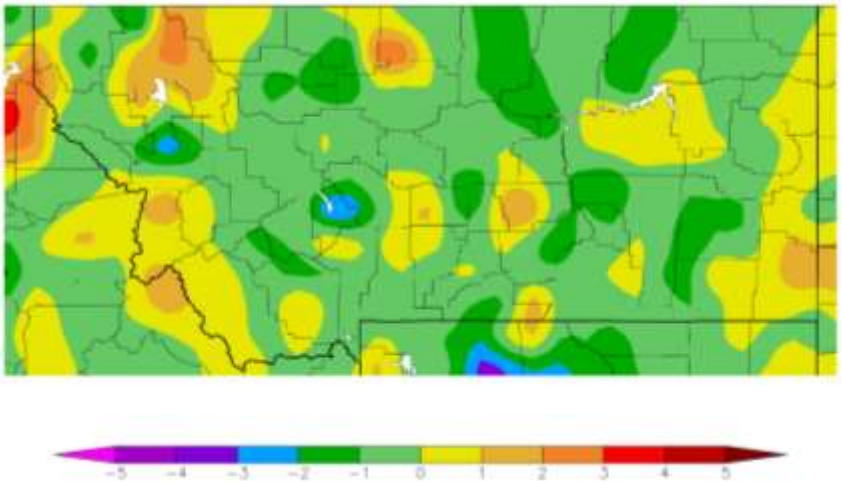
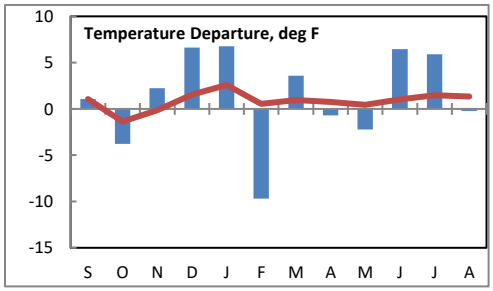
Montana Weather/Precipitation Summary

August 2021 NOAA's National Weather Service Great Falls Montana

Upper level flow was generally from the west over Montana for most of August (Fig. 1). Typically, a weak ridge is centered over the state. In Montana temperatures averaged a near normal. Several warm maximum temperature records were set. Precipitation was above normal over most of the state, except the eastern quarter. Winds averaged near normal.

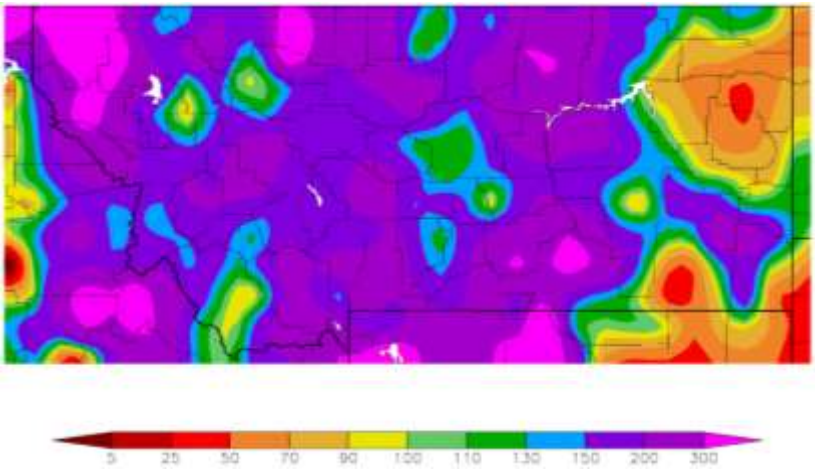
August temperature anomalies ranged from 1.2°F below normal at Butte to 1.2°F above normal at Kalispell. The map below shows the variation in departures. The warmest average temperatures were in southeast Montana. The warmest average of 73.7°F was at Broadus (Powder River), while the coolest was 50.3°F at Placer Basin (Sweet Grass). The highest temperature was 105°F at Hardin (Big Horn) on the 17th. The coldest was 21°F at Gates Park (Lewis and Clark) on the 24th. This range of 84°F is slightly above the August average range of 83°F and the largest since 2017. The statewide temperature average of 66.7°F was 0.2°F below normal and the 68th coolest of record. It was the coolest since 2018. The red line on the graph shows the cumulative 12-month departure from normal, which was 1.3°F above normal. See the state summary and temperature tables below for more details.

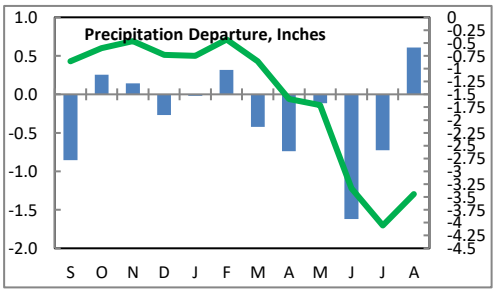




Temperature departure from normal (HPRCC)

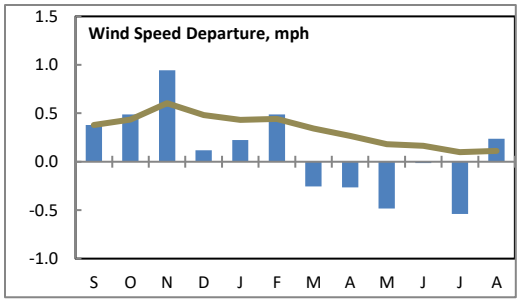
Precipitation was heaviest portions of northwest and southwest Montana. All but the eastern quarter of the state received above normal precipitation. The highest amount (8.10-inches) fell at Stahl Peak SNOTEL (Lincoln), with 4.19-inches falling at Eureka. The month's statewide composite of 1.81" was 0.61" above normal. This ranks as the 21st wettest August of record for Montana, and the wettest since 2014. The green line on the precipitation graph (right) shows the cumulative 12-month departure from normal, which is now 3.45" below normal, and the driest 12-month period since 1988.



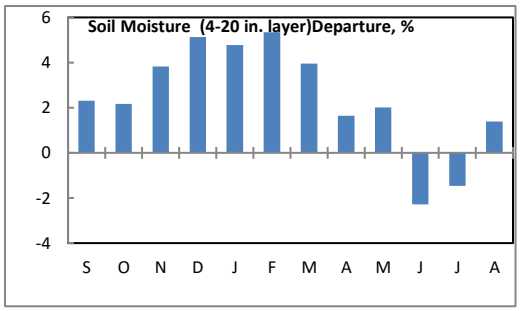


Precipitation percent of normal (gauge only)

Wind speed averages were near normal. Statewide, the month ranked as the 30th calmest August, with an average speed of 8.0-mph, or 0.2-mph above normal. The strongest averages were along the Rocky Mountain and Livingston area. The brown line of the wind graph to the right shows the 12-month cumulative statewide wind departure from normal, which is 0.1-mph above normal.



Above normal rains across much of the state have pushed soil moisture values to slightly above normal. Still, August ranked 9th driest and the driest August soils since 2018 (records since 1995).



Refer to NCEI's State of the Climate report for the latest monthly discussion: http://www.ncdc.noaa.gov/sotc/

August started warm, as much as 10 to 15 degrees above normal. Some daily record high temperatures were tied or set on the 1st. Thunderstorms with heavy rain brought some localized flash flooding to Bozeman on the 2nd. Severe thunderstorms produced one-inch hail over eastern Great Falls on the 4th. Thunderstorms on the 5th brought high wind gusts. Helena had a gust to 63-mph, which was their highest August gust since 1976 and 4th highest for August overall. Livingston had a gust to 65-mph. Strong thunderstorm gusts occurred again on the 8th. Miles City had a gust to 65-mph, which was their highest August gust since 2009. Logan reported a gust to 67-mph as well. Heavy rain fell along the Rocky Mountain Front and northern portions of the area. One to 1.5-inches of rain fell. Temperatures warmed again and on the 14th, some record high temperatures were set. Cut Bank tied their daily record. This occurred again on the 16th, when Helena tied their daily record. Hot and dry conditions in eastern Montana produced low relative humidity values. At Sidney, they recorded their 5th lowest all-time relative humidity (10.7-percent). This was their lowest relative humidity value since April of this year.

Thunderstorms with a cold front produced gusty winds on the 17th. Dillon recorded a gust to 69-mph, which was their second highest gust of record for August. As the cold front pushed through Bozeman, 63-mph gusts were recorded. These winds continued across eastern Montana as the front moved east. Flaxville reported a gust to 60-mph on the 17th. Cooler air and precipitation settled over the area from the 17th-18th. Great Falls recorded 1.61-inches in a 24-hr period, which was their 9th highest 24-hr amount of record for August. On the 18th, Great Falls reached only 48F for a high temperature. This was their earliest high of less than 50F of record. The previous record was August 22, 1992 when the high was only 38F. This also occurred at Lewistown. Record low maximum temperatures were set across the region on the 18th. Point Six (Missoula) recorded a high temperature of only 38°F. This was the earliest sub-40°F maximum temperature in the climatological record of Montana. The previously earliest such record was 33°F at Marias Pass on August 22, 1992. From the 18th-20th, 1.5- to 2-inches of rain fell from the southwest through central portions of Montana.

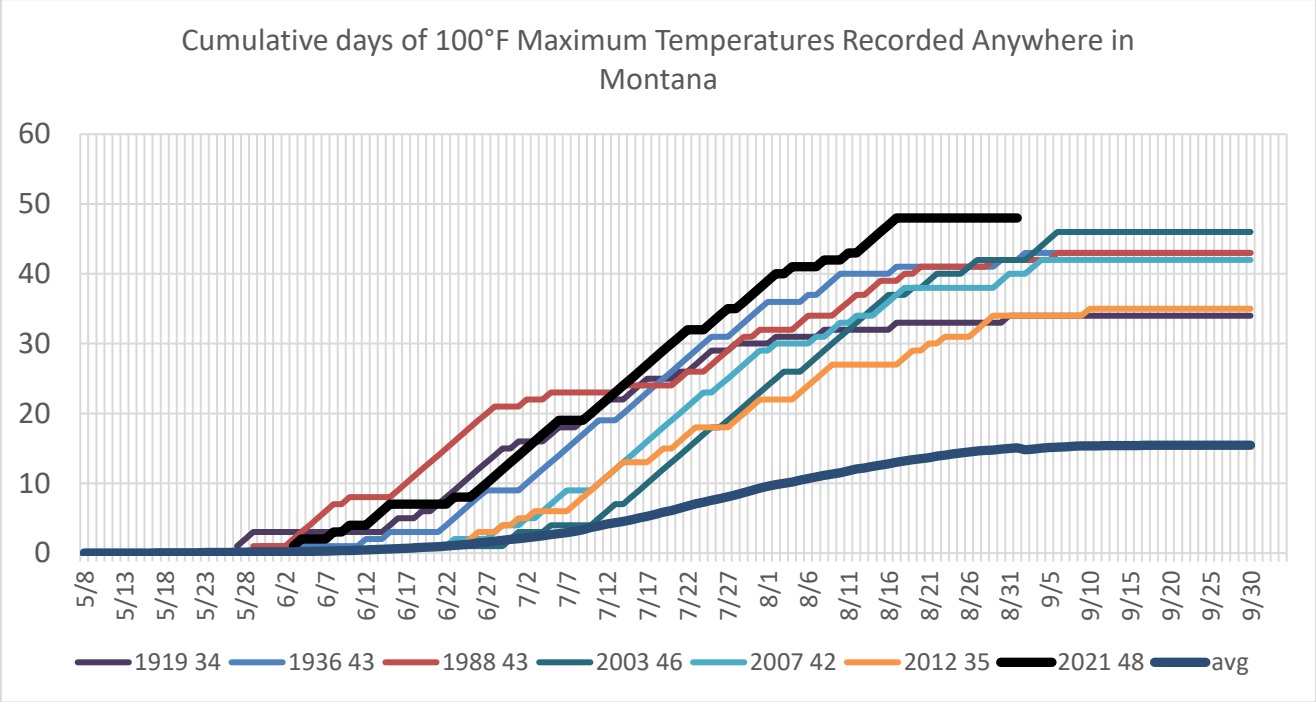
Isolated thunderstorms with heavy rain dropped over one inch of rain near Boulder and Monarch on the 22nd, and again on the 26th, areas of heavy rain and hail fell over central Montana. Hail to 1.25-inches fell near Tiegen (Petroleum). On the 30th, a collapsing thunderstorm produced wind gusts of 79-mph at Bozeman airport. This was a new all-time high gust at the airport. The old record was 78-mph set July 30, 1957.

Smoke continued to plague the state in August. At Great Falls, with smoke information through August, this has caused this year to have the highest visibility restrictions of less than 10 miles since records began in 1994. There have been nearly 390 hours (equivalent of 16-days) with less than 10-miles visibility recorded at Great Falls this season. The previous high through August was 271-hours in 2017. Cut Bank has the highest number of hours of visibility restriction for the

season, recording 735-hours of less than 10-miles visibility due to smoke. This is the equivalent of 31-days. The following table summarizes smoke hours for select sites across Montana during August.

Location	August 2021 hours of smoke vsby <10 miles (hrs)	Record or Previous record (hrs)	2021 season hours of smoke vsby <10 miles (hrs)	Record or Previous record (hrs)	Records began
Billings	165	140 hrs in 2018	276	161 hrs in 2015	1998
Glasgow	119	196 in 2018	231	269 in 2015	1994
Great Falls	152	213 in 2015	388	271 in 2017	1994
Missoula	240	459 in 2017	637	706 in 2017	1998

A high temperature of 100°F or higher was recorded on 10 days anywhere in the state during August. The record for August is 12 days set in 2012. The following chart shows the accumulation, along with other years with high accumulations. This year exceeded previous year's records on July 14, and has maintained that edge since.



The highest daily temperatures in August occurred on four days near Troy, Libby, Plains and Hardin. Gates Park had the state's lowest temperature on ten days. For the year through August, Troy has been the state's warmest on 33 days and West Yellowstone has been coolest on 44 days. The state's warmest daily temperature has been in the western climate division on 105 days and coldest was in the southwest division on 130 days.

Water Year-to-date

For the water-year through August, the state composite temperature averaged 43.5°F, which was 1.4°F above normal. This has been the warmest water year since 2016. Precipitation totaled 11.20-inches, which was 2.79" below normal and 22nd driest. This was the driest since 2003. Winds averaged 9.0-mph, which is 0.1-mph higher than normal, ranking 25th calmest.

Calendar Year-to-date

The calendar year has produced a composite temperature average of 47.1°F, which was 1.4°F above normal. This is the warmest such period since 2015. Precipitation totaled 8.23-inches, which was 2.71" below normal and driest since 1988. This has been the 5th driest start to a year.

Statewide winds averaged 8.8-mph, which is 0.1-mph below normal. This was the 16th lowest average of record.

June-August (Summer)
Persistently warm temperatures during June and July caused the warmest June and July combined in 33 years. Cooler conditions in August produced the 5th warmest summer period of record. The average temperature for Montana for this period was 69.2°F, which warmest since 69.7°F in 1988. Precipitation has been variable during these three months. In June, some areas of the northeast received heavy rain, then were dry the rest of the time. Other areas were dry in June and July, then received above normal rain in August. All-told, these three monthly have been the 14th driest of record, with an average of 3.23-inches, which is 1.74-inches below normal. Winds averaged 8.1-mph, which is 0.1-mph below normal. This was the 19th calmest summer period.

Precipitation/convection
Severe convective weather occurred on 10 days in August, which is two days above normal. Thunderstorm gusts reached a record 79 mph at Bozeman Airport on the 30th, and 1.25-inch hail fell near Tiegen (Petroleum) on the 26th.

August information:

High Temperature	105°F at Hardin (Big Horn) (17th)	**Greatest Precip**	4.19" at Eureka (Lincoln)
Low Temperature	21°F at Gates Park (Lewis and Clark)(24th)		7.50" at Stahl Peak SNOTEL (Lincoln)
Warmest Ave Temp	73.7°F at Broadus (Powder River)	**Peak Wind Gust**	79 mph at Bozeman Apt (Gallatin) (30th)
Coolest Ave Temp	50.3°F at Placer Basin (Sweet Grass)		
Range of Temp departures	-1.2°F at Butte to +1.2°F at Kalispell	**Highest Ave Wind**	13.6 mph at Deep Creek RAWS 11.7 mph at Livingston
21 city mean monthly Temperature/Nrml	66.7/66.9F normal. 68th coolest of record (since 1880). 47th percentile.	**20 city mean monthly wind speed/Nrml**	8.0 mph/7.8 mph; 30th calmest of record (since 1936). 35th percentile.
22 city mean monthly precipitation/Nrml	1.81"/1.20" – 151% of normal. 21st wettest of record (since 1880). 84th percentile.		

Historical Rank of Precipitation (inches) for the Current Month and Water Year to Date

Location	Aug	% of Norm	Rank	Pcntl	Oct 1 - Aug	% of norm	Rank	Pcntl	Years
Baker	1.89	138%	26	80	6.92	52%	91	97	94
Billings	2.44	280%	4	3	10.29	79%	69	59	117
Belgrade	1.92	204%	11	12	9.68	78%	77	92	84
Butte	1.62	127%	36	28	6.66	57%	117	92	127
Cut Bank	1.67	174%	33	28	8.93	92%	79	70	113
Dillon WMU	0.97	110%	56	45	7.39	71%	111	92	121
Glasgow	1.51	119%	32	24	7.77	63%	105	87	121
Great Falls	2.18	179%	23	17	12.71	95%	71	55	129
Havre	1.03	112%	63	44	7.36	68%	128	91	141
Helena	1.98	190%	15	10	9.75	93%	83	58	142
Jordan	2.06	191%	14	13	8.00	68%	81	86	94
Kalispell	1.73	228%	25	19	15.09	97%	54	42	127
Lewistown	2.19	130%	31	24	11.13	71%	119	95	125
Livingston	2.91	272%	4	3	12.04	90%	74	64	115
Miles City	1.45	159%	43	29	7.42	63%	135	94	144
Missoula	1.55	187%	26	18	12.09	92%	79	58	135
Mullan Pass	2.91	305%	10	11	42.87	114%	20	23	82
Wolf Point	1.09	73%	46	49	8.27	74%	64	88	73
Glendive	1.32	94%	51	40	7.39	55%	115	96	120
Sidney	1.34	96%	37	44	7.15	53%	77	95	81
BZN-MSU	3.31	257%	4	2	16.60	91%	68	48	142
W Yellowstone	3.21	307%	6	4	20.72	101%	38	38	98

Rankings and Percentiles are 1=wettest, higher numbers=drier.
For an automated version of this chart, updated daily, go to
http://www.wrh.noaa.gov/tfx/dx.php?wfo=tfx&type=&loc=products&fx=PCPNTOTALS

Historical Rank of Average Temperature (°F) for the Current Month and Water Year to Date

Location	Aug	Normal	Rank	Pcntl	Oct 1 - Aug	Normal	Rank	Pcntl	Years
Baker	69.1	65.8	60	54	44.5	41.4	17	15	107
Billings	70.7	71.6	58	46	48.0	47.0	12	9	117
Belgrade	65.3	65.8	43	49	42.8	41.7	14	15	86
Butte	60.3	61.8	89	69	39.7	38.9	49	38	127
Cut Bank	63.4	63.9	57	50	41.7	40.7	29	25	112
Dillon	63.0	63.4	56	71	41.9	40.7	35	45	77
Glasgow	71.0	71.0	34	27	45.1	42.4	8	6	125
Great Falls	66.2	66.7	80	62	44.5	43.4	54	43	124
Havre	68.0	68.4	60	42	44.0	42.3	26	18	141
Helena	68.9	68.8	35	24	46.4	44.3	7	4	141
Jordan	70.5	69.7	47	46	45.4	42.9	15	15	96
Kalispell	65.2	63.7	32	25	44.2	42.1	46	38	120
Lewistown	65.0	65.4	53	43	42.8	41.9	35	30	116
Livingston	66.8	66.5	54	46	45.7	44.4	27	23	115
Miles City	71.5	72.5	85	60	46.4	44.8	26	18	139
Missoula	67.4	67.2	46	35	45.6	44.0	19	14	126
Mullan Pass	59.3	60.2	22	49	38.9	37.1	4	7	44
Wolf Point	68.9	69.9	44	58	43.2	41.6	18	24	71
Glendive	74.4	72.3	22	17	45.0	44.9	42	35	120
Sidney	69.0	70.0	44	44	43.6	43.2	44	45	98
W Yellowstone	56.7	57.5	57	49	33.8	33.8	53	47	113

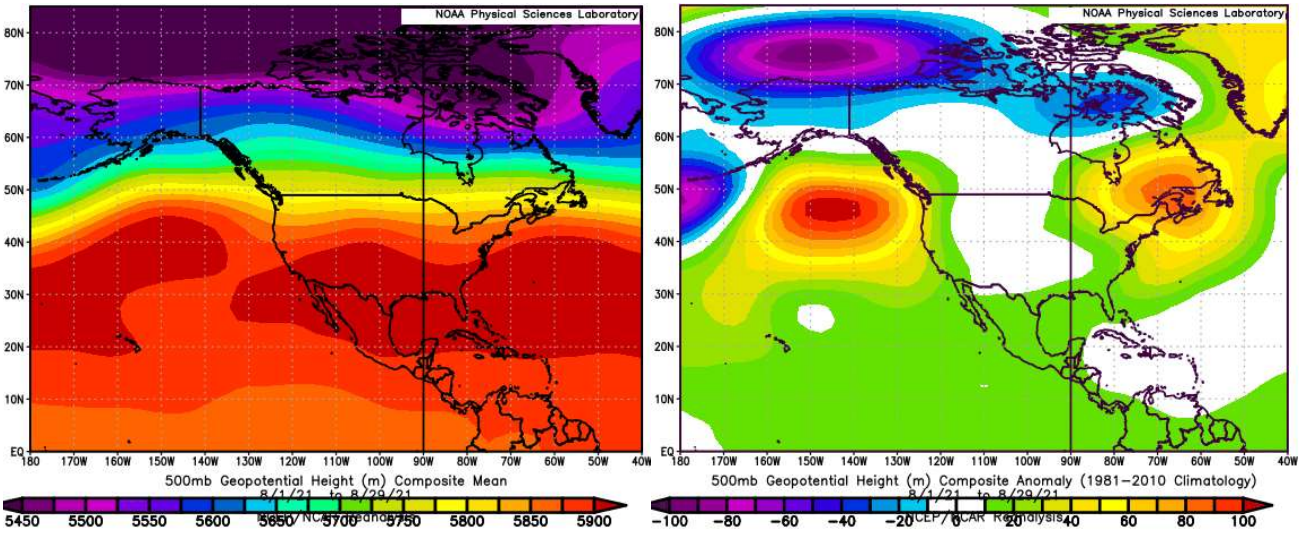
Rankings and Percentiles are 1=coldest, higher numbers=warmer.

Historical Rank of Average Wind Speed (mph)
for the Current Month and Water Year to Date

Location	Aug	Normal	Rank	Pcntl	Oct 1 - Aug	Normal	Rank	Pcntl	Years
Baker	10.3	10.0	7	25	10.9	11.1	16	68	23
Billings	8.8	8.8	68	78	10.9	10.8	55	64	85
Belgrade	5.9	6.0	37	65	5.6	5.7	37	65	56
Butte	5.5	6.1	45	77	5.6	5.9	41	71	57
Cut Bank	11.1	10.4	27	34	13.3	13.3	40	50	79
Dillon	8.0	7.5	32	46	9.5	9.1	31	45	67
Glasgow	10.8	10.6	28	36	10.5	10.6	45	59	76
Great Falls	9.4	9.0	49	58	11.9	11.5	45	54	83
Havre	9.4	8.7	23	17	10.5	9.9	21	15	132
Helena	6.7	6.3	87	61	6.8	6.7	99	70	141
Jordan	8.8	7.9	6	14	8.8	8.2	4	8	38
Kalispell	4.8	5.3	112	91	5.4	5.2	110	90	122
Lewistown	8.0	7.7	43	55	9.3	9.4	55	69	79
Livingston	11.7	10.4	13	21	15.2	15.1	26	47	54
Miles City	9.6	9.4	44	33	9.7	10.1	63	48	130
Missoula	5.1	5.5	69	80	5.0	5.1	69	80	86
Mullan Pass	3.3	4.7	32	100	4.8	5.5	28	93	30
Wolf Point	8.4	7.5	5	18	8.0	8.1	17	73	23
Glendive	9.7	9.4	14	48	10.0	10.1	15	52	29
Sidney	8.6	7.7	6	23	9.1	8.9	12	38	32
W Yellowstone	5.1	5.1	7	55	6.2	6.1	#N/A	#N/A	6

Rankings and Percentiles are 1=windiest, higher numbers=calmer.

Figure 1. Mean flow at 500 millibars (~18,000 ft) for this month (left) and climatology for the month (right) (from NOAA/ESRL Physical Sciences Laboratory).



For the latest information on mountain snowpack from the NRCS, go to: https://www.nrcs.usda.gov/wps/portal/wcc/home/quicklinks/

For the latest U.S. Drought Monitor, issued weekly by the National Drought Mitigation Center, USDA and NOAA, go to: http://droughtmonitor.unl.edu/

These data are preliminary and have not undergone final QC by NCEI. Therefore, these data are subject to revision. Final and certified climate data can be access at the National Centers for Environmental Information (NCEI) http://www.ncei.noaa.gov. Many more links are on the Drought Information Page of the NWS Great Falls web site at http://www.wrh.noaa.gov/tfx/main/drought.php?wfo=tfx. The climatological record for normals is 1991-2020. The ranking period for temperature, precipitation and snowfall is since 1880. The ranking period for wind speeds is since 1936. The ranking period for soil moisture is since 1995.