

Montana Weather/Precipitation Summary

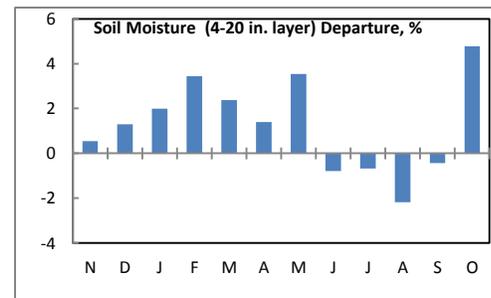
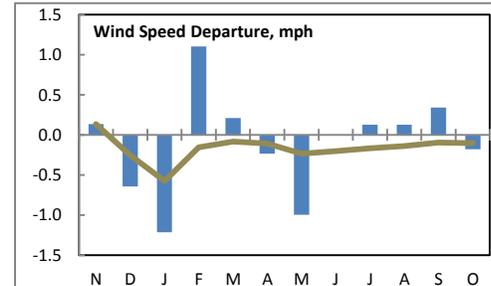
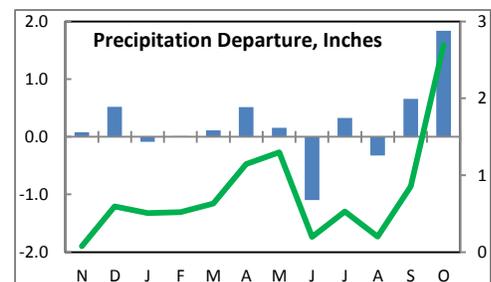
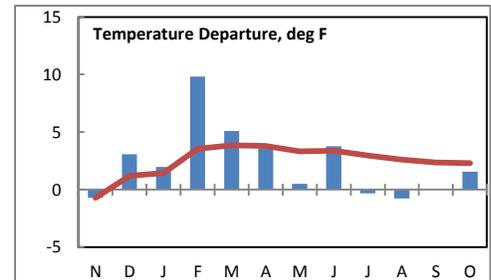
October 2016 NOAA's National Weather Service Great Falls Montana

Upper level flow was generally westerly during October, but a strong trough along the west coast caused a dip in the flow over western Montana (Fig. 1). This pattern brought heavy and **record setting** precipitation to the state. Only a small area of eastern Montana saw below normal precipitation. Temperatures were above normal over much of the state. Below normal averages were over the hi-line. September's winds were near to below normal across the state.

Statewide composite temperatures averaged normal for the month. The red line on the graph to the right shows the cumulative 12-month departure from normal. The temperature anomalies ranged from -3.4°F at Simpson to $+5.1^{\circ}\text{F}$ at Broadus (Fig. 2). The warmest average monthly temperature was 52.6°F at Yellowtail Dam, and the coolest was 32.5°F at Point Six RAWs (Missoula). This was the 62nd coolest October of record. For the past 12-months, the statewide composite average temperature is 2.3°F above normal. Nine of the last 12 months have had warmer than normal temperatures.

The monthly departure from normal for precipitation across Montana is shown in Figure 3. Above, to much above precipitation fell over most of the state. A small area in eastern Montana recorded below normal precipitation. The highest precipitation amount recorded was a record shattering 20.40-inches at Poorman Creek (Cabinet Mtns). Record high monthly values were recorded across much of northwestern Montana, and northeastern Montana. Elsewhere, 12.23" was reported at Hungry Horse Dam and 6.80" at Malta. Statewide, this month averaged 2.97", or 1.84" above normal (the wettest of record). The extreme precipitation for this October exceeded the previously wettest October of 1975 (2.58"). The statewide composite precipitation for the past 12 months is 2.69" above normal. The green line on the graph to the right shows the cumulative 12-month departure from normal. Nine of the past 12 months have measured above normal precipitation. Most of the state did see some snow in October. Around 3-feet of snow fell at Flattop Mountain. A weather system brought 18" to Heart Butte on the 10th and 11th, while 6-inches fell at Havre.

The statewide average winds were weaker than normal in October. Glasgow was a notable exception, tying their windiest October of record (12.6 mph). Statewide, the month ranked as the 17th calmest October of record. The statewide composite average was 8.6 mph, 0.2-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 0.1-mph below average. Six of the past 12 months have had above normal average speeds. The fastest average speed was 17.6 mph at Bighorn Mountain RAWs (Big Horn). At lower elevations, the strongest average was 16.5 mph at Livingston. The strongest wind gusts were 71 mph near Denton on the 1st, 78 mph at Deep Creek on the 9th, 84 mph at Deep Creek on the 14th, 72 mph at Deep Creek on the 16th and 75 mph near Denton on the 31st.



With well above normal precipitation across much of the station, composite statewide soil moisture jumped to well above normal for October. The average of 22.7-percent is 4.8 points above the 22-year average of 17.9-percent. This is the highest October value since 1996.

Refer to NEIC's State of the Climate report for the latest monthly discussion:

<http://www.ncdc.noaa.gov/sotc/>

Oct 1-13

The first half of October had widely variable weather conditions. The first day was warm, with temperatures in the 70s and 80s. Powderville reached 87°F.. A cold front produced strong thunderstorms over much of eastern Montana. Wind gusts reached 71 mph near Denton (Fergus) and pea-size hail fell near Stanford. Nickel-sized hail fell near Dodson (Phillips). Cooler weather brought rain to much of the state, along with snow in some areas. Precipitation amounts of 2-inches were common, with amounts as high as 6-inches over Phillips County. Nineteen inches of snow fell at Crystal Lake in the Snowy Mtns. Rivers in northeast Montana rose above flood stage in response to the heavy rain. On the fifth, another storm system moved across the state. Hail to penny size was reported in the Helena area, along with snowfall amounts of six inches in the Bears Paws, six inches in the Little Rockies, and seven inches in the Little Belts. Warmer air pushed across the state on the 8th and 9th. Temperatures rebounded to the sixties and lower 70s. Winds along the Rocky Mountain Front gusted to 78 mph at Deep Creek on the 9th. Another cold front swept across the state late on the 9th. By the 10th and 11th, high temperatures were only in the 30s. Heavy rain and snow fell over much of the state. Higher amounts included 18-in at Heart Butte, 15-in at East Glacier, 13-in at Livingston, 12-in at Roundup, 10-in at Simpson, 6-in at Lewistown and 4-in at Billings. Precipitation was on the heavy side as well with 3.7-in at Flattop Mtn, 3.1-in at Noxon, and 3.06-in at Mullan Pass. The lowest temperature in the state on the 12th was -2° at Blackfeet (Glacier) and -5°F at Simpson. This was the earliest zero degree temperature in Montana since 2012, and well ahead of the average for this of October 31. As warmer air began to return, winds gusted to 67 mph at Deep Creek.

Oct 14-31

Temperatures were near to above normal for the rest of the month. Although there were periods with light precipitation, the period was mainly dry. Along with the warmer conditions came windy conditions. Record wind daily wind gusts were recorded at several locations in central Montana on the 14th. Gusts reached 84 mph on the 14th and 72 mph on the 16th at Deep Creek. Along with the strong winds, some heavier precipitation fell west of the divide. Amounts of up to 1.7-in fell over Mineral and Ravalli Counties. A strong low-pressure area brought widespread rain and strong winds to the state on the 31st. Gusts reached 75 mph near Denton, 69 mph near Harlowton and 65 mph near Geraldine. Rainfall amounts exceeded one-inch over portions of central and southwest Montana. Sustained heavy precipitation over portions of northwest Montana produced a new all-time October monthly precipitation record at Kalispell. They received 4.12-in, exceeding their previous record of 3.4-in set in 1914.

Precipitation/convection

Severe convective weather occurred on 2 days in October, two above normal for the month.

Record Precipitation for October

Some areas of the state recorded all-time high October precipitation values. Poorman Creek SNOTEL recorded 20.40-in of precipitation. The previous high value in Montana for October was 15.40-in at Flattop Mountain SNOTEL in 1990. This also established a new all-time monthly record for Poorman Creek. Their previous record for a month was 17.10-in in March 2003. Hungry Horse Dam measured 12.34-in for the month. The previous record high value at a cooperative site was 8.47-in at Heron in 1950. Hungry Horse Dam also set an all-time monthly record of 12.34". Their previous record was 10.84" in November 1973. Many Glacier received 11.90", their second highest October amount. Highest was 13.00" in 1990. West Glacier measured 10.60". Their previous October record was 7.90" in 2012.

Location	Oct 2016 precip	Old record	Year
Poorman Creek SNOTEL	20.40"	13.00"	1998
Flattop Mtn SNOTEL	14.60"	12.40"	1990
Hawkins Lake SNOTEL - 2 nd highest of any month	13.20"	6.70"	1994
Noisy Basin	13.20"	10.10"	2012
Stahl Peak SNOTEL	12.70"	9.20"	1995
Hungry Horse Dam	12.34"	7.34"	1995
Grave Creek SNOTEL	12.30"	8.80"	1995
Hoodoo Basin SNOTEL	12.10"	9.50"	1990
Mullan Pass	11.49"	9.05"	1967
Black Bear SNOTEL	10.90"	7.10"	2004
West Glacier	10.60"	6.19	2012
Emery Creek SNOTEL	10.40"	7.00"	1990
Garver Creek SNOTEL	8.90"	4.10"	2012
W Yellowstone	6.58"	5.13"	1938
Zortman	6.03"	3.21"	1995
Thompson Falls	5.96"	4.84"	1967
Rocky Boy	5.80"	4.22"	1995
Grass Range	4.95"	2.75"	1938
Chinook	4.20"	2.58"	1914
Lewistown	4.01"	3.09"	1940
Havre	3.52"	2.82"	1914
Ennis	3.21"	3.08"	2006

October summary information:

High Temperature	87°F at Powderville (1 st)	Greatest Precip	12.34" at Hungry Horse Dam
Low Temperature	-5°F at Simpson (12 th)		20.40" at Poorman Crk SNOTEL (Lincoln)
Warmest Ave Temp	52.6°F at Yellowtail Dam	Peak Wind Gust	84 mph at Deep Creek RAWS (14 th)
Coollest Ave Temp	32.5°F at Point Six RAWS		75 mph near Denton (31 st)
Range of Temp departures	-3.4°F at Simpson to +5.1° at Broadus	Highest Ave Wind	13.4 mph at Harlowton 16.9 mph at Deep Creek RAWS
21 city mean monthly Temperature/Normal	45.4/43.8F normal. 62 nd coolest of record (since 1880). 46 th percentile. Jan-Oct 49.3/46.8 2.5F above normal. 8 th warmest of record.	20 city mean monthly wind speed/Normal	8.6 mph/8.8 mph; 17 th calmest of record (since 1936). 34 th percentile. Jan-Oct 8.9 mph/9.0 0.1-mph below normal. 27 th calmest of record.
22 city mean monthly precipitation/Normal	2.97"/1.13" - 262% of normal. Wettest of record (since 1880). 99 th percentile. Jan-Oct 15.63"/13.53" - 1.10" above normal. 15 th wettest of record.		

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

Location	Oct	% of Norm	Rank	Pcntl	Oct 1 - 31	% of norm	Rank	Pcntl	Years
Baker	0.96	80%			0.96	80%			19
Billings	3.51	279%	2	1	3.51	279%	2	1	116
Belgrade	2.45	223%	6	6	2.45	223%	6	6	80
Butte	2.31	296%	4	2	2.31	296%	4	2	123
Cut Bank	1.07	243%	12	10	1.07	243%	12	10	110
Dillon	2.22	322%	2	1	2.22	322%	2	1	77
Glasgow	3.11	415%	2	1	3.11	415%	2	1	120
Great Falls	1.76	205%	14	10	1.76	205%	14	10	125
Havre	3.52	607%	1	1	3.52	607%	1	1	137
Helena	1.68	247%	13	9	1.68	247%	13	9	137
Jordan	2.89	325%			2.89	325%	1	1	20
Kalispell	4.86	481%	1	1	4.86	481%	1	1	123
Lewistown	0.89	79%	57	47	0.89	79%	57	47	121
Livingston	3.32	263%	2	1	3.32	263%	2	1	114
Miles City	0.97	105%	43	30	0.97	105%	43	30	140
Missoula	2.83	314%	6	4	2.83	314%	6	5	137
Mullan Pass	11.49	374%	1	1	11.49	374%	1	1	77
Wolf Point	1.50	185%			1.50	185%			19
Glendive	0.79	75%	40	33	0.79	75%	40	33	121
Sidney	0.77	70%	41	53	0.77	70%	41	53	77
BZN-MSU	3.66	213%	4	2	3.66	213%	4	2	138

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>

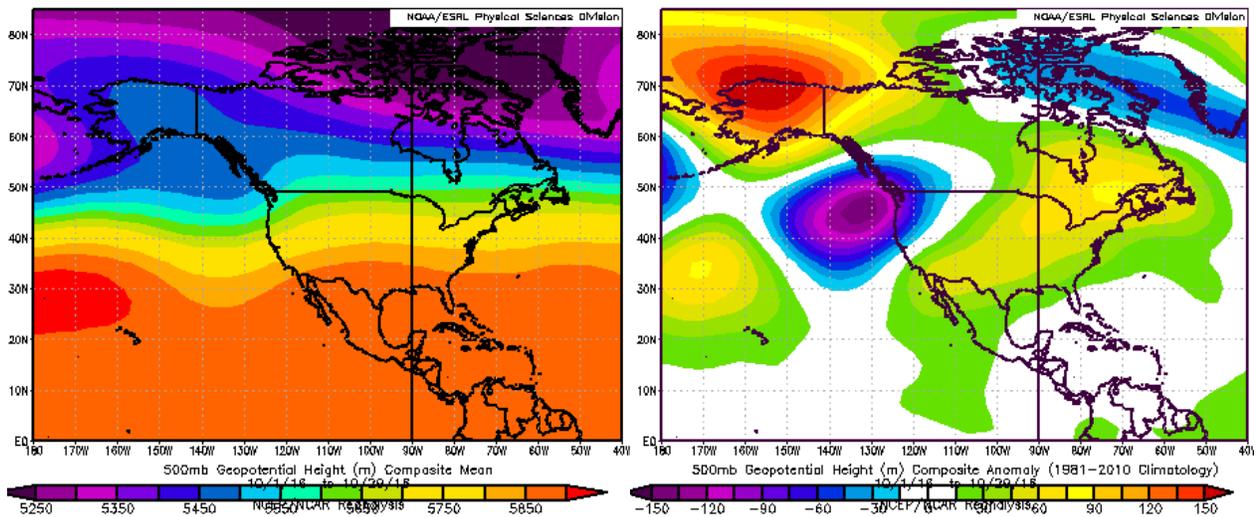


Figure 1. Mean flow at 500 millibars (~18,000 ft) for this month (left) and departure from normal (right).

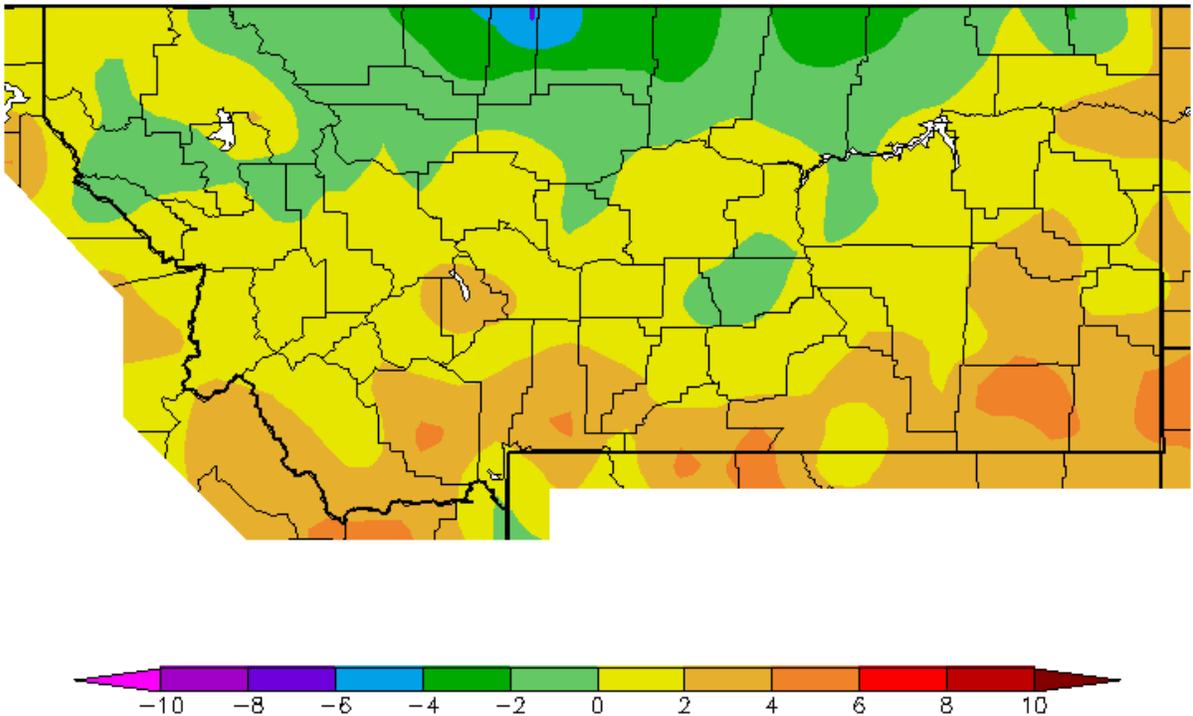


Figure 2. October 2016 temperature departures from normal (°F) (Western Region Climate Center).

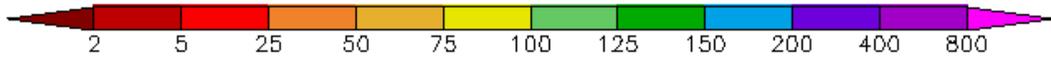
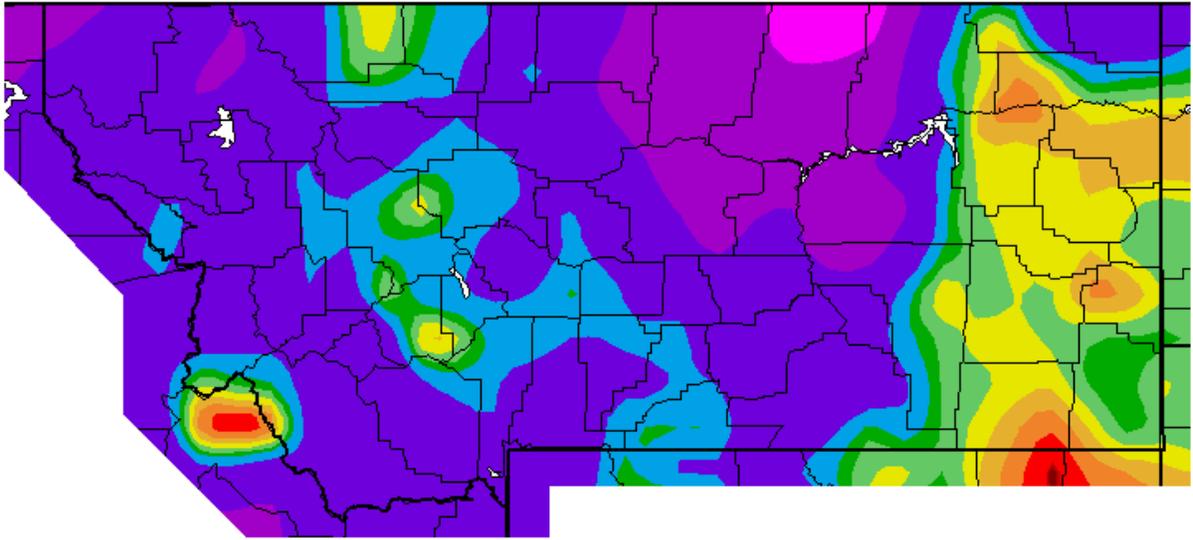


Figure 3. October 2016 precipitation departures from normal (percent) (Western Region Climate Center).

For a state map of % of normal water year precipitation (updated around the 7th of each month), go to:
<http://www.wrh.noaa.gov/tfx/climate/monthlysum/climatesum.php?wfo=txf>

For the latest information on mountain snowpack from the NRCS, go to: <http://www3.wcc.nrcs.usda.gov/snow/index.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.ncdc.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.