND.—*Geo. P. Hardwick.* Normal weather prevailed until the last four days when snow covered the ground. This interfered with corn gathering only two days.

CHARITON.—*C. C. Burr.* Corn is a good half crop, and there is an unusually large amount of it in the cribs, and a large area in shock ready for the shredder. Plenty of pasturage and stock is selling high.

DAVENPORT.—*U. S. Weather Bureau.* Except on the 11th, the temperature was continuously above the normal during the first 15 days, and from the 16th to the 31st, it was cooler than the average except on the 24th and 25th. The snowfall was greater than in any other October on record, except that of 1898. The first killing frost occurred on the 21st. The Mississippi river averaged 1.0 foot higher throughout the Davenport river district at the close of the month than at the end of September.

DUBUQUE.—*U. S. Weather Bureau.* The minimum temperature, 22°, on the 31st, is the lowest reading recorded in October for 18 years. The first killing frost occurred on the 21st, but as it was one week later than the normal, no damage was done. There was an excess of cloudy days, accompanied by rain or snow, and Indian summer weather was conspicuous for its absence. The highest stage of the Mississippi river at Dubuque was 4.8 feet on the 23d; lowest, 3.7 feet on the 1st; mean, 4.4 feet.

FOREST CITY.—*J. A. Peters.* There was but little corn cribbed this month. Pasturage is now good and fall plowing is about all done.

INWOOD.—*F. B. Hanson.* The month was the coldest October for years. It was also dry. No fall grain was sown this year. Corn is exceptionally dry and of excellent quality. Husking started on the 15th. Yields from 45 to 90 bushels and will average 55 to 60 bushels per acre.

IOWA CITY.—*Prof. Arthur G. Smith.* The month was marked by unusual extremes of temperature; the average for the month being 4° below the normal.

MOUNT AYR.—*Alex. Maxwell.* A severe hail storm occurred in this county on the 9th. Many of the stones were as large as walnuts and many windows were broken.

OLIN.—*Frank W. Port.* The first snow of the season fell on the 20th, and the ground was frozen hard on the 31st.

EFFECT OF THE FREEZE OF OCTOBER 19-21, 1913, UPON APPLES IN WESTERN IOWA.

By Laurenz Greene, Asst. Chief, Section of Horticulture, Iowa Agricultural Experiment Station.

On the night of October 19th, the temperature at Council Bluffs fell to 22 degrees. This was followed on the 20th by a small amount of sunshine and then cloudy weather in the P. M. Fruit which was frozen solid on the trees thawed out late in the day. The temperature on the night of the 20th fell to 18 degrees and the fruit was again frozen solid. The next day a trace of snow fell but the temperature rose to 38 degrees in the P. M. On the night of the 21st the temperature did not go below 30 degrees. A small amount of rather warm rain fell during the night. On the morning of the 21st there was apparently no frost in any of the fruit except in a very few cases, near the ground or where the fruit was well protected by leaves. This fruit came through these freezes with practically no injury to apples larger than two and one-quarter inches in diameter. All smaller grades seemed to be entirely ruined for ordinary market purposes. They were brown inside and soft. The Ben Davis and Gano seemed to be worse injured than harder varieties like Winesap.

It was interesting to note that on the morning of the 21st when the apples were apparently free from frost that water thrown upon the surface of the fruit immediately froze and remained frozen until about 10:00 o'clock A. M. Fruit frozen as this was should not be picked until after it is entirely free from frost as each finger mark and other bruises will blacken and start decay.

At Hamburg the injury was less noticeable. While definite records of the temperature are not known, at present, the conditions would indicate that the temperature did not go so low in that portion of the state. Thermometers in and about Hamburg recorded temperatures of 22 degres on the morning of the 20th and 18 degrees on the morning of the 21st. Here no apples larger than three-quarters of an inch to one inch in diameter, and only a small percentage of this size were injured. It was reported that nine miles northeast of Hamburg that the No. 1 apples were uninjured and No. 2 apples were all ruined. In all probability this would mean that apples above two and one-quarter inches in diameter were sound while those smaller than two and one-quarter inches were entirely ruined.

A Chicago buyer reported that the conditions in Nebraska were practically the same as those above reported for like latitude. At Nebraska City, there was practically no injury but at points farther north the injury was more severe. The statement was made that the sod orchards suffered more injury than those which were cultivated. All of this frozen fruit was being picked and packed for cold storage purposes, but buyers and growers were emphatic that no fruit should be picked until entirely free from frost, else the keeping qualities in storage would be ruined.

NOVEMBER.

The month was the warmest November since state-wide observations began in 1890; the mean temperature being 44.1°, or 8.2° higher than the normal for Iowa. The latter half of the month was especially warm, and on the warmest days, which were at and near the close of the second decade, the daily means were as much as 25° higher than the normal. The highest temperatures were recorded generally on the 20th and the lowest on the 9th, 10th, or 11th.

The precipitation was slightly less than the normal, but there was a great excess of damp, foggy and cloudy weather during the latter half of the month, during which time nearly all the precipitation fell in the form of rain or snow. There was, however, much less than the usual amount of snowfall. In fact there was no snowfall over the southern half and but little in the northern half of the state; the greatest amount being 3.0 inches in Sioux Center. The mild weather was favorable for all out-of-door operations. The bulk of the corn crop was harvested and plowing was in progress until the close of the month. The mild weather was also favorable for the growth of winter grains and these crops are in excellent condition.

TEMPERATURE.—The monthly mean temperature for the state, as shown by the records of 107 stations, was 44.1°, or 8.2° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 41.5°, or 7.8° higher than the normal; Central, 44.3°, or 8.6° higher than the normal; Southern, 46.4°, or 8.2° higher than the normal. The highest monthly mean was 49.4° at Keokuk, Lee County, and the lowest monthly mean, 37.6°, at Rock Rapids, Lyon County. The highest temperature reported was 78°, at Lamoni, Decatur County, on the 19th; the lowest temperature reported was 10°, at Elma, Howard County, on the 11th. The average monthly maximum was 70°, and the average monthly minimum was 16°. The greatest daily range was 57°, at Burlington, Des Moines County. The average of the greatest daily ranges was 35°.

PRECIPITATION.—The average precipitation for the state, as shown by the records of 114 stations, was 1.18 inches, or 0.21 inch less than the normal. By sections the averages were as follows: Northern, 1.01 inch, or 0.30 inch less than the normal; Central, 1.06 inches, or 0.37 inch less than the normal; Southern, 1.47 inches, or 0.03 inch less than the normal. The greatest amount, 3.49 inches, occurred at Corning, Adams County, and the least, 0.20 inch, at Lake Park, Dickinson County. The greatest amount in any 24 consecutive hours, 2.4 inches, occurred at Chariton, Lucas County, on the 29th. Measurable precipitation occurred on an average of 6 days.

SNOW.—The average snowfall for the state was 0.4 inch. By sections the averages were as follows: Northern, 1.0 inch; Central, 0.2 inch; Southern, trace. The greatest amount, 3.0 amount, 3.0 inches, occurred at Sioux Center, Sioux County.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 11; partly cloudy, 7; cloudy, 12. The duration of sunshine was below the normal, the percentage of the possible amount being 47 at Charles City; 47 at Davenport; 51 at Des Moines; 47 at Dubuque; 38 at Keokuk; and 38 at Sioux City.

WIND.—South winds prevailed. The highest velocity reported was at the rate of 54 miles an hour from northwest, at Sioux City, Woodbury County, on the 7th.

NOVEMBER NORMALS FOR IOWA, 1890-1913.

Normal temperature for November, 36.2°.
Warmest November, 1913, with mean temperature of 44.1°.
Coldest November, 1896, with mean temperature of 29.6°.
Normal precipitation for November, 1.44 inches.
Wettest November, 1909, with total precipitation of 5.39 inches.
Driest November, 1904, with total precipitation of 0.15 inch.
Average depth of snowfall for November, 2.3 inches (1892 to 1913, inclusive).
Greatest snowfall in November, 8.7 inches in 1898.
Least snowfall in November, trace in 1912.
Average number of days with 0.01 inch or more of precipitation, 6.
Prevailing direction of wind, northwest.
Average number of clear days, 13; partly cloudy, 8; cloudy, 9.

DECEMBER.

December, 1913, was characterized by its mild and comparatively dry weather, and by the fact that the lowest temperature and greatest amounts of snowfall occurred in the extreme southern part of the state. In fact, there were no temperature readings of zero or below over the northern half of the state, except in the extreme northwestern counties, and even there the readings were not as low as in the southern districts. The lowest temperature, —13°, and the greatest amount of snowfall, 7.6 inches, occurred in Taylor County, near the Missouri line.

The weather during much of the month was unusually pleasant for the time of year, but dense fog prevailed on several days during the morning hours. Somewhat colder weather obtained during the last decade of the month, and most if not all the snowfall of the month occurred at that time. A moderate amount of snow fell in the extreme southern part of the state, but elsewhere the amounts were light, none whatever occurring at numerous stations in the extreme north. There were no severe storms, and the month's wind movement was probably the lightest of record for December. Most of the precipitation came during the first week of the month, and light snow flurries occurred between the 20th and the end of the month. There was practically no precipitation between the 7th and the 19th. The amount of precipitation over the state decreased from south to north. Two stations in the north had no precipitation whatever, while Clarinda had 4.73 inches and Corning had 4.70 inches.

The moderate temperature and dry weather was exceptionally favorable for all out-of-door pursuits. Plowing was continued as late as the 20th and live stock was in pasture until near the close of the month. In some localities in the southern part of the state frogs were heard croaking on the 1st and dandelions bloomed until the 18th. Much more than the usual amount of fall plowing has been done and winter grains are reported to be in excellent condition.

TEMPERATURE.—The monthly mean temperature for the state, as shown by the records of 107 stations, was 32.0°, or 8.4° higher than the normal for Iowa. By sections the mean temperatures were as follows: Northern, 29.9°, or 9.0° higher than the normal; Central, 32.6°, or 8.8° higher than the normal; Southern, 33.6°, or 7.4° higher than the normal. The highest monthly mean was 37.0°, at Keokuk, Lee County; and the lowest monthly mean, 25.1°, at Rock Rapids, Lyon County. The highest temperature reported was 65°, at Leon, Decatur County, on the 2d; the lowest temperature reported was —13°, at Bedford, Taylor County, on the 21st. The average monthly maximum was 55°, and the average monthly minimum was 4°. The greatest daily range was 51°, at Bedford. The average of the greatest daily ranges was 31°.

PRECIPITATION.—The average precipitation for the state, as shown by the records of 116 stations, was 1.02 inches, or 0.17 inch less than the normal. By sections the averages were as follows: Northern, 0.21 inch, or 0.82 inch less than the normal; Central, 0.91 inch, or 0.29 inch less than the normal; Southern, 1.94 inches, or 0.61 inch greater than the normal. The greatest amount, 4.73 inches, occurred at Clarinda, Page County, and the least, 0.00 at two stations. The greatest amount in any 24 consecutive hours, 1.68 inches, occurred at Thurman, Fremont County, on the 6th. Measurable precipitation occurred on an average of four days.

SNOW.—The average snowfall for the state was 1.3 inches. By sections the averages were as follows: Northern, 0.3 inch; Central, 0.4 inch; Southern, 3.2 inches. The greatest amount, 7.6 inches, occurred at Bedford; several stations reported no snowfall whatever.

SUNSHINE AND CLOUDINESS.—The average number of clear days was 15; partly cloudy, 5; cloudy, 11. The duration of sunshine was about the normal, the percentage of the possible amount being 47 at Charles City; 43 at Davenport; 58 at Des Moines; 49 at Dubuque; 29 at Keokuk; and 61 at Sioux City.

WIND.—Southwest winds prevailed. The highest velocity reported was at the rate of 48 miles an hour from the north, at Sioux City, Woodbury County, on the 6th.

DECEMBER NORMALS FOR IOWA—1890-1913.

Normal temperature for December, 24.8°.
Warmest December, 1891, with mean temperature of 23.3°.
Coldest December, 1909, with mean temperature of 15.5°.
Normal precipitation for December, 1.19 inches.
Wettest December, 1911, with total precipitation of 2.57 inches.
Driest December, 1910, with total precipitation of 0.37 inch.
Average depth of snowfall for December, 6.2 inches (1892 to 1913, inclusive).
Greatest amount of snowfall in December, 15.9 inches in 1897.
Least amount of snowfall in December, 1.1 inches in 1912.
Average depth of snowfall for December, 1913, 1.3 inches.
Average number of days with 0.01 inch or more of precipitation, 5.
Prevailing direction of wind, northwest.
Average number of clear days, 13; partly cloudy, 7; cloudy, 11.

OBSERVERS' REMARKS.

ALGONA.—*Dr. F. T. Seeley.* December was a remarkable month, with only a trace of rain or snow and no zero temperature.

ALTA.—*David E. Hadden.* December, 1913, was an ideal winter month. No snow fell and roads were dry all month. The only precipitation was in the form of light showers in the first week.

AMANA.—*Conrad Schadt.* December was unusually mild and dry. The mean temperature was 11.2° above and the rainfall 0.87 inches below normal. The air was hazy from the 11th to the end of the month.

ATLANTIC.—*Thos. H. Whitney.* December was a favorable winter month. Live stock was in pasture throughout the month.

BELLE PLAINE.—*O. C. Burrows.* A remarkably mild, pleasant month, with few radical changes of temperature. Stock was in the open throughout the month, and is wintering nicely; and with the exception of hogs, which are still afflicted locally with cholera, all stock is in the best of condition. Country roads are in fine condition for hauling and auto driving.

BELMOND.—*Geo. P. Hardwick.* Cloudiness and fog were excessive and precipitation light during the month. Sleighs were out in October, but not in November or December. Ideal autumn for maturing corn, which was harvested in good condition. Stock pasturing late on the aftermath.

BLOOMFIELD.—*V. G. Warner.* This has been a fine winter month. Roads are very good. Many cloudy days during the month.

BRITT.—*L. M. Goodman.* Very mild weather for December. There was no snow and only .02 inch of rain. Roads are in excellent condition.

CHARITON.—*C. C. Burr.* The month was favorable for all farm work and plowing was general until the 24th. Stock has gone into winter quarters in good condition. Feed is plentiful.

CORYDON.—*May C. Miller.* Frogs were croaking on December 1st, and dandelions were in bloom on the 18th.

DAVENPORT.—*U. S. Weather Bureau.* The Mississippi river was frozen at Le Claire on the 28th, but it remains open elsewhere in the Davenport river district, though there is considerable floating ice in the stream.

DUBUQUE.—*U. S. Weather Bureau.* The mean temperature for December is 34.2°, or 9.7° above the normal. This is the highest December mean in 24 years, and with two exceptions the highest in 40 years. The total precipitation was only 0.34 inch, which is the smallest amount in December in 40 years, except 0.33 inch in 1898. There was only a trace of snowfall. Lawns and pastures remained green and there was considerable growth of hardy vegetation until the middle of the month. Owing to the absence of precipitation, city streets and country roads were exceedingly dusty at the end of the month. Merchants with heavy winter goods complain of the unseasonable weather. Outside building operations were carried forward until the end of the year.

FAYETTE.—*R. Z. Latimer.* This was the warmest December in 22 years, and the first December in 2 years during which the temperature did not drop to zero or below at this station.

FOREST CITY.—*J. A. Peters.* The mean temperature was the highest of any December on record here (20 years). It was the first December without any precipitation and the first one in which the minimum temperature did not register zero or below.

FORT MADISON.—*Miss L. A. McCready.* The first snowfall occurred on the night of the 23d. The lawns were green as in the spring, and buds on shrubs were swollen almost ready to burst into leaf.

GRAND MEADOW.—*F. L. Williams.* The month was dry and warm, and favorable for all stock. There was no sleighing and no zero weather during the month.

INWOOD.—*F. B. Hanson.* This was a remarkably nice December, permitting the shelling and marketing of a vast amount of corn.

KEOKUK.—*U. S. Weather Bureau.* December has been unusually warm, the temperature being above the normal on all dates except the 8th, 21st and 22d. The mild weather has kept fall pasturage in good condition, and stock has needed but little feeding thus far.

KEOSAUQUA.—*J. H. Landes.* December was a mild month, characterized by an unusual number of dense fogs and cloudy days.

NORA SPRINGS.—*Arthur Betts.* This is both the warmest and driest December I have ever reported in northern Iowa. Fall plowing and working of roads continued until Christmas.

NORTHBORO.—*J. M. Darby.* December has been a dark, dreary month. No frost in the ground. The wheat is under a blanket of snow. Corn very scarce and worth 70 cents per bushel. Some hog cholera in the neighborhood.

ROCK RAPIDS.—*W. C. Wycoff.* The roads are the finest ever seen in December. Froze up smooth and dry and are just like pavement.

WAUKEE.—*Samuel F. Foft.* There was no extremely cold weather, but the first and last weeks were foggy and damp. So far, the winter has been fair for stock. Very little snow.

MONTHLY STATE DATA FOR 1913.

MONTH	Temperature				Precipitation				Number of Days				Prevailing direction of wind
	Mean	Departure from normal	Highest	Lowest	Average	Departure from normal	Greatest	Least	1 in. or more of precip'n	Clear	Partly cloudy	Cloudy	
January	20.9	+1.6	62	—25	0.77	—0.28	2.05	0.04	5	14	9	8	nw
February	20.2	+1.0	70	—24	0.82	—0.24	2.39	0.07	4	14	7	7	nw
March	31.9	—2.1	78	—23	2.48	+0.56	5.88	0.74	9	11	10	10	nw
April	50.2	+1.7	88	16	3.29	+0.46	7.43	1.12	9	15	5	10	s
May	59.4	—0.7	102	30	6.24	+1.74	10.25	3.14	13	11	8	12	se
June	71.5	+2.7	102	33	3.31	—1.21	8.95	0.74	7	19	8	3	sw
July	76.1	+2.7	108	45	1.82	—2.62	6.23	T	5	21	8	2	sw
August	76.6	+4.8	108	40	2.68	—1.31	7.13	0.08	6	17	10	4	se
September	64.5	+0.8	107	19	3.31	—0.10	7.44	0.45	9	15	8	7	se
October	49.2	—2.7	89	—2	3.03	+0.68	7.29	0.35	9	15	8	8	nw
November	44.1	+8.2	78	10	1.18	—0.21	3.49	0.10	6	11	7	12	s
December	32.0	+8.4	65	—13	1.02	—0.17	4.73	0.00	4	15	5	11	sw
Annual	49.7	+2.2	108	—25	29.95	—2.70	10.25	0.00	86	182	89	94	s

"T" indicates amount too small to measure.

DATES OF KILLING FROSTS, 1913

STATIONS	Killing Frosts	
	Last in spring	First in autumn
Afton	May 11*	Sept. 22*
Albia	April 27*	Sept. 22
Algona	May 10*	Sept. 22
Allerton	April 28	Sept. 22
Alta	April 27*	Sept. 22
Alta (near)	April 29	Sept. 22
Alton	April 27	Sept. 22
Amana	April 28	Sept. 22
Ames	April 27	Sept. 22
Atlantic	April 27	Sept. 22
Audubon	April 27	Sept. 22*
Baxter	April 28*	Sept. 22
Bedford	April 28*	Sept. 22
Belle Plaine	April 27	Sept. 22
Belmond	April 27	Sept. 22
Bloomfield	May 11*	Sept. 22
Bonaparte	April 28*	Sept. 22
Boone	April 28	Sept. 22
Britt	April 26	Sept. 22
Burlington	April 13	Sept. 22
Carroll	April 29*	Sept. 22
Cedar Rapids	April 28*	Sept. 22
Centerville	April 13	Sept. 22
Chariton	April 29*	Sept. 22*
Charles City	April 7*	Sept. 22
Clarinda	----------	Sept. 22
Clinton	April 27	Sept. 22
Columbus Junction	April 26*	Sept. 22
Corning	May 10*	----------
Corydon	April 27*	Sept. 22
Council Bluffs	April 27*	Sept. 22
Creston	April 14	Sept. 21*
Davenport	April 27*	Sept. 22*
Decorah	April 28	Sept. 22
Delaware	May 10*	Sept. 22
Denison	April 27*	Sept. 22
Des Moines	April 12*	Sept. 22
Dubuque	April 27*	Sept. 22
Earlham	April 27*	Sept. 22
Elkader	April 27*	Sept. 22*
Elliott	April 27*	Sept. 22*
Elma	April 28	Sept. 22
Estherville	April 12*	Sept. 22
Fairfield	April 27	Sept. 22*
Fayette	April 28*	Sept. 22*
Forest City	May 11	Oct. 18
Fort Dodge	April 12*	Oct. 20
Grand Meadow	April 13*	Sept. 22
Greenfield	April 27*	Sept. 22
Grinnell	April 28	Sept. 22*
Grundy Center	April 27*	----------
Guthrie Center	April 26*	Sept. 21*
Hampton	April 29*	Sept. 22
Harlan	April 28*	Sept. 22
Humboldt	April 27*	Sept. 22*
Independence	May 6*	Sept. 22
Indianola	April 18*	Sept. 22*
Inwood	----------	Sept. 22
Iowa City	April 27*	Sept. 22*
Iowa Falls	April 27*	----------
Jefferson	May 6*	Sept. 21*
Keokuk	April 27*	Sept. 22
Keosauqua	April 27*	Sept. 22*
Knoxville	April 14	Oct. 11
Lacona	April 25*	Sept. 22*
Lake Park	April 7	Sept. 22
Lamoni	April 27	Sept. 22
Lansing	April 14*	Sept. 22*
Le Mars	April 7*	Oct. 20*
Lenox	April 27*	Sept. 22
Leon	April 29*	Sept. 22
Little Sioux	April 27*	Sept. 22
Logan	April 27*	Sept. 22
Marshalltown	April 28*	Sept. 22*
Mason City	April 28*	Sept. 22*
Monroe	April 27*	Sept. 22
Mount Ayr	April 27*	Sept. 22
Mount Pleasant	April 28*	Sept. 22*
Murray	----------	----------
New Hampton	April 27*	Sept. 22*
Nora Springs	April 28	Sept. 22
Northboro	April 12*	Sept. 22
Northwood	April 27	Sept. 22*
Odebolt	April 28*	Sept. 22*
Olin	May 11	Oct. 18
Omaha, Neb.	April 12*	Oct. 20
Onawa	April 13*	Sept. 22
Osage	April 27*	Sept. 22
Oskaloosa	April 28	Sept. 22*
Ottumwa	April 27*	----------
Pacific Junction	April 26*	Sept. 21*
Pella	April 29*	Sept. 22
Perry	April 28*	Sept. 22
Pocahontas	April 27*	Sept. 22*
Rock Rapids	May 6*	Sept. 22
Rockwell City	April 18*	Sept. 22*
Sac City	----------	Sept. 22
Saint Charles	April 27*	----------
Sheldon	April 27*	----------
Sibley	May 6*	Sept. 21*
Sigourney	April 27*	Sept. 22
Sioux Center	April 27*	Sept. 22*
Sioux City	April 14	Oct. 11
Spencer	April 28*	Sept. 22*
Stockport	April 7	Sept. 22
Storm Lake	April 27	Sept. 22
Thurman	April 14*	Sept. 22*
Tipton	April 7*	Oct. 20*
Toledo	April 29*	Sept. 22*
Washington	April 27*	Sept. 22
Washta	May 23*	Sept. 22
Waterloo	April 27*	Sept. 22
Waukee	April 27*	Sept. 22
Webster City	April 28*	Sept. 22*
West Bend	April 27*	Sept. 22
Whitten	April 27	Sept. 22
Winterset	April 28*	Sept. 22*

STATIONS	Killing Frosts	
	Last in spring	First in autumn
Afton	April 12*	Sept. 22
Albia	April 13*	Sept. 22
Algona	April 27*	Sept. 22
Allerton	April 27*	Sept. 22
Alta	----------	Sept. 22
Alta (near)	April 23*	Sept. 22
Alton	April 29*	Sept. 22
Amana	April 28*	Sept. 22
Ames	April 28*	Sept. 22
Atlantic	April 28	Sept. 22
Audubon	April 27	Sept. 22
Baxter	April 25	Sept. 22
Bedford	April 27*	Sept. 22
Belle Plaine	April 28*	Sept. 22
Belmond	April 27	Sept. 22
Bloomfield	April 27*	Sept. 22*
Bonaparte	April 27*	Sept. 22
Boone	April 25*	Sept. 22
Britt	April 27	Sept. 22
Burlington	April 27	Sept. 22*
Carroll	April 29*	Sept. 22*
Cedar Rapids	April 14*	Sept. 22
Centerville	April 25	Sept. 13
Chariton	April 27	Sept. 22
Charles City	April 23	Sept. 22
Clarinda	April 28*	Sept. 22*
Clinton	April 29*	Oct. 19
Columbus Junction	Mar. 23	Oct. 21
Corning	April 23*	Sept. 22
Corydon	April 28*	Sept. 22
Council Bluffs	April 26	Sept. 22
Creston	April 27	Oct. 21
Davenport	April 29*	----------
Decorah	May 11*	Sept. 22*
Delaware	April 28*	Sept. 22
Denison	April 7*	Sept. 22
Des Moines	April 13	Oct. 21
Dubuque	April 29*	Sept. 22
Earlham	----------	----------
Elkader	----------	----------
Elliott	----------	----------
Elma	----------	----------
Estherville	----------	----------
Fairfield	----------	----------
Fayette	----------	----------
Forest City	----------	----------
Fort Dodge	----------	----------
Grand Meadow	----------	----------
Greenfield	----------	----------
Grinnell	----------	----------
Grundy Center	----------	----------
Guthrie Center	----------	----------
Hampton	----------	----------
Harlan	----------	----------
Humboldt	----------	----------
Independence	----------	----------
Indianola	----------	----------
Inwood	----------	----------
Iowa City	----------	----------
Iowa Falls	----------	----------
Jefferson	----------	----------
Keokuk	----------	----------
Keosauqua	----------	----------
Knoxville	----------	----------
Lacona	----------	----------
Lake Park	----------	----------
Lamoni	----------	----------
Lansing	----------	----------
Le Mars	----------	----------
Lenox	----------	----------
Leon	----------	----------
Little Sioux	----------	----------
Logan	----------	----------
Marshalltown	----------	----------
Mason City	----------	----------
Monroe	----------	----------
Mount Ayr	----------	----------
Mount Pleasant	----------	----------

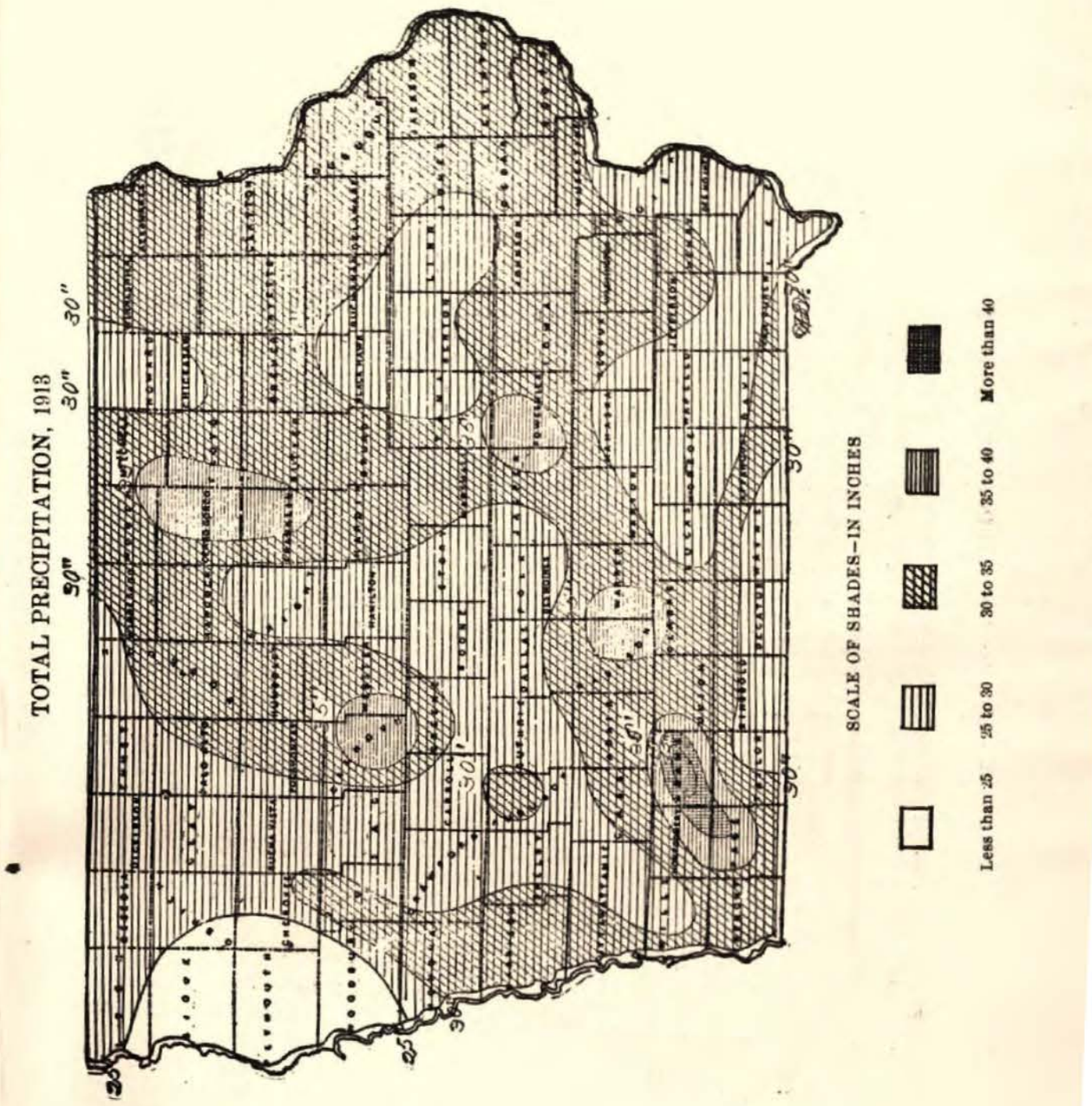
*Date of last temperature of 32° or lower in spring, or first temperature of 32° or lower in autumn, as the case may be, when frost was not reported.

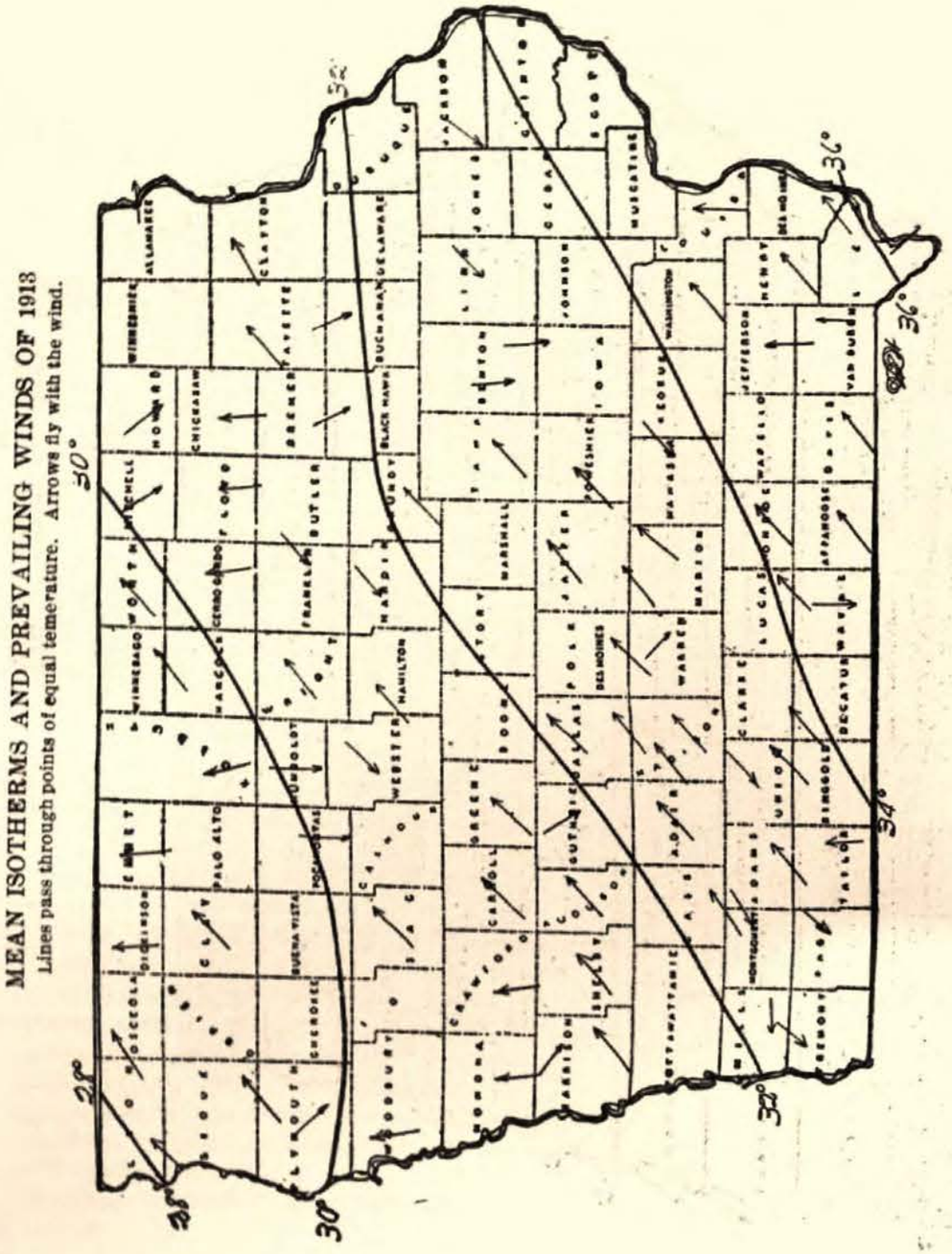
COMPARATIVE DATA FOR THE STATE—ANNUAL

Year	Temperature: Mean annual	Highest	Date	Lowest	Date	Precipitation in inches: Annual	Greatest annual	Least annual	Av. snowfall
1890..	48.0	110	July 13	—27	January 22	31.30	45.74	16.00	------
1891..	47.3	106	August 9	—31	February 4	32.90	49.05	23.48	------
1892..	46.6	104	July 11	—38	January 19	36.58	48.77	24.78	34.2
1893..	45.7	102	July* 13	—36	January 14	27.59	33.27	19.19	37.2
1894..	49.7	109	July 26	—37	January 25	21.94	29.81	15.65	19.2
1895..	47.2	104	May 28	—33	February 1	26.77	35.25	18.57	26.0
1896..	48.6	104	July 3	—20	January 4	37.23	51.60	28.68	22.6
1897..	47.8	106	July* 23	—30	January 25	26.98	36.18	20.21	38.8
1898..	47.7	103	August 20	—25	December 31	31.34	55.47	19.51	40.3
1899..	47.8	104	September 6	—40	February 11	28.68	42.06	21.79	23.4
1900..	49.3	103	August 3	—27	February 15	35.05	47.33	25.05	25.8
1901..	49.0	113	July 22	—31	December 15	24.41	37.69	16.35	38.5
1902..	47.7	98	July 30	—31	January 27	43.82	58.80	20.14	28.0
1903..	47.2	101	August 24	—27	December 13	35.39	50.53	26.41	19.4
1904..	46.3	100	July 17	—32	January 27	28.51	38.93	19.34	29.2
1905..	47.2	104	August 11	—41	February 2*	36.56	52.26	24.66	38.3
1907..	47.4	102	July 5	—31	February 10	31.60	44.34	20.63	32.8
1906..	48.4	102	July 21	—32	February 5	31.61	43.90	19.93	24.0
1908..	49.5	101	August 3	—18	January 29	35.26	49.98	24.11	22.7
1909..	47.4	103	August* 15	—26	February* 15	40.01	53.48	27.20	49.0
1910..	48.6	108	July 16	—35	January 7	19.87	27.99	12.11	23.4
1911..	49.5	111	July* 3	—35	January 3	31.37	46.77	19.74	35.3
1912..	46.4	104	September 8	—47	January 12	28.89	38.13	15.25	39.5
1913..	49.7	108	July 16*	—25	January 8	29.95	45.18	20.31	25.4

ANNUAL NORMALS FOR IOWA, 1890-1913.

Annual normal temperature, 47.9°.
Warmest years, 1894 and 1913, with mean temperature of 49.7°.
Coldest year, 1893, with mean temperature of 45.7°.
Annual normal precipitation, 31.39 inches.
Wettest year, 1902, with total precipitation of 43.82 inches.
Driest year, 1910, with total precipitaion of 19.87 inches.
Average annual snowfall, 30.5 inches.
Greatest annual snowfall, 49.0 inches in 1909.
Least annual snowfall, 192 inches in 1894.
Average number of days with 0.01 inches or more precipitation, 83.
Prevailing direction of wind, northwest.
Average number of clear days, 165; partly cloudy, 102; cloudy, 98.





CLIMATE AND CROP REVIEW

Season 1913.

WEATHER AND CROP REVIEW BY MONTHS.

The year 1913 was characterized by a cold and wet spring, an excessively hot and dry summer, an early autumn with frosts and freezing temperatures in September, followed during the last two months by mild and generally pleasant weather. The drought during the summer months was exceptionally severe in the southern counties, and materially reduced the yield of corn in that section and reduced the output of potatoes in all parts of the state. But for the state as a whole the output of soil products was considerably above the average of past years, and high prices made it the most valuable crop ever produced in the history of the state.

January and February were unusually pleasant, with an excess of temperature and a deficiency of precipitation although there was nearly the normal amount of snow which was beneficial to fall sown grains during the time of the lowest temperatures. On several days the temperature was considerably below zero but there were no severe winter storms.

March was cold, wet and changeable with frequent high winds, and in many localities destructive wind storms. The most marked features were the low temperatures on the 2d and the destructive wind storms on the afternoon and night of Easter Sunday, the 23d. The 2d was not only the coldest day of the month but at nearly all stations it was the coldest day of the winter, and at many stations the temperature was the lowest of record for the month of March. Precipitation was frequent and at times heavy between the 12th and 25th; the greatest amounts being recorded between the 13th and 15th. As a whole, the month was unfavorable for farm operations. Practically no field work was done until the last three or four days, when a little plowing and seeding was done. Fall sown grains, clover, grasses and fruits were, however, in fine condition with scarcely any indications of winter killing.

With the exception of the five days from the 7th to 11th, inclusive, when precipitation was almost continuous, April was a pleasant month and favorable for farm operations. One of the heaviest snowstorms of record occurred over the west central and northwestern counties on the 9th and 10th. Considerable damage was done to trees, and in Sioux City, where more than 20 inches fell, street car service was suspended for 36 hours, and telephone and lighting service were badly demoralized. Freezing temperatures occurred in all parts of the state on one or more nights and were unreasonably low between the 26th

and 28th. There was a slight excess of precipitation. Owing to the wet weather during the first 11 days of the month farm work was delayed, but by the close of the month practically all of the seeding of small grain was finished, early potatoes were planted and much ground was prepared for corn. Grasses and winter grains were in fine condition and fruit trees were showing abundance of bloom in southern and beginning to blossom in northern counties.

With the exception of short periods of unusually high temperatures at the beginning of the close of the month, May was cold and wet. Rain fell at some place in the state on every day of the month, and as a result plowing and corn planting were delayed until the 27th.

June was characterized by low temperatures during the first half, and almost continuously high temperatures during the latter half of the month. At some stations the temperature between the 7th and 12th was lower than ever before recorded in June. Corn probably never made more rapid growth than it did during the latter half of the month, and notwithstanding the fact that planting was delayed many fields were knee to waist high and much of the crop had been laid by in the southern counties by the close of the month, and general crop conditions were excellent.

July was the warmest month of that name since state-wide observations began in 1890, except 1894 and 1901, and it was the driest since 1894. Droughty conditions prevailed in all parts of the state, and were severe over the southeastern counties. However, sufficient rain fell over the southwestern and northern counties to keep corn in excellent condition, but pastures and potatoes suffered for moisture.

August was characterized by an excess of temperature and a deficiency of rainfall, but those features were more pronounced in the southern than in the northern part of the state. In the southwestern counties it was the warmest August on record, and one of the driest. High temperatures were almost continuous. The showers were local and generally light, except on the night of the 10th-11th, when heavy rain fell in some localities and was accompanied by damaging wind squalls over the central counties where corn was blown down and uprooted. The second and only other storm of importance occurred over the northern counties on the night of the 17th-18th. Except in some of the northern counties, all vegetation suffered by the absence of moisture and the long continued high temperatures. At the close of the month pastures were brown, late potatoes were practically a failure, and corn in the southern counties was suffering. Wells were failing and small streams were dry in the southern part of the state.

The high temperatures and droughty conditions continued with increased severity during the first week of September. It was the hottest week of record in September. The daily maximum temperature readings were 100° or higher over the southern and considerably above 90° in the northern counties. After the 7th the temperature was lower and light frost occurred in the northern districts on the 13th, and killing frost and freezing temperatures were general on the 22d. Owing to the high temperatures during July, August and the early part of September, the bulk of the corn crop escaped serious injury by the freezing temperatures on the 22d. Rains during the second and third decade of the month revived pasturage, replenished the water supply and put the ground in excellent condition for fall plowing and seeding and much of that wok was done.

The fore part of October was generally warm and pleasant, although showers were frequent between the 4th and 10th, while the last 15 days were cold and inclement. As a whole, the month was colder than usual, and had more than the average precipitation as well as an excess of snowfall. As a whole, the month was favorable to agricultural interests. The rains were beneficial to grass and small grains and facilitated plowing. Corn husking began between the 15th and 23d, and by the close of the month much of the crop was in the crib.

November was the warmest month of that name since Statewide observations began in 1890; the mean temperature being 44.1°, or 8.2° higher than the normal for the State. The latter half of the month was especially warm, and on the warmest days, which were at and near the close of the second decade, the daily means were 25° higher than the normal. The precipitation was slightly less than the normal, but there was an excess of damp, foggy and cloudy weather during the latter half of the month, during which time nearly all of the precipitation fell in the form of rain or snow. There was, however, much less than the usual amount of snowfall. In fact, there was no snow over the southern and but little in the northern half of the State. The bulk of the corn crop was harvested and plowing was in progress until the close of the month. Winter grains made a good growth and were in fine condition.

December was characterized by its mild and dry weather, and by the fact that the lowest temperatures and greatest amounts of snowfall occurred in the extreme southern part of the State. The temperature was not below zero in the northern half of the State, except in the extreme northwestern counties, and there the readings were not as low as in the southern districts. The lowest temperature, —13°, and the greatest amount of snowfall, 7.6 inches, occurred in Taylor County, near the Missouri line. There was no rain or snow at several stations in the extreme northern counties. Plowing was continued and stock was in pasture as late as the 20th. In some localities in the southern part of the State, frogs were heard croaking on the 1st and dandelions bloomed until the 18th. Much more than the usual amount of fall plowing had been done and winter grains were reported to be in excellent condition.

CLIMATE AND CROP BULLETINS

Summaries of Weekly Bulletins Issued in the Season of 1913.

Bulletin No. 1. For the week ending April 6.—The six months from October 1, 1912, to March 31, 1913, were as a whole mild, dry and pleasant, with no severe winter storms. The average temperature for the period was about two degrees above, and the precipitation slightly above the normal. The excess of precipitation was, however, made up during the first ten days of October and the month of March, during which time rains or snows were frequent and heavy, but the amount of snow during the winter months was much smaller than usual. March was cold and stormy, with frequent rain and snowstorms and unusually high winds which have delayed field work. The soil is, however, in fine physical condition and with favorable weather plowing and seeding will become general during the coming week. Some oats and spring wheat were sown early last week, but the work was stopped by the rain and snow on the 3d and 4th. Fall sown grains, clover, timothy, blue grass, live stock and fruit trees wintered well and are now generally in excellent condition. More than the usual amount of hay and rough feed are left on hand. The acreage of winter wheat is reported to be somewhat greater than the area harvested last year, and with favorable weather conditions the acreage of other small grains will be up to the normal. Fruit buds are still dormant, and the indications as present are favorable for a good crop of all kinds of fruit except peaches.

Bulletin No. 2. For the week ending April 13.—The past week was unseasonably cold and stormy. The average daily temperature was about 7 degrees below, and the average rainfall nearly two inches more than normal. Rain or snow fell almost continuously from Sunday night to Friday. Over the northern half of the state the snowfall was heavy on the 10th; the amounts ranging from one inch in the southern part of that section to twenty inches in the northwestern counties. The sunshine was nil until Saturday. Freezing temperatures occurred on one or two mornings over a large part of the state, but the only damage resulting from the cold, wet weather was in delaying the necessary work of an already belated season, and in the small loss of young pigs and chickens. Unsheltered stock suffered during the storm. The freezing temperatures did no damage to fruit as the buds are still dormant, and in good condition, as are also winter grains and grasses. Compared with the average of past years the season is now fully two weeks late, but the soil is saturated with moisture, and only warmth and sunshine are needed to quicken the growth of vegetation.

Bulletin No. 3, for the week ending April 20.—Nearly a full week of bright sunshine, with practically no rain has started the growth of all vegetation, put the ground in fairly good condition, and enabled farmers to do a great amount of field work. The average temperature was about seven degrees above the normal, and the daily maximum temperatures ranged from 60 to 80 degrees. Except on low and untiled ground, where the soil is still too wet, rapid progress was made in seeding and plowing. The bulk of the oats is now in, and with favorable weather, all small grain will be sown before the close of the coming week. In many localities early potatoes have been planted, and a good start has been made in preparing ground for corn. Grass is starting nicely, and is earlier than usual although farm work is two weeks late. Winter grains are in fine condition. Peach and plum trees are in blossom in the extreme southeastern counties and all fruit trees show an abundance of healthy buds.

Bulletin No. 4, for the week ending April 27.—The past week was, as a whole, favorable for farm work, and over the larger part of the state, rapid progress was made in sowing small grain and plowing for corn. Work was, however, retarded in the northwestern counties by heavy rains on the 23d and 24th, which were followed in all sections by light to heavy frosts on the last three mornings of the week.

About 90 per cent of the seeding has been finished, and the remainder will be completed within the next few days. In the northwestern counties, where the rainfall was the heaviest and field work seriously retarded, considerable of the acreage intended for oats will be reserved for corn. The early sown grain is up and shows a good stand. Grass is growing nicely, and in some localities stock is in pasture. Fruit trees are still in fine condition. Plum trees are in blossom in the central districts and all fruit buds are beginning to swell in northern counties. The spring pig crop is reported to be short in many localities and especially where cholera was prevalent last year.

The indications at the close of the week are favorable for rising temperature, and with warm weather corn, planting will begin during the coming week.

Bulletin No. 5, for the week ending May 4.—Another week with much sunshine and no rain until Friday night has advanced farm work rapidly. A large acreage of ground is ready for the planter, and in many localities, in the southern counties, corn planting has begun. The first few days of the week were too cool for normal growth of vegetation, and the heavy frost on the 28th endangered the prospects of a fruit crop, but late reports do not show any damage done. After the 28th the days were warm enough to bring the average temperature for the week to about eight degrees above the normal. Copious to heavy showers occurred Friday night, Saturday or Sunday in all parts of the state. The needed moisture will be highly beneficial to all vegetation, and especially to small grains, grasses and early potatoes.

The Iowa Horticultural Experiment Station at Council Bluffs reports: "All varieties of apples show a full crop of blossoms, even where they bore heavily last fall; the Jonathan, perhaps, showing the heaviest. Next

in order come Ben Davis, Missouri Pippen, Northwestern, Winesap, and Grimes. The Duchess, Salome, Arkansas and Iowa Blush are also heavily loaded. Plums showed a full set of bloom, but from all appearances did not fertilize well. Sour cherries full crop. Peaches in the southern part of the state will perhaps make 75 to 80 per cent crop. Pears show nearly full bloom. Berries wintered well. In many vineyards 10 to 20 per cent of the older vines appear dead. Conditions are unfavorable for fertilization as scarcely an insect is working on the blossoms. The pollen is withering so that if the present cool and rainy weather prevails many of the fruits will not develop.

Bulletin No. 6, for the week ending May 11.—The past week was cold, and over the southern and eastern counties unusually wet. Showers were general on Thursday and Friday, and in many localities on Monday. The average temperature was about four degrees below the normal, and light frost occurred in many sections on two or three mornings, but no material damage was done to fruit, which is still in good condition. Where the rainfall was not too heavy rapid progress was made in preparing ground for corn, and considerable corn was planted especially in the northwestern counties. Corn planting will be general during the coming week. The rains were beneficial to small grain, grass and potatoes, and in the eastern counties, where the soil had been dry, it put the ground in good condition for plowing. Most of the live stock is now in pasture.

The following report by the secretary of the Iowa State Horticultural Society shows the average condition of fruit on May 1st: Apples, 93 per cent; pears, 90; American plums, 90; domestic plums, 75; Japanese plums, 80; cherries, 89; peaches, 79; red raspberries, 77; black raspberries, 88; blackberries, 89; currants, 94; gooseberries, 90; strawberries, 84 per cent of a full crop. The average for all crops is 85.5 per cent, the highest since 1901 when it was 4.5 per cent higher.

Bulletin No. 7, for the week ending May 18.—Reports from nearly all parts of the state tell about the same story of cool, cloudy weather, frequent and heavy showers and delayed farm work. The temperature was, however, but slightly below the normal over the southern half of the state, and the rainfall over the southern tier of counties was considerable less than one inch. Over the northern sections the temperature was four to eight degrees below the seasonable average and the fainfall was much in excess of the normal, especially in the west central and northwestern counties where creeks were out of their banks and much bottom land was flooded. Probably not more than one-fourth of the corn has been planted, and there is much ground yet to be plowed. Except for delaying planting and plowing, the rains have been generally beneficial. All small grain and grass crops are in excellent condition. Orchard and small fruits are unusually promising.

Bulletin No. 8, for the week ending May 25.—Another unfavorable week has been added to the record of this belated season. The average temperature was about 6 degrees below, and the rainfall was much in excess of the normal over the larger part of the state. The first half of the week was especially unfavorable, it being cool, cloudy and wet, but the latter half was somewhat better, and gave two days of sunshine. Farm work was practically at a standstill until Friday, but corn planting was rushed on Friday and Saturday. Probably not more than 30 or 35 per cent of the crop has been planted, and unless drier weather and more favorable conditions come soon the anticipated acreage of corn will be materially reduced. Much of the corn that is up is yellow, and some of the later planting is reported to be rotting in the ground. The cold, wet and cloudy weather is also detrimental to garden truck, and is causing too rank a growth of oats, wheat and clover. Light frost occurred in many localities on the morning of the 23d, but no damage was done, and the fruit prospects are still promising.

Bulletin No. 9, for the week ending June 1.—The last week of May brought a marked improvement, and the weather conditions during the six working days were ideal for field work and the germination and growth of vegetation. Excessively high temperatures and almost continuous sunshine prevailed, with no rain after Monday noon, except a few light local showers on Friday morning, until Saturday night. Rapid progress was made in planting corn, and 80 to 85 per cent of the crop is now in. The early planting is up and shows a good stand. Cultivation is in progress in many fields, but there is considerable plowing yet to be done on low wet ground. With a continuance of the warm, dry weather practically all of the corn will be planted by the close of the coming week, but if wet weather prevails the acreage will be considerably less than it was last year. Winter wheat and rye are heading in southern, and rye is in blossom in central counties. All small grain, grass and clover are making rank growth. Potatoes and garden truck are doing nicely, and fruits are promising.

Bulletin No. 10, for the week ending June 8.—With the exception of heavy local rains in a few localities and the cool weather during the last two days, the past week was ideal for farm work and the growth of vegetation. The average temperature was very nearly the normal, and over the larger part of the state the rainfall was much less than the seasonable average. A torrential downpour occurred in Poweshiek county on Friday afternoon, which did a great deal of damage to crops, railroads and other property. At Grinnell, 4.75 inches of rain fell between 3 p. m. and 6:30 p. m. The bulk of the corn is planted, and much of it has been cultivated once. There is however, some low land which is still too wet to plow or plant. The late planting is coming strong and is growing rapidly. Small grain is getting rank, too rank in fact for heavy yields. A large hay crop is assured, and pastures are in excellent condition. In many sections plums did not set well, but apples and small fruits are still promising.

Bulletin No. 11, for the week ending June 15.—With the exception of light local showers over the northern half of the state on Friday night or Saturday, the week was dry and generally clear. The temperatures were, however, unseasonably low during the first four days, and light frosts occurred in many localities on one or more nights. While the weather was too cool for corn and garden truck all conditions were exceptionally favorable for field work, and the cultivation of corn has progressed rapidly. About all of the early planted fields have been plowed once and many of them twice. Practically all of the corn is planted, but some low ground that was intended for corn is still too wet to plow and will be used for cane, millet or buckwheat. The acreage of corn will, however, be about the same as last year. The cool, dry weather has been beneficial to small grain, most of which is heading nicely and is in fine condition. Considerable alfalfa was cut and put up without injury by rain, and clover will soon be ready to harvest. Haying will begin in the southern counties during the coming week, with every indication of heavy yields. Strawberries are beginning to ripen, but need rain to mature a full crop. The week closes with much warmer weather, and all indications are promising, but rain would be acceptable to soften the surface of the ground.

The following summary by the secretary of the state horticultural society shows the average condition of fruit on June 1st: apples, 73 per cent; pears, 48; American plums, 51; domestic plums, 48; cherries, 54; peaches, 71; red raspberries, 77; black raspberries, 83; blackberies, 85; grapes, 89; currants, 78; gooseberries, 70; strawberries, 76 per cent of a full crop.

Bulletin No. 12, for the week ending June 22.—Excessively high temperatures and bright sunshine prevailed until Friday, when light to heavy showers occurred in nearly all parts of the state. In some localities the showers were unusually heavy, while in others the amount of rainfull was only a trace. Over a strip about two counties wide, from Polk to Fremont county, and over Mahaska, Washington, Johnson, Linn, Iowa, Scott and Clinton counties, the amounts ranged from one to more than three inches. The high temperature made corn grow rapidly, and the dry, hot weather checked the tendency to rankness in small grain. The conditions were favorable for field work, and cornfields are now generally clean, and much clover and alfalfa and some slough grass was put up in fine condition. The dry weather, however, cut the strawberry and cherry crops short, and was beginning to affect pastures, oats, potatoes and garden stuff, but the late rains will be of great benefit to all growing crops. Owing to cool weather at pollinating time apples are dropping badly.

Bulletin No. 13, for the week ending June 29.—Under the combined effects of high temperatures, bright sunshine and sufficient moisture corn has made exceptionally rapid growth, and much of it is now up to the average stage for this time of the year. Probably a third of the

crop in the southern counties has been laid by in good condition. High temperatures have been continuous, the average daily excess being about 6 degrees, and during the last four days the maximum readings were above 90 degrees. General and, in many localities, heavy showers occurred on the night of the 24th and the 25th; the greatest amounts being over the southern and extreme northern counties, where they ranged from one to more than three inches. Winter wheat and rye are beginning to ripen in southern and central counties, and the harvest will begin during the coming week. Reports vary as to the condition of oats, but over the larger part of the state, both the straw and heads are short. In most cases they are, however, filling fairly well. In many localities small grain was badly lodged by the wind squalls accompanying the thunderstorms on Tuesday night. In the vicinity of Pocahontas and Cherokee counties small grains, and especially oats, have been seriously injured by dry weather. Haying is in progress, and the crop is being secured under favorable conditions. Potatoes and pastures are still doing well. Apples continue to drop badly.

Bulletin No. 14, for the week ending July 6.—Another week of hot weather, with local showers over the larger part of the state, has brought corn fully up to the average for the season of the year. The fields are clean; the plants are strong and vigorous and of good color, and are knee to waist high. The average temperature was about 5 degrees above the normal, but the rainfall was deficient except in a few localities in the northern counties, where heavy local showers, accompanied by high winds and some hail, occurred. Over a large area in the southern part of the state there was no rainfall. The weather as a whole was exceptionally favorable for haying and harvesting. Much clover hay was put up in fine condition, and probably half of the winter wheat and rye is in shock in southern sections. Oats and barley have improved during the last ten days and are filling well, although the oats straw is shorter than usual. Pastures, potatoes and gardens continue in good condition, but rain would be beneficial, and in some localities is badly needed. Hog cholera is again appearing in some of the western counties.

Bulletin No. 15, for the week ending July 13.—One more week of favorable weather has been added to this auspicious mid-crop season. The temperature was about normal, and cooler than the two preceding weeks. Showers were general on Friday except over the extreme southeastern counties, and the amounts of rainfall exceeded an inch in many localities. Rapid progress was made in haying and harvesting. Clover hay is exceptionally heavy and timothy is fair to good. Much winter wheat, rye, early oats and barley are in shock, and threshing has begun in southern counties. Late oats are beginning to ripen and will be ready to cut in a week or ten days. Winter wheat is a good crop, but the yield will not be as great as last year. The showers were of great

benefit to corn, pastures, late potatoes and garden truck, but more rain is needed for corn, which is beginning to tassel and will require plenty of moisture to produce heavy earing. Apples continue to drop badly.

Bulletin No. 16, for the week ending July 20.—The first four days of the week were excessively hot, the daily maximum temperatures ranged from 100 to 104 degrees, over the southern counties on one or more days, and as the rainfall was inappreciable over the large part of the state, late crops are beginning to feel the effect of the dry, hot weather. Late oats, potatoes, garden truck and pastures have already been damaged to some extent by the intense heat and lack of moisture. In some localities, corn on light sandy soil is beginning to curl during the day, but corn on good soil and in well cultivated fields is holding up remarkably well and making rapid growth. All of the early planted corn is in tassel and is earing nicely. The dry, hot weather has been favorable for haying and harvesting and the time has been well improved. Most of the haying is finished and the crop has been secured in excellent condition. Nearly all of the winter wheat and rye has been cut and much of the early oats, barley and spring wheat and some late oats is in shock. Threshing is progressing in southern counties, and the early reports indicate more than an average crop of winter wheat of extra good quality. Some fields yield from forty to fifty bushels per acre, but the average will be about thirty bushels. Rain is needed for all growing crops.

Bulletin No. 17, for the week ending July 27.—The past week has been moderately cool and pleasant, with a marked deficiency of rainfall over the southern half of the state, where the average amount of precipitation was only .04 inch. Frequent and well distributed showers prevailed over the northern half of the state, with an average of .81 inch for the week.

Haying is practically finished and the bulk of the small grain is in the shock. Threshing is being rushed, and early reports indicate fair to extra good yields. Late oats were damaged some by the hot weather that prevailed during the third week of the month, but are turning out better than anticipated two weeks ago. All growing crops are in a flourishing condition in the northern counties, but corn, potatoes, pastures and garden truck need rain badly in the southern half of the state. In some localities in the southeastern counties, where there has been only .05 inch of rain during the last thirty days, corn is firing and is at a standstill, pastures are brown, late potatoes are dried up and water for stock is getting scarce. The dry weather has, however, enabled farmers to secure the hay and small grain crops in good condition.

Bulletin No. 18, for the week ending August 3, 1913.—The week was hot and dry; the temperature being up to or about 100 degrees on two days, and the rainfall was almost inappreciable, there being only a few

light and widely scattered showers. All vegetation is badly in need of rain. Pastures and potatoes have been seriously injured, but corn on good soil is holding its own remarkably well, and nearly all of it in the northern half of the state is still in good condition. In the southern counties, where there has been little or no rain since June 25th, corn has been damaged, but reports as to the amount of injury done are conflicting. Some claim that if rain comes soon there will have been little or no damage, while others say that there will not be more than half of a crop regardless of future condition. An average of about 1,000 reports indicates that there was a loss of only four points in condition of corn in the state between July 1st and August 1st.

Bulletin No. 19, for the week ending August 10.—The drouthy conditions continued with increased severity until the 10th, when copious showers occurred over the larger part of the state, and were followed on Sunday night by heavy rains, accompanied by high winds in many localities. On the 8th the temperature ranged from 100 to 105 degrees over the southern sections, and were attended by hot winds. Corn in the northern part of the state has held its own remarkably well and gives promise of a good crop. In the southern counties corn has steadily retrograded and the condition has been reduced 20 to 50 per cent since July 15th. While much of the damage to corn is irreparable the rains will greatly improve the general condition and prevent further injury. The rains will also be of great value to potatoes, pastures, meadows and gardens, and will increase the water supply, which was getting scarce in the southern counties.

Bulletin No. 20, for the week ending August 17.—The week was excessively hot and generally dry, but the heavy rains on the night of the 10th, and the local showers that occurred on several other days gave sufficient moisture for present needs. The showers on the night of the 10th were better distributed than was indicated by the few telegraphic reports given in the last bulletin, but they were, in many localities, accompanied by high wind and severe squalls which did considerable damage to corn. The worst damage was done over a strip about ten to fifteen miles wide extending from Guthrie to Jasper counties. Within that area corn was badly lodged and some of it was blown down but much of it is up again, and the final output will not be reduced as much as estimated soon after the storm. Damage was also done by the wind in other sections of smaller area, but the injury to the crop as a whole will be light in comparison to the vast amount of benefit resulting from the abundant moisture. The corn crop as a whole was greatly benefited, but the rain came too late to improve the early corn in the southern counties where the drought has been severe and of long duration. Late potatoes, garden truck, pastures, meadows, and fruits were also greatly benefited by the rains. Fall plowing has begun.

Bulletin No. 21, for the week ending August 24.—High temperatures continued until Thursday night, and this, with excessive humidity, made the weather conditions oppressive during the first four days. The last three days were clear, cool and pleasant. The rain fall was unevenly distributed; the larger amounts being recorded in the northern and a few of the southeastern counties; but it was generally ample for the needs of all growing crops and for fall plowing and seeding, except in the southwestern district where the amounts were small. Some of the local showers, in the northern counties, on the night of the 17th were accompanied by heavy rain, high winds and severe electrical storms which did considerable damage to buildings and blew down much of the corn. The rains have been of great benefit to late corn, late potatoes and pastures, but were insufficient in the southern part of the state to have any effect on the failing wells. Corn is making rapid advancement toward maturity, and some of the early planting will be safe from harm by frost by the end of the coming week. While corn has been materially injured by the drought, and especially in the southern districts, the state as a whole will produce a full average crop. With normal weather during the remainder of the season the average yield will not be less than thirty-five bushels per acre. If this estimate is realized the state will produce about 330,000,000 bushels. Rapid progress has been made in threshing, and this work is nearly finished over the southern half of the state. The average yields of grain, as given in the former bulletins, are being maintained. Where the rainfall has been sufficient, fall plowing and the preparation of the ground for fall seeding is being pushed. Pastures have been greatly benefited.

Bulletin No. 22, for the week ending August 31.—Although the nights were cool the days were hot, making the average daily temperature about five degrees above the normal. The sunshine was excessive; there being scarcely any cloudiness until Saturday afternoon, and there was practically no rainfall in the state until Sunday morning, and then only a few light showers in the northeastern counties. Corn is doing as well as could be expected under the present conditions. In the southern part of the state, where the drought has been most severe, much of the early planted corn is dry enough to cut, and the binders are at work in some fields. Under the effects of the rains of two weeks ago late corn is filling out fairly well, and in the northern counties where the rainfall has been the most plentiful the crop will be fully up to if not above the average of past years, but elsewhere the present dry, hot weather in forcing it toward maturity too rapidly for the best results. The dry weather is also damaging apples, pastures and late potatoes, and delaying plowing. In southern districts wells are again failing and pastures are brown. In some sections stock is being given almost full winter rations.

Bulletin No. 23, for the week ending September 7.—The past week was the hottest ever before recorded in the state dcring September. The daily maximum temperatures were above 90 degrees in practically all

sections, and in the southern counties the average maximum temperatures ranged from 100 to 103 degrees. The sky was nearly cloudless and the sunshine intense. There was no rainfall except a few light showers over the northern districts on Tuesday night. The intense heat, bright sunshine and brisk winds have dried the ground and all vegetation rapidly. Corn is being rushed toward maturity, and much of it in the southern part of the state is dry and dead. Corn binders have, however, been at work during the entire week. The drought and hot weather has also been very damaging to late potatoes, grass and fruit, and if rain does not come soon the acreage of fall sown grain will be materially reduced. Potatoes are practically ruined in many sections, pastures are dry and brown, wells are failing and water for stock is scarce in the southern counties.

Bulletin No. 24, for the week ending September 14.—A marked change in temperature occurred on the 8th, and the past week was cool and pleasont. The average temperature was, however, slightly above the normal, although light frost was observed in many localities on Friday and Saturday mornings. Copious to heavy rains fell in all parts of the state, except the extreme southeastern and northwestern counties, on Wednesday night and Thursday. Pastures have revived and show considerable improvement, but the rains came too late to be of benefit to corn or late potatoes except in a few localities where the potato vines were still green. The rains were, however, sufficient to facilitate plowing in many sections, but not enough to be of material benefit to the water supply. The excessively hot, dry weather during the first seven days of the month hurried corn to a premature death and stopped the filling process that usually occurs during all of September and part of October, and as a result the crop will be lighter than was indicated on September 1st. Much corn was cut and many silos were filled during the week.

Bulletin No. 25, for the week ending September 21.—The past week was cooler than usual, the average daily deficiency in temperature being about 4 degrees, and the week closes with a cool wave which will probably result in light to heavy frost tonight. Light to copious showers occurred on several days, and while there has not been enough moisture to effectually break the drought or increase the water supply, the ground has been softened and much plowing and seeding of winter wheat has been done. Pastures and meadows have been greatly improved and in some sections late potatoes have been benefited. Potatoes will, however, yield only about 50 per cent of a normal crop. The bulk of the corn is now beyond danger of injury by frost, and practically all of it will be matured by the close of the month. Probably a little more than the usual amount of corn has been put in shock, and the amount cut for ensilage is much greater than ever before. Reports received Monday morning, September 22d, show that freezing temperatures occurred in all parts of the state, the lowest reported being 21 degrees at Sibley, Osceola County.

IOWA CROP REPORT, JUNE 1, 1913.

Following is a summary showing average condition of crops on June 1st, as compared with the average of past years on that date: corn, 80 per cent; oats, barley and rye, 95; spring wheat, 94; winter wheat, 96; flax, 90; potatoes, 87; tame hay and alfalfa, 102; wild hay, 100; pastures, 103.

Last year on June 1st, the conditions were as follows: corn, 92; oats, 100; spring wheat, 96; winter wheat, 90; barley, 99; rye, 95; flax, 99; potatoes, 98; hay, 95; alfalfa, 94; pastures, 99 per cent.

The Secretary Iowa State Horticultural Society reports conditions of fruit as follows: apples, 73 per cent; pears, 48; American plums, 51; domestic plums, 48; cherries, 54; peaches, 71; red raspberries, 77; black raspberries, 83; blackberries, 85; grapes, 89; currants, 78; gooseberries, 70; strawberries, 76 per cent of a full crop.

IOWA CROP REPORT, JULY 1, 1913.

Acreage of Farm Crops and Estimated Condition of Staple Crops and Fruit.

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

CORN.—The estimated number of acres of corn planted is 9,434,500, or an increase of only 14,067 acres, as compared with the area reported by the township assessors for 1912. There would have been a much greater increase but for the fact that the weather was wet and cold at planting time, which necessitated the abandonment of a large acreage intended for corn. The average condition of corn on July 1st was placed at 93 per cent as against 89 per cent on July 1, 1912.

OATS.—The area of oats is estimated to be 4,804,400, or a little more than one per cent less than the area harvested last year. The average condition is 91 per cent, or 9 per cent less than on July 1, 1912.

WHEAT.—The area of winter wheat is placed at 505,740; and spring wheat, 365,300, making a total wheat acreage of 871,040 acres, or a decrease of 6,270 acres, as compared with the acreage reported by township assessors for 1912. There is, however, an increase of 7,800 acres in the area of winter wheat. The estimated condition of spring wheat is 92 per cent, and winter wheat 97 per cent, as compared with 95 per cent for spring wheat and 90 for winter wheat on July 1, 1912.

BARLEY.—Acreage sown 368,600 acres; condition 91 per cent or the same as last year at the same time.

RYE.—Acreage of rye sown 69,830; condition of the crop, 97 per cent, or one per cent better than on July 1, 1912.

FLAX.—The acreage of flax is 22,255 or 1,860 acres less than was seeded last year. Condition 92 per cent.

POTATOES.—The acreage of the potato crop is estimated to be 117,000 acres, which is about 3,000 acres less than was planted last year. Condition of crop, 94 per cent.

HAY.—The acreage of tame and wild hay is 3,359,365, or a decrease of 30,700 acres. Condition 97 per cent, or 11 points better than on July 1, 1912.

ALFALFA.—Area, 51,490 acres, which is an increase of about 11 per cent over last year. The condition on July 1st was * * *

PASTURES.—The acreage is about 99.5 per cent, and the condition is 101 per cent, or two points better than last year.

APPLES.—A summary of the reports on apples for July 1st shows about 82 per cent of the 1909 crop, which was, according to the 1910 census, 6,746,668 bushels. The estimates would indicate a production of about 5,500,000 bushels for the state in 1913.

The estimates from the six leading apple counties of the state, Fremont, Mills, Pottawattamie, Harrison, Page and Taylor, which produced 26 per cent of the total crop of the state in 1909, shows only 70 per cent of the 1909 crop or 1,268,318 bushels for 1913 against 1,803,469 bushels for 1909.

Railroad data show that 70 per cent of the crop of Mills and Fremont counties was shipped out to foreign markets in 1909. On this basis, these six counties will export about 300,000 barrels this year or about 1,700 cars. But as shown below diseases and insects will cut this estimate down.

Of the total apple crop it is estimated that about 25 per cent are summer apples, about 30 per cent fall apples and about 45 per cent are winter apples. Apple scab and worms are shown to be abundant with an average of only 15 per cent of the orchards of the state being sprayed.

PLUMS.—An average of the reports show about 65 per cent of a crop of plums.

GRAPES.—The grape crop is reported good from all parts of the state and an average of 92 per cent of a full crop is estimated.

IOWA CROP REPORT, AUGUST 1, 1913.

Following is a summary of reports from crop correspondents on August 1st. The average condition of corn was placed at 89 per cent, or four points lower than on July 1st. This, however, does not give an accurate idea of the change in condition of corn that has taken place since the middle of July, when it was estimated to be fully up to the average condition of past years, or 100 per cent. The dry weather and excessively high temperatures during the latter half of the month lowered the condition materially, and by the end of the month the crop was in a critical condition over the southern half of the state, where the rainfall had been extremely light. The estimated condition of pastures is 86; potatoes 75,

and flax 88 per cent, showing a loss of 15 per cent in pastures, 19 in potatoes, and 4 per cent on condition of flax since July 1st.

On August 1st, 1912, corn was rated at 93 per cent, potatoes, 94, and pastures 92 per cent. Preliminary reports from correspondents and threshermen indicate an average yield of 24 bushels per acre of winter wheat; spring wheat, 17; oats, 34; barley, 26; rye, 18. The average yield of hay is placed at 1.5 tons and wild hay at 1.3 tons. If these average yields are maintained by final reports the total yields for the state will be about as follows: winter wheat, 12,000,000 bushels; spring wheat, 6,200,000; oats, 163,000,000; barley, 9,500,000; rye, 1,200,000 bushels; tame hay, 3,900,000 tons; wild hay, 950,000 tons. A summary of the crop estimates on apples for August 1st, shows 83 per cent of the 1909 crop, which was according to the 1910 census, 6,746,668 bushels. These estimates will indicate a production of 5,600,000 bushels for the state for this year. The estimates are somewhat higher than on July 1st, though practically the same. Reports from certain sections indicate a heavy decrease in yield on account of dry weather. The unsprayed orchards are suffering most because of the reduced leaf surface due to the apple scab and insect enemies earlier in the season. Scabby apples are reported as stunted and at a standstill. Plums: estimates show a decline in plums from 65 per cent July 1st to 56 per cent August 1st. Grapes: This crop seems to have suffered no injury from weather conditions. The estimates indicate 91.5 per cent of a full crop, a decrease of only one-half of 1 per cent between July 1st and August 1st. The crop will be exceptionally clean on account of freedom from disease due to the dry weather. There are no insects reported as serious in any part of the state.

IOWA CROP REPORT, SEPTEMBER 1, 1913.

The following is a summary of reports from correspondents on September 1. The estimated condition of corn as compared with the average of past years on that date was placed at 78 per cent, but this does not give an accurate idea of the actual condition of the crop in all parts of the state. In many of the northern counties where showers have been frequent the crop is in a flourishing condition and is rated nearly up to or above the average of past years; the average for the three northern tiers of counties on September 1st was 95 per cent. In the central counties where the effects of the drought was more apparent, and the wind had blown much of the corn down, the average condition was placed at 82 per cent. In the southern district where the temperatures were excessive, and the drought severe during the whole month, the average was only 58 per cent, and this is too high for many localities. Corn is maturing rapidly, and with normal weather more than half of the crop will be safe from damage by frost by September 15th, and more than 80 per cent and probably nearly all of it by the end of September.

POTATOES.—The drought has been very damaging to potatoes; the average condition on September 1st being only 47 per cent for the state. This, however, may be improved in localities where the vines are still alive, if rain comes withn a week or two.

Three-fourths of the threshing has been done. The average yield of winter wheat is 24 bushels, spring wheat, 17; oats, 35; barley, 25; rye, 19; timothy seed, 4.1 bushels per acre. The acreage of timothy cut for seed is 67 per cent of the area cut last year.

The reports show that the state will produce this year 70 per cent of the 1909 apple crop. These estimates indicate a total yield for this year of 4,739,280 bushels. This is a decrease from the estimates of August 1st of 860,000 bushels. Estimates also show that only 58.9 per cent of this year's yield will be marketable or a total of 2,793,795 bushels of marketable apples for the state. This estimate is probably too high. The six leading apple producing counties of the state, Fremont, Mills, Pottawattamie, Harrison, Page and Taylor, report an estimated production of 932,835 bushels for 1913. These same counties produced 1,803,469 bushels in 1909. Of this year's crop only 55 per cent of 513,000 bushels is estimated as marketable.

Unless rains come soon these estimates will be greatly reduced in the next two weeks. Jonathan is standing the drought well, but Grimes Golden, Ben Davis and other leading commercial varieties are suffering for moisture.

FINAL REPORT FOR THE STATE—TOTAL YIELD OF SOIL PRODUCTS—VALUE AT FARM PRICE, DECEMBER 1, 1913.

Following is a summary of reports from crop correspondents of the Iowa Weather and Crop Service, showing the average yield per acre and total yields of staple soil products, and the average price at the nearest station, December 1, 1913.

In spite of many adverse conditions that prevailed during the season, Iowa has produced a full average crop of all soil products, except potatoes, and the value of the year's output is far in excess of any other year in the history of the state.

CORN.—The drought that prevailed over the southern half of the state reduced the yield of corn materially, but owing to the fact that timely and well distributed showers occurred in the northern counties, the state average is better than the normal. In Monroe County the average yield per acre was only 18 bushels while in many of the northern counties the average yield was more than 40 bushels per acre, making the average for the state 34.9 bushels. The total yield was 329,343,000 bushels and the total value at 59 cents per bushel is $194,311,370. The total yield is 92,025,000 bushels less than last year, but the total value exceeds that of last year by $42,612,756. The condition of the crop is fully up to if not better than the average and practically all of it is now in the cribs.

OATS.—The area harvested was 4,824,400; average yield, 34.2 bushels per acre; total yield, 164,851,000; aggregate value at 34 cents per bushel, $56,049,340. Last year the average yield was 44.4 bushels per acre; total yield, 206,949,700 bushels; average price, 27 cents; total value, $55,876,419.

SPRING WHEAT.—Area harvested, 365,300 acres; average yield, 15.1 bushels per acre; total yield, 5,510,200 bushels; price per bushel, 75 cents; total value, $4,132,650.

WINTER WHEAT.—Area harvested, 505,740 acres; average yield per acre, 23.1 bushels; total yield, 11,693,900 bushels; average price, 77 cents per bushel; total value, $9,004,303.

BARLEY.—Average per acre, 23.8 bushels; total yield, 8,756,300 bushels; average price, 53 cents; total value, $4,640,839.

RYE.—Average yield, 18.3 bushels per acre; total crop, 1,274,500 bushels; farm price, 59 cents; total value, $751,955.

FLAX SEED.—Average per acre, 10.0 bushels; total product, 223,490 bushels; total value at $1.36 per bushel, $303,946.

POTATOES.—Average yield per acre, 47.3 bushels; total yield, 5,532,170 bushels; total value at 85 cents per bushel, $4,702,344.

HAY (TAME).—Average yield, 1.5 tons; total yield, 4,010,300 tons; average price, $9.93; total value, $39,822,279.

HAY (WILD).—Average yield, 1.3 tons; total yield, 910,205 tons; average price, $8.80 per ton; total value, $8,009,804.

TABULATED CROP SUMMARY.

	Average	Average Yield	Av'r'ge Price	Total Yield	Total Value
Corn	9,434,500	34.9 bu.	$ 0.59	329,343,000 bu.	$ 194,311,870
Oats	4,824,400	34.2 bu.	.34	164,851,000 bu.	56,049,340
Spring Wheat	365,300	15.1 bu.	.75	5,510,200 bu.	4,132,650
Winter Wheat	505,740	23.1 bu.	.77	11,693,900 bu.	9,004,303
Barley	368,000	23.8 bu.	.53	8,756,300 bu.	4,640,839
Rye	69,830	18.3 bu.	.59	1,274,500 bu.	751,955
Flax Seed	22,255	10.0 bu.	1.36	223,490 bu.	303,946
Potatoes	117,000	47.3 bu.	.85	5,532,170 bu.	4,702,344
Hay (Tame)	2,632,200	1.5 tons	9.93	4,010,300 tons	39,822,270
Hay (Wild)	727,165	1.3 tons	8.80	910,205 tons	8,009,894
Pasture and Grazing				Estimated	83,000,000
Alfalfa				Estimated	1,821,090
Ensilage				Estimated	2,156,000
Timothy Seed				Estimated	3,059,965
Clover Seed				Estimated	592,552
Sweet Corn				Estimated	700,000
Pop Corn				Estimated	385,090
Fruit Crop				Estimated	7,000,000
Garden Truck				Estimated	1,000,000
Miscellaneous Crops				Estimated	8,000,000
Total value					$ 429,443,437

The estimated value of soil products for 1912 was ..... $ 392,420,668

FUNGUS DISEASES IN IOWA FOR THE YEAR 1913

BY L. H. PAMMEL AND CHARLOTTE M. KING.

For nearly a quarter of a century observations have been made here at Ames, on fungus diseases of plants. The notes thus gathered have been published at various times in reports of the State Horticultural Society, proceedings of the Society for the Promotion of Agricultural Science, the Iowa Academy of Science, etc. In volume 16 of the Iowa Academy* the data for a number of years was brought together. In the report of the Iowa State Horticultural Society** for 1912 weather maps were published to show the influence of temperature and moisture on the development of fungus diseases. It has been shown by Melhus*** that temperature has a marked influence on the germination of spores in white rusts. The effect of cloudy weather and precipitation during the month of April this year had a marked influence on the spread and infection of lettuce mildew (*Bremia*). The dry weather during the past season especially at the time when oats and wheat were heading out, checked the spread of grain rust. On the other hand, smut of oats will germinate under conditions favorable for the germination of oats. The record of oats smut in this state during the present season shows that the loss was not far from $6,000,000. This is a disease which can largely be prevented.

The growing season of 1913 started in with splendid prospects for a large crop of grain and fruit. The soil was in excellent condition, there was enough moisture to insure a good hay and grass crop. However, cold and wet weather when small grain was sown made the stand of oats very unequal. This was shown in the yield of oats in some fields where it was sown early, the yield was good but where the oats was sown during the cold, wet weather the straw was short with a low yield.

Mr. Chappel of the Iowa Weather and Crop Service reported on April 20th that "Nearly a full week of bright sunshine with practically no rain has started growth of all vegetation, put the ground in fairly good condition, and enabled farmers to do a great amount of field work." The bulk of the oats was in by the end of the week ending May 4th. This indicated that it was too cool for normal growth of the vegetation. There was a heavy frost on April 28th. The week ending May 11th showed cold and wet weather in many parts of the state. The week ending June 22d showed excessively high temperature and bright sunshine with showers in many parts of the state on Friday of that week. The crop indications on June 29th were: High temperatures, bright sunshine, the straw and heads of oats were short.

*Proc. Ia. Acad. of Sci. 16:41. Contr. Bot. Dept., I. S. C. No. 41.
**Rept. Ia. State Hort. Soc. 47:189.
***Phytopathology, 2:197.

In regard to the prospects for fruit, Mr. Wesley Greene, of the State Horticultural Society, reported as follows, on May 7:

Apples, 93 per cent; pears, 90 per cent; American plums, 90 per cent; domestic plums, 75 per cent; Japanese plums, 80 per cent; cherries, 89 per cent; peaches, 79 per cent; red raspberries, 77 per cent; black raspberries, 88 per cent; blackberries, 89 per cent; currants, 94 per cent; gooseberries, 90 per cent; strawberries, 84 per cent of a full crop. The general average for all crops is 85.5 per cent, the highest since 1901 when it was 4.5 per cent higher.

In southern Iowa, a prolonged drouth lessened the yield of corn, although the small grain crop was good. Northern, and especially northeastern Iowa was more favored with rain and hence the crops were much better.

Rust of wheat, oats, apple scab and apple blight were more serious in northern and northeastern Iowa than in southern Iowa. Oats smut was common everywhere in the state, Mr. Burger reporting a loss of 13.5 per cent in Black Hawk county, a loss somewhat larger than in many other parts of the state. The loss probably is not far from 10 per cent in the state. Surely the farmers of Iowa should treat the oats seed with the formalin method before planting.

The money loss from various other fungus diseases is as great or greater than from oats smut. Some of the diseases are preventable and the loss can be very materially reduced by better methods of culture or the treatment with fungicides. Root diseases, like potato scab, blight of wheat, yellow leaf disease of barley, can only be prevented by the use of seed treatment and proper rotation of crops. The farmer and horticulturist should take heed of the lessons taught by the ravages of the fungus parasites of plants.

In order to show the influence precipitation has on the abundance of fungus diseases, the weather conditions are given for several localities in Iowa, namely Decorah, Ames, Council Bluffs and Keokuk, in the following tables:

TEMPERATURE AND PRECIPITATION FOR APRIL TO SEPTEMBER, 1913, AMES, IOWA.

	APRIL		MAY		JUNE		JULY		AUGUST		SEPT.	
	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.
1	56		68		69	.25	73		73		85	
2	65	.62	70		71		77	.34	74		84	
3	55	.15	64	1.47	72	.08	76		77		83	
4	41	.21	57	.20	66		82		69		86	
5	43		56	.04	72	.01	78		75		84	
6	40		49		70	.02	76		74		82	
7	42		53		62	.10	79		77	.53	81	
8	36		64		53		81		81		73	
9	38	.15	50	.60	54		78		85		74	
10	37	.50	49		56		69		82	.05	71	
11	36	.12	52		59		69	1.20	73	.13	70	.92
12	40		65		62		72		76		57	
13	46		63	.80	63		73		79	.24	58	
14	53		55	2.02	72		73		84		60	
15	57		56	.58	69		84		84		61	
16	62		57		80		83		86		63	.14
17	62		58		80		83		88		67	
18	62		53		76		77		80		62	
19	45		52	.34	77		72		79	.10	63	.20
20	52		57	.85	79	.80	71		74	.67	59	
21	60		55	.02	74		68		80		51	
22	70		51		70		72		70		42	.13
23	67		56		69		72	.41	67		55	
24	54		65	.20	77	.48	66		71		64	
25	48		61	.37	77		70		75		47	
26	45		60	.25	80		80		76		50	
27	50		66		80		80		75		52	
28	48		70		84		77		71		58	.43
29	57		76		84		87		69		61	
30	61		75		82		86		70		60	
31			72				79		81			
Sums		1.65		7.74		1.74		1.95		2.72		1.82
Means	51.2		55.8		71.8		76.4		76.6		65.1	

*In April for Ames the condition of the sky was as follows: Rainy days, 9; clear days, 12; partly cloudy days, 7; cloudy days, 11. Prevailing wind, south. The cloudy days occurred April 6-16. This was the lettuce mildew inspection period.

TEMPERATURE AND PRECIPITATION FOR APRIL TO SEPTEMBER, 1913, COUNCIL BLUFFS, IOWA.

	APRIL		MAY		JUNE		JULY		AUGUST		SEPT.	
	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.
1	55		73		70	1.20	79		76		83	
2	67		67	.03	69		82		72		85	.25
3	45	.10	55	1.16	68	.07	83		78		82	
4	44	.09	55		67	.04	76		80		83	
5	48		57		75	.02	73	.78	83		85	
6	53		50		73	.13	76	1.00	75		83	
7	45	.87	56		70	.12	80		83		84	
8	38	.27	65		56		75		95		77	.26
9	39	.52	53	.45	58		76				75	
10	36	.82	45	.09	62		68				77	1.55
11	40	.03	54		67		68	.13	77	.27	64	.05
12	42		64		71		72		80		61	
13	45		70	.81	79		76		84	.75	60	
14	52		64		82		88		85		64	
15	59		54	.38	78		85		86		62	
16	65		66		75		89		83		60	.33
17	61		62	.09	77				88		67	.20
18	58		54		74		73		84		62	
19	52		62	.10	76	1.91	69		82			
20	53		58	1.74	76	.43	69		87	.04		
21	66		52		71		70					
22	65		49		72		76	.05	66			
23	60	.76	54		79		73	.34	66			
24	45	.45	60		73	.80	67		72		62	1.74
25	41		66	.20	82		74		76		48	.26
26	47		62	.12	83		89		83		48	
27	48		67		82			.06	86		55	
28	52		77		81		82	.26	77		52	.27
29	57		81		76	.30	91		65		58	
30	69		78		73		80		76		61	.55
31			76				74		79			
Sums		3.91		5.37		5.01		2.62		1.06		5.46
Means	52		66.5		73.3		77.9		79		67.8	

TEMPERATURE AND PRECIPITATION FOR APRIL TO SEPTEMBER, 1913, KEOKUK, IOWA.

	APRIL		MAY		JUNE		JULY		AUGUST		SEPT.	
	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.
1	54		70		74	.01	77	.04	75		90	
2	66		72		72		79		77		88	
3	56	.68	67	.20	72	.09	82		83		89	
4	42	.20	68	.64	69		83		77		83	
5	41	.05	61	1.01	78	.08	82		76		81	
6	42		58		60		77		79		84	
7	39	.39	58		51	.65	79		86		77	
8	37	1.29	62		54		79		90	.08	73	
9	46		50	.09	58		72		90		73	
10	49		40		68		78		82		70	.05
11	39		51	.04	67		78		75	1.21	65	
12	39		65		73		83		78		62	
13	45		68	.17	78		85		82		64	
14	53		65	.02	84		87		82		62	.09
15	54		61	.43	82		89	.03	88		65	.27
16	65		62		84		88		92		65	.04
17	64		61	.26	85		80		86		66	
18	63	.01	60		85		78		83	.13	66	.79
19	53		57	.23	83		72		78	.26	64	.01
20	62		70	.35	76		73		82		48	
21	59		59	.01	66		76		81		45	
22	70		52		77	1.36	75		69		62	
23	68		57		78		72	.04	69		72	
24	57		64		78	1.61	70	.01	67		68	.02
25	50		68		83	.49	78		72		51	
26	51		60	.42	86		81		79		54	
27	46		63		86		82		81		57	.13
28	53		75		87		89		77		55	.01
29	56		77		85		89		65		63	.01
30	57		79		75	.01	83		74			
31			78						86			
Sums		2.62		3.87		4.15		.12		1.63		1.42
Means	53		64		74.8		79.6		80.1		67.8	

TEMPERATURE AND PRECIPITATION FOR APRIL TO SEPTEMBER, 1913, DECORAH, IOWA.

	APRIL		MAY		JUNE		JULY		AUGUST		SEPT.	
	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.	T.	P.
1	46	.52	65	------	------	------	------	.03	72	------	84	------
2	49	------	66	------	------	------	------	.02	76	------	85	------
3	43	.15	65	.35	------	------	------	------	79	------	82	------
4	35	.23	48	.85	------	------	------	------	74	------	80	------
5	39	------	53	------	------	.05	------	1.00	71	------	83	------
6	42	------	52	------	------	.85	------	------	78	------	88	------
7	41	.31	49	.04	------	------	------	------	66	------	82	------
8	41	.30	51	.54	------	------	------	.53	76	.15	75	------
9	37	.32	50	------	------	------	------	------	76	------	67	------
10	33	.30	50	------	------	------	------	------	71	.75	74	------
11	37	.06	52	------	------	------	------	1.45	69	------	68	.50
12	45	------	53	------	------	------	------	------	74	.11	60	------
13	45	------	60	.93	------	------	------	------	79	.09	68	------
14	54	------	58	.66	------	------	------	------	81	------	63	------
15	56	------	54	.22	------	------	------	------	82	------	62	------
16	60	------	65	------	------	------	------	------	87	------	65	.20
17	65	------	64	------	------	------	------	------	85	------	64	------
18	59	------	67	------	------	------	------	.32	80	.18	60	------
19	47	------	69	.66	------	------	------	------	81	------	65	.62
20	49	------	57	.98	------	.50	------	------	82	------	52	.46
21	59	------	53	------	------	------	------	------	80	------	46	------
22	67	------	54	.03	------	------	------	------	70	------	44	------
23	69	------	51	------	------	------	------	.95	66	------	52	.22
24	63	.01	56	------	------	.28	------	------	72	------	62	------
25	57	------	61	.09	------	.12	------	------	76	------	54	.20
26	38	------	60	------	------	------	------	------	72	------	49	------
27	45	------	59	.38	------	------	------	------	69	------	55	------
28	55	------	69	------	------	------	------	.15	75	------	56	------
29	49	------	79	------	------	------	------	------	68	------	64	------
30	60	------	81	------	------	------	------	------	69	------	59	1.30
31	------	------	65	------	------	------	------	.22	74	------	------	------
Sums	------	2.19	------	5.67	------	1.80	------	4.67	------	1.28	------	3.50
Means	49.6	------	59.8	------	------	------	------	------	75.5	------	65.1	------

A summary of the diseases for the season of 1913, is as follows:

The bitter rot, some reported from southwestern and central Iowa. It is not, however, as common as the Illinois canker (*Nummularia discreta*) which is abundant in southern and southwestern Iowa, reported frequently on the Ben Davis apple. Apple blotch (*Phyllosticta solitaria*) though reported chiefly from southwestern Iowa, is common wherever the Northwest Greening is cultivated. Little complaint was made of the powdery mildew (*Podosphdera leucotricha*). Apple scab (*Venturia inaequalis*) was abundant in many parts of the state, especially on leaves early in the season, though less in southern Iowa. Fruit was less scabby this year than in seasons of greater moisture. Apple blight (*Bacillus amylovorus*) was common in many parts of the state, though less than in some seasons. Reported from various sections of the state by Prof. Herrick on the Transcendent, Yellow Transparent, Wolf River, Tallman. Apple rust reported on Wealthy, Jonathan, Ben Davis, Iowa Blush. The Grimes Golden, though in proximity of infected red cedar, did not show the disease according to Prof. Herrick at Red Oak. The period of infection from the red cedar fungus was shorter than usual; some seasons it extends over a period of a month. The gelatinous spore masses may become dry and on becoming moistened the spores again germinate.

Crown gall on blackberry was reported as serious in Scott county by Mr. Bliss. It was also reported as serious on the apple in Page county.

Pear blight occurred in some sections of the state. In Story county there was much of the spot disease (*Entomosporium maculatum*) on the leaves. Mr. J. P. Anderson reports considerable of *Septoria pyrina* in Decatur county.

Rust of blackberry (*Gymnoconia Peckiana*) was reported as troublesome in blackberry patches in several counties, probably widely distributed in the state. The custom of digging up the diseased plants has done much to lessen the disease.

Cherry spot (*Cylindrosporium padi*) occurred in central Iowa and probably quite general in the state, most serious to nursery trees. It was not common as during wet years.

Mildew (*Podosphaera oxyacanthae*) was widely distributed in the state though not as abundant as in 1912. There was also much mildew (*Microsphaera alni*) on the lilac, some on the oak. There was much complaint of rose mildew (*Sphaerotheca pannosa*) on the Crimson Rambler. The mildew on wheat (*Erysiphe graminis*) was not as abundant as in 1912. The mildew on grape (*Uncinula necator*) was not as common as in 1912. It was much more abundant on the Virginia creeper.

Red currants were attacked by *Cercospora angulata* but not as serious as in 1912.

The downy mildews were not abundant this year, the grape was notably free or nearly so except in northern Iowa. The lettuce mildew (*Bremia Lactucae*) was abundant in greenhouses (Nevada) early in April during the cloudy and misty weather, April 10-20. A few days of sunshine checked the spread of the disease. There was less of the peppergrass mildew (*Peronospora parasitica*) this spring than in 1912.

There was comparatively little of *Sclerospora graminicola* on millet. Potato blight (*Phytopthora infestans*) was not observed. It was reported

from Scott county. Its presence there is doubtful. Its occurrence in the state seems doubtful.

In September after the rains there was some white rust (*Cystopus candidus*) on the radish. Gooseberry rust (*Aecidium Grossulariae*) was abundant on cultivated gooseberries in Fayette county and common on wild gooseberries in many parts of the state.

The black knot of the plum (*Plowrightia morbosa*) is common wherever the European Damson's plums are cultivated; it was common on wild plums of *Prunus Americana* in Winnebago county (Bakke), and Allamakee and Clayton counties (Pammel). Plum pocket (*Exoascus Pruni*) was abundant on *Prunus Americana* in Allamakee, Fayette, and Clayton counties. The *Exoascus communis* produces swollen branches on the Miner plum, reported only from a few places (Boone county), but probably widely distributed in the state.

Brown rot (*Sclerotinia fructigena*) was far less common this year than in 1912. Some occurred on the peach, plum, and apple and early during the season some reported on the cherry and young branches of Crataegus.

Raspberry anthracnose (*Gloeosporium venetum*) was reported from different localities in the state.

The sycamore blight (*Gloeosporium nervisequum*) was reported from many counties where the sycamore is native. This disease manifested itself by the dying of the young shoots giving to the trees the appearance of having been nipped by frost. The disease appeared after a wet cold spell followed by warm weather.

Some early blight (*Macrosporium Solani*) was reported from central Iowa, Scott and Muscatine counties. The dying of young potato shoots in the field was reported from Scott and Muscatine counties. The shoots contained *Fusarium sp.*

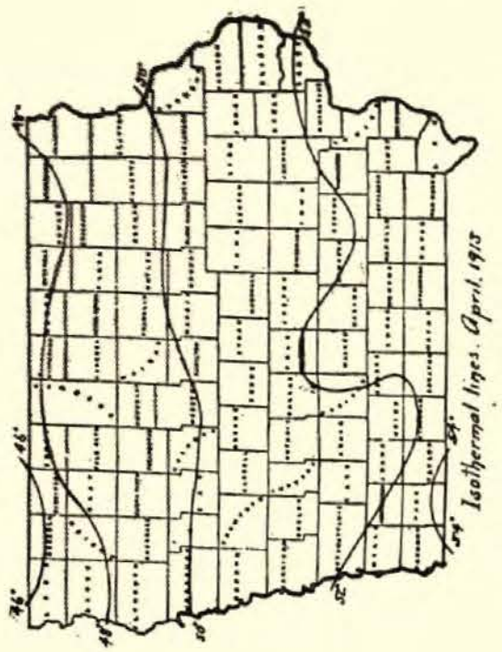
Of the diseases of grain attention may be called to the presence of *Puccinia graminis* on the leaf sheaths of wheat, and oats, but not so destructive as in wet years. The *Puccinia rubigovera* was somewhat more destructive in leaves of wheat. There was also some *P. coronata* on oat leaves and some corn rust (*Puccinia sorghi*) on sweet and field corn, and some *P. graminis* on red top and some *P. phlei-pratensis* on timothy.

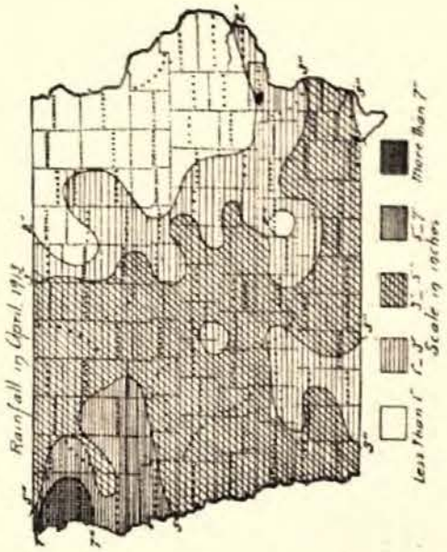
There was also some clover rust (*Uromyces Trifolii*) on red clover and late in the season some alfalfa rust (*Uromyces stritus*) on alfalfa though not as abundant as in 1911 and 1912.

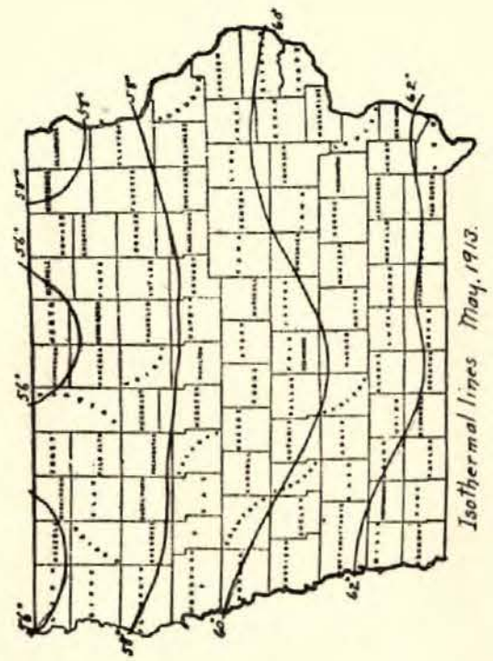
The leaf spot of alfalfa (*Phacidium medicaginis*) was abundant wherever alfalfa is grown. Reported as abundant in Scott, Story, Harrison, and Pottawattamie counties in Iowa.

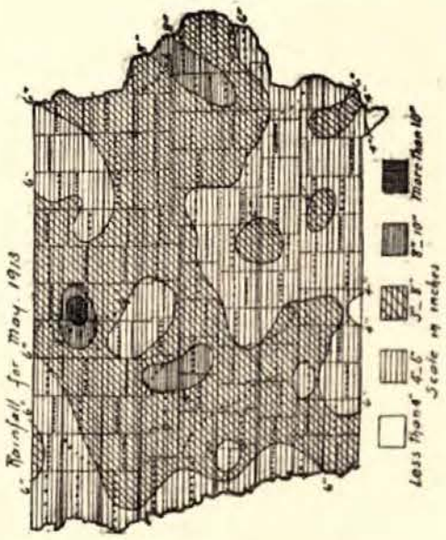
There was much silvertop (*Sporotrichum sp.*) in Fayette, Allamakee, Clayton and Bremer counties, in some cases as much as 40 per cent of the "seed stalks" were killed. On an average of 25 per cent of the stalks were diseased. There was, however, little of the disease in central and southern Iowa.

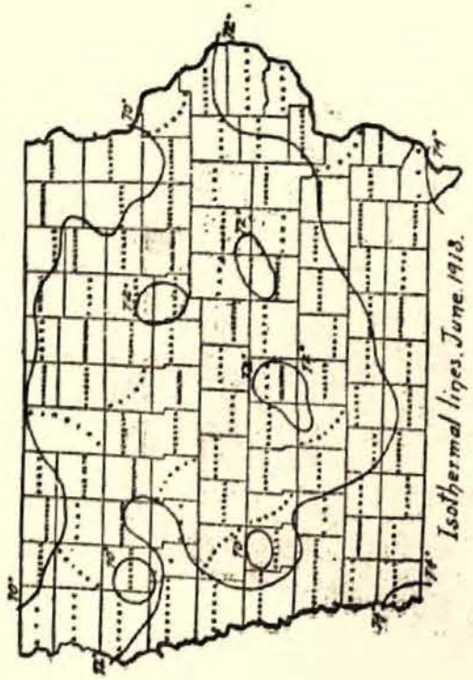
In regard to the diseases of forest trees in addition to the sycamore blight mentioned above, the box elder, especially in wounds, there was much of *Pleuroibs ulmarius* in Story, Marion, and Buena Vista counties. The usual amount of *Melampsora salicis* and *Phyllachora ulmi* occurred There was much of *Marsonia juglandis* on the black walnut in central and northern Iowa.

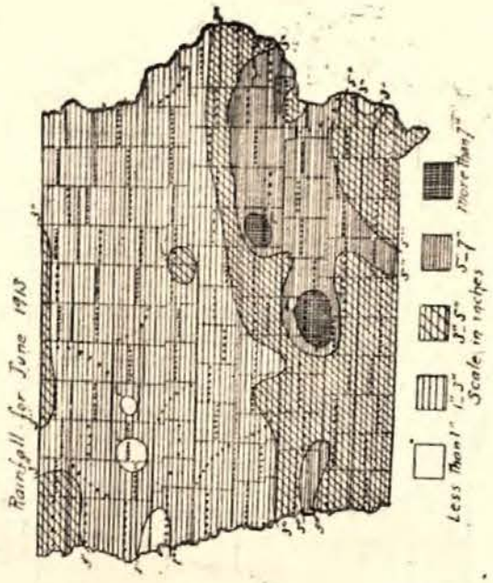


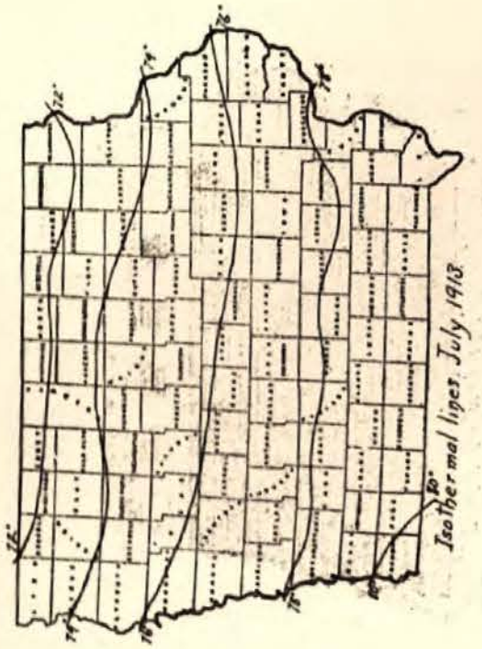


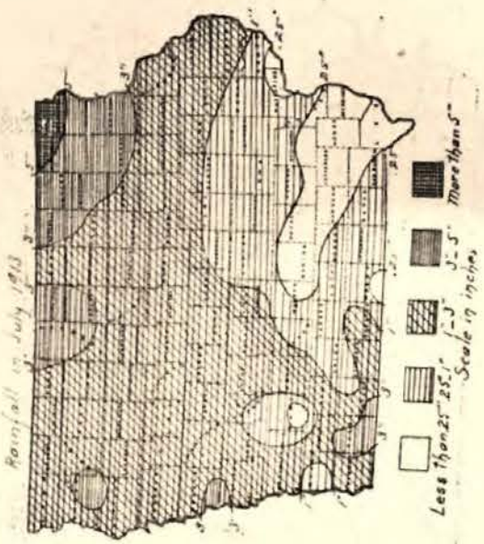


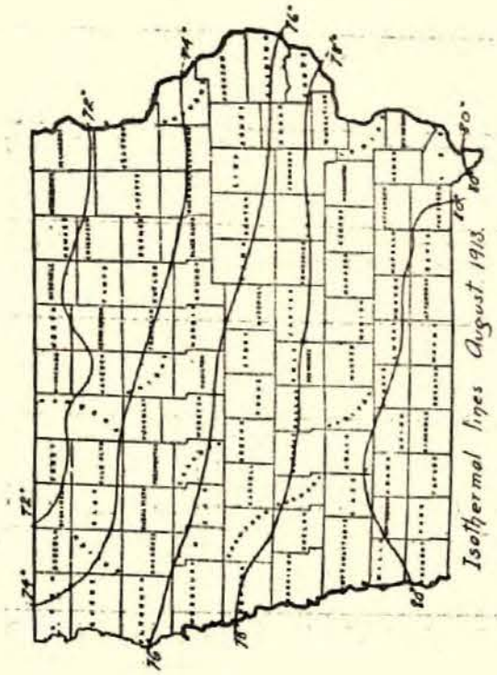


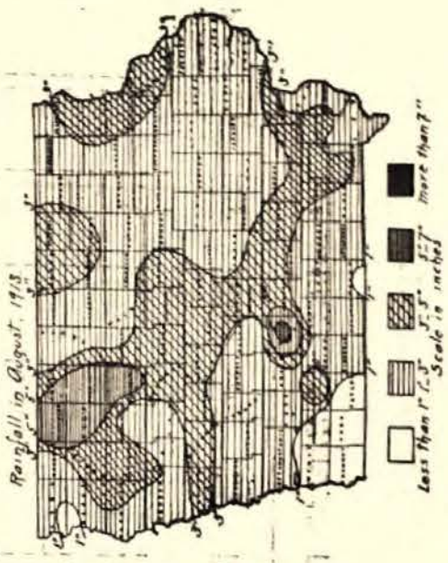

Isothermal lines. June 1913.

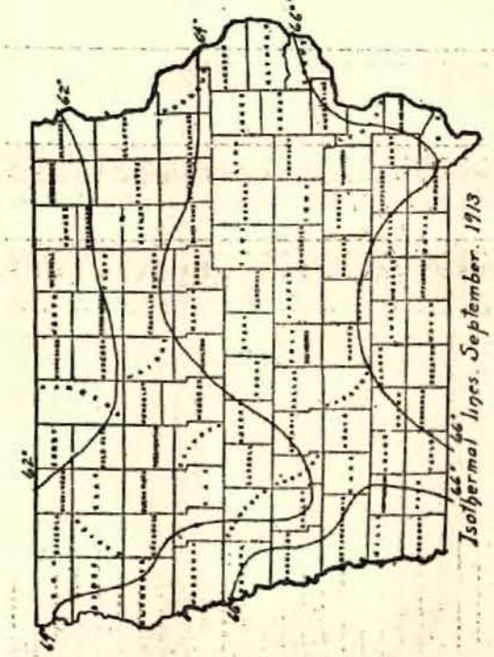

Rainfall for June 1913
Less than 1"
1"-3"
3"-5"
5"-7"
More than 7"
Scale in inches

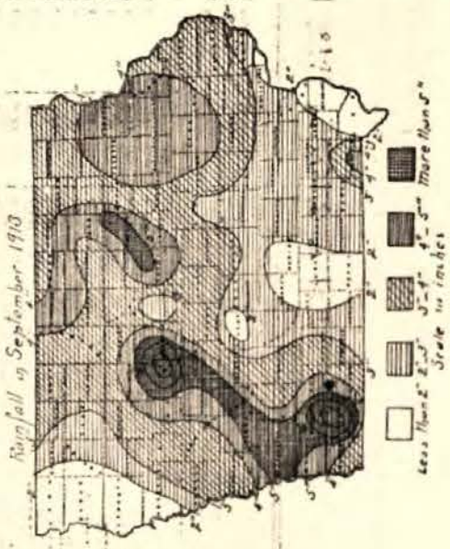

Isothermal lines. July. 1913


Rainfall in July 1913
Less than 2"
2"-5"
5"-8"
More than 8"
Scale in inches


Isothermal lines August 1913.


Rainfall in August. 1913
Less than 1"
1"-3"
3"-5"
5"-7"
More than 7"
Scale in inches


Isothermal lines. September. 1913


Rainfall in September 1913
Less than 2"
2"-4"
4"-6"
More than 6"
Scale in inches

IOWA CROPS, 1913, NUMBER OF ACRES BY COUNTIES.

	Corn Acres	Oats Acres	Spring Wheat Acres	Winter Wheat Acres	Barley Acres	Rye Acres	Flax Acres	Potatoes Acres	Tame Hay Acres	Wild Hay Acres	Alfalfa Acres	Pastures Acres
Adair	101,500	34,500	4,100	3,000	1,500	300	----------	1,200	33,400	3,300	40	116,000
Adams	72,000	21,800	640	11,200	590	540	----------	300	26,000	1,500	130	89,000
Allamakee	40,000	35,000	1,100	1,000	14,700	1,140	30	1,000	46,500	1,500	60	161,000
Appanoose	43,500	18,000	200	3,000	----------	290	----------	200	25,600	1,300	----------	98,000
Audubon	94,500	42,100	5,850	1,000	5,900	70	----------	1,000	24,800	2,600	100	72,400
Benton	129,200	77,000	830	570	12,700	1,090	----------	1,000	37,000	4,000	20	100,700
Black Hawk	99,000	59,000	270	1,700	6,200	2,300	----------	2,500	28,400	9,500	70	96,900
Boone	114,000	60,000	1,800	2,800	300	130	30	1,500	23,300	12,800	80	75,600
Bremer	63,000	51,300	350	320	2,200	1,300	25	1,250	17,000	19,400	30	68,200
Buchanan	88,100	58,000	240	420	390	1,080	----------	900	33,300	12,600	20	106,200
Buena Vista	115,000	82,500	1,140	600	1,030	----------	260	1,800	18,200	16,600	140	61,300
Butler	104,000	85,000	500	830	1,400	2,900	----------	1,500	22,500	10,500	15	89,000
Calhoun	138,500	92,500	500	1,100	1,100	40	115	1,100	18,600	11,200	80	57,400
Carroll	108,000	65,900	6,400	1,200	3,400	100	----------	2,600	23,500	9,900	80	69,600
Cass	110,000	37,600	7,800	17,000	2,500	250	35	1,250	33,200	1,980	230	95,000
Cedar	100,500	54,400	590	2,400	14,200	970	----------	1,100	41,600	330	40	96,000
Cerro Gordo	93,000	73,200	1,300	630	3,200	550	600	1,200	20,900	14,400	60	66,700
Cherokee	123,000	76,000	900	300	3,390	70	75	1,400	25,000	10,800	600	83,400
Chickasaw	50,200	46,900	1,930	330	4,100	700	400	1,000	18,500	11,000	----------	66,900
Clarke	54,000	19,600	300	7,500	60	70	----------	250	17,700	120	----------	89,600
Clay	97,500	75,400	2,900	450	2,970	350	1,240	900	19,400	19,100	40	81,000
Clayton	69,000	55,000	660	1,700	14,400	1,950	----------	1,850	55,400	1,530	40	158,000
Clinton	118,000	43,600	1,150	5,300	9,200	1,870	----------	1,050	54,000	4,300	20	142,400
Crawford	133,500	62,000	14,000	2,800	5,300	280	----------	2,050	40,000	6,200	800	98,000
Dallas	128,500	53,200	1,650	10,000	850	350	----------	750	25,000	4,800	180	91,000
Davis	56,500	28,900	50	2,200	----------	300	----------	450	34,600	60	20	106,800
Decatur	67,000	20,200	160	10,000	----------	550	----------	200	30,000	450	60	96,000
Delaware	86,300	45,000	240	200	8,580	2,050	----------	1,150	36,500	6,800	----------	114,500
Des Moines	66,500	29,000	260	1,500	420	850	----------	700	22,600	200	50	80,900
Dickinson	56,500	33,400	5,400	250	2,630	240	850	500	7,700	14,600	45	44,000
Dubuque	67,000	50,300	600	370	2,540	900	----------	2,100	51,800	700	50	146,000
Emmet	52,300	38,000	5,500	230	2,890	210	1,100	750	12,500	14,000	----------	45,400
Fayette	90,000	69,400	900	700	8,000	1,900	90	1,800	47,000	12,000	20	156,000
Floyd	79,000	70,200	1,500	680	2,100	2,150	440	1,700	28,000	4,500	----------	55,000
Franklin	110,000	84,900	1,200	750	1,400	150	260	1,600	23,700	14,000	50	81,000
Fremont	96,900	11,800	1,600	31,400	100	1,100	----------	550	10,700	5,600	4,500	68,000
Greene	124,000	65,000	980	1,150	770	100	40	800	23,600	9,600	40	75,600
Grundy	104,600	48,200	400	800	6,000	100	----------	2,800	21,200	7,300	25	66,100
Pottawattamie	198,000	44,200	14,800	28,000	3,500	780	----------	2,450	33,700	9,100	9,400	129,000
Poweshiek	116,000	49,100	1,800	1,400	1,400	400	----------	1,100	29,200	400	40	104,300
Ringgold	74,700	23,500	200	8,800	20	260	----------	150	36,000	330	10	100,000
Sac	114,000	69,500	1,450	640	5,500	90	50	1,200	26,000	8,800	270	75,000
Scott	74,100	25,000	1,640	5,530	24,300	3,200	----------	6,000	28,000	3,040	100	74,200
Shelby	132,600	47,200	11,600	1,500	8,700	440	----------	1,300	27,400	5,700	560	84,000
Sioux	170,000	84,200	29,700	1,600	18,500	40	140	1,900	17,800	19,100	700	76,100
Story	124,000	60,300	700	4,200	160	270	50	500	28,500	7,100	140	64,000
Guthrie	99,000	49,000	3,400	2,500	1,200	70	----------	1,300	23,300	4,600	50	111,600
Hamilton	117,500	77,600	720	1,700	300	100	250	800	24,800	12,700	60	75,600
Hancock	93,000	72,200	5,200	400	500	500	770	1,850	17,300	27,700	15	70,200
Hardin	104,000	69,000	1,800	950	550	100	----------	1,250	23,500	10,200	70	72,800
Harrison	154,500	20,200	19,200	21,000	2,100	360	----------	830	10,000	9,000	6,500	79,000
Henry	66,000	33,000	90	900	70	550	----------	350	21,800	----------	30	80,700
Howard	50,100	49,300	2,100	1,300	9,600	1,250	1,500	900	28,000	8,700	----------	68,000
Humboldt	82,000	59,600	4,100	690	1,350	100	500	650	16,600	12,600	50	48,000
Ida	94,000	46,600	2,800	520	7,500	260	----------	900	22,100	2,600	100	53,600
Iowa	96,000	44,000	1,030	1,730	1,240	670	----------	1,350	29,200	1,280	45	109,000
Jackson	62,000	30,400	1,100	1,060	2,900	2,400	----------	1,200	36,800	1,240	20	162,000
Jasper	138,400	56,100	5,000	7,000	400	340	----------	1,100	39,200	1,260	25	136,600
Jefferson	57,000	26,200	430	2,160	380	500	----------	440	24,400	----------	20	81,000
Johnson	86,800	41,500	760	3,200	1,470	1,800	----------	1,100	41,300	1,000	50	103,000
Jones	76,800	34,100	460	350	7,400	1,280	----------	820	42,800	450	20	117,400
Keokuk	97,800	39,400	2,100	3,130	540	690	----------	800	38,500	160	15	114,000
Kossuth	152,000	117,800	12,500	650	6,400	400	1,450	3,000	27,300	53,500	25	112,500
Lee	60,600	22,800	150	3,250	380	3,200	----------	1,100	31,200	200	40	118,000
Linn	95,800	61,000	1,550	800	2,300	1,160	----------	1,580	48,000	3,800	30	126,000
Louisa	64,000	21,800	150	1,900	260	1,330	----------	400	15,400	720	110	64,000
Lucas	48,800	21,000	700	8,800	----------	430	----------	200	14,700	350	30	88,200
Lyon	119,000	84,600	9,200	280	11,100	230	120	2,300	1,200	11,500	380	56,200
Madison	105,200	26,500	1,700	9,200	1,740	440	----------	800	28,000	1,220	50	108,300
Mahaska	157,600	38,000	2,200	5,900	750	800	----------	690	29,300	500	50	94,800
Marion	86,600	2,700	3,100	17,200	650	760	----------	550	25,300	370	15	116,900
Marshall	117,500	74,500	1,820	6,500	780	200	----------	1,580	31,100	1,150	30	80,600
Mills	84,000	15,900	2,460	21,000	450	500	----------	400	11,300	3,900	4,500	59,000
Mitchell	64,500	75,000	3,700	550	8,300	260	2,400	1,800	20,600	2,300	10	64,000
Monona	142,000	20,000	12,100	27,500	2,000	270	----------	1,000	10,400	16,400	10,000	85,000
Monroe	51,000	19,300	2,900	6,800	40	400	----------	250	26,000	110	----------	92,900
Montgomery	84,000	16,400	4,040	27,700	370	430	----------	550	22,600	800	1,000	74,400
Muscatine	71,800	21,800	610	3,450	6,800	3,000	----------	2,450	24,200	900	50	100,000
O'Brien	113,000	74,500	3,640	310	12,600	200	290	1,800	20,100	9,000	80	72,100
Osceola	73,600	61,000	3,600	270	8,350	320	750	980	9,500	11,300	----------	43,900
Page	103,500	19,200	2,630	32,000	300	930	----------	450	30,000	1,060	320	99,800
Palo Alto	89,500	60,100	3,300	200	1,650	400	1,100	800	10,800	31,200	15	57,000
Plymouth	188,000	77,300	39,200	3,000	6,500	90	110	3,650	24,100	21,100	2,500	89,400
Pocahontas	118,000	90,300	1,600	850	1,000	290	920	1,200	14,300	21,200	50	60,600
Polk	97,000	35,500	3,600	20,000	140	270	----------	1,350	22,800	3,500	100	71,600

IOWA CROPS, 1913, NUMBER OF ACRES BY COUNTIES—CONTINUED.

	Corn Acres	Oats Acres	Spring Wheat Acres	Winter Wheat Acres	Barley Acres	Rye Acres	Flax Acres	Potatoes Acres	Tame Hay Acres	Wild Hay Acres	Alfalfa Acres	Pastures Acres
Tama	125,000	68,400	3,300	2,100	10,500	500	40	1,800	38,800	3,060	50	116,000
Taylor	73,000	19,000	250	18,300	390	700	----------	450	29,200	670	120	95,100
Union	62,000	22,000	750	2,800	120	290	----------	700	24,500	1,050	15	94,100
Van Buren	55,000	20,300	80	2,000	70	660	----------	230	31,400	50	160	125,000
Wapello	54,800	18,300	580	8,500	200	1,050	----------	650	26,000	----------	15	88,000
Warren	83,700	20,000	1,300	24,200	280	1,000	----------	700	30,200	650	40	126,000
Washington	97,700	48,400	560	2,260	290	460	----------	580	32,500	95	----------	102,000
Wayne	68,000	29,600	60	4,300	60	600	----------	200	37,500	80	----------	98,000
Webster	134,000	97,600	3,500	1,400	380	60	390	900	22,300	23,000	70	87,000
Winnebago	59,300	35,600	16,400	60	4,600	120	1,400	970	12,700	26,800	65	54,400
Winneshiek	71,000	61,300	7,500	1,100	21,400	1,860	1,160	1,300	46,500	4,800	45	130,000
Woodbury	185,000	52,000	12,000	12,200	3,850	160	50	1,500	22,000	13,000	5,400	97,500
Worth	51,200	47,500	12,000	320	5,230	230	3,000	1,300	15,300	17,900	80	54,000
Wright	105,400	82,400	2,500	450	1,500	60	225	900	25,200	11,800	20	66,600
Totals	9,434,500	4,804,400	365,300	505,740	368,600	69,830	92,255	117,000	2,632,200	727,165	51,490	8,922,600

FINAL CROP REPORT, 1913

AVERAGE YIELD PER ACRE AND TOTAL PRODUCT—BY COUNTIES

Counties	Corn		Oats		Spring Wheat		Winter Wheat		Barley		Rye		Flax Seed		Potatoes		Hay—Tame		Hay—Wild	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Tons per acre	Total Tons	Tons per acre	Total Tons
Adair	30	3,045,000	36	1,242,000	16	75,600	23	69,000	28	42,000	17	5,100	----	----------	30	36,000	1.3	43,400	1.6	5,200
Adams	25	1,800,000	36	785,000	17	10,800	24	268,800	30	17,700	21	11,300	----	----------	23	6,900	1.5	39,000	1.3	1,900
Allamakee	44	1,760,000	39	1,365,000	20	22,000	23	23,000	26	382,200	17	19,300	5	150	70	70,000	1.8	83,700	2.0	3,000
Appanoose	24	1,044,000	40	720,000	19	3,800	22	66,000	----	----------	20	5,800	----	----------	34	6,800	1.2	30,700	1.3	1,700
Audubon	30	2,835,000	38	1,599,000	17	99,400	29	29,000	25	147,500	18	1,200	----	----------	60	60,000	1.5	37,200	1.8	4,600
Benton	39	5,038,000	34	2,618,000	17	7,100	21	11,900	23	292,100	23	25,000	----	----------	42	42,000	1.9	70,300	1.6	6,400
Black Hawk	38	3,762,000	36	2,124,000	18	4,800	26	44,200	29	179,800	19	43,700	----	----------	45	112,500	1.5	42,600	1.1	10,400
Boone	38	4,332,000	33	1,980,000	18	32,400	24	67,200	24	7,200	15	1,900	9	270	32	48,000	1.9	44,200	1.4	17,900
Bremer	37	2,331,000	36	1,846,000	17	5,900	24	7,600	26	57,200	20	26,000	8	200	48	60,000	1.7	28,900	1.2	23,200
Buchanan	36	3,172,000	34	1,972,000	19	4,500	20	8,400	28	10,900	20	21,600	----	----------	61	54,900	1.5	49,900	1.5	18,900
Buena Vista	37	4,255,000	30	2,475,000	14	15,900	24	14,400	24	24,700	----	----------	10	2,600	37	66,600	1.5	27,300	1.3	21,500
Butler	36	3,744,000	29	2,465,000	13	6,500	16	13,200	22	30,800	17	49,300	----	----------	54	81,000	1.8	40,500	1.4	14,700
Calhoun	39	5,400,000	33	3,052,000	20	10,000	22	24,200	25	27,500	18	700	9	1,000	29	31,900	1.6	29,700	1.0	11,200
Carroll	37	3,996,000	34	2,240,000	17	108,800	24	28,800	27	91,800	17	1,700	----	----------	57	148,200	1.6	37,600	1.2	11,800
Cass	29	3,190,000	35	1,316,000	17	132,600	25	425,000	30	75,000	15	3,700	7	240	19	23,700	1.3	43,100	1.3	2,500
Cedar	37	3,718,000	36	1,958,000	18	10,600	20	48,000	26	369,200	15	14,500	----	----------	57	62,700	1.9	79,000	1.5	500
Cerro Gordo	43	3,999,000	38	2,781,000	15	19,500	22	13,800	22	70,400	12	6,600	10	6,000	56	67,200	1.4	29,200	1.1	15,800
Cherokee	34	4,182,000	30	2,280,000	18	16,200	23	6,900	18	61,000	16	1,100	10	750	37	51,800	1.9	35,000	1.1	11,800
Chickasaw	44	2,208,000	32	1,500,000	17	32,800	18	5,900	27	110,700	19	13,300	10	4,000	43	43,000	1.4	25,900	1.3	14,300
Clarke	24	1,296,000	31	607,000	16	4,800	20	150,000	25	1,500	19	1,300	----	----------	43	19,700	1.1	19,400	1.0	120
Clay	43	4,192,000	38	2,865,000	15	43,500	17	7,600	26	77,200	19	6,600	8	9,900	55	49,500	1.3	25,200	1.0	19,100
Clayton	44	3,036,000	35	1,925,000	18	11,800	20	34,000	26	374,000	20	39,000	----	----------	58	107,300	1.7	94,100	1.3	2,000
Clinton	34	4,012,000	28	1,220,000	15	17,200	16	84,800	22	202,000	15	28,000	----	----------	39	40,900	1.3	70,200	1.1	4,700
Crawford	37	4,939,000	35	2,170,000	14	196,000	21	58,800	25	132,000	16	4,400	----	----------	55	112,700	1.5	60,000	1.0	6,200
Dallas	34	4,369,000	38	2,021,000	20	33,000	24	240,000	30	25,500	22	7,700	----	----------	31	23,200	1.5	37,500	1.1	5,200
Davis	24	1,356,000	33	954,000	13	600	20	44,000	----	----------	15	4,500	----	----------	38	17,100	1.4	48,400	1.0	10
Decatur	27	1,809,000	35	707,000	20	3,000	20	200,000	----	----------	17	9,300	----	----------	29	5,800	1.2	36,000	1.5	670
Delaware	33	2,847,000	30	1,350,000	17	4,000	16	3,200	26	123,000	17	34,800	----	----------	53	60,900	1.5	54,700	1.7	11,500
Des Moines	28	1,862,000	31	899,000	15	3,900	20	30,000	23	9,600	17	14,400	----	----------	63	44,100	1.4	31,600	1.1	220
Dickinson	39	2,208,000	36	1,202,000	12	64,800	18	4,500	24	63,000	17	4,000	11	9,300	63	31,500	1.3	10,000	1.1	16,000
Dubuque	37	2,479,000	32	1,609,000	19	11,400	20	7,400	30	76,000	16	14,400	----	----------	62	130,200	1.3	67,300	0.8	560

FINAL CROP REPORT, 1913—CONTINUED

AVERAGE YIELD PER ACRE AND TOTAL PRODUCTION—BY COUNTIES

Counties	Corn		Oats		Spring Wheat		Winter Wheat		Barley		Rye		Flax Seed		Potatoes		Hay—Tame		Hay—Wild	
	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Bushels per acre	Total Bushels	Tons per acre	Total Tons	Tons per acre	Total Tons
Emmet	38	1,987,000	37	1,406,000	13	71,500	20	4,600	21	60,600	12	2,500	9	9,900	65	48,700	1.6	20,000	1.1	15,400
Fayette	41	3,690,000	35	2,429,000	18	16,200	21	14,700	28	224,000	22	41,800	11	990	55	99,000	1.5	70,500	1.1	13,200
Floyd	36	2,844,000	29	2,085,000	19	28,500	22	14,900	26	54,600	16	34,400	9	3,960	46	78,200	1.3	29,900	1.0	4,500
Franklin	42	4,620,000	38	3,226,000	18	21,600	23	17,200	23	32,200	17	2,500	10	2,600	52	83,200	1.5	35,000	1.2	16,800
Fremont	25	2,322,000	31	366,000	17	27,200	24	753,600	29	2,900	21	23,000	----	----------	57	31,300	1.4	15,000	1.3	7,200
Greene	39	4,836,000	38	2,470,000	21	20,500	25	28,700	27	20,700	20	2,000	----	----------	32	25,000	1.4	33,000	1.1	10,500
Grundy	43	4,497,000	40	1,928,000	16	6,400	19	15,200	25	150,000	20	2,000	----	----------	53	148,400	1.5	31,800	1.1	8,000
Guthrie	31	3,069,000	31	1,519,000	16	54,400	25	62,500	27	32,400	16	1,100	----	----------	35	45,500	1.9	44,200	1.4	6,400
Hamilton	43	5,052,000	34	2,638,000	16	11,500	18	30,600	26	7,800	18	1,800	9	2,250	39	31,200	1.6	39,600	1.0	12,700
Hancock	41	3,813,000	33	2,382,000	17	88,400	20	8,000	27	13,500	23	11,500	10	7,700	70	129,500	1.5	25,900	1.3	36,000
Hardin	43	4,472,000	36	2,484,000	14	25,200	19	18,000	26	22,100	19	1,900	----	----------	34	42,500	1.8	42,300	1.0	10,200
Harrison	31	4,789,000	36	727,000	15	288,000	22	462,000	28	58,800	22	7,900	----	----------	45	37,300	1.8	18,000	1.9	17,100
Henry	28	1,848,000	29	957,000	17	1,500	21	18,900	24	1,600	17	9,300	----	----------	60	21,000	1.7	37,000	----	----------
Howard	41	2,054,000	34	1,676,000	18	37,800	18	23,400	26	249,600	15	19,200	12	18,000	70	63,000	1.5	42,000	1.2	10,400
Humboldt	41	3,362,000	35	2,066,000	17	69,700	23	15,800	22	29,700	17	1,700	10	5,000	57	37,000	1.6	26,500	1.1	13,800
Ida	38	3,572,000	32	1,491,000	15	42,000	20	10,400	24	180,000	21	5,400	----	----------	35	31,500	1.4	30,900	1.1	2,800
Iowa	33	3,168,000	33	1,452,000	19	19,500	22	38,000	30	37,200	22	14,700	----	----------	41	55,300	1.6	46,700	1.3	1,600
Jackson	40	2,480,000	28	851,000	19	20,900	20	21,200	27	78,300	20	48,000	----	----------	60	72,000	1.6	58,800	1.5	1,800
Jasper	34	4,705,000	36	2,019,000	15	75,000	21	147,000	30	12,000	17	5,700	----	----------	32	35,200	1.6	62,700	1.2	1,500
Jefferson	28	1,596,000	30	786,000	16	6,800	17	36,700	20	7,600	12	6,000	----	----------	65	28,600	1.4	34,100	----	----------
Johnson	30	2,604,000	30	1,245,000	14	10,600	21	67,200	24	35,200	16	28,800	----	----------	45	49,500	1.6	66,000	0.5	500
Jones	40	3,072,000	33	1,125,000	15	6,900	15	5,200	25	185,000	14	17,900	----	----------	56	45,900	1.5	64,200	1.2	540
Keokuk	29	2,836,000	31	1,311,000	18	37,800	23	72,000	22	11,800	20	13,800	----	----------	37	29,600	1.7	65,400	1.3	200
Kossuth	40	6,080,000	37	4,358,000	12	150,000	18	11,700	20	128,000	18	7,200	6	8,700	40	120,000	1.8	49,100	1.1	58,800
Lee	27	1,636,000	29	661,000	15	2,200	19	61,700	12	4,500	17	54,400	----	----------	53	58,300	1.3	40,500	1.0	200
Linn	34	3,257,000	34	2,074,000	19	29,400	12	9,600	28	64,400	22	25,800	----	----------	55	86,900	1.2	57,600	1.0	3,800
Louisa	30	1,920,000	28	610,000	19	2,800	21	39,900	24	6,200	20	26,600	----	----------	39	15,600	1.6	24,600	1.0	720
Lucas	26	1,268,000	40	840,000	15	10,500	22	193,600	----	----------	18	7,700	----	----------	42	8,400	1.5	22,000	1.2	420
Lyon	44	5,236,000	47	3,976,000	17	156,400	18	5,000	24	266,400	18	4,100	12	1,400	70	91,000	1.3	1,500	1.6	18,400
Madison	29	3,060,000	33	874,000	15	25,500	25	230,000	24	41,700	21	9,200	----	----------	47	37,600	1.5	42,000	1.2	1,400
Mahaska	28	4,412,000	33	1,254,000	16	35,200	22	129,800	29	21,700	18	14,400	----	----------	31	21,300	1.5	43,900	1.2	600
Marion	28	2,424,000	36	817,000	17	52,700	25	430,000	22	14,300	21	15,900	----	----------	32	17,600	1.9	48,000	0.9	330
Marshall	42	4,935,000	35	2,607,000	18	32,700	21	136,500	24	18,700	20	4,000	----	----------	40	63,200	1.8	55,900	0.5	570
Mills	28	2,352,000	32	508,000	14	34,400	26	546,000	21	9,400	17	8,500	----	----------	65	26,000	2.0	22,600	2.0	7,800
Mitchell	40	2,580,000	36	2,700,000	21	77,700	21	11,500	30	249,000	23	5,900	15	36,000	70	126,000	1.6	32,900	1.1	2,500
Monona	28	3,976,000	31	620,000	13	157,300	22	605,000	26	52,000	15	4,000	----	----------	44	44,000	1.7	17,600	1.7	27,800
Monroe	18	918,000	33	636,000	19	55,100	22	149,600	20	800	17	6,800	----	----------	15	3,700	0.9	23,400	0.8	100
Montgomery	30	2,520,000	32	524,000	16	64,600	25	692,500	21	7,700	18	7,700	----	----------	28	15,400	1.5	33,900	2.0	1,600
Muscatine	34	2,441,000	23	501,000	15	9,100	21	72,100	21	142,800	20	60,000	----	----------	56	137,200	1.3	31,400	1.0	900
O'Brien	39	4,407,000	32	2,384,000	20	72,800	25	7,700	21	264,600	18	3,600	13	3,700	53	95,400	1.4	28,100	1.0	9,000
Osceola	42	3,091,000	43	2,623,000	15	54,000	26	7,000	24	200,400	17	5,400	10	7,500	70	68,600	1.6	15,200	1.4	15,800
Page	27	2,794,000	35	672,000	17	44,700	26	832,000	27	8,100	17	15,800	----	----------	37	16,600	1.6	48,000	1.2	1,200
Palo Alto	42	3,759,000	34	2,043,000	12	39,600	15	3,000	23	37,900	17	6,800	9	9,900	65	5,200	1.3	14,000	1.1	34,300
Plymouth	33	6,204,000	26	2,009,000	13	509,600	20	60,000	15	97,500	16	1,400	8	880	36	131,400	1.3	31,300	1.5	31,600
Pocahontas	39	4,602,000	33	2,979,000	15	24,000	21	17,800	18	18,000	17	4,900	6	5,500	37	44,400	1.2	17,100	1.1	23,300
Polk	34	3,298,000	35	1,242,000	15	54,000	24	480,000	26	3,600	19	5,100	----	----------	32	43,200	1.9	43,300	1.3	4,500
Pottawattamie	31	6,138,000	32	1,414,000	16	236,800	26	728,000	25	87,500	19	14,800	----	----------	36	88,200	1.3	43,800	1.4	12,700
Poweshiek	34	3,944,000	32	1,571,000	13	23,400	22	30,800	27	37,800	20	8,000	----	----------	36	39,600	1.4	40,800	1.2	480
Ringgold	24	1,792,000	33	775,000	15	3,000	22	193,600	23	500	16	4,100	----	----------	48	7,200	1.6	57,600	1.1	360
Sac	38	4,332,000	30	2,085,000	13	18,800	22	14,000	23	126,500	18	1,600	8	400	43	51,600	1.6	41,600	1.2	10,500
Scott	26	2,667,000	30	750,000	17	27,800	24	132,700	19	461,700	17	54,400	----	----------	57	342,000	1.6	44,800	1.5	4,500
Shelby	31	4,110,000	34	1,604,000	14	162,400	22	33,000	25	217,500	20	8,800	----	----------	32	41,600	1.4	38,300	1.5	8,500
Sioux	42	7,140,000	35	2,947,000	15	445,500	22	35,200	22	407,000	17	600	10	1,400	50	95,000	1.7	30,100	1.4	26,700
Story	40	4,960,000	39	2,351,000	19	13,300	26	109,200	27	4,300	18	4,800	----	----------	49	24,500	1.7	48,400	1.2	8,500
Tama	39	4,875,000	34	2,325,000	20	66,000	26	54,600	25	262,500	18	9,000	----	----------	42	75,600	1.7	65,900	1.0	3,000
Taylor	27	1,971,000	43	871,000	15	3,700	27	494,000	29	11,300	25	17,500	----	----------	48	21,600	1.7	49,600	1.1	730
Union	25	1,550,000	36	792,000	19	14,200	22	61,600	26	3,100	18	5,200	----	----------	37	25,900	1.5	36,700	1.5	1,500
Van Buren	25	1,375,000	33	670,000	16	1,200	19	38,000	21	1,400	17	11,200	----	----------	49	11,279	1.4	43,900	1.0	50
Wapello	28	1,534,000	37	677,000	16	9,200	22	187,000	16	3,200	16	16,800	----	----------	46	29,900	1.2	31,200	----	----------
Warren	26	2,176,000	33	660,000	15	19,500	21	508,200	27	7,500	23	23,000	----	----------	27	18,900	2.0	60,400	1.0	650
Washington	30	2,931,000	35	1,694,000	16	8,900	20	45,200	23	6,600	17	7,800	----	----------	48	25,400	1.6	52,000	1.0	95
Wayne	25	1,700,000	37	1,095,000	14	800	23	98,900	20	1,200	17	10,200	----	----------	40	8,000	1.2	45,000	1.0	80
Webster	42	5,628,000	38	3,708,000	16	56,000	11	15,400	26	9,300	20	1,200	9	3,500	50	45,000	1.7	37,900	1.3	29,900
Winnebago	42	2,490,000	35	1,246,000	14	229,600	16	900	26	119,600	20	2,400	9	12,600	70	67,900	1.5	19,000	1.5	40,200
Winneshiek	43	3,053,000	35	2,145,000	16	120,000	18	19,800	23	492,200	20	37,200	10	11,600	70	91,000	1.5	69,700	1.1	5,200
Woodbury	32	5,962,000	35	1,300,000	12	144,000	18	219,600	18	69,300	18	2,800	8	400	34	51,000	1.4	30,800	1.4	18,200
Worth	42	2,150,000	33	1,567,000	14	168,000	18	5,700	26	136,000	18	4,100	11	33,000	60	78,000	1.8	27,500	1.4	25,000
Wright	40	4,216,000	32	2,636,000	17	42,500	24	10,800	29	43,500	16	1,000	10	2,200	45	40,500	1.6	40,300	1.1	13,000
Totals		329,343,000		164,851,000		5,510,200		11,693,900		8,756,300		1,274,500		223,490		5,532,170		4,010,300		910,205
Averages	34.9		34.2		15.1		23.1		23.8		18.3		10.0		47.3		1.5		1.3	