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: FOSSTON 1 E, MN **COOP ID: 212916**

Climate Division: MN 1 **NWS Call Sign:** **Elevation: 1,310 Feet** **Lat: 47˚34N** **Lon: 95˚43W**

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	13.3	-8.1	2.6	46	1973	17	16.8	1990	-50	1996	20	-9.6	1982	1937	0	.0	.0	@	27.8	31.0	20.2
Feb	21.0	-.7	10.2	61	1958	26	27.8	1998	-53+	1996	2	-4.6	1989	1538	0	.0	.0	.2	20.7	27.9	14.0
Mar	33.7	13.2	23.5	77	1963	31	33.5	2000	-35	1996	7	11.6	1996	1289	0	.0	.0	3.8	11.8	28.7	5.5
Apr	51.5	28.0	39.8	96	1980	21	48.4	1987	-9	1979	6	32.1	1996	758	0	.0	.1	17.6	1.4	20.4	.3
May	66.7	41.8	54.3	95	1964	21	64.3	1977	6	1967	3	46.6	1979	358	25	.0	.4	28.9	.0	5.4	.0
Jun	74.2	51.2	62.7	98	1980	25	68.6	1995	30	1964	1	55.7	1982	132	63	.0	.8	30.0	.0	.1	.0
Jul	78.5	54.8	66.7	100	1980	10	71.8	1989	34	1983	5	59.5	1992	64	115	@	2.2	31.0	.0	.0	.0
Aug	77.4	52.5	65.0	103	1976	19	69.9	1976	28	1982	27	59.5	1977	94	93	.1	2.0	31.0	.0	.1	.0
Sep	66.8	42.2	54.5	97	1976	6	60.7	1998	19	1974	22	49.4	1993	325	10	.0	.4	28.5	.0	4.3	.0
Oct	53.7	31.4	42.6	91	1963	5	48.9	1973	4	1984	31	37.9	1976	697	0	.0	.0	19.9	.7	16.6	.0
Nov	33.1	16.2	24.7	72+	1990	2	35.6	1999	-24+	1996	26	13.7	1985	1210	0	.0	.0	3.4	13.5	27.9	3.1
Dec	19.0	.4	9.7	58	1962	1	22.1	1997	-40+	1990	31	-3.5	1983	1714	0	.0	.0	.1	25.2	30.9	14.8
Ann	49.1	26.9	38.0	103	Aug 1976	19	71.8	Jul 1989	-53+	Feb 1996	2	-9.6	Jan 1982	10116	306	.1	5.9	194.4	101.1	193.3	57.9

\+ 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: 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	.63	.57	.90	1989	7	2.42	1989	.00	1973
Feb	.50	.47	.65	1977	24	1.27	1984	.00	1989
Mar	.91	.94	1.25	1968	19	1.91	1995	.06	1986
Apr	1.36	1.06	1.97	1991	30	4.76	1991	.00	1980
May	2.68	2.41	2.21+	1985	10	7.24	1985	.41	1976
Jun	4.40	4.27	6.00	1950	25	9.70	1997	1.27	1974
Jul	4.06	3.98	5.26	1985	23	9.44	1995	.64	1984
Aug	3.50	3.23	2.50	1992	22	9.72	1992	.47	1996
Sep	2.87	2.21	5.47	1973	1	10.04	1973	.44	1979
Oct	2.37	1.92	4.71	1984	13	10.14	1984	.15	1992
Nov	1.01	1.13	1.28	1974	1	3.45	1977	.00+	1990
Dec	.55	.46	1.25	1949	11	1.33	1972	.06	1994
Ann	24.84	25.63	6.00	Jun 1950	25	10.14	Oct 1984	.00+	Nov 1990

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	5.8	2.3	.1	.0
Feb	4.5	2.2	@	.0
Mar	5.4	3.2	.3	.1
Apr	6.3	3.7	.7	.2
May	9.7	6.2	1.8	.5
Jun	11.6	7.4	2.6	1.1
Jul	11.1	7.6	2.7	1.0
Aug	10.1	6.5	2.1	.9
Sep	9.3	5.6	1.6	.6
Oct	7.4	4.4	1.4	.4
Nov	5.6	3.1	.3	.1
Dec	5.4	2.1	.1	.0
Ann	92.2	54.3	13.7	4.9

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	.05	.12	.23	.32	.42	.52	.64	.78	.98	1.29	1.59
Feb	.05	.11	.19	.26	.33	.41	.50	.61	.75	.99	1.21
Mar	.19	.27	.41	.53	.65	.78	.93	1.11	1.34	1.72	2.07
Apr	.07	.20	.40	.60	.82	1.05	1.33	1.67	2.14	2.91	3.67
May	.80	1.05	1.43	1.76	2.08	2.42	2.78	3.22	3.77	4.65	5.46
Jun	1.50	1.92	2.52	3.04	3.53	4.04	4.59	5.24	6.07	7.36	8.54
Jul	1.09	1.48	2.06	2.58	3.08	3.61	4.20	4.90	5.81	7.23	8.57
Aug	.98	1.31	1.81	2.25	2.68	3.13	3.62	4.21	4.97	6.17	7.28
Sep	.61	.88	1.30	1.68	2.06	2.47	2.93	3.48	4.21	5.37	6.47
Oct	.17	.33	.63	.96	1.32	1.74	2.24	2.87	3.75	5.24	6.70
Nov	.00	.11	.30	.46	.62	.80	1.01	1.25	1.59	2.15	2.68
Dec	.09	.14	.22	.29	.37	.45	.55	.67	.82	1.08	1.33
Ann	17.29	18.74	20.60	22.01	23.27	24.49	25.76	27.15	28.85	31.32	33.46

\+ 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	9.7	9.3	12	10	8.0	1989	7	23.0	1989	31+	1997	29	26	1997	5.4	4.2	.9	.3	.0	29.7	28.6	27.5	15.7
Feb	5.6	5.4	13	12	7.0	1977	24	14.5	1991	32	1997	17	28	1997	3.4	2.8	.6	.1	.0	27.3	25.5	25.0	22.0
Mar	7.6	6.8	8	6	12.0	1997	4	18.0	1976	38	1997	7	30	1997	3.6	3.1	.7	.3	@	17.2	14.6	13.2	8.9
Apr	1.5	1.0	1	#	5.0	1974	1	5.5	1990	17	1996	2	7	1996	1.0	.9	.2	.1	.0	2.4	1.4	1.2	.8
May	.1	.0	#	0	3.0	1991	1	3.0	1991	2	1991	1	#+	2000	.1	.1	@	.0	.0	.1	.0	.0	.0
Jun	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Jul	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Aug	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sep	#	.0	#	0	#	1991	18	#+	1991	#	1991	18	#	1991	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	.5	.0	#	#	5.0	1972	30	5.5	1972	5	1972	30	#+	2000	.3	.2	.1	@	.0	.4	.1	@	.0
Nov	6.2	4.5	2	1	10.0	1977	20	17.0	1998	24	1977	29	12	1977	3.3	2.7	.9	.3	.1	9.3	6.9	3.0	.6
Dec	8.3	8.4	6	4	8.0	1973	31	20.0	1973	24	1977	13	20	1977	4.3	3.6	.6	.2	.0	25.1	17.6	12.7	4.7
Ann	39.5	35.4	N/A	N/A	12.0	Mar 1997	4	23.0	Jan 1989	38	Mar 1997	7	30	Mar 1997	21.4	17.6	4.0	1.3	.1	111.5	94.7	82.6	52.7

+ 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	6/25	6/17	6/12	6/07	6/03	5/29	5/24	5/19	5/11
32	5/31	5/26	5/23	5/20	5/17	5/14	5/12	5/08	5/03
28	5/20	5/15	5/12	5/09	5/06	5/03	4/30	4/26	4/21
24	5/09	5/03	4/29	4/26	4/22	4/19	4/16	4/12	4/06
20	4/25	4/21	4/18	4/15	4/13	4/10	4/07	4/04	3/31
16	4/16	4/12	4/09	4/07	4/04	4/02	3/31	3/28	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	8/19	8/25	8/30	9/03	9/06	9/10	9/14	9/19	9/25
32	9/04	9/09	9/12	9/15	9/18	9/21	9/24	9/27	10/02
28	9/13	9/18	9/22	9/25	9/28	9/30	10/03	10/07	10/12
24	9/23	9/29	10/03	10/07	10/10	10/14	10/17	10/22	10/28
20	10/04	10/10	10/14	10/17	10/21	10/24	10/27	11/01	11/06
16	10/11	10/18	10/22	10/27	10/31	11/04	11/08	11/13	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	126	115	108	101	95	89	83	75	65
32	145	138	132	128	123	119	114	109	101
28	166	159	153	148	144	140	135	130	122
24	196	187	181	175	170	165	160	153	144
20	214	206	200	195	190	186	181	175	167
16	233	224	218	213	208	204	198	192	184

***** 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	1937	1538	1289	758	358	132	64	94	325	697	1210	1714	10116
60	1782	1398	1134	611	240	59	17	34	202	542	1060	1559	8638
57	1689	1314	1041	526	181	31	7	16	140	451	970	1466	7832
55	1627	1258	979	471	147	19	2	8	106	392	910	1404	7323
50	1472	1118	826	343	79	4	0	1	44	258	760	1249	6154
32	926	647	345	55	1	0	0	0	0	18	298	718	3008

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	13	34	79	287	692	920	1074	1022	675	344	78	27	5245
55	0	0	0	13	125	250	363	317	91	5	0	0	1164
57	0	0	0	8	97	201	306	263	66	2	0	0	943
60	0	0	0	4	62	139	223	188	37	0	0	0	653
65	0	0	0	0	25	63	115	93	10	0	0	0	306
70	0	0	0	0	8	19	43	32	2	0	0	0	104

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	0	11	145	481	704	856	805	470	179	15	0	0	0	11	156	637	1341	2197	3002	3472	3651	3666	3666
45	0	0	1	73	345	554	701	650	329	100	6	0	0	0	1	74	419	973	1674	2324	2653	2753	2759	2759
50	0	0	0	35	220	409	546	496	210	46	1	0	0	0	0	35	255	664	1210	1706	1916	1962	1963	1963
55	0	0	0	15	128	266	393	345	115	18	0	0	0	0	0	15	143	409	802	1147	1262	1280	1280	1280
60	0	0	0	3	61	148	243	205	52	3	0	0	0	0	0	3	64	212	455	660	712	715	715	715
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	8	108	313	438	548	510	287	119	10	0	0	0	8	116	429	867	1415	1925	2212	2331	2341	2341

(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