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: GREAT FALLS INTL AP, MT **COOP ID: 243751**

Climate Division: MT 4 **NWS Call Sign: GTF** **Elevation: 3,664 Feet** **Lat: 47˚28N** **Lon: 111˚23W**

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	32.1	11.3	21.7	67	1992	31	35.8	1986	-37	1969	23	5.5	1982	1327	0	.0	.0	4.0	12.3	27.0	8.6
Feb	37.7	15.1	26.4	70	1992	27	38.2	1991	-35+	1996	2	9.2	1989	1065	0	.0	.0	7.4	8.4	24.0	5.3
Mar	45.3	21.5	33.4	78	1978	29	42.7	1986	-29	1951	8	24.5	1996	964	0	.0	.0	13.3	5.0	25.4	1.8
Apr	55.6	29.7	42.6	89	1980	20	51.6	1987	-6+	1975	6	29.2	1975	657	1	.0	.0	21.4	1.3	16.3	.1
May	64.7	38.3	51.5	93	1980	21	56.8	1987	15	1954	1	46.7	1974	410	7	.0	.1	28.5	.0	4.1	.0
Jun	73.9	46.0	60.0	101	1990	30	68.5	1988	31+	1999	10	55.4	1998	183	47	@	2.2	29.9	.0	.1	.0
Jul	82.0	50.4	66.2	105	1973	10	72.0	1985	36	1999	16	57.1	1993	52	105	.3	7.1	31.0	.0	.0	.0
Aug	81.2	49.9	65.6	106+	1969	24	72.9	1971	30	1992	24	59.6	1993	73	107	.4	7.3	30.9	.0	.1	.0
Sep	69.6	41.2	55.4	98+	1980	6	63.1	1998	16	2000	23	47.5	1985	291	19	.0	1.1	27.8	@	2.8	.0
Oct	58.0	33.0	45.5	91	1992	1	49.3	1974	-11	1991	30	39.6	1984	592	2	.0	@	24.1	1.1	12.7	.2
Nov	42.1	22.5	32.3	76+	1999	7	43.3	1999	-25+	1985	28	11.7	1985	967	0	.0	.0	10.0	6.0	22.6	2.2
Dec	34.2	14.4	24.3	63+	1980	27	35.2	1999	-43	1968	29	3.4	1983	1247	0	.0	.0	4.7	10.6	26.6	6.1
Ann	56.4	31.1	43.7	106+	Aug 1969	24	72.9	Aug 1971	-43	Dec 1968	29	3.4	Dec 1983	7828	288	.7	17.8	233.0	44.7	161.7	24.3

\+ 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

Issue Date: February 2004

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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	.68	.60	.72	1955	2	1.68	1978	.05+	1995
Feb	.51	.46	.88	1951	21	1.21	1978	.15	1995
Mar	1.01	1.01	1.06	1977	29	2.09	1981	.10	1986
Apr	1.40	1.16	2.20	1951	30	4.63	1975	.05	1981
May	2.53	2.49	2.50	1980	25	5.20	1981	.69	1979
Jun	2.24	1.71	2.28	1964	8	5.18	1998	.54	1977
Jul	1.45	1.12	1.61	1983	10	4.68	1993	.05	1984
Aug	1.65	1.24	1.89	1989	25	4.90	1985	.12	2000
Sep	1.23	1.10	1.56	1982	27	3.23	1985	.09	1990
Oct	.93	.81	1.11	1975	13	3.43	1975	.02	1987
Nov	.59	.45	.64	1961	25	1.44	1978	.18	1997
Dec	.67	.49	.63	1973	17	1.92	1977	.03	1999
Ann	14.89	14.05	2.50	May 1980	25	5.20	May 1981	.02	Oct 1987

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	8.7	2.4	.1	.0
Feb	7.2	1.8	@	.0
Mar	9.7	3.3	.2	@
Apr	9.3	3.8	.6	.1
May	11.9	6.0	1.4	.3
Jun	10.8	5.0	1.3	.2
Jul	7.7	3.6	.8	.2
Aug	8.8	3.9	.9	.3
Sep	7.1	3.3	.5	.1
Oct	6.4	2.7	.3	@
Nov	7.0	2.1	@	.0
Dec	8.1	2.1	.1	.0
Ann	102.7	40.0	6.2	1.2

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	.10	.16	.26	.35	.45	.56	.68	.83	1.04	1.37	1.68
Feb	.13	.18	.25	.32	.39	.45	.53	.62	.74	.92	1.10
Mar	.24	.34	.48	.62	.75	.89	1.04	1.23	1.47	1.86	2.22
Apr	.17	.28	.47	.67	.88	1.11	1.38	1.72	2.17	2.92	3.65
May	.92	1.16	1.50	1.79	2.06	2.34	2.65	3.01	3.46	4.16	4.80
Jun	.58	.79	1.11	1.40	1.68	1.98	2.31	2.71	3.22	4.03	4.79
Jul	.11	.21	.40	.60	.82	1.08	1.38	1.77	2.30	3.20	4.08
Aug	.20	.33	.56	.79	1.04	1.31	1.62	2.01	2.54	3.41	4.26
Sep	.20	.31	.49	.66	.83	1.02	1.24	1.50	1.86	2.43	2.98
Oct	.11	.19	.32	.45	.59	.74	.92	1.14	1.44	1.93	2.40
Nov	.15	.20	.29	.36	.44	.52	.61	.72	.86	1.08	1.29
Dec	.07	.12	.21	.30	.40	.52	.65	.82	1.05	1.43	1.80
Ann	9.48	10.49	11.81	12.82	13.73	14.63	15.56	16.59	17.87	19.73	21.37

\+ 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

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Snow (inches)

Snow Totals

Means/Medians (1)

Extremes (2)

Mean Number of Days (1)

Snow Fall >= Thresholds

Snow Depth >= Thresholds

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year	0.1	1.0	3.0	5.0	10.0	1	3	5	10
Jan	9.6	8.8	2	2	8.1	1988	11	19.7	1982	17+	1978	30	10	1978	8.7	3.2	.6	.2	.0	15.9	7.9	5.0	.8
Feb	7.4	7.1	2	1	8.6	1978	11	18.7	1989	21+	1978	13	13	1978	7.0	2.6	.6	.2	.0	11.5	6.8	3.4	.8
Mar	11.1	10.7	1	1	11.5	1987	19	24.2	1989	15	1977	30	3+	1996	8.0	3.3	.9	.4	.1	8.8	4.7	2.5	.2
Apr	8.0	5.4	#	1	16.5	1973	20	29.2	1975	24	1975	9	5	1975	5.0	2.2	.9	.3	.1	3.0	1.5	.9	.3
May	2.3	.6	#	1	9.9	1989	29	11.6	1989	8	1983	10	1	1983	1.3	.7	.2	.1	.0	.3	.2	.1	.0
Jun	.0	.0	#	0	.2	1998	2	.3	1998	1	2000	1	#	2000	.1	.0	.0	.0	.0	@	.0	.0	.0
Jul	.0	.0	#	0	.0	0	0	.0	0	0	0	0	#	2000	.0	.0	.0	.0	.0	.0	.0	.0	.0
Aug	.3	.0	#	0	6.6	1992	23	8.3	1992	3	1992	23	#	1997	.1	.1	@	@	.0	@	@	.0	.0
Sep	1.4	.0	#	0	5.7	1983	18	10.4	1984	5	1988	18	#	2000	.9	.3	.2	.1	.0	.3	.1	@	.0
Oct	4.4	3.4	#	0	6.6	1975	13	16.6	1975	6+	1985	9	1+	1991	2.9	1.5	.5	.1	.0	1.5	.6	.2	.0
Nov	7.5	7.4	1	1	6.8	1983	25	18.1	1985	11+	1978	21	4+	1985	5.9	2.4	.7	.1	.0	8.3	4.3	2.0	.1
Dec	7.9	5.9	1	1	6.1	1977	23	19.9	1989	11	1985	1	6	1983	7.4	2.9	.7	.2	.0	12.9	6.2	2.8	.1
Ann	59.9	49.3	N/A	N/A	16.5	Apr 1973	20	29.2	Apr 1975	24	Apr 1975	9	13	Feb 1978	47.3	19.2	5.3	1.7	.2	62.5	32.3	16.9	2.3

+ 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	6/19	6/12	6/08	6/04	5/31	5/27	5/23	5/18	5/11
32	6/01	5/27	5/23	5/20	5/17	5/14	5/11	5/07	5/02
28	5/13	5/08	5/04	5/01	4/28	4/25	4/22	4/19	4/14
24	5/04	4/28	4/24	4/20	4/17	4/13	4/10	4/05	3/30
20	4/23	4/17	4/13	4/09	4/05	4/02	3/29	3/25	3/19
16	4/12	4/07	4/04	4/01	3/29	3/26	3/23	3/19	3/14

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	8/31	9/05	9/08	9/11	9/14	9/17	9/20	9/24	9/29
32	9/08	9/13	9/16	9/19	9/22	9/24	9/27	10/01	10/05
28	9/23	9/27	9/30	10/03	10/06	10/08	10/11	10/14	10/18
24	9/28	10/04	10/08	10/11	10/15	10/18	10/21	10/25	10/31
20	10/05	10/12	10/17	10/21	10/25	10/29	11/02	11/07	11/14
16	10/14	10/21	10/26	10/31	11/04	11/08	11/12	11/17	11/25

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	135	125	118	112	106	100	94	86	76
32	150	142	136	132	127	123	118	112	105
28	181	174	168	164	160	155	151	145	138
24	207	198	191	185	180	175	169	162	153
20	233	222	214	208	202	196	189	182	171
16	245	236	230	224	219	214	209	202	194

***** 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	1327	1065	964	657	410	183	52	73	291	592	967	1247	7828
60	1192	949	825	529	277	95	29	56	201	451	839	1109	6552
57	1108	870	732	446	202	55	14	32	145	359	754	1026	5743
55	1049	817	671	393	159	35	8	22	113	301	698	967	5233
50	905	689	524	273	77	9	0	7	51	170	563	822	4090
32	459	314	121	31	1	0	0	0	0	6	202	385	1519

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	79	111	192	375	642	877	1103	1082	737	466	175	89	5928
55	0	0	2	17	68	208	392	375	137	34	3	0	1236
57	0	0	1	11	47	164	333	317	104	22	1	0	1000
60	0	0	0	5	26	108	248	236	63	10	0	0	696
65	0	0	0	1	7	47	105	107	19	2	0	0	288
70	0	0	0	0	1	14	47	45	5	0	0	0	112

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	20	41	71	182	409	644	864	843	512	263	70	29	20	61	132	314	723	1367	2231	3074	3586	3849	3919	3948
45	5	10	25	104	267	495	709	688	373	159	33	4	5	15	40	144	411	906	1615	2303	2676	2835	2868	2872
50	0	0	4	51	153	348	554	535	246	84	11	0	0	0	4	55	208	556	1110	1645	1891	1975	1986	1986
55	0	0	0	18	69	216	400	386	141	38	0	0	0	0	0	18	87	303	703	1089	1230	1268	1268	1268
60	0	0	0	4	28	112	255	245	67	11	0	0	0	0	0	4	32	144	399	644	711	722	722	722
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	7	23	56	133	254	392	543	526	322	170	40	6	7	30	86	219	473	865	1408	1934	2256	2426	2466	2472

(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