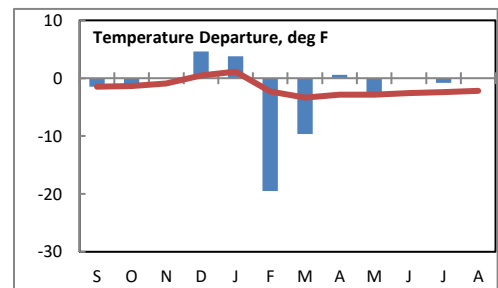
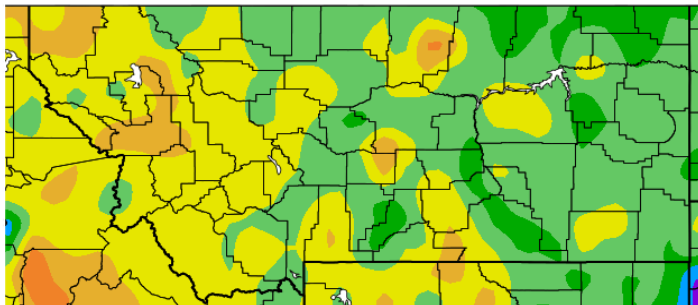


Montana Weather/Precipitation Summary

August 2019 NOAA's National Weather Service Great Falls Montana

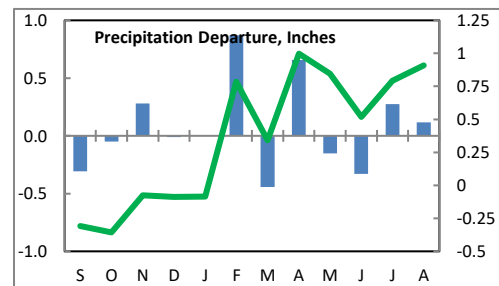
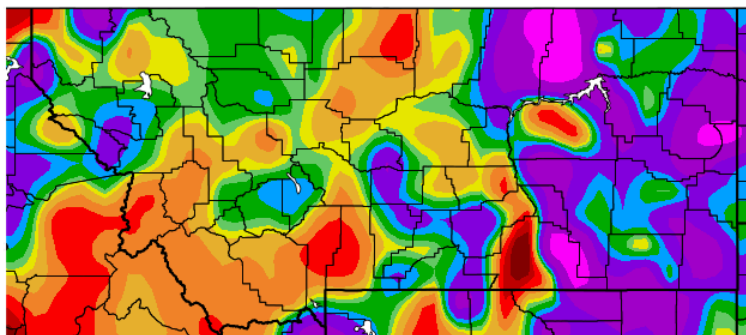
August's average temperatures were a couple of degrees above or below normal. Precipitation was variable with above normal amounts across the east and below normal over central Montana. Winds averaged below normal. The upper level flow was generally from the west-northwest (Fig. 1), which was normal for the month.

August temperature anomalies ranged from 2.1°F below normal at Baker to 2.8°F above normal at Billings. The map below shows the variation. The warmest average temperatures were in eastern Montana. The warmest average temperature was at Billings, with an average of 74.3°F, while the coolest was 53.4°F at Fisher Creek (Park). The highest temperature was 103°F at Libby (Lincoln) on the seventh. The coldest temperature was 25°F at Gates Park (Lewis and Clark) on the 27th. This absolute range of 78°F was below average for August (August's record is 101°F) and smallest since 2014. The statewide temperature average of 66.8°F was normal. The red line on the graph shows the cumulative 12-month departure from normal, which is 2.2°F below normal. See the state summary and temperature tables below for more details.



Temperature departure from normal

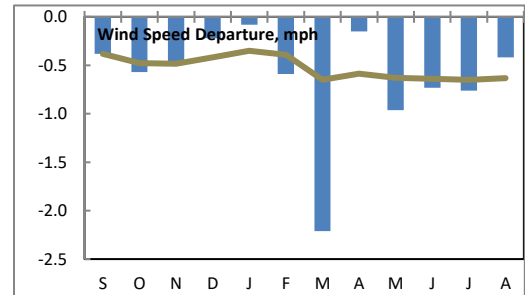
Precipitation was heaviest in the Glasgow and Lindsay areas. The highest amount (5.38-inches) fell near Glasgow. The statewide composite of 1.38-inches was 0.12" above normal. The green line on the precipitation graph shows the cumulative 12-month departure from normal, which is 0.91" above normal. See state summary and precipitation tables below for more details.



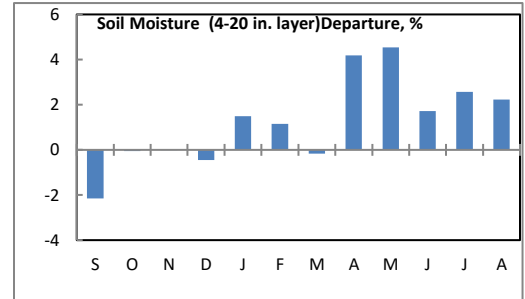
Percent of normal precipitation

Wind speed averages were below normal. Statewide, the month ranked as the 13th calmest August, with an average speed of 7.6-mph. The strongest averages were in central and eastern Montana. The composite statewide average was 0.4-mph below normal. The brown line of the

wind graph to the right shows the 12-month cumulative statewide wind departure from normal. The 12-month average is running 0.7-mph below normal. All months since January 2018 have had below average wind speeds.



Statewide soil moisture averages continued above normal for August (right). This data is from NRCS SCAN and SNOTEL, NOAA CRN and MT Mesonet stations. For August, this was the third wettest of record. The record began in 1995.



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

August started out with above normal temperatures. Hot conditions prevailed through the seventh, when Libby reached 103°F. Scattered thunderstorms dotted the state with isolated reports of severe winds. Gusts reached 62 mph at Butte on the first, 62-mph at Great Falls on the 2nd and 59-mph at Livingston on the fifth. Stronger thunderstorms on the 10th produced golf-ball size hail near Butte and 1-inch hail over portions of south central Montana. On the 11th, severe thunderstorms produced a 250-acre tree blow-down in the Tobacco Root Mountains, gusts to 61 mph at Missoula and 69-mph at Billings and large hail at Petrolia Lake and in Gallatin County. Thunderstorms continued in the southeast on the 14th with 1.5-inch hail reported in Carter County. Snow fell at the higher elevations on the 17th, and was gone by the end of the day. On the 21st, a cold front accompanied by thunderstorms produced gusts to 72-mph near Great Falls and flooding in the city. Winds and thunderstorms continued the next day with gusts to 67-mph and 1.75-inch hail in Billings. Heavy rain from thunderstorms produced flooding in Valley County on the 23rd. Up to 4-inches of rain caused the flooding.

Precipitation/convection

Severe convective weather occurred on 10 days in August, which is 2 days above normal and the most days recorded in August since 2013.

Summer season (Jun-Aug)

The summer average temperature was 64.7°F, 0.3°F below normal. This was the 52nd coolest such period and coolest summer since 2014.

The composite summer precipitation totaled 5.37-inches, 0.06" below normal. This was the 54th driest summer period of record.

Winds averaged 7.7-mph, which is 0.6-mph below normal. This was the fourth calmest summer.

Crop season (Apr-Aug)

The crop-year average temperature was 57.4°F, 0.6°F below normal. This was the 38th coolest such period and coolest since 2011.

Composite crop-year precipitation totaled 9.60-inches, 0.57" above normal. This was the 41st wettest such season.

Winds averaged 8.2-mph, which is 0.7-mph below normal. This was the fourth calmest crop-year.

Water year (Oct-Aug)

For the water year, the temperature average was 39.8°F, 2.3°F below normal. The cold February, March and May kept the average down, as both December and January had above average temperatures. This was the 17th coolest such season, and the coolest since 1992.

Composite precipitation totaled 15.35-inches, 1.22" above normal. This was the 32nd wettest of record.

Although December was windy, February, March and May had very light winds so the season's average of 8.3-mph is the second calmest of record and calmest such period since 2010.

August information:

High Temperature	103°F at Libby (7 th)	Greatest Precip	5.38" near Glasgow
Low Temperature	25°F at Gates Park RAWS (27 th)		
Warmest Ave Temp	74.3°F at Billings	Peak Wind Gust	72 mph near Great Falls (21 st)
Coollest Ave Temp	53.4°F at Fisher Creek		
Range of Temp departures	-2.1°F at Baker to +2.8 at Billings	Highest Ave Wind	11.8 mph at Deep Creek RAWS 11.4 mph at Roy
21 city mean monthly Temperature/Normal	66.8/66.8F normal. 69 th warmest of record (since 1880). 51 st percentile.	20 city mean monthly wind speed/Normal	7.6 mph/8.0 mph; 13 th calmest of record (since 1936). 19 th percentile.
22 city mean monthly precipitation/Normal	1.38"/1.26" – 109% of normal. 49 th wettest of record (since 1880). 65 th percentile.		

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

Location	Aug	% of Norm	Rank	Pcntl	Oct 1 – Aug 31	% of norm	Rank	Pcntl	Years
Baker	2.04	210%	6	74	16.92	161%	3	87	21
Billings	2.05	241%	8	6	15.77	117%	21	18	115
Belgrade	0.32	30%	73	88	12.59	98%	42	51	82
Butte	1.48	109%	44	34	11.69	99%	59	47	124
Cut Bank	1.42	122%	44	38	11.26	117%	35	31	111
Dillon	0.55	52%	54	67	7.77	80%	53	67	79
Glasgow	2.74	221%	15	11	13.73	128%	34	28	119
Great Falls	1.15	73%	53	41	13.68	103%	58	45	127
Havre	0.50	45%	99	71	8.66	86%	105	75	139
Helena	1.62	135%	28	19	12.53	124%	39	27	140
Jordan	0.85	71%	15	67	13.44	117%	8	35	21
Kalispell	0.68	69%	79	62	14.49	93%	62	49	125
Lewistown	1.56	90%	51	41	14.66	95%	79	63	124
Livingston	0.80	72%	68	58	17.81	131%	11	9	113
Miles City	1.38	152%	46	32	13.37	118%	48	33	142
Missoula	1.28	107%	36	25	15.42	118%	19	14	133
Mullan Pass	1.00	75%	31	38	37.07	102%	38	49	77
Wolf Point	1.73	135%	6	25	13.89	124%	2	5	21
Glendive	2.73	198%	17	13	14.09	114%	38	32	117
Sidney	2.74	236%	12	14	16.25	124%	12	14	79
BZN-MSU	0.45	31%	125	87	20.04	109%	22	15	140
W Yellowstone	1.18	104%	49	44	22.48	111%	28	29	94

Rankings and Percentiles are 1=driest, higher numbers=wetter.

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 31	Normal	Rank	Pcntl	Years
Baker	67.5	65.7	80	74	39.3	41.3	98	93	105
Billings	74.3	71.5	11	12	45.1	47.0	62	73	85
Belgrade	65.7	65.7	37	43	38.9	41.6	74	88	84
Butte	62.4	61.7	51	40	37.1	38.8	102	81	125
Cut Bank	63.9	63.6	44	39	38.0	40.9	91	83	110
Dillon	63.7	64.2	50	64	38.8	41.6	74	99	75
Glasgow	70.2	70.2	50	40	40.5	41.8	64	52	123
Great Falls	66.8	66.3	70	55	40.8	43.5	115	94	122
Havre	68.1	68.0	57	40	39.5	42.2	107	77	139
Helena	69.7	68.3	19	13	41.7	44.2	100	72	139
Jordan	69.8	68.9	58	58	40.4	42.2	85	90	94
Kalispell	64.7	63.9	41	33	41.0	42.3	44	37	118
Lewistown	64.4	65.1	57	47	38.9	41.9	105	92	114
Livingston	66.8	65.6	53	46	41.6	43.7	109	96	113
Miles City	71.2	72.6	89	64	41.7	44.7	119	87	137
Missoula	68.5	67.5	27	21	42.7	44.8	93	75	124
Mullan Pass	60.8	59.4	14	32	37.0	36.7	18	41	42
Wolf Point	68.1	69.2	17	80	39.0	40.7	15	70	21
Glendive	71.5	72.9	76	61	42.5	45.1	89	75	118
Sidney	67.5	71.1	59	61	39.2	44.2	39	41	96
W Yellowstone	57.2	57.1	42	43	32.3	33.1	78	85	92

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

Location	Aug	Normal	Rank	Pcntl	Oct 1 – Aug 31	Normal	Rank	Pcntl	Years
Baker	10.2	10.1	7	27	10.6	11.2	19	90	21
Billings	8.9	8.9	59	69	10.6	10.7	68	82	83
Belgrade	5.8	6.3	41	75	5.1	5.9	48	89	54
Butte	5.5	6.9	45	80	5.3	6.6	50	91	55
Cut Bank	9.0	10.3	65	85	11.5	12.8	73	95	77
Dillon	6.9	7.5	61	92	8.4	9.1	60	92	65
Glasgow	10.8	10.6	18	23	10.1	10.5	60	81	74
Great Falls	8.5	9.6	67	81	10.7	12.2	81	100	81
Havre	9.8	8.2	11	8	10.1	9.1	29	22	130
Helena	5.8	6.6	129	92	5.9	7.0	139	100	139
Jordan	8.6	7.9	8	20	7.9	8.1	25	69	36
Kalispell	5.0	5.6	106	88	5.3	5.5	109	92	119
Lewistown	7.9	7.9	37	47	8.6	9.3	70	91	77
Livingston	9.3	10.2	46	83	13.8	14.3	48	92	52
Miles City	9.7	9.7	32	24	9.3	10.2	68	53	128
Missoula	4.4	6.1	81	96	5.0	5.7	68	81	84
Mullan Pass	3.6	4.9	29	97	4.3	5.6	28	100	28
Wolf Point	7.8	7.6	9	40	7.9	8.1	18	85	21
Glendive	9.1	10.1	20	105	9.4	10.4	26	96	27
Sidney	8.4	8.4	6	23	8.8	9.1	20	67	30
W Yellowstone	4.9	5.3			5.3	6.4			5

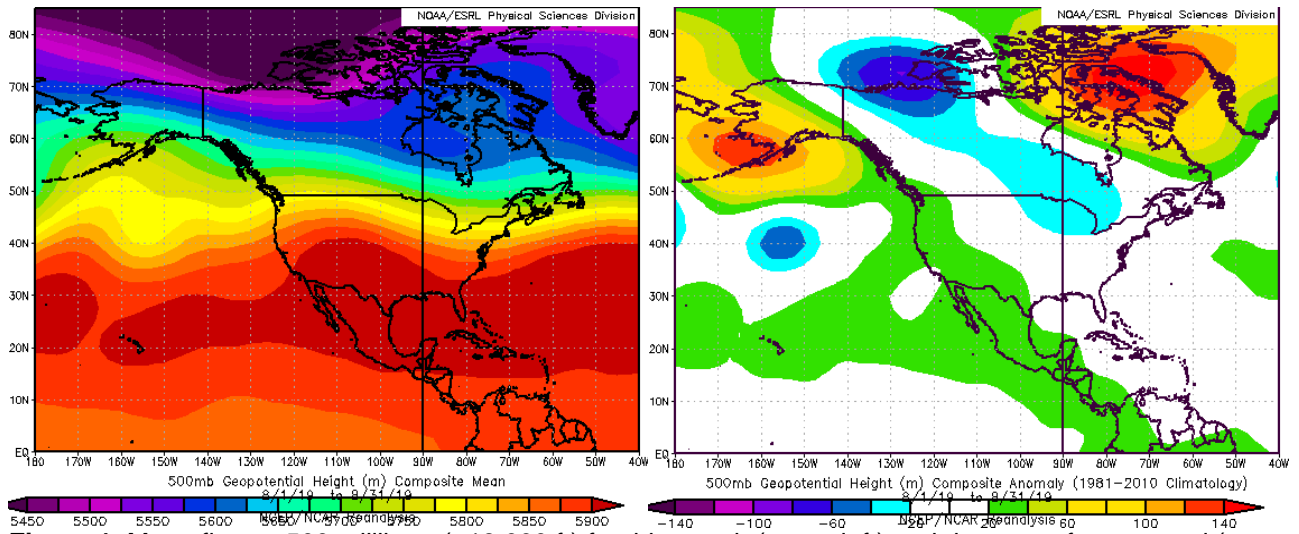


Figure 1. Mean flow at 500 millibars (~18,000 ft) for this month (upper left) and departure from normal (upper right).

For the latest information on mountain snowpack from the NRCS, go to: <https://www.wcc.nrcs.usda.gov/gis/snow.html>

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 NEIC. Therefore, these data are subject to revision. Final and certified climate data can be access at the National Environmental Information Center (NEIC) <http://www.nei.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 1981-2010. 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.