

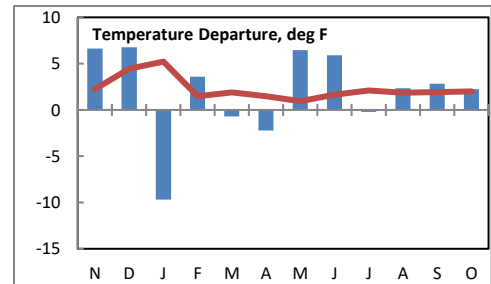
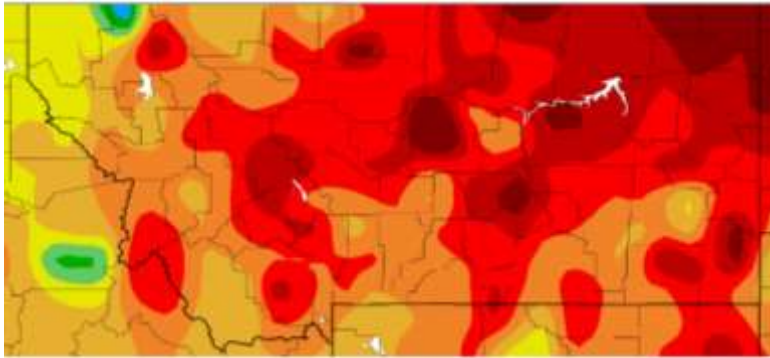
# Montana Weather/Precipitation Summary

October 2021 NOAA's National Weather Service Great Falls Montana

**This summary will be discontinued in 2022.**

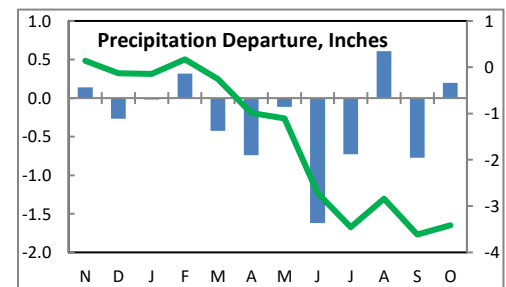
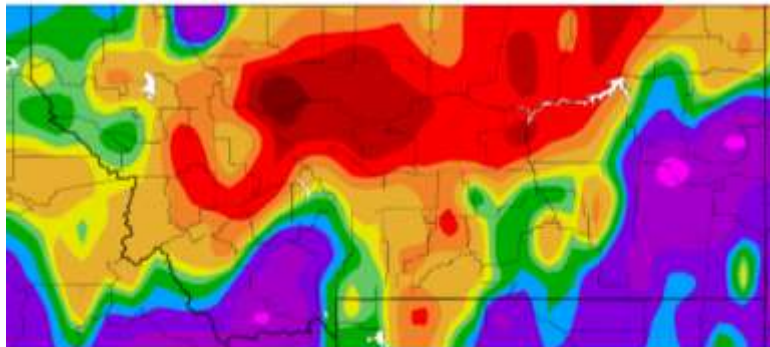
Upper level flow was generally from the west-southwest over Montana for much of October (Fig. 1). Typically, flow is from the west-northwest over the state. In Montana temperatures averaged above normal. Precipitation was mostly below normal, with the exception higher values over the northwest, south and southeast. Wind averaged near normal.

October temperature anomalies ranged from 0.1°F above normal at Glendive to 4.9°F above normal at Jordan. The map below shows the variation in departures. The warmest average temperatures were in central and southeast Montana. The warmest average of 51.6°F was at Holter Dam (Lewis and Clark), while the coolest was 31.0°F at Yellow Mule (Gallatin). The highest temperature was 93°F at Sidney (Richland) on the 6<sup>th</sup>. The coldest was -2°F at Gates Park (Lewis and Clark) on the 13<sup>th</sup>. This range of 95°F is normal for October. The statewide temperature average of 46.5°F was 2.8°F above normal and the 52<sup>nd</sup> warmest of record. It was the warmest since 2015. The red line on the graph shows the cumulative 12-month departure from normal, which was 2.0°F above normal. See the state summary and temperature tables below for more details.



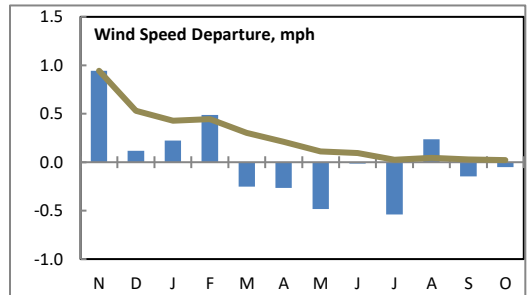
**Temperature departure from normal (HPRCC)**

Precipitation was heaviest over mountains of western Montana and southeast portions. Much of central and northeast Montana received below normal precipitation. The highest amount (9.20-inches) fell at Stahl Peak SNOTEL (Lincoln), with 7.05-inches falling at Goat Haunt (Glacier) and 5.24-inches at St Mary. The month's statewide composite of 1.45" was 0.20" above normal. This ranks as the 18<sup>th</sup> wettest October of record for Montana. Glendive had their 2<sup>nd</sup> wettest October of record. The green line on the precipitation graph (right) shows the cumulative 12-month departure from normal, which is now 3.42" below normal. Snowfall averaged 3.7-in, which was 0.8-in above normal. This is also 0.2-in above normal for the snowfall season.

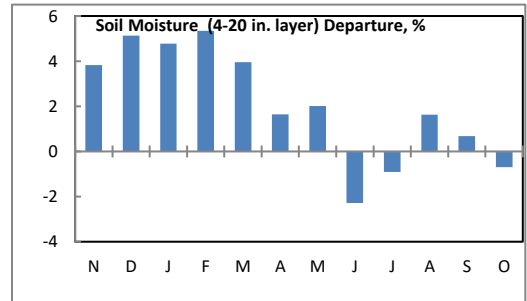


**Precipitation percent of normal (gauge only)**

Wind speed averages were near normal. As an average, the state's winds ranked as the 35<sup>th</sup> calmest for October, with an average speed of 8.7-mph, which was 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 normal.



Except for eastern Montana, the below normal precipitation continued to keep soil moisture values below normal. The average statewide values for October are the lowest for the month since 2015, and 11<sup>th</sup> 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/>

October started very warm and dry. Very low relative humidity values were seen at several locations during the first week of the month. On the 3<sup>rd</sup>, Dillon recorded a relative humidity (RH) of 6.3%, which was their lowest since August 2012 and sixth lowest overall. This was their lowest of record for October. Previous low was 7.1% on October 4, 1979. The 4<sup>th</sup> and 5<sup>th</sup> produced very low RH values over eastern Montana. Warm temperatures across the area produced a tying of the record high temperature at Bozeman (82°F). On the 5<sup>th</sup>, Glendive recorded an RH of 8.3%, their lowest since July 2017 and lowest of record. Their previous record low was 9% set July 5, 2017. Sidney also set an all-time low of 9.2%. Their previous record low was set earlier this year on April 3. Jordan and Wolf Point set record low RH values for October. Jordan recorded 7.9%...the previous October low was 8.6% on the 1<sup>st</sup> in 2005. Wolf Point recorded 9.6%...the previous low in October was 9.8% on the 17<sup>th</sup> in 2017. Sidney recorded a high temperature of 93°F on the 6<sup>th</sup>. Normally, the last 90°F or higher in Montana occurs on September 22. The weather took a sharp change around the 11<sup>th</sup>, when snow fell...mostly over southern Montana. Amounts of up to two feet fell in the mountains and 1.5 to nearly two feet fell in the southeast. Two inches of rain and water-equivalent were also common in these areas. Gates Park (Lewis and Clark) reached a low of -2°F on the 13<sup>th</sup>. This sub-zero temperature occurred 10-days ahead of normal for the state.

After this storm, warmer and dry conditions prevailed through the 24<sup>th</sup>. Some weaker weather systems moved through the state from the 25<sup>th</sup>-27<sup>th</sup>. Rainfall amounts of up to one-inch fell over the southwest on the 25<sup>th</sup>. The strongest winds of the month occurred on the 27<sup>th</sup> and 28<sup>th</sup>. Gusts reached 74-mph near Highwood on the 27<sup>th</sup>, with Deep Creek's peak gust of 78-mph on the 28<sup>th</sup>. On the 29<sup>th</sup>, a strong cold front moved southward from Canada. Cooler conditions prevailed for the rest of the month with some snow accompanying the front. For some areas, of north central Montana, this was the first snow of the season. At Great Falls, the average date for the first trace or more of snow is September 27, measurable is October 7 and one-inch or more is October 14. The tenth of an inch of snow that fell on the 30<sup>th</sup> was the first of any snow for the season at Great Falls. This was the latest of such an event at Great Falls since November 4, 2007.

The highest daily temperatures in October occurred on four days at Billings, while Gates Park had the state's lowest temperature on 11 days. For the year through October, Yaak Hill has been the state's warmest on 48 days and Gates Park has been coolest on 45 days. The state's warmest daily temperature has been in the western climate division on 118 days and coldest was in the southwest division on 168 days.

### Calendar Year-to-date

The calendar year has produced a composite temperature average of 48.2°F, which was 1.5°F above normal. This is the warmest such period since 2016. Precipitation totaled 10.07-inches,

which was 3.28" below normal and driest since 2017. This has been the 12<sup>th</sup> driest such period. Statewide winds averaged 8.7-mph, which is normal. This was the 14<sup>th</sup> lowest average of record.

### April – October (Growing Season)

Persistently warm temperatures during June and July caused the warmest June and July combined in 33 years. Over the April-October period, the composite temperature average was 57.8°F, which was 2.0°F above normal ranking 17<sup>th</sup> warmest and warmest since 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 seven months have been the 12<sup>th</sup> driest of record, with a composite of 7.96-inches, which is 3.17-inches below normal. Winds averaged 8.7-mph, which is 0.4-mph below normal. This was the 26<sup>th</sup> calmest summer period.

Following are summaries of periods ending with October where the location has a particularly low precipitation total, its rank, driest since period and the normal precipitation for the period. Glasgow has had 357 days with 6-inches or less accumulated precipitation. This is their 5<sup>th</sup> longest such period and longest since 383-days starting April 1, 1984. Their record for this is 402-days starting in May 1979.

### Apr-Oct

Area/Location	Amount	Rank from driest	Driest since	Normal
State	7.96"	12 <sup>th</sup> driest	7.25" 1988	11.13"
Butte	4.69"	2 <sup>nd</sup> driest	4.08" 1924	10.19"
Glasgow	5.04"	5 <sup>th</sup> driest	3.33" 2017	11.80"
Lewistown	8.60"	8 <sup>th</sup> driest	5.04" 1984	14.10"
Sidney	6.20"	6 <sup>th</sup> driest	4.65" 2020	10.67"

### May-Oct

Area/Location	Amount	Rank from driest	Driest since	Normal
State	7.24"	16 <sup>th</sup> driest	6.76" 2016	9.67"
Butte	4.25"	2 <sup>nd</sup> driest	3.57 1919	8.86"
Sidney	5.82"	5 <sup>th</sup> driest	5.18" 2020	10.09"

### Jun-Oct

Area/Location	Amount	Rank from driest	Driest since	Normal
State	5.07"	11 <sup>th</sup> driest	4.77" 2003	7.38"
Butte	3.00"	3 <sup>rd</sup> driest	2.47" 2000	6.84"
Cut Bank	3.12"	7 <sup>th</sup> driest	2.71" 2006	6.63"
Glasgow	2.91"	6 <sup>th</sup> driest	2.83" 1979	8.57"
Great Falls	3.31"	5 <sup>th</sup> driest	3.10" 2007	7.57"
Havre	2.39"	1 <sup>st</sup> driest	2.78" 1952	6.75"
Lewistown	5.29"	7 <sup>th</sup> driest	3.45" 2003	9.46"
Sidney	5.94"	9 <sup>th</sup> driest	2.88" 2020	9.04"

### Precipitation/convection

Severe convective weather occurred on zero days in October, which is normal. There were a couple of days with thunderstorms, but no severe weather associated with them.

### PM2.5 data for the month (MT DEQ)

Location	October 2021 PM2.5 Average	Rank	October Average	Records began
Billings	8.6 µg/m <sup>3</sup>	2 <sup>nd</sup> highest	6.2 µg/m <sup>3</sup>	1999
Great Falls	5.8 µg/m <sup>3</sup>	9 <sup>th</sup> highest	5.9 µg/m <sup>3</sup>	2000
Missoula	4.0 µg/m <sup>3</sup>	2 <sup>nd</sup> lowest	7.9 µg/m <sup>3</sup>	1999

**October information:**

<b>High Temperature</b>	93°F at Sidney (Richland) (6 <sup>th</sup> )	<b>Greatest Precip</b>	7.05" at Goat Haunt (Glacier)
<b>Low Temperature</b>	-2°F at Gates Park (Lewis and Clark) (13 <sup>th</sup> )		9.20" at Stahl Peak SNOTEL (Lincoln)
<b>Warmest Ave Temp</b>	51.6°F at Holter Dam (Lewis and Clark)	<b>Peak Wind Gust</b>	74 mph near Highwood (Cascade) (27 <sup>th</sup> )
<b>Coolest Ave Temp</b>	31.0°F at Yellow Mule (Gallatin)		78 mph at Deep Creek RAWS (Glacier) (28 <sup>th</sup> )
<b>Range of Temp departures</b>	0.1°F at Glendive to +4.9°F at Jordan	<b>Highest Ave Wind</b>	17.8 mph at Deep Creek RAWS 15.2 mph at Livingston
<b>21 city mean monthly Temperature/Nrml</b>	46.5/43.6F normal. 52 <sup>nd</sup> warmest of record (since 1880). 63 <sup>rd</sup> percentile.	<b>20 city mean monthly wind speed/Nrml</b>	8.7 mph/8.7 mph; 35 <sup>th</sup> calmest of record (since 1936). 42 <sup>nd</sup> percentile.
<b>22 city mean monthly precipitation/Nrml</b>	1.45"/1.25" – 116% of normal. 18 <sup>th</sup> wettest of record (since 1880). 86 <sup>th</sup> percentile.		

**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	1.76	144%	13	86	1.76	144%	13	13	97
Billings	1.45	106%	30	24	1.45	106%	30	23	128
Belgrade	1.75	159%	14	15	1.75	159%	14	15	85
Butte	0.52	62%	79	61	0.52	62%	65	50	128
Cut Bank	0.63	111%	41	35	0.63	111%	41	35	115
Dillon	1.21	127%	31	25	1.21	127%	31	25	122
Glasgow	0.26	28%	67	52	0.26	28%	90	72	125
Great Falls	0.10	9%	114	88	0.10	9%	114	88	130
Havre	0.66	88%	63	44	0.66	88%	63	44	142
Helena	0.40	51%	89	62	0.40	51%	89	62	142
Jordan	0.57	55%	59	57	0.57	55%	58	58	100
Kalispell	1.49	110%	29	22	1.49	110%	29	22	128
Lewistown	0.57	45%	96	76	0.57	45%	96	76	126
Livingston	1.26	93%	48	39	1.26	93%	48	37	127
Miles City	2.41	248%	9	6	2.41	248%	9	6	145
Missoula	1.05	89%	60	42	1.05	89%	59	41	142
Mullan Pass	5.69	151%	13	15	5.69	151%	13	14	84
Wolf Point	0.87	110%	29	31	0.87	110%	30	32	93
Glendive	3.76	350%	2	1	3.76	350%	2	1	127
Sidney	1.72	157%	15	17	1.72	157%	15	17	82
BZN MSU	2.50	140%	18	12	2.50	140%	18	12	145
W Yellowst	1.42	82%	50	42	1.42	82%	49	41	117

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	Oct	Normal	rank	Pcntl	Oct 1 - 31	Normal	rank	Pcntl	Years
Baker	47.1	43.4	44	59	47.1	43.4	44	59	110
Billings	51.5	47.9	33	73	51.5	47.9	33	33	124
Belgrade	46.3	43.4	24	72	46.3	43.4	24	72	86
Butte	43.5	40.6	44	65	43.5	40.6	44	65	128
Cut Bank	43.4	42.0	59	49	43.4	42.0	59	49	114
Dillon	44.1	42.2	46	57	44.1	42.2	46	57	79
Glasgow	50.0	45.2	11	35	50.0	45.2	11	35	126
Great Falls	48.0	44.8	55	56	48.0	44.8	55	56	125
Havre	47.2	44.1	53	63	47.2	44.1	53	63	142
Helena	50.0	45.5	10	92	50.0	45.5	10	92	142
Jordan	49.4	44.5	16	84	49.4	44.5	16	84	103
Kalispell	44.0	41.6	69	63	44.0	41.6	69	63	123
Lewistown	46.9	43.4	40	67	46.9	43.4	40	67	123
Livingston	48.5	45.5	51	57	48.5	45.5	51	57	119
Miles City	49.4	46.4	56	60	49.4	46.4	56	60	141
Missoula	47.5	44.1	29	77	47.5	44.1	29	77	130
Mullan Pass	38.5	37.3	18	61	38.5	37.3	18	61	45
Wolf Point	47.9	44.4	16	79	47.9	44.4	16	79	78
Glendive	47.8	47.7	76	41	47.8	47.7	75	41	127
Sidney	48.0	45.8	23	75	48.0	45.8	24	75	100
W Yellowst	37.0	36.2	59	47	37.0	36.2	61	47	116

Rankings and Percentiles are 1=warmest, higher numbers=colder.

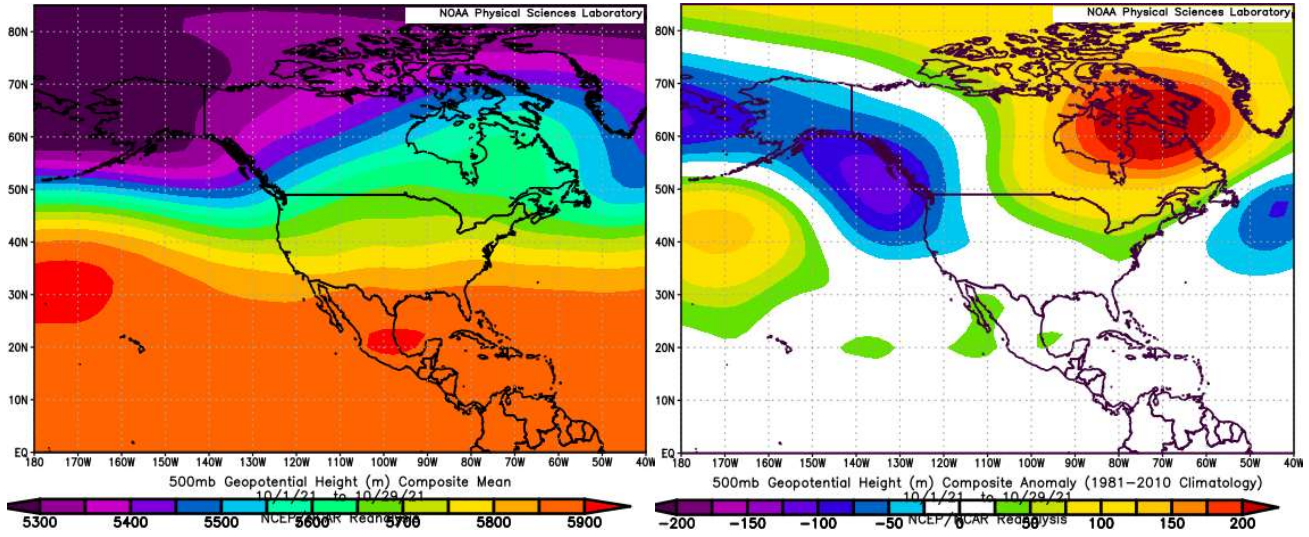
**Historical Rank of Average Wind Speed (mph)  
for the Current Month and Water Year to Date**

Location	Oct	Normal	Rank	Pcntl	Oct 1 - 31	Normal	Rank	Pcntl	Years
Baker	10.9	5.6	10	58	10.9	5.6	10	58	24
Billings	10.3	10.7	63	28	10.3	10.7	63	63	87
Belgrade	5.7	5.6	35	53	5.7	5.6	18	53	74
Butte	6.1	5.9	30	50	6.1	5.9	30	50	59
Cut Bank	13.2	13.6	41	48	13.2	13.6	41	48	78
Dillon	9.8	8.9	23	67	9.8	8.9	23	67	68
Glasgow	10.2	10.6	33	35	10.2	10.6	49	35	76
Great Falls	12.0	11.8	53	38	12.0	11.8	53	38	84
Havre	9.8	9.8	39	70	9.8	9.8	39	70	133
Helena	6.1	6.4	104	27	6.1	6.4	104	27	142
Jordan	8.1	8.2	17	56	8.1	8.2	17	56	38
Kalispell	5.2	4.5	98	49	5.2	4.5	98	49	123
Lewistown	9.1	9.5	50	37	9.1	9.5	50	37	78
Livingston	15.2	14.9	18	68	15.2	14.9	18	68	57
Miles City	9.5	10.2	52	60	9.5	10.2	52	60	131
Missoula	5.2	4.3	32	63	5.2	4.3	32	63	86
Mullan Pass	4.6	5.8	29	9	4.6	5.8	28	9	31
Wolf Point	7.4	8.0	18	28	7.4	8.0	18	28	24
Glendive	10.0	10.2	17	46	10.0	10.2	16	46	30
Sidney	9.2	9.0	12	61	9.2	9.0	12	61	33
W Yellowst	5.6	5.8	7	50	5.6	5.8	7	50	9

Rankings are 1=windiest, higher numbers=calmer. Percentiles are 1=calmest, higher=windier.



**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=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.