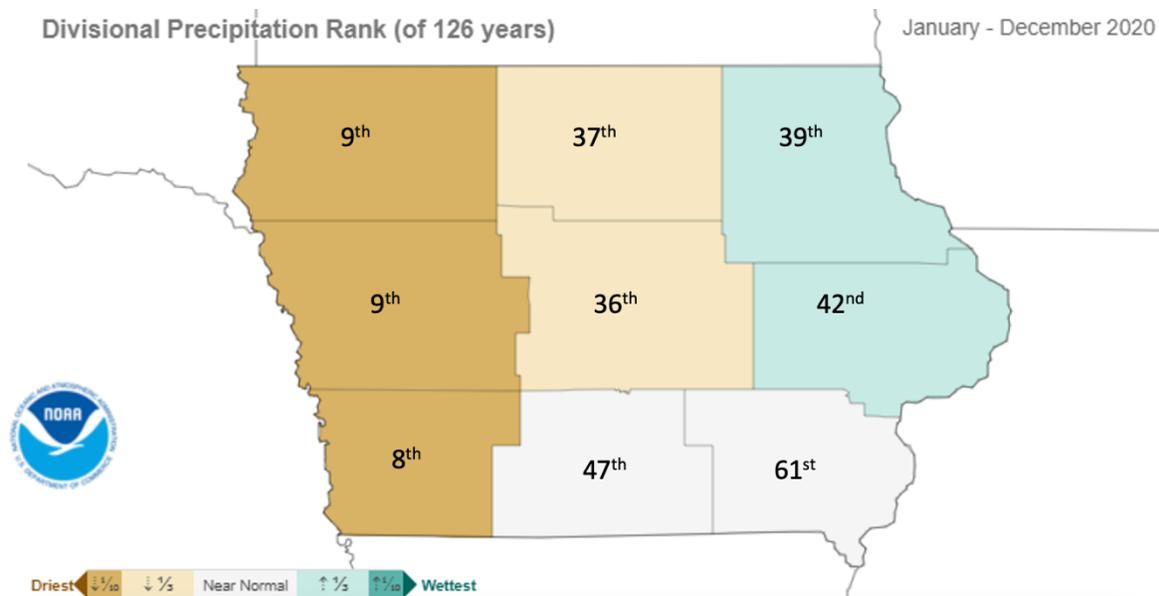
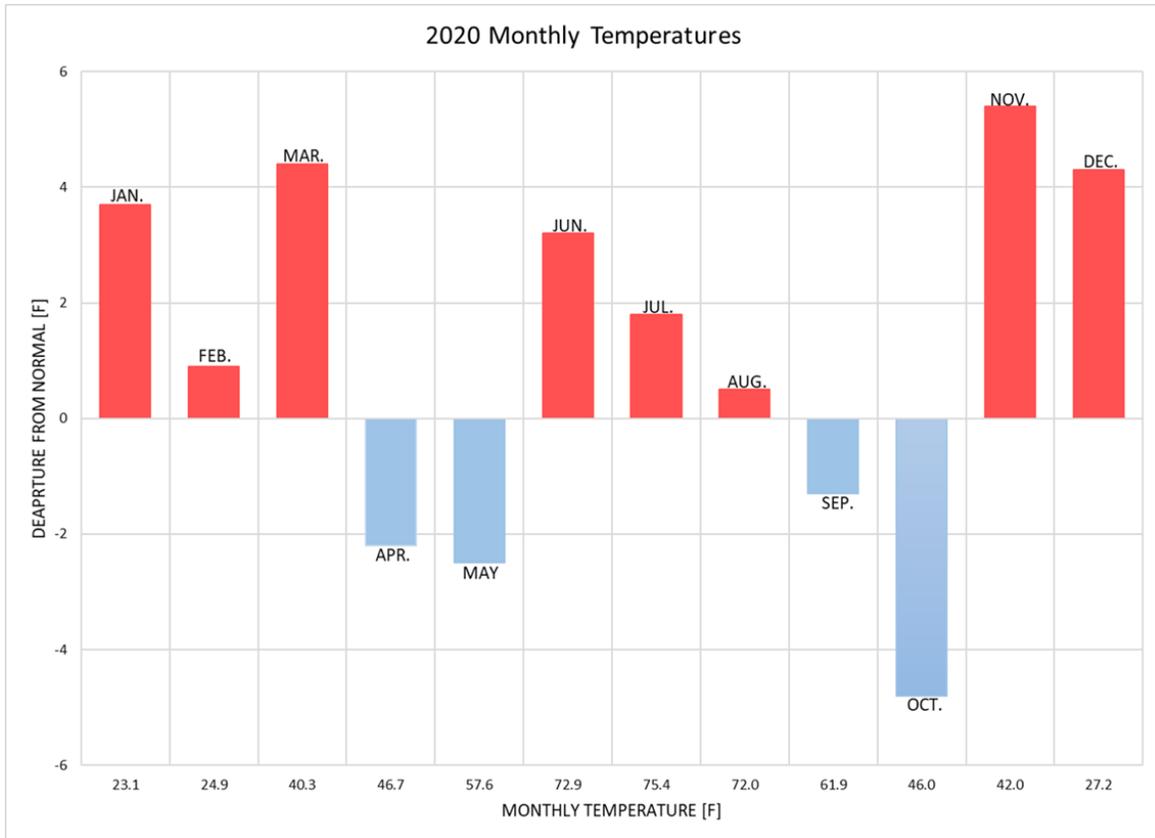


IOWA ANNUAL WEATHER SUMMARY – 2020

General Summary: In 2020, Iowa temperatures averaged 49.2 degrees or 1.1 degrees above normal tying 1908, 1928, 1944, 1977 and 2015 as the 33rd warmest year in 148 years of statewide records. A warmer year was last reported in 2017. In terms of precipitation, Iowa experienced its 36th driest year on record with a statewide average precipitation accumulation of 28.92 inches, 6.18 inches below normal. A drier year last occurred in 2012. In 2020, precipitation was below normal for eight of the 12 months of the year and was significantly below normal during the summer months of July and August. Additionally, in 2020 the distribution of precipitation was not uniform across Iowa. The western one-third of the state saw much below normal precipitation, with the northwest, west-central and southwest climate divisions experiencing the top ten driest years going back to 1895. This stands in contrast to eastern Iowa, where conditions were wetter than normal.



Temperature: Iowa experienced eight months in which the monthly statewide average temperature was above the 30-year climatological normal; only April, May, September and October were below average. Months of note are October with an average temperature of 46.0 degrees, 4.6 degrees below average and ranking as the 6th coldest on record. November's average temperature was 42.1 degrees or 5.5 degrees warmer than normal ranking as the 10th warmest on record.



Seasonally, temperatures for the three spring months of March, April and May averaged 48.3 degrees, which is equal to the 30-year climatological normal, tying 1914; this ranks spring as 68th warmest spring on record. Over the summer months of June, July and August, the average temperature was 73.4 degrees or 1.8 degrees above normal making Summer 2020 the 31st warmest in 148 years of observations. Fall 2020 ties 1974, 1986 and 1988 as the 51st coldest.

In terms of temperature extremes, the warmest daytime high temperature of 2020 was 100 degrees reported on June 2nd in Le Mars (Plymouth County), Sioux Center (Sioux County) and Spencer Municipal Airport (Clay County); Sioux Center also observed this temperature on June 7th as well as Lake Park (Dickinson County) on August 24th. The coldest overnight low temperature was -28 degrees at Cresco (Howard County) on February 20th. Fall 2020 was just slightly below average with the three autumn months of September, October and November averaging just 0.2 degrees below normal at 50.0 degrees.

2020 Statewide Monthly Temperature Extremes							Statewide Monthly Rank*	
Month	Max. Temp.	Day	Location	Min. Temp.	Day	Location	Temperature	Precipitation
January	63	9th	Bloomfield Centerville	-17	22nd	Rockwell City	38th warmest	37th wettest
February	64	23rd	Multiple southern stations	-28	20th	Cresco 1 NE	54th warmest	13th driest
March	77	28th	Bloomfield Centerville	2	1st	Fayette	20th warmest	29th wettest
April	87	7th	Red Oak Shenandoah	9	15th	Estherville 4E	40th coldest	17th driest
May	90	1st	Battle Creek Sioux Center	21	9th	Elkader Stanley	34th coldest	57th wettest
June	100	2nd 2nd,7th 2nd	Le Mars Sioux Center 2SE Spencer A.P.	44	1st	Fayette	18th warmest	66th wettest
July	98	18th	Little Sioux 2NW	44	16th	Mason City A.P.	47th warmest	41st driest
August	100	24th	Lake Park	43	4th	Mason City A.P.	72nd warmest	3rd driest
September	96	6th	Spencer A.P.	35	18th	Mason City A.P.	39th coldest	55th wettest
October	88	9th	Ames A.P. Red Oak Shenandoah	5	27th	Estherville A.P.	6th coldest	48th driest
November	81	3rd	Shenandoah	2	13th	Estherville A.P.	10th warmest	48th wettest
December	66	10th	Centerville Lamoni	-7	25th	Mason City A.P. Northwood Pocahontas	48th warmest	54th driest

Precipitation: The year started slightly wetter than normal as above average snowfall blanketed much of Iowa; it was the 20th snowiest January in 134 years of snowfall observations. In February, almost all of Iowa's reporting stations observed below-average precipitation with the largest negative departures of 1.00" to 1.40" across the state's southern quarter. Multiple National Weather Service coop stations reported their driest February on record. Wetter conditions returned to Iowa in March as a more active storm track brought multiple weather systems across the state. Almost all observing stations reported above-average precipitation with the largest positive departures of 2.00 to 2.50 inches at various locations across the state.

While measurable rain and snow fell across Iowa during April, a majority of the National Weather Service coop stations reported below-average precipitation totals. The driest part of the state was located across a band stretching from western Iowa into north-central Iowa, where precipitation deficits were between 2.50 – 3.00 inches. April 2020 was the 17th driest April on record. Pockets of above and below-average precipitation were reported across Iowa during May. Western Iowa experienced negative departures

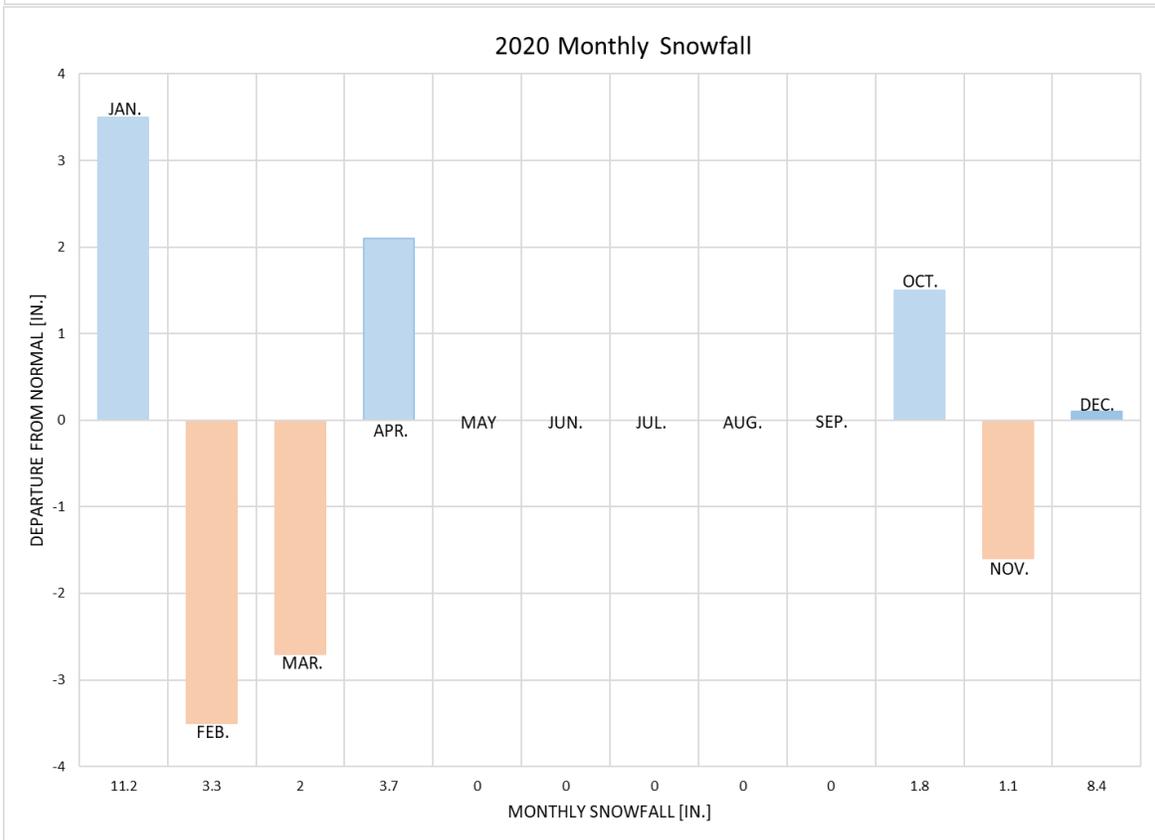
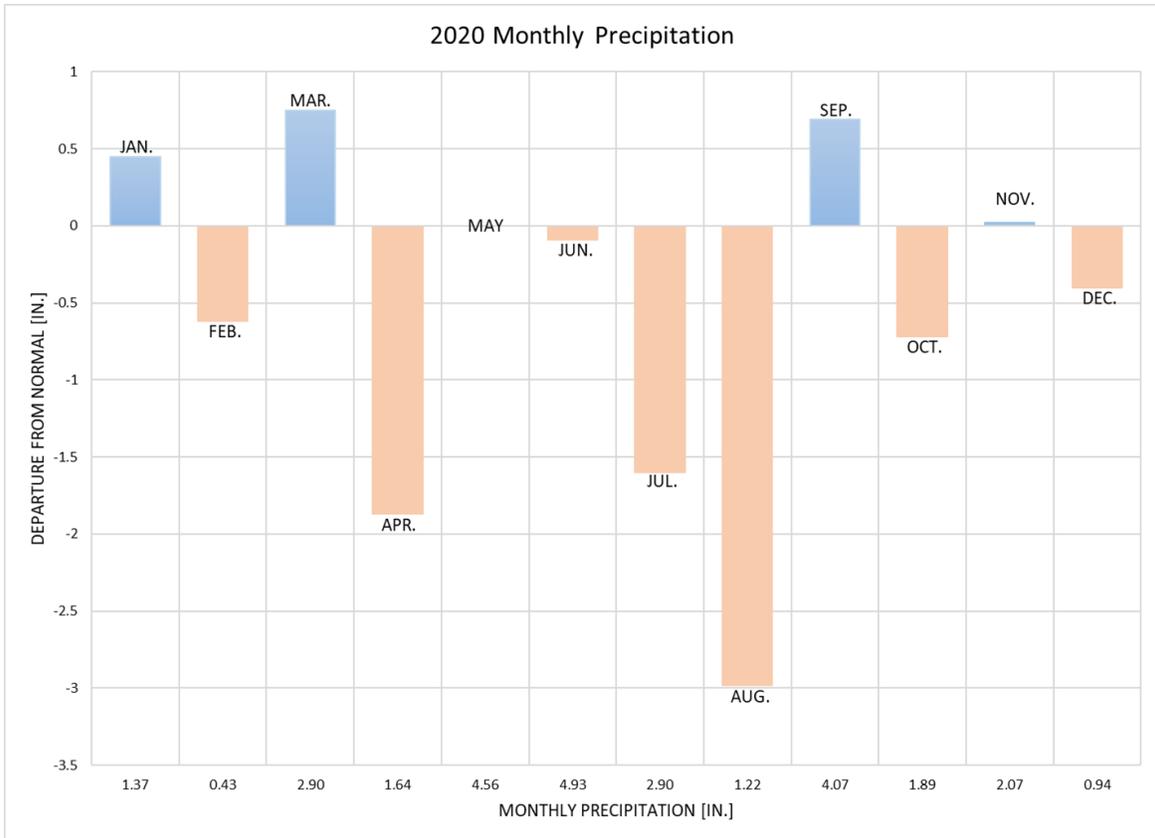
between 1.00" – 2.00" while other sections of the state reported above-average totals of similar magnitude. For the three meteorological spring months of March, April and May, precipitation totaled 8.72 inches or 1.5 inches below normal ranking as the 68th driest spring in 148 years of records with a drier spring last occurring in 2018.

In June, the statewide average precipitation was near normal, though there couldn't be a starker contrast between eastern and western Iowa. Much of Iowa's eastern half reported totals from 2.00 inches to 6.00 inches above average. On the other hand, western Iowa reported precipitation deficits of up to 4.00". On June 9th the remnants of Tropical Storm Cristobal, classified as a tropical depression, entered Iowa from northeastern Missouri. Cristobal became only the second tropical system on record to move through Iowa with the first occurrence happening on September 11, 1900. Unseasonably dry conditions persisted across most of Iowa during July. A good portion of the state reported precipitation departures on the order of two to four inches with only a small swath of southwestern and eastern Iowa reporting above-average rainfall. Dryness allowed drought conditions to advance across much of western Iowa.

Precipitation deficits of two to four inches were reported across much of Iowa during August leading to an intensification and expansion of drought. Some stations in southeastern Iowa observed deficits over four inches; August 2020 was the 3rd driest August on record as the statewide average precipitation was 3.05 inches below normal. With dryness persisting through meteorological summer, Iowa experienced the 17th driest summer on record as rainfall across the state was 4.74 inches below the normal of 8.97 inches.

In September, much of the eastern two-thirds of Iowa reported above-average precipitation totals with the highest amounts occurring in eastern Iowa; four to six inches of above-average rainfall were recorded across more than ten counties. On the other side of the state, precipitation deficits from one to two inches were found. Northwest Iowa observed the driest conditions of two or more inches below normal. Dry conditions persisted into October with precipitation deficits of one to two inches reported over much of Iowa. Wetter than average conditions were found across portions of eastern Iowa with over two inches or more in a few northeastern counties. Portions of Iowa experienced both wetter and drier than normal conditions in November. Precipitation deficits of up to 1.50 inches were reported in northeastern Iowa while above-normal totals on the same order were observed in southern Iowa; a band of positive departures was also observed from western Iowa through north-central Iowa. Precipitation over the three autumn months (September-October-November) averaged 7.80 inches or 0.23 inches below normal ranking as the 67th wettest fall on record.

Closing out 2020, Iowa's northern half experienced drier than normal conditions on the order of 0.50 inch to one inch in December; a few counties in northeast Iowa reported negative departures approaching 1.50 inches. Southern Iowa, in particular southeastern Iowa, observed above normal totals of similar magnitudes as multiple winter systems moved through Iowa leaving behind measurable snow statewide. Over the month, above-average snow totals accumulated from Omaha northeast through Dubuque; portions of central and eastern Iowa measured accumulations of four to six inches above average.



Severe Weather: Compared to Iowa's severe weather climatology, severe events were fewer than expected in 2020; the exception was the August 10th derecho, which will be summarized in detail later. The first severe weather event occurred on March 19th and was associated with a cold front moving through southern Iowa. Severe storms formed and quickly propagated to the east. There were several reports of severe hail across Montgomery and Page counties; Stanton (Montgomery County) reported a three-inch diameter hailstone. A second and more widespread event occurred during the afternoon and evening hours of March 28th. A warm front lifted north through southern Iowa, firing off discrete supercells. These thunderstorms produced multiple reports of weak tornadoes from Bridgewater (Adair County) and then later in the evening in the vicinity of Waterloo (Black Hawk County). Damage to a few machine sheds and barns was reported. An EF-1 tornado, the strongest of the day, occurred near Sherrill (Dubuque County). Additional damage to farm structures and uprooted trees was observed. A handful of hail and high wind events were also associated with the thunderstorms.

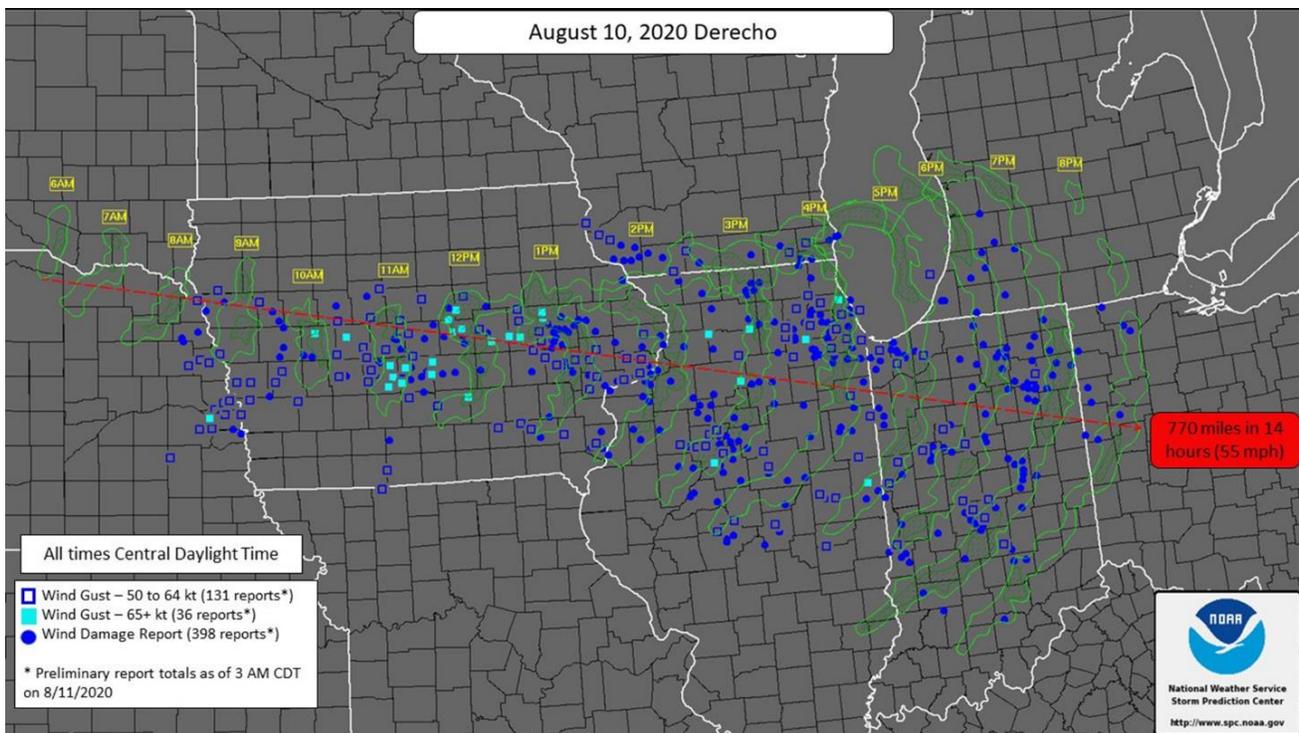
April was relatively quiet with only two days of storm reports from severe-warned thunderstorms. The first event occurred during the evening and nighttime hours of April 7th. Several discrete severe thunderstorms popped up in eastern Iowa leading to multiple reports of hail ranging in size from nickels to ping-pong balls; some vehicle damage was reported with many of the reports occurring across eight counties. A cold front swept through Iowa on the 8th producing a few severe thunderstorms that raced through southeastern Iowa during the late afternoon. Hail up to the size of golf balls was reported in Lowell (Henry County).

Severe weather was reported on five days during May with four of the five days occurring between May 22nd and the 26th. There were also preliminary reports of 13 weak tornadoes during May, four of which were rated at EF-1; climatologically, Iowa expects 12 tornadoes in May. The first severe weather event occurred on the 14th as a warm front lifted across southern Iowa overnight in advance of a strong low pressure center. This system forced showers and thunderstorms in southern Iowa. Additional storms, some strong to severe, formed during the evening hours across central Iowa with multiple reports of hail and straight-line winds; a 3.00-inch-sized hailstone was reported in New Virginia (Warren County). A slow-spinning low pressure system along the Kansas-Nebraska border pushed into Iowa during the late-night hours on the 22nd, bringing showers and thunderstorms through the 23rd. Some thunderstorms turned severe across eastern Iowa shortly after noon. A few weak tornadoes were reported, including one with an EF-1 rating in Morse (Johnson County), which caused some minor structural damage on a farm. Southerly flow brought waves of showers and thunderstorms through the day with isolated severe thunderstorms across central Iowa. Johnston (Polk County) reported a brief EF-1 tornado with an estimated peak wind speed of 95 mph.

June was a relatively calm month with only a handful of severe weather events. Thunderstorms began popping up across eastern Iowa during the afternoon on the 21st ahead of a strong disturbance that produced some severe thunderstorms across northern Iowa over the evening hours. There were several reports of one-inch hail and severe straight-line winds in excess of 60 mph; Sheldon (O'Brien County) reported a 62 mph wind gust. Further development occurred in the early morning hours as the complex over eastern Iowa consolidated, bringing locally heavy downpours and strong wind gusts. Balmy conditions on July 9th helped fire a line of severe thunderstorms through the evening hours, leading to a widespread severe wind event across northeastern Iowa. Heavy rain from the stronger storms was also

reported in northern and eastern Iowa. With warm and humid conditions in the state's eastern half, strong thunderstorms fired in the late afternoon of July 14 and sped east and southeast through the evening. Some storms in central Iowa turned severe with several reports of straight-line winds; widespread crop damage was observed around Sandyville (Marion County). There were also a few severe hail reports with two-inch diameter hail in Grimes (Polk County).

August 10, 2020 will go down as a significant weather date in state history. A derecho, which is a convectively (thunderstorm) initiated straight-line windstorm, propagated through Iowa's central west-to-east corridor. The term "derecho" was coined by Dr. Gustavus Hinrichs at the University of Iowa in the late 1800s and is derived from a Spanish word that can be interpreted as "direct" or "straight-ahead." Formed in the early morning hours in southeast South Dakota, the line of thunderstorms moved across the Nebraska border into Iowa where it significantly strengthened east of Carroll, Iowa (Carroll County), as downbursts formed. Downbursts are key for the formation of low-level, strong straight-line winds; moist air high up in a thunderstorm interacts with surrounding drier air, forcing atmospheric water vapor to evaporate fast. Rapid evaporation cools the air producing a relatively large volume of cold, dense air. These bubbles of dense air drop rapidly, hit the surface and spread out, creating straight-line winds that can produce widespread damage. As the derecho entered central Iowa, the center of the line pushed out creating a bow echo; this feature indicated rapid strengthening as downburst clusters became more numerous. The system expanded north and south as it moved through east-central Iowa where a broadening swath of damage was found in satellite images. The derecho held together for 770 miles and over 14 hours before losing strength as it entered western Ohio.



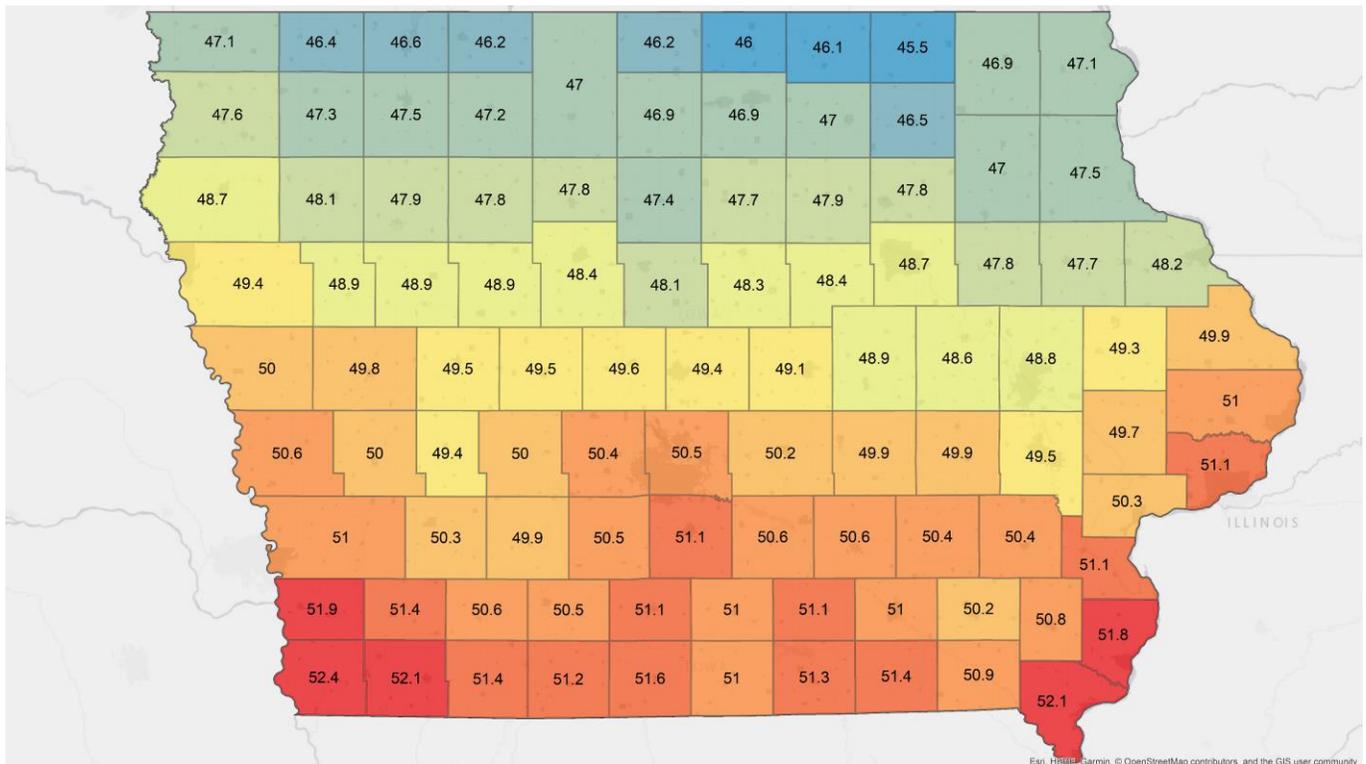
Damage to crops, grain bins and structures was catastrophic. The derecho also moved over the D3 (Extreme Drought) region in west-central Iowa, producing agricultural damage to already stressed corn and soybeans. USDA Risk Management Agency (RMA) data indicated that around 8.2 million acres of corn and 5.6 million acres of soybeans across 57 counties may have been impacted by the derecho. Urban areas from Des Moines (Polk County), Cedar Rapids (Linn County) and the Quad Cities reported substantial and long-lasting power outages along with severe damage to trees and structures from extremely strong, sustained winds. Recorded wind gusts along the derecho's path ranged from 58 mph to well over 100 mph; according to the National Weather Service, "maximum recorded wind speeds were around 110 mph over portions of Benton and Linn Counties in eastern Iowa." A personal weather station in Atkins (Benton County) reported a gust of 126 mph.

Drought Monitor: Iowa began 2020 free from drought and dryness. The first indication of dryness appeared in the US Drought Monitor (USDM) on May 12th. With precipitation deficits accumulating across western Iowa, around 18% of the state was classified as D0 or "Abnormally Dry" at the end of June. Moisture stress from abnormally dry conditions manifests as rolled corn leaves and flipped soybean leaves. In early July, Moderate Drought (D1) was introduced in eight west-central counties, centered on Greene County. Three counties in extreme northwest Iowa were also given the D1 designation; D0 conditions expanded northwest and southeast. As precipitation deficits continued to increase through the month, D1 conditions expanded north and west. Severe Drought (D2) conditions were introduced across nearly six percent of west-central Iowa on July 14th. This region expanded through the end of the month, where D1 to D2 conditions covered over 34% of the state. During the first week of August 11th counties in western Iowa were downgraded to Extreme Drought (D3); as timely rainfall had yet to materialize. This was the first D3 introduction since July 17, 2018. Abnormal dryness also pushed into wide swaths of northeastern Iowa. Drought conditions continue to expand from the west-central core in all directions. Overall, D0-D3 conditions cover 80% of the state, which is the widest expanse of abnormal dryness and drought since April 2014.

The first USDM depiction of meteorological fall was issued for the week of September 1st and showed that 99% of Iowa was in the D0-D3 category, the largest expanse since August 27th, 2013. Moderate to Severe Drought (D2-D3) conditions covered 37% of the state with D3 conditions over 15% of Iowa. By September 8, 2020, the state was experiencing the worst drought conditions of 2020, with almost 15 percent of the state designated as D3. By early October the D3 designation had shifted to northwest Iowa, where about four percent of the state remained in extreme drought heading into 2021. Drought conditions continued to cover western Iowa through November. The initial drought depiction for the month showed a large region of D2 covering 28% of western Iowa with a 4% region of D3 in the northwest corner. Overall, D0 to D3 covered 64% of Iowa. Though minor changes occurred during the month, the map remained generally status quo through much of the rest of November. Wetter conditions across southern and eastern Iowa led to the removal of a majority of the existing D0 region with only a small extent in extreme southeast Iowa remaining. As the year ended, drought and abnormally dry conditions remained across Iowa, though with no change in the D0-D3 boundaries through December. As of the final USDM release of 2020 D0-D3 conditions covered slightly over 62% of Iowa; the categorical breakdown was 26% D0, 19% D1, 13% D2 and 4% D3.

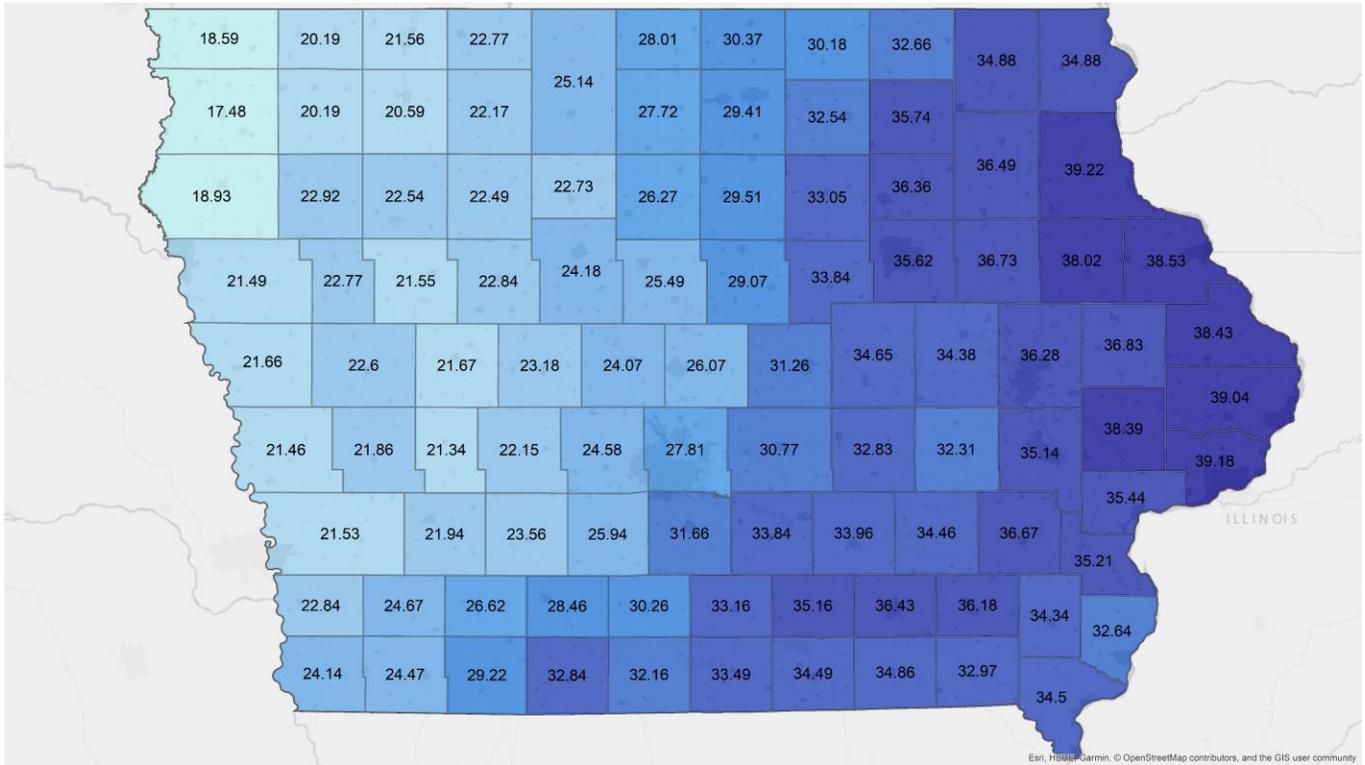
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2020 County-Level Average Temperatures (°F)



Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

2020 County-Level Average Precipitation (inches)



2020 County-Level Average Precipitation Departure (inches)

