



North Dakota Climate Bulletin

Summer 2023

Volume 17, No. 2

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Sciences

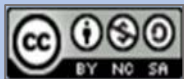
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From the office of the State Climatologist

The North Dakota Climate Bulletin is a quarterly publication of North Dakota's weather and climate from the North Dakota State Climate Office in the College of Natural Resource Sciences, North Dakota State University in Fargo, North Dakota.

The summer of 2023 was mild and dry across a majority of North Dakota. The average summer temperature June-August 2023 had a typical average temperature, less than 1°F warmer than normal (NDAWN), and ranks as the 23rd warmest summer on record (NCEI). June on its own ranked as the third warmest, followed by a relatively cool July. Statewide average precipitation was less than normal by 2.23 inches, making it the 41st driest summer in North Dakota (NCEI). Over the course of these three months, total statewide average precipitation was around 6.3 inches (NDAWN). June started off with a majority of North Dakota in optimal conditions with only portions of the Northern Red River Valley in D0 (abnormally dry) conditions. By the end of June this expands to cover much of Eastern North Dakota.

Despite a drier summer season, there certainly was no shortage of severe weather across the state. It was particularly rainy in South Central North Dakota, where the Carson (9ENE) NDAWN station recorded a total of 15.4 inches of rain!



A destructive storm moved through Western North Dakota August 1st 2023. Taken near Marshall courtesy of Shane Ornelas. (NWS).

Detailed monthly summaries can be found at www.ndsu.edu/ndsco

Seasonal Summary

Precipitation

Statewide summer (1 June - 31 August) total precipitation averaged 6.31 inches, notably below normal total precipitation, 8.54 inches, during this same time period. Isolated regions in South Central North Dakota received significant rainfall while a majority of North Dakota dealt with dry, or even drought, conditions. The most significant rainfall was observed at the Carson (9ENE) station, which measured 15.41 inches in just three months. Some flooding was seen at Antelope Creek near Carson, where daily gauge height periodically rose above 9 feet (USGS). This was the result of frequent widespread stratus precipitation events that concentrated on the Southwest, rather than severe weather (Figure 2). Carson also had the highest monthly total rainfall, 8.51 inches in June. The lowest monthly rainfall was Bowbells with just 0.18 inches in July, almost five inches below normal. It is easy to see why much of northern North Dakota entered drought conditions throughout the summer, with some areas dipping into single digit percentages of normal total rainfall (NDAWN).

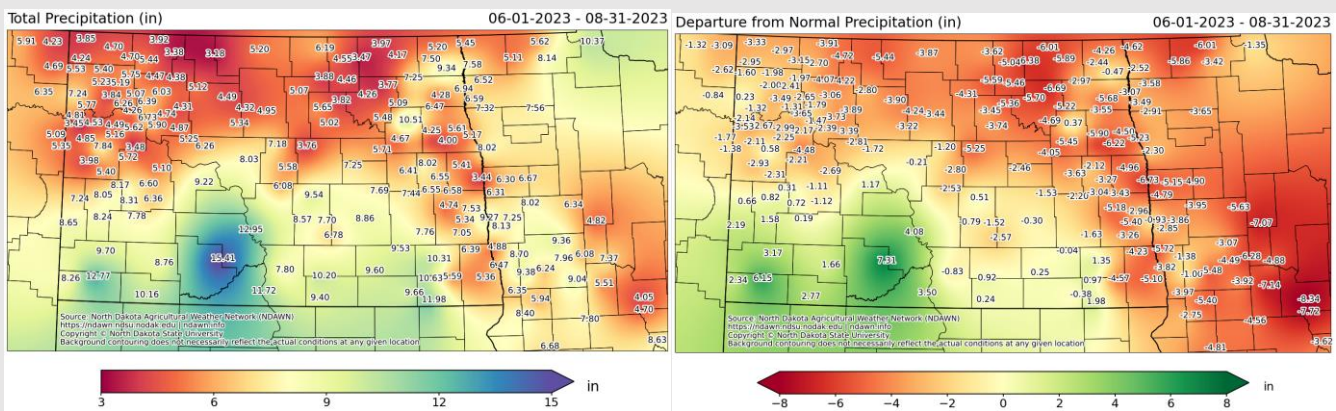


Figure 1: Total precipitation (left) and departure from normal (right) recorded by NDAWN stations between 06/01/2023-8/31/2023

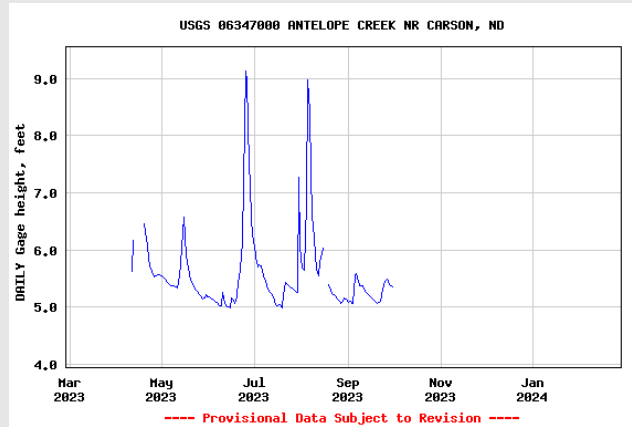


Figure 2: Water level gauge at Antelope Creek near Carson, ND which received almost 200% of normal summer rainfall



Figure 3: Radar mosaic from June 24, 2023 of widespread precipitation that produced the Carson NDAWN station's highest daily summer precipitation measurement: 2.55 inches (IEM)

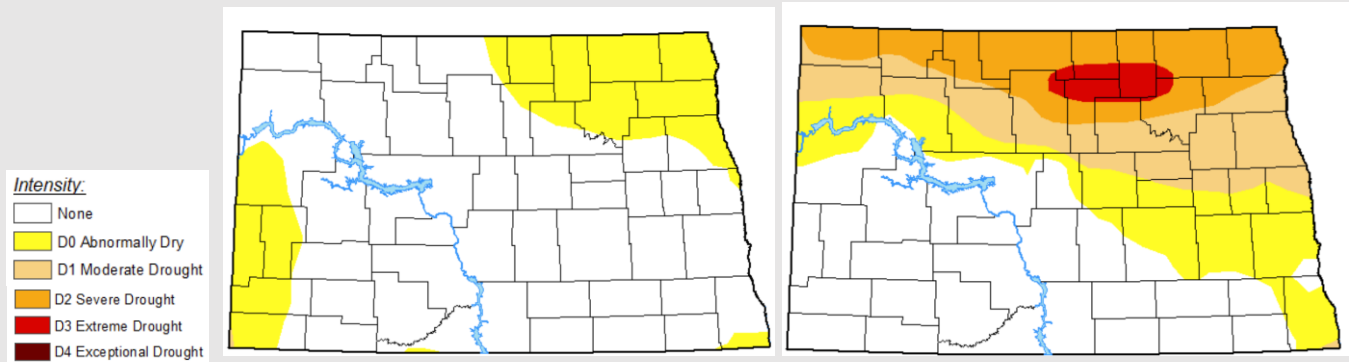


Figure 4: U.S. Drought Monitor conditions on June 6, 2023 where 78.73% of North Dakota has no drought (Left) and August 29, 2023 where that decreases to only 46.68% of North Dakota with no drought (Right)

*Only North Dakota stations used for NDAWN data. All MN and MT stations omitted.

North Dakota Summer Precipitation Summary

Summer	Precipitation	Normal	Anomaly	Rank	Wettest/Driest Since	Record Year
2023 <i>June-August</i>	6.31"	8.55"	+0.93"	89 th Wettest	Wettest since 2020	1993
				41 st Driest	Driest since 2022	1929

Table 1: Ranking from NCEI NOAA based on data for the Summer season June-August 1885-2023. Precipitation amounts averaged from records at NDAWN stations in North Dakota.

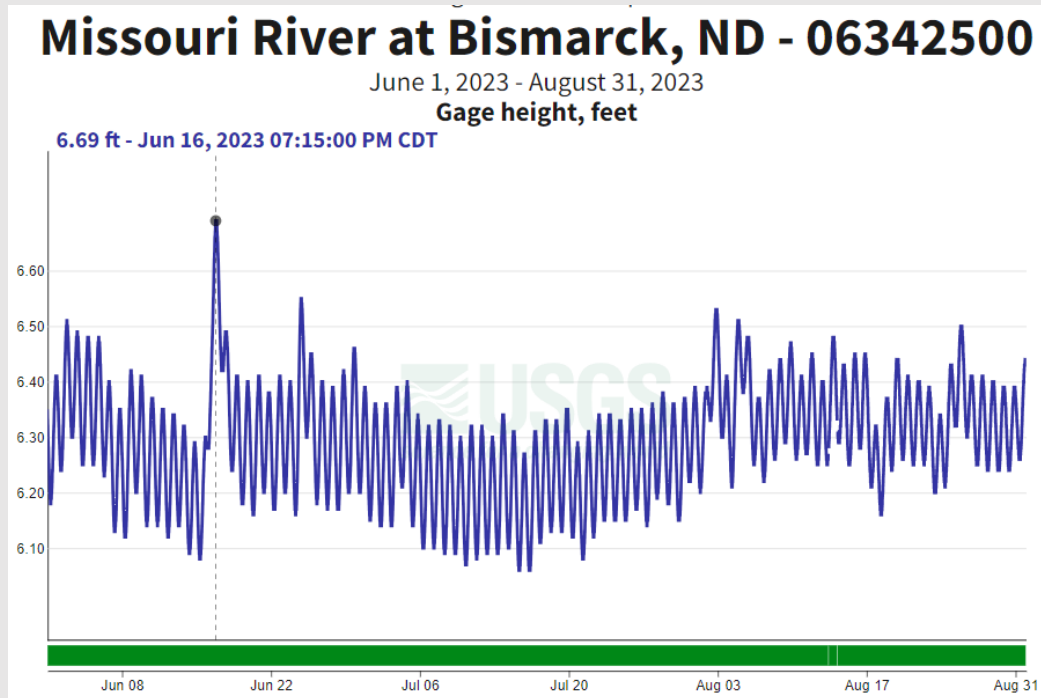


Figure 5: Missouri River gauge height at Bismarck North Dakota peaking at 6.69 feet on June 16 after significant rainfall in the area (USGS)

Temperature

The average temperature across North Dakota for the three-month period was 67.8°F, which is less than a degree warmer than normal average temperature (NDAWN) (Figure 6). However, this is an average of a rollercoaster of monthly temperatures. June was over 6°F warmer than normal, July was colder than average, and the temperature swing essentially cancelled each other out (Figure 7). More information about these individual months can be found at www.ndsu.edu/ndsco

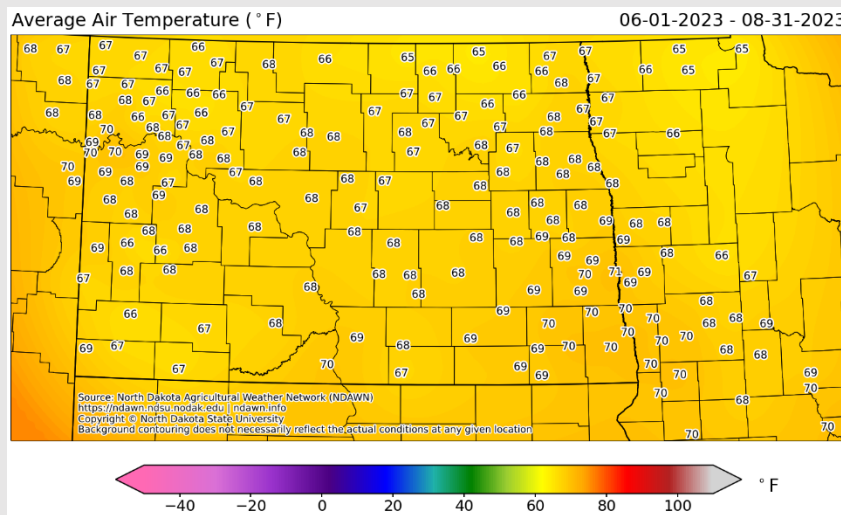


Figure 6: Average temperature across North Dakota NDAWN stations from 6/1/2023-8/31/2023

Despite the summertime variability, the statewide average maximum temperature was 80.1°F, just above normal at 79.3°F. Average minimum temperature was warmer than normal by just 1.1°F at 55.5°F (NDAWN). It is no doubt that North Dakota saw both sides of the extremes this summer. The highest temperature recorded within June-August was 104°F at the Buford (3SE) station, and the coldest temperature was 33°F at the Poker Jim station. Both of these temperatures were recorded in July (NDAWN).

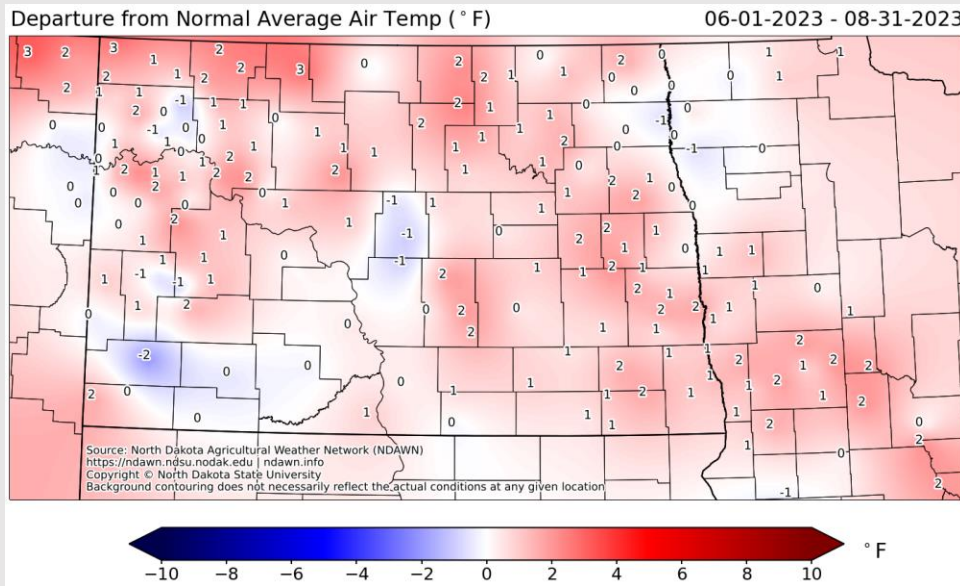


Figure 7: NDAWN Departure from normal temperatures for each station from 6/1/2023 - 8/31/2023

North Dakota Summer Temperature Summary

<i>Summer 2023 June-August</i>	Average T	Avg max T	Avg min T	Maximum	Minimum
	67.8°F	80.1°F	55.5°F	104°F	33°F
Anomaly	+0.9°F	+0.7°F	+1.1°F		
Rank					
Warmest	23 rd Warmest	128 th Warmest	7 th Warmest		
Coolest	107 th Coolest	2 nd Coolest	123 rd Coolest		
Record					
Warmest	72.0°F (1936)	87.2°F (1936)	56.8°F (1936)	121°F (Steele, July 6, 1936)	
Coolest	61.2°F (1915)	72.8°F (1993)	48.8°F (1915)		4°F (Hansboro, June 9, 2004)

Table 2: Summer temperature summary for North Dakota. 2023 statistics from NDAWN station data. Ranking and records based on NCEI climate data (1885-2023) (NOAA)

*Only North Dakota stations used for NDAWN data. All MN and MT stations omitted.

Storm Reports & Record Events

NWS Issued Warnings

2023 was exceptionally slow in the severe weather department, though not without some historic damage, particularly for West Central North Dakota. In total, the National Weather Services Bismarck and Grand Forks combined issued 169 Severe Thunderstorm and Tornado Warnings in North Dakota for June-August 2023 (Figure 8) The average number of summer severe warnings is 277. Convective inhibition was high during our stormiest month of July, where only 60 severe warnings were issued- the lowest since the introduction of more advanced radars in 1994.

Not only was the number of warnings low, but there were also less Local Storm Reports (LSR) than normal between June-August. In 2023, 261 preliminary storm reports of wind, hail, or tornadoes were documented in North Dakota (Figure 10). This is down significantly from the average of 456 LSR in a typical summer season.



Figure 8: Severe Thunderstorm and Tornado Warnings issued across North Dakota from 6/1/2023-8/31/2023 by NWS Grand Forks and Bismarck (IEM, NWS)

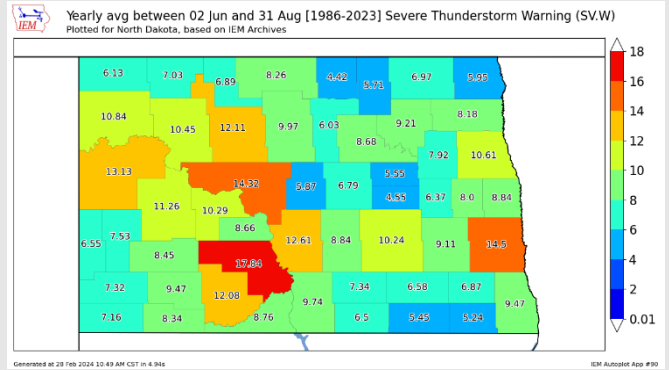
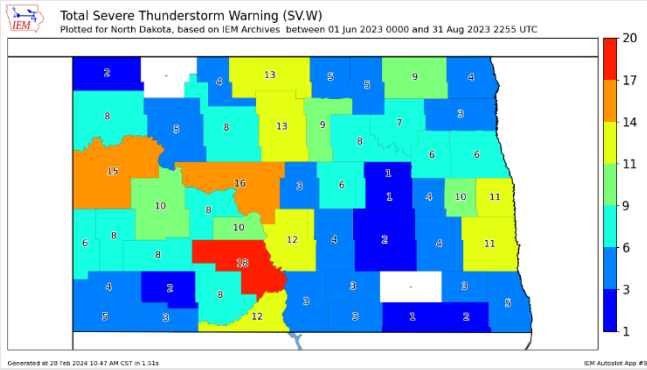


Figure 9: Total number of Severe Thunderstorm Warnings by county (Left) and 1986-2023 average number of Severe Thunderstorm Warnings between June-August by county (Right)

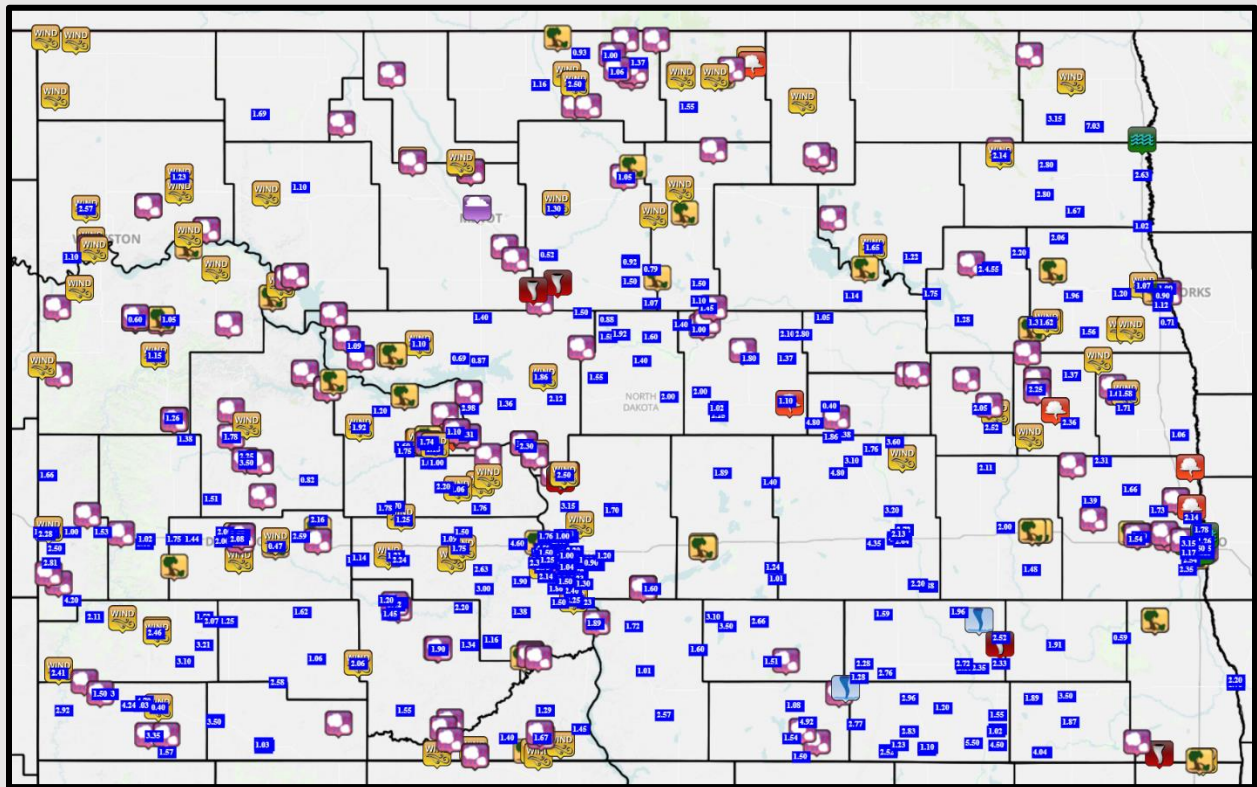


Figure 10: Map of Local Storm Reports between 6/1/2023-8/31/2023 differentiated by each respective icon. Blue numbers are reported precipitation totals (NWS, IEM)

*Only North Dakota stations used for NDAWN data. All MN and MT stations omitted.

Though 2023 summer storms were few and far between, that did not stop the destructive nature of the familiar Northern Plains storms. One of the notable storms occurred on June 21st and brought powerful winds to Sioux County. An intense microburst was estimated to be 125 mph at approximately 22:18 CDT, causing structural damage and injuring one person (NWS). Many other 70-75 wind gusts were produced in the area from the same event (Figure 10).

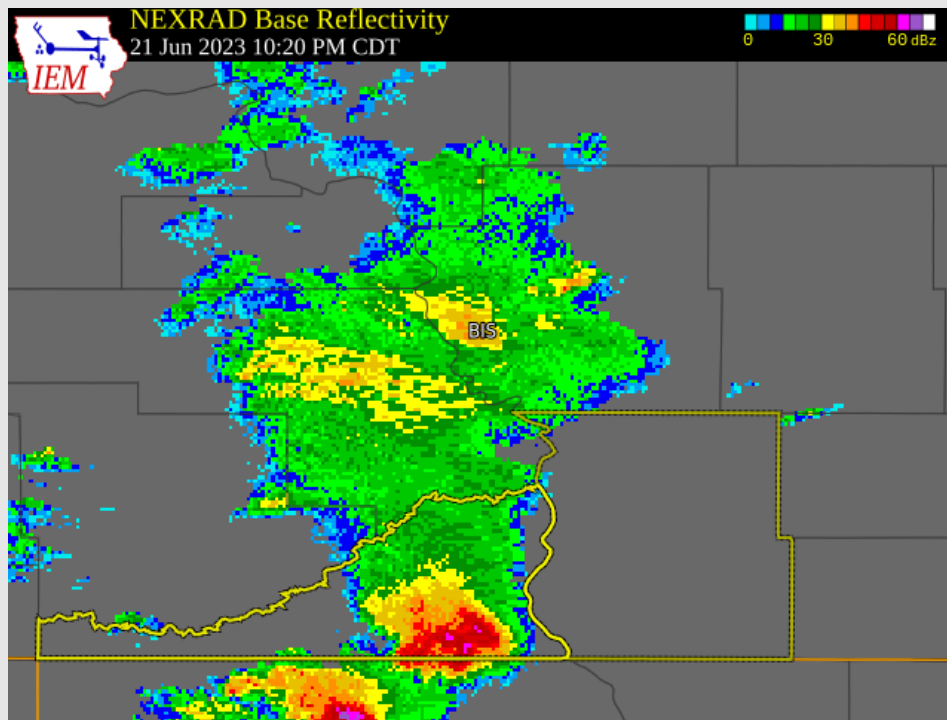


Figure 11: Bismarck Radar imagery from June 21 2023 at 22:20 CDT, near the time a 125 mph wind gust was reported 6 miles ESE of Selfridge in Sioux County. Yellow outlines indicate an active Severe Thunderstorm Warning within that county (IEM, NWS)

A more significant summer storm barreled down Mercer County, especially around the Lake Sakakawea area, on August 1 2023. The worst of this happened around Beulah Bay and Hazen Bay, where winds on the upwards of 70 mph unfortunately caused serious damage to campers and mobile homes. NWS Bismarck reported hail anywhere from quarter to golf ball size hail that fell consistently for 10+ minutes at a time, and rain poured inches for hours throughout the event. A tornado was reported in Burleigh County but was confirmed as a funnel cloud. This event was particularly devastating to farmers in the area. This storm destroyed any field in its path, shredding crops and leaving fields empty.

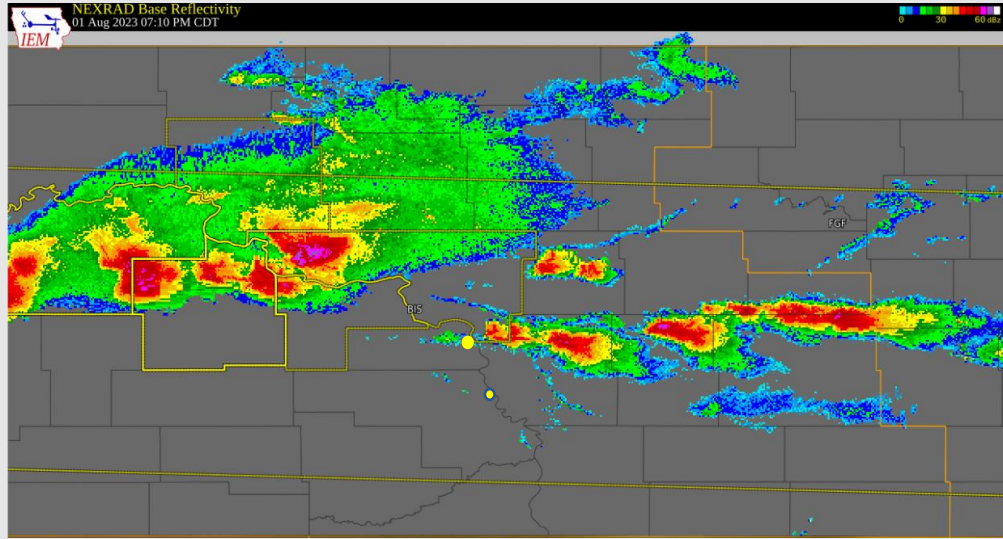


Figure 12: Bismarck Radar image 8/1/2023 19:10 as the severe thunderstorm crosses Lake Sakakawea and causing extreme damage to buildings and crops. Cross Ranch State Park and Bismarck locations marked (IEM, NWS)



Figure 13: Storm damage at Beulah Bay from the August 1, 2023 severe thunderstorm. Strong wind gusts tipped a camper on its side (Left, courtesy of Lexy Emter) and downed trees (Right, courtesy of Bob Hafner)



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Image/Data Sources

Climate at a Glance | National Centers for Environmental Information (NCEI).

NDAWN Weather

Iowa Environmental Mesonet

U.S. Drought Monitor

SPC Storm Reports

NCEI Storm Events Database

NWS Grand Forks and Bismarck

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