North Dakota Climate Bulletin

Winter 2023-2024 **Volume 18, No. 1**

In this Issue:

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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.

Winter 2023-2024 was warmer than most, ranking as the second warmest winter on record (130 years) (NCEI). The average winter temperature was 8.5°F warmer than normal. With a lack of winter precipitation and little to no snowpack, all three months of the winter season measured considerably warmer than average. Precipitation across the state stayed around average, with the exception of Southeastern North Dakota, where a late December rain brought the region to 150 to nearly 200% above normal.

North Dakota felt the effects as an El Nino weather pattern took place across the country. Mild temperatures allowed a disastrous ice storm to occur in late December, followed by a major cold snap in mid-January, which brought down average temperatures for the month to even out to normal.

Figure 1: NDAWN Tripod station coated in hoar frost and rime ice due to fog in the Red River Valley 1/9/2024

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

Cassidy Holth, Assistant to the North Dakota State Climatologist.

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

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Seasonal Summary

Precipitation

Statewide winter (1 December 2023 - 29 February 2024) total precipitation averaged 0.33 inches, just below normal total precipitation of 0.55 inches for the three month period. Most areas of North Dakota saw precipitation below normal, with the exception of the Southern Red River Valley, which received up to 193% of normal precipitation. The most significant precipitation was measured at the Fargo (NW) NDAWN Station with a total of 3.98 inches, of which 3.06 inches fell in December. The Sonora (1E) NDAWN station recorded the maximum monthly precipitation of 3.61 inches in December. The lowest seasonal rainfall occurred at Liberty (5E) with 0.60 inches. Though December was soggy for the Southeast, in January the Mooreton (3SW) NDAWN station only recorded 0.05 inches of precipitation. The minimum and maximum monthly precipitation amounts both occurred in Richland County during the winter season.

Autumn moisture begins off of a drier than average summer. The U.S. Drought Monitor reported that only 46.6% of North Dakota was without a drought on September 5th. Northern North Dakota received a decent amount of precipitation to lessen the impacts of drought, but D2 (Severe Drought) conditions persisted in the northeast region (Figure 4).

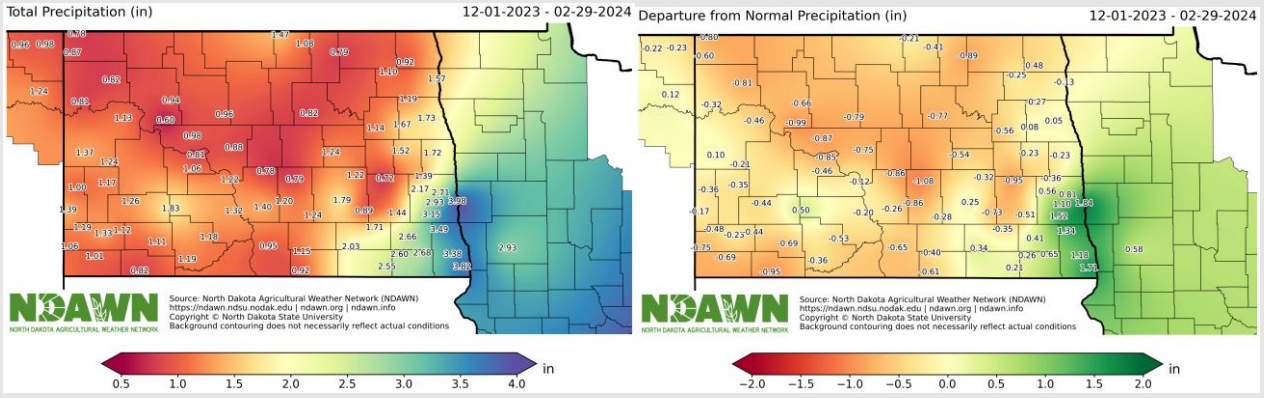

Figure 2: Total precipitation (left) and departure from normal (right) recorded by NDAWN stations between 12/01/2023-2/29/2024

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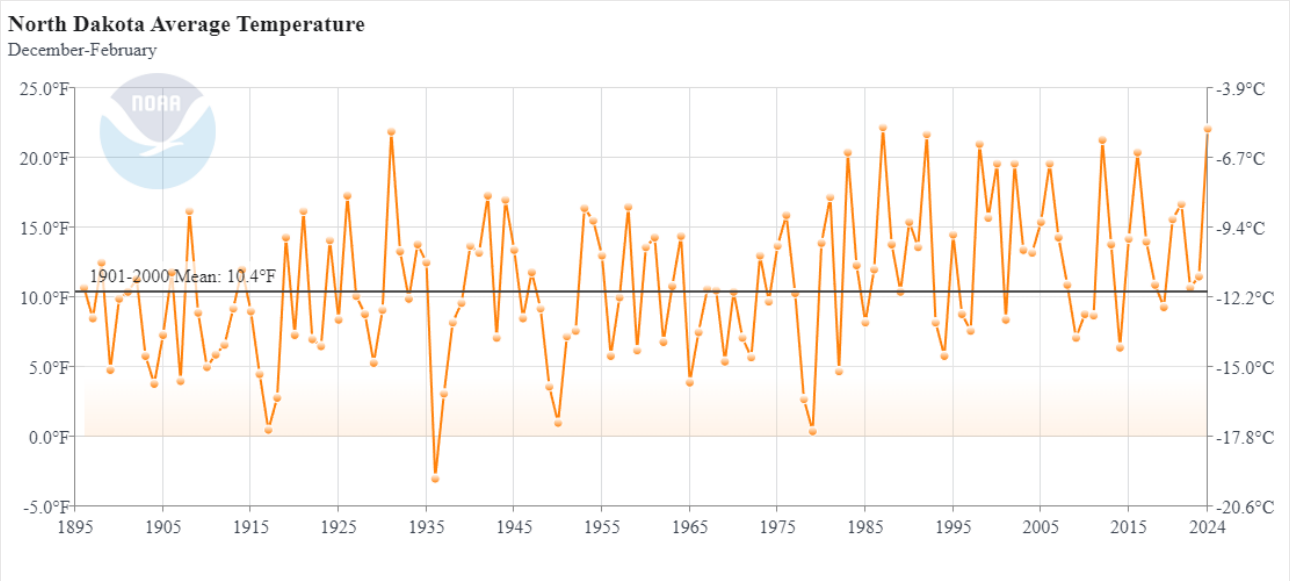

Figure 3: Historical Average Temperature in North Dakota from December-February 1895-2024

North Dakota Winter Precipitation Summary

	Precipitation	Normal	Anomaly	Rank	Wettest/Driest Since	Record Year
Winter '23-'24 September-November	0.33"	0.55"	-0.22"	74th Wettest	Wettest since 2023	1969
				56th Driest	Driest since 2021	1990

Table 1: Ranking from NCEI NOAA based on data for the winter season December-February 1885-2024. Precipitation amounts averaged from records at NDAWN stations in North Dakota.

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Temperature

All three months of the winter season were unseasonably warm, high temperatures even reached into the 60s in most of Southern North Dakota. The average temperature across the state for the winter season was 21.8°F, much warmer than the normal average temperature of 13.3°F (NDAWN) (Figure 5). This is particularly impressive, due to the cold snaps that still occurred despite a lack of snowpack and warm temperatures. January in particular had a week of below-zero temperatures, reaching into the -30s, and still averaged about 6°F above normal. More information about these individual months can be found at www.ndsu.edu/ndsco

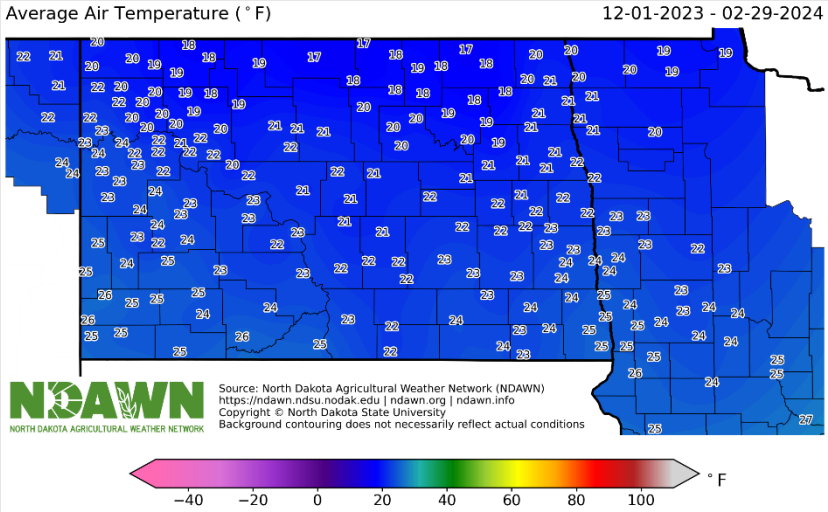

Figure 4: Average temperature across North Dakota NDAWN stations from 12/1/2023-2/29/2024

The same is to be said about statewide average maximum and maximum temperatures, well above normal for the season. The maximum temperature for the '23-'24 season was 30.5°F, almost above freezing, while the normal temperature is 7.6°F cooler than this year's. Minimum temperatures were almost 10°F warmer than normal at 13.1°F. The maximum temperature observed from December-February was 66°F at the Fort Yates (2W) and Carson (9ENE) NDAWN stations. This occurred in February. The minimum temperature observed was a frigid -36°F in January at the Grenora (8N) NDAWN Station.

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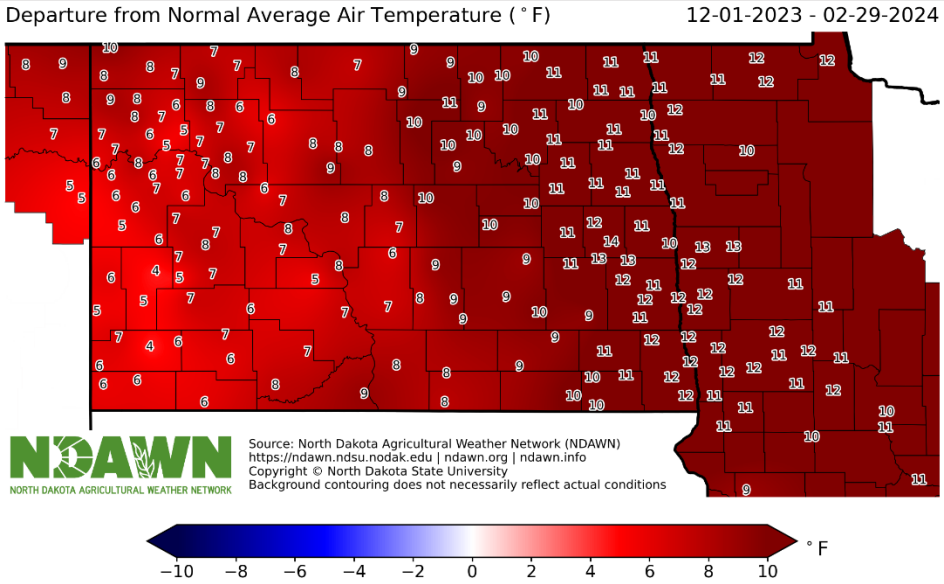

Figure 6: NDAWN Departure from normal temperatures for each station from 12/1/2023 – 2/29/2024

North Dakota Winter Temperature Summary

Winter '23-'24 December-February	**Average T**	**Avg max T**	**Avg min T**	**Maximum**	**Minimum**
	21.8°F	30.5°F	13.1°F	66°F	-36°F
Anomaly	+8.5°F	+7.6°F	+9.5°F		
Rank					
Warmest	2nd Warmest	5th Warmest	1st Warmest		
Coolest	128th Coolest	125th Coolest	129th Coolest		
Record					
Warmest	22.2°F (1987)	31.5°F (1992, 2012)	Warmest to Date	74°F (Bismarck AP, 2016)	
Coolest	-3.0°F (1936)	6.3°F (1936)	-12.3°F (1936)		-60°F (Parshall, 1936)

Table 2: Winter temperature summary for North Dakota. 2023-2024 statistics from NDAWN station data. Ranking and records based on NCEI climate data (1885-2024) (NOAA)

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Storm Reports & Record Events

NWS Issued Warnings

By the end of 2023, temperatures still had not dropped consistently below zero. Because of this, North Dakota experienced one of its worst ice storms in history. On December 25th significant freezing rain impacted much of Southeastern North Dakota and lasting until the 27th. Rain continued in that area as well, resulting in Cass and Richland Counties wettest December on record, and seven surrounding counties had a top 10 wettest December. Valley City and the surrounding area had up to 1" of ice accumulation, most of the affected region received at least 0.25" of ice. This major event caused holiday travel interruptions and widespread power outages lasting days.

Figure 5: Ice coats the various instruments of the Edgeley NDAWN station during the historical ice storm of December 2023

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In January 2024 despite the continuing mild winter, a classic North Dakota cold snap befell the region. Temperatures dropped below zero and wind speeds picked up, bringing wind chill values to dangerous levels. This event peaked on January 13th, when temperatures plummeted to -30s and winds were well into the 25-35 mph category. This was quite the temperature change from the rest of the winter which stayed around freezing.

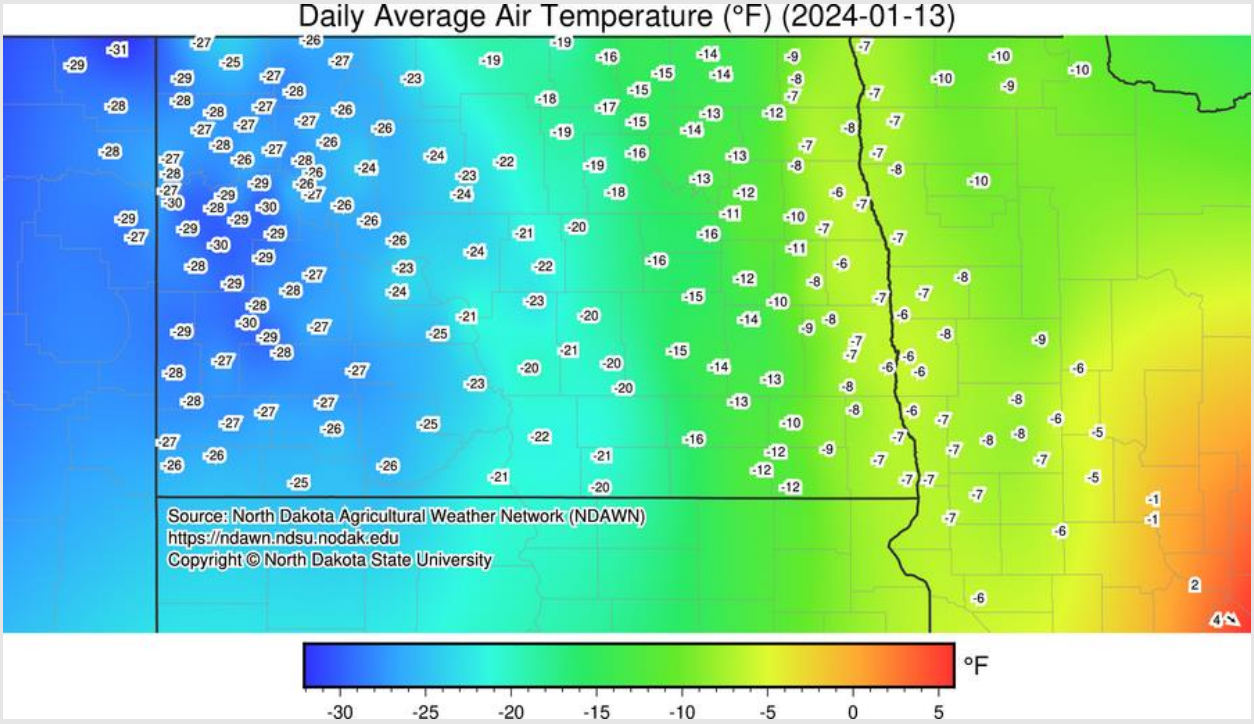

Figure 6: Daily average air temperature on 1/13/2024 showing frigid temperatures making their way towards Eastern North Dakota

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February 2024 was abnormal in the sense that temepratures were over 10°F above average for the month. However, midmonth, a significant weather system moved through the state, harboring a forceful cold front with it. Temperatures dropped almost 60°F in 24 hours across the state between 2/26-2/27. Strong winds and blizzard conditions followed, prompting a blizzard warning in eight North Dakota counties.

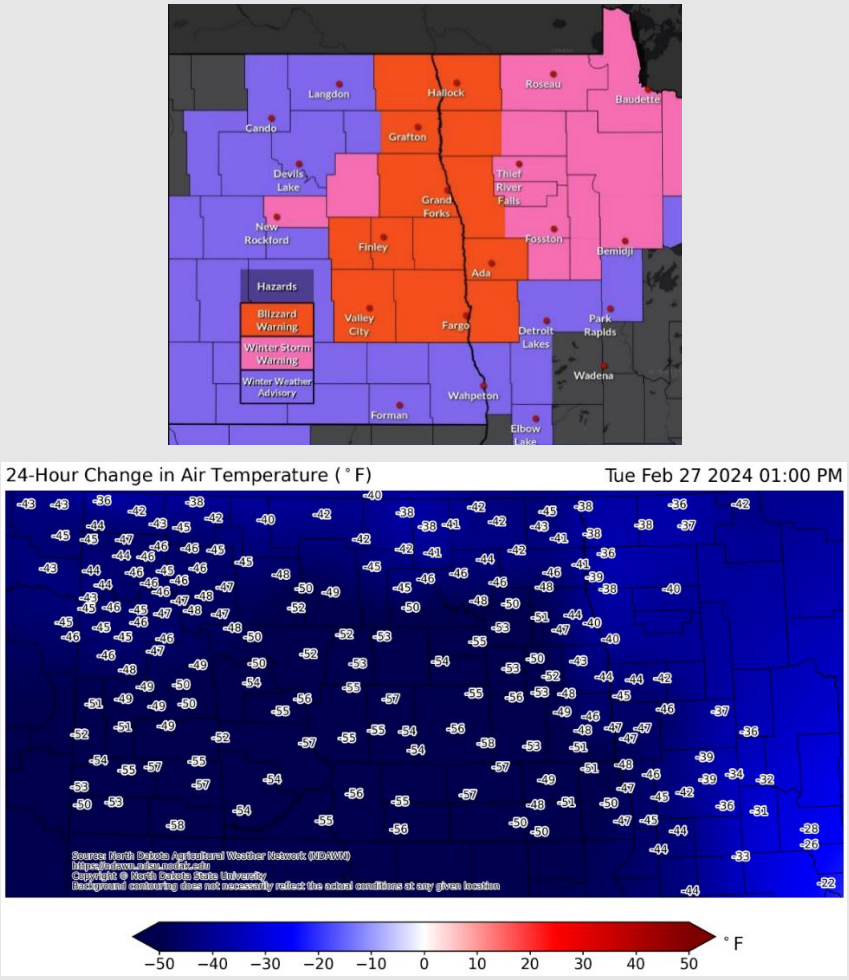

Figure 7: Blizzard warning as well as winter storm warning and winter weather advisories following the weather system on 2/27/2024 (top). 24 hour change in air temperature from 2/26-2/27 2024. Temperatures dropped a max of -59°F (Marion NDAWN Station) (Bottom)

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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

XMACIS2

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