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: BOULDER, MT **COOP ID: 241008**

Climate Division: MT 2 **NWS Call Sign:** **Elevation: 4,904 Feet** **Lat: 46˚14N** **Lon: 112˚07W**

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	34.3	9.9	22.1	58+	1989	30	30.1	1983	-38	1957	26	4.4	1979	1331	0	.0	.0	2.3	10.9	30.0	8.0
Feb	39.5	13.9	26.7	65+	1995	25	36.5	1991	-39	1989	3	8.9	1989	1074	0	.0	.0	5.3	6.1	27.0	4.4
Mar	46.6	19.9	33.3	72+	1986	27	41.3	1986	-28	1955	25	25.9	1996	985	0	.0	.0	12.4	3.3	29.2	1.4
Apr	55.8	26.3	41.1	83	1987	28	48.2	1987	-6	1997	6	30.0	1975	719	0	.0	.0	20.9	.6	22.7	.1
May	64.6	34.3	49.5	89+	1986	31	54.2	1992	9	1967	2	44.7	1996	482	0	.0	.0	28.4	.0	10.2	.0
Jun	73.8	41.8	57.8	96+	1988	26	65.4	1988	22	1954	1	52.8	1998	238	22	.0	1.0	29.8	.0	1.9	.0
Jul	82.2	46.8	64.5	99+	1960	20	70.2	1985	30	1949	28	55.0	1993	113	97	.0	5.1	31.0	.0	.1	.0
Aug	82.0	45.5	63.8	100	1961	5	69.3	1971	19	1992	25	57.9	1993	120	82	.0	4.3	30.9	.0	.7	.0
Sep	71.4	36.4	53.9	94	1950	4	60.1	1998	8	1965	17	47.5	1985	346	12	.0	.5	28.8	@	8.2	.0
Oct	59.6	27.5	43.6	87	1992	2	49.3	1988	-14	1991	30	39.0	1984	665	0	.0	.0	24.8	.4	21.8	.1
Nov	42.1	17.9	30.0	71+	1999	13	39.0	1999	-34	1959	16	16.0	1985	1050	0	.0	.0	8.6	5.7	27.6	2.8
Dec	34.6	10.7	22.7	62	1980	16	31.7	1980	-42	1990	22	8.3	1983	1313	0	.0	.0	2.1	11.1	29.9	6.3
Ann	57.2	27.6	42.4	100	Aug 1961	5	70.2	Jul 1985	-42	Dec 1990	22	4.4	Jan 1979	8436	213	.0	10.9	225.3	38.1	209.3	23.1

\+ 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: 1880-2001

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

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COOP ID: 241008

Climate Division: MT 2 **NWS Call Sign:** **Elevation: 4,904 Feet** **Lat: 46˚14N** **Lon: 112˚07W**

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	.40	.29	.60	1975	26	1.62	1975	.06	1987
Feb	.30	.25	.60	1986	17	1.11	1986	.01	1977
Mar	.52	.53	.52	1965	16	1.05	1982	.04	1999
Apr	.76	.67	1.37	1955	26	2.29	1975	.19	1983
May	1.99	1.85	1.70	1981	24	5.61	1981	.43	1979
Jun	1.94	1.59	1.46	1991	22	3.60	1976	.23	1974
Jul	1.51	1.29	1.85	1983	10	3.89	1993	.16	1985
Aug	1.43	.96	1.46	1990	20	4.91	1990	.31	1988
Sep	1.06	.90	1.18	1995	8	2.60	1985	.10	1979
Oct	.61	.46	.75	1967	3	2.35	1975	.02	1987
Nov	.56	.39	1.05	1971	29	1.63	1973	.07	1976
Dec	.43	.38	.62	1948	3	1.38	1977	.00	1997
Ann	11.51	11.23	1.85	Jul 1983	10	5.61	May 1981	.00	Dec 1997

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	6.6	1.1	.1	.0
Feb	4.7	.8	@	.0
Mar	7.4	2.1	.0	.0
Apr	8.1	2.7	.2	.0
May	12.4	5.9	.7	.2
Jun	11.6	6.0	.8	.1
Jul	8.6	4.6	.6	.1
Aug	8.6	4.3	.6	.2
Sep	7.0	3.0	.6	@
Oct	5.6	1.8	.2	.0
Nov	6.6	2.1	.1	@
Dec	6.5	1.6	@	.0
Ann	93.7	36.0	3.9	.6

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	.04	.07	.13	.18	.24	.31	.39	.49	.63	.85	1.07
Feb	.03	.05	.09	.13	.18	.23	.29	.36	.47	.64	.81
Mar	.12	.17	.24	.31	.38	.45	.53	.63	.76	.96	1.15
Apr	.17	.24	.35	.46	.56	.66	.78	.93	1.12	1.42	1.70
May	.54	.73	1.02	1.27	1.51	1.77	2.06	2.39	2.83	3.52	4.16
Jun	.46	.64	.92	1.17	1.43	1.70	2.00	2.35	2.82	3.57	4.27
Jul	.24	.37	.58	.79	1.01	1.24	1.51	1.84	2.28	3.00	3.68
Aug	.22	.34	.55	.75	.95	1.18	1.43	1.75	2.17	2.86	3.51
Sep	.12	.20	.35	.50	.66	.84	1.04	1.30	1.65	2.22	2.78
Oct	.04	.07	.14	.23	.32	.43	.56	.74	.98	1.39	1.79
Nov	.08	.13	.21	.29	.37	.45	.56	.68	.85	1.12	1.38
Dec	.04	.08	.15	.21	.28	.35	.43	.52	.66	.87	1.07
Ann	7.11	7.91	8.97	9.79	10.52	11.25	12.00	12.85	13.89	15.42	16.76

\+ 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: 1880-2001
(3) Derived from 1971-2000 serially complete daily data

Complete documentation available from:
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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	4.0	-99.9	3	2
Feb	2.6	2.2	2	#
Mar	1.5	-99.9	1	0
Apr	.7	.0	1	0
May	.3	.0	0	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	#	.0	0	0
Oct	.4	.0	#	0
Nov	5.3	1.5	1	0
Dec	2.0	-99.9	2	#
Ann	16.8	-9.9	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	8.0	1971	10	8.0	1971	18	1972	4	10+	1979
Feb	3.0	1972	9	8.2	1975	12	1979	14	11	1975
Mar	3.0	1974	8	7.5	1974	6	1975	27	4	1975
Apr	6.0	1975	4	6.0	1975	12	1976	26	11	1976
May	4.0	1982	29	4.0	1982	0	0	0	0	0
Jun	.0	0	0	.0	0	0	0	0	0	0
Jul	.0	0	0	.0	0	0	0	0	0	0
Aug	.0	0	0	.0	0	0	0	0	0	0
Sep	#	1974	2	#	1974	0	0	0	0	0
Oct	3.0	1971	15	3.0	1971	3+	1980	15	#+	2000
Nov	9.0	1973	6	22.5	1973	20	1973	7	4	1978
Dec	4.0	1971	26	4.0	1971	11	1978	28	7	1978
Ann	9.0	Nov 1973	6	22.5	Nov 1973	20	Nov 1973	7	11+	Apr 1976

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	2.7	1.7	.8	.5	.0
Feb	2.2	1.2	.3	.0	.0
Mar	-9.9	-9.9	-9.9	-9.9	-9.9
Apr	-9.9	-9.9	-9.9	-9.9	-9.9
May	.1	.1	.1	.0	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.0	.0	.0	.0	.0
Oct	.2	.2	.1	.0	.0
Nov	2.0	1.5	.3	.2	.0
Dec	-9.9	-9.9	-9.9	-9.9	-9.9
Ann	-9.9	-9.9	-9.9	-9.9	-9.9

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	-9.9	-9.9	-9.9	-9.9
Feb	2.2	.0	.0	.0
Mar	-9.9	-9.9	-9.9	-9.9
Apr	.0	.0	.0	.0
May	.0	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.1	.1	.0	.0
Nov	2.9	.9	.6	.5
Dec	-9.9	-9.9	-9.9	-9.9
Ann	-9.9	-9.9	-9.9	-9.9

+ 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	7/20	7/13	7/09	7/05	7/01	6/27	6/23	6/18	6/12
32	6/30	6/24	6/19	6/15	6/12	6/08	6/04	5/31	5/25
28	6/10	6/04	5/31	5/28	5/25	5/21	5/18	5/14	5/08
24	5/25	5/19	5/15	5/11	5/08	5/04	4/30	4/26	4/20
20	5/08	5/02	4/28	4/25	4/21	4/18	4/15	4/10	4/05
16	4/23	4/18	4/14	4/11	4/08	4/05	4/02	3/29	3/24

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	8/12	8/17	8/21	8/24	8/27	8/30	9/02	9/05	9/11
32	8/21	8/26	8/30	9/02	9/05	9/08	9/11	9/15	9/20
28	9/03	9/07	9/10	9/13	9/15	9/17	9/20	9/23	9/27
24	9/10	9/14	9/17	9/20	9/22	9/25	9/27	10/01	10/05
20	9/16	9/22	9/26	9/30	10/03	10/06	10/10	10/14	10/19
16	9/27	10/02	10/07	10/10	10/14	10/17	10/20	10/25	10/30

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	81	73	66	61	56	51	46	40	31
32	108	100	94	89	85	80	75	69	61
28	134	127	121	117	113	109	104	99	92
24	159	151	146	141	137	133	128	123	115
20	191	182	175	169	164	158	153	146	137
16	211	203	197	192	188	183	178	172	164

***** 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)

Base	Heating Degree Days (1)												
Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	1331	1074	985	719	482	238	113	120	346	665	1050	1313	8436
60	1176	934	830	569	333	131	46	51	222	510	900	1158	6860
57	1083	850	737	483	250	83	23	26	160	418	810	1065	5988
55	1021	794	675	426	200	57	14	16	124	357	750	1003	5437
50	867	662	522	292	101	17	2	3	56	218	608	848	4196
32	371	250	106	24	0	0	0	0	0	7	192	353	1303

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	64	100	145	295	541	774	1007	984	657	365	133	63	5128
55	0	0	0	7	28	141	309	287	90	2	0	0	864
57	0	0	0	4	16	106	256	235	66	1	0	0	684
60	0	0	0	0	5	65	186	167	38	0	0	0	461
65	0	0	0	0	0	22	97	82	12	0	0	0	213
70	0	0	0	0	0	5	37	28	3	0	0	0	73

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	0	9	35	129	321	554	775	753	437	180	27	3	0	9	44	173	494	1048	1823	2576	3013	3193	3220	3223
45	0	0	6	57	195	405	620	598	301	91	6	0	0	0	6	63	258	663	1283	1881	2182	2273	2279	2279
50	0	0	0	19	99	268	465	445	185	33	0	0	0	0	0	19	118	386	851	1296	1481	1514	1514	1514
55	0	0	0	2	39	150	318	297	90	7	0	0	0	0	0	2	41	191	509	806	896	903	903	903
60	0	0	0	0	7	70	182	161	27	0	0	0	0	0	0	0	7	77	259	420	447	447	447	447
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	14	46	125	239	365	501	495	330	176	26	0	0	14	60	185	424	789	1290	1785	2115	2291	2317	2317

(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