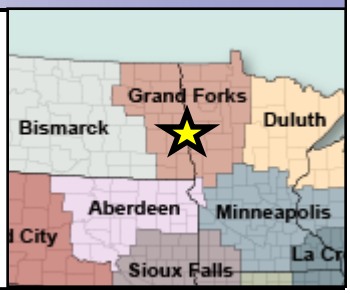
National Weather Service Grand Forks

Weather & Climate Review

August-September 2023



August

	AveT	TDept	THigh	TLow	Pcpn	PDept	Snow	AveW	WDept	Av>15	Av>20	PWnd	HDD	CDD	Tstms	DFog	Clear	PCldy	MCldy
DVL	68.1	0.9	92	45	0.79	-1.64	0.0	8.7	M	2	1	45	28	132	3	4	20	8	3
NWS GF	69.0	1.2	94	49	1.40	-1.63	0.0	M	M	M	M	M	16	149	M	M	M	M	M
GFK	68.3	1.3	96	45	1.14	-1.67	0.0	8.4	-0.1	3	0	45	21	131	8	4	8	20	3
RDR	68.0	1.0	96	42	0.75	-2.06	0.0	7.1	M	1	0	53	27	128	3	7	15	13	3
FAR	71.8	3.0	96	50	4.00	1.40	0.0	8.4	-0.6	2	0	42	3	222	7	3	19	10	2
BDE	67.2	2.5	89	48	0.69	-2.38	0.0	6.5	-0.1	0	0	42	17	93	5	5	15	12	4
PKD	69.0	2.3	92	46	1.20	-1.58	0.0	7.8	-0.1	1	0	43	12	143	6	2	15	15	1
BJI	65.7	0.6	88	43	1.45	-1.78	0.0	6.8	M	0	0	32	47	77	2	3	16	11	4
TVF	67.4	0.4	88	49	0.61	-2.89	0.0	8.2	M	1	0	40	21	103	4	3	17	11	3
Y63	71.1	2.9	97	51	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
AGA	64.1	-4.2	88	36	0.44	-2.81	0.0	M	M	M	M	M	M	M	M	M	M	M	M

Table 1 August 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.

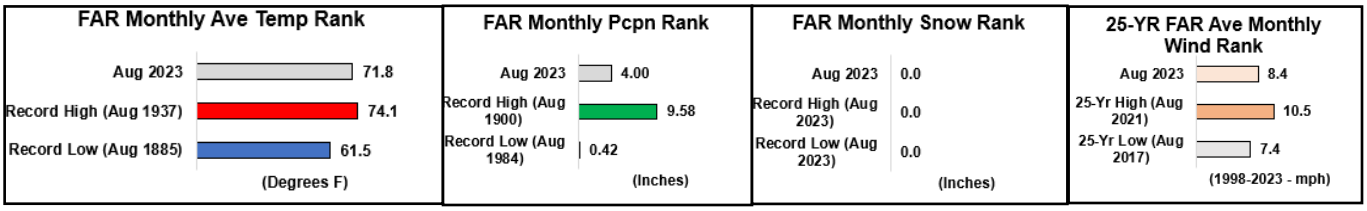


Figure 1 August 2023 Fargo Temperature, Precipitation, Snow & Wind Statistics Compared to Records

Per Table 1, for all sites except the Agassiz NWR, the August average temperature was slightly above normal, and all precipitation amounts (except Fargo) were below normal. The monthly average wind speed was slightly 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 August 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 shows August 2023 at Fargo was slightly above normal temperature wise, slightly higher on precipitation, and slightly below average for wind.

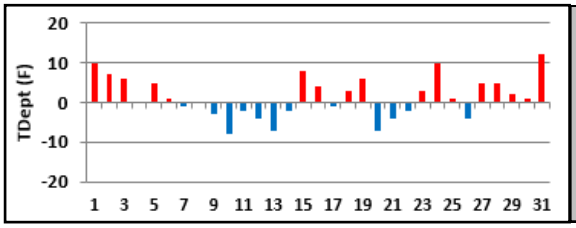


Figure 2 August Daily Departure from Normal Temperatures at the NWS Grand Forks ND

Blue Bars = Colder than Normal Days & Red Bars = Warmer than Normal Days

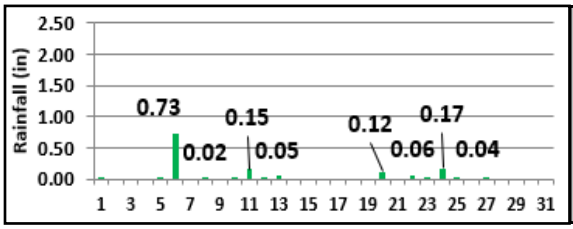


Figure 3 August Daily Rainfall Totals NWS Grand Forks ND

Figure 2 plots the daily departure from normal temperatures in August 2023 at the NWS Grand Forks. Most notably, there were a few more above normal days than below normal ones. Figure 3 shows the August daily rainfall totals at NWS Grand Forks. The highest total occurred on the 6th, with 0.73 inches of rain.

Figure 4 plots the daily cloud cover at the Grand Forks airport along with the daily solar radiation at the Agassiz NWR (only January through August are shown so far). There have been a high number of partly cloudy days (per Table 1 on the previous page), and the amount of solar radiation continues to fall. Figure 5 plots the Fargo highs and lows against the normals and records. For most of the month, the high and low line was pretty close to the normal high and normal low line.

Records

At Fargo-Moorhead, the rainfall of 3.11 inches on August 5th set a new record.

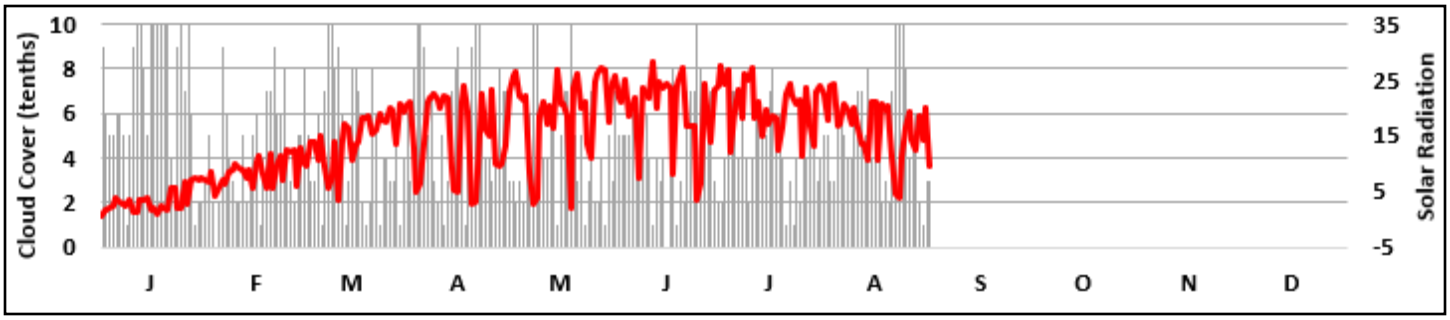


Figure 4 January to August 2023 - Grand Forks Airport cloud cover (tenths, in black) and Agassiz NWR solar radiation (MJ/M^2, in red)

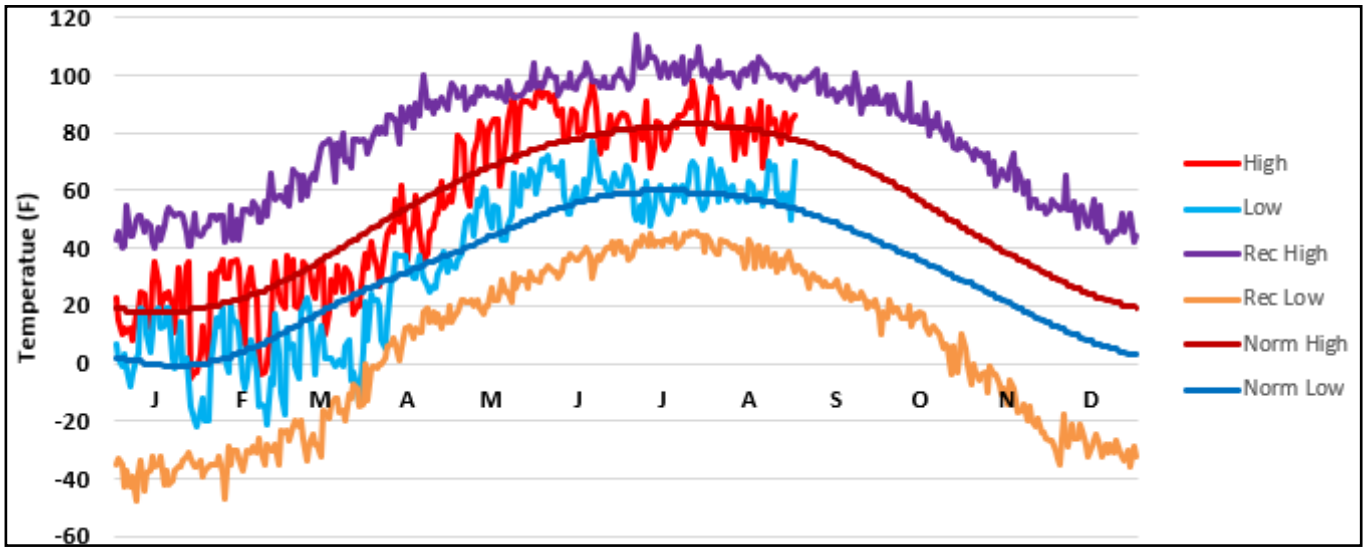


Figure 5 Fargo Airport January to August 2023 highs and lows compared to normal and records

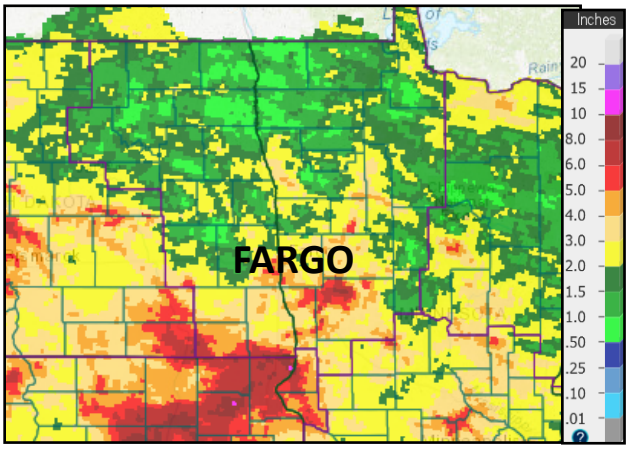


Figure 6 August Observed Precipitation

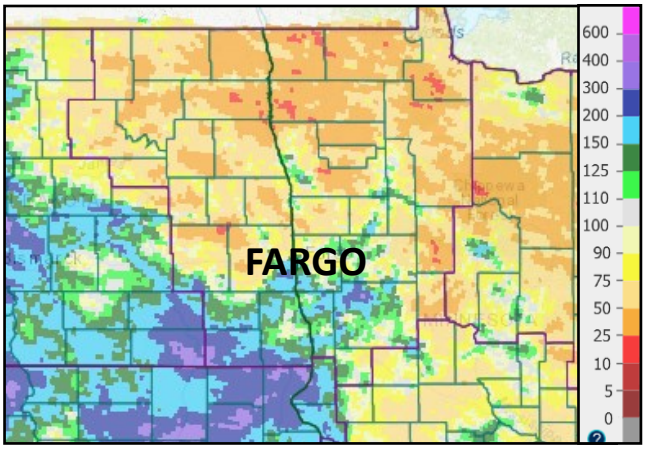


Figure 7 August Percent of Normal Precipitation

Figure 6 gives an August precipitation estimate for all of eastern North Dakota and the northwest quarter of Minnesota. The highest amounts of 4 to 6 inches (the orange and light red colors) were very spotty. The Fargo airport total of 4.00 inches was one of the spots. Figure 7 shows the August percent of normal precipitation. Other than the few areas mentioned above, the rest of the region had below normal amounts (the yellow to red colors), which represents about 5 to 90 percent of normal.

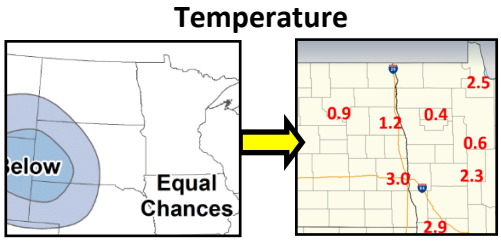


Figure 8 CPC Temp Outlook

Figure 9 Obs Temp Dept

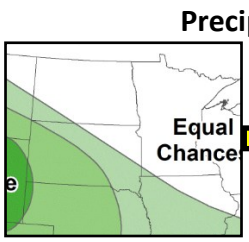


Figure 10 CPC Pcpn Outlook

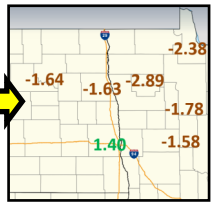


Figure 11 Obs Pcpn Dept

The August temperature (Figure 8) and precipitation (Figure 10) outlooks issued by the Climate Prediction Center (CPC) in late July are shown above. Compare these with the observed August departures from normal temperatures (Figure 9) and precipitation (Figure 11).

Longer Term Trends

Looking at just the Fargo climate site (FAR), Figures 12 and 13 show how August 2023 fits into the previous 5 months. Figure 12 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 13 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.

After a colder than normal March and April (Figure 12), three out of the past four months have been above normal. For precipitation, if the Fargo airport wouldn't have received the 3.11 inches on August 5th, it would have continued the dry trend (Figure 13).

Figure 14 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.

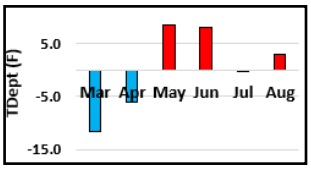


Figure 12 Monthly Departures from Normal Temps at Fargo, ND

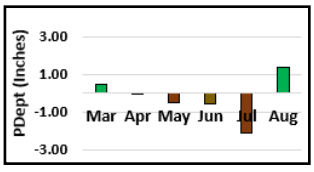


Figure 13 Monthly Departures from Normal Pcpn at Fargo, ND

	Observed Value	Normal	Departure from Normal	Last Year
Pcpn Since Jan 1	15.14	17.24	-2.10	18.05
Snow Since Jul 1	0.0	0.0	0.0	0.0

Figure 14 Yearly Precipitation & Seasonal Snowfall Trends at Fargo

U. S. Drought Monitor

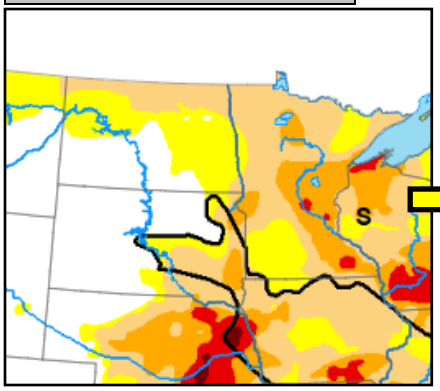


Figure 15 U. S. Drought Monitor, July 27

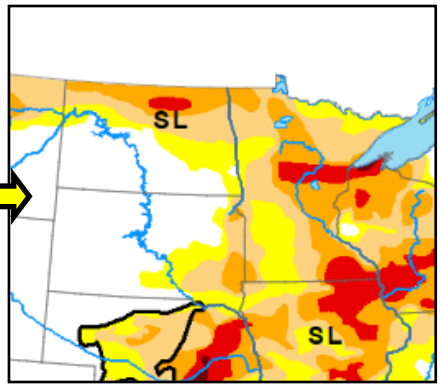
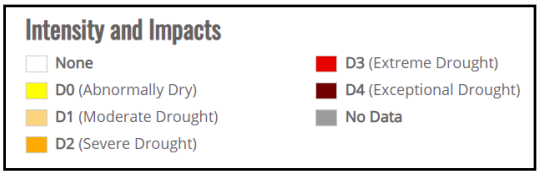


Figure 16 U. S. Drought Monitor, Aug 31

Several areas of D3 drought designation were included for the area on the U. S. Drought Monitor in late August 2023 (Figure 16). The key for both figures is shown below.



Soil Moisture

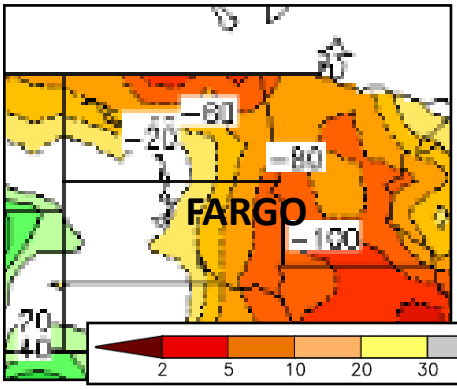


Figure 17 Soil Moisture Anomaly Jul 30

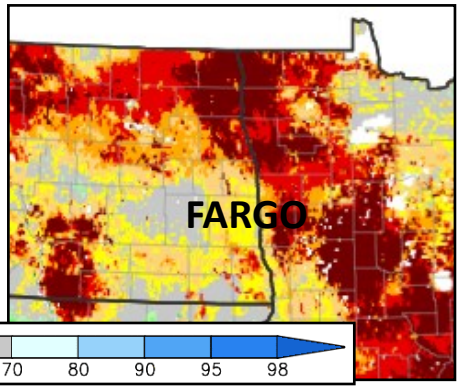


Figure 18 NASA 0-100cm Soil Moisture Aug 31

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.

NASA SPORT data appears to be fixed now, so Figures 17 and 18 are not comparing the same graphic this month. Figure 18 shows a little finer detail for drought monitoring. The driest soil moisture percentages stretch from Wadena to Mahnomen up into the northern Red River Valley.

Rivers

Gage heights on the Red River at Fargo (Figure 19) and Grand Forks (Figure 20) 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.

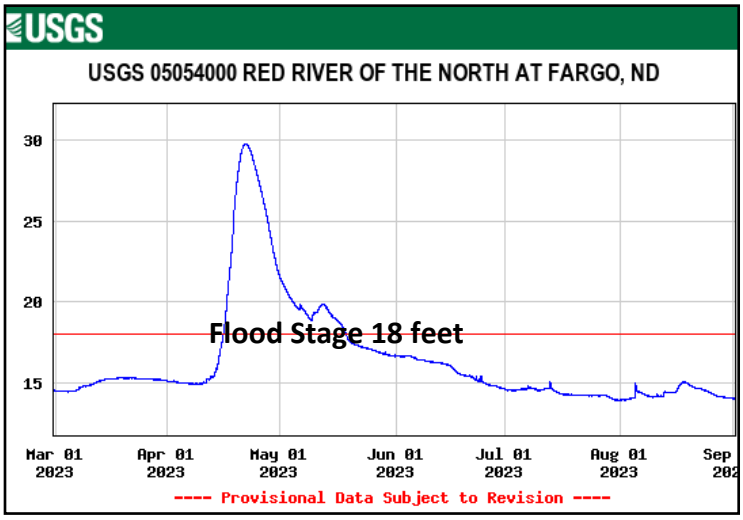


Figure 19 Red River Level at Fargo ND

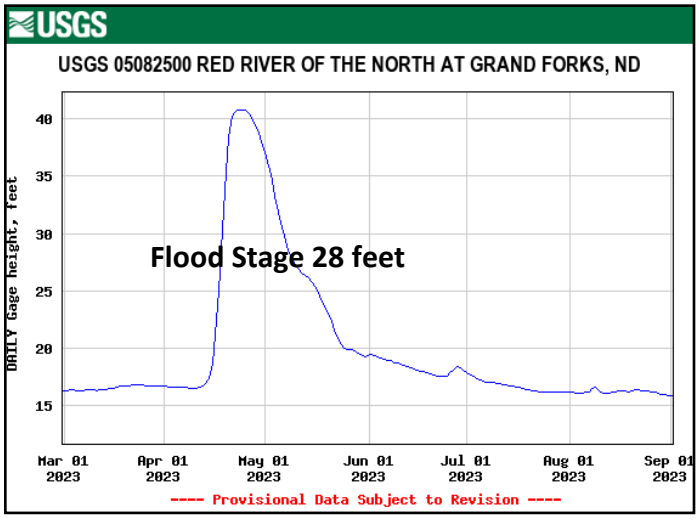


Figure 20 Red River Level at Grand Forks ND

Summer Warnings

August 2023 closed out with 16 Severe Thunderstorm and 2 Tornado warnings issued (Figure 21). August 1st was the most active day, when 6 Severe Thunderstorm and 2 Tornado warnings were issued. Figure 22 shows the 18 warning polygons that were issued in August. One Excessive Heat Warning was issued on August 22nd for Grant County, Minnesota, when temperatures in the middle 90s combined with dew points in the middle 70s. Finally, it has been a smoke-filled summer, with a number of Air Quality Alerts (AQA's) from the Minnesota Pollution Control Agency. Figure 24 shows the number of warm season days from 2017-2023 when AQA's were in effect for northwest Minnesota. 2023 does stand out. Figure 25 shows the actual warm season days in 2023 that had AQA's in effect for the northwest quarter of Minnesota.

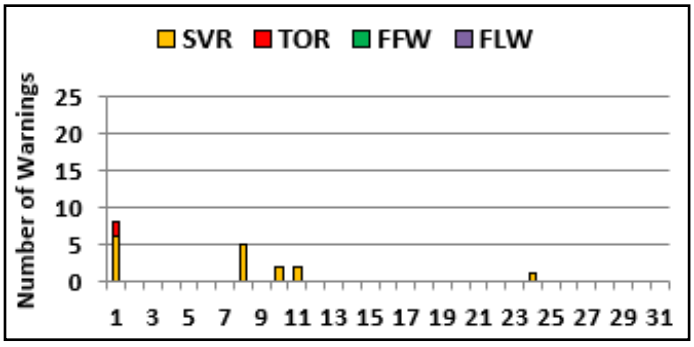


Figure 21 Number of August 2023 Warnings

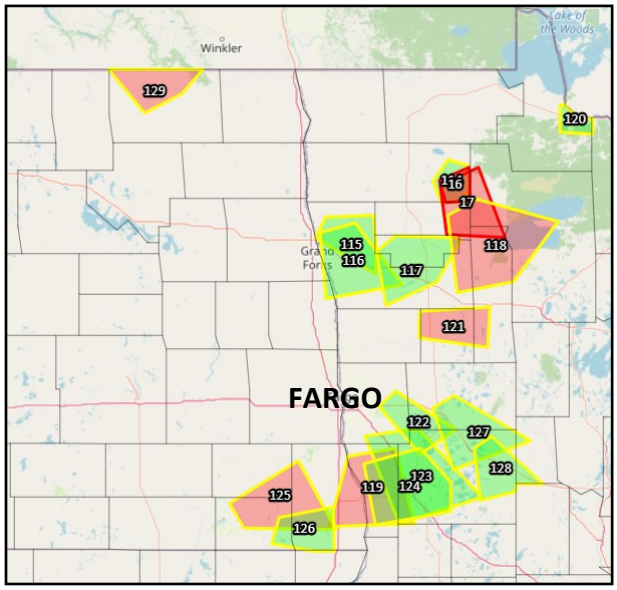


Figure 22 Warning Polygons for July 13th
Severe Thunderstorm Warnings have yellow borders,
Tornado Warnings have red borders

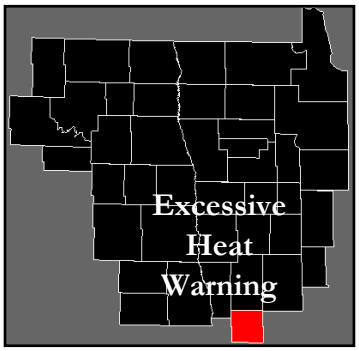


Figure 23 Excessive Heat Warning Aug 22nd

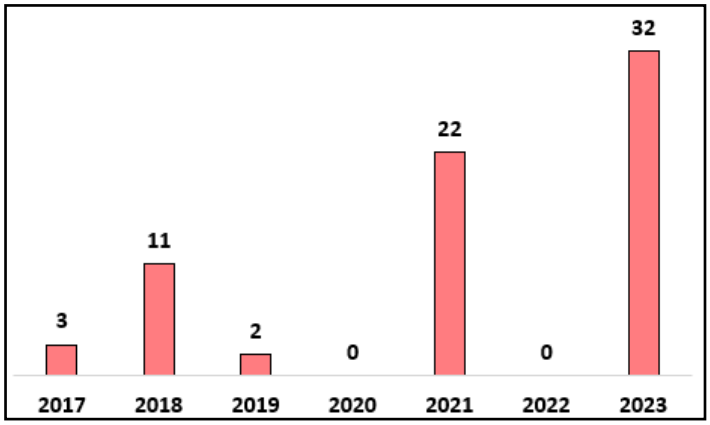


Figure 24 Number of Warm Season Days with Air
Quality Alerts (AQA's) across northwest Minnesota

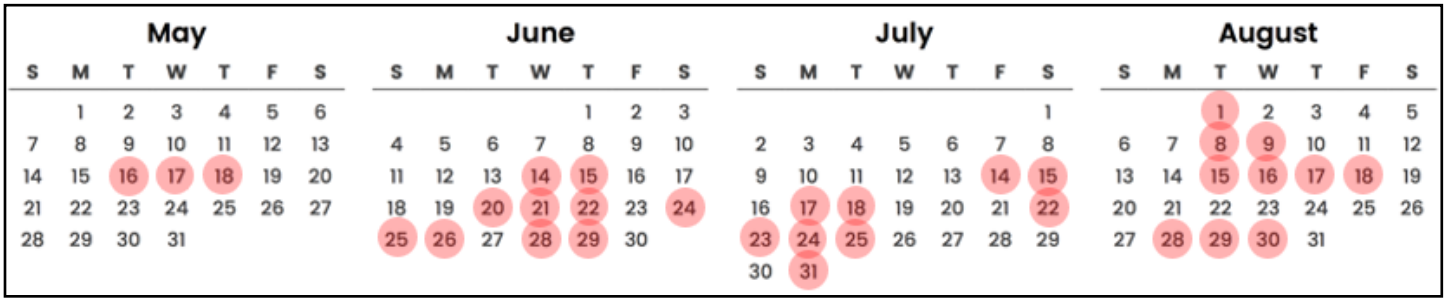


Figure 25 Days from May-August with Air Quality Alerts (AQA's) across the northwest quarter of Minnesota

Figure 26 shows the combined number of Severe Thunderstorm and Tornado warnings issued in 2023 (through August 31st) for all the NWS offices (146 at NWS Grand Forks). Figure 27 shows how the 146 warnings issued so far in 2023 compares to previous years (the 2023 total has been on the lower end).

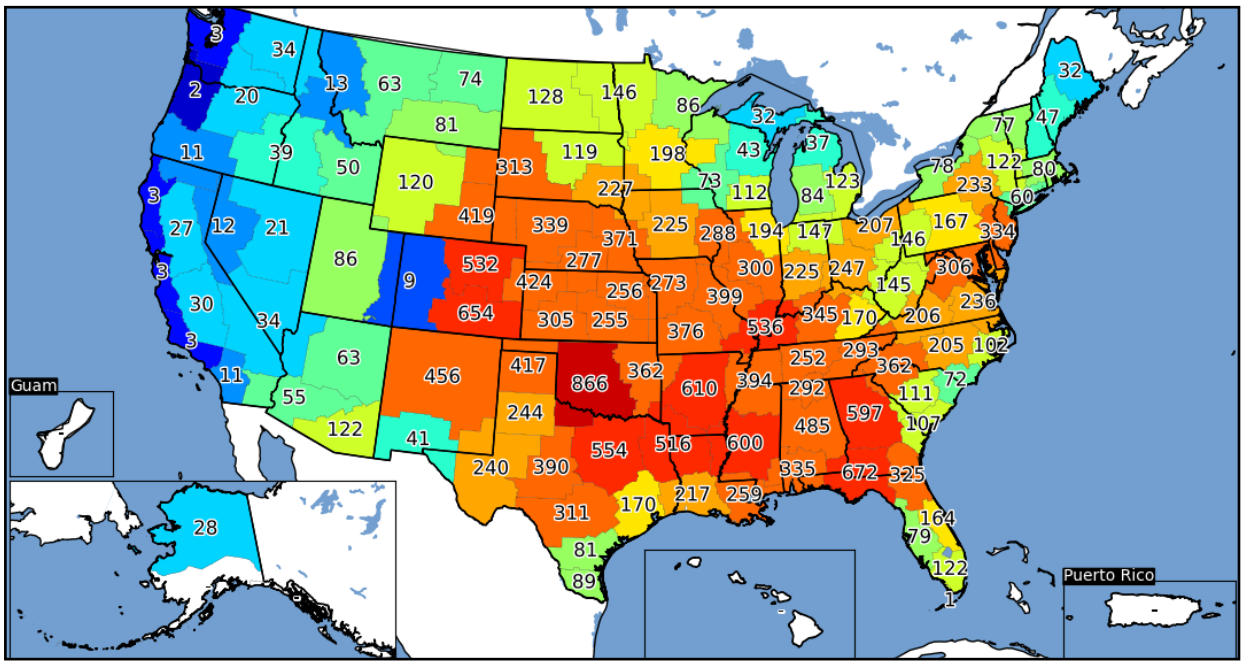


Figure 26 Number of combined SVR & TOR Warnings in 2023 (through August 31st) by NWS Office

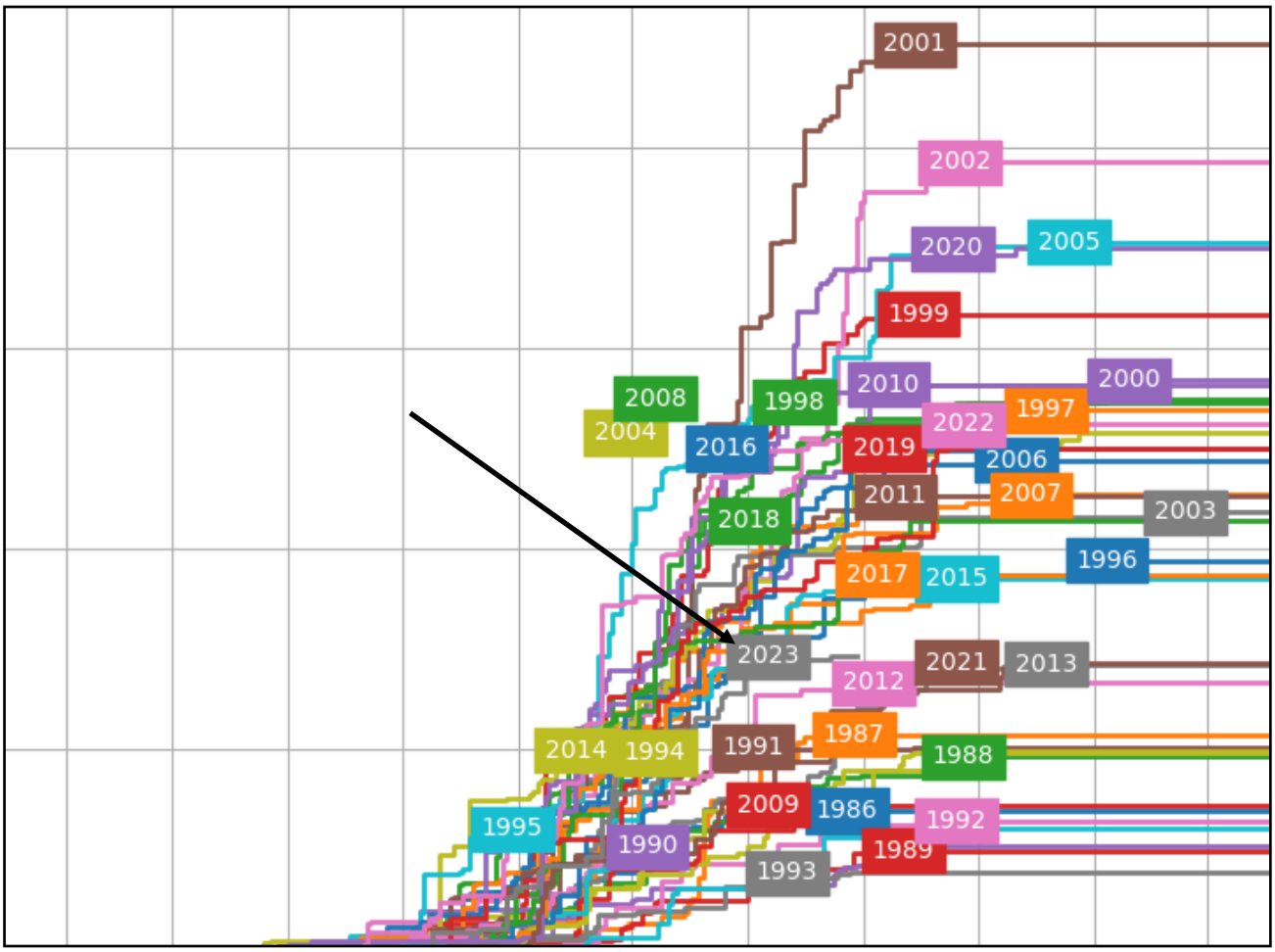


Figure 27 Number of combined SVR & TOR Warnings in 2023 (through August 31st) at NWS Grand Forks, compared to previous years

September

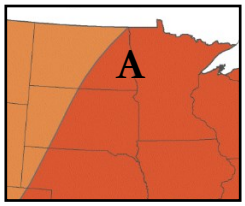


Figure 28 Temperature

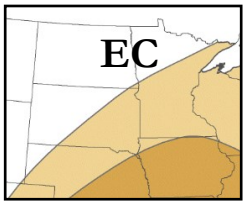


Figure 29 Precipitation

The latest Climate Prediction Center (CPC) temperature (Figure 28) and precipitation (Figure 29) outlooks for September 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 equal chances for above, normal, or below normal precipitation.

Sunrise/Sunset

Fargo, ND	Sep 1	Sunrise: 6:46 am	Sunset: 8:09 pm
	Sep 30	Sunrise: 7:24 am	Sunset: 7:11 pm

Last Year & Normals

Per Table 2, in September 2022, the monthly average temperature was slightly above normal at all sites, except the Agassiz Refuge. Precipitation amounts were below normal at all sites, except the Agassiz Refuge.

	AveT	TDept	THigh	TLow	Pcpn	PDept	Snow	PWnd
DVL	60.3	2.8	91	32	0.44	-1.52	0.0	39
NWS GF	60.9	2.4	89	36	0.43	-1.99	0.0	M
GFK	60.2	2.3	90	31	0.53	-1.73	0.0	41
RDR	59.3	1.4	90	29	0.15	-2.11	0.0	35
FAR	61.0	1.0	87	35	0.50	-2.18	0.0	46
BDE	58.8	3.0	88	31	1.11	-2.02	0.0	43
PKD	59.7	1.9	86	28	1.06	-1.64	0.0	44
BJI	57.4	1.2	85	25	1.29	-1.79	0.0	43
TVF	59.4	1.5	86	32	1.24	-1.57	0.0	39
Y63	62.0	2.2	88	36	M	M	M	M
AGA	55.3	-3.9	86	24	4.12	1.42	0.0	M

Table 2 Sep 2022 Temperature and Precipitation Statistics

Figure 30 shows normal highs and lows on September 1st for selected cities across eastern North Dakota and northwest Minnesota. Figure 31 shows how normal highs and lows change by September 30th. As an example, at NWS Grand Forks on September 1st, the normal high is 76 and the normal low is 53. By September 30th, the normal high falls to 63 and the normal low falls to 42. Figure 32 shows the normal precipitation amounts for a few selected sites. As an example, the normal precipitation at NWS Grand Forks in September is 2.42 inches.

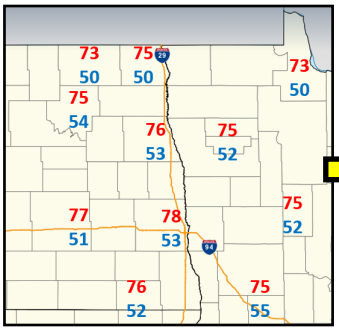


Figure 30 Normal Temps Sep 1

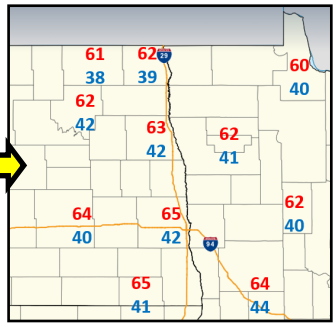


Figure 31 Normal Temps Sep 30

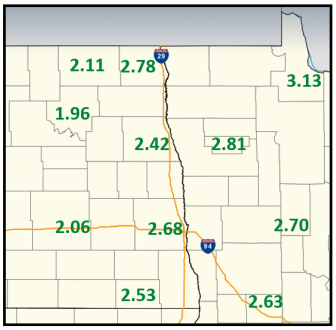


Figure 32 Normal Sep Pcpn

September 2022 Warnings

Figure 33 shows the number of convective warnings issued in September 2022. Three Severe Thunderstorm Warnings were issued on September 17th and three on September 19th. The preliminary severe weather reports from September 17th are shown in Figure 34 (green H = large hail report and blue W = strong wind report).

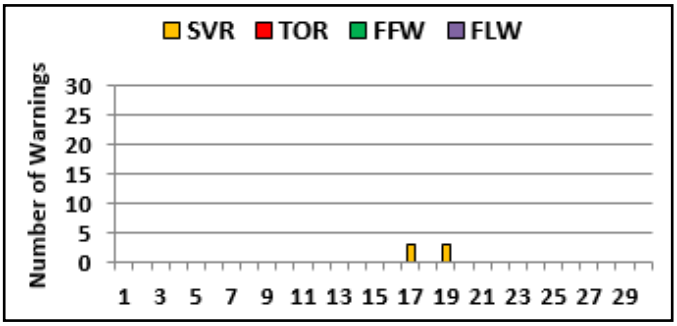


Figure 33 Number of Sep 2022 Warnings

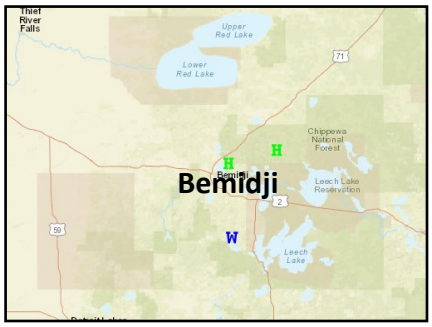


Figure 34 Severe Weather Reports from Sep 17th