U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Service

Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: BOZEMAN MONTANA ST UNIV, MT **COOP ID: 241044**

Climate Division: MT 2 **NWS Call Sign:** **Elevation: 4,913 Feet** **Lat: 45˚40N** **Lon: 111˚03W**

Temperature (˚F)

Mean (1)				Extremes										Degree Days (1) Base Temp 65		Mean Number of Days (3)					
Month	Daily Max	Daily Min	Mean	Highest Daily(2)	Year	Day	Highest Month(1) Mean	Year	Lowest Daily(2)	Year	Day	Lowest Month(1) Mean	Year	Heating	Cooling	Max >= 100	Max >= 90	Max >= 50	Max <= 32	Min <= 32	Min <= 0
Jan	33.4	13.9	23.7	65	1896	8	32.6	1994	-36+	1949	25	6.9	1979	1283	0	.0	.0	1.8	11.6	29.0	5.8
Feb	38.6	18.1	28.4	63+	1995	24	37.9	1991	-43	1936	8	11.6	1989	1027	0	.0	.0	4.4	6.8	25.5	3.0
Mar	46.0	24.1	35.1	73	1978	30	43.5	1986	-27	1932	10	28.7	1976	928	0	.0	.0	11.6	2.8	25.5	.7
Apr	55.5	31.4	43.5	83	1897	26	51.3	1987	-10	1936	1	33.0	1975	647	0	.0	.0	20.7	.5	17.0	.0
May	64.5	39.4	52.0	91	1892	22	56.4	1992	16+	1954	2	46.9	1975	407	2	.0	.0	28.5	.0	5.3	.0
Jun	73.7	46.4	60.1	96+	1990	30	68.0	1988	26+	1951	3	53.7	1998	183	36	.0	.9	29.9	.0	.5	.0
Jul	81.8	51.9	66.9	105	1892	31	71.6	1985	32+	1955	2	58.6	1993	66	124	.0	4.3	31.0	.0	.0	.0
Aug	81.7	50.7	66.2	99	1961	5	70.9	1971	26	1910	25	60.8	1993	72	109	.0	3.3	31.0	.0	.1	.0
Sep	71.0	42.1	56.6	95	1947	2	63.3	1994	12	1926	24	50.3	1985	280	27	.0	.6	28.7	@	3.3	.0
Oct	59.0	33.2	46.1	88	1992	1	52.6	1988	-10	1935	30	41.1	1984	587	0	.0	.0	24.9	.6	14.1	.1
Nov	41.8	22.3	32.1	73	1999	12	42.5	1999	-26+	1959	16	18.4	1985	989	0	.0	.0	8.3	6.2	24.9	1.3
Dec	34.1	14.6	24.4	63	1980	27	33.4	1980	-36	1919	9	10.2	1983	1260	0	.0	.0	2.4	11.9	28.8	4.0
Ann	56.8	32.3	44.6	105	Jul 1892	31	71.6	Jul 1985	-43	Feb 1936	8	6.9	Jan 1979	7729	298	.0	9.1	223.2	40.4	174.0	14.9

\+ Also occurred on an earlier date(s)

@ Denotes mean number of days greater than 0 but less than .05

Complete documentation available from: www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1892-2001

(3) Derived from 1971-2000 serially complete daily data

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Precipitation (inches)

Precipitation Totals

Month	Means/ Medians(1) Mean	Means/ Medians(1) Median	Extremes Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year
Jan	.84	.81	.77	1942	28	2.00	1995	.12	1983
Feb	.70	.67	.88	1942	16	1.61	1986	.04	1973
Mar	1.40	1.38	1.20	1991	11	2.80	1982	.32	1987
Apr	2.06	2.09	1.53	1951	30	3.42	1995	.39	1980
May	3.22	2.94	2.68	1988	7	6.99	1981	1.37	1998
Jun	2.85	2.86	2.29	2001	13	5.49	1992	.56	1985
Jul	1.44	1.17	2.05	1993	3	4.95	1993	.10	1999
Aug	1.48	1.39	1.33	1964	29	3.43	1999	.46	1991
Sep	1.80	1.60	1.69	1947	10	4.22	1978	.07	1979
Oct	1.61	1.57	1.66	1935	15	4.29	1975	.12	1987
Nov	1.10	1.16	1.35	1918	5	2.20	1996	.20	1976
Dec	.79	.73	.94	1996	25	2.12	1996	.12	1986
Ann	19.29	18.93	2.68	May 1988	7	6.99	May 1981	.04	Feb 1973

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	9.8	3.0	.1	.0
Feb	7.1	2.4	.1	.0
Mar	10.6	5.0	.3	@
Apr	11.7	6.1	.9	.1
May	14.8	7.8	1.9	.4
Jun	13.2	7.5	1.6	.3
Jul	9.5	3.9	.5	.2
Aug	9.9	4.4	.7	@
Sep	9.5	4.7	1.0	.2
Oct	8.3	4.2	1.0	.1
Nov	8.9	3.3	.3	@
Dec	8.6	2.8	.1	.0
Ann	121.9	55.1	8.5	1.3

Precipitation Probabilities (1)

Probability that the monthly/annual precipitation will be equal to or less than the indicated amount

Monthly/Annual Precipitation vs Probability Levels
These values were determined from the incomplete gamma distribution

Month	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
Jan	.26	.33	.45	.56	.66	.76	.87	1.00	1.18	1.45	1.70
Feb	.14	.20	.30	.40	.49	.60	.71	.86	1.04	1.34	1.63
Mar	.54	.67	.85	1.01	1.15	1.30	1.46	1.65	1.89	2.25	2.58
Apr	.77	.96	1.24	1.47	1.69	1.92	2.16	2.44	2.80	3.36	3.86
May	1.29	1.59	2.01	2.36	2.68	3.01	3.37	3.79	4.31	5.12	5.85
Jun	.92	1.19	1.59	1.93	2.26	2.60	2.97	3.40	3.96	4.83	5.63
Jul	.16	.27	.47	.68	.89	1.13	1.41	1.76	2.24	3.03	3.79
Aug	.44	.58	.79	.97	1.15	1.33	1.54	1.78	2.09	2.57	3.02
Sep	.31	.47	.73	.98	1.23	1.50	1.81	2.19	2.69	3.50	4.28
Oct	.38	.53	.76	.98	1.19	1.41	1.66	1.96	2.35	2.97	3.55
Nov	.31	.41	.57	.71	.84	.98	1.14	1.32	1.55	1.93	2.27
Dec	.22	.30	.41	.51	.61	.71	.82	.95	1.12	1.38	1.63
Ann	14.22	15.21	16.48	17.44	18.29	19.10	19.94	20.87	21.99	23.60	24.99

\+ Also occurred on an earlier date(s)
\# Denotes amounts of a trace
@ Denotes mean number of days greater than 0 but less than .05
****** Statistics not computed because less than six years out of thirty had measurable precipitation

(1) From the 1971-2000 Monthly Normals
(2) Derived from station's available digital record: 1892-2001
(3) Derived from 1971-2000 serially complete daily data

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Snow (inches)

Snow Totals

Means/Medians (1)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	13.4	13.6	7	7
Feb	10.9	11.1	6	5
Mar	16.9	18.7	4	3
Apr	13.1	11.5	1	#
May	4.5	3.0	#	#
Jun	.3	.0	#	0
Jul	#	.0	0	0
Aug	.1	.0	#	0
Sep	.9	.1	#	0
Oct	5.8	4.5	#	#
Nov	12.2	12.0	2	2
Dec	13.0	12.5	5	5
Ann	91.1	87.0	N/A	N/A

Extremes (2)

Month	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year
Jan	9.0	1980	10	25.1	1989	23	1995	29	15	1995
Feb	8.0	1986	13	27.0	1986	23	1986	13	13+	1997
Mar	16.0	1991	11	33.8	1980	20	1980	30	10+	1998
Apr	15.0	1983	3	34.7	1973	15	1991	12	4	1982
May	13.3	1997	1	21.5	1975	10	1997	1	1	1997
Jun	1.8	1973	17	2.5	1973	1	1974	7	#+	1998
Jul	#	1972	19	#	1972	0	0	0	0	0
Aug	2.0	1992	24	2.0	1992	#	1979	27	#	1979
Sep	4.2	1983	19	5.1	1971	2	1985	27	#+	1999
Oct	7.0	1978	29	22.5	1975	8	1975	23	2	1998
Nov	11.5	1979	19	24.7	1994	14	2000	30	6	2000
Dec	14.5	1998	4	32.3	1996	28	1996	25	13+	2000
Ann	16.0	Mar 1991	11	34.7	Apr 1973	28	Dec 1996	25	15	Jan 1995

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	9.5	4.3	1.5	.5	.0
Feb	7.0	3.3	1.5	.5	.0
Mar	9.0	5.3	2.0	.7	.1
Apr	6.7	3.8	1.4	.9	.1
May	2.3	1.3	.5	.2	@
Jun	.3	.1	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	@	@	.0	.0	.0
Sep	.9	.4	.1	.0	.0
Oct	3.1	1.9	.8	.3	.0
Nov	7.1	4.0	1.4	.5	@
Dec	8.6	4.0	1.5	.5	.1
Ann	54.5	28.4	10.7	4.1	.3

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	28.3	24.1	20.6	4.6
Feb	20.6	15.8	12.1	2.2
Mar	14.0	10.0	5.9	.8
Apr	4.0	2.7	1.8	.3
May	.9	.5	.2	@
Jun	@	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.1	.0	.0	.0
Oct	3.0	1.8	.8	.0
Nov	14.4	10.1	5.5	.6
Dec	26.1	21.8	15.9	3.7
Ann	111.4	86.8	62.8	12.2

+ Also occurred on an earlier date(s) #Denotes trace amounts

@ Denotes mean number of days greater than 0 but less than .05

-9/-9.9 represents missing values
Annual statistics for Mean/Median snow depths are not appropriate

(1) Derived from Snow Climatology and 1971-2000 daily data

(2) Derived from 1971-2000 daily data

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Freeze Data

Spring Freeze Dates (Month/Day)

Temp (F)	Probability of later date in spring (thru Jul 31) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	7/01	6/26	6/22	6/18	6/15	6/12	6/08	6/04	5/30
32	6/11	6/05	6/01	5/29	5/26	5/23	5/19	5/15	5/09
28	5/21	5/16	5/12	5/09	5/06	5/03	4/30	4/26	4/21
24	5/09	5/03	4/29	4/25	4/22	4/18	4/15	4/11	4/05
20	4/29	4/23	4/18	4/15	4/11	4/08	4/04	3/31	3/25
16	4/21	4/14	4/09	4/05	4/01	3/28	3/23	3/18	3/11

Fall Freeze Dates (Month/Day)

Temp (F)	Probability of earlier date in fall (beginning Aug 1) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	8/29	9/02	9/05	9/08	9/10	9/12	9/15	9/18	9/22
32	9/06	9/11	9/14	9/17	9/19	9/22	9/24	9/28	10/02
28	9/16	9/22	9/26	9/29	10/02	10/06	10/09	10/13	10/19
24	9/28	10/03	10/06	10/09	10/12	10/15	10/18	10/22	10/27
20	10/04	10/10	10/14	10/18	10/21	10/24	10/28	11/01	11/07
16	10/15	10/21	10/26	10/30	11/03	11/06	11/10	11/15	11/22

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	105	99	94	90	86	83	79	74	68
32	136	129	124	120	116	111	107	102	95
28	174	165	159	154	149	144	138	132	123
24	199	190	184	178	173	168	162	156	147
20	219	210	203	197	192	187	181	174	165
16	248	237	229	222	215	209	202	194	183

***** Probability of observing a temperature as cold, or colder, later in the spring or earlier in the fall than the indicated date.

0/00 Indicates that the probability of occurrence of threshold temperature is less than the indicated probability.

Derived from 1971-2000 serially complete daily data

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Degree Days to Selected Base Temperatures (˚F)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	1283	1027	928	647	407	183	66	72	280	587	989	1260	7729
60	1128	887	773	500	265	92	20	24	172	433	839	1105	6238
57	1035	803	680	416	191	53	9	10	120	344	749	1012	5422
55	973	747	618	361	149	34	4	5	91	287	690	950	4909
50	818	614	472	238	68	8	0	1	37	164	551	796	3767
32	331	208	89	16	0	0	0	0	0	4	161	311	1120

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	71	105	185	360	618	842	1081	1060	737	440	162	74	5735
55	0	0	1	15	54	186	371	352	137	10	1	0	1127
57	0	0	0	9	34	145	314	295	106	5	0	0	908
60	0	0	0	3	15	94	232	216	68	2	0	0	630
65	0	0	0	0	2	36	124	109	27	0	0	0	298
70	0	0	0	0	0	9	50	40	8	0	0	0	107

Growing Degree Units (2)

Base	Growing Degree Units (Monthly)												Growing Degree Units (Accumulated Monthly)											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
40	3	14	53	171	386	610	846	821	510	246	43	8	3	17	70	241	627	1237	2083	2904	3414	3660	3703	3711
45	0	0	16	90	249	463	691	667	365	136	16	0	0	0	16	106	355	818	1509	2176	2541	2677	2693	2693
50	0	0	1	43	138	319	536	512	242	65	2	0	0	0	1	44	182	501	1037	1549	1791	1856	1858	1858
55	0	0	0	14	60	191	382	360	136	18	0	0	0	0	0	14	74	265	647	1007	1143	1161	1161	1161
60	0	0	0	0	22	96	238	219	59	3	0	0	0	0	0	0	22	118	356	575	634	637	637	637
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	10	45	123	243	381	536	528	330	175	28	1	0	10	55	178	421	802	1338	1866	2196	2371	2399	2400

(1) Derived from the 1971-2000 Monthly Normals
(2) Derived from 1971-2000 serially complete daily data
Note: For corn, temperatures below 50 are set to 50, and temperatures above 86 are set to 86

Complete documentation available from:
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Notes

a. The monthly means are simple arithmetic averages computed by summing the monthly values for the period 1971-2000 and dividing by thirty. Prior to averaging, the data are adjusted if necessary to compensate for data quality issues, station moves or changes in station reporting practices. Missing months are replaced by estimates based on neighboring stations.

b. The median is defined as the middle value in an ordered set of values. The median is being provided for the snow and precipitation elements because the mean can be a misleading value for precipitation normals.

c. Only observed validated values were used to select the extreme daily values.

d. Extreme monthly temperature/precipitation means were selected from the monthly normals data.
Monthly snow extremes were calculated from daily values quality controlled to be consistent with the Snow Climatology.

e. Degree Days were derived using the same techniques as the 1971-2000 normals.
Compete documentation for the 1971-2000 Normals is available on the internet from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

f. Mean "number of days statistics" for temperature and precipitation were calculated from a serially complete daily data set .
Documentation of the serially complete data set is available from the link below:

g. Snowfall and snow depth statistics were derived from the Snow Climatology.
Documentation for the Snow Climatology project is available from the link under references.

Data Sources for Tables

Several different data sources were used to create the Clim20 climate summaries. In some cases the daily extremes appear inconsistent with the monthly extremes and or the mean number of days statistics. For example, a high daily extreme value may not be reflected in the highest monthly value or the mean number of days threshold that is less than and equal to the extreme value. Some of these difference are caused by different periods of record. Daily extremes are derived from the station's entire period of record while the serial data and normals data were are for the 1971-2000 period. Therefore extremes observed before 1971 would not be included in the 1971-2000 normals or the 1971-2000 serial daily data set. Inconsistencies can also occur when monthly values are adjusted to reflect the current observing conditions or were replaced during the 1971-2000 Monthly Normals processing and are not reconciled with the Summary of the Day data.

a. Temperature/ Precipitation Tables
   1. 1971-2000 Monthly Normals
   2. Cooperative Summary of the Day
   3. National Weather Service station records
   4. 1971-2000 serially complete daily data

b. Degree Day Table
   1. Monthly and Annual Heating and Cooling Degree Days Normals to Selected Bases derived from 1971-2000 Monthly Normals
   2. Daily Normal Growing Degree Units to Selected Base Temperatures derived from 1971-2000 serially complete daily data

c. Snow Tables
   1. Snow Climatology
   2. Cooperative Summary of the Day

d. Freeze Data Table
   1971-2000 serially complete daily data

References

U.S. Climate Normals 1971-2000, www.ncdc.noaa.gov/normals.html
U.S. Climate Normals 1971-2000-Products Clim20, www.ncdc.noaa.gov/oa/climate/normals/usnormalsprods.html
Snow Climatology Project Description, www.ncdc.noaa.gov/oa/climate/monitoring/snowclim/mainpage.html
Eischeid, J. K., P. Pasteris, H. F. Diaz, M. Plantico, and N. Lott, 2000: Creating a serially complete, national daily time series of temperature and precipitation for the Western United States. J. Appl. Meteorol., 39, 1580-1591,
www1.ncdc.noaa.gov/pub/data/special/ serialcomplete_jam_0900.pdf