

U. S. DEPARTMENT OF AGRICULTURE,
WEATHER BUREAU,

IN CO-OPERATION WITH THE

Iowa Weather and Crop Service.

ANNUAL REPORT FOR 1903.

GEO. M. CHAPPEL,
Local Forecaster, Ass't Director.

JOHN R. SAGE,
Director.

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LETTER OF TRANSMITTAL.

STATE OF IOWA.
OFFICE OF THE WEATHER AND CROP SERVICE,
DES MOINES, Aug. 5, 1904.

To His Excellency, ALBERT B. CUMMINS, Governor of Iowa:

SIR—In accordance with the requirements of the law, we have the honor to submit herewith the fourteenth annual report of the Iowa Weather and Crop Service, for the year 1903.

We are, sir, very respectfully,

Your obedient servants,

JOHN R. SAGE,
Director.

GEORGE M. CHAPPEL,
Local Forecaster U. S. Weather Bureau,
Assistant Director.

ANNUAL REPORT, 1903.

The special purpose of this compilation is to present in condensed form the salient climatic features of the year and statistics of soil products, for future reference and comparison. In the maintenance of this Climate and Crop Service there is recognition of the well understood fact that the output of soil products depends upon prevalent climatic conditions during the year, and more especially in the season from seed time to harvest. In this form of presentation of meteorological data and statistics of farm crops students of science and practical business men will find equal matter of interest, though regarded from different points of view.

By co-operation of the state with the national department, more valuable service to the public has been rendered than would be possible by working on independent lines. In this branch of the public service we have also the efficient co-operation of an able corps of voluntary meteorological observers and expert crop reporters, whose generous, uncompensated labors are gratefully recognized.

During the year climatic records have been received and compiled from the fully equipped United States Weather Bureau stations at Des Moines, Davenport, Dubuque, Keokuk, Sioux City and Omaha; and reports have also been received with a fair measure of regularity from 132 voluntary meteorological stations, distributed in all parts of the state. Great care has been exercised in the correction of these reports and the elimination of errors from the monthly records.

Official publications have been issued as follows: Annual Report (for 1902), 10,000 copies; Monthly Reviews, 32,000 copies; Weekly Climate and Crop Bulletins, 70,000 copies. The Annual Report referred to contained an appendix of 185 pages, covering all available data relative to the climate and crop products of this state. The most gratifying advancement has been made in the dissemination of the daily weather forecasts by the means of the rural mail delivery, and over the wires of rural telephone lines. At the close of the fiscal year, ended June 30, 1904, about fifty thousand patrons of the various telephone lines in the rural districts received daily weather forecasts; and about seven thousand farmers received the forecasts by rural free delivery. The extension of the service in this line has brought forth many expressions of appreciation from recipients of the forecasts.

CLIMATOLOGY OF THE YEAR 1903.

Barometer—The mean pressure for the year was 30.04 inches. The highest observed pressure was 30.68 inches on February 18th and December 14th at Des Moines; lowest pressure, 29.19 inches, on October 6th at Sioux City. Range for the state 1.49 inches.

Temperature—The mean temperature for the state was 47.3° , which is 0.3° below normal. The highest temperature reported was 101° on August 24th at Logan. The lowest temperature reported was 27° below zero on December 13th at Sibley. Range for the year 128° .

Precipitation—The average amount of rain and melted snow for the year, as shown by complete records of 95 stations, was 35.66 inches, which is 4.75 inches above the normal, and 8.65 inches below the average amount for 1902. The greatest amount recorded at any station for the year was 50.53 inches at Onawa. Least amount recorded 26.41 inches at Ames. The greatest monthly rainfall was 17.74 inches at Woodburn in August; least monthly amount, a trace at Afton and thirteen other stations in January, November and December; the greatest amount in any consecutive twenty-four hours was 11.22 inches at Cherokee, August 27th. The average number of days on which .01 of an inch or more of rain fell was 92.

Wind and Weather—The prevailing direction of wind was northwest. Highest velocity reported, seventy-two miles an hour, in Sioux City, from the northwest and southeast on January 6th and May 21st. Average daily wind movement 210 miles. There were 156 clear days, 100 partly cloudy, and 109 cloudy days; against 145 clear days, 111 cloudy and 109 partly cloudy in 1902.

MONTHLY SUMMARIES.

JANUARY.

The monthly mean temperature for the state, as shown by records of 105 stations, was 23.0° , which is 3.5° above normal. By sections the mean temperatures were as follows: Northern section, 19.8° ; central section, 22.8° ; southern section, 25.8° . The highest monthly mean was 27.8° , at Red Oak; lowest monthly mean, 17.5° , at New Hampton. The highest temperature reported was 60° , at Belknap, on the 1st; lowest temperature reported, -12° , at Clear Lake, on the 11th. The average monthly maximum was 46.7° ; average monthly minimum, -6.2° . Greatest daily range, 45° , at Carroll; average of greatest daily ranges, 32.1° . Average precipitation for the state, as shown by records of 120 stations, was 0.28 inch, which is .74 of an inch below normal. The averages by sections were as follows: Northern section, .21; central section, .29; southern section, .28. The largest amount reported was 1.46 inches, at Fort Madison; least amount reported, a trace, at Charles City, Carroll, Cumberland, Afton, Atlantic, Thurman and Winterset. The greatest daily rainfall reported was .70 inches, at Danville, on the 2d. Average number of days on which .01 of an inch or more was reported, 4. Prevailing direction of wind, northwest; highest velocity reported, 72 miles per hour, from the northwest, at Sioux City, on the 6th. Average number of clear days, 13; partly cloudy, 7; cloudy, 11.

OBSERVERS' NOTES.

Afton—N. W. ROWELL: On the 7th the wind was 40 to 50 miles an hour, the high wind prevailing 24 hours.

Alta—DAVID E. HADDEN: Gale with blinding snowstorm raged from 8 P.M. of the 6th to sunset on the 7th. Last week of the month was warm.

Amara—C. SCHADT: Excepting a few days, January was mild; cattle still finding green grass in protected places.

Atlantic—J. W. LOVE: The mildest January in 12 years. No rain and only a trace of snow three times; zero temperature only on two days.

Bonaparte—B. R. VALE: A mild month, too soft at times; stock did well on blue grass meadows and pastures all the month.

Britt—Geo. P. HARDWICK: Mild weather, excepting severe wind on 7th and 8th; ground nearly bare at close of month; stock healthy.

Clinton—DR. LUKE ROBERTS: Cloudiness, 59 per cent, or 8 per cent above normal. Precipitation 1.03 less than normal; country roads better than usual; two weeks of sleighing; ice crop excellent, and an abundance secured. Mean temperature for January, 22.7° , being 4.1° above normal. Maximum velocity of wind twenty-seven miles an hour, on the 7th, and again on 29th; total wind movement for the month, 4,000 miles—nearly 1,000 miles less than normal.

Grand Meadow—F. L. WILLIAMS: On the 6th the mercury in barometer was down to 27.80 inches; month, as a whole, a pleasant one; stock wintering well.

Ridgeway—ARTHUR BETTS: Mild January; no excessive cold; distant lightning after sunset on 6th and 26th; 142 hours of sunshine; forest ground has remained unfrozen; farmers grubbing every day; crows and other birds numerous.

FEBRUARY.

The monthly mean temperature for the state, as shown by the records of 108 stations was 19.8° , which is 0.2° below normal. By sections the mean temperatures were as follows: Northern section, 17.2° ; central section, 20.2° ; southern section, 22.1° . The highest monthly mean was 26.4° at Keokuk; lowest monthly mean, 14.2° at Estherville. The highest temperature reported was 56° , at Eldon on the 2d; lowest temperature reported, -21° , at Clear Lake, Estherville and Sioux Center, on the 16th, 17th, and 18th. The average monthly maximum was 45.7° ; average monthly minimum, -16.4° . Greatest daily range, 44° at Villisca; average of greatest daily ranges, 35.8° . Average precipitation for the state, as shown by records of 120 stations, was 1.18 inches, which is .09 of an inch above normal. The averages by sections were as follows: Northern section, 1.02 inches; central section, 1.13 inches; southern section, 1.38 inches. The largest amount reported was 3.25 inches at Danville; least amount reported, .30 of an inch, at Galva. The greatest daily rainfall reported was 1.50 inches at Indianola, on the 4th. Average number of days on which .01 of an inch or more was reported, 4. Prevailing direction of the wind, northwest; highest velocity reported, 52 miles per hour, from the northwest, at Sioux City, on the 28th. Average number of clear days, 13; partly cloudy, 7; cloudy, 8.

OBSERVERS' NOTES.

Bonaparte—B. R. VALE: A pleasant month; coldest of the season 16th to 20th; roads very muddy at close of the month.

Britt—GEO. P. HARDWICK: Excepting from 15th to 20th the month was comparatively mild, with light snow fall, allowing stock feeding in stalk fields.

MARCH.

The monthly mean temperature for the state, as shown by records of 114 stations, was 38.8°, which is 6.6° above normal. By sections the mean temperatures were as follows: Northern section, 36.1°; central section, 39.4°; southern section, 41.1°. The highest monthly mean was 45.0°, at Eldon; lowest monthly mean, 30.8°, at Sibley. The highest temperature reported was 82°, at Mt. Pleasant, on the 14th; lowest temperature reported, 6°, at Baxter and Clear Lake, on the 1st. The average monthly maximum was 72.1°; average monthly minimum, 11.2°. Greatest daily range, 48°, at Monticello; average of greatest daily ranges, 35.3°. Average precipitation for the state, as shown by records of 126 stations, was 1.38 inches, which is 0.53 of an inch below normal. The averages by sections were as follows: Northern section, 1.40 inches; central section, 1.34 inches; southern section, 1.39 inches. The largest amount reported was 3.90 inches, at Le Mars; least amount reported, .15 of an inch, at Denison and Ruthven. The greatest daily rainfall reported was 1.80 inches, at Keokuk, on the 7th. Average number of days on which .01 of an inch or more was reported, 7. Prevailing direction of the wind, southwest; highest velocity reported, 41 miles per hour, from the northwest, at Sioux City, on the 23d. Average number of clear days, 11; partly cloudy, 7; cloudy, 13.

OBSERVERS' NOTES.

Alta—DAVID E. HADDEN: Month warm, dry and generally cloudy; mean temperature 7° above, and precipitation 1.09 inches below average of preceding thirteen years.

Amana—CONRAD SCHADT: Spring opened early, yet no field work could be done till about the close of the month, as the ground was too wet, on account of lack of sunshine and drying winds. Some wheat and oats sown.

Atlantic—J. W. LOVE: Wild geese observed on 6th, robins on 7th and bluebirds on 8th. Month unusually mild.

Bonaparte—B. R. VALE: Severe electrical storms on 7th, 17th and 18th, the last doing much damage to barns and stock; ground very wet and no farming practicable.

Britt—GEO. P. HARDWICK: Month comparatively mild, with little snow or wind; fruit buds forward.

Columbus Junction—PROF. H. E. SIMPSON: Ice went out of the Iowa and Cedar rivers early on the morning of the 7th, followed by a very rapid rise of water on 8th, rising within three feet of high water mark of last August.

Forest City—J. A. PETERS: Robins came on 11th. No seeding done; frost out of ground.

Grand Meadow—F. L. WILLIAMS: Bluebirds on the 12th and robins on 17th. All frost out by the 20th; grass well started by end of month; roads very bad.

Grundy Center—E. S. KING: Some sod plowing done; clover mostly killed; heaviest snowstorm of season on 23d.

Hantontown—MISS G. M. PASCHEN: First flock of geese observed on 8th; ducks on 18th; robins on 17th. Pussy Willows in bud the 13th.

Humboldt—H. S. WELLS: First robin observed on 17th; fine weather at close of month.

Ida Grove—THRO. A. COLLETT: On 12th robins appeared; on 14th plowing sod begun; on 17th lawns looked green.

APRIL.

The monthly mean temperature for the state, as shown by records of 107 stations, was 49.8°, which is 0.3° above normal. By sections the mean temperatures were as follows: Northern section, 47.6°; central section, 50.0°; southern section, 51.8°. The highest monthly mean was 53.8°, at Burlington; lowest monthly mean 44.9°, at Forest City. The highest temperature reported was 86°, at Mt. Vernon on the 11th; lowest temperature reported, 17° at Larchwood on the 30th. The average monthly maximum was 77.4°; average monthly minimum, 25.0°. Greatest daily range, 52°, at Stuart; average of greatest daily ranges, 39.7°. Average precipitation for the state, as shown by records of 120 stations, was 2.98 inches, which is 0.03 of an inch below normal. The averages by sections were as follows: Northern section, 3.38 inches; central section, 2.89 inches; southern section, 2.67 inches. The largest amount reported was 6.00 inches, at Grand Meadow; least amount reported, 0.74 of an inch, at Logan. The greatest daily rainfall reported was 3.16 inches, at Columbus Junction, on the 10th and 11th. Average number of days on which .01 of an inch or more was reported, 9. Prevailing direction of the wind, northwest; highest velocity reported, 45 miles per hour, from the south, at Sioux City, on the 27th. Average number of clear days, 11; partly cloudy, 9; cloudy, 10.

OBSERVERS' NOTES.

Allerton—REX SHRIVER: Oats sowing began on 1st. Plums and cherries in bloom on 20th; peaches blooming the 26th.

Alta—DAVID E. HADDEN: Compared with the preceding thirteen years April, 1903, was about normal in temperature, and the precipitation was about one half inch below the average.

Amana—CONRAD SCHADT: Snow, ice and frost on morning of 30th; fruit damaged.

Atlantic—J. W. LOVE: Ice formed five nights during April; snow fell on evening of 29th and morning of 30th.

Bonaparte—B. R. VALE: A cold, wet month; not over half the acreage of oats sown; sub-soil, full of water and 4.15 inches of rain fell.

Clarinda—A. S. VANSANDT: Hailstones on 11th were very large; one measured 6 inches the larger circumference and 5 inches the shorter

Clinton—DR. LUKE ROBERTS: Rainfall 4.93 inches, 2.04 above normal; plenty of moisture and coolness; spring opened early enough, but lack of warmth retarded vegetable growth.

Columbus Junction—H. E. SIMPSON: The spring which opened so early has been set back; fruit badly damaged.

Estherville—EARLE W. PETERSON: It is a peculiar fact that the first day of the month was the warmest, and the last day the coldest.

Forest City—J. A. PETERS: Seeding began about the 5th; ground very wet; considerable plowing done for corn at close of the month.

Grand Meadow—F. L. WILLIAMS: Month very wet and work backward; grass in pastures good.

Ridgeway—ARTHUR BETTS: Wettest April on record at this station; a degree warmer than 1902; ground thoroughly soaked; 202 hours of sunshine and seven days without a sun. Large hailstones fell on the 1st and 12th.

Wauke—E. J. LEONARD: Last half of month unseasonably cold; closed with a severe snowstorm and freeze for a climax.

MAY.

The monthly mean temperature for the state, as shown by records of 117 stations, was 61.6°, which is 1.4° above normal. By sections the mean temperatures were as follows: Northern section, 60.4°; central section, 61.9°; southern section, 62.6°. The highest monthly mean was 65.2°, at Burlington; lowest monthly mean, 55.2°, at Estherville. The highest temperature reported was 91°, at Clinton, on the 20th; lowest temperature reported, 24° at Bedford and Earlham, on the 1st and 3d. The average monthly maximum was 83.3°; average monthly minimum, 29.6°. Greatest daily range, 490, at Larchwood, average of greatest daily ranges 33.8°. Average precipitation for the state, as shown by records of 129 stations, was 8.55 inches, which is 4.52 inches above normal. The averages by sections were as follows: Northern section, 8.11 inches; central section, 8.73 inches; southern section, 8.80 inches. The largest amount reported was 15.45 inches, at Thurman; least amount reported, 2.88 inches, at Fort Madison. The greatest daily rainfall reported was 4.80 inches, at Thurman on the 22d. Average number of days on which .01 of an inch or more was reported, 16. Prevailing direction of the wind, southeast; highest velocity reported, 72 miles per hour, from the southeast, at Sioux City, on the 21st. Average number of clear days, 9; partly cloudy, 12; cloudy, 10.

OBSERVERS' NOTES.

Afton—N. W. ROWELL: Greater rainfall in May, 1903, than in any one month in eight years past; 11.90 inches. Frost and ice on 1st and 3d.

Allerton—REX SHRIVER: Rain has fallen 21 days in May; very little over half of corn crop planted at close of month; meadows and pastures good.

Alta—DAVID E. HADDEN: Severe wind squall about 8 P. M. on 22d, damaged some buildings, windmills and trees, southwest and west of town. Mean temperature of the month one degree above the normal of the preceding thirteen years. The precipitation (6.96 inches), is 2.82 inches in excess

of the average during the same period. Thunderstorms occurred on thirteen days; maximum temperature, 79°, is the lowest record in thirteen years, except in May, 1892, when it only reached 74°. Last frost on May 3d, which is from two to three weeks earlier than usual.

Amana—CONRAD SCHADT: The river was 6 to 8 inches higher than last year. The last decade of May was very wet and little farm work could be done.

Atlantic—J. W. LOVE: Heaviest rainfall (12.37 inches) of any month on record here. Soil very wet and much land under water; rain fell on 20 days.

Audubon—FRANK MOTT: More than twice as much rain in this month as in May, 1902.

Bonaparte—B. R. VALE: Rainfall 4.30 inches; first half of month seasonable; last half constant rainfall and cold; little farm work possible during last eleven days.

Britt—GEO. P. HARDWICK: Rainfall 6.89 inches; excessively cloudy—not one clear day; field work retarded; but half of corn planted at end of month; severe wind and lightning on 23d, damaging windmills and buildings.

Earlham—GEO. PHILLIPS: May was abnormally wet, with 11.60 inches of rain, on ground already saturated; 7.46 inches fell in the last week.

Forest City—J. A. PETERS: Greatest rainfall during the month (10.17 inches) ever recorded here for May within ten years; 20 per cent of corn will not be plowed.

Larrabee—H. B. STREVER: Rain for month, 10.52 inches. Heavy hailstorm about 1 P. M. on 24th; poultry, pigs and young lambs were killed, and much damage to crops and trees. At this place hail lay on the ground four inches deep.

Ottumwa—DR. W. B. LAFORCE: The Des Moines river was 22 feet above low water mark on May 31st and June 1st, breaking all records.

Perry—J. A. HARVEY: A terrible windstorm evening of 22d; rainfall this month, 11.41 inches.

Ridgeway—ARTHUR BETTS: This May was 2° above normal. Rainfall, 8.70 inches, or 0.89 of an inch less than the amount in May, 1902; many severe thunderstorms; 262 hours of sunshine; gale on 22d was the worst that ever visited this section, destructive to trees, windmills and buildings.

Spirit Lake—W. C. DRUMMOND: Rainfall, 13.03 inches; last ten days of month brought 7.18 inches, causing the worst washout of bridges known in years.

Storm Lake—L. C. BURDICK: Damaging hail and snowstorm about twenty miles north and west on 24th.

Vilisca—C. E. MATTESON: Hail on 20th destroyed crops in a radius of three miles. Rainfall for the year to date, 19.33 inches, of which 13.65 fell in May.

Wauke—E. J. LEONARD: Rainfall for the month, 10.78 inches; May, last year, 3.42 inches; June, last year, 8.57 inches. So this month breaks the record of any month last year by 2.21 inches.

JUNE.

The monthly mean temperature for the state, as shown by records of 109 stations was 64.6°, which is 5.6° below normal. By sections the mean temperatures were as follows; Northern section 64.1°; central section 64.5°; southern section 65.3°. The highest monthly mean was 67.8° at Tipton; lowest monthly mean, 59.4° at Ogden. The highest temperature reported was 96°, at Cedar Rapids and Sigourney, on the 26th and 30th; lowest temperature reported, 30°, at Denison, on the 4th. The average monthly maximum was 89.7°; average monthly minimum, 38.6°. Greatest daily range, 50°, at Scranton; average of greatest daily ranges, 34.1°. Average precipitation for the state, as shown by records of 125 stations, was 2.86 inches, which is 1.52 inches below normal. The averages by sections were as follows: Northern section, 2.84 inches; central section, 2.89 inches; southern section, 2.85 inches. The largest amount reported was 6.04 inches, at Humboldt; least amount reported, .75 of an inch, at West Union. The greatest daily rainfall reported was 3.00 inches, at Washta, on the 30th. Average number of days on which .01 of an inch or more was reported, 10. Prevailing direction of the wind, northwest; highest velocity reported, 66 miles per hour, from the northwest, at Sioux City, on the 8th. Average number of clear days, 13; partly cloudy, 10; cloudy, 7.

OBSERVERS' NOTES.

Alta—DAVID E. HADDEN: Compared with thirteen preceding Junes the month just closed was 5.4° cooler, and the precipitation was .91 of an inch below the normal.

Amana—CONRAD SCHADT: The Iowa river was at its highest on June 1st, being about six to eight inches above last year's flood mark.

Bonaparte—B. R. VALE: A seasonable month; too cool for corn till just at the close.

Britt—GEO. P. HARDWICK: No serious storms except on morning of the last day, when high and damaging wind swept over south half of county; corn uneven and late; grain below average.

Clinton—DR. LUKE ROBERTS: Mean temperature, 65.4°, which is 4.3° below normal, and 1.7° below June, 1902, which was then a record breaker as a cold June. The average of the first decade was 64°; second decade, 63.7°; third decade, 67.5°. Rainfall, 1.66 inches, or 2.89 inches below normal. Very little fell after the 5th and crops were much in need of it before the close of the month.

Columbus Junction—J. B. JOHNSTON: On 1st and 2d the Iowa river was higher than in 1881.

Earlham, R. F. D.—GEO. PHILLIPS: Corn was smallest for years at close of month; small grain and grass never looked better.

Estherville—EARLE W. PETERSON: A severe windstorm swept through the northwestern part of Emmet county on afternoon of 24th; in its path, about three rods wide, all buildings were destroyed.

Grand Meadow—F. L. WILLIAMS: The month was favorable to most crops; there were extreme variations between day and night temperatures

Hanlontown—MISS G. M. PASCHEN: There was frost on night of 11th, which did some damage to corn and other tender vegetation on low ground.

Humboldt—H. S. WELLS: Rainfall, 6.04 inches; much low ground still unplowed; corn has made advance; haying begun; small fruit and apples good.

Larrabee—H. B. STREVER: Wet weather retarded field work first half of the month; frost on the 11th did little damage.

Ridgeway—ARTHUR BETTS: Month was fine, with 333 hours of sunshine, though the temperature was 3° below normal. I have been reporter since May, 1882, and never reported so small rainfall (1.22) for June.

Stockport—C. L. BESWICK: Continued rainy weather the first six days and continued dry the last nine days of the month, with rain badly needed at close.

Storm Lake: L. E. BURDICK: Small grain rank, corn backward, potatoes commencing to rot. Rainfall for month 4.85 inches.

Washta—H. L. FELTER: Rain 4.42 inches; a very heavy storm on night of 29th; lightning struck an elevator at Washta and burned it.

Wauke—E. J. LEONARD: Rain 3.11 inches; month remarkably free from storms; only one heavy rain (1.61 inches) fell, on 18th; continuous northeast wind for nine days, from May 29th to June 6th.

Whitten—FRANK P. BUTLER, M. D: Frost on morning of 12th but little damage resulting, rain on 30th was a great help to all vegetation.

JULY.

The monthly mean temperature for the state, as shown by records of 112 stations, was 72.9°, which is 1.5° below normal. By sections the mean temperatures were as follows: Northern section, 71.0°; central section, 72.9°; southern section, 74.7°. The highest monthly mean was 77.4°, at Keokuk; lowest monthly mean, 68.5°, at New Hampton. The highest temperature reported was 100°, at Thurman and Sigourney, on the 9th and 27th; lowest temperature reported, 40°, at Chester, on the 31st. The average monthly maximum was 92.7°; average monthly minimum, 46.4°. Greatest daily range, 39°, at Lansing, Clarinda, Earlham; average of greatest daily ranges, 31.3°. Average precipitation for the state, as shown by records of 124 stations, was 4.83 inches, which is .91 of an inch above normal. The averages by sections were as follows: Northern section, 6.49 inches; central section, 5.28 inches; southern section, 2.73 inches. The largest amount reported was 12.72 inches at Elkader; least amount reported, .94 of an inch, at Belknap. The greatest daily rainfall reported was 5.12 inches, at Delaware, on the 10th. Average number of days on which .01 of an inch or more was reported, 9. Prevailing direction of the wind, south; highest velocity reported, 48 miles per hour, from the northwest, at Sioux City, on the 1st. Average number of clear days, 17; partly cloudy, 9; cloudy, 5.

OBSERVERS' NOTES.

Alta—DAVID E. HADDEN: On the 20th a hailstorm lasting 7 minutes caused much damage west and southwest of town.

Amana—CONRAD SCHADT: Fine weather for harvesting and threshing; corn made good growth during month.

Atlantic—J. W. LOVE: A severe storm of wind, rain and hail occurred at 4:30 P.M. on 20th, damaging crops, buildings, trees and electric lines.

Bedford—E. E. HEALY: A severe hailstorm on 20th destroyed corn in a wide belt.

Bonaparte—B. R. VALE: A very seasonable and satisfactory month; rain was needed at close for corn and pastures.

Britt—GEO. P. HARDWICK: A month of variable temperature, but no severe storms; wheat blighted and oats rusted badly.

Clinton—LUKE ROBERTS: A good month for farmers. Rain 5.27 inches, which is 1.11 above normal. Mean temperature about normal; highest, 96°; lowest, 51°. Mean of first decade was 77.1°; second decade, 69.6°; third decade, 78.9°.

Corning—JEROME SMITH: A destructive hailstorm on afternoon of the 20th, covered about one-third of the county.

Cumberland—J. H. REPERT: Much damage done to corn and small grain by wind and hail on 20th.

Earlham—GEO. PHILLIPS: Poorest show for corn crop for years; best hay crop.

Forest City—J. A. PETERS: Harvesting grain begun on 25th, and about 80 per cent in shock by close of month. Early planted corn in silk.

Hanlontown—MISS G. M. PASCHEN: Haying commenced on the 6th; barley harvested on the 13th; commenced oats harvest on the 22d.

Olin—NATHAN POTTER: First part of July was too wet for cultivating corn; last half of month all that could be desired for hay and grain harvest, but too cool for rapid growth of corn.

Oskaloosa—JOS. BOYD: A fine month for securing the hay crop.

Ridgeway—ARTHUR BETTS: A pleasant month; 358 hours of sunshine; growing weather.

Washita—W. L. FELTER: On July 3d water in small streams was highest ever known.

Wauke—E. J. LEONARD: Rain was well distributed through the month; heavy thunderstorms and high winds were lacking, and there has been very little uncomfortably hot weather.

Lenox—J. L. HURLEY: On the 20th a severe windstorm came with the hail, damaging windmills, barns and outbuildings. Two large barns north of town were blown to pieces and some parts scattered eighty rods. Corn almost a total failure in the hail strip from eight to twelve miles wide.

AUGUST.

The mean monthly temperature for the state, as shown by records of ninety-nine stations, was 69.1°, which is 3.1° below normal. By sections the mean temperatures were as follows: Northern section, 67.0°; central section, 69.3°; southern section, 70.9°. The highest monthly mean was 75.0°, at Logan; lowest monthly mean, 63.8°, at New Hampton. The highest temperature reported was 101°, at Logan, on the 24th; lowest temperature reported, 41°, at Ogden, on the 31st. The average monthly maximum was 91.6°; average monthly minimum, 47.3°. Greatest daily range,

45°, at Logan; average of greatest daily ranges, 31.4°. Average precipitation for the state, as shown by records of 110 stations, was 6.64 inches, which is 3.45 inches above normal. The averages by sections were as follows: Northern section, 5.51 inches; central section, 5.67 inches; southern section, 8.74 inches. The largest amount reported was 17.74 inches at Woodburn; least amount reported, 2.55 inches at Toledo. The greatest daily rainfall reported was 11.22 inches, at Chariton, on the 27th. Average number of days on which .01 of an inch or more was reported, 11. Prevailing direction of the wind, southwest; highest velocity reported, 44 miles per hour, from the southeast, at Sioux City, on the 1st. Average number of clear days, 12; partly cloudy, 10; cloudy, 9.

OBSERVERS' NOTES.

Atta—DAVID E. HADDEN: Frequent and heavy rains during the month, with total of 6.28 inches; several destructive electric storms and some hail; bright aurora on evening of 21st.

Amara—C. SCHADT: On the 1st 0.42 of an inch of rain fell in ten minutes—7:32 to 7:42 P.M. Weather has been too cool for corn, but favorable for harvesting and threshing.

Atlantic—J. W. LOVE: A very wet and cool August.

Belknap—A. W. RANKIN: Heavy rain, greatly needed, on 26th, 27th and 28th; damaging hailstorm on 28th.

Bonaparte—B. R. VALE: A cool but growing month; 7.53 inches of rain, but none too much; fall plowing begun and pastures improved.

Britt—GEO. P. HARDWICK: Cool, with excessive cloudiness; no damaging winds.

Chariton—C. C. BURR: Rainfall in August 14.05 inches. The storm of the 27th (11.22 inches) was accompanied by excessive lightning and three barns were burned. The floods washed away bridges and covered lowlands, floating away hayricks which looked like steamboats going down the streams.

Clinton—DR. LUKE ROBERTS: Rainfall 4.79 inches, which is 1.77 above normal; mean temperature 2° below normal; no other August during the last twenty-five years gave a lower mean temperature; coldest day was the 30th; per cent of cloudiness high. It was not golden weather for maturing corn.

Postville—F. L. WILLIAMS: The month was noted for cool nights and heavy rains; corn late and oats light.

Hanlontown—MISS G. M. PASCHEN: Threshing from shock and fall plowing commenced on first of month; oats light, ranging from twenty to thirty-one pounds per bushel.

Hopeville—M. T. ASHLEY: About 5 P.M. on the 26th a terrific electrical storm occurred; three fires from effects of lightning were visible during the storm. The rainfall of the 26th and 27th made a total of 10.08 inches—the heaviest since this station was established.

Jefferson—ISAAC YOUNG: Hail at Scranton on 14th destroyed several hundred acres of corn.

Leon—MILLARD F. STOOKEY: The floods of the 26th and 27th swept away bridges and culverts, and damaged the corn crop on bottom lands.

Olin—NATHAN POTTER: August has been cool, and the corn crop was delayed in ripening.

Osceola—MRS. S. LEWIS: Between 5:30 on the 26th and 5:30 on the 27th the amount of rainfall was 9.34 inches, of which amount 7.68 fell in thirteen hours.

Ridgeway—ARTHUR BETTS: The coolest August on record here, and the smallest daily range, but the mean minimum was lower in 1898 and 1902. There were 249 hours of sunshine, or 57 per cent. Pretty northern lights on the 21st.

Villisca—C. E. MATTERSON: An unusual month of thunderstorms and excessive rains and floods; much damage to crops on bottom lands.

Wauke—E. J. LEONARD: Cool and wet; rainfall, 9.33 inches; last year, for August, 6.89 inches; farm work delayed and corn endangered by retarding its growth.

Woodburn—C. B. McDONOUGH: Rainfall, 17.74 inches; greatest amount in twenty-four hours, 14.61 inches, began at 6 P.M. on the 26th; much damage was done to railroad and country bridges.

SEPTEMBER.

The monthly mean temperature for the state, as shown by records of 104 stations, was 60.8°, which is 3.4° below normal. By sections the mean temperatures were as follows: Northern section, 59.0°; central section, 61.1°; southern section, 62.4°. The highest monthly mean was 66.2°, at Belknap; lowest monthly mean, 59.9°, at Forest City. The highest temperature reported was 94°, at Logan, on the first; lowest temperature reported, 28°, at Larchwood, on the 16th. The average monthly maximum was 84.8°; average monthly minimum, 33.6°. Greatest daily range, 51°, at Clarinda and Marshalltown; average of greatest daily ranges, 34.8°. Average precipitation for the state, as shown by records of 116 stations, was 3.81 inches, which is 0.61 of an inch above normal. The averages by sections were as follows: Northern section, 3.94 inches; central section, 3.46 inches; southern section, 4.09 inches. The largest amount reported was 8.79 inches, at Larrabee; least amount reported, 1.42 inches, at Wauke. The greatest daily rainfall was 4.09 inches, at Larrabee, on the 11th and 12th. Average number of days on which .01 of an inch or more was reported, 10. Prevailing direction of the wind, south; highest velocity reported, 42 miles per hour, from the northwest, at Sioux City, on the 26th. Average number of clear days, 14; partly cloudy, 6; cloudy, 10.

OBSERVERS' NOTES.

Alla—DAVID E. HADDEN: Unusually fierce lightning on morning and evening of 13th, with temperature at 40°. First frost of season on 16th, mainly light, and killing only in exposed places; last decade of month brought ideal fall weather.

Bonaparte—B. R. VALR: Rain 5.95 inches, following 5.44 the last six days of August. Too much moisture, but otherwise a seasonable month; vegetation luxuriant.

Grand Meadow—F. L. WILLIAMS: Many fields of corn still green, and frost did little damage; most of it safe at close of month; pastures extra good; oats proved the poorest crop ever raised here.

Greenfield—J. G. CULVER: No frost sufficient to injure the tenderest vegetation; 70 per cent of corn safe at close of month, and more sound corn than last year.

Grinnell—A. O. PRICE: No killing frosts during the month; pastures seldom better.

Grundy Center—E. S. KING: All corn past frost; very little harm done by frosts on 17th, 18th, 24th and 27th.

Hanlontown—MISS G. M. PASCHEN: Corn cutting began 21st and mostly finished by 30th; not as large acreage as last year; upland corn good well filled ears; potatoes light and subject to rot.

Harlan—C. A. REYNOLDS: September has been a very acceptable month in this vicinity.

Hopeville—M. T. ASHLEY: No frost except very light on 17th and 18th; no vegetation hurt; much green corn at close of month needing ten days to ripen.

Pacific Junction—H. H. MCCARTNEY: Frost on the 16th was not killing on account of continued cloudy weather; 40° always shows white frosts in this locality if clear and calm at the time.

Ridgeway—ARTHUR BETTS: Month was 2° warmer than September, 1902; last decade was fine; killing frost of the 18th was general hereabout, with temperature 27° to 33°; about 90 per cent of cornfields were deadened, and there will be much soft corn; we had 234 hours of sunshine, or 63 per cent.

Stockport—C. L. BESWICK: An unusual month; only four days in which wind was not in south, southeast or southwest.

Toledo—H. P. GIGER: On the 17th frost was averted by clouding over a little about midnight; other frosts did not seem to do much harm.

Wauke—E. J. LEONARD: Except the rainy period, 4th to 14th, the month was generally clear and cool; light frost on the 18th and 24th did no damage.

OCTOBER.

The monthly mean temperature for the state, as shown by records of 105 stations, was 52.2°, which is 0.3° above normal. By sections the mean temperatures were as follows: Northern section, 50.7°; central section, 52.1°; southern section, 53.8°. The highest monthly mean was 57.7°, at Belknap; lowest monthly mean, 47.2°, at Belle Plaine. The highest temperature reported was 90°, at Chariton, on the 3d; lowest temperature reported, 16°, at Earlham, on the 27th. The average monthly maximum was 80.4°; average monthly minimum, 25.4°. Greatest daily range, 57°, at Carroll; average of greatest daily ranges, 39.7°. Average precipitation for the state, as shown by records of 115 stations, was 1.95 inches, which is 0.49 of an inch below normal. The averages by sections were as follows: Northern section, 2.12 inches; central section, 1.78 inches; southern section, 1.95 inches. The largest amount reported was 4.50 inches, at Harlan; least

amount reported, 0.32 of an inch at St. Charles. The greatest daily rainfall reported was 2.90 inches, at Ruthven, on the 6th. Average number of days on which 0.1 of an inch or more was reported, 5. Prevailing direction of the wind, south; highest velocity reported, 58 miles per hour, from the west, at Sioux City, on the 7th. Average number of clear days, 19; partly cloudy, 6; cloudy, 6.

OBSERVERS' NOTES.

Alta—DAVID E. HADDEN: First week in October was wet and changeable; during balance of month this county enjoyed ideal Indian summer weather, clear, mellow and warm, which came opportunely for maturing corn and finishing fall work.

Clinton—DR. LUKE ROBERTS: Rainfall 1.85 inches, 0.55 below normal; temperature normal; sunshine in excess of normal; a good month for hardening corn and securing the crop and general outdoor work.

Carroll—MOSES SIMON: A fine month; geraniums and other tender flowers still in bloom on 31st.

Grand Meadow—F. L. WILLIAMS: First killing frost of season on 18th; corn ripened well and potatoes were fine; month was ideal for farm work.

Grundy Center—E. S. KING: More fall plowing than for years. Last half of month made fine corn; only about ten per cent soft.

Hanlontown—MISS G. M. PASCHEN: Began husking corn on 23d, but some began about 14th; corn well dried out.

Olin—NATHAN POTTER: October has been an ideal fall month; cribbing corn begun about 20th, and mostly in good condition.

Perry—J. A. HARVEY: Total rainfall 2.35 inches; month very fine for the farmer.

Ridgeway—ARTHUR BETTS: No rain after 27th, 241 hours of sunshine, or 72 per cent; second season of roses from 12th to 24th; roads dry and dusty; much hazy weather.

Waukeg—E. J. LEONARD: Weather unusually fine, over two-thirds of the days absolutely cloudless; first killing frost here was on 9th and late corn was injured.

West Bend—PH. DORWEILER: An ideal month, the finest October on record.

NOVEMBER.

The monthly mean temperature for the state, as shown by records of 105 stations, was 34.2°, which is 0.1° below normal. By sections the mean temperatures were as follows: Northern section, 32.2°; central section, 34.0°; southern section, 36.3°. The highest monthly mean was 39.0° at Osceola and Red Oak; lowest monthly mean, 30.0° at Estherville. The highest temperature reported, was 76° at Pacific Junction, on the first; lowest temperature reported, 5° below zero, at Carroll and Audubon, on the 18th and 26th. The average monthly maximum was 68.3°; average monthly minimum, 3.1°. Greatest daily range, 43° at Osceola; average greatest daily ranges, 30.9°. Average precipitation for the state, as shown by

records of 116 stations, was 0.52 of an inch, which is 0.85 of an inch below normal. The averages by sections were as follows: Northern section, 0.17 inch; central section, 0.57 inch; southern section, 0.82 inch. The largest amount reported was 1.74 inches, at Allerton; least amount reported, trace, at Algona, Charles City, Forest City, Mason City, Northwood and Whitten. The greatest daily rainfall reported was 1.38 inches, at Washington, on the 10th and 11th. Average number of days on which .01 of an inch or more was reported, 3. Prevailing direction of the wind, northwest; highest velocity reported, 43 miles per hour, from the northwest, at Sioux City, on the 9th. Average number of clear days, 13; partly cloudy, 8; cloudy, 9.

Alta—DAVID E. HADDEN: November was comparatively dry and pleasant. The first snowfall of the season was on the 24th—amount one inch. Light aurora was noticed on the evening of the 18th.

Amana—CONRAD SCHADT: The weather was dry, affording sufficient time for the soft corn to dry out. Cold weather in the middle of the month put a stop to plowing.

Audubon—GEO. E. KELLOGG: First snow of the season fell on the 13th.

Bonaparte—B. R. VALE: A dry and pleasant month. No storms and not excessively cold. Farm work progressed finely.

Britt—GEO. P. HARDWICK: Precipitation for the month, .05 inch, the least of any November during past seven years. Ground frozen after the 12th. The dry weather during the past weeks has been beneficial to unripe corn, nearly all of which has been gathered.

Charles City—C. H. PRIEBE: Unusually fine weather. Only a trace of snow during entire month.

Clinton—LUKE ROBERTS: Rainfall, 0.78 inch, being a deficiency of 1.12 inches as compared with the normal. The mean and minimum temperature and the number of clear days were above normal. The first snow of the season fell on the 28th.

Earlham—GEO. PHILLIPS: No snow on ground at close of month. Ten per cent of corn still in field.

Grand Meadow (Postville P. O.)—F. L. WILLIAMS: The month was very dry and favorable for farm work. Stock pastured all the month.

DECEMBER.

The monthly mean temperature for the state, as shown by records of 103 stations, was 19.6°, which is 3.9° below normal. By sections the mean temperatures were as follows: Northern section, 16.0°; central section, 19.7°; southern section, 23.0°. The highest monthly mean was 26.2°, at Glenwood; lowest monthly mean, 12.5°, at Sibley. The highest temperature reported was 58°, at Hopeville, Mount Ayr, Osceola and St. Charles, on the 31st; lowest temperature reported, 27°, at Sibley, on the 13th. The average monthly maximum was 48.8°; average monthly minimum, 15.3°. Greatest daily range, 56°, at Whitten; average of greatest daily ranges, 40.5°. Average precipitation for the state, as shown by records of 118 stations, was 0.41 of an inch, which is 0.88 of an inch below normal. The averages by sections were as follows: Northern section, 0.49 of an inch; central section, 0.37 of an inch; southern section, .38 of an inch. The largest

CLIMATE AND CROP REVIEW.

COMPARATIVE DATA OF THREE ABNORMAL SEASONS, AND SUMMARY OF 1903.

The first three crop seasons of the new century—1901-1902-1903—may be classed as radically abnormal in respect to seasonable rainfall and temperatures, their records serving as striking illustrations of possible climatic extremes of this section. The season of 1901 was notable for extreme heat and aridity of air and earth, breaking all records of daily averages and maximum temperatures in the midsummer period. The droughty conditions continued until about May 1, 1902; then came heavy downpours, with streams bankfull and overflowing, and continued excess of precipitation for a period of about seventeen consecutive months, or until September 15, 1903. For reference and comparison the following table is appended, showing the average precipitation and mean temperatures for the state, for the six crop months—April 1st to September 30th—in the last three years; also the monthly normals for the same period.

PRECIPITATION, INCHES.

Months.	1903	1902	1901	Norm'l
April.....	2.98	1.71	1.79	2.89
May.....	8.55	5.89	2.85	4.13
June.....	2.86	7.16	3.17	4.50
July.....	4.83	8.67	2.34	4.23
August.....	6.64	6.58	1.29	3.43
September.....	8.81	4.85	4.77	3.30
Total for six months.....	29.67	38.86	16.25	22.48
Total for the year.....	35.89	43.82	24.41	31.42

MEAN TEMPERATURES, DEGREES.

April.....	49.8	48.2	49.9	49.3
May.....	61.6	63.8	60.7	60.4
June.....	64.6	65.2	72.3	69.6
July.....	72.9	73.1	82.4	74.2
August.....	69.1	69.1	73.8	71.8
September.....	60.8	59.1	63.8	63.6
Means.....	63.1	63.0	67.0	64.8

The records of the four critical crop months—May 1st to September 1st—show the marked difference in the rainfall and temperature of 1901 in comparison with the two following seasons. The total amounts for the four months were as follows: In 1901, 9.69 inches; in 1902, 27.80 inches; in 1903, 22.88 inches. The normal for the four months is 16.29 inches. The most favorable showing in these records is the fact that the rainfall in the crop season of 1903 was nearly 5.00 inches less than in the same period in 1902, indicating a return towards normal conditions.

The winter of 1903 was generally about normal and favorable for live stock and the usual farm operations of the season. The soil was very wet, and the ponds and streams were more than usually filled with water and ice. Fall wheat and rye wintered fairly well, though the covering of snow

was generally light. March was warmer than usual, with somewhat less than the normal precipitation; but the excessive cloudiness and humidity retarded farm work except in dry, sandy soil. While the spring opened earlier than usual, the fields were too wet to allow an early start in farm work.

April was about normal in temperature and rainfall, but the prevalence of cloudy, misty and humid weather during the larger part of the month retarded the necessary drying of the surface. The usual farm operations were pursued under these adverse conditions, causing material reduction of the acreage of spring wheat, oats and barley. Pastures and meadows made an early start and the grain crops germinated readily, making a fairly good stand. A snowstorm with freezing temperature, at the close of the month, checked crop growth and injured the earlier varieties of apples, cherries and plums.

May was the wettest and most unfavorable month of the season. The soil at the outset was supersaturated, and the average rainfall for the state for the month was 8.55 inches. The distribution of this excessive amount of rainfall was variable, ranging at local stations from 2.88 to 15.45 inches; but the averages of each section were above 8 inches. The best conditions as to dryness of soil were in the Mississippi river districts. The great interior basins of the Des Moines, Iowa and Cedar rivers were subjected to very heavy floods about the close of the month, causing much delay in farming operations and damage to all crops. From about the 3d to the 18th conditions were at their best, and during that part of the month the plowing, planting and other farm operations were in progress on the drier lands, with only occasional interruption by showers. Most of the corn that was planted was put in during that period. The protracted and very heavy storms during the last decade rendered field work impracticable in more than four-fifths of the state. At the close of the month not more than two-thirds of the usual corn area had been planted. The germination was generally quick and satisfactory in the stand, but the fields soon became very foul from the lack of cultivation, and much more than the usual amount of replanting was necessitated as a result of washing and flooding the fields. The general condition of wheat, oats, rye, barley and meadows was better than seemed to be possible during prevalence of the storms.

June was unseasonably cool, but generally dry and more favorable for field work and crops than the preceding month. The mean temperature was about 5° below normal, and the rainfall was 1.52 inches below the average. The surface dried off slowly, and the cool weather was more favorable for small grain than for the rapid germination and growth of the belated corn. Good progress was made in replanting the washed out corn fields and in cultivating the early planted corn on the dry upland. Seasonable temperature about the close of the month caused a marked improvement in the appearance and prospects of this important staple, and in size and color it was much nearer the normal condition than was deemed possible at the outset. Clover cutting was begun near the middle of the month, and haymaking was quite general at the close, the output being above the average.

July was characterized by frequent and sudden alternations from high to low temperatures. The daily mean for the month was about 2° below normal, the first decade being unusually warm, the second decade unseasonably cool, and the third decade bringing the two extremes of temperature. The average rainfall for the state, 4.83 inches, was .91 of an inch above the July normal. The distribution was very unequal, the average of the northern section being 6.49, the central section 5.28, and the southern section 2.73 inches. The heaviest amounts of rainfall were reported at stations in the Northeast district. The most destructive storm of the month occurred on the afternoon of the 20th, sweeping across the state on a direct line from Lyon and Osceola southward to Adams, Taylor and Ringgold, its pathway varying in width from one to eight miles. At numerous points along this line the storm was accompanied by high winds and very heavy hail, causing almost total loss of growing crops within an area of more than three hundred square miles. In portions of the southern section drouthy conditions prevailed for many days, causing some detriment to growing crops; but the closing week brought generous showers. On the whole the month was favorable to haymaking and harvesting of wheat, oats, barley and rye. The hay crop proved to be one of the best ever produced in the state, and the greater part of it was secured in excellent condition. Wheat and oats were generally harvested in good condition, but on account of the rust and blight the yield has been disappointing, though the quality of the grain will be greatly superior to the output of last year. The corn crop made fairly good progress during the month, though the temperature was somewhat unfavorable about half of the time. The early planted portion of the crop reached the earing stage while the late planted corn was generally small and unpromising. The outlook of the crop, as a whole, was not encouraging at the close of July.

August was cooler than usual with a large excess of rainfall, humidity and cloudiness. The mean temperature was 3.1° below normal, and the average rainfall, 6.64 inches, was 3.43 inches above normal. The southern section received the larger amount, an average of 8.74 inches, the bulk of it falling in the last week of the month (State Fair week). It was the wettest August of which we have records for the state. There were nineteen cloudy or partly cloudy days. During the fair weather periods considerable progress was made in threshing and other farm operations. Hay making was continued throughout the month, when the weather permitted, securing a large amount of aftermath, wild hay, and second crop of clover for seed and fodder. More than the usual amount of plowing was done, with generally favorable conditions of soil for this work. Threshing returns indicated generally light and unsatisfactory yield of wheat, oats and barley; the yield of timothy seed has been unusually heavy. The development of the corn crop was all that could be expected under the prevalent weather conditions. At the close of the month the early planted corn, about forty per cent of the whole area, had reached the roasting ear stage, or a little beyond, giving promise of reaching maturity within twenty days, under favorable conditions. The balance of the crop was in various stages of growth, indicating need of very good ripening weather for a full month or more to place the bulk of it beyond danger of harm by frost. The outlook for the crop as a whole was at that time unsatisfactory. The late potato crop made

fair growth in dry and sandy soil, but there were reports of damage by rot in many localities. The crop of early and fall apples gave good returns, especially in the northern half of the state; but winter apples were unpromising. Pasturage made a heavy growth, giving assurance of abundant fall feed for stock.

September was cooler than usual, the mean temperature being 3.4° below normal. Frosts occurred at numerous stations on the 16th, 17th, 18th, 24th and 27th, but little damage resulted to corn and other crops, except in limited areas on low ground. The main detriment caused by the cold and frosty period was the delay in bringing belated corn to full maturity. The period of most unfavorable weather and heaviest rainfall was from the 4th to the 16th. In the last half of the month there were about twelve days of ideal weather for maturing crops, harvesting, threshing and plowing. During this time corn made very good progress, and at the close of the month fully eighty per cent of the crop was well matured, the balance requiring two weeks of frostless weather and generally favorable conditions to make it safe. There was but little expectation of bringing all of the belated portion of the crop to maturity, as some of it was green and soft at the close of September. A considerable amount of the early corn was cut and put into shocks after the first appearance of frost. Fall pasturage was never better, and seldom as good at this time of year. Fair progress was made in harvesting the minor crops, and a good deal of second crop hay was secured. Fall plowing was well advanced, much more than the usual acreage having been done with the soil in excellent condition. The potato harvest showed a very light yield, and much damaged by rotting. The fall apple crop was fair, but winter apples were inferior in size and quality. On the whole September was a fairly satisfactory month, though below normal in temperature and sunshine. The adverse features of the month were the natural sequence of the preceding abnormal spring and summer.

October was an ideal autumn month. The mean temperature was slightly above and the rainfall below the normal, and the percentage of sunshine was higher than usual. The bulk of the rainfall came in the first seven days, and generally with but little disturbance of the elements. No trace of snow was reported during the month. The first general killing frost occurred on the 18th, at which time there was practically very little of value exposed to damage by freezing temperature. The greater portion of the late planted corn was fairly well matured before the middle of the month. Reports were received of very many fields planted as late as June 15th which were well ripened by October 10th. The amount of fall plowing in the state at large was much greater than in recent years. A limited acreage of fall wheat and rye was sown, and the conditions were favorable for germination and growth, insuring a good stand. The fall pasturage was never better, being very green and succulent at the close of October. The dry weather was favorable to harvesting potatoes, apples, and all the late maturing crops. The potato crop was generally light, with considerable damage by rot, though some localities report a fair yield. The yield of winter apples was much below the average. Forage crops and garden truck made excellent yields. As a whole October was a remarkably fine month, making an exceptional record in view of the adverse weather conditions of the preceding months.

November was unusually dry and seasonably warm, with less than the average amount of atmospheric disturbance. Conditions were favorable for farm operations, and excellent progress was made in cribbing the corn crop. The cobs contained more than the usual amount of moisture, but the dry weather and freezing temperature prevented damage by heating in the cribs. The small acreage of fall wheat and rye suffered no material injury from dry weather and freezing. The weather was highly favorable for stock feeding and pastures afforded good feed throughout the month. The supply of water for stock was ample for the winter.

On the whole the crop season of 1903 was materially better than the preceding season, the quality of the output of the soil being much superior. The forage crops were exceptionally heavy, and the fall months were favorable for securing the full benefit of the abundant yield of pasturage and fodder. There is much cause for congratulation and thankfulness that, under such unusual conditions, the yield of all staple crops has been sufficient to afford a liberal reward for the labor of the tillers of the soil of this most fertile state.

CLIMATE AND CROP BULLETINS.

SUMMARIES OF WEEKLY BULLETINS ISSUED DURING THE CROP SEASON, 1903.

BULLETIN No. 1. WEEK ENDING APRIL 18, 1903.

In respect to temperature and growth of vegetation the spring is earlier than usual. At the central station there has been an average daily excess of 6° in the temperature since March 1st, and conditions have been about the same throughout the state. The rainfall has been generally below normal; but the great excess of moisture in the soil prevented field work in March, and a considerable area of low and undrained land is still too wet for plowing or seeding. On rolling and well drained land seeding operations were begun about the 1st of April, and the work is now well advanced. The reports indicate a decreased acreage of spring wheat and a larger area of oats and barley than last year. Plowing for corn is in progress, and if conditions are favorable the acreage of that crop will be large. Grass has made an unusually early start, and stock will soon be on pasture. Fruit buds appear to be in fair condition. Stock wintered well, and the spring pig crop is promising.

BULLETIN No. 2, APRIL 20.

The week begun and ended with cool, wet and cloudy weather. The daily average temperature was from 2° to 4° below normal, and on several mornings the minimum was at the frost line. On the average the conditions were favorable for field work about half the week, and some progress has been made in seeding and preparations for planting. The amount of rain-

fall has not been excessive except in limited portions of the eastern districts, but in all sections many fields or parts of fields are still too wet for seeding or plowing. The continuance of wet and cloudy weather will unquestionably tend to reduce the acreage of cereals to some extent as compared with recent dry years. In the northern section the reports indicate that seeding is about one-half to two-thirds completed. Pasturage is making early growth, and farm stock are grazing in many localities. Fruit buds are showing signs of early blooming, and the prospect is good.

BULLETIN No. 3, APRIL 27.

The past week was cool and cloudy, with light rainfall. At the central station the daily temperature was 5° below normal, which was about the average deficiency for the state. Light to heavy frosts, with some ice, were observed on several mornings, and traces of snow were reported at a number of stations on the 25th. The extent of damage to fruit can not be ascertained at this time, but it is probably not heavy.

The general conditions for farm work have been somewhat better than during the preceding week. The soil is slowly drying, though there is still great excess of moisture in flat and undrained fields, some of which are not likely to be seeded or planted this season. Seeding of small grain is practically completed, except in portions of the north central and northeast districts. Early seeded fields generally show a good stand, though the growth has been retarded by cold weather. Wherever the land is sufficiently dry plowing for corn has been vigorously pushed. In a few favored localities in the west and southwest planting has been begun. Reports indicate that the soil is generally heavy, and more than the usual amount of labor is required to put it in good tilth for planting. With the restoration of normal weather conditions the crop outlook will be good.

BULLETIN No. 4, MAY 4.

The week was excessively wet and cloudy and unseasonably cold. The deficiency in daily temperature ranged about 3° at Keokuk, 6° at Des Moines and 13° at Sioux City, where the minimum was 22° on the 30th. The lowest temperature reported was 17° at Larchwood, Lyon county. From all reports received it appears that the northwest district and the counties on the Missouri slope suffered the brunt of the cold wave on April 29th to May 3d. The snow fall was general, ranging from half an inch to three inches. This measurably protected grass, grain and small fruit during the period of lowest temperature, though it greatly retarded field work. The soil is saturated and several warm and drying days will be required to put it in condition for plowing and planting. The reports indicate much uncertainty as to the extent of damage to the different kinds of fruit. The estimates range from 20 to 75 per cent, though few reporters make any definite figures on the loss. Unquestionably the aggregate of injury will be heaviest in the west and southwest, where the fruit had reached the tenderest stage. There has been a great profusion of bloom and it may be hoped that the final output will exceed present expectations.

BULLETIN No. 5, MAY 11.

This has been the most favorable week of the season for field work. The average temperature has been about normal, and the rainfall was generally light during the six working days of the week. Whenever the soil is dry enough for plowing, preparations for corn planting have been vigorously pushed. A considerable acreage is in readiness for planting, and with favorable weather a big percentage of the corn area will be planted before the 20th. The work of planting is already well begun in all districts. The condition of the soil is quite variable, but on the average it is not in as good tilth as usual in the planting season. Grass and small grain crops are doing fairly well. The growth of pastures and meadows is generally in advance of former seasons. Late reports as to the fruit crop are much more cheerful in tone than last week. The damage by frosts and freezing weather is not nearly so great as the earlier reports seemed to indicate. The northern section will show but slight injury. In the south and west cherries and plums suffered greatest damage. The apple crop is still quite promising.

BULLETIN No. 6, MAY 18.

The past week was warmer than usual, with excessive rainfall in about two thirds of the state. The relatively dry portions of the state are in the three eastern districts, and in some localities the need of rain to soften the clods is strongly emphasized. The excessive downpours occurred, for the most part, in the counties where the rainfall for the season had been greatest. Plowing and planting operations have been delayed in the saturated sections, but wherever field work was practicable it has been vigorously pushed. In the most favored localities corn planting is well advanced, and reports indicate very prompt germination in all well drained and properly tilled fields. Unusual care has been exercised in the selection of seed corn, and the results are so far encouraging. Grass in pastures and meadows and small grain have made very satisfactory growth. With normal weather conditions in the near future the general crop situation in the larger part of the state will be much improved. Fairly good reports are received as to apples and some of the most important small fruits.

BULLETIN No. 7, MAY 25.

Continued wet and cloudy weather during the past week, with very heavy local downpours, increased the unfavorable conditions of soil and still further delayed corn planting and field work in large portions of the central and western districts of the state. The most cheering reports come from the counties contiguous to the Mississippi river, where the showers were timely and beneficial, softening the clods and facilitating the work of plowing and planting. In the northeast district and portions of the east central and southeast districts, the conditions have been much improved by warmth and moisture. The heaviest downpours of rain, with more or less damage by wind, hail and lightning, occurred in the Missouri river districts. This will materially lessen the corn acreage in a considerable portion of the territory visited by the heavy storms of the past week. Germination of corn has been generally very satisfactory, with indications of an excellent stand in all sections. Small grain, pastures and meadows have made

fine growth. The chief drawback is the tendency to rank growth of the oat crop on rich soils. The general crop situation is still contingent upon a return to normal weather conditions.

BULLETIN No. 8, JUNE 1.

This has been the most unfavorable week of the season. The temperature was below normal, with a very large excess of cloudiness. Heavy showers occurred daily in the larger part of the state, and severe local windstorms (not tornadoes) caused much damage to trees, windmills and light structures in many places. Following are some of the reports of heavy rainfall for the week: Des Moines, 7.40 inches; Jefferson, 7.49; Scranton, 5.93; Carroll, 4.77; Marshalltown, 5.61; Blairtown, 5.10; Iowa City, 5.68; Mount Vernon, 4.94; Grundy Center, 5.30; Amana, 5.15; Waterloo, 4.58; Logan, 3.99; Albia, 4.80; Charles City, 4.25. All stations report a very heavy excess above normal. Damage by floods has been almost unprecedented. The loss to crops by washing will be considerable, and much of the low lands will be abandoned. Field work has been practically impossible, except in a very few favored localities. There is great need of dry, warm weather to repair some measure of the damages and to secure crops from the uplands that have been planted. The acreage of all cereal crops must of necessity be materially less than the area harvested last year. The apple crop is promising.

BULLETIN No. 9, JUNE 8.

The first week in June brought a marked improvement, and the weather conditions of the last three days caused a resumption of field work in considerable portions of the state, and seems to give promise of the early restoration of seasonable temperature, sunshine and rainfall. This is imperatively needed to prevent well nigh total loss of corn and some other important crops. Reports are much more encouraging in tone from the larger number of counties. The greatest amount of damage by excessive rains and floods has been suffered in the drainage basins of the Des Moines, Iowa and Cedar rivers. The rainfall for the week ending the 8th was generally light, and the work of plowing, planting and replanting corn has been resumed in upland fields in four fifths of the counties of the state. The present conditions justify the belief that the amount of irreparable damage to crops, though quite heavy in many localities, will not be as heavy as appeared to be imminent during the height of the floods. The acreage of corn will, of course, be very considerably short of the large area planted in recent years. The oats crop is becoming quite rank, and the same is measurably true of wheat, barley and clover. Apples and berries are quite promising.

BULLETIN No. 10, JUNE 15.

The past week was cooler than usual, the daily mean temperature for the state ranging from 8° to 10° below normal. There was about the usual amount of sunshine, with but little precipitation in form of light local showers. In view of the previous saturated condition of the soil, the

weather conditions of the week were altogether more favorable than would have been a sudden change to hot and dry weather, resulting in encrusting the surface. The low temperature was favorable for oats and spring wheat, checking the tendency to rankness of growth and damage by rust, and these crops are generally doing fairly well. Work in the corn fields has been vigorously carried on, in planting, replanting and cultivating. In numerous localities farmers were cultivating the second time, while in the same vicinity planting was being done in fields previously too wet. The weather has been too cool for quick germination and rapid growth of corn, but the crop has shown a fair measure of improvement within the last few days. The work of finishing planting is likely to be continued till the 20th; but with the best conditions the usual acreage will not be planted. The hay crop is likely to be a record breaker, and in a few localities hay making operations have been commenced. The apple crop still gives promise of a fair yield.

BULLETIN No. 11, JUNE 22.

The daily mean temperature for the last week ranged from 4° to 6° below the normal. The first half was generally clear and dry; the last half was partly cloudy, with showers which brought timely moisture to all sections, and excessive downpours in some localities. The rains were generally beneficial, softening the clods and encrusted surface of fields that were previously saturated or flooded. On the whole the general crop conditions have been improved. Field work has been vigorously pushed in all sections, with relatively little hindrance from wet weather. The area of the corn crop has been considerably enlarged by continued planting, while in early planted fields good progress has been made in subduing the weeds and putting the soil in better condition for growth of the plant, which now shows a healthy color, though smaller than usual at this season of the year.

Spring wheat, oats and barley are in the heading stage of growth, and are doing fairly well, considering all the vicissitudes of storms and floods. The heavy hay crop is nearing the time for harvest, and clover cutting is in progress in many places.

The apple crop appears to be doing fairly well, with less than the usual complaint of damage by blight or dropping. Berries and garden truck are very plenty.

BULLETIN No. 12, JUNE 29.

Though the average temperature was below normal, the past week was favorable for field work and advancement of crops. The conditions have been especially favorable for wheat, oats and barley, and except in limited areas these crops are doing well. The cultivation of corn has been continued vigorously with but little interruption from excessive moisture in the larger part of the state, and all reports indicate that the crop as a whole has made fair progress. The acreage of corn, including the late planted area, is much greater than was deemed possible a month ago, though materially less than last year. Notable good progress has been made in cultivating the early planted fields, and in size and general condition this portion of the crop is nearly up to the ten-year average in this state. Clover

cutting has been general during the week, with heavy yield, and the hay harvest is likely to crowd the farmers, possibly to the detriment of the late planted cornfields, which will need thorough cultivation to bring good results. The general condition of the apple crop is fairly good. The yield of strawberries has been very large, and other small fruits are promising. Potatoes and garden truck are doing well.

BULLETIN No. 13, JULY 6.

Unusually warm weather prevailed during the past week from Monday morning to Friday night. The rainfall was unequally distributed, some very heavy showers occurring in the northwest quarter of the state. In all districts the amount of moisture is ample for the needs of the crops, and generally there has been but little hindrance by wet weather. Corn has made rapid growth, and the early planted fields are being laid by in good condition, some portions of the crop being up to the standard in size and vigor. Cultivation of late planted corn is in progress, with improving prospects of reaching maturity. Wheat, oats and barley are doing fairly well. The potato crop in many localities is unusually good. The hay harvest is in progress in nearly all sections, and in the larger part of the state the yield will be very heavy.

BULLETIN No. 14, JULY 13.

The week was unusually warm, with high per cent of humidity. The average daily excess of temperature was 3° to 4°. On the 8th, 9th and 10th very heavy showers, with high winds, swept over extensive areas in the east central, northeast and north central districts, and the excessive amount of rainfall were reported ranging from 2 to 6.30 inches. In about one half to two thirds of the state the rainfall did not exceed the normal requirement of the crops, and in some of the southern localities there is a scant supply of moisture at the surface. Considerable damage was done by high winds and local floods in storm-swept districts, but the percentage of loss of crops is not large. Numerous reports indicate that the spring wheat and oats are considerably affected by rust and smut, especially in the districts recently subjected to excessive moisture. The extent of injury to small grain from this cause can not as yet be determined. The high temperature and humidity afforded ideal conditions for the corn crop, which is reported to be making excellent progress in all parts of the state, the early planted fields beginning to show tassels at about the normal height. In the central and southern districts haying operations have been carried on, and the crop is generally heavy. At many points early sown oats are being cut. The recent windstorms have been damaging to early apples in the northern section, but generally that important crop is doing well in other sections. Numerous reports are received of damage to potatoes by rot and fungus disease of the tops.

BULLETIN No. 15, JULY 20.

The past week afforded four or five days of fine weather for haymaking and harvesting small grain, and the time was well improved. A large amount of well cured hay has been put into stacks and barns, and the quality of the crop is generally up to the average. The showers of the 17th and

18th were timely and very beneficial, except in limited areas in the northern and eastern districts, where damage resulted from heavy downpours. In the southern districts the showers were generally light, and in some places the surface is becoming dry and hard. The general condition of the corn crop appears to be steadily improving, though the temperature for the week was slightly below normal. A survey of the fields will show unusual variation in size and appearance of the corn plant, ranging from twelve inches to the normal tasseling height, and it is evident that extremely favorable weather will be required to bring the belated portion of the crop to maturity.

Spring wheat and oats are affected by rust, especially the late seeded portions, and the quality of the grain will be somewhat impaired. The barley harvest is well advanced, and early seeded wheat and oats are in shock. Reports indicate that the early potato crop is below expectations, being affected by blight and rot. The apple crop seems to be holding its own, and the yield of early fruit is good.

BULLETIN No. 16, JULY 27.

In the larger part of the state ideal weather conditions prevailed for harvesting hay and grain, and fine progress has been made during the week. The greater part of a very heavy hay crop of fine quality has been secured and most of it without damage by rainfall. In the southern districts the harvest is practically completed, and threshing is in progress. In the northern districts the work is well advanced, with varying reports as to the bulk and quality of the small grain crops. The corn crop has made substantial gains in all districts, though in many localities in the southern and eastern counties copious showers would be beneficial, as the more advanced portion has reached the earing stage.

On the afternoon of the 20th a series of very heavy hailstorms swept across the state on a direct line from Lyon and Osceola to Taylor and Ringgold counties, causing great destruction to crops in their pathway, which in some portions was six miles in width. This visitation was the chief drawback in one of the best weeks of the season. While the loss falls heavily upon two or three thousand farms, yet the aggregate of total destruction involves a small percentage of the products of the state.

The minor crops are doing fairly well. The markets are being supplied with early apples and garden truck.

BULLETIN No. 17, AUGUST 3.

The first week was dry and very warm, followed by well distributed and beneficial showers and cooler weather. The week closed warm and showery with some heavy local rains. There was an average of about four days of good harvest weather, which was well improved. Except in portions of the northern section the hay and grain harvest is practically completed. All reports indicate a very heavy crop of hay, mostly secured in good condition. Threshing wheat, oats and barley is in progress, with somewhat variable reports as to the yield. Generally, however, the output of spring wheat and oats is reported to be below the average in amount and weight of grain. The copious showers have been timely and beneficial to the corn crop, and as a whole it has made fairly good progress. It needs warmer weather in

the future, and is now in condition to mature with but little additional moisture. There are numerous reports of damage to the potato crop by rotting and blight. There is no special change in the condition of the apple crop.

BULLETIN No. 18, AUGUST 10.

The temperature of the past week was nearly normal, but the nights were unseasonably cool. The rainfall was ample in all sections, and some heavy and damaging local storms occurred in the North Central and Northeast districts. In the larger part of the state conditions were favorable for field work four to five days during the week. Fair progress has been made in threshing and stacking small grain. Reports as to yield of wheat and oats are generally unsatisfactory, both as to the weight and measure of the output. The condition of the grain, however, is very much better than the average of last year. The corn crop has made as much growth as was possible under abnormal conditions, the soil being generally wet and cold and the temperature of the air unseasonably intermittent. Some portions of the early planted corn on dry and warm land has reached the roasting ear stage, while the bulk of the crop is straggling in the rear, and much of it unpromising. There is great need of a long period of warm, dry, ripening weather to make a good yield even to the most advanced portion of the crop. The hay crop bids fair to break recent records as to bulk and quality. The pastures are fine, and the meadows are bearing a heavy burden of aftermath. The minor field crops and apples are doing fairly well.

BULLETIN No. 19, AUGUST 17.

The week has been unseasonably cool and cloudy, with excessive humidity. The amount of rainfall was light except in portions of the western and central districts. In a few localities some damage was caused by wind and hail with excessive downpours of rain.

Threshing and stacking were considerably retarded by damp weather, cloudiness and fog. In some localities small grain in shock has been somewhat damaged by excessive moisture. In relation to the corn crop the burden of all crop reports is to the effect that the weather has been too continuously cool and cloudy for its normal advancement. Unquestionably the crop as a whole has made some progress, but its generally belated condition and the continuance of cold nights and cloudy days give just cause for anxiety as to the final output. There is certainly imminent need of warmer weather to develop normally the early planted, and to produce anything of value in the late planted fields. With good old-time hot days and nights for the balance of the season a very liberal amount of sound corn may yet be produced.

A very large hay crop has been secured, and the pastures and meadows are heavily burdened with forage. Reports are generally more favorable as to late potatoes. Early apples yield abundantly.

BULLETIN No. 20, AUGUST 24.

The week was warm and dry, the records of the central station showing a daily excess of 5° in temperature. Conditions were all that could be desired for ripening early planted corn, but late planted fields in many

localities were too dry for best results. As a whole the crop has made very good progress. In response to a circular, special reports have been received as to the probable length of time required under normal conditions to place corn beyond danger of harm by killing frost. Reports show an unusually variable condition of the crop as to stage of growth and prospective output. Even in the same districts and adjoining counties marked differences are in evidence. For the whole state about 40 per cent was planted early and made a fair start; and this portion of the crop on average may be safe by September 10th to 20th. A portion of the later planted (possibly 20 per cent of the whole area) may be fairly matured by September 30th. With favorable weather till October 10th we may reasonably expect to harvest sound corn in three fourths of the area planted and not abandoned to the weeds. The output from this area will range from light to very good. With a benign and frostless period through September and a little beyond, the total yield for the state may equal the crop of 1901.

BULLETIN No. 21, AUGUST 31.

The week past brought three days of warm weather, and the balance of the week was cloudy, wet and cold. The average daily deficiency in temperature was 2° to 4°. The rainfall was above normal in all parts of the state, and reports show phenomenal downpours at numerous stations in the west central and southern districts, ranging from 5 to 11 inches, the larger part of which fell on the afternoon and night of the 26th. There was a general need of showers, especially in the southern part of the state, and it is probable that the beneficial effects of the copious moisture will exceed the damage to the corn crop resulting from local floods and high winds. As a whole the crop made some advancement, and with a month of good ripening weather a considerable portion of the acreage planted may reach maturity. In the present variable and critical condition of corn no one is wise enough to forecast the final output. There is absolute certainty, however, as to the urgent need of warm and dry weather for the greater part of the coming month.

The copious rainfall assures ample pasturage and facilitates fall plowing, which is well begun. Late potatoes have been benefited, though there are numerous reports of damage by rotting. The fall apple crop is quite good in the northern half of the state. Winter apples very light.

BULLETIN No. 22, SEPTEMBER 7.

September opened with nearly normal temperature and generally favorable conditions for farm operations. The nights were quite cool, but there has been sufficient warmth by day during the week to maintain the growth of vegetation. The corn crop has made fair advancement, but most of the fields still show the deep green color of midsummer, and the ripening process has not been sufficiently rapid to allay the feeling of anxiety as to the future safety of the crop. The final output, as to the amount and soundness, depends upon warm and generally dry weather the balance of this month. Excellent progress has been made in fall plowing, with the soil in good condition. Threshing reports indicate a very large yield of

timothy seed. The late potato crop is doing fairly well except in low, wet soil. A very satisfactory crop of fall apples is being harvested and marketed.

BULLETIN No. 23, SEPTEMBER 14.

The past week has been unseasonably cool, wet and cloudy. The average temperature was but little below normal, but the large excess of rainfall and general prevalence of cloudiness made it unfavorable for rapid maturing of crops and farming operations. Threshing has been delayed, and grain in shock and stack has suffered very considerable damage. Reports indicate that corn has made some advancement toward maturity, but not as rapidly as seems necessary for the safety of the bulk of the crop. Early planted corn is reported to be mostly beyond danger of harm by frost in the northeast district, and in favored localities in the southeast district; but for the state at large the percentage of well matured corn is as yet relatively small. The bulk of the crop needs two or three weeks of good ripening weather. The conditions have been favorable for pasturage, which was never better at this time of the year. Apples and potatoes are about as previously reported.

BULLETIN No. 24, SEPTEMBER 21.

The first half of the past week was unseasonable cold, wet and cloudy, and the last three days were fair and much more favorable for the unmaturing crops. At the Des Moines station the daily average temperature was 9° below normal. The deficiency was greater in the west and north, and less in the south and east districts. In all sections light to heavy frosts were reported and at a few stations the frosts were described as "killing" on the 17th and 18th. Later reports, however, do not justify this extreme designation, except as to effects on tender vegetation and on very low ground. The corn crop appears to have escaped any very serious damage, even in localities where the temperature was lowest. The subsequent drying winds have been very favorable to the most advanced portion of the crop, and corn harvesters have begun operations in all sections. With continued ripening weather the bulk of the crop will be safe from harm by frost by September 30th. But some of the area planted will yield nothing but poor fodder. Thrashing was delayed by wet weather, and reports indicate considerable damage to grain in stacks as well as shocks. Plowing is well advanced.

BULLETIN No. 25, SEPTEMBER 28.

This has been an ideal week for ripening the belated crops, and advancement of usual fall work. The temperature was about normal, with drying winds, and more than the usual amount of sunshine. The week closed with light rains, followed by a moderate frost on the morning of the 27th, which caused no material damage to any field crops. Reports indicate that corn binders are at work in all districts, and a considerable acreage will be put into shock to save the valuable fodder. Except in limited areas which suffered most heavily from storms and floods, reports from the fields are more cheerful in tone, giving assurance of better returns from the harvest than was deemed possible during the first half of the month. About three-fourths of the corn area of the state is now beyond danger of injury by

frost, and a considerable part of the balance is rapidly nearing maturity. While it is certain the total output of the crop will be much below the returns of 1902, yet it is likely to possess greater commercial and feeding value. Excellent progress is being made in plowing, fall seeding and harvesting the minor crops.

The potato crop as a whole will be much below the average. Apples and grapes are better than earlier reports indicated.

SPECIAL BULLETIN, OCTOBER 6.

The past week was slightly warmer than usual, with an excess of cloudiness and rainfall in the larger part of the state. About half the week conditions were favorable for drying out well ripened corn, and the belated portion of the crop made fairly good progress toward maturity. The greater part of the corn crop of the state is now fully matured, and with normal drying weather a good portion may be dry enough to be cribbed by the 15th to the 20th of October. The output will be unusually variable, ranging from less than half an average up to some record-breaking yields. The quality and value for feeding and commercial purposes will be materially above the much larger total of 1902. Reports indicate that, for the state at large, from ten to fifteen per cent of the crop is still green and immature, exposed to some measure of damage by killing frosts. A week of dry, warm weather would ripen a considerable part of the belated portion of the crop, though at best there is likely to be somewhat more than an average percentage of soft and unmerchantable corn in the output of this abnormal wet and cool summer.

CROP ACREAGE AND CONDITION.

JUNE 1st. CROP REPORT.

Reports of the regular crop correspondents of the Iowa Weather and Crop Service, made June 1st, have been received and tabulated for the state at large. The showing as to the acreage, as compared with last year is somewhat better than we had reason to expect in view of the adverse weather conditions and saturated state of the soil in the seeding and planting season.

The figures as to the acreage of corn, as compared with last year, must needs be revised, and will be included in the report for July 1st. It was impossible to make, during the last week in May, even an approximate estimate of the acreage that will be finally included in the corn harvest of this year. So the figures as to the corn acreage will be omitted from this report. The percentages of the acreage of the other staples are as follows, the figure 100 representing the area of last year:

Winter wheat, 83 per cent; spring wheat, 85; oats, 92; barley, 90; rye, 88; meadows, 101; potatoes, 94; flax, 87.

Condition of Crops and Fruit.—Winter wheat, 96; spring wheat, 93; corn already planted, 75; oats, 93; barley, 96; rye, 94; meadows, 109; pastures, 107; flax, 84; potatoes, 91; apples, 70; plums, 35; peaches, 40; cherries, 35; grapes, 70; strawberries, 90; blackberries, 92; raspberries, 85.

Live Stock.—Cattle, 99; sheep, 99; hogs, 98; spring pigs, 89; horses, 96; foals, 95.

Last year at corresponding date conditions were rated as follows: Corn, 97 per cent; wheat, 99; oats, 98; barley, 100; rye, 99; flax, 98; potatoes, 103; meadows, 96; apples, 70; plums, 72; cherries, 70; grapes, 72; strawberries, 80; raspberries, 71; blackberries, 67.

CONDITION OF FRUIT JUNE 1.

Secretary Green, of the Agricultural Society, issued the following report:

A summary of the reports for June shows a decline of 10 to 30 per cent in some varieties of fruit since the last report. The lowest percentage is in the Des Moines valley, the next lowest is in the Nishnabotna. The counties east of the Iowa river show the highest percentage in plums, cherries, currants and gooseberries; these fruits, if properly distributed, should bring a good price, as not more than one fourth the usual crop will be harvested. Apples will be about half a crop in the southwest, from present indications, and three quarters in the north and east. Strawberries, raspberries and blackberries are well distributed over the state, and will be a good crop unless injured by unfavorable weather conditions later in the season.

A summary for June is as follows: Apples, 68 per cent; pears, 22; plums, 27; cherries, 26; peaches, 30; grapes, 64; currants, 36; gooseberries, 34; red raspberries, 76; black raspberries, 72; blackberries, 90; strawberries, 86 per cent of a full crop.

JULY 1st. CROP REPORT.

Reports from county and township crop reporters for July 1st show the following percentages of condition: Spring wheat, 88 per cent; corn, 77; oats, 87; barley, 89; rye, 98; flax, 85; meadows, 104; pastures, 107; potatoes, 96; apples, 70; plums, 49; grapes, 78.

Last year at corresponding date the percentages were as follows: Wheat, 97; corn, 92; oats, 95; rye, 98; barley, 97; flax, 99; potatoes, 108; meadows, 99; pastures, 107; apples, 65; grapes, 65.

A revised estimate of the area of corn planted this year shows 87 per cent, or an average decrease of 13 per cent, compared with the area planted in 1902.

AUGUST 1st. CROP REPORT.

Reports from township and county crop correspondents of the Iowa Weather and Crop Service show the following estimates of the condition of the staple crops on August 1, 1903: Spring wheat, 82 per cent; corn, 73; oats, 77; millet, 96; flax, 84; buckwheat, 89; pastures, 104; sorghum, 84; potatoes, 80; apples, 65; grapes, 80.

At corresponding date last year the estimates were as follows: Spring wheat, 84; corn, 93; oats, 83; flax, 91; potatoes, 107; apples, 66.

IOWA CROPS—FINAL REPORT, 1903.

AVERAGE YIELD PER ACRE; TOTALS FOR THE STATE; CURRENT FARM PRICES, DECEMBER 1, 1903.

Following is a summary of crop reports from correspondents of the Iowa Weather and Crop Service, showing the average yield per acre and totals of staple soil products, and the average prices at the farms or nearest stations December 1, 1903. In this showing of the value of the season's output of grain, forage, etc., no reckoning is made of the increment in value gained by consumption of soil products on the farms in the production of beef, pork, mutton, horses, butter, poultry, eggs, etc. Usually the prices obtainable for the crops at the close of the season do not express more than two thirds of the actual value of the staple products of the soil:

The Corn Crop.—In estimating the output of this crop the most difficult problem is to determine the extent of loss of acreage caused by floods and adverse weather conditions in the season of planting and cultivating. As a result of inquiry and careful computation it appears that the corn area actually harvested this season is approximately 7,398,320 acres. The returns of township assessors show that the area planted in 1902 was 8,925,068 acres, and by comparison it is shown that the reduction this season amounted to about 1,526,748 acres. The average yield per acre for the state this year was 31 bushels, and the aggregate product is estimated at 230,511,310 bushels. The average farm price on December 1st was 36 cents per bushel, making the aggregate value \$82,984,071. Last year the product was much inferior in quality though much larger in amount, and the value was computed at \$83,000,000. The yearly average for 13 years has been \$69,633,000.

In respect to quality of the grain and actual commercial value, the corn crop of this season is fully 20 per cent better than the output of 1902.

Wheat.—Winter wheat acreage harvested 84,934 acres; yield per acre, 16.9 bushels; total yield, 1,435,380 bushels; average price 70 cents per bushel; total value \$1,004,766. Spring wheat area harvested 752,488 acres; average yield 12.6 bushels per acre; total product 9,481,350 bushels; price per bushel 65 cents; total value \$6,162,877. Aggregate value of wheat \$7,167,643. Last year the value was \$7,062,640. Average yearly value for past thirteen years, \$10,524,000.

Oats.—The oats crop this season has been below the average in yield per acre and weight per bushel, as a result of adverse conditions. The area harvested was 3,822,882 acres; average yield 25.9 bushels per acre; total product, 99,012,660 bushels; aggregate value, at 30 cents per bushel, \$29,703,798. Last season the product was 92,907,000 bushels, valued at \$22,907. The average yearly output for thirteen years has been 117,118,000 bushels, and the value \$25,420,000.

Barley.—Area harvested, 493,108 acres; yield per acre, 24.7 bushels; total product, 12,179,790 bushels; average price, 37 cents per bushel; total value, \$4,506,522. The yield and value are about the 13-year average.

Rye.—Area harvested, 123,273 acres; average yield, 15.6 bushels per acre; total product, 1,923,060 bushels; current price, 44 cents per bushel; total value, \$846,146.

Flax.—Area harvested, 40,823 acres; yield per acre, 8.7 bushels; total yield, 355,160 bushels; current farm price, 78 cents per bushel; total value, \$277,024.

Potatoes.—Area harvested, 113,433 acres; average yield, 5.38 bushels per acre; total product, 6,082,694 bushels; average farm price, 75 cents per bushel; value of product, \$4,562,020. The total yield is about half the 13-year average; total value about the average of the 13-year period.

Hay.—(Tame). Average yield per acre, 1.9 tons; total product, 5,216,404 tons; current farm price, \$5.75 per ton; value of crop, \$29,994,323.

Hay.—(Wild). Yield per acre, 1.3 tons; total product, 1,191,345 tons; average price, \$4.95 per ton; total value, \$5,897,157. The hay crop as a whole (tame and wild) is nearly 900,000 tons in excess of the 13-year average.

Pasturage.—This most important soil product has been at its best in the recent wet seasons, when the cereal crops have suffered much detriment from excessive moisture. It is not measured by the ton or bushel, and its value can only be estimated approximately by considering it as a basis of stock growing and dairying. From this point of view it will be a conservative estimate to figure the output of pastures and all other grazing lands at an average of \$300 per farm. This makes a total value of \$68,000,000 for the state.

Corn fodder in shock and fields is worth at least \$10,000,000.

Sorghum, broom corn and sweet potatoes are worth about \$750,000.

TABULATED CROP SUMMARY.

CROPS.	Total Products.	Farm Values Dec. 1.
Corn	230,511,310 bushels	\$ 82,984,071
Wheat	10,916,780 bushels	7,167,643
Oats	99,012,660 bushels	29,703,798
Barley	12,179,790 bushels	4,506,522
Rye	1,923,060 bushels	846,146
Flax	355,160 bushels	277,024
Potatoes	6,082,694 bushels	4,562,020
Hay (tame)	5,216,404 tons	29,994,323
Hay (wild)	1,191,345 tons	5,897,157
Pasturage (estimated)		68,000,000
Timothy and Clover Seed		1,225,000
Corn Fodder		10,000,000
Sorghum, Broom Corn and Sweet Potatoes		750,000
Fruits and Vegetables		10,500,000
Total value		\$256,413,704

FINAL CROP REPORT, 1903.

AVERAGE PER ACRE AND TOTAL YIELD BY COUNTIES.

Counties.	Corn.		Winter Wheat.		Spring Wheat.		Oats.		Rye.		Barley.		Flax.		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.....	25	2,989,400	8	2,720	12	118,200	25	741,250	15	3,000	24	14,210	.....	.....	38	44,000	1.2	72,430	1.2	3,210
Adams.....	25	1,605,000	20	25,220	11	35,320	21	268,170	20	10,800	20	20,400	.....	.....	40	30,590	1.8	52,540	1.6	1,590
Allamakee.....	40	1,641,200	15	15,600	12	38,820	20	1,388,300	10	14,200	30	109,790	8	3,240	40	43,680	2.0	78,550	1.0	2,310
Appanoose.....	25	2,100,250	15	22,250	.....	.....	27	283,300	10	23,910	.....	.....	.....	.....	45	50,900	1.7	71,740	2.0	1,640
Audubon.....	30	2,141,100	10	640	12	235,320	24	763,340	18	2,970	25	24,100	.....	.....	45	41,710	2.0	51,890	2.0	8,490
Benton.....	32	3,682,820	.....	.....	15	25,720	30	1,930,350	12	10,080	25	33,000	.....	.....	50	107,340	1.7	58,740	1.0	7,920
Black Hawk.....	34	2,752,200	20	940	12	5,700	24	1,507,440	16	27,840	29	107,010	.....	.....	50	110,610	1.9	58,050	1.5	24,340
Boone.....	20	2,081,110	.....	.....	11	34,310	24	1,100,640	11	5,412	30	5,400	.....	.....	45	40,000	2.0	60,900	1.5	18,000
Bremer.....	25	1,331,420	.....	.....	12	5,040	24	1,229,620	20	27,700	24	20,680	.....	.....	62	82,460	1.8	31,650	1.2	18,730
Buchanan.....	40	2,439,200	.....	.....	15	7,680	25	1,329,870	18	12,610	25	38,000	.....	.....	80	76,520	2.0	71,680	1.5	18,550
Buena Vista.....	33	2,699,090	.....	.....	15	54,690	24	1,555,680	16	6,720	22	68,640	.....	.....	70	78,640	2.0	37,200	1.5	24,000
Butler.....	28	2,514,540	.....	.....	12	4,830	25	1,819,000	11	22,100	20	16,400	.....	.....	80	100,320	1.9	83,420	1.5	10,420
Calhoun.....	20	1,312,140	.....	.....	19	40,410	23	1,291,310	10	2,790	21	80,610	.....	.....	30	25,200	2.0	32,840	1.4	16,250
Carroll.....	40	2,950,720	.....	.....	12	194,000	25	1,305,020	18	4,080	20	65,420	.....	.....	70	85,650	2.0	42,990	2.0	30,740
Cass.....	28	2,831,390	.....	.....	14	269,080	25	735,250	20	9,120	22	33,700	.....	.....	45	69,750	1.8	62,290	1.5	4,110
Cedar.....	41	3,805,210	22	18,280	16	21,120	32	1,690,680	17	40,490	30	335,300	.....	.....	80	89,280	2.5	47,650	1.5	1,240
Cerro Gordo.....	31	2,302,060	.....	.....	11	10,560	28	1,895,620	16	8,120	25	52,250	6	10,490	80	104,800	1.8	41,770	1.2	4,180
Cherokee.....	38	3,370,220	.....	.....	11	240,790	31	1,404,510	15	1,650	26	135,460	.....	.....	40	47,400	2.0	40,460	1.5	16,270
Chickasaw.....	27	1,555,170	.....	.....	15	15,750	25	1,780,640	15	11,670	24	63,120	13	60,430	72	87,294	1.0	46,380	1.5	16,270
Clarke.....	21	1,010,550	23	9,900	.....	.....	21	312,910	15	7,680	.....	.....	.....	.....	45	21,010	1.0	72,430	1.0	610
Clay.....	24	1,671,800	.....	.....	10	62,300	25	1,240,250	15	15,300	22	34,730	8	13,610	42	41,620	1.5	28,630	1.4	29,270
Clayton.....	41	2,924,450	16	24,410	13	75,730	28	1,811,790	10	80,720	30	185,000	.....	.....	82	63,400	2.0	91,620	1.5	4,980
Clinton.....	35	3,053,100	18	9,450	12	32,480	24	817,040	15	48,150	22	113,410	.....	.....	70	81,970	2.0	88,640	1.5	6,810
Crawford.....	30	3,484,470	.....	.....	10	424,270	25	932,750	14	9,870	20	50,590	.....	.....	70	98,550	2.0	65,020	1.3	12,240
Dallas.....	35	3,157,700	30	38,080	14	33,760	31	1,694,280	20	15,200	30	25,200	.....	.....	50	43,750	2.0	49,380	1.5	14,130
Davis.....	25	1,029,050	13	24,530	.....	.....	21	359,060	10	24,480	.....	.....	.....	.....	30	19,500	1.8	54,020	1.0	670
Decatur.....	24	1,427,280	16	24,690	.....	.....	25	398,500	12	8,940	.....	.....	.....	.....	30	40,000	1.6	60,970	1.0	7,910
Delaware.....	32	2,645,760	20	1,220	16	20,990	28	1,352,540	20	38,200	35	168,000	.....	.....	50	58,150	1.6	60,390	1.0	1,670
Des Moines.....	22	808,530	18	63,180	15	7,230	26	653,120	16	15,640	.....	.....	.....	.....	58	40,790	1.8	35,800	1.0	540
Dickinson.....	25	916,250	.....	.....	10	62,800	22	581,680	12	4,200	20	302,600	10	14,600	45	22,950	1.8	13,990	1.5	22,140
Dubuque.....	42	2,583,260	15	2,370	15	55,560	24	1,254,400	20	41,920	33	83,820	.....	.....	60	115,200	2.0	91,650	1.4	3,940
Emmet.....	31	1,348,710	.....	.....	12	31,680	31	1,140,800	10	2,730	30	245,300	10	14,790	58	28,890	2.2	29,910	1.8	20,770
Fayette.....	35	2,865,240	18	3,240	12	36,360	25	1,063,250	20	23,200	30	152,700	9	17,820	70	114,000	2.0	97,240	1.5	10,780
Floyd.....	28	2,080,700	.....	.....	12	5,210	26	1,636,700	17	23,200	31	119,040	8	20,080	45	85,050	1.8	31,650	1.4	10,220
Franklin.....	33	2,887,830	.....	.....	12	21,720	29	1,088,380	12	10,080	25	25,550	.....	.....	50	51,450	2.0	40,200	1.0	17,190

Fremont.....	30	3,116,100	12	60,480	11	22,770	25	222,550	20	10,820	.....	.....	.....	.....	60	88,400	2.0	28,170	1.0	5,710
Greene.....	20	1,355,700	.....	.....	12	27,720	22	867,240	12	1,800	24	53,040	.....	.....	51	32,280	2.0	30,410	1.2	14,320
Grundy.....	40	3,428,500	.....	.....	12	27,780	25	1,565,720	5	1,870	22	233,080	.....	.....	70	106,750	2.0	43,480	1.0	8,100
Guthrie.....	28	2,231,480	20	8,900	13	122,330	26	900,920	20	4,940	30	31,200	.....	.....	52	28,080	2.0	62,890	1.3	9,210
Hamilton.....	25	1,594,500	.....	.....	12	37,080	22	1,047,420	14	980	20	15,000	7	5,740	53	60,900	1.8	33,400	1.4	33,150
Hancock.....	30	1,547,800	.....	.....	13	61,690	25	1,837,000	20	15,300	24	62,640	9	12,780	40	36,480	1.5	29,110	1.5	28,530
Hardin.....	31	2,706,010	.....	.....	11	40,610	27	1,402,110	16	3,080	21	15,350	.....	.....	62	87,800	1.8	37,100	1.5	22,140
Harrison.....	35	3,653,050	15	4,810	12	367,080	25	358,750	15	18,300	30	31,850	.....	.....	65	90,450	2.2	29,750	1.5	19,920
Henry.....	30	1,737,000	15	32,400	12	840	25	563,000	15	67,800	22	40,370	.....	.....	70	35,420	2.0	44,250	1.0	140
Howard.....	25	1,140,250	.....	.....	15	10,120	30	1,694,400	18	2,340	28	161,640	10	61,800	48	41,100	1.8	53,210	1.2	14,010
Humboldt.....	36	1,554,840	.....	.....	12	53,160	32	1,200,640	16	2,240	30	60,900	10	11,220	80	35,640	2.4	35,400	1.5	21,340
Ia.....	28	2,555,020	.....	.....	10	189,800	24	792,350	15	5,400	22	97,460	.....	.....	40	36,880	2.0	41,420	1.2	5,410
Iowa.....	39	2,678,910	30	7,800	19	25,080	30	1,029,600	20	13,800	28	122,920	.....	.....	70	86,100	2.2	97,350	2.0	2,100
Jackson.....	33	2,337,720	17	6,630	15	61,500	22	757,340	18	90,100	30	104,200	.....	.....	75	87,000	1.8	77,590	1.5	8,670
Jasper.....	35	3,604,150	15	16,200	18	99,600	27	1,168,800	16	19,680	30	19,680	.....	.....	78	118,610	1.8	62,570	1.2	2,440
Jefferson.....	31	1,485,990	14	34,440	12	367,080	25	358,750	15	31,200	30	31,850	.....	.....	85	81,850	1.7	51,612	.....	.....
Johnson.....	38	3,421,520	15	12,900	14	17,220	27	1,081,020	15	52,020	28	170,120	.....	.....	71	91,500	2.0	87,290	1.5	2,880
Jones.....	36	2,680,400	.....	.....	12	15,360	26	901,300	16	33,800	30	183,800	.....	.....	70	59,570	2.0	90,420	1.5	1,510
Keokuk.....	28	2,383,080	14	22,540	12	9,840	25	785,500	18	57,760	24	70,440	.....	.....	55	46,750	1.5	59,800	1.0	370
Kossuth.....	22	2,461,220	.....	.....	13	197,300	24	1,594,280	15	3,330	25	139,250	9	28,980	35	55,780	1.5	34,660	1.0	56,670
Lee.....	30	1,530,900	15	109,650	.....	.....	21	439,340	15	90,000	20	2,420	.....	.....	50	58,050	1.6	60,390	1.0	210
Linn.....	32	2,780,920	18	1,800	12	25,320	30	1,481,600	16	23,570	25	23,570	.....	.....	65	96,480	1.5	60,430	1.0	5,210
Louis.....	28	1,335,350	15	45,000	15	910	28	1,167,080	15	60,450	20	18,800	.....	.....	58	28,520	2.0	32,070	1.5	710
Lucas.....	27	1,135,830	20	25,400	.....	.....	30	4,200	14	25,700	.....	.....	.....	.....	25	12,240	1.5	63,550	1.0	350
Lyon.....	28	1,975,120	.....	.....	11	379,300	27	1,295,100	15	2,550	25	1,063,000	7	1,540	34	70,100	2.0	16,750	1.5	20,670
Madison.....	35	2,498,750	15	21,150	12	43,680	27	510,480	20	13,800	30	51,000	.....	.....	45	27,200	2.0	77,020	1.5	4,470
Malaska.....	32	3,020,150	15	24,750	12	20,520	30	952,500	15	31,500	25	70,280	.....	.....	40	35,000	2.0	61,880	1.0	940
Marion.....	31	2,706,920	15	46,200	12	44,120	20	598,000	16	31,000	22	20,240	.....	.....	88	48,720	2.4	51,220	1.2	1,100
Marshall.....	42	4,178,160	.....	.....	15	93,750	24	1,294,080	20	11,620	25	64,350	.....	.....	58	66,120	1.8	50,580	1.0	2,180
Millis.....	31	2,179,610	17	36,720	10	71,200	23	294,100	16	8,480	20	8,400	.....	.....	45	38,250	1.8	29,510	1.2	4,910
Mitchell.....	25	1,379,250	.....	.....	10	53,000	23	1,399,320	14	8,510	25	324,000	8	38,120	22	27,000	1.5	36,780	1.0	3,200
Monona.....	32	2,882,240	20	18,400	11	616,200	20	541,920	10	11,070	25	132,250	.....	.....	50	60,500	2.0	8,600	1.5	42,840
Monroe.....	25	1,175,350	12	5,840	12	1,730	28	24,640	11	10,450	20	6,400	.....	.....	40	22,400	2.0	61,700	1.0	430
Montgomery.....	32	2,738,500	.....	.....	30	230	30	348,000	15	7,400	20	10,000	.....	.....	40	7,400	1.0	1,000	1.0	1,000
Muscatine.....	30	2,430,800	20	49,800	15	23,100	28	662,560	18	66,380	23	149,730	.....	.....	65	130,054	2.2	52,820	1.0	3,070
O'Brien.....	30	2,430,800	.....	.....	15	297,150	30	1,672,200	15	4,200	20	522,600	8	3,640	50	61,150	2.0	25,020	1.5	20,370
Oceola.....	21	814,620	.....	.....	8	66,680	20	692,660	18	2,160	17	49,870	6	4,690	32	30,160	1.7	18,130	1.5	12,420
Page.....	24	2,890,520	18	104,750	13	65,540	22	309,940	20	26,200	25	28,000	.....	.....	70	62,570	1.8	34,890	1.5	4,080
Palo Alto.....	28	1,720,720	.....	.....	11	30,470	29	1,187,680	10	8,508	28	175,740	7	23,120	40	32,390	1.7	16,670	1.0	31,900
Plymouth.....	33	3,597,090	.....	.....	12	858,300	23	1,008,000	17	7,350	22	225,060	8	1,680	50	96,230	2.0	35,840	1.5	37,010
Pocahontas.....	30	1,014,000	.....	.....	10	20,730	26	1,637,340	20	9,530	24	20,990	.....	.....	40	115,120	1.8	32,870	1.0	3,800
Polk.....	30	2,430,800	16	20,730	15	61,630	31	1,107,940	18	14,700	20	2,620	.....	.....	45	100,680	1.0	43,770	1.8	17,850
Pottawattamie.....	42	5,735,360	12	12,120	12	403,320	23	600,230	16	12,900	22	221,010	.....	.....	58	117,120	2.0	67,060	1.5	19,660
Poweshiek.....	35	3,169,460	15	1,800	13	34,190	26	1,005,860	16	8,900	30	139,260	.....	.....	72	76,320	2.1	91,890	1.2	770
Ringgold.....	25	1,730,600	14	13,020	10	130	23	490,360	12	10,080	25	4,820	.....	.....	83	13,500	2.2	55,060	1.4	800
Sac.....	30	3,432,600	.....	.....	18	118,820	31	1,617,600	20	5,900	28	145,880	11	1,210	70	71,750	1.9	47,330	1.3	15,880
Scott.....	41	3,003,710	21	46,020	16	115,440	23	559,970	17	37,900	25	214,600	.....	.....	85	306,630	2.0	53,380	1.5	6,840
Shelby.....	30	3,218,700	.....	.....	13	291,140	18	1,053,720	21	419,520	21	1,053,720	.....	.....	40	115,120	1.8	32,870	1.0	3,800
Sion.....	35	3,003,710	.....	.....	13	750,720	28	1,053,720	18	8,620	25	876,660	10	4,300	42	58,880	1.7	18,150	1.6	37,120
Story.....	30	2,652,300	22	8,830	14	21,940	29	1,383,180	18	1,830	23	11,730	.....	.....	60	48,840	2.0	44,860	1.5	22,900

Counties.	Corn.		Winter Wheat.		Spring Wheat.	Oats.		Rye.		Barley.		Flax.		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	Bushels per acre	Total bushels.	Tons per acre	Total tons.	Tons per acre	Total tons.
Tama	34	2,002,060	13	93,892	36	1,252,160	13	6,630	22	398,640	...	...	...	70	113,750	2.0	81,780	1.4	7,130
Taylor	38	1,415,600	15	70,310	22	355,740	13	13,780	19	20,330	...	...	...	62	33,390	2.0	69,480	1.6	8,610
Union	35	1,915,600	18	44,100	12	1,320	15	4,350	21	8,610	...	...	...	62	41,890	2.0	58,420	1.2	1,290
Van Buren	39	1,123,080	16	44,100	12	2,160	12	7,140	23	24,750	...	...	...	59	20,750	1.8	65,440	1.5	45
Wapello	31	1,552,170	20	50,100	14	2,600	12	3,120	23	24,750	...	...	...	53	48,760	1.7	53,890	1.5	140
Warren	31	2,517,820	20	24,200	14	618,500	17	31,620	24	115,380	...	...	...	51	40,290	1.8	72,960	1.5	2,400
Washington	35	2,296,350	18	37,180	14	719,910	14	42,290	30	115,380	...	...	...	43	17,400	1.7	32,430	1.0	180
Wayne	22	1,150,160	15	2,370	30	447,120	12	13,350	26	30,160	8	6,490	8	13	17,400	2.0	32,430	1.0	180
Webster	35	2,293,560	...	...	15	1,866,930	15	3,900	26	30,160	8	6,490	8	55	17,400	2.0	32,430	1.0	180
Winnebago	30	818,800	...	...	12	99,840	22	852,420	23	95,760	8	48,290	30	30	30,400	2.0	32,430	1.0	180
Winnechick	30	2,098,860	...	...	13	1,756,300	19	6,840	26	95,760	8	48,290	30	30	30,400	2.0	32,430	1.0	180
Winneshiek	33	2,098,860	...	...	13	1,756,300	19	6,840	26	95,760	8	48,290	30	30	30,400	2.0	32,430	1.0	180
Worthington	32	1,137,440	...	...	13	104,220	13	10,530	30	222,360	9	2,250	11	45	65,250	2.0	20,890	1.5	22,780
Wright	35	1,801,000	...	...	12	1,385,040	15	2,620	24	30,120	8	12,680	8	40	33,300	2.0	33,520	1.5	15,600
Total for state	...	230,511,910	...	9,451,350	...	39,012,060	...	1,924,000	...	12,179,760	...	335,190	...	...	6,082,694	...	5,216,404	...	1,191,345
Average per acre	31	...	13.9	...	25.9	...	15.6	...	24.7	...	8.7	...	...	53.8	...	1.9	...	...	...

FLOODS, DROUGHTS AND PREDICTIONS OF DISASTER.

From the Iowa Monthly Review, May, 1903.

"Is America's Ruin Threatened by an Era of Floods?" Under this alarming headline the Chicago *Inter-Ocean*, of June 7th, published a half-page article written by John P. Brown, secretary of the International Society of Arboriculture, in which was uttered this solemn warning:

"Within twenty-five years these great inundations, which have been steadily increasing in number and violence for sixty years, will be general throughout the continent, and no section will be secure from periodical deluges; and within half a century the great agricultural regions of the continent will be sterile as the deserts of Arizona, or the plains of China." This most deplorable condition, Mr. Brown affirms, we are bringing upon ourselves by the rapid denudation of forest areas, stripping state after state of the fertilizing timber which for ages has chained the soil to the fields, fed the rivers with a steady flow and regulated the water supply.

This solemn warning is evidently uttered to promote the most excellent cause of arboriculture, by scaring people into good works in the line of tree planting. But the end to be attained, though good in itself, does not justify the questionable means employed in its promotion, such as dire prophecies of evil, and irrational arguments or assumptions. There are some most convincing reasons that may be urged in favor of conservation of our remaining forest areas, and in behalf of tree planting on some of the slopes, ridges and practically useless lands in these prairie states, but in this work the appeal must be made to intelligent people, who may not be moved by specious arguments and warnings of awful calamities to come. This pessimistic prophecy uttered by Mr. Brown appears very like the familiar scarecrow that was made to do duty in the same good cause during our recent antediluvian (before the flood) period of severe drought, the only difference observable being that the frightful figure is now toggled out in a rubber suit to withstand the latter day wet weather!

When the excessively wet period began, about a year ago, we found a measure of comfort amid our watery woes in the thought that we had secured a short season of rest from being worried by good people who persisted in warning us that the climate of this section is being ruined by drainage of wet lands and cutting timber, and that this region will become sterile from droughts of greater frequency and severity in future years; that we can only be saved from utter desiccation by planting trees and taking up our tile drains. But now comes Prophet Brown, with a new chapter of lamentations, and a fresh batch of predictions of woes to come in the form of floods only a little less in amount than the Noachian deluge.

There is a confusion of tongues among these two classes of prophets, but they all agree that there is no way of escape from the predicted disasters except to take to the woods. Plant trees to save from droughts and make increased rainfall; and to prevent damaging floods, plant more trees. The trees make more rain, and then perform a beneficent office, we are told, by preventing floods by holding back a big portion of the surplus waters. Mr. Brown says the forests regulate the water supply and feed the rivers with a steady flow.

Seriously now, while it is true that in time of excessive rainfall the forests help to retard the overflow of a portion of the surplus waters, yet this is only a half-truth that has been made to give currency to unsound theories. In matter of fact, the capacity of a forest bed to serve as a reservoir of surplus waters depends upon its character as to density, the kind of trees, and the location, whether on rocky hillsides and mountains or level lands in the valleys. Millions of acres of forests on the rocky hillsides possess no appreciable capacity to retain moisture beyond the actual necessity of the trees, and they only serve a mechanical purpose in preventing erosion of the slopes. There are millions of acres of slopes now subject to erosion that ought to be protected by trees, but that is far from allowing that such slopes would thereby prevent torrential rains or keep water from running down hill. The dense forests on level lands in the valleys do serve a beneficent end in retaining a portion of the surplus water, and in using a goodly portion of it in the growth of timber. In that respect there is but little to choose between a bottom land forest and a well drained and deeply tilled corn field on the same kind of soil, and the difference, if any, is on the side of the latter. That is to say, our best bottom land corn fields soak up and hold back from the streams more water than the average forest beds.

The floods and droughts of this abnormal season appear to have been sadly misplaced to serve as object lessons in support of Mr. Brown's theories and predictions. The early and later rains of nearly the whole continent were poured out upon the well-nigh treeless plains and valleys of the central west, producing disastrous floods, very nearly as heavy as those which visited this region fifty and sixty years ago. At the east from Ohio to Jersey and Maine, a very damaging drought held sway over a region including the Alleghany and Catskill mountains, the great Adirondack forest preserves, the Green and White mountains, and all the most heavily timbered regions of Maine, Ontario and New Brunswick. In large portions of the forests great destruction was caused by fires, and reports stated that even in some of the most dense forests the fires burned beneath the moss down to the roots of the greenest trees. In that time of greatest need the forests of that region did not "feed the rivers and regulate the water supply," nor did they have capacity to retain enough moisture to save the heaviest timber from destructive flames. In times of severe drought the trees consume for their own support the storage of moisture, and then the litter of the forest becomes dry as tinder, constituting an element of destruction instead of a source of water supply for streams.

So it appears that Mr. Brown's theory will scarcely hold water. He affirmed that great inundations have been steadily increasing in frequency and volume for the past sixty years, but refrained from offering evidence to sustain the statement. As a matter of fact, the flood of 1844 at St. Louis

scored high water records that have not been reached since that time. In the Des Moines valley the volume of the flood in 1851 was the greatest ever known. And in that early period the cutting of the forests at the head waters of the Mississippi had not progressed very far. It would be an easier task to prove the reverse of Mr. Brown's assertion. Not only in the treeless central valleys, but also in the most heavily timbered regions of the south and east, the student may notice the erosive effects of great floods, which came at frequent intervals in the centuries before the axe of a civilized man had cut a tree to build a cabin. There have been floods and floods all along down the ages of human history, and in the most distant ages the vast forests of all the continents did not avail much in averting great disasters by floods. Note the formation of the vast delta at the mouth of the Mississippi as proving the occurrence of great inundations for unknown centuries.

While giving due credit to forests for their beneficent effects in the retention of a portion of excessive rainfall, we must also recognize the fact that the deeply tilled soils and subsoils of these western prairies perform the same good office in a larger measure, because they possess greater storage capacity than the average forest areas. In this section the floods have never invaded the valleys to any considerable extent until the deep soil, subsoil and drift deposits had been filled down to the impervious bed rock. So it may be proven quite readily that the mulched and moss-carpeted forests of the rocky hillsides, mountains and valleys of the east do not possess nearly as much storage capacity for moisture as an equal area of well cultivated tile-drained farming lands in Iowa.

It is a subject of general remark by people from abroad, as well as residents of this section, that these well-tilled fields possess a marvelous quality for withstanding both droughts and floods, and the reason is obvious. The storage capacity of the soil and the immense deposits of humus afford a large measure of immunity from ill effects of droughts which would ruin the crops of the lighter soils of the east. With a fair supply of moisture at the outset of the season, it has been found possible in this state to grow and ripen a good crop of corn with less than one third of our normal rainfall for the crop season.

Prophet Brown, in attempting to sustain his prediction of disastrous floods that will ruin this treeless valley, says the excessive rainstorms that visit this section are caused by electrical disturbances, which are due to the absence of trees. Of this, he says, there is no doubt, and then hedges by saying: "To what extent this is true is not known." Exactly so; and because it is not known it is best not to indulge in dogmatic statements. We have been led to believe that the electrical disturbance in a storm is a result of rapid condensation of vapor and not the cause thereof; and that condensation of vapor into rain is due to dynamic cooling of the humid air. Mr. Brown's mistake is in confounding causes and effects, like the man who expressed wonder that electricity possesses the power to make the dynamos revolve so rapidly in the power plants at Niagara Falls.

Our prophet who warns us that this valley will soon be washed into sterility in consequence of its treeless condition, does not stop to consider the fact that this region has been treeless very many centuries, and that during this period the rich humus of the soil has been stored up for the support of millions. The process of growth and decay, with alternations of wet and

dry seasons, has been in operation for centuries, resulting in making a marvelously fertile plain, far away from the "fertilizing timber." And the fact that it was made rich under the same climatic and treeless conditions, gives us strong faith that it will retain its position as the granary of America for centuries to come.

Our faith in the substantial permanence of general climatic conditions in this valley is so strong that we unhesitatingly advise the farmers of Iowa to hold their farms as the richest legacies they can leave to their posterity for scores of generations. But if we gave credence to much of the talk of our over-zealous arboriculturists, we should exhort friends to get out and take to the woods, or climb a tree.

At the east the drought problem has been the foremost topic, while our people have been worried over the floods. And professional rainmakers exploited their theories while the drought was at its worst. The complex weather problems have been discussed at considerable length in the papers, but the sanest and most well considered article appeared in the editorial columns of the *New York Tribune*. Referring to proposed experiments in rain making the *Tribune* said:

"It is not at all strange that the people whose interests are affected by the present drought in Canada, New England and the Middle Atlantic states should jump at any chance to secure relief. Some of their projects are, however, unpromising. Scientific men long ago became convinced that the occasional association between bombardment and rain after a heavy battle was purely accidental. They think that the precipitation would have come anyhow, owing to other causes, and point to the fact that many engagements in which artillery was employed were not attended with the same consequences. After testing the theories of General Dyrenforth ten years ago, the United States weather bureau reached the conclusion that explosions in the upper air had no effect whatever. Overlooking these experiments and conclusions, perhaps, one of the *Tribune's* contemporaries in this city promoted a similar venture in 1900, but with absolutely no success. A lot of vine growers in southern Europe are resorting to practically the same means to break up hailstorms. Possibly they, too, will in time conclude that their procedure is foolish. At any rate, it is hardly logical to resort to bombardment both to induce and to stave off precipitation.

"A partial but convincing explanation of the present drought is furnished by the daily weather maps. Any one who possesses the most elementary knowledge of meteorology is aware that rain and snow occur in this country only in connection with the great barometric depressions, which move in a generally eastward direction across the continent. The area in which most precipitation is observed is not at the center, but in advance of it, say from two hundred to five hundred miles. The great majority of these depressions, when they come as far east as the Mississippi valley, follow the great lakes and St. Lawrence valley to the Atlantic. Since the middle of April, however, all storms which have entered the country have departed from that rule. Either they would move out to the southward—perhaps entering the Gulf of Mexico—or they would die out. In the latter case precipitation would cease with the rising of the barometer at the center of the 'low.' To all appearances this abnormal behavior was due to the singular obstinacy of

areas of high barometer which lingered over the lakes and blocked the path of the storms.

"Now, eccentricities of that sort are compensated by eccentricities of another kind in another part of the country or the hemisphere. While their cause is not fully understood, most meteorologists worthy of the name believe that both 'highs' and 'lows' are a product of the great currents which flow between equatorial and polar regions, and hence the general circulation of the atmosphere. Sooner or later nature herself, in some mysterious way, effects a readjustment in the distribution of pressure, as it appears on the weather maps. It may be asserted with perfect confidence, therefore, that such a change will occur in the route of rainstorms between the Mississippi and the Atlantic, though one cannot predict the exact time. Anybody can see, however, that the forces involved operate on a colossal scale. Possibly half of the globe will be affected in one way or another when a new chapter of meteorological history opens. To hope to hasten that transition by any means within the power of man, is the height of folly. One might with equal sanity expect to bail out the ocean with a thimble, or obliterate Pike's Peak with a firecracker!"