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: FORT BENTON, MT **COOP ID: 243113**

Climate Division: MT 3 **NWS Call Sign:** **Elevation: 2,636 Feet** **Lat: 47˚49N** **Lon: 110˚40W**

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	35.1	10.1	22.6	71	1992	31	37.2	1986	-49	1969	24	6.2	1979	1315	0	.0	.0	6.2	12.1	28.0	9.8
Feb	41.4	14.7	28.1	77	1992	27	41.3	1991	-37	1994	8	12.3	1989	1042	0	.0	.0	10.0	8.0	25.1	6.0
Mar	51.1	23.3	37.2	82	1999	25	46.3	1986	-35	1951	8	28.8	1989	862	0	.0	.0	18.1	3.1	25.2	1.4
Apr	62.8	32.0	47.4	93	1980	20	53.5	1987	-8	1975	6	35.4	1975	532	3	.0	.1	25.5	.6	15.1	@
May	71.8	41.3	56.6	97+	1988	16	61.6	1988	16	1954	2	50.9	1974	274	12	.0	.8	30.1	.0	3.5	.0
Jun	79.3	48.8	64.1	104	1988	4	73.0	1988	30+	1979	8	60.1	1981	102	73	.2	3.5	30.0	.0	.1	.0
Jul	86.6	52.6	69.6	106	1960	19	75.1	1985	35+	1973	2	62.8	1993	33	175	1.0	10.4	31.0	.0	.0	.0
Aug	85.8	51.7	68.8	109	1961	5	74.0	1998	29	1992	25	62.8	1974	64	180	.7	10.5	31.0	.0	.1	.0
Sep	75.4	41.7	58.6	100+	2001	25	66.6	1998	17+	1985	30	52.1	1985	235	42	.1	2.7	28.9	.0	4.0	.0
Oct	64.3	32.4	48.4	94	1992	1	51.3	1999	-15	1991	30	43.5	1984	517	0	.0	.1	27.3	.5	15.6	.2
Nov	46.6	21.2	33.9	79+	1999	12	43.7	1999	-29	1985	23	15.4	1985	934	0	.0	.0	13.3	4.8	24.8	2.5
Dec	37.3	13.2	25.3	67+	1987	6	39.1	1999	-45	1983	24	1.3	1983	1233	0	.0	.0	6.9	10.0	28.4	6.5
Ann	61.5	31.9	46.7	109	Aug 1961	5	75.1	Jul 1985	-49	Jan 1969	24	1.3	Dec 1983	7143	485	2.0	28.1	258.3	39.1	169.9	26.4

\+ 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: 1948-2001

(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	.55	.50	.82	1959	24	1.20	1978	.00+	1995
Feb	.39	.33	.73	1951	21	.98	1980	.02	1990
Mar	.85	.69	1.72	1977	29	3.32	1981	.05	1994
Apr	1.21	1.06	1.82	1973	20	3.25	1975	.05	1981
May	2.30	1.91	2.65	1962	21	6.83	1981	.75	1973
Jun	2.45	2.01	3.01	1995	5	7.07	1975	.22	1985
Jul	1.33	1.19	2.39	1983	10	6.48	1993	.01	1984
Aug	1.52	1.13	1.90	1968	15	4.85	1985	.05	1988
Sep	1.23	.91	1.65	1978	12	3.46	1978	.11	1976
Oct	.80	.72	1.17	1954	23	2.22	1975	.03	1987
Nov	.54	.38	.78	1958	4	1.45	1978	.01	1999
Dec	.52	.38	.68	1966	21	1.86	1977	.02	1991
Ann	13.69	12.96	3.01	Jun 1995	5	7.07	Jun 1975	.00+	Jan 1995

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	6.2	2.0	.1	.0
Feb	5.0	1.5	@	.0
Mar	6.7	2.5	.3	.1
Apr	7.1	3.3	.5	.2
May	9.6	5.3	1.2	.3
Jun	9.7	5.7	1.2	.3
Jul	6.7	3.5	.8	.1
Aug	6.7	3.7	.8	.3
Sep	6.3	3.4	.6	.1
Oct	5.1	2.7	.2	@
Nov	5.0	2.1	.1	.0
Dec	5.9	2.0	.0	.0
Ann	80.0	37.7	5.8	1.4

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	.00	.05	.15	.23	.32	.43	.55	.69	.89	1.22	1.53
Feb	.06	.09	.15	.20	.26	.32	.39	.48	.60	.79	.97
Mar	.13	.20	.32	.44	.56	.70	.85	1.04	1.29	1.70	2.10
Apr	.15	.24	.41	.58	.76	.96	1.19	1.48	1.87	2.50	3.12
May	.60	.81	1.15	1.44	1.73	2.04	2.38	2.78	3.31	4.14	4.91
Jun	.47	.69	1.05	1.38	1.72	2.08	2.49	2.98	3.64	4.69	5.69
Jul	.06	.13	.29	.46	.67	.91	1.21	1.60	2.15	3.09	4.03
Aug	.17	.29	.50	.71	.93	1.19	1.49	1.85	2.36	3.19	3.99
Sep	.17	.27	.44	.61	.79	.99	1.22	1.50	1.88	2.50	3.10
Oct	.12	.19	.31	.42	.53	.66	.80	.98	1.21	1.59	1.96
Nov	.04	.08	.15	.23	.31	.40	.52	.66	.85	1.18	1.51
Dec	.05	.09	.16	.23	.31	.40	.51	.64	.82	1.13	1.43
Ann	8.24	9.23	10.54	11.55	12.47	13.37	14.31	15.37	16.67	18.60	20.29

+ 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: 1948-2001
(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	9.0	7.4	3	2
Feb	7.2	4.0	2	1
Mar	7.4	6.5	1	#
Apr	4.2	1.0	#	0
May	.4	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.0	.0	0	0
Oct	1.8	.0	#	0
Nov	7.7	5.0	1	#
Dec	9.4	7.1	2	1
Ann	47.1	31.0	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	10.0	1988	11	24.0	1978	20	1978	31	11	1978
Feb	8.5	1982	22	20.5	1978	26	1978	12	18	1978
Mar	12.0	1977	29	25.0	1989	14	1978	5	7	1978
Apr	17.0	1973	20	30.0	1975	17	1975	8	4	1975
May	5.0	1983	10	5.0	1983	3	1983	10	#	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	1.0	1984	26	1.0	1984	0	0	0	0	0
Oct	6.0	1985	7	9.5	1984	10	1972	29	1	1991
Nov	7.0	1983	25	27.0	1978	14	1978	20	7	1978
Dec	7.0	1972	2	26.3	1977	15	1989	21	9	1983
Ann	17.0	Apr 1973	20	30.0	Apr 1975	26	Feb 1978	12	18	Feb 1978

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	5.1	4.0	1.5	.3	@
Feb	3.5	2.7	1.0	.2	.0
Mar	2.8	2.5	.9	.4	.1
Apr	1.0	.9	.4	.2	.1
May	.1	.1	.1	@	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	@	@	.0	.0	.0
Oct	.7	.6	.2	.1	.0
Nov	2.9	2.7	1.2	.2	.0
Dec	4.9	3.5	1.2	.3	.0
Ann	21.0	17.0	6.5	1.7	.2

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	10.5	8.4	6.9	1.6
Feb	9.4	6.3	3.4	1.3
Mar	4.8	3.1	1.7	.6
Apr	1.1	1.0	.8	.3
May	@	@	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.6	.4	.2	.0
Nov	5.7	3.7	2.3	.8
Dec	11.2	8.3	5.3	.8
Ann	43.3	31.2	20.6	5.4

+ 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	6/20	6/14	6/10	6/06	6/02	5/30	5/26	5/22	5/15
32	5/31	5/27	5/23	5/20	5/17	5/15	5/12	5/08	5/03
28	5/19	5/13	5/10	5/07	5/04	5/01	4/27	4/24	4/19
24	5/03	4/28	4/25	4/22	4/20	4/17	4/14	4/11	4/06
20	4/24	4/19	4/16	4/14	4/11	4/08	4/06	4/03	3/29
16	4/19	4/13	4/08	4/05	4/01	3/29	3/25	3/21	3/15

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	8/26	8/31	9/04	9/07	9/09	9/12	9/15	9/19	9/24
32	9/04	9/09	9/12	9/15	9/17	9/20	9/23	9/26	9/30
28	9/09	9/15	9/18	9/22	9/25	9/28	10/01	10/05	10/11
24	9/21	9/26	9/30	10/04	10/07	10/10	10/13	10/17	10/23
20	9/27	10/03	10/07	10/11	10/14	10/18	10/21	10/25	10/31
16	10/12	10/18	10/23	10/26	10/30	11/02	11/06	11/10	11/16

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	122	114	108	103	98	94	89	83	75
32	145	137	131	127	122	118	113	107	99
28	168	160	154	148	144	139	134	127	119
24	192	184	179	174	169	165	160	154	146
20	208	200	195	190	186	181	176	171	163
16	235	227	221	216	211	206	201	195	187

***** 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	1315	1042	862	532	274	102	33	64	235	517	934	1233	7143
60	1166	911	707	391	153	38	8	24	135	363	788	1083	5767
57	1082	832	616	313	99	17	1	12	89	273	704	999	5037
55	1023	781	556	265	71	9	0	7	64	216	648	940	4580
50	880	656	413	164	24	1	0	1	22	101	511	797	3570
32	440	303	73	6	0	0	0	0	0	1	160	370	1353

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	148	192	234	468	761	961	1165	1140	797	508	215	160	6749
55	19	26	4	36	119	280	452	433	170	9	13	17	1578
57	16	21	2	24	85	228	391	377	136	4	10	14	1308
60	6	15	0	12	46	159	305	296	92	1	4	5	941
65	0	0	0	3	12	73	175	180	42	0	0	0	485
70	0	0	0	0	1	23	85	96	16	0	0	0	221

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	23	37	80	246	508	723	912	890	548	278	65	26	23	60	140	386	894	1617	2529	3419	3967	4245	4310	4336
45	4	11	30	138	359	573	757	735	404	163	30	6	4	15	45	183	542	1115	1872	2607	3011	3174	3204	3210
50	0	1	6	65	218	423	602	581	272	79	8	0	0	1	7	72	290	713	1315	1896	2168	2247	2255	2255
55	0	0	0	19	114	277	447	428	153	25	1	0	0	0	0	19	133	410	857	1285	1438	1463	1464	1464
60	0	0	0	3	46	152	294	279	68	6	0	0	0	0	0	3	49	201	495	774	842	848	848	848
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	18	39	94	195	336	454	573	560	372	233	62	24	18	57	151	346	682	1136	1709	2269	2641	2874	2936	2960

(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