

MIGRATION OF BIRDS.

Geese flying southward.—Mobile, Alabama, 14th; Cairo, Illinois, 5th, 23d, 24th, 28th; Fort Madison, Iowa, 30th; Yates Centre, Kansas, 3d; New River Inlet, North Carolina, 2d; Point Judith, Rhode Island, 5th. *Flying northward.*—Red Bluff, California, 19th; Holton, Kansas, 29th; Leavenworth, Kansas, 13th; Portland, Oregon, 27th. *Flying eastward.*—Manhattan, Kansas, 5th. *Flying westward.*—Yates Centre, Kansas, 17th.

Ducks flying northward.—Sacramento, California, 13th, 15th to 18th; Cantonment, Indian Territory, 3d; Holton, Kansas, 29th; Indianola, Texas, 30th, 31st. *Flying southward.*—Mobile, Alabama, 4th.

Brents flying northward.—Indianola, Texas, 31st.

DROUGHT.

Red Bluff, California, 31st.—It is estimated that the recent rains benefited this county alone to the extent of more than \$500,000. Before the rains many farmers had stopped ploughing and seeding on account of the drought. Sheep raisers were compelled to kill the young lambs, there not being sufficient water for both the sheep and lambs. The late rains have insured good crops of grain and wool.

PRAIRIE AND FOREST FIRES.

Cantonment, Indian Territory, 13th.
Reno, Indian Territory, 13th.
Dodge City, Kansas, 13th.
Fort Stockton, Texas, 27th, 29th.
Indianola, Texas, 20th.

NOTES AND EXTRACTS.

Hon. A. J. McWhirter, Commissioner of Agriculture for Tennessee, and director of the weather service of that state, in his report for January, 1884, furnishes the following:

The following report is based on returns from forty-three (43) stations, distributed as follows: Twelve in the eastern, nineteen in the middle, and twelve in the western division.

The mean temperature for the month was 29°.45, 13°.42 below that for December, and several degrees below the January mean of many years past. Indeed, a generally lower temperature has not been recorded for the past twenty years. The lowest point recorded was 16° below zero, at Knoxville. As low as 14° below zero was reported from two other stations, the general minimum being from 5° to 10° below zero. The maximum temperature during the month was 74°, reported from Darnall, in Lake county. The range of temperature was 90°, the greatest during the year, and 24° greater than that for December.

The highest temperature was recorded about the 1st and 30th, and the lowest about the 5th, 6th, and 25th.

The mean depth of rainfall was 6.55 inches, 2.24 inches greater than that for December. This amount appears small when the number of rainy days and the depth of snow are considered. It is much smaller than the precipitation of January, 1882, which was almost unprecedented. The month was one of rain and snow, only four or five days being reported without rainfall in some parts of the state. The days on which rains were general were the 1st, 7th, 11th, 14th, 18th, 19th, 23d, 24th, and 31st. The heaviest rainfalls occurred on the 31st, 14th, and 24th, in the order named. The greatest precipitation was 14 inches, reported from McMinnville, and the least was only .80 of an inch, reported from Darnall. There may be some slight inaccuracies in the measurement of the fall of snow in some instances, on account of the want of proper care being taken in measuring the actual depth of the snow and in melting it. By reference to the "Instructions to Observers" it will be seen that no little care is required to make an accurate measurement.

The feature of the month was the unusual amount of snow-fall, the fall at some stations being as much as 22 inches. The first and heaviest fall of the month was in the early part—about the 5th-7th—and was accompanied by the abnormally low temperature. The average depth of the fall during the month was 11.71 inches, the greatest that has been recorded for many years.

The ground was frozen throughout the state on several days during the month. Special mention was made from Dyersburg on the 5th, 6th, and 7th, of 4 inches; at McKenzie, 14 inches on the 26th, at which time ice formed in the centre of oak trees sixteen inches in diameter; at Hurricane Switch, on the 3d to the 14th, inclusive; the 16th and 17th; the 19th to the 23d, inclusive; the 25th to the 29th, inclusive; at Howell, on the 7th, 4.50 inches; at Florence, Station, on the 6th, 4 inches; at Riddleton, on several days, the depth varying from 1.50 to 13 inches, the latter on the 6th; and at Grief, on the 5th and 6th.

A new table has been introduced in this report, and will be a feature in future reports, giving the daily rainfall at each station during the month;

also a table of the rainfall and temperature at the four principal stations in the state for the month of January for a number of years past. These tables will no doubt prove valuable for reference, and observers are specially requested to note carefully the days on which the rainfall occurs; also the exact amount of the fall each day.

The Commissioner is gratified to announce that, through the kind co-operation of Gen. W. B. Hazen, Chief Signal Officer, he has been able to procure a number of rain gauges to be distributed throughout the state, thereby securing in the future a more accurate estimate of the precipitation each month.

Average number of clear days, 5.4.

Average number of fair days, 7.

Average number of cloudy days, 18.6.

Average number of days on which rain or snow fell, 10.8.

Prevailing direction of wind, north.

The following extract is reprinted from the January report of the "Ohio Meteorological Bureau," Professor T. C. Mendenhall, director:

The meteorological conditions during the month were, on the whole, quite exceptional. The maximum barometric height was reached at Canton on the 26th, the record being 30.83 inches. This is the highest reading reported to the bureau since its organization. The range of the barometer was greater than for any month of the past year.

The precipitation was also considerably in excess of that of last year, much of it being in the shape of snow. In some portions of the state the depth of snow was unusual. In Marietta it was twenty-two inches, which is reported as being the deepest snow since the year 1818.

But the most remarkable feature of the weather of the month was the extremely low temperature which was reached on several days and at nearly all observing stations. The mean temperature for the month for the entire state was 19°.4, being nearly 5° lower than for January of last year. The maximum temperature observed, at Cincinnati on the 30th, was 59°.7, being only slightly less than the maximum for the same month of last year. The minimum temperatures recorded on several occasions were much lower than any of last year. There were three distinct and severe depressions of temperature during the month. The first began about the 3d and lasted four or five days. During at least two days of these every observer reported temperatures below zero. The greatest cold of this wave was on the 6th, the minimum observed at Wauseon being 24°.6 below zero; the mean minimum over the whole state was 15°.8 below zero. The second cold wave was of shorter duration, and showed its strength on the 21st. Although the depression was greater than in the first, this second wave was more limited in its area, being restricted in its severity to a belt running east and west through the central part of the state. The mean minimum was, therefore, not equal to that in the first case, being 11°.1 below zero. The lowest temperature observed was 31° below zero at the Ohio State University. The third wave began to be felt in the northern and western portions of the state on the 24th, and reached its greatest severity on the 25th at nearly all stations, but in one or two instances the minimum was not reached until the 26th. This was much the most remarkable depression of the month. The mean minimum was 19°.8 below zero; the lowest point was reached at Sidney. Some of the extreme temperatures reported on the 25th were as follows: Sidney, -34°; Ohio State University, -32°; Wauseon, -31°.7; Junction, -30°.5; Levering, -29°.2; Logan, -29°; Westerville, -28°. It is believed that these temperatures are entirely unprecedented in the history of this state, there being no meteorological records known to the writer which show such extreme cold in Ohio. Mr. Mikesell, who has observed for many years at Wauseon, which easily ranks as the coldest station in the state, reports that the lowest temperature ever known there previous to that of the 25th was 29°.2 below zero, observed January 29, 1873.

SUMMARY OF REPORTS FOR THE STATE.

Mean, barometer 30.20; highest barometer, 30.83, on the 26th, at Canton; lowest barometer, 29.48, on the 2d, at Wauseon; range of barometer, 1.35.

Mean relative humidity, 82.6 per cent.

Mean temperature, 19°.4; highest temperature, 59°.7, on the 30th, at Cincinnati; lowest temperature, -34°.0, on the 25th, at Sidney; range of temperature, 93°.7; mean daily range of temperature, 18°.9; greatest daily range of temperature, 48°, on the 25th, at Sidney; least daily range of temperature, 2°.1, on the 1st, at Cincinnati.

Average number of clear days, 6.4; fair days, 8.2; cloudy days, 16.4; days on which rain fell, 14.

Mean monthly rainfall for the state, 2.72 inches; average daily rainfall, 0.09 inch; greatest monthly rainfall, 5.61 inches, at Marietta; least monthly rainfall, 1.39 inches, at Junction.

Prevailing direction of the wind, southwest.

The above summary is compiled from the reports of observations made at twenty-seven stations.

Mr. S. R. Thompson, director of the "Nebraska Weather Service," furnishes the following report, based upon reports from thirty-two stations:

BULLETIN FOR JANUARY, 1884.

Rainfall.—The average by sections was as follows: Southeast, 0.64 inch; northeast, 0.88 inch; southwest, 1.22 inches; northwest, 0.38 inch.

Temperature.—The mean temperature of the air was 18°. The average of all noon observations was 25°.4.

The mean temperature and average precipitation for the state was about the normal for January.

The following extract is taken from the San Francisco "Daily Alta Californian," of January 16, 1884, preceding the heavy rains which fell during the latter part of the month in California:

* * * * *

These halcyon days which have greeted us week after week thus far, since the beginning of the so-called rainy months—this continuous period of sunshine, until now far into the middle of the "rainy season," hardly broken by a rainfall worthy of the name—brings us face to face with the question of what is in store for us for the year, whether it is to be one of drought, or otherwise.

Speculation upon this question can, of course, accomplish nothing in the adjustment and disposition of the elements, calculated to minister to and relieve our necessities. An analysis of the facts furnished by the history of the annual rainfall in the state since 1849 may, however, furnish a reasonable basis for conclusion as to what is in store for us during the current season of "seed-time and harvest," and prepare us for the possibilities, if not the probabilities, that we are to encounter.

The record of the annual rainfall at Sacramento since 1849 shows with painful exactitude that every sixth or seventh year thus far, in California, has been one of drought. An analysis of these six or seven-year periods shows likewise that the average rainfall in each period has been from 18 to 19 inches per annum. We purpose to carry this analysis a little further, in the full faith that it will prove interesting, if not instructive, reading.

Since 1849, and up to the close of December, 1883, the years in which the aggregate rainfall for the months of September, October, November, and December has been less than three inches, have been as follows:

Year.	Rainfall for Sept., Oct., Nov., and Dec.	Total for season.
1850.....	0.000	4.710
1854.....	2.810	18.620
1855.....	2.750	13.770
1862.....	2.687	11.579
1870.....	1.575	8.470
1876.....	1.506	16.772
1883.....	2.920	.....

Average rainfall per annum for each of these seasons, 12.32 inches.

The years in which the aggregate rainfall for the same months has been less than four inches were as follows:

Year.	Rainfall for Sept., Oct., Nov., and Dec.	Total for season.
1853.....	3.045	20.065
1856.....	3.242	10.443
1863.....	3.308	7.868
1865.....	3.351	17.924
1868.....	3.386	16.644
1876.....	3.640	9.325
1877.....	3.037	21.249

Average rainfall per annum for each of these seasons, 14.788 inches.

The years in which the aggregate rainfall for these same months was less than five inches were as follows:

Year.	Rainfall for Sept., Oct., Nov., and Dec.	Total for season.
1869.....	4.932	13.572
1879.....	4.043	18.511

Average rainfall per annum for these seasons, 16.041 inches.

The years in which the aggregate rainfall for these months was less than six inches were as follows:

Year.	Rainfall for Sept., Oct., Nov., and Dec.	Total for season.
1860.....	5.540	15.548
1881.....	5.773	16.280

Average per annum for these seasons, 15.914 inches.

The years in which the aggregate rainfall for these months was over seven and less than eight inches were as follows:

Year.	Rainfall for Sept., Oct., Nov., and Dec.	Total for season.
1858.....	7.486	16.041
1872.....	7.530	14.208
1882.....	7.580	18.300

Average per annum for these seasons, 16.183 inches.

We have seen that the average rainfall per annum for the six and seven-year periods between and including the years of drought has been 18 and 19 inches. From the foregoing analysis it appears that in order to reach this average—if the record of preceding years is of any value as precedent—it is necessary that there should be a rainfall in the months of September, October, November, and December of more than 8 inches. Further than this, in no season where the rainfall in these months has been less than 3 inches has the average for the season exceeded 12.32 inches. What, then, is the inference for 1883-4, when the rainfall has only reached 2.92 in September, October, November, and December? True, in 1853-4, when the rainfall in these months was but 2.81 inches, the aggregate for the season was 18.62 inches. This, however, was the only exception to the rule. And, while the present season may also prove an exception, and abundant rains may still come to bless us, yet the other unpleasant fact remains that this is the seventh season since the last one of drought, and if it should prove fairly up to the average it would be the first break in the regular periodicity of drought since 1849.

INDIANA WEATHER SERVICE.

Monthly summary of meteorological observations for January, 1884, made at Purdue University, La Fayette, Indiana; also a review of the State Volunteer Weather Service, compiled from the reports from thirty-two stations, by W. H. Ragan, director.

Latitude 40° 27' north, longitude 9° 54' west of Washington; altitude above sea-level, 661 feet.

	Day of month.	At Purdue University.	Day of month.	In the state.
<i>Barometer—inches.</i>				
Maximum height.....	26	30.70	26	30.79
Minimum height.....	13	29.67	13	29.54
Mean height.....		30.20		30.07
Monthly range.....		1.03		1.25
<i>Thermometer—degrees.</i>				
Maximum height.....	30	56.0	31	62.0
Minimum height.....	24	-28.0	5	-28.0
Greatest daily range.....		32.0	25	37.0
Least daily range.....	28	5.0	1	0.0
Mean of warmest day.....		42.5		48.4
Mean of coldest day.....		-18.0		-16.7
Monthly range.....		84.0		90.0
Monthly mean.....		17.6		20.0
<i>Precipitation—inches.</i>				
Greatest on any day.....	2	0.50	10	1.80
Maximum.....		1.09		3.13
Minimum.....				0.61
Mean.....				1.68
<i>Wind—miles travelled.</i>				
Maximum velocity.....	2	33		
Mean hourly velocity.....		12		
Total miles for month.....		8,845		

Comments.—The average temperature for January for five years, as recorded at this office, is 25°.1, while the average at Indianapolis for thirteen years is 29°.5. The average temperature of January, 1884, at Purdue University is, therefore, 7°.5 below the average of five years, and for the state, 9°.5 below the Indianapolis average for thirteen years. The following temperatures for January, for five years, as recorded at this office will be of interest in this connection:

Year.	Highest.	Lowest.	Average.	Range.
1880.....	68.0	16.0	41.3	52.0
1881.....	39.0	-15.0	19.1	54.0
1882.....	59.0	1.0	27.9	58.0
1883.....	42.0	-15.0	19.6	57.0
1884.....	56.0	-28.0	17.6	84.0

From the above it will be seen that in two of the years named the temperature did not fall to zero. In 1881 it was below zero on seven different days during the month. In 1883 it was below zero on five days, and in 1884 it was below on eleven days, viz: 3d, 4th, 5th, 6th, 7th, 9th, 16th, 20th, 21st, 24th, and 25th.

The highest temperature (62°) reported for the state is from Crawford county; also the greatest daily range.

The lowest temperature is reported from Tippecanoe county. The coldest day (-21°) from Putnam county. The warmest day (52°.2) is reported from Spencer county. The least daily range of temperature is reported from Wayne and Switzerland counties. The highest barometer is reported from Vanderburg county; the lowest from Wabash county. The greatest precipitation is reported from Crawford county; the least from Lawrence county. The greatest aggregate depth of snow (18.5 inches) is reported from Warrick county; the least (7.5 inches) from Hamilton county. The average January precipitation at Indianapolis for thirteen years is 2.79 inches; for Purdue University for five years, 2.32 inches.

Average miles of wind recorded for January at Purdue University for five years, 7,356.

The report of the "Missouri Weather Service," as given below, is based upon observations made at twenty-nine stations:

January, 1884, has been unusually cold, with deficiency of precipitation. The average temperature was 22°.3 at the central station, which is 9°.1 below the normal January temperature for Saint Louis, as shown by Doctor Engelmann's series for forty-nine years. The average January temperature was, however, lower than in the past January in 1856, when it fell to 20°.2, and in 1857, when the mean was 19°.3. In 1875, also, it was 21°.3.

In the state the temperature has been, as is usual, much colder than in Saint Louis. The lowest means reported were 17°.1 at Lexington, 17°.6 at Boonville, 17°.8 at Sedalia, and 17°.9 at Oregon, the first three being in central Missouri and the last in the northwestern part of the state.

The lowest temperature recorded in Saint Louis was -23°.5, which is half a degree colder than the previously observed minimum, in January, 1873. In the state the temperature has fallen still lower. The lowest minimum reported was -33° at Sedalia; Warrensburg and Kirksville reporting -32°; Boonville and Harrisonville, -31°; Miami, -30°, and Savannah, -27°. The highest minimum temperatures reported were -16° at Cairo, Illinois; -23°.5 at Saint Louis, and -24°.2 at Keokuk, Iowa.

The following notes on the cold temperature of the 5th are given by the observers: Saint Charles—the 5th was the coldest ever observed here. Oregon—coldest since January 18, 1857, when the thermometer registered -30°. Louisiana—thermometer stood at -33° on the river bridge. Ironton—coldest weather yet observed here; thermometer read -23°; the coldest heretofore was -17°. Chamois—January, 1875, the thermometer read two degrees lower than in the present month. Clinton—at 7 o'clock, -32°. Steelville—on the 5th, -18°. The observer at O'Fallon reports that on January 29, 1873, the thermometer read -28°, and at Trenton, Saint Louis county, on January 1, 1864, his thermometer read -23°.

The sky glow before sunrise and after sunset has been visible during the month when the clouds did not prevent. The color, however, is somewhat less brilliant than in November and December. At several stations in Europe volcanic dust has been collected from the air identical with that thrown out at Krakatowa, so that the cause for the phenomenon seems to be conclusively settled.

The death of Dr. George Engelmann, which occurred on the 4th of February, is an event which we deplore in common with lovers of science in all lands. He had just entered upon the forty-ninth year of his meteorological observations, and his report for January of the present year was made out after all hope had been abandoned by his physicians. His greatest work was in the field of botany, and an important paper on this subject, upon which he labored until the very last, was not perhaps as fully completed as he desired. It was a worthy ending of a noble life. His report on the temperature of Saint Louis during forty-seven years is just issuing from the press, and will be forwarded to observers and exchanges of the service.

FRANCIS E. NIPHER, Director.

WASHINGTON UNIVERSITY, February 6, 1884.

WEATHER REPORT FOR JANUARY, 1884.

Prepared by Prof. F. H. SNOW, of University of Kansas, from observations taken at Lawrence.

In mean temperature only three Januarys in the past sixteen years have been colder than this (in 1873, 1875, and 1883). The minimum temperature of 21°.5 below zero, on the 5th, has been exceeded but once, on January 29, 1873, when the mercury reached 26° below zero. The low mean temperature of the 5th (12°.1 below zero) has also been exceeded but once, on January 28, 1873, when the mean was 14°.2 below zero. The remarkable red skies at sunrise and sunset were observed during the entire month, being nearly as brilliant on the 30th as on any day in November and December.

Mean temperature—20°.99, which is 5°.65 below the January average. The highest temperature was 57°, on the 29th; the lowest was 21°.5 below zero, on the 5th, giving a range of 78°.5. The mercury fell below zero on seven days. Mean temperature at 7 a. m., 14°.09; at 2 p. m., 27°; at 9 p. m., 21°.39.

Rainfall—(consisting of melted snow) 1.28 inches, which is 0.08 inch above the January average. There was no rain. Snow fell on seven days. The entire depth of snow was 12 inches, none of which remained on the ground at the end of the month.

Mean cloudiness—41.42 per cent. of the sky, the month being 1.46 per cent. clearer than usual. Number of clear days (less than one-third cloudy), 16; half-clear (from one to two-thirds cloudy), 7; cloudy (more than two-thirds), 8. There were 7 entirely clear days, and 4 entirely cloudy. Mean cloudiness at 7 a. m., 45.87 per cent.; at 2 p. m., 42.90 per cent.; at 9 p. m., 35.48 per cent.

Wind—southwest, 30 times; northeast, 24 times; northwest, 18 times; west, 11 times; north, 5 times; southeast, 3 times; east, twice. The total run of the wind was 14,368 miles, which is the highest January total upon our record, and is 2,957 miles above the January average. This gives a mean daily velocity of 463.48 miles and a mean hourly velocity of 19.31 miles. The highest velocity was 50 miles an hour, on the 10th.

Barometer—mean for month, 29.313 inches; at 7 a. m., 29.333 inches; at 2 p. m., 29.295 inches; at 9 p. m., 29.311 inches; maximum, 29.881 inches, on the 4th; minimum, 28.735 inches, on the 9th; monthly range, 1.146 inches.

Relative humidity—mean for month, 73.9; at 7 a. m., 85.3; at 2 p. m., 56.7; at 9 p. m., 79.8; greatest, 100, on sixteen occasions; least, 32, on the 13th. There were three fogs.

The following table furnishes a comparison with the sixteen preceding years:

January.	Mean temperature.	Maximum temperature.	Minimum temperature.	Winter days.	Zero days.	Rain (inches).	Snow (inches).	Rainy days.	Thunder-storms.	Mean cloudiness.	Humidity.	Number of fogs.	Miles of wind.	Mean barometer.	Maximum barometer.	Minimum barometer.
1868	23.97	64.0	-7.0	23	2	0.36	5.00	1	0	37.00	0	0	.....	.....	.....	.....
1869	30.50	59.0	0.0	18	0	2.90	4.00	6	0	43.97	83.7	1	.....	29.101	29.390	28.616
1870	29.43	59.5	-1.0	20	1	0.67	3.00	6	0	49.25	74.2	1	.....	29.158	29.764	28.191
1871	28.86	67.5	-5.0	18	3	1.11	11.00	8	0	64.00	75.7	2	.....	29.199	29.726	28.665
1872	24.35	59.5	-7.5	22	4	0.17	1.00	1	0	42.66	68.3	1	.....	29.238	29.697	28.810
1873	18.61	46.5	-20.0	24	7	2.06	16.00	9	0	47.10	75.5	1	10,933	29.117	29.704	28.627
1874	28.01	61.0	-2.5	18	1	2.35	7.50	8	0	53.65	73.0	0	13,203	29.184	29.845	28.427
1875	15.60	46.0	-10.5	30	10	0.12	0.00	8	0	54.81	63.1	0	10,679	29.303	29.856	28.793
1876	34.70	65.5	-2.0	13	0	0.57	0.00	6	0	42.17	68.4	1	14,135	29.176	29.665	29.527
1877	25.60	62.5	-9.0	25	3	1.17	8.00	8	0	48.82	75.5	1	9,178	29.255	29.751	28.563
1878	33.97	55.0	-7.5	9	0	3.05	0.00	8	1	46.77	73.4	0	9,966	29.144	29.618	28.835
1879	23.49	53.0	-16.0	20	6	0.37	0.80	4	0	43.98	70.0	1	8,309	29.253	29.745	28.752
1880	41.23	67.0	-20.5	4	0	1.50	0.00	3	0	48.49	73.8	9	12,861	29.094	29.631	28.604
1881	21.60	53.0	-8.0	20	4	0.34	0.50	6	0	58.60	75.9	1	12,192	29.255	29.722	28.713
1882	32.68	65.0	-5.0	12	0	0.70	2.00	6	0	51.72	66.2	1	11,673	29.200	29.768	28.709
1883	19.65	47.0	-14.0	28	5	0.73	5.50	7	0	53.55	79.1	1	12,526	29.253	29.741	28.526
1884	20.99	57.0	-21.5	21	7	1.28	12.00	7	0	41.42	73.9	3	14,368	29.313	29.881	28.735
Mean.....	26.64	57.2	-5.5	20	3	1.20	4.50	6	.06	42.88	74.7	2	11,669	29.202	29.719	28.631

In the column of minimum temperatures a dash indicates temperature below zero. In the column of winter days is given the number of days whose mean temperature was below 38°.

