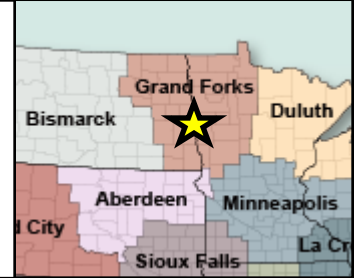


# National Weather Service Grand Forks



## Weather & Climate Review

November-December 2023



### November

	AveT	TDept	THigh	TLow	Pcpn	PDept	Snow	AveW	WDept	Av>15	Av>20	PWnd	HDD	CDD	Tstms	DFog	Clear	PCldy	MCldy
DVL	30.6	4.3	54	6	M	M	M	11.8	M	6	0	38	1025	0	0	1	14	10	6
NWS GF	30.7	3.4	56	4	0.10	-0.77	0.6	M	M	M	M	M	1021	0	M	M	M	M	M
GFK	30.8	4.1	58	0	0.10	-0.82	0.3	10.7	0.1	4	0	51	1019	0	0	2	8	14	8
RDR	30.5	3.8	59	2	M	M	M	10.0	M	3	0	40	1027	0	0	1	7	12	11
FAR	33.9	4.4	60	1	0.20	-0.77	0.8	10.3	-1.0	3	0	50	923	0	0	0	16	8	6
BDE	32.0	5.3	60	-1	M	M	M	8.2	0.0	0	0	28	983	0	0	0	14	7	9
PKD	29.9	2.0	57	-3	M	M	M	8.9	-0.2	2	0	46	1041	0	0	0	13	9	8
BJI	29.4	2.7	58	-1	M	M	M	8.5	M	1	0	40	1061	0	0	0	12	8	10
TVF	29.0	1.8	53	-3	M	M	M	11.1	M	3	0	39	1071	0	0	0	15	7	8
Y63	34.5	4.8	60	1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
AGA	27.3	-0.3	54	-8	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Table 1 November 2023 Temperature and Precipitation Statistics

In Table 1, **DVL** = Devils Lake, **NWS GF** = NWS Grand Forks, **GFK** = GF Airport, **RDR** = GF Air Force Base, **FAR** = Fargo, **BDE** = Baudette, **PKD** = Park Rapids, **BJI** = Bemidji, **TVF** = Thief River Falls, **Y63** = Elbow Lake, **AGA** = Agassiz MN NWR. **AveT** = monthly average temperature, **TDept** = monthly departure from normal, **THigh** = highest temperature of the month, **TLow** = lowest temperature of the month, **Pcpn** = monthly precipitation, **PDept** = departure from normal precipitation, **Snow** = monthly snowfall, **AveW** = average monthly wind speed (mph), **WDept** = departure from average wind (1998-2022), **Av>15** = number of days with an average wind speed greater than 15 mph, **Av>20** = number of days with an average wind speeds greater than 20 mph, **PWnd** = peak wind speed in mph, **HDD** = monthly total Heating Degree Days, **CDD** = monthly total Cooling Degree Days, **Tstms** = number of days with thunder, **DFog** = number of days with visibility <=1/4 mile in fog, **Clear** = number of days with sky cover 0-3 tenths, **PCldy** = number of days with sky cover 4-7 tenths, **MCldy** = number of days with sky cover 8-10 tenths.

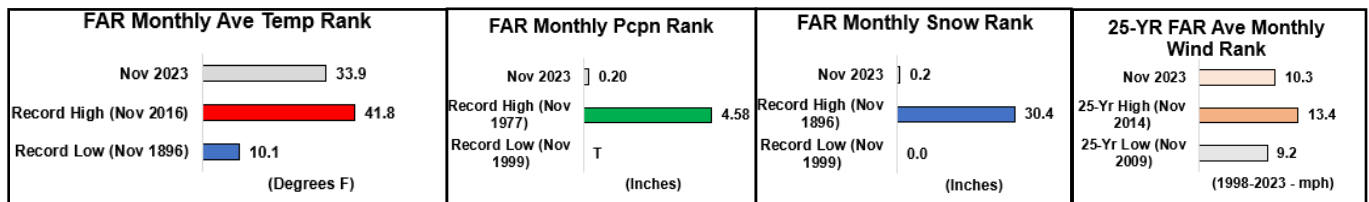


Figure 1 Nov 2023 Fargo Temperature, Precipitation, Snow & Wind Statistics Compared to Records

Per Table 1, for all sites except the Agassiz NWR, the November average temperature was above normal, and precipitation and snowfall amounts were below normal. The monthly average wind speed was near or below average at the four ASOS sites with available 25-year averages (most ASOS's were commissioned around 1998, so this data is a consistent computerized-era set, that followed manual human observations).

Figure 1 compares the November 2023 average temperature (AveT), precipitation (Pcpn), snowfall (Snow), and monthly average wind speed (AveW) at Fargo to the established records (AveW only goes back to 1998). A quick glance through these charts (and Table 1) shows November 2023 at Fargo was warmer than normal, below normal on precipitation, below normal on snowfall (normal November snowfall is 6.8 inches), and slightly below average for wind.

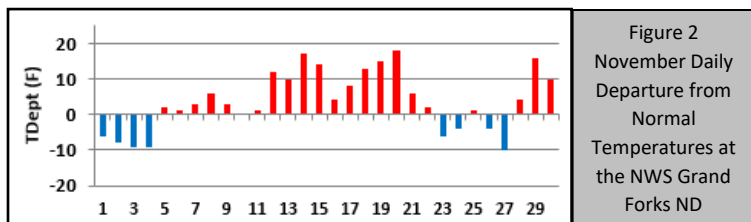


Figure 2  
November Daily  
Departure from  
Normal  
Temperatures at  
the NWS Grand  
Forks ND

Figure 2 plots the daily departure from normal temperatures in November 2023 at the NWS Grand Forks. There were the traditional back and forth swings in temperature, but overall there were a few more warm than cold days. Figure 3 shows the November daily snowfall totals at NWS Grand Forks (almost nothing). Figure 4 displays the daily snow depth at NWS Grand Forks. There were only a few days at the beginning of November that had a snow depth, which was leftover from the October 25-27, 2023 Winter Storm (until that melted too).

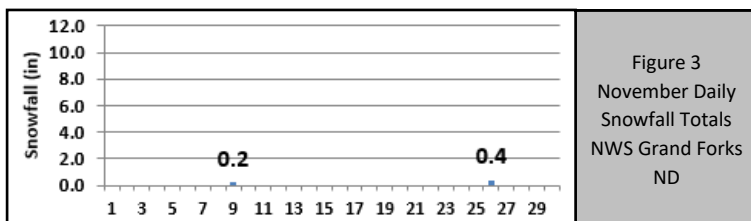


Figure 3  
November Daily  
Snowfall Totals  
NWS Grand Forks  
ND

Figure 5 plots the daily cloud cover at the Grand Forks airport along with the daily solar radiation at the Agassiz NWR. Other than some cloudier days at the beginning of the month, there were still a good amount of clear or partly cloudy days. However, the amount of solar radiation continued to fall. Figure 6 plots the Fargo highs and lows against the normals and records. As mentioned below in the Records section, there were no records in November. However, the more warmer than colder days are also evident on this graphic.

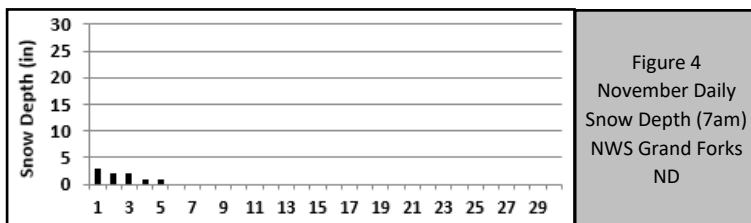


Figure 4  
November Daily  
Snow Depth (7am)  
NWS Grand Forks  
ND

## Records

At Fargo-Moorhead, there were no records set in November 2023.

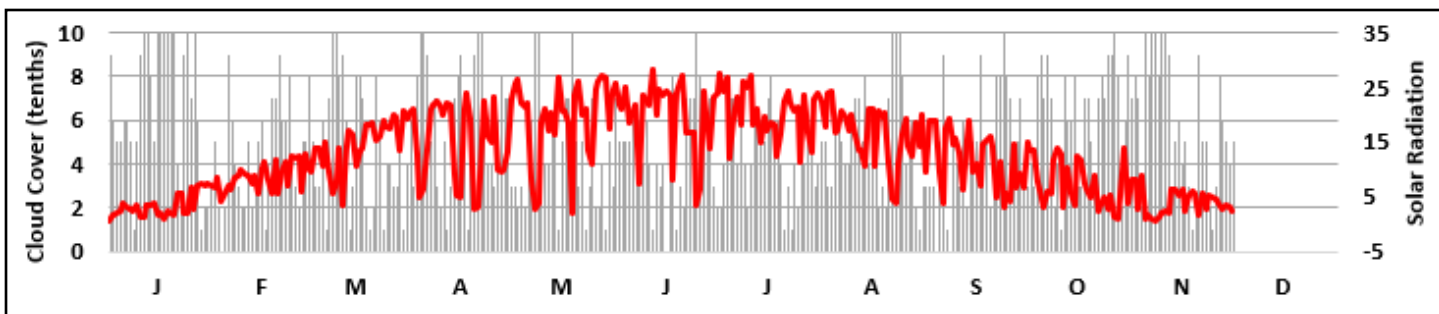


Figure 5 Jan to Nov 2023 - Grand Forks Airport cloud cover (tenths, in black) and Agassiz NWR solar radiation ( $\text{MJ}/\text{M}^2$ , in red)

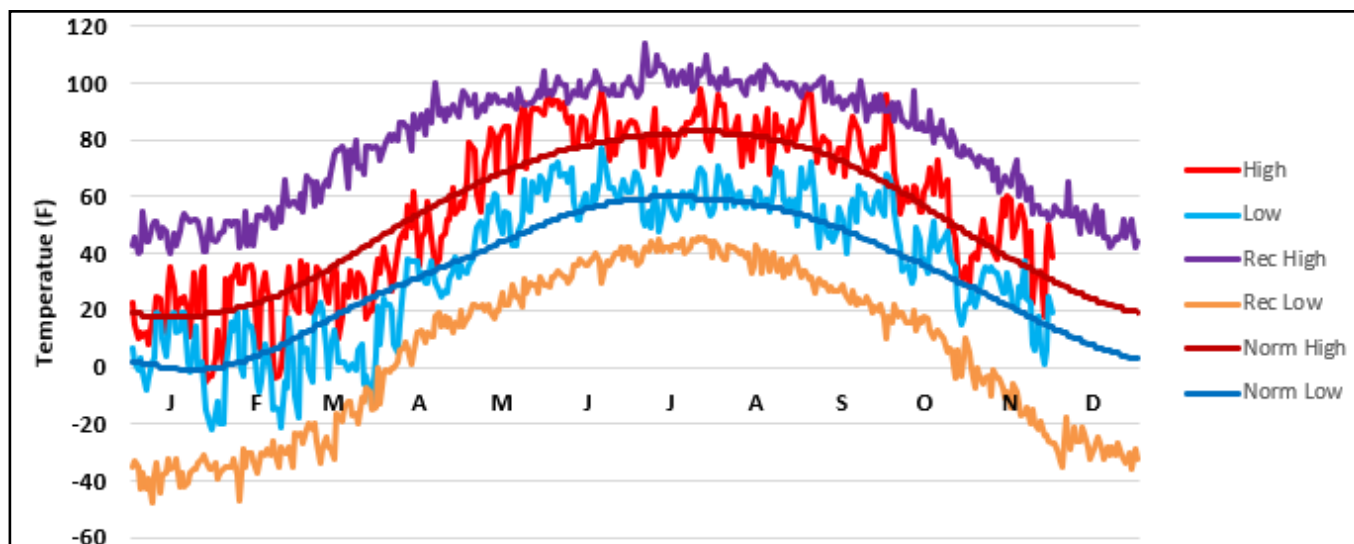


Figure 6 Fargo Airport January to November 2023 highs and lows compared to normal and records

Figure 7 shows how the running precipitation total this year at the Fargo airport (dotted red line) compares to the highest precipitation year (34.74" in 2000, dark green line), lowest precipitation year (8.84" in 1976, light green line), normal precipitation (23.95", black line), and last year (21.42", dashed red line).

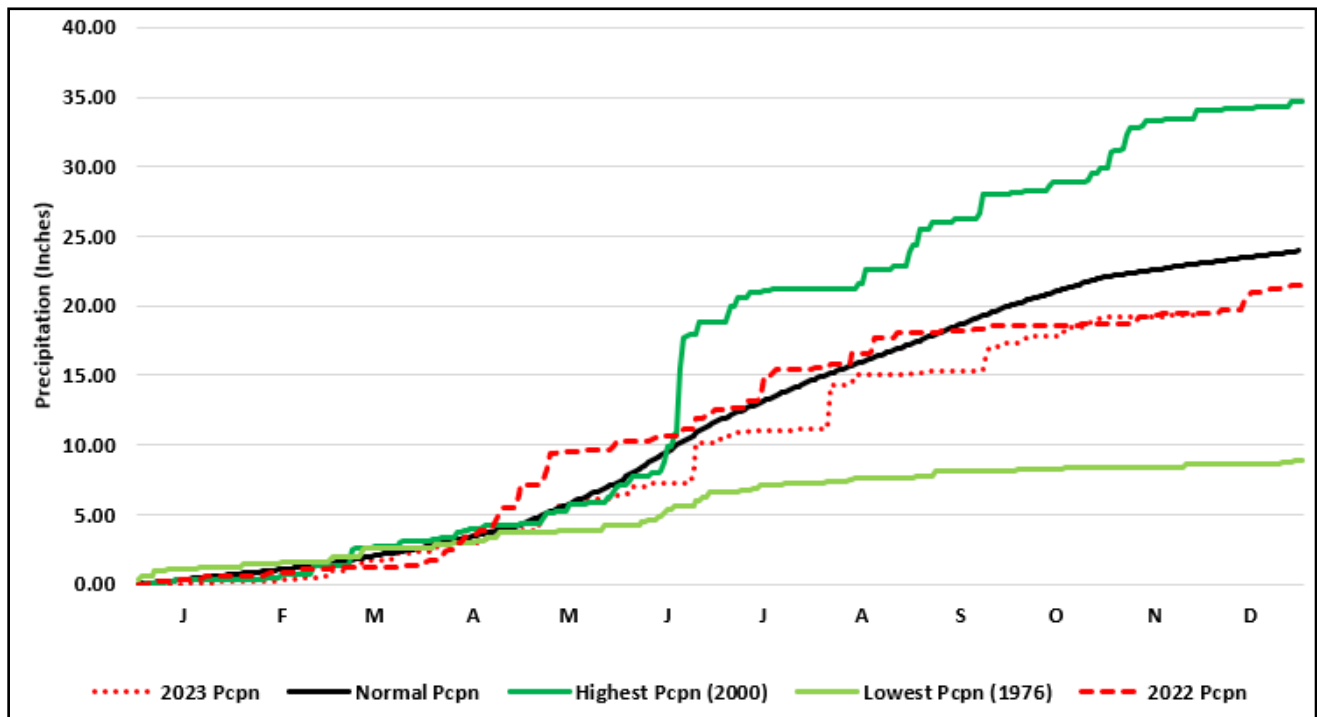


Figure 7 Running 2023 precipitation total compared to records, normal, and last year (Fargo airport)

Figure 8 shows how the running snowfall total this year at the Fargo airport (dotted red line) compares to the highest snowfall year (117.0" in 1996-97, blue line), lowest precipitation year (9.3" in 1957-58, light blue line), normal snowfall (51.4", black line), and last year (67.4", dashed red line).

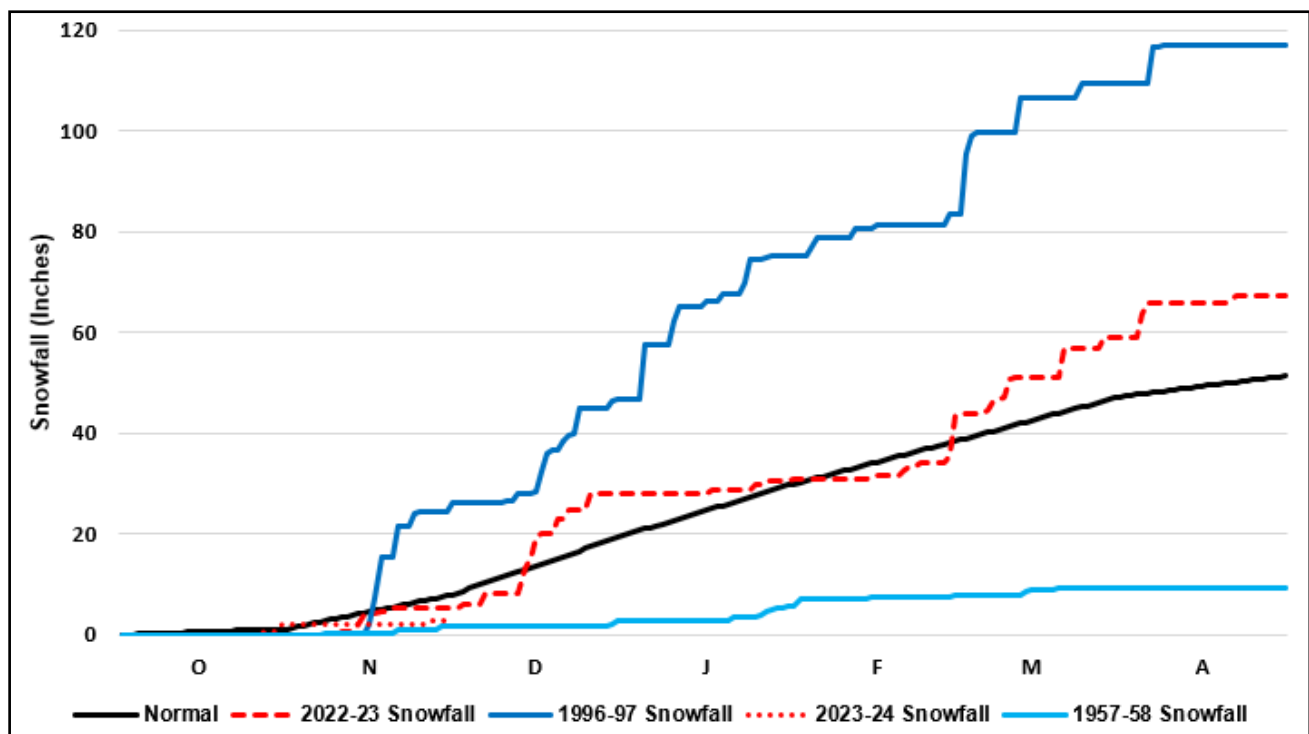


Figure 8 Running 2023-24 snowfall total compared to records, normal, and last year (Fargo airport)

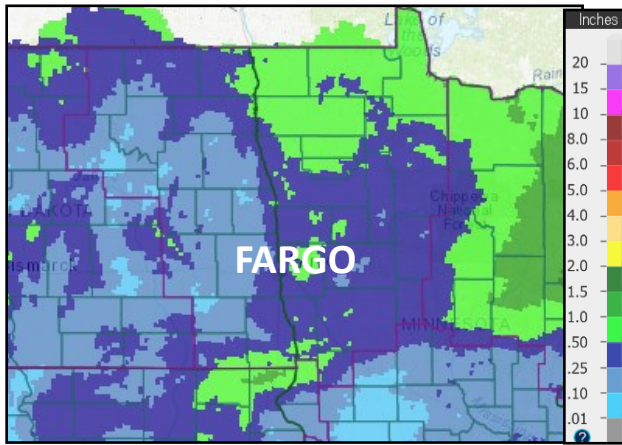


Figure 9 November Observed Precipitation

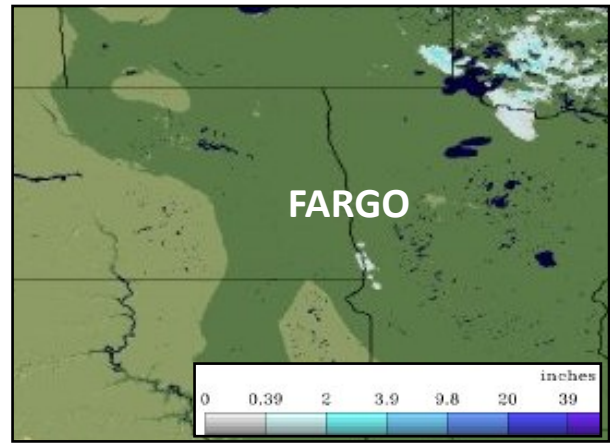
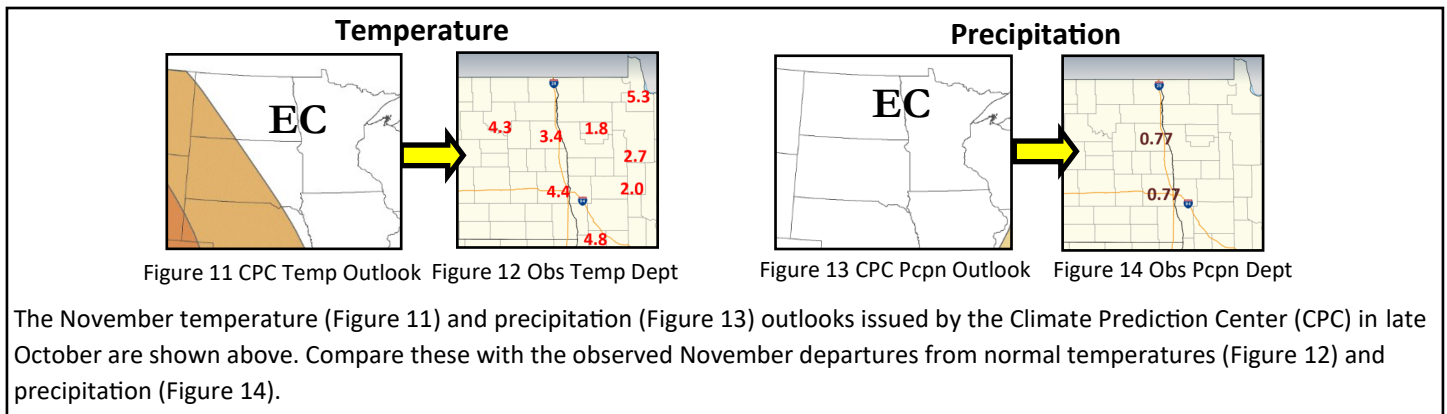


Figure 10 November 30th Observed Snow Depth

Figure 9 gives a November precipitation estimate for all of eastern North Dakota and the northwest quarter of Minnesota. The highest amounts of 0.50 to 1 inch (the light green color) fell across the far southern Red River Valley and portions of northwest Minnesota. Figure 10 shows the depth of snow on the ground on November 30th. The graphic only shows some snow on the ground around the Lake of the Woods (generally less than 2 inches).



**Longer Term Trends** Looking at just the Fargo climate site (FAR), Figures 15 and 16 show how November 2023 fits into the previous 5 months. Figure 14 plots the monthly departures from normal temperatures at Fargo. The blue bars represent months that were colder than normal, while the red bars represent months that were warmer than normal. Figure 15 plots the monthly departures from normal precipitation at Fargo. The green bars represent months that were wetter than normal, while the brown bars represent months that were drier than normal.

Other than July, the other 5 months have been warmer than normal (Figure 15). For precipitation, the dry trend continues (Figure 16).

Figure 17 tracks how much precipitation has fallen since January 1, 2023, and how it compares to normal and last year. Snowfall is also tracked for the snow season, which began on July 1, 2022.

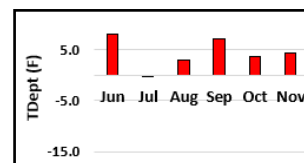


Figure 15 Monthly Departures from Normal Temps at Fargo, ND

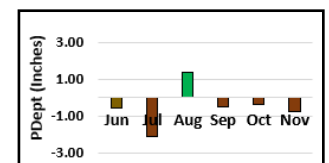


Figure 16 Monthly Departures from Normal Pcpn at Fargo, ND

	Observed Value	Normal	Departure from Normal	Last Year
Pcpn Since Jan 1	19.37	23.06	-3.69	19.47
Snow Since Jul 1	2.8	8.0	-5.2	5.3

Figure 17 Yearly Precipitation & Seasonal Snowfall Trends at Fargo

## U. S. Drought Monitor

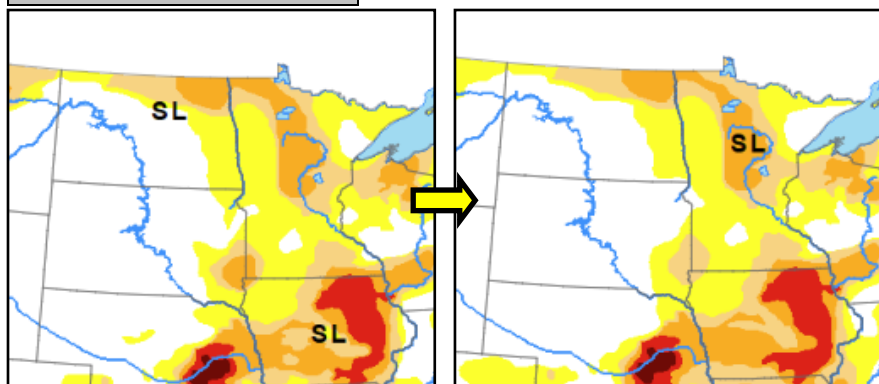
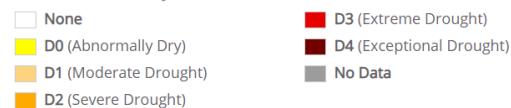


Figure 18 U. S. Drought Monitor, Nov 2

Figure 19 U. S. Drought Monitor, Nov 30

There is usually not too much change in the U. S. Drought Monitor during the winter months (Figures 18 and 19). The key for both figures is shown below.

### Intensity and Impacts



## Soil Moisture

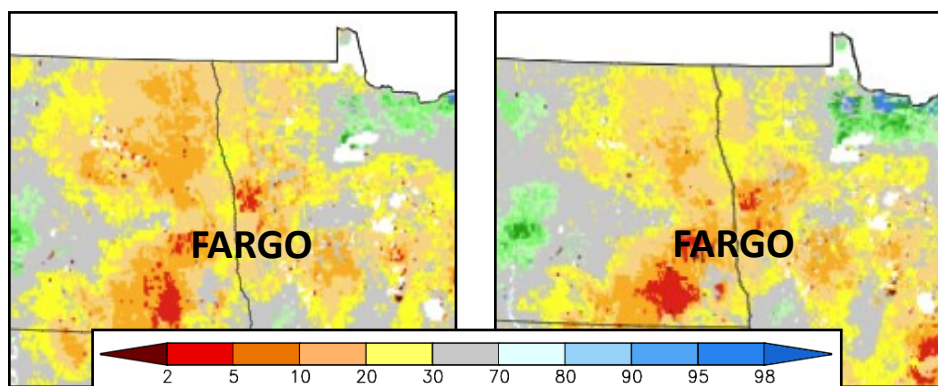


Figure 20 NASA 0-100cm Soil Moisture Oct 31

Figure 21 NASA 0-100cm Soil Moisture Nov 30

NASA SPORT: 0-100 cm soil moisture percentile data has been shown to be useful for drought monitoring. The 0-10cm layer responds quickly to heavy precipitation and rapid drying events. The 0-100 cm layer evolves much slower and shows a greater utility for drought monitoring.

As with the U. S. Drought Monitor, there is usually not too much change in the 0-100cm soil moisture percentile map during the winter months.

## Rivers

Gage heights on the Red River at Fargo (Figure 22) and Grand Forks (Figure 23) are shown (below) for the past 6 months. Since the spring crests, the Red River has remained below flood stage. This is strictly preliminary data.

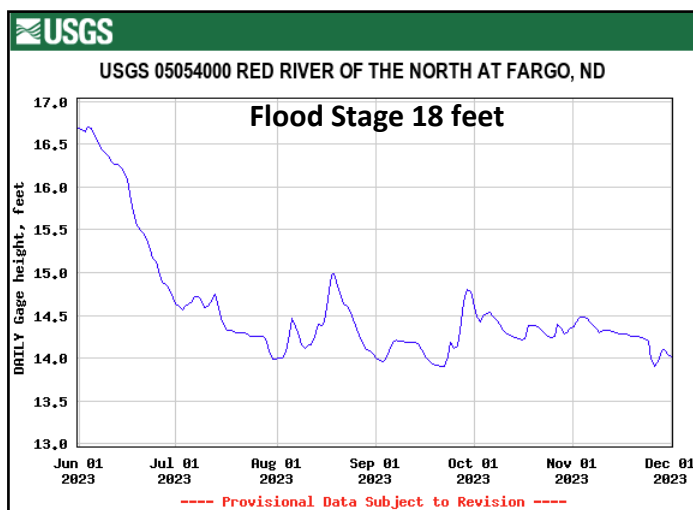


Figure 22 Red River Level at Fargo ND

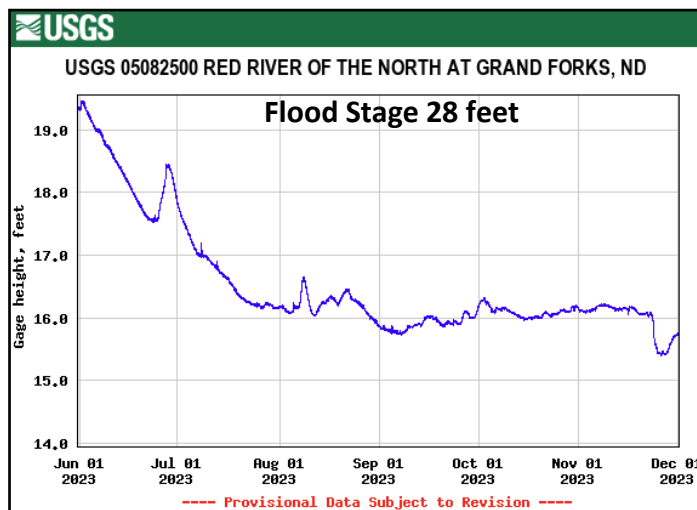


Figure 23 Red River Level at Grand Forks ND

## Fall Warnings

No warnings were issued during the month of November 2023.



## December

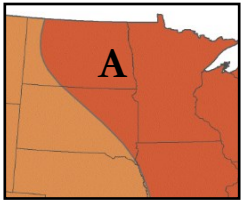


Figure 24 Temperature

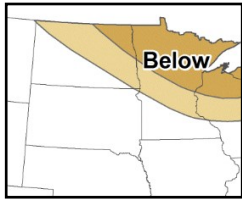


Figure 25 Precipitation

The latest Climate Prediction Center (CPC) temperature (Figure 24) and precipitation (Figure 25) outlooks for December 2023 are shown to the left. For eastern North Dakota and the northwest quarter of Minnesota, the CPC is forecasting higher probabilities for above normal temperatures and below normal precipitation.

### Sunrise/Sunset

Fargo, ND

Dec 1 Sunrise: 7:51 am

Sunset: 4:41 pm

Dec 31 Sunrise: 8:13 am

Sunset: 4:47 pm



### Last Year & Normals

Per Table 2, in December 2022, the average temperature was below or well below normal at all sites. Precipitation amounts were above normal at the three winter sites.

	AveT	TDept	THigh	TLow	Pcpn	PDept	Snow	PWnd
DVL	6.2	-6.6	33	-28	M	M	M	45
NWS GF	8.6	-5.0	34	-24	1.77	1.04	24.8	M
GFK	8.5	-4.3	35	-26	1.57	0.91	16.6	41
RDR	8.1	-4.7	35	-24	M	M	M	37
FAR	9.0	-6.7	33	-25	1.95	1.06	22.8	44
BDE	10.7	-1.6	35	-25	M	M	M	44
PKD	10.4	-3.8	32	-30	M	M	M	42
BJI	9.5	-4.2	33	-25	M	M	M	35
TVF	8.5	-5.0	35	-28	M	M	M	41
Y63	11.3	-4.8	37	-18	M	M	M	M
AGA	8.0	-5.0	34	-27	M	M	M	M

Table 2 Dec 2022 Temperature and Precipitation Statistics

Figure 26 shows normal highs and lows on December 1st for selected cities across eastern North Dakota and northwest Minnesota. Figure 27 shows how normal highs and lows change by December 31st. As an example, at NWS Grand Forks on December 1st, the normal high is 27 and the normal low is 12. By December 31st, the normal high falls to 16 and the normal low falls to 1. Figure 28 shows the normal precipitation and snowfall amounts for a few selected sites. As an example, the normal precipitation at NWS Grand Forks in December is 0.73 inches and the normal snowfall is 13.4 inches.

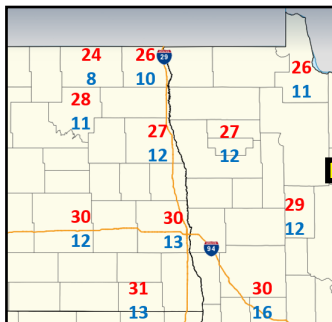


Figure 26 Normal Temps Dec 1

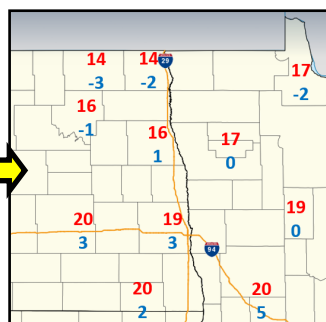


Figure 27 Normal Temps Dec 31

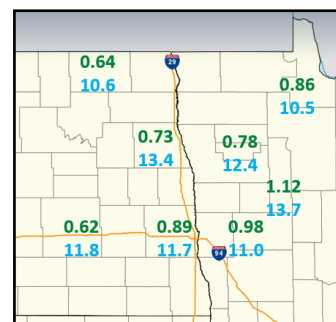


Figure 28 Normal Dec Pcpn/Snow

## December 2022 Warnings

December 2022 remained quite active. Three Winter Storm Warnings (Figures 29, 30, and 36), two Blizzard Warnings (Figures 32 and 35), and two Wind Chill Warnings (Figures 33 and 34) were issued. Snowfall maps for the two Winter Storm Warnings are shown in Figures 31 and 37 (Figure 31 shows a combination snowfall map covering both Winter Storms from Figures 29 and 30). Peak wind speeds during the Blizzard Warnings are also included.



Figure 29 December 12-14  
Winter Storm area

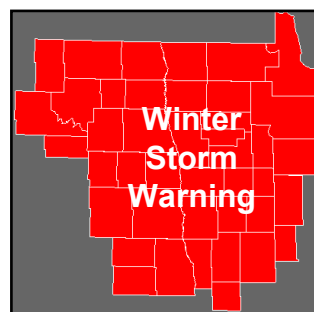


Figure 30 December 15  
Winter Storm area

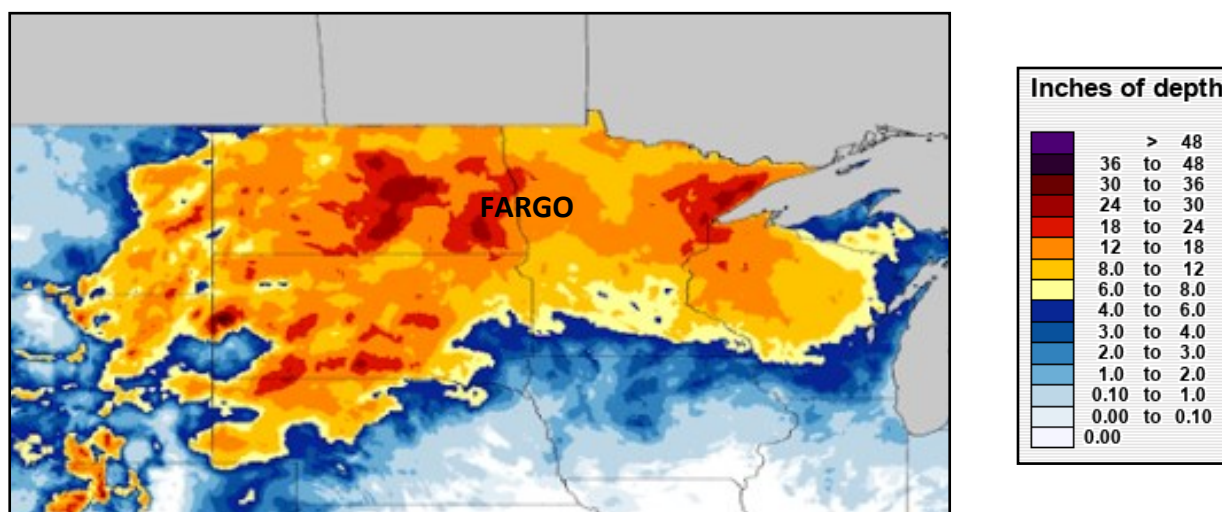


Figure 31 Observed Snowfall December 13-17  
(not exact for all areas)

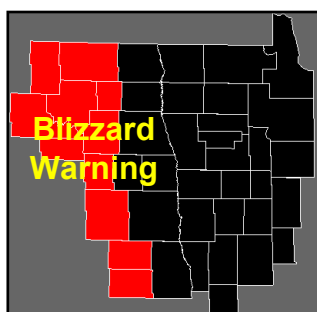


Figure 32 December 15-16  
Blizzard area

### Peak Winds

Jamestown 54 mph

Cooperstown 46 mph

Oakes 46 mph

Valley City 44 mph

Devils Lake 39 mph



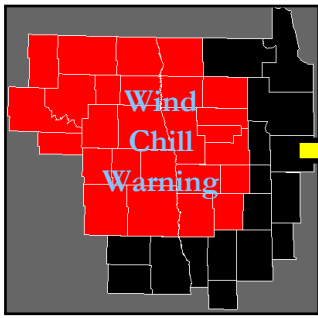


Figure 33 December 20-21  
Wind Chill Warning area  
(-40F to -50F wind chills)

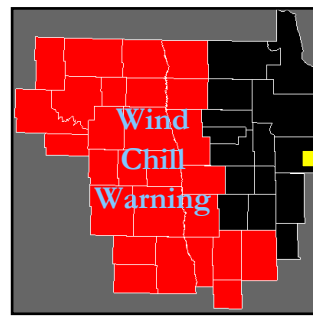
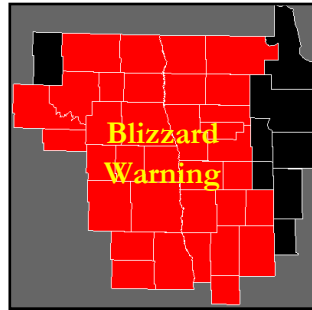


Figure 34 December 22-24  
Wind Chill Warning area  
(-40F to -50F wind chills)

Figure 35 December 22-23  
Blizzard area



Peak Winds  
Herman MN 52 mph  
Fergus Falls 49 mph  
East Grand Forks 48 mph  
Wahpeton 46 mph  
Lake Park MN 46 mph

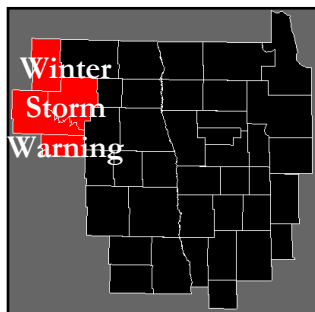


Figure 36 December 25  
Winter Storm area

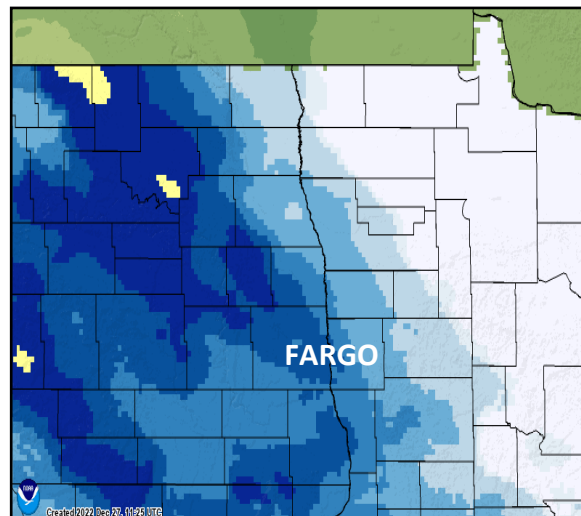
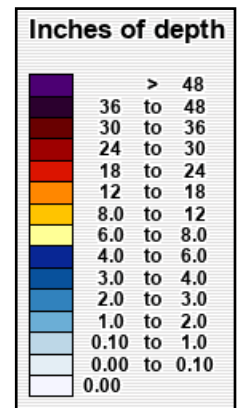


Figure 37 Observed Snowfall December 25  
(not exact for all areas)



## Long Term

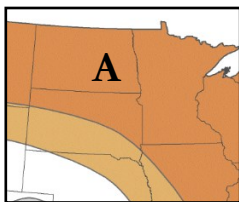


Figure 38 Temperature

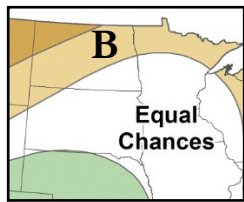


Figure 39 Precipitation

The latest Climate Prediction Center (CPC) temperature (Figure 38) and precipitation (Figure 39) outlooks for **December-January-February 2023-24** are shown to the left. For eastern North Dakota and the northwest quarter of Minnesota, the CPC is forecasting higher probabilities for above normal temperatures and mainly below normal precipitation.

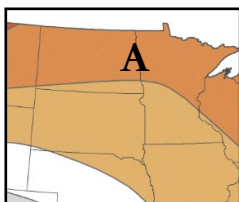


Figure 40 Temperature

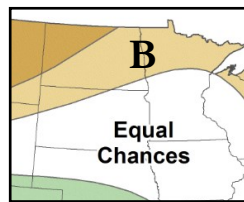


Figure 41 Precipitation

The latest Climate Prediction Center (CPC) temperature (Figure 40) and precipitation (Figure 41) outlooks for **January-February-March 2024** are shown to the left. For eastern North Dakota and the northwest quarter of Minnesota, the CPC is forecasting higher probabilities for above normal temperatures and mainly below normal precipitation.