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: BENSON, MN **COOP ID: 210667**

Climate Division: MN 4 **NWS Call Sign:** **Elevation: 1,040 Feet** **Lat: 45˚19N** **Lon: 95˚37W**

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	19.6	.9	10.3	63	1981	24	24.7	1990	-35+	1977	16	-2.6+	1982	1699	0	.0	.0	.2	24.7	31.0	15.1
Feb	26.8	8.6	17.7	59+	1991	2	31.2	1987	-35+	1996	2	4.4	1979	1325	0	.0	.0	1.1	17.0	27.2	8.8
Mar	39.0	21.0	30.0	78+	1968	30	40.3	2000	-27	1962	1	20.7	1975	1085	0	.0	.0	5.8	7.9	25.7	2.4
Apr	56.6	34.1	45.4	97	1980	21	53.8	1987	0	1975	1	37.5	1975	592	3	.0	.1	21.2	.5	12.6	@
May	70.8	47.2	59.0	98+	2001	14	66.6	1977	20+	1967	3	52.8	1979	236	49	.0	.8	30.4	.0	1.6	.0
Jun	78.8	56.7	67.8	104	1988	24	75.2	1988	34	1964	2	62.2	1982	51	135	.1	2.9	30.0	.0	.0	.0
Jul	82.7	61.3	72.0	103	1966	10	76.0	1983	41	1971	30	64.4	1992	18	235	.3	6.0	31.0	.0	.0	.0
Aug	80.4	59.1	69.8	103+	1988	16	76.2	1983	37	1964	13	65.1	1992	31	178	.3	3.5	31.0	.0	.0	.0
Sep	71.7	49.1	60.4	99	1978	7	66.1	1998	21	1965	26	55.2	1993	172	34	.0	1.3	29.7	.0	1.0	.0
Oct	58.8	36.9	47.9	93	1963	5	53.4	1973	12	1976	27	42.9	1976	532	0	.0	.1	24.8	.2	9.8	.0
Nov	38.6	21.9	30.3	81	1999	8	40.9	1999	-21	1964	30	21.0	1985	1042	0	.0	.0	6.1	9.3	25.8	1.3
Dec	24.4	7.3	15.9	60+	1998	1	25.8	1997	-28	1955	19	-.1	1983	1525	0	.0	.0	.3	22.2	30.8	9.8
Ann	54.0	33.7	43.9	104	Jun 1988	24	76.2	Aug 1983	-35+	Feb 1996	2	-2.6+	Jan 1982	8308	634	.7	14.7	211.6	81.8	165.5	37.4

\+ 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: 1952-2001

(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	.88	.67	1.00	1996	18	2.99	1975	.03	1974
Feb	.72	.60	1.74	1977	24	2.35	1977	.06	1997
Mar	1.66	1.55	3.06	1985	3	4.23	1977	.39	1971
Apr	2.10	1.72	3.43	2001	23	6.43	1986	.14	1980
May	3.01	2.79	3.55	1969	16	6.44	1993	.13	1976
Jun	4.50	4.05	3.40	1984	5	9.35	1983	.65	1973
Jul	4.03	3.65	5.26	1994	5	9.57	1994	1.43	1984
Aug	3.90	3.48	5.57	1990	18	9.35	1990	.59	1976
Sep	2.60	2.15	3.53	1991	8	5.96	1986	.02	1979
Oct	2.45	1.89	3.12	1971	16	8.71	1984	.02	1978
Nov	1.43	1.34	2.22	1977	9	4.62	1977	.10+	1999
Dec	.64	.58	1.37	1965	12	1.88	1977	.00	1986
Ann	27.92	28.45	5.57	Aug 1990	18	9.57	Jul 1994	.00	Dec 1986

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	8.3	2.8	.3	@
Feb	6.0	2.1	.2	@
Mar	8.3	4.1	.8	.2
Apr	9.2	4.6	1.2	.3
May	10.4	6.5	2.0	.4
Jun	11.7	7.2	2.9	1.1
Jul	9.0	6.3	2.8	1.1
Aug	9.8	6.3	2.5	1.0
Sep	8.5	4.7	1.5	.6
Oct	7.2	3.9	1.5	.8
Nov	7.1	2.9	.9	.1
Dec	6.7	2.3	.1	.0
Ann	102.2	53.7	16.7	5.6

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	.11	.18	.31	.43	.56	.70	.87	1.08	1.36	1.81	2.26
Feb	.08	.14	.24	.34	.44	.56	.70	.87	1.11	1.49	1.87
Mar	.45	.61	.85	1.06	1.26	1.48	1.72	2.00	2.37	2.95	3.49
Apr	.33	.51	.82	1.11	1.41	1.73	2.10	2.56	3.17	4.16	5.10
May	.85	1.14	1.57	1.94	2.31	2.69	3.12	3.62	4.27	5.29	6.24
Jun	1.09	1.51	2.17	2.76	3.34	3.95	4.63	5.45	6.52	8.21	9.80
Jul	1.31	1.69	2.25	2.73	3.20	3.68	4.20	4.82	5.61	6.84	7.97
Aug	1.18	1.55	2.10	2.58	3.04	3.53	4.05	4.68	5.48	6.74	7.90
Sep	.34	.56	.93	1.29	1.67	2.09	2.58	3.18	3.99	5.32	6.60
Oct	.12	.25	.53	.86	1.23	1.68	2.23	2.94	3.95	5.67	7.40
Nov	.12	.22	.41	.61	.83	1.08	1.38	1.75	2.26	3.11	3.95
Dec	.07	.15	.26	.35	.44	.54	.66	.79	.97	1.26	1.53
Ann	17.79	19.67	22.12	24.01	25.71	27.37	29.11	31.04	33.41	36.88	39.92

\+ 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: 1952-2001
(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	10.8	9.5	7	7
Feb	7.5	5.7	7	6
Mar	8.2	7.5	5	4
Apr	1.8	.2	#	#
May	#	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	#	.0	0	0
Oct	.3	.0	#	0
Nov	7.1	5.7	1	1
Dec	6.0	5.2	4	3
Ann	41.7	33.8	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	8.3	1976	2	27.2	1975	18	1982	27	15	1997
Feb	7.3	1987	28	18.8	1971	19+	1986	19	16	1979
Mar	18.7	1985	3	25.1	1985	24	1985	4	15	1997
Apr	9.1	1996	13	9.1	1996	9	1996	13	5	1975
May	#	1992	26	#+	1992	#+	1994	1	#+	1994
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	#	1995	21	#+	1995	0	0	0	0	0
Oct	2.5	1976	19	2.5	1976	2	1981	24	#+	1997
Nov	9.2	1971	26	24.8	1985	16	1985	30	3+	1996
Dec	8.3	1995	8	13.3	1973	13	1996	31	10	1996
Ann	18.7	Mar 1985	3	27.2	Jan 1975	24	Mar 1985	4	16	Feb 1979

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	8.2	3.5	.9	.4	.0
Feb	5.3	2.3	.7	.2	.0
Mar	4.4	2.2	.8	.3	.1
Apr	1.3	.4	.3	.1	.0
May	.0	.0	.0	.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	.3	.1	.0	.0	.0
Nov	4.1	1.9	.8	.3	.0
Dec	6.1	2.2	.7	.1	.0
Ann	29.7	12.6	4.2	1.4	.1

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	27.5	25.3	19.4	6.2
Feb	24.0	20.5	15.8	7.9
Mar	15.7	11.5	8.8	3.6
Apr	1.7	.8	.4	.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	.2	.0	.0	.0
Nov	9.1	4.4	2.2	.3
Dec	21.5	14.5	8.7	1.9
Ann	99.7	77.0	55.3	19.9

+ 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	5/24	5/20	5/17	5/14	5/12	5/09	5/07	5/04	4/29
32	5/17	5/12	5/09	5/06	5/03	4/30	4/27	4/23	4/18
28	5/04	4/29	4/26	4/23	4/21	4/19	4/16	4/13	4/08
24	4/19	4/15	4/13	4/11	4/09	4/07	4/05	4/02	3/30
20	4/15	4/10	4/07	4/05	4/02	3/31	3/28	3/25	3/21
16	4/10	4/05	4/01	3/29	3/26	3/23	3/20	3/16	3/11

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	9/13	9/16	9/19	9/22	9/24	9/26	9/28	10/01	10/05
32	9/17	9/21	9/24	9/27	9/30	10/02	10/05	10/09	10/13
28	9/24	9/30	10/04	10/07	10/10	10/13	10/17	10/21	10/26
24	10/03	10/09	10/13	10/16	10/20	10/23	10/26	10/30	11/05
20	10/14	10/19	10/23	10/26	10/29	11/01	11/04	11/08	11/13
16	10/27	10/31	11/03	11/06	11/08	11/11	11/13	11/17	11/21

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	153	147	142	138	134	131	127	122	116
32	171	163	158	154	150	145	141	136	128
28	194	186	181	176	172	167	162	157	149
24	210	204	200	196	193	190	186	182	176
20	230	223	218	213	209	205	200	195	188
16	247	240	235	231	227	223	219	214	207

***** 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	1699	1325	1085	592	236	51	18	31	172	532	1042	1525	8308
60	1544	1185	930	450	140	15	4	7	80	381	892	1370	6998
57	1451	1101	837	371	96	5	0	2	44	296	802	1277	6282
55	1389	1045	776	322	72	3	0	0	27	245	742	1215	5836
50	1234	908	629	213	31	0	0	0	5	137	597	1060	4814
32	706	459	197	16	0	0	0	0	0	4	182	548	2112

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	30	58	135	418	836	1073	1241	1170	852	495	130	47	6485
55	0	0	0	33	195	386	528	457	190	23	0	0	1812
57	0	0	0	23	157	329	466	397	146	13	0	0	1531
60	0	0	0	12	108	248	377	310	93	4	0	0	1152
65	0	0	0	3	49	135	235	178	34	0	0	0	634
70	0	0	0	0	17	57	126	85	8	0	0	0	293

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	2	33	225	606	848	1007	940	624	282	33	0	0	2	35	260	866	1714	2721	3661	4285	4567	4600	4600
45	0	0	11	131	455	698	852	785	475	171	11	0	0	0	11	142	597	1295	2147	2932	3407	3578	3589	3589
50	0	0	2	68	316	548	697	630	334	88	2	0	0	0	2	70	386	934	1631	2261	2595	2683	2685	2685
55	0	0	0	31	195	398	542	476	210	39	0	0	0	0	0	31	226	624	1166	1642	1852	1891	1891	1891
60	0	0	0	14	105	265	388	322	117	11	0	0	0	0	0	14	119	384	772	1094	1211	1222	1222	1222
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	0	23	145	372	548	671	613	384	170	24	0	0	0	23	168	540	1088	1759	2372	2756	2926	2950	2950

(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