IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

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Secretary of Agriculture

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IOWA MONTHLY WEATHER SUMMARY – DECEMBER 2021

General Summary: Temperatures averaged 31.9 degrees or 6.9 degrees above normal, ranking as the 13th warmest December on record. Precipitation averaged 0.82 inch or 0.55 inch less than normal, ranking it as the 47th driest. A warmer December occurred in 2015 while a drier one was last recorded in 2017.

Temperatures: December was an anomalously warm month with positive departures ranging from five to eight degrees statewide; southern Iowa reported the warmest conditions. Nearly 100 National Weather Service (NWS) co-op stations tied or broke their December record highs on December 15th in advance of a potent low pressure system advancing towards Iowa from Colorado.

December's statewide average maximum temperature was 41.9 degrees, 8.7 degrees above normal while the average minimum temperature was 21.9 degrees, 5.2 degrees above normal. Several stations reported the month's high temperature of 75 degrees on the 15th, on average 39 degrees above normal. This reading also breaks the December record high temperature of 74 degrees that was observed at Thurman (Fremont County) on December 6, 1939. Postville (Allamakee County) reported the month's low temperature of -8 degrees on the 29th, 18 degrees below normal.

Heating Degree Day Totals: Home heating requirements, as estimated by heating degree day totals, averaged 13% less than last December and 17% less than normal. Thus far this heating season, heating degree day totals are running 15% less than last year at this time and 18% less than normal.

Precipitation: With the exception of stations in extreme northwest and eastern Iowa, below-average precipitation was reported over a majority of Iowa. Precipitation deficits of over an inch were observed in west-central and southern Iowa while lesser totals were reported farther north.

The first winter storm of the season moved through the northwestern two-thirds of Iowa on the 10th and 11th. Heavier snow, on the order of four to eight inches, fell across northwestern Iowa with amounts tapering off farther southeast. Larchwood (Lyon County) measured 8.3 inches with central and eastern stations reporting a dusting. A mix of rain, freezing rain and snow fell along the system's southerly track with a gauge near Camanche (Clinton County) reporting 2.02 inches of rain.

A spring-like low pressure system brought a line of severe thunderstorms through Iowa on the 15th. The line was relatively narrow but packed a punch as it raced northeast at over 70 mph [see the "Severe Weather" section below for detailed analysis]. Heavier rain fell over Iowa's northwest corner as well as in central Iowa. Larchwood observed 0.97 inch of rainfall while Adel (Dallas County) measured 0.78 inch. Most NWS co-op stations and Community Collaborative Rain, Hail and Snow (CoCoRaHS) gauges reported measurable totals with the statewide average rainfall at 0.22 inch.

December's second and final winter system to impact Iowa moved through the state's northwest one-third on the 28th, leaving behind snow totals in the four to five-inch range; a CoCoRaHS observer in Decorah (Winneshiek County) observed 5.2 inches. Rain and freezing rain fell over southern Iowa where temperatures remained above freezing. Liquid totals were generally a few tenths of inch or less with Muscatine (Muscatine County) reporting 0.53 inch.

Monthly precipitation totals ranged from 0.10 inch in Pacific Junction (Mills County) to 2.78 inches at a rain gauge in Camanche. The statewide average snowfall was 2.0 inches, which is 5.9 inches below normal.

US Drought Monitor: Drought and abnormally dry conditions remained largely unchanged through the month. As of the beginning of December, the categorical breakdown of abnormally dry (D0) to moderate drought (D1) conditions covered 51% of Iowa; moderate drought covered 13% of north-central and eastern Iowa. While December is the second driest month of the year for Iowa, precipitation across the state was below average at nearly all of the NWS co-op stations. Even with these below-average totals, top and sub-soil profiles did not drop below 32 degrees until the end of the month. Hence, much of the rain that did fall was able to infiltrate into soil profiles, holding conditions status quo. As of the first week of January, portions of eastern Iowa saw a one-category improvement with D1 conditions decreasing by one percent, where a heavier snowpack was present after a New Year's Day winter storm.

Severe Weather: Unseasonably warm and record setting air and dewpoint temperatures produced unstable conditions in advance of a potent Colorado low pressure system on December 15th. Temperatures across the state were 30 to 40 degrees above average, creating an explosive spring-like thunderstorm environment. Coupled with very strong gradient winds that produced southwesterly flow in the 40 to 50 mph range, a squall line developed in eastern Nebraska and propagated into Iowa during the late afternoon and evening hours. This squall line was classified as a Quasi-Linear Convective System (QLCS) and had unique features known as Line Echo Wave Patterns (LEWPS); these structures produce bows or divots along the length of the QLCS line and are associated with strong to severe thunderstorms embedded within. These bow echo features, combined with strong ambient flow, produced multiple tornadoes across the northwestern half of Iowa. Non-tornadic wind gusts associated with these thunderstorms were in excess of 80 mph with 88 mph observed in Audubon (Audubon County). After the QLCS line passed through Iowa, strong gradient winds approaching 70 mph formed on the backside of the low pressure system. The highest non-thunderstorm wind gusts were reported at Decatur City (Decatur County; 83 mph), Marshalltown (Marshall County; 81 mph) and Johnston (Polk County; 80 mph).

The preliminary tornado count as of January 7th, 2022 for this event stands at 61, breaking Iowa's all-time highest tornado outbreak that occurred on August 31st, 2014; 35 tornadoes were reported in that event. Twenty-one of the tornadoes were rated EF-2 with peak winds between 111-135 mph. The multi-state tornado outbreak is the highest December outbreak in recorded history as well. Given the path length of the QLCS system and with wind gusts of 55 mph or greater along a majority of the system path, the December 15th event is classified as serial derecho; the first of which to ever occur in December. A serial derecho typically occurs in conjunction with a strong and well-organized low pressure system. This derecho differs from the August 10, 2020, Midwest derecho – the costliest thunderstorm in United States history – which was a "progressive" derecho. Progressive derechos are dominated by self-sustaining thunderstorms that produce downbursts/microbursts and travel along a generally west-to-east-oriented surface boundary with strong, unidirectional steering winds. These derechos have a smaller footprint, longer path length and typically occur in the summer. Serial derechos have a larger footprint and smaller pathlength. Overall, the 55+ mph wind gust count from the serial derecho outnumber those from the August 10 progressive derecho, however, the progressive derecho produced widespread and catastrophic damage.

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December 2021

WEATHER BY DISTRICTS

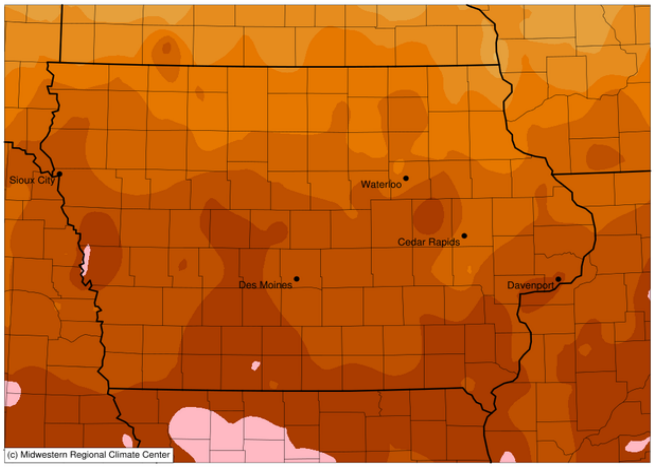
DISTRICT	TEMPERATURE (F)		HEATING DEGREE DAYS				PRECIPITATION (inches)				
	December 2021		December 2021		Since Jul., 1, 2021		December 2021		Since Jan.1, 2021		SNOWFALL Dec 2021
	Average	Departure*	Average	Departure*	Average	Departure*	Average	Departure*	Average	Departure*	Average
Northwest	28.0	+6.1	1147	-188	2453	-479	0.80	-0.19	28.09	-2.65	4.6
North Central	28.1	+6.0	1144	-184	2464	-464	0.93	-0.34	29.88	-5.33	4.3
Northeast	29.2	+6.0	1110	-185	2411	-455	1.25	-0.29	30.71	-7.29	3.8
West Central	32.2	+7.5	1017	-232	2187	-508	0.40	-0.76	29.28	-3.86	1.6
Central	32.2	+7.1	1017	-221	2172	-489	0.80	-0.56	28.19	-7.85	1.2
East Central	32.7	+6.6	1001	-206	2135	-441	1.40	-0.30	29.65	-7.91	2.4
Southwest	35.4	+8.0	918	-248	1972	-501	0.36	-0.94	32.97	-2.52	0.3
South Central	35.5	+7.6	914	-237	1973	-469	0.53	-0.90	36.56	-0.55	0.3
Southeast	35.9	+7.5	902	-233	1932	-449	0.83	-0.84	37.07	-0.78	0.2
STATE	31.9	+6.9	1020	-213	2187	-470	0.82	-0.55	31.06	-4.49	2.1

* Departures are computed from 1991-2020 normals.

The weather data in this report are based upon information collected by the U. S. Dept. of Commerce, NOAA National Weather Service.

Average Temperature (°F): Departure from 1991-2020 Normals

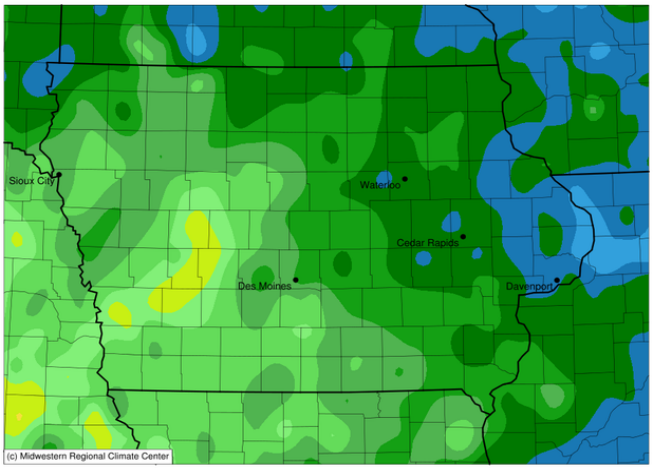
December 01, 2021 to December 31, 2021



Stations from the following networks used: WBAN, COOP, FAA, GHCN, ThreadEx, CoCoRaHS, WMO, ICAO, NWSLI,
Midwestern Regional Climate Center
cli-MATE: MRCC Application Tools Environment
Generated at: 1/10/2022 12:32:00 AM CST

Accumulated Precipitation (in)

December 01, 2021 to December 31, 2021



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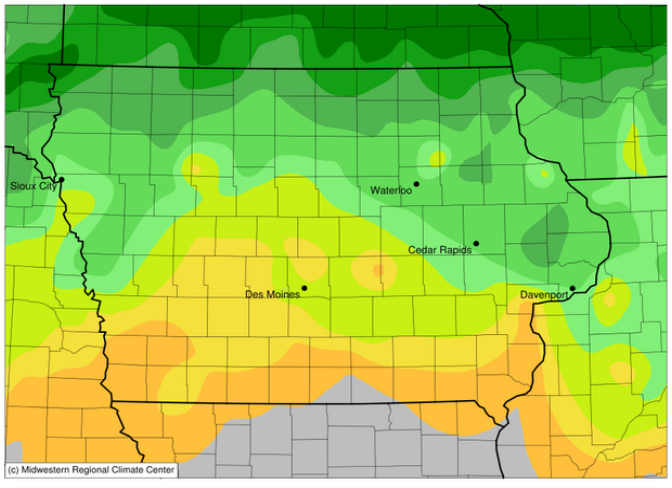
Midwestern Regional Climate Center
cli-MATE: MRCC Application Tools Environment
Generated at: 1/10/2022 12:32:50 AM CST

Accumulated Snowfall (in)

December 01, 2021 to December 31, 2021



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