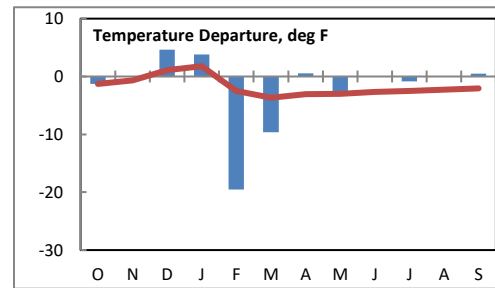
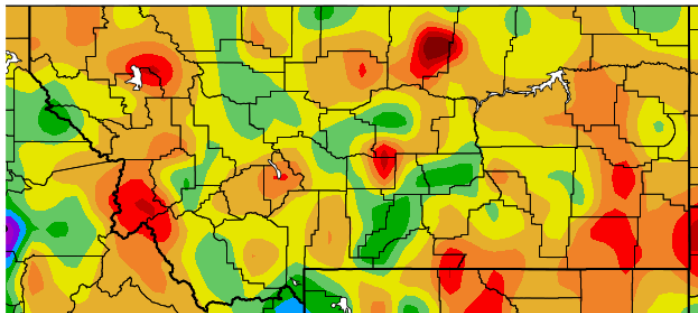


Montana Weather/Precipitation Summary

September 2019 NOAA's National Weather Service Great Falls Montana

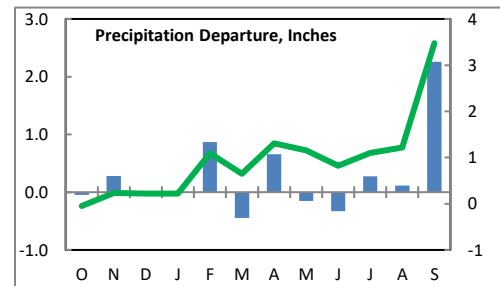
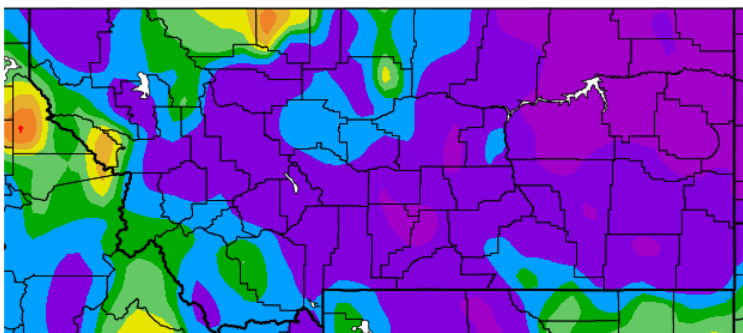
September's average temperatures were a couple of degrees above or below normal. Precipitation was mostly above normal with small pockets of below normal. Winds averaged below normal. The upper level flow was generally from the west (Fig. 1), which was normal for the month.

September temperature anomalies ranged from 1.2°F below normal at Lewistown to 2.0°F above normal at Livingston. 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 62.4°F, while the coolest was 43.4°F at Yellow Mule (Gallatin). The highest temperature was 101°F at Ingomar on the 4th. The coldest temperature was 5°F at Blackfeet Seville Colony (Glacier) on the 30th. This absolute range of 96°F was slightly above average for September (September's record is 110°F). The statewide temperature average of 56.6°F was slightly above normal. The red line on the graph shows the cumulative 12-month departure from normal, which is 2.0°F below normal. See the state summary and temperature tables below for more details.



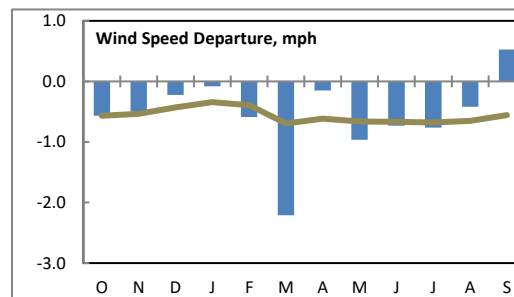
Temperature departure from normal

Precipitation was heaviest in the Sidney area. The highest amount (10.92-inches) fell at near Sidney. The statewide composite of 3.63-inches was 2.26" above normal. This ranks as the wettest September of record for the state. The green line on the precipitation graph shows the cumulative 12-month departure from normal, which is 3.47" above normal. See state summary and precipitation tables below for more details. The heaviest monthly snow amount was 52.0-inches at Babb. This was from a record late September snowfall.



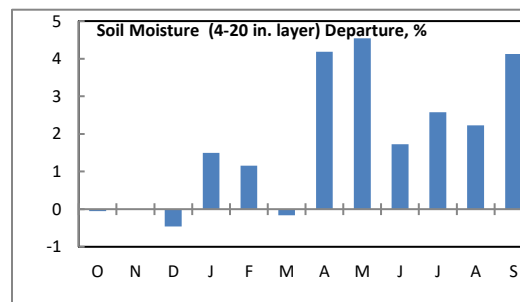
Percent of normal precipitation

Wind speed averages were slightly above normal. Statewide, the month ranked as the 39th windiest September, with an average speed of 8.6-mph. The strongest averages were in eastern Montana. The composite statewide average was 0.5-mph above 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 0.6-mph below normal. This is the first month since January 2018 to have above normal wind speeds.



Statewide soil moisture averages continued above normal for September (right). This data is from NRCS SCAN and SNOTEL, NOAA CRN and MT Mesonet stations. For September, 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/>



September started with very warm temperatures. The warmest, 101°F was observed at Ingomar on the fourth. There were isolated severe thunderstorms in eastern Montana on the 1st and 2nd, with up to 1.75-inch hail near Sidney on the 2nd. Thunderstorms moved through southwest Montana on the 6th. Wind gusts reached 71-mph at Brenner RAWS (the highest gust of the month), with over one-inch of rain reported at Lima Reservoir. Rain continued over much of the state from the 7th-11th. Up to six-inches of rain fell in the Sidney area on the 7th. Then on the 9th, around four inches of rain fell around Flathead Lake. This heavy rain trend continued over eastern Montana on the 10th-13th. Volborg (Custer). Even White Sulphur Springs had some heavy rain, with 1.10-inches falling there on the 11th. A cold front and associated thunderstorms moved through the state on the 13th. Thunderstorm gusts of 62-mph occurred at Lewistown. This was their highest September gust of record. Gusty winds prevailed through much of central Montana from the 14th-16th. Gusts reached 56 mph near Ringling (Meagher) on the 14th, 49 mph at Cameron (Madison) on the 15th, and 59 mph at Townsend (Broadwater) on the 16th. Thunderstorms brought gusty winds and heavy rain to eastern Montana on the 17th. Flooding from heavy rain occurred in the Glendive and Sidney areas, with gusts peaked at 69 mph at Beaver Hill (Wibaux). Severe thunderstorms moved through northeast Montana on the 19th, with 2-inch hail reported near Brockton (Roosevelt). Another storm system brought heavy rain across south central Montana over the 20th and 21st. Columbus (Stillwater) reported almost 3-inches of rain, while nearly 2-inches fell in the Bozeman area. Thunderstorms again moved through central and eastern Montana on the 24th, producing wind gusts to 54 mph at Big Timber and Fort Peck. Strong winds blew across central Montana on the 26th, with gusts of 71 mph at Deep Creek RAWS (the highest gust of the month) and 56 mph near Highwood (Chouteau). Very strong winds blew ahead of the month-end snowstorm. Gusts of 56-mph occurred at Joplin. In the Flathead Lake area, gusts of 35-45 mph caused erosion on the eastern shore, and caused trees to be blown down, resulting in the closure of MT 35 for a period. Finally, the historic snowstorm started on the 28th. By the end of the month, 52-inches of snow was on the ground at Babb and 48-inches at Browning. Snow fell over a large portion of central, northeast and western Montana.

Precipitation/convection

Severe convective weather occurred on 6 days in September, which is 4 days above normal and the most recorded in any September since 2013.

New Daily and Monthly Records established in September and early October...

Date	Record Type	Location	New Value	Old Record	Year of Old Record
Sept 4	Record Warm Max Temp	Bozeman	96°F	94°	1998
Sept 6	Record Daily Precip	Livingston	0.68"	0.61"	1976
Sept 7	Record Daily Precip	Glasgow	0.62"	0.61"	1938
		Kalispell	0.77"	0.73"	1986
Sept 20	Record Daily Precip	Billings	0.68"	0.50"	1970
		Livingston	1.08"	0.59"	1970
Sept 28	Record Daily Precip	Billings	0.35"	0.32"	1983
		Miles City	1.15	0.18	1983
	Record Daily Snowfall	Great Falls	9.7"	6.1"	1954
Sept 29	Record Daily Precip	Great Falls	0.60"	0.40"	1937
		Havre	0.65"	0.44"	1925
	Record Daily Snowfall	Grass Range	9.6"	1.1"	1954
	Record cold Max Temp	Bozeman	35°F	40°F	1983
		Butte	30	34	1950
		Cut Bank	28	32	1954
		Dillon	29	36	1950
		Great Falls	32	35	1954
		Havre	33	39	1982
		Helena	33	38	1925
		Kalispell	39	44	1925
		Lewistown	32	34	1950
		Missoula	36	47	1950
	Record Daily Snowfall	Missoula	1.7"	T	1954
Sept 30	Record cold Min Temp	Cut Bank	6°F	19°F	1959
		Great Falls	12	22	1985
Sept 30	Record cold Max Temp	Cut Bank	30°F	32°F	2018
		Dillon	32	33	1950
		Great Falls	31	33	1950
		Lewistown	31	31	1950
		Livingston	39	39	1985
September	Record Monthly Snowfall	Grass Range	19.3"	13.2"	1934
		Havre	10.1	8.7	1934
		Missoula	1.7"	1.5"	1934
	Record Monthly Snowdepth	Cut Bank	18"	5"	1947
Oct 1	Record cold Min Temp	Cut Bank	1°F	14°F	1950

Oct 1	Record cold Min Temp	Great Falls	9	22	1959
	Record Daily Snowdepth	Cut Bank	11"	Trace	1919
Oct 1	Record cold Max Temp	Cut Bank	27°F	34°F	1999
		Dillon	36	37	1971
		Great Falls	34	36	1999
Oct 2	Record cold Min Temp	Cut Bank	8°F	15°F	1925
		Great Falls	17	18	1999
		Kalispell	19°F	21°F	1999
	Record Daily Snowdepth	Cut Bank	9"	2"	1947
Oct 3	Record Daily Snowdepth	Cut Bank	9"	2"	2018

Crop season (Apr-Sep)

The crop-year average temperature was 57.3°F, 0.4°F below normal. This was the 38th coolest such period and coolest since 2012.

Composite crop-year precipitation totaled 13.23-inches, 2.83" above normal. This was the sixth wettest such season, and wettest since 2010.

Winds averaged 8.3-mph, which is 0.4-mph below normal. This was the ninth calmest crop-year.

Water year (Oct-Sep)

For the water year, the temperature average was 41.2°F, 2.0°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 16th coolest such season, and the coolest since 1993.

Composite precipitation totaled 18.96-inches, 3.46" above normal. This was the sixth wettest of record, and the wettest since 2011.

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.

September information:

High Temperature	101°F at Ingomar (4 th)	Greatest Precip	10.92" near Sidney
Low Temperature	5°F at Mystic Lake (29 th) and Blackfeet Agrimet (30 th)		
Warmest Ave Temp	61.2°F at Little Bighorn RAWS	Peak Wind Gust	71 mph at Brenner RAWS (6 th) and Deep Creek RAWS (26 th)
Coollest Ave Temp	43.4°F at Yellow Mule RAWS		
Range of Temp departures	-1.2°F at Lewistown to +2.0 at Livingston	Highest Ave Wind	15.1 mph at Deep Creek RAWS 12.0 mph at Hillside
21 city mean monthly Temperature/Normal	56.6/56.1F normal. 62 nd coldest of record (since 1880). 56 th percentile.	20 city mean monthly wind speed/Normal	8.6 mph/8.1 mph; 39 th windiest of record (since 1936). 54 th percentile.
22 city mean monthly precipitation/Normal	3.63"/2.26" – 160% of normal. 1 st wettest of record (since 1880). 1 st percentile.	20 city mean monthly snowfall/Normal	4.7"/0.5" highest of record.

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

Location	Sep	% of Norm	Rank	Pcntl	Oct 1 – Sep 30	% of norm	Rank	Pcntl	Years
Baker	5.18	453%			22.10	190%			21
Billings	3.24	242%	5	3	19.01	129%	10	8	115
Belgrade	3.03	280%	5	5	15.62	112%	18	21	82
Butte	1.95	195%	20	15	13.64	107%	43	34	124
Cut Bank	2.50	205%	14	12	13.76	127%	24	21	111
Dillon	0.81	96%	45	56	8.58	82%	56	71	79
Glasgow	4.57	486%	3	2	18.30	157%	10	8	119
Great Falls	2.13	150%	24	18	15.81	107%	46	36	127
Havre	2.48	221%	12	8	11.14	99%	82	59	139
Helena	3.03	275%	4	2	15.56	139%	18	12	140
Jordan	5.59	462%			19.03	150%			21
Kalispell	2.52	183%	13	10	17.01	100%	46	36	125
Lewistown	3.09	229%	8	6	17.75	105%	56	45	124
Livingston	3.91	323%	4	3	21.72	147%	4	3	112
Miles City	2.85	264%	9	6	16.22	130%	31	21	142
Missoula	2.40	209%	13	9	17.82	125%	12	8	133
Mullan Pass	2.75	172%	18	22	39.82	105%	32	41	77
Wolf Point	5.63	557%			19.52	160%			21
Glendive	8.46	666%	1	1	22.55	166%	2	1	116
Sidney	7.12	570%	1	1	23.37	163%	1	0	79
BZN-MSU	4.20	300%	7	4	24.24	123%	8	5	138
W Yellowstone	2.47	226%	19	16	24.95	117%	24	25	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	Sep	Normal	Rank	Pcntl	Oct 1 – Sep 30	Normal	Rank	Pcntl	Years
Baker	58.9	55.5	41	37	40.9	42.5	96	91	105
Billings	62.4	60.3	23	26	46.5	48.1	56	65	85
Belgrade	56.3	55.5	27	31	40.3	42.8	73	87	84
Butte	53.2	51.9	44	34	38.5	39.9	95	76	125
Cut Bank	53.1	53.9	63	56	39.3	42.0	90	82	110
Dillon	54.7	54.9	41	53	40.1	42.7	75	100	75
Glasgow	59.4	58.2	38	30	42.0	43.2	62	50	123
Great Falls	56.0	56.1	81	65	42.0	44.5	117	96	122
Havre	57.1	56.5	61	43	41.0	43.4	106	76	139
Helena	59.1	57.8	27	19	43.1	45.3	93	67	139
Jordan	59.0	57.2	42	42	42.0	43.4	82	88	93
Kalispell	55.7	54.2	32	26	42.2	43.3	45	38	118
Lewistown	53.8	54.9	74	61	40.1	43.0	105	92	114
Livingston	57.8	55.8	46	38	42.9	44.7	107	95	112
Miles City	60.9	60.1	60	43	43.3	46.0	119	87	137
Missoula	58.1	57.4	41	31	44.0	45.9	89	72	124
Mullan Pass	47.6	50.5	35	81	37.9	37.9	19	44	42
Wolf Point	58.4	57.1			40.6	42.1			21
Glendive	61.6	61.3	43	35	44.1	46.5	81	70	115
Sidney	58.5	60.0	40	41	40.8	45.5	41	43	95
W Yellowstone	47.7	48.0	48	49	33.5	34.3	79	86	92

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

Location	Sep	Normal	Rank	Pcntl	Oct 1 – Sep 30	Normal	Rank	Pcntl	Years
Baker	11.4	11.3			10.7	11.2			22
Billings	9.9	9.3	43	50	10.5	10.6	65	78	83
Belgrade	5.9	5.9	24	43	5.2	5.9	48	89	54
Butte	5.7	6.9	40	71	5.4	6.7	49	89	55
Cut Bank	11.8	11.1	28	36	11.5	12.7	72	93	77
Dillon	8.9	8.1	17	25	8.5	9.0	60	92	65
Glasgow	11.1	10.2	12	15	10.2	10.4	56	75	74
Great Falls	10.2	10.6	49	59	10.7	12.1	80	99	81
Havre	10.1	8.3	12	8	10.1	9.1	26	19	130
Helena	6.6	6.6	106	76	5.9	7.0	139	100	139
Jordan	9.3	7.8	2	3	8.0	8.0	23	63	36
Kalispell	5.5	5.3	75	62	5.4	5.5	105	88	119
Lewistown	8.4	8.3	37	47	8.6	9.2	70	91	77
Livingston	12.6	10.7	17	30	13.7	14.0	44	84	52
Miles City	10.1	10.1	27	20	9.4	10.2	66	51	128
Missoula	5.0	5.4	64	76	5.0	5.6	69	82	84
Mullan Pass	4.1	5.4	29	97	4.3	5.6	28	100	28
Wolf Point	9.3	7.4			8.0	8.1			21
Glendive	10.5	9.8	6	33	9.5	10.3	25	93	27
Sidney	9.1	8.3	5	19	8.8	9.1	19	63	30
W Yellowstone	6.0	5.3			5.4	6.3			5

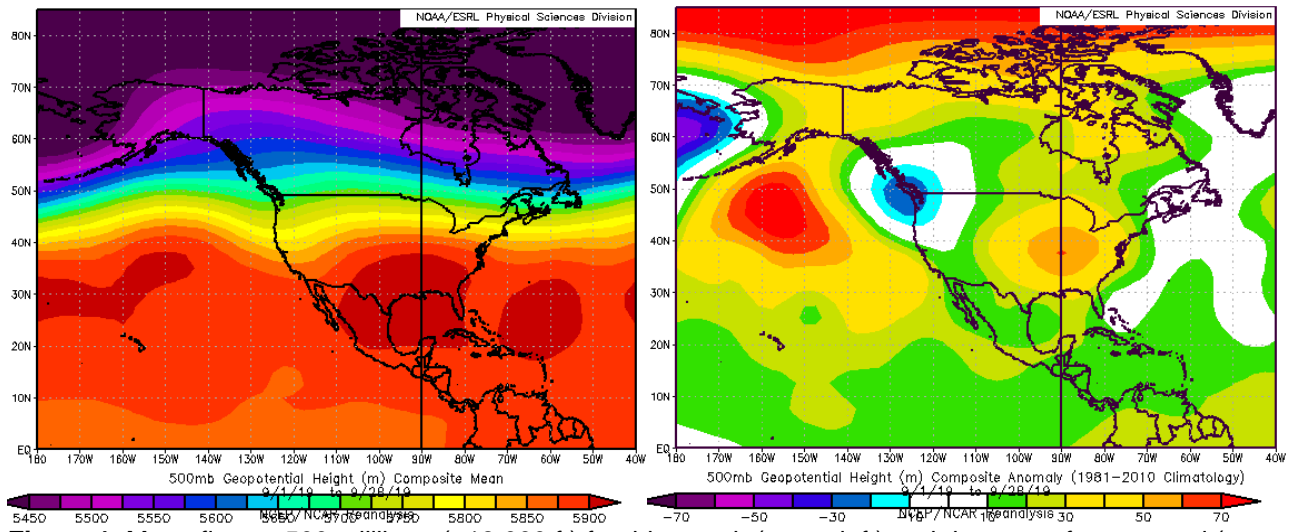


Figure 1. Mean flow at 500 millibars (~18,000 ft) for this month (upper left) and departure from normal (upper right).

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=tfx>. 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.