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: MOORHEAD 9 NE, MT **COOP ID: 245870**

Climate Division: MT 7 **NWS Call Sign:** **Elevation: 3,220 Feet** **Lat: 45˚11N** **Lon: 105˚45W**

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	32.3	7.5	19.9	66	1992	31	32.4	1981	-37	1997	11	3.5	1979	1398	0	.0	.0	2.5	12.2	30.6	9.1
Feb	39.6	14.1	26.9	73	1992	29	36.9	1991	-40	1989	3	14.0	1989	1068	0	.0	.0	7.2	7.2	26.9	4.7
Mar	49.2	22.6	35.9	79	1994	16	44.2	1986	-27	1989	4	27.8	1996	901	0	.0	.0	16.6	2.9	27.2	1.4
Apr	59.6	31.6	45.6	89+	1989	21	52.3	1987	2	1997	11	38.9	1975	582	0	.0	.0	23.7	.6	16.4	.0
May	69.7	41.1	55.4	97	1966	21	60.4+	1987	14	1967	4	50.8	1983	310	13	.0	.8	30.2	.0	4.3	.0
Jun	79.9	50.4	65.2	106	1988	20	77.6	1988	27	1964	2	59.9	1998	108	112	.6	4.3	29.9	.0	.1	.0
Jul	88.1	54.9	71.5	109	1959	24	75.8	1988	34	1971	30	64.5	1993	26	227	2.1	14.3	31.0	.0	.0	.0
Aug	87.1	52.9	70.0	107+	2001	3	77.9	1983	27	1964	25	64.5	1974	44	198	1.1	13.3	31.0	.0	.1	.0
Sep	75.4	42.5	59.0	105	1960	4	67.0	1998	9	1984	25	53.3	1984	225	44	.4	4.0	29.1	.0	3.7	.0
Oct	62.1	32.0	47.1	94+	1992	1	50.9	1979	-13	1991	30	41.6	1984	555	0	.0	.2	26.7	.4	15.5	@
Nov	44.1	20.1	32.1	77+	1999	8	43.2	1999	-32	1959	16	15.0	1985	987	0	.0	.0	11.6	5.0	27.2	1.9
Dec	34.0	10.1	22.1	66	1980	16	32.8	1999	-48	1983	24	1.6	1983	1332	0	.0	.0	3.5	10.9	30.3	6.4
Ann	60.1	31.7	45.9	109	Jul 1959	24	77.9	Aug 1983	-48	Dec 1983	24	1.6	Dec 1983	7536	594	4.2	36.9	243.0	39.2	182.3	23.5

\+ 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: 1958-2001

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

Issue Date: February 2004

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Precipitation (inches)

Precipitation Totals

Means/Medians(1)

Month	Mean	Median
Jan	.37	.31
Feb	.30	.21
Mar	.62	.50
Apr	1.30	1.17
May	2.22	1.99
Jun	2.37	2.20
Jul	1.48	1.16
Aug	1.06	.95
Sep	1.09	.94
Oct	1.08	.81
Nov	.48	.45
Dec	.37	.39
Ann	12.74	12.73

Extremes

Month	Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year
Jan	.39	1998	11	1.35	1971	.05	1973
Feb	.45	1959	17	.84	1978	.01	1992
Mar	.75	1992	18	1.98	1992	.14	1978
Apr	2.01	1990	26	3.83	1990	.13	1987
May	2.43	1970	8	5.92	1978	.40	1998
Jun	1.58	1975	18	5.40	1975	.47	1988
Jul	3.35	1982	25	3.68	1982	.02	1980
Aug	1.64	1968	23	3.01	1999	.21	1996
Sep	1.44	1966	13	4.74	1986	.06	1975
Oct	2.22	1971	2	5.49	1971	.07	1987
Nov	.72	1978	9	1.26	1978	.00	1990
Dec	.50	1961	30	.76	1989	.00	1994
Ann	3.35	Jul 1982	25	5.92	May 1978	.00+	Dec 1994

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	5.3	1.4	.0	.0
Feb	4.3	.9	.0	.0
Mar	6.4	2.0	.1	.0
Apr	7.9	3.8	.5	.1
May	10.5	5.6	1.4	.3
Jun	9.2	5.4	1.4	.4
Jul	6.8	3.8	.7	.1
Aug	5.7	3.0	.6	.1
Sep	5.2	2.9	.6	.1
Oct	4.9	2.7	.6	.2
Nov	5.2	1.6	.1	.0
Dec	5.2	1.3	.0	.0
Ann	76.6	34.4	6.0	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	.06	.09	.14	.20	.25	.31	.37	.45	.56	.73	.90
Feb	.03	.05	.09	.13	.18	.23	.29	.36	.46	.64	.80
Mar	.13	.19	.28	.36	.45	.53	.63	.75	.90	1.15	1.38
Apr	.24	.36	.55	.73	.91	1.10	1.32	1.59	1.94	2.51	3.05
May	.54	.74	1.07	1.36	1.64	1.94	2.28	2.68	3.21	4.05	4.83
Jun	.72	.95	1.28	1.57	1.85	2.14	2.46	2.84	3.32	4.08	4.78
Jul	.18	.29	.50	.70	.92	1.17	1.45	1.80	2.28	3.07	3.83
Aug	.20	.30	.45	.60	.74	.90	1.07	1.29	1.57	2.02	2.45
Sep	.13	.21	.37	.52	.68	.86	1.07	1.33	1.68	2.26	2.82
Oct	.11	.18	.33	.48	.64	.83	1.04	1.31	1.68	2.30	2.90
Nov	.10	.16	.24	.31	.37	.43	.50	.58	.69	.85	1.00
Dec	.03	.07	.13	.18	.24	.30	.37	.46	.57	.76	.94
Ann	8.22	9.06	10.15	10.99	11.74	12.48	13.24	14.09	15.13	16.66	17.99

+ 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: 1958-2001
(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	6.6	5.4	4	3
Feb	5.0	3.0	3	1
Mar	5.2	3.6	1	#
Apr	3.9	1.0	#	#
May	.6	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.3	.0	0	0
Oct	.6	.0	#	0
Nov	4.5	4.0	1	1
Dec	5.6	4.4	3	2
Ann	32.3	21.4	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	10.0	1998	11	21.8	1971	15	1979	12	13	1979
Feb	4.0	1975	14	14.5	1979	18	1979	22	14	1979
Mar	10.0	1989	17	17.8	1989	13	1989	17	4	1996
Apr	14.0	1994	26	24.0	1984	24	1984	27	2	1984
May	6.0	1983	12	7.0	1983	3	1983	12	#	1983
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	8.0	1984	23	8.0	1984	8	1984	24	1	1984
Oct	4.0	1993	8	4.0	1993	5	1991	28	1	1991
Nov	9.0	1978	10	17.9	1978	11	1978	12	5	1985
Dec	9.0	1984	23	15.4	1984	13	1989	22	10	1978
Ann	14.0	Apr 1994	26	24.0	Apr 1984	24	Apr 1984	27	14	Feb 1979

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	4.1	2.4	.5	.1	@
Feb	3.8	2.0	.4	.0	.0
Mar	3.0	1.8	.7	.2	@
Apr	.9	.8	.4	.3	.1
May	.2	.2	.1	@	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	@	@	@	@	.0
Oct	.4	.4	@	.0	.0
Nov	2.3	1.5	.3	.1	.0
Dec	3.8	2.3	.4	.1	.0
Ann	18.5	11.4	2.8	.8	.1

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	20.8	15.5	10.8	2.3
Feb	14.6	11.2	7.5	3.2
Mar	4.5	2.2	.9	.2
Apr	1.3	.8	.4	.2
May	.1	@	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.1	.1	.1	.0
Oct	.4	.1	.0	.0
Nov	5.1	2.9	1.5	.2
Dec	14.3	9.0	4.4	1.1
Ann	61.2	41.8	25.6	7.2

+ 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	6/23	6/15	6/10	6/06	6/01	5/28	5/24	5/18	5/11
32	6/04	5/29	5/25	5/21	5/18	5/15	5/11	5/07	5/02
28	5/17	5/12	5/09	5/07	5/05	5/02	4/30	4/27	4/22
24	5/04	4/30	4/27	4/25	4/23	4/21	4/18	4/15	4/12
20	4/26	4/21	4/17	4/14	4/12	4/09	4/06	4/02	3/28
16	4/21	4/15	4/10	4/05	4/02	3/29	3/24	3/20	3/13

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	9/01	9/04	9/07	9/09	9/11	9/13	9/15	9/17	9/20
32	9/04	9/09	9/12	9/15	9/18	9/20	9/23	9/26	10/01
28	9/13	9/18	9/21	9/24	9/27	9/30	10/03	10/06	10/11
24	9/20	9/25	9/30	10/03	10/07	10/10	10/13	10/18	10/23
20	10/06	10/11	10/15	10/19	10/22	10/25	10/28	11/01	11/07
16	10/08	10/16	10/21	10/25	10/29	11/02	11/07	11/12	11/19

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	123	115	110	105	101	96	91	86	78
32	145	137	131	126	122	117	112	107	99
28	163	157	152	148	145	141	137	133	127
24	186	179	174	170	166	162	158	153	146
20	215	207	202	197	193	188	183	178	170
16	238	228	221	215	210	204	198	191	182

***** 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	1398	1068	901	582	310	108	26	44	225	555	987	1332	7536
60	1243	928	746	435	186	47	7	15	128	402	837	1177	6151
57	1150	849	653	351	126	25	2	6	83	312	747	1084	5388
55	1089	797	592	297	93	16	0	3	60	256	694	1023	4920
50	939	667	446	180	36	4	0	0	20	137	553	879	3861
32	452	280	79	5	0	0	0	0	0	3	171	405	1395

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	77	136	201	413	726	994	1225	1177	809	470	173	95	6496
55	0	10	1	15	106	320	512	467	178	10	6	0	1625
57	0	6	0	9	77	269	451	407	142	5	0	0	1366
60	0	0	0	3	43	202	364	323	97	1	0	0	1033
65	0	0	0	0	13	112	227	198	44	0	0	0	594
70	0	0	0	0	2	50	124	104	16	0	0	0	296

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	1	15	69	220	487	745	970	934	592	269	45	3	1	16	85	305	792	1537	2507	3441	4033	4302	4347	4350
45	0	2	25	120	336	595	815	779	448	154	14	0	0	2	27	147	483	1078	1893	2672	3120	3274	3288	3288
50	0	0	4	55	208	447	660	624	313	72	0	0	0	0	4	59	267	714	1374	1998	2311	2383	2383	2383
55	0	0	0	18	105	303	505	471	193	25	0	0	0	0	0	18	123	426	931	1402	1595	1620	1620	1620
60	0	0	0	3	40	178	353	320	99	6	0	0	0	0	0	3	43	221	574	894	993	999	999	999
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	29	84	179	320	470	603	585	396	220	50	6	0	29	113	292	612	1082	1685	2270	2666	2886	2936	2942

(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