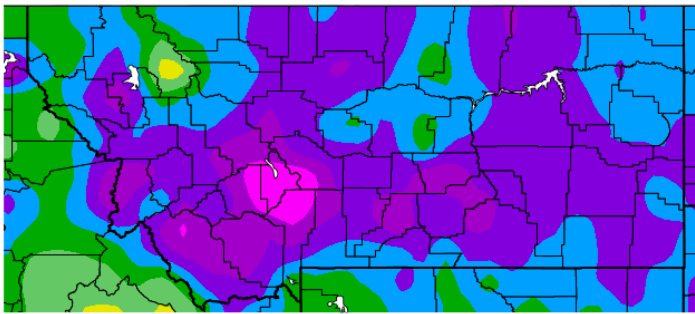


Montana Weather/Precipitation Summary

March 2019 NOAA's National Weather Service Great Falls Montana

March 2019 was one of the colder Marchs of record in Montana. A large trough of low pressure dominated for the first 10 days, transitioning to a ridge over the west coast (Fig. 1). This kept a steady stream of cold air from the north over Montana for the first part, with milder air for the last 20 days. Precipitation was generally below normal with winds at record low levels.

March temperature anomalies ranged from four to 17°F below normal. The map below shows the variation. The warmest average temperatures were in western Montana. The warmest, Thompson Falls had an average temperature of 33.5°F, while the coolest was 15.2°F at Elk Park. The highest temperature was 75°F at Yaak on the 21st. The coldest temperature was -46°F at Elk Park on the 3rd. This absolute range of 121°F is the greatest in any March since 1978 (March's record is 125°F), and the greatest for any month since February 2006. In February 2006, the high temperature was 72°F and the low -54°F, a range of 127°F. The state-wide temperature average of 23.6° was 9.6°F below normal and coldest since 2002. Some locations across southwest Montana had their coldest March of record. The red line on the graph shows the cumulative 12-month departure from normal, which is 1.4°F below normal. See the state summary and temperature tables below for more details.

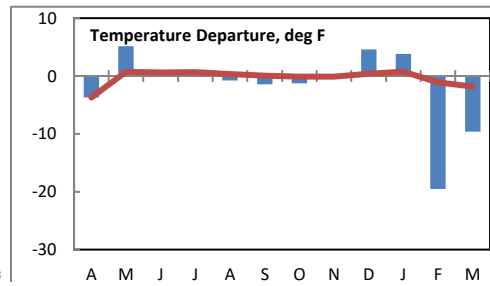


Generated 4/4/2019 at HPRCC using provisional data.

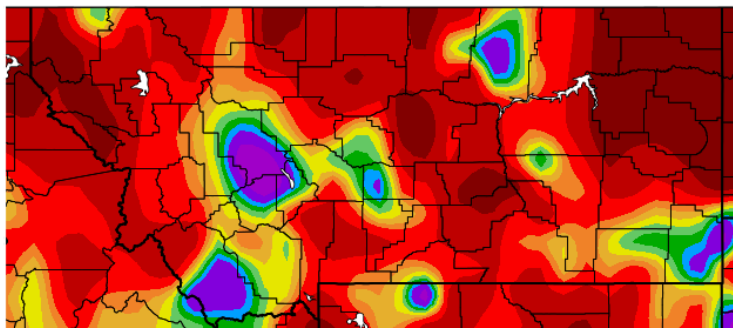
NOAA Regional Climate Centers

Temperature departure from normal

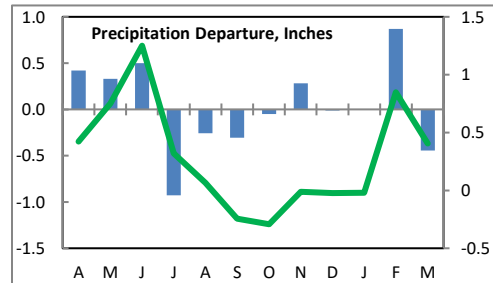
The red line on the graph shows the cumulative 12-month departure from normal, which is 1.4°F below normal. See the state summary and temperature tables below for more details.



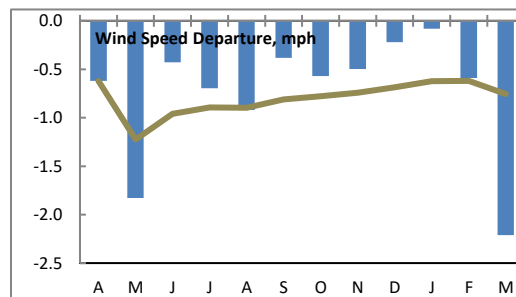
Precipitation was heaviest along the western border. The highest amount (3.50-inches) fell at Noisy Basin SNOTEL. The highest amount elsewhere was 1.86-inches at Hamilton. The statewide composite average of 0.51-inches was 0.44" below and the driest since 2004. The green line on the precipitation graph shows the cumulative 12-month departure from normal, which is 0.41" above normal. See state summary and precipitation tables below for more details. The heaviest monthly snow amount was 31.5-inches at Mystic Lake. The state average snowfall was 4.6-inches, which is the lowest since 2016.



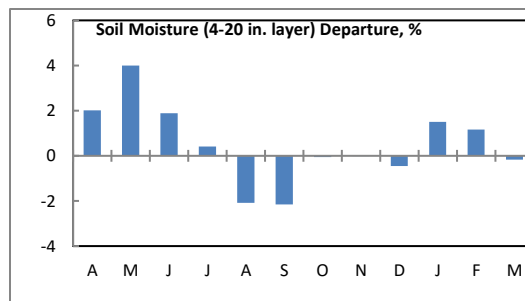
Percent of normal precipitation



Winds averaged much less than normal over the state. Statewide, the month ranked as the calmest March of record, with an average speed of 7.2-mph. The strongest averages were along the northern Rocky Mountain Front. The composite statewide average was 2.2-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 0.8-mph below normal. All months since January 2018 have had below average wind speeds.



Statewide average soil moisture conditions are near normal for March (right).



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

The cold and snowy pattern from February persisted into early March. Blizzard conditions prevailed over the north central on the 1st, while up to 10-inches of snow fell at Fishtail (Stillwater). The coldest morning of the month occurred on the 3rd when a reading of -46°F was reported at Elk Park. Many locations in central and southwest Montana reported their coldest March temperature of record during this period. A summary of records set during March follows in the table of records.

The temperature finally went above freezing at Great Falls on the 7th. This 32-day period broke the previous long period of 31-days ending February 14, 1929. Since records began at Great Falls (1891), there have been only 8 winters during which the temperature failed to reach freezing for more than 20 consecutive days.

The cold and snowy conditions prevailed for the first 10 days. Heavy snow fell over the southeast on the 9th. Broadus and Ekalaka reported up to 9-inches of snow. Some buildings had roof failures due to the weight of the accumulated snow. Ice jam flooding started in southwest Montana on the 9th. Windy and warmer conditions pushed into portions of eastern Montana on the 11th. Ground blizzard conditions caused roads to be closed along the Rocky Mountain Front. Wind gusts reached 68 mph at Two Medicine and 74 mph near Choteau. Heavy snow fell over northwest Montana, with Hungry Horse picking up 8-inches of snow.

From the 16th through the rest of the month, warmer weather brought melting snow and flooding. Many rivers and streams were flooding, with ice jams producing very high water. An ice jam on the Missouri River at the Fred Robinson Bridge produced one of the highest stages since the 1950s. Flooding also caused the closure of I-90 from Hardin to the Wyoming border for a period starting on March 23. The nearby Big Horn River flooded and water was covering the interstate near Crow Agency.

Great Falls also had 13-days with a foot or more snow on the ground. This is the second longest such period. The longest was a 15-day period ending February 26, 1936. Helena had a 20-day stretch with a foot or more on the ground, a new record. The old record was 19-days ending February 8, 1962. They also had a record 31-day stretch with 10-inches or more on the ground, ending March 18. The old record was 29-days ending February 23, 1978.

Records...

Date	Location	Record	Record low	Old record
Mar 1	Missoula	Low min for date	-4°F	-3°F 1960
Mar 2	Cut Bank	Low min for date	-29°F	-27°F 1960
	Havre	Low min for date	-32°F	-23°F 2002
	Jordan	Low min for date	-28°F	-24°F 2002
	Lewistown	Low min for date	-30°F	-23°F 1976
	Miles City	Low min for date	-28°F	-19°F 2014
Mar 3	Billings	Low min for date	-19°F	-13°F 1978
	Bozeman	Low max for date and month	-5°F	3°F 1976
	Bozeman	Low min for date	-32°F	-27°F 1976
	Butte	Low min for date	-27°F	-25°F 1976
	Cut Bank	Low min for date	-33°F	-32°F 1960
	Dillon	Low max for date and month	-4°F	1°F 1960
	Dillon	Low min for date	-21°F	-16°F 1976
	Elk Park	Low min all time for month	-46°F	-45°F
	Glendive Apt	Low min for date	-22°F	-13°F 2002
	Jordan	Low min for date	-30°F	-7°F 1989
Lewistown	Low min for date and month	-34°F	-28°F 1896	
	Livingston	Low min for date	-28°F	-17°F 1976
	Miles City	Low min for date and month	-31°F	-25°F 1960
Mullan Pass	Low min for date and month	-7°F	5°F 2015	
Mar 4	Billings	Low min for date	-19°F	-19°F 1989
	Bozeman	Low min for date and month	-39°F	-31°F 1989
	Butte	Low min for date	-30°F	-25°F 1989
	Dillon	Low min for date and month	-23°F	-14°F 1989
	Great Falls	Low min for date	-24°F	-19°F 1962
	Helena	Low min for date and month	-30°F	-19°F 1989
	Kalispell	Low min for date	-21°F	-16°F 1966
	Livingston	Low min for date and month	-32°F	-13°F 1948
	Mullan Pass	Low min for date	-5°F	11°F 2015
	Mar 5	Bozeman	Low min for date	-33°F
Dillon		Low min for date	-20°F	-19°F 1951
Helena		Low min for date	-27°F	-24°F 1945
Kalispell		Low min for date	-20°F	-17°F 1955
Livingston		Low min for date	-16°F	-16°F 1951
Mullan Pass		Low min for date	5°F	12°F 2013
Month	Bozeman	Coldest March	17.5°F	18.0°F 1969
	Dillon	Coldest March	22.3°F	23.0°F 1952
	Bozeman	Calmest March	3.2 mph	4.2 mph 1984
	Butte	Calmest March	3.7 mph	4.8 mph 2013
	Dillon	Calmest March	6.1 mph	7.5 mph 1981
	Helena	Calmest March	3.4 mph	4.7 mph 1992
	Livingston	Calmest March	10.7 mph	10.9 mph 1949

	Missoula	Calmeest March	4.2 mph	4.3 mph 1998
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Precipitation/convection

Severe convective weather occurred on 0 days in March, which is normal.

February and March

February and March both averaged well below normal across the state. At many locations, this year had the coldest February and March combined of record.

Sites recording their coldest combined February and March average temperature of record.

Location	Average Period Temp	Old Record
Billings	18.9°F	19.4°F in 1936
Bozeman	13.4°F	14.2°F in 1969
Dillon	16.1°F	20.8°F in 1969
Great Falls	11.6°F	14.4°F in 1936
Lewistown	12.7°F	15.1°F in 1936
Missoula	22.7°F	22.9°F in 1894

Water year (Oct-Mar)

For the water year, the temperature average was 25.1°F, 3.5°F below normal. The cold February and March brought the average down, as both December and January had above average temperatures. This was the 13th coolest such season, and the coolest since 2003.

Composite precipitation totaled 5.75-inches, 0.65" above normal. This was the 45th wettest of record. Last water year was even wetter, ranking 7th wettest. Heavy snow has fallen in most areas. The composite snowfall was 58.3-inches, ranking 24th highest and nearly 10-inches above normal. Last winter was 2nd snowiest with 50.8-inches. For the water year, the precipitation average of 5.24-inches is the 27th wettest of record. Average snowfall of 53.7-inches is the 13th highest of record.

Although December was windy, February had very light winds so the season's average of 8.7-mph was the 13th calmest of record and calmest winter since 2014-15. For the water year, average winds of 8.5-mph rank as 8th lightest of record and lightest winds for such period since 2008.

March information:

High Temperature	75°F at Yaak (21 st)	Greatest Precip	1.86" at Hamilton
Low Temperature	-46°F at Elk Park (3 rd)		3.5" at Noisy Basin
Warmest Ave Temp	33.5°F at Thompson Falls	Peak Wind Gust	74 mph near Choteau (12 th)
Coollest Ave Temp	15.2°F at Elk Park		94 mph at Deep Creek (11 th)
Range of Temp departures	-0.4°F at Mullan Pass to -16.6°F at Bozeman Apt	Highest Ave Wind	13.1 mph at Browning 13.2 mph at Deep Creek RAWS
21 city mean monthly Temperature/Normal	23.6/33.2F normal. 13 th coldest of record (since 1880). 10 th percentile.	20 city mean monthly wind speed/Normal	7.2 mph/9.4 mph; 1 st calmest of record (since 1936). 1 st percentile.
22 city mean monthly precipitation/Normal	0.51"/0.95" - 53% of normal. 15 th driest of record (since 1880). 11 th percentile.	20 city mean monthly snowfall/Normal	4.6"/8.9" -4.3" 14 th percentile.

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

Location	Mar	% of Norm	Rank	Pcntl	Oct 1 - Mar	% of norm	Rank	Pcntl	Years
Baker	0.12	19%			2.79	90%			21
Billings	0.37	33%	94	78	5.17	100%	36	30	118
Belgrade	0.27	30%	80	96	4.05	96%	44	53	82
Butte	0.71	93%	61	48	3.52	99%	58	46	124
Cut Bank	0.45	90%	49	43	4.49	235%	7	5	112
Dillon	0.64	119%	28	34	2.18	92%	46	58	79
Glasgow	0.19	45%	62	50	4.48	172%	15	12	120
Great Falls	0.56	62%	86	67	5.80	149%	19	14	127
Havre	0.20	37%	105	75	3.08	120%	76	54	139
Helena	1.00	169%	32	22	4.68	166%	36	25	140
Jordan	0.31	60%			4.63	180%			21
Kalispell	0.50	46%	106	84	6.85	93%	75	60	125
Lewistown	0.24	24%	119	96	4.05	90%	89	72	124
Livingston	0.62	74%	75	62	5.53	132%	23	19	116
Miles City	0.23	38%	119	84	2.69	98%	94	66	142
Missoula	0.55	57%	104	73	7.90	144%	22	15	139
Mullan Pass	1.86	42%	67	88	23.53	92%	51	65	78
Wolf Point	0.00	0%			2.25	91%			21
Glendive	0.06	10%	121	98	3.62	114%	42	34	121
Sidney	0.01	2%	79	99	3.25	93%	36	45	79
BZN MSU	1.10	80%	84	59	8.75	128%	19	13	142
W Yellowst	1.21	74%	70	68	13.19	117%	28	27	100

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					Oct 1 -				
	Mar	Normal	Rank	Pcntl	Mar	Normal	Rank	Pcntl	Years
Baker	22.2	34.1	95	89	23.8	28.1	87	82	106
Billings	29.3	37.7	76	89	29.9	34.3	75	88	85
Belgrade	17.5	34.1	84	100	24.1	28.7	74	88	84
Butte	20.5	31.4	117	94	23.2	26.5	107	85	125
Cut Bank	23.7	31.5	89	80	24.1	28.9	91	83	110
Dillon	22.3	34.3	76	100	25.2	29.7	71	95	75
Glasgow	22.6	31.7	95	77	23.0	25.8	69	56	123
Great Falls	25.4	34.2	114	91	27.0	31.7	115	94	122
Havre	21.2	32.8	123	88	23.7	27.8	101	72	139
Helena	21.1	36.3	136	98	26.5	31.2	124	89	139
Jordan	23.5	33.2	89	90	24.3	27.7	81	84	96
Kalispell	26.6	35.4	114	95	27.7	30.5	27	22	119
Lewistown	23.6	32.9	110	90	25.5	30.2	107	91	117
Livingston	23.4	35.6	118	99	28.9	32.8	110	95	116
Miles City	24.6	34.7	124	88	25.7	29.6	106	77	137
Missoula	28.0	38.8	124	97	28.8	32.8	111	88	126
Mullan Pass	27.2	27.6	19	45	26.1	26.3	23	54	42
Wolf Point	22.2	30.6			21.8	24.5			21
Glendive	25.6	34.6	102	81	26.3	29.8	78	63	123
Sidney	26.0	34.1	67	70	22.8	28.6	23	24	96
W Yellowst	18.9	24.6	76	81	19.2	19.9	77	82	94

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

Location					Oct 1 -				
	Mar	Normal	Rank	Pcntl	Mar	Normal	Rank	Pcntl	Years
Baker	10.1	12.0			10.6	10.9			21
Billings	9.7	10.7	70	83	11.7	11.7	58	70	83
Belgrade	3.2	6.2	54	100	4.2	5.4	43	79	54
Butte	3.7	6.9	57	102	4.7	5.9	50	91	55
Cut Bank	7.8	13.0	74	99	12.2	13.6	69	89	77
Dillon	6.1	9.8	66	100	8.4	9.4	61	94	65
Glasgow	8.9	11.0	33	43	9.5	9.9	59	79	74
Great Falls	8.8	12.2	76	95	11.5	13.5	79	99	80
Havre	10.2	9.2	37	28	10.3	9.2	31	23	130
Helena	3.4	7.5	139	100	5.0	6.4	138	99	139
Jordan	7.0	8.4	28	82	7.3	7.5	25	71	35
Kalispell	4.5	6.1	118	98	4.7	4.8	110	92	119
Lewistown	6.8	9.5	74	99	8.7	9.9	67	87	77
Livingston	10.7	15.1	54	100	16.2	17.1	44	84	52
Miles City	9.0	10.7	70	55	9.2	9.9	66	51	128
Missoula	4.2	6.1	84	100	4.5	4.8	62	73	84
Mullan Pass	5.2	6.3	26	86	4.8	5.9	28	100	28
Wolf Point	8.0	8.8			7.7	7.7			21
Glendive	9.7	10.7	24	89	9.3	10.1	23	85	27
Sidney	10.4	9.5	4	10	8.88	9.1	18	60	30
W Yellowst	4.6	8.7			5.35	6.6			5

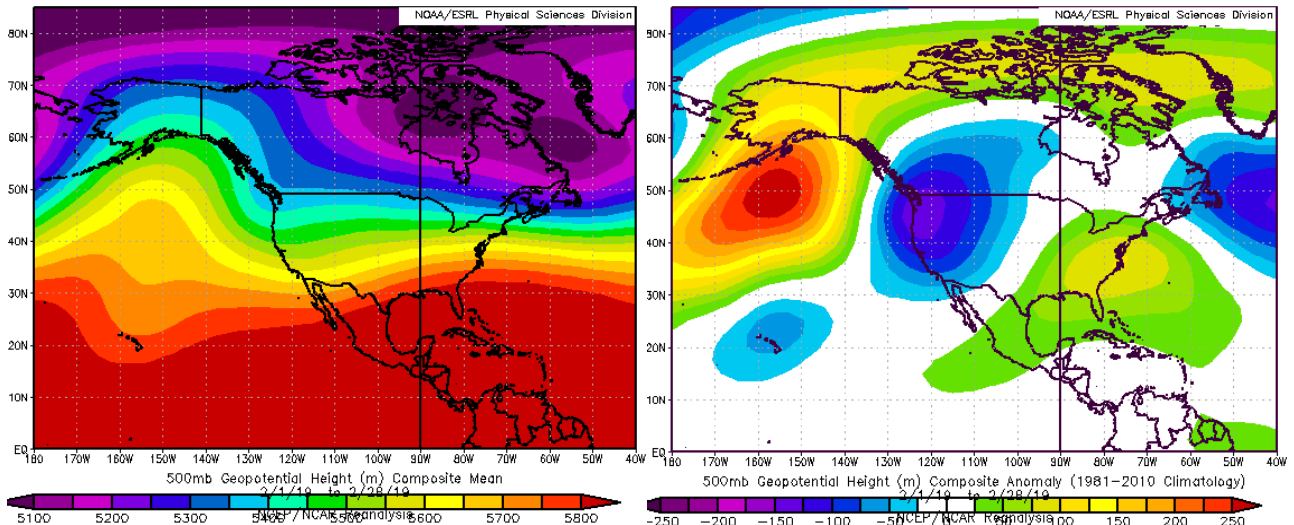


Figure 1. Mean flow at 500 millibars (~18,000 ft) for this month (upper left) and departure from normal (upper right).

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.