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: TOWER 3 S, MN **COOP ID: 218311**

Climate Division: MN 3 **NWS Call Sign:** **Elevation: 1,460 Feet** **Lat: 47˚45N** **Lon: 92˚17W**

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	15.7	-13.6	1.1	52	1973	27	12.2	1990	-57+	1996	21	-11.7	1982	1983	0	.0	.0	@	28.2	31.0	21.8
Feb	23.9	-8.2	7.9	58+	2000	24	25.8	1998	-60+	1996	3	-3.4	1989	1602	0	.0	.0	.4	21.1	28.1	16.7
Mar	35.4	5.9	20.7	70	2000	8	30.4	2000	-42	1989	2	12.5+	1980	1375	0	.0	.0	3.7	12.4	30.0	8.8
Apr	50.5	21.7	36.1	87	1977	11	43.8	1987	-22	1982	6	29.2	1975	867	0	.0	.0	16.4	1.5	25.6	1.0
May	65.4	33.4	49.4	95	1986	31	58.4	1977	10+	1997	13	43.0	1997	492	8	.0	.2	28.1	.1	14.4	.0
Jun	73.0	42.8	57.9	97	1995	19	63.5	1995	21	1985	3	50.8	1985	237	24	.0	.8	29.9	.0	4.6	.0
Jul	77.1	47.5	62.3	98+	1988	28	67.6	1983	24	1997	7	56.0	1992	128	43	.0	1.5	31.0	.0	.6	.0
Aug	75.0	45.1	60.1	97	1976	20	65.7	1983	21	1986	28	52.7	1977	191	37	.0	1.0	31.0	.0	2.3	.0
Sep	64.5	36.0	50.3	95	1976	8	54.5	1998	14	1976	25	44.7	1974	444	1	.0	.2	28.2	.0	9.9	.0
Oct	51.7	26.3	39.0	84	1963	5	45.3	1973	-7	1976	27	32.1	1976	807	0	.0	.0	17.5	1.0	21.3	.2
Nov	34.2	11.6	22.9	75	1999	9	32.9	1999	-33	1976	30	13.9	1995	1264	0	.0	.0	3.2	14.4	28.8	5.0
Dec	20.5	-5.5	7.5	57	1962	1	20.4	1997	-52	1983	19	-5.7	1983	1784	0	.0	.0	.1	25.8	31.0	17.6
Ann	48.9	20.3	34.6	98+	Jul 1988	28	67.6	Jul 1983	-60+	Feb 1996	3	-11.7	Jan 1982	11174	113	.0	3.7	189.5	104.5	227.6	71.1

\+ 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	.76	.54	1.13	1975	11	3.56	1975	.05	1981
Feb	.70	.54	2.10	1964	24	2.81	1979	.00	1988
Mar	.99	.91	1.91	1966	4	2.02+	1977	.12	1983
Apr	1.57	1.33	2.15	1956	7	5.23	1981	.12	1988
May	3.05	3.19	2.45	1978	29	5.63	1974	.39	1980
Jun	4.49	4.03	3.30	1968	8	8.41	1976	.60	1995
Jul	4.42	4.00	3.48	1959	8	9.81	1993	.60	1989
Aug	4.29	3.95	3.22	1980	30	12.26	1988	.48	1976
Sep	4.00	3.81	3.71	1991	8	7.74	1991	1.38	1976
Oct	2.90	2.23	4.00	1995	1	8.11	1971	.71	1987
Nov	1.33	1.27	3.21	1996	17	4.21	1996	.07	1999
Dec	.61	.58	1.07	1948	6	1.49	1972	.08	1999
Ann	29.11	28.01	4.00	Oct 1995	1	12.26	Aug 1988	.00	Feb 1988

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	6.8	2.3	.2	@
Feb	5.5	2.2	.2	.1
Mar	6.9	3.1	.3	.0
Apr	7.5	4.4	.9	.2
May	11.3	7.0	1.9	.5
Jun	13.5	8.5	3.1	.9
Jul	13.0	9.0	3.1	1.0
Aug	12.1	8.2	2.7	1.0
Sep	13.0	8.1	2.4	.9
Oct	9.7	6.1	1.7	.6
Nov	8.1	3.4	.7	.1
Dec	6.6	1.9	.2	.0
Ann	114.0	64.2	17.4	5.3

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	.08	.13	.24	.34	.46	.59	.74	.93	1.19	1.62	2.04
Feb	.03	.09	.19	.29	.40	.52	.67	.86	1.11	1.53	1.95
Mar	.18	.26	.41	.54	.68	.83	1.00	1.21	1.48	1.93	2.35
Apr	.22	.35	.57	.79	1.02	1.27	1.56	1.92	2.40	3.19	3.95
May	.95	1.24	1.67	2.04	2.40	2.76	3.17	3.64	4.26	5.21	6.10
Jun	1.60	2.02	2.63	3.15	3.64	4.14	4.69	5.33	6.15	7.41	8.57
Jul	1.35	1.77	2.40	2.94	3.46	4.00	4.60	5.30	6.21	7.62	8.93
Aug	1.25	1.66	2.27	2.80	3.32	3.86	4.45	5.15	6.05	7.47	8.78
Sep	1.64	2.01	2.52	2.95	3.35	3.75	4.19	4.69	5.33	6.30	7.19
Oct	.58	.84	1.27	1.66	2.05	2.48	2.96	3.53	4.29	5.51	6.67
Nov	.20	.31	.50	.68	.88	1.09	1.33	1.62	2.02	2.67	3.29
Dec	.13	.18	.27	.35	.43	.52	.62	.74	.89	1.14	1.38
Ann	21.09	22.65	24.65	26.16	27.50	28.79	30.12	31.59	33.37	35.95	38.18

\+ 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)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	14.7	12.2	20	18
Feb	9.9	10.3	25	23
Mar	10.1	10.0	17	18
Apr	4.9	5.0	4	#
May	.4	.0	#	#
Jun	.0	.0	0	0
Jul	.0	.0	#	0
Aug	.0	.0	0	0
Sep	.0	.0	#	0
Oct	2.1	1.0	#	#
Nov	9.6	7.8	4	3
Dec	8.7	8.8	10	10
Ann	60.4	55.1	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	13.0	1996	18	46.0	1975	61	1975	31	42	1989
Feb	8.0	1991	19	22.0	1979	65	1989	28	59	1989
Mar	10.0	1976	12	28.0	1976	61	1979	11	48	1986
Apr	8.0	1972	13	11.1	1972	40	1979	12	20	1980
May	3.0	1976	2	3.0	1976	3	1984	1	#+	2000
Jun	.0	0	0	.0	0	0	0	0	0	0
Jul	.0	0	0	.0	0	#	1972	30	#	1972
Aug	.0	0	0	.0	0	0	0	0	0	0
Sep	.2	1974	30	.2	1974	#+	1984	26	#+	1984
Oct	12.0	1990	18	12.0	1990	12	1990	18	1	1995
Nov	15.0	1991	2	30.0	1991	34	1983	30	13	1991
Dec	10.0	1995	14	16.0	1990	42	1993	31	36	1993
Ann	15.0	Nov 1991	2	46.0	Jan 1975	65	Feb 1989	28	59	Feb 1989

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	6.0	5.1	1.9	.6	.1
Feb	4.9	4.3	1.2	.3	.0
Mar	4.9	4.1	1.2	.5	@
Apr	2.4	2.1	.7	.2	.0
May	.3	.2	@	.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
Oct	1.1	1.0	.2	.1	@
Nov	5.2	4.3	1.1	.6	@
Dec	5.3	4.4	1.1	.4	@
Ann	30.1	25.5	7.4	2.7	.1

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	-9.9	-9.9	-9.9	-9.9
Feb	-9.9	-9.9	-9.9	-9.9
Mar	-9.9	-9.9	-9.9	-9.9
Apr	-9.9	-9.9	-9.9	-9.9
May	-9.9	-9.9	-9.9	-9.9
Jun	-9.9	-9.9	-9.9	-9.9
Jul	-9.9	-9.9	-9.9	-9.9
Aug	-9.9	-9.9	-9.9	-9.9
Sep	-9.9	-9.9	-9.9	-9.9
Oct	-9.9	-9.9	-9.9	-9.9
Nov	-9.9	-9.9	-9.9	-9.9
Dec	-9.9	-9.9	-9.9	-9.9
Ann	-9.9	-9.9	-9.9	-9.9

+ 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	8/05	7/30	7/25	7/21	7/18	7/14	7/11	7/06	6/30
32	7/21	7/13	7/08	7/03	6/29	6/24	6/20	6/14	6/07
28	7/05	6/27	6/22	6/18	6/14	6/10	6/05	5/31	5/24
24	6/14	6/08	6/04	5/31	5/28	5/24	5/20	5/16	5/10
20	5/20	5/15	5/12	5/09	5/06	5/04	5/01	4/28	4/23
16	5/10	5/05	5/01	4/27	4/24	4/21	4/17	4/13	4/08

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	7/29	8/01	8/04	8/07	8/09	8/11	8/14	8/17	8/21
32	8/01	8/08	8/13	8/17	8/21	8/25	8/29	9/02	9/09
28	8/14	8/21	8/25	8/29	9/02	9/05	9/09	9/13	9/20
24	8/29	9/04	9/08	9/12	9/16	9/19	9/23	9/27	10/03
20	9/12	9/19	9/23	9/27	10/01	10/05	10/09	10/14	10/20
16	9/30	10/06	10/11	10/15	10/19	10/22	10/26	10/31	11/06

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	44	36	31	26	21	17	12	6	0
32	81	71	64	58	52	47	41	34	24
28	108	98	91	85	79	73	67	60	50
24	135	127	120	115	110	105	100	93	85
20	172	163	157	152	147	142	137	131	122
16	200	192	186	181	177	172	168	162	154

***** 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	1983	1602	1375	867	492	237	128	191	444	807	1264	1784	11174
60	1828	1462	1220	717	354	135	49	98	302	652	1114	1629	9560
57	1735	1378	1127	628	280	89	21	57	225	559	1024	1536	8659
55	1673	1322	1065	569	235	64	11	37	179	498	964	1474	8091
50	1518	1182	910	426	142	23	0	10	87	351	814	1319	6782
32	965	695	398	70	5	0	0	0	0	35	320	779	3267

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	5	17	46	193	544	777	938	870	548	251	46	18	4253
55	0	0	0	2	61	150	236	194	36	1	0	0	680
57	0	0	0	1	44	116	184	152	23	0	0	0	520
60	0	0	0	0	25	72	119	99	9	0	0	0	324
65	0	0	0	0	8	24	43	37	1	0	0	0	113
70	0	0	0	0	1	7	9	10	0	0	0	0	27

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	6	87	346	568	716	657	354	119	11	0	0	0	6	93	439	1007	1723	2380	2734	2853	2864	2864
45	0	0	0	40	225	419	561	504	228	58	2	0	0	0	0	40	265	684	1245	1749	1977	2035	2037	2037
50	0	0	0	17	129	280	408	351	131	22	0	0	0	0	0	17	146	426	834	1185	1316	1338	1338	1338
55	0	0	0	7	67	165	262	212	64	2	0	0	0	0	0	7	74	239	501	713	777	779	779	779
60	0	0	0	1	32	81	140	109	26	0	0	0	0	0	0	1	33	114	254	363	389	389	389	389
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	0	8	87	262	376	469	432	240	92	11	0	0	0	8	95	357	733	1202	1634	1874	1966	1977	1977

(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