

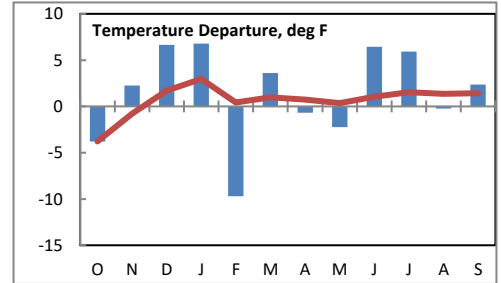
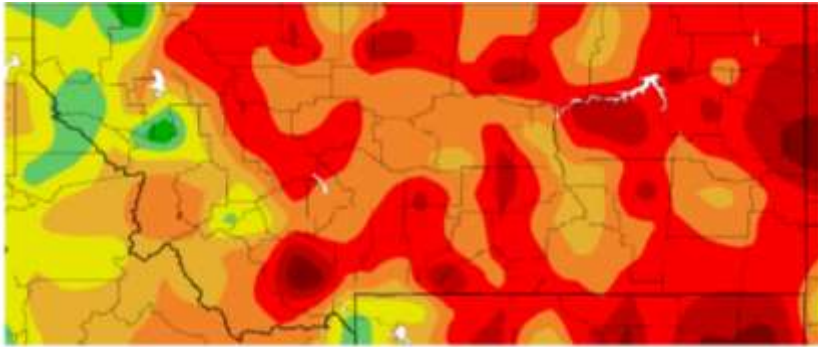
Montana Weather/Precipitation Summary

September 2021 NOAA's National Weather Service Great Falls Montana

This summary will be discontinued in 2022.

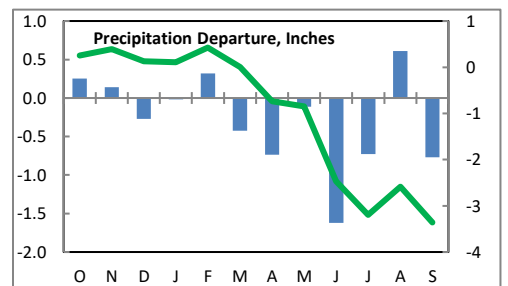
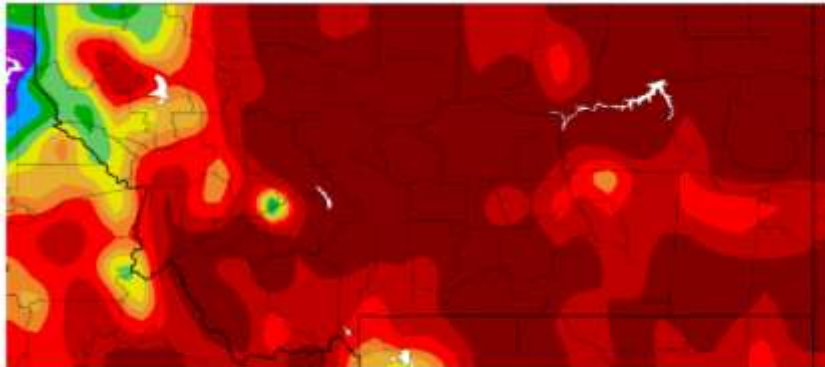
Upper level flow was generally from the west over Montana for most of September (Fig. 1). Typically, a weak ridge is centered over the state. This year it was a bit stronger than normal. In Montana temperatures mostly averaged above normal. Precipitation was mostly below normal, with winds averaging near to slightly above normal.

September temperature anomalies ranged from 0.2°F below normal at West Yellowstone to 4.6°F above normal at Glendive. The map below shows the variation in departures. The warmest average temperatures were in southeast Montana. The warmest average of 66.7°F was at Glendive, while the coolest was 46.1°F at Elk Park (Jefferson). The highest temperature was 100°F at Saint Marie (Valley) on the 18th. The coldest was 10°F at Elk Park (Jefferson) on the 30th. This range of 90°F is normal for September. The statewide temperature average of 59.4°F was 2.4°F above normal and the 24th warmest of record. It was the warmest since 2013. The red line on the graph shows the cumulative 12-month departure from normal, which was 1.4°F above normal. See the state summary and temperature tables below for more details.



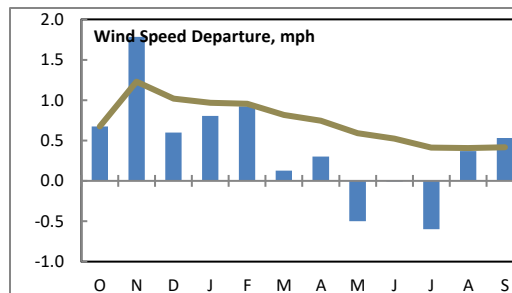
Temperature departure from normal (HPRCC)

Precipitation was heaviest over portions of northwest and southwest Montana. Most of the state had much below normal precipitation. The highest amount (7.70-inches) fell at Stahl Peak SNOTEL (Lincoln), with 1.91-inches falling near Ronan. The month's statewide composite of 0.39" was 0.77" below normal. This ranks as the 11th driest September of record for Montana, and the driest since 2012. The green line on the precipitation graph (right) shows the cumulative 12-month departure from normal, which is now 3.36" below normal, and the driest 12-month period since 1988.

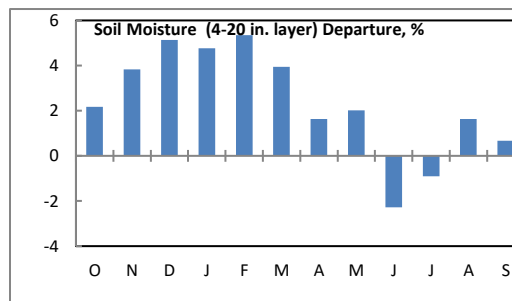


Precipitation percent of normal (gauge only)

Wind speed averages were near to above normal. As an average, the state's winds ranked as the 35th calmest for September, with an average speed of 8.5-mph, or 0.5-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 0.4-mph above normal.



Generally below normal precipitation has caused soil conditions to continue to dry out. The values for September are the lowest for the month since 2018, and 7th driest of record (since 1995).



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

September began with below normal temperatures. Some freezing temperatures occurred mostly at higher elevations. Warming began on the 4th, with temperatures reaching the lower and mid 90s over portions of the state through the 10th. A cold front brought strong thunderstorm winds to southwest Montana on the 9th and 10th. Dillon recorded a gust of 63-mph on the 10th, which is their second highest gust of record for September. The highest is 70-mph occurring in 2002. There were some smoky days during this period of warmth as well. Cooler temperatures followed the cold front, with some areas of central Montana experiencing their first freezing temperatures by the 16th and 17th. Heavy rain fell over higher elevations of northwest Montana from the 10th-13th. Gates Park (Lewis and Clark) reached a low of 11°F on the 17th. Temperatures rapidly rebounded, with a high of 100°F reported at Saint Marie (Valley) on the 18th. This was the latest in the year for a temperature of 100°F in the state since 2001, ranking as the 5th latest of record. Normal for the latest is August 31. Wolf Point recorded a relative humidity of 7% on the 18th. This set a low record for September and ranked second lowest overall at Wolf Point. It was also very windy across southwest Montana with Livingston recording their 4th windiest September day of record. Their average daily speed of 26.9-mph was their windiest day in September since 2013. Helena recorded their 4th highest gust of record for September (60-mph). This was their highest September gust since 2016. Cut Bank recorded a gust to 62-mph...all on the 18th. While very warm temperatures prevailed over eastern Montana, snow was falling at higher elevations of central and western Montana. A few inches accumulated at locations such as Lone Mountain and a trace was observed at West Yellowstone. Heavy rain again fell over the higher elevations of northwest Montana.

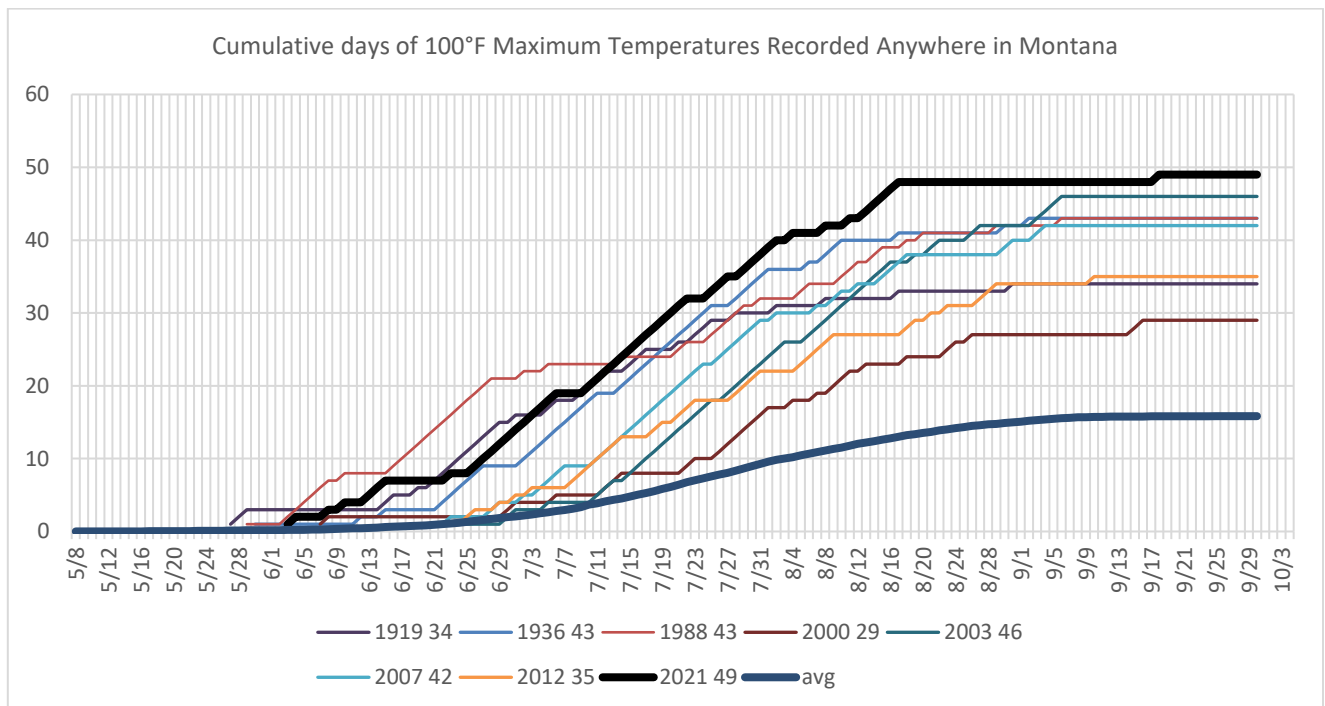
Warm and dry conditions prevailed for the rest of the month. On the 28th, Glendive recorded a low humidity of 10.8%. This was their 3rd lowest of record for September and 7th lowest overall. Additionally, Baker recorded a maximum temperature of 99°F. This tied for the state's latest high temperature of 99°F, which was set at Brandenburg in 2001.

Periods of smoke continued in September. At Great Falls (with smoke data through September) this year has the highest number of hours of visibility restrictions of less than 10 miles since records began in 1994. There have been over 482 hours (equivalent of 20-days) with less than 10-miles visibility recorded at Great Falls this season. The previous high through September was 271-hours in 2017. Of airport locations, Cut Bank had the highest number of hours of visibility restriction for the season, recording 802-hours of less than 10-miles visibility due to smoke. This is the equivalent of 33-days. The following table summarizes smoke hours for select sites across Montana for the season.

Location	2021 season hours of smoke vsby <10 miles (hrs)	Record or Previous record (hrs)	2021 season hours of smoke vsby <=6 miles (hrs)	Record or Previous record (hrs)	Records began
Billings	313**	161 hrs in 2015	110**	75 hrs in 2015	1998
Glasgow	237	269 in 2015	49	198 in 2015	1994
Great Falls	482**	271 in 2017	205**	173 in 2015	1994
Missoula	760**	706 in 2017	423	484 in 2017	1998

** Denotes new record

A high temperature of 100°F or higher was recorded on 1 day in the state during September. This brought the 2021 accumulation of such days to 49, which is the highest of record. The previous yearly record was set in 2003 when the temperature soared over to 100°F or higher on 46 days.



The highest daily temperatures in September occurred on four days at Hardin. Elk Park had the state’s lowest temperature on 15 days. For the year through September, Yaak Hill has been the state’s warmest on 46 days and West Yellowstone has been coolest on 43 days. The state’s warmest daily temperature has been in the western climate division on 112 days and coldest was in the southwest division on 151 days.

Water Year 2021

For the 2021 water-year, the state composite temperature averaged 44.8°F, which was 1.4°F above normal. This has been the warmest water year since 2016. Precipitation totaled 11.60-inches, which was 3.36” below normal and 10th driest. This was the driest since 1988. 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 48.4°F, which was 1.3°F above normal. This is the warmest such period since 2016. Precipitation totaled 8.62-inches, which was 3.49” below normal and driest since 1934. This has been the 4th driest such period. Statewide winds averaged 8.8-mph, which is 0.1-mph below normal. This was the 16th lowest average of record.

April – September (Growing Season)

Persistently warm temperatures during June and July caused the warmest June and July combined in 33 years. Over the April-September period, the composite temperature average was 59.7°F, which was 1.9°F above normal ranking 17th warmest and warmest since 2006. 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 six months have been the 3rd driest of record, with an average of 5.80-inches, which is 2.62-inches below normal. Winds averaged 8.1-mph, which is 0.1-mph below normal. This was the 19th calmest summer period.

Apr-Sep

Area/Location	Amount	Rank from driest	Driest since	Normal
State	6.52"	5 th driest	6.48" 1936	9.88"
Butte	4.17"	3 rd driest	4.08" 1924	9.35"
Glasgow	4.78"	8 th driest	3.33" 2017	10.88"
Glendive	6.02"	9 th driest	4.39" 1988	10.72"
Havre	4.86"	9 th driest	3.03" 2017	8.31"
Lewistown	8.03"	9 th driest	5.04" 1984	12.80"
Sidney	6.20"	6 th driest	4.65" 2020	10.67"

May-Sep

Area/Location	Amount	Rank from driest	Driest since	Normal
State	5.80"	3 rd driest	5.74" 1919	8.42"
Butte	3.73"	2 nd driest	3.57 1919	8.02"
Glasgow	4.20"	5 th driest	3.72" 2017	9.87"
Glendive	5.84"	6 th driest	4.56" 1988	10.15"
Helena	2.51"	9 th driest	1.81" 2012	5.27"
Lewistown	6.99"	4 th driest	4.97" 1984	11.10"
Sidney	5.82"	5 th driest	5.18" 2020	10.09"

Jun-Sep

Area/Location	Amount	Rank from driest	Driest since	Normal
State	3.63"	3 rd driest	2.93" 1919	6.14"
Butte	2.48"	5 th driest	2.47" 2000	6.00"
Dillon WMU	2.14"	7 th driest	2.14" 2012	5.64"
Glendive	3.55"	4 th driest	3.30" 1939	8.70"
Great Falls	3.21"	7 th driest	3.10" 2007	7.60"
Havre	1.72"	1 st driest	2.03" 2017	6.00"
Lewistown	4.72"	10 th driest	3.45" 2003	8.19"
Sidney	4.16"	5 th driest	2.88" 2020	8.88"

Precipitation/convection

Severe convective weather occurred on two days in September, which is normal. Thunderstorm gusts reached 63-mph at Dillon on the 10th.

September information:

High Temperature	100°F at Saint Marie (Valley) (18 th)	Greatest Precip	0.92" at West Yellowstone
Low Temperature	10°F at Elk Park (Jefferson) (10 th)		7.70" at Stahl Peak SNOTEL (Lincoln)
Warmest Ave Temp	66.7°F at Glendive (Dawson)	Peak Wind Gust	65 mph at Elkhorn RAWS (Broadwater) (19 th)
Coollest Ave Temp	46.1°F at Elk Park (Jefferson)		78 mph at Deep Creek RAWS (Glacier) (15 th)
Range of Temp departures	-0.2°F at West Yellowstone to +4.6°F at Glendive	Highest Ave Wind	19.7 mph at Deep Creek RAWS 12.7 mph at Livingston
21 city mean monthly Temperature/Nrml	59.4/57.0F normal. 24 th warmest of record (since 1880). 83 rd percentile.	20 city mean monthly wind speed/Nrml	8.5 mph/8.0 mph; 25 th calmest of record (since 1936). 42 nd percentile.
22 city mean monthly precipitation/Nrml	0.39"/1.16" – 34% of normal. 11 th driest of record (since 1880). 8 th percentile.		

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

Location	Sep	% of Norm	Rank	Pcntl	Oct 1 - Sep	% of norm	Rank	Pcntl	Years
Baker	0.66	51%	66	7	7.58	52%	93	99	94
Billings	0.04	3%	119	98	10.33	72%	81	69	117
Belgrade	0.12	12%	80	94	9.80	73%	79	94	84
Butte	0.07	7%	122	95	6.73	53%	118	93	127
Cut Bank	0.13	12%	103	89	9.06	84%	87	77	113
Dillon WMU	0.60	65%	82	67	7.99	71%	114	94	121
Glasgow	0.03	2%	96	75	7.80	56%	112	93	121
Great Falls	0.26	20%	114	87	12.97	88%	87	67	129
Havre	0.05	5%	141	99	7.41	63%	135	96	141
Helena	0.03	3%	138	97	9.78	86%	105	74	142
Jordan	0.05	4%	95	97	8.05	62%	81	87	93
Kalispell	1.40	120%	46	35	16.49	98%	53	41	127
Lewistown	0.07	5%	124	98	11.20	65%	124	99	125
Livingston	0.29	24%	109	91	12.33	85%	85	74	114
Miles City	0.65	61%	88	60	8.07	63%	136	94	144
Missoula	0.57	59%	96	67	12.66	90%	88	65	135
Mullan Pass	1.90	121%	34	40	44.77	114%	23	27	82
Wolf Point	0.20	20%	61	67	8.47	69%	64	90	71
Glendive	0.25	18%	99	78	7.64	52%	115	97	119
Sidney	0.49	35%	57	69	7.64	51%	79	98	81
BZN-MSU	0.13	9%	141	97	16.73	86%	95	68	140
W Yellowstone	0.92	69%	72	61	21.64	99%	45	45	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	Sep	Normal	Rank	Pcntl	Oct 1 - Sep	Normal	Rank	Pcntl	Years
Baker	62.2	56.3	20	17	46.0	42.7	17	15	107
Billings	65.2	61.4	9	7	49.5	48.2	14	11	117
Belgrade	57.8	56.3	20	22	44.0	43.0	15	16	86
Butte	53.0	52.8	47	36	40.8	40.1	48	37	127
Cut Bank	57.0	54.4	19	16	42.9	41.8	22	19	112
Dillon	57.7	54.7	14	17	43.2	41.8	32	41	77
Glasgow	63.6	59.9	7	5	46.6	43.9	5	3	125
Great Falls	59.8	58.2	26	20	45.8	44.7	51	41	124
Havre	60.9	57.7	14	9	45.4	43.6	18	12	141
Helena	62.2	58.9	7	4	47.7	45.5	6	4	141
Jordan	62.3	58.4	16	15	46.8	44.2	14	14	95
Kalispell	55.6	54.3	37	30	45.1	43.1	47	39	120
Lewistown	58.5	55.9	18	14	44.1	43.1	32	27	116
Livingston	59.9	57.3	26	21	46.9	45.5	23	19	114
Miles City	63.0	61.2	35	24	47.8	46.2	22	15	139
Missoula	58.8	57.5	34	26	46.7	45.2	15	11	126
Mullan Pass	51.2	51.1	20	43	39.9	38.3	4	7	44
Wolf Point	60.8	58.8	14	18	44.6	43.0	14	19	69
Glendive	66.7	61.7	7	6	46.8	46.3	34	29	117
Sidney	62.3	60.0	13	13	45.2	44.6	45	47	97
W Yellowstone	48.4	48.6	40	34	35.0	35.0	53	48	111

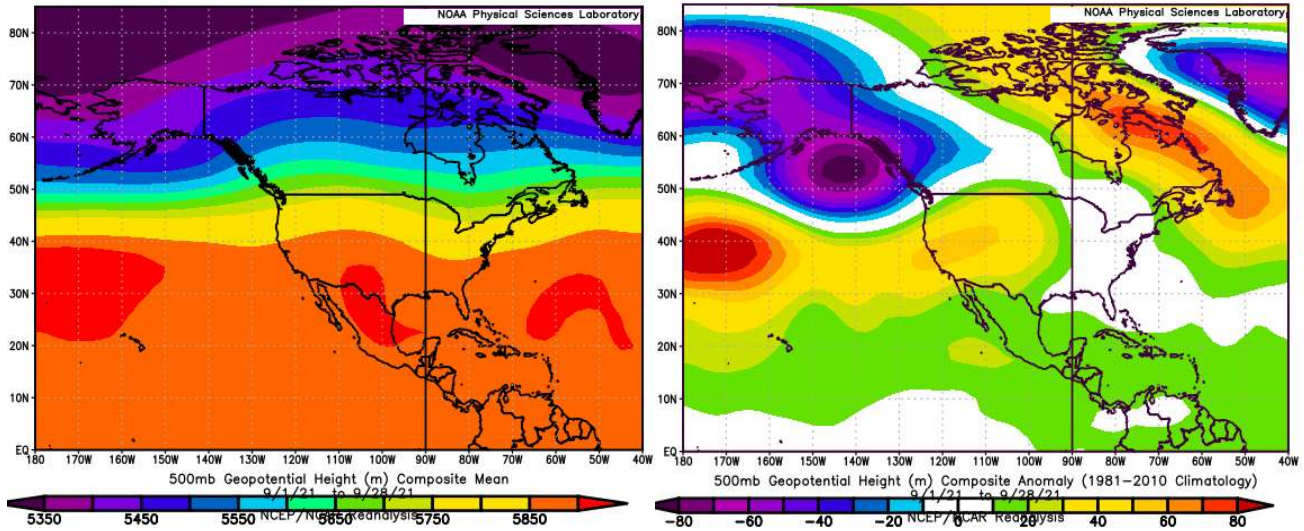
Rankings and Percentiles are 1=coldest, higher numbers=warmer.

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

Location	Sep	Normal	Rank	Pcntl	Oct 1 - Sep	Normal	Rank	Pcntl	Years
Baker	8.4	11.0	22	88	10.7	11.1	20	83	24
Billings	9.3	9.3	61	70	10.8	10.7	58	68	85
Belgrade	6.0	5.7	34	45	5.7	5.7	49	67	73
Butte	5.4	6.0	47	81	5.6	5.9	42	73	57
Cut Bank	12.3	11.4	28	36	13.2	13.1	38	47	79
Dillon	8.9	8.0	26	38	9.5	9.0	31	45	67
Glasgow	9.3	10.3	38	48	10.4	10.5	50	65	76
Great Falls	10.8	10.0	34	40	11.8	11.3	44	52	83
Havre	9.5	8.9	28	20	10.5	9.8	20	15	132
Helena	6.8	6.3	79	55	6.8	6.7	100	71	141
Jordan	7.8	7.8	17	43	8.7	8.2	4	8	38
Kalispell	4.3	4.9	114	93	5.3	5.2	107	88	122
Lewistown	8.0	8.3	61	78	9.2	9.3	57	72	79
Livingston	12.7	11.8	16	27	15.0	14.9	24	43	54
Miles City	8.7	9.8	68	52	9.6	10.1	65	50	130
Missoula	4.1	4.8	77	89	4.9	5.1	71	82	86
Mullan Pass	4.1	5.2	30	94	4.7	5.5	29	97	30
Wolf Point	6.5	7.5	19	82	7.9	8.1	20	86	23
Glendive	9.2	9.6	20	71	10.0	10.1	17	59	29
Sidney	8.0	8.2	19	86	9.0	8.9	12	38	32
W Yellowstone	5.9	5.4			6.2	6.0			7

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](https://www.noaa.gov/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=txf>. 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.