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: COTTON, MN **COOP ID: 211840**

Climate Division: MN 3 **NWS Call Sign:** **Elevation: 1,329 Feet** **Lat: 47˚10N** **Lon: 92˚28W**

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	17.5	-9.9	3.8	52+	1981	25	15.1	1998	-50+	1996	20	-8.3	1982	1898	0	.0	.0	.1	27.6	31.0	19.8
Feb	25.6	-2.7	11.5	59	1976	24	28.5	1998	-46+	1996	4	.1	1989	1501	0	.0	.0	.5	19.6	28.1	13.9
Mar	36.7	11.1	23.9	72	1986	31	33.1	1973	-40	1989	2	15.5	1996	1275	0	.0	.0	3.7	9.9	29.1	6.8
Apr	52.2	25.1	38.7	87	1977	10	45.2	1987	-14	1975	2	32.2	1975	791	0	.0	.0	18.0	.9	23.1	.4
May	66.0	37.3	51.7	93	1986	28	59.3	1977	8	1966	1	46.0	1997	423	9	.0	.2	29.5	.0	9.8	.0
Jun	73.9	46.5	60.2	96	1995	18	66.1	1995	24	1969	20	54.5	1985	176	32	.0	.7	30.0	.0	1.5	.0
Jul	78.2	51.6	64.9	100	1988	27	68.8	1983	30	1969	6	59.1	1992	74	70	@	1.4	31.0	.0	.1	.0
Aug	75.6	50.0	62.8	96	1976	19	67.6	1983	23	1970	31	57.9	1977	127	58	.0	.6	31.0	.0	.5	.0
Sep	65.8	41.2	53.5	97	1976	7	60.5	1994	16	1965	26	48.4	1993	349	4	.0	.2	28.9	.0	6.4	.0
Oct	53.4	31.1	42.3	82	1992	2	48.1	1973	-2	1976	27	36.2	1976	705	0	.0	.0	19.4	.6	16.9	@
Nov	35.3	16.1	25.7	72+	1990	1	33.7	1981	-30	1985	29	17.6	1985	1179	0	.0	.0	3.3	12.8	27.8	3.2
Dec	21.5	-.9	10.3	59	1962	1	22.6	1997	-44	1983	19	-2.7	1983	1697	0	.0	.0	.1	24.8	30.9	15.3
Ann	50.1	24.7	37.4	100	Jul 1988	27	68.8	Jul 1983	-50+	Jan 1996	20	-8.3	Jan 1982	10195	173	@	3.1	195.5	96.2	205.2	59.4

\+ 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: 1962-2001

(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	.89	.82	1.80	1997	5	3.13	1975	.11	1991
Feb	.59	.50	1.77	2001	25	1.59	1998	.01	1973
Mar	1.03	.79	1.45	1985	4	3.42	1979	.23	1992
Apr	1.94	1.75	2.49	2001	23	5.70	1986	.34	1988
May	2.62	2.46	2.23	1987	17	5.89	1987	.24	1976
Jun	4.45	4.10	2.53	1996	26	9.51	1984	1.18	1987
Jul	4.89	3.87	5.72	1999	5	14.14	1999	1.66	1984
Aug	3.56	3.24	5.84	1988	13	10.52	1988	1.03	1991
Sep	3.23	3.02	4.25	1998	14	5.94	1986	.62	1974
Oct	2.35	1.98	2.16	1968	16	6.37	1971	.85	1987
Nov	1.63	1.49	1.63	1991	1	3.89	1991	.26	1999
Dec	.76	.72	1.34	1984	16	1.75	1983	.12	1999
Ann	27.94	28.37	5.84	Aug 1988	13	14.14	Jul 1999	.01	Feb 1973

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	8.4	2.8	.3	.1
Feb	6.2	2.1	.1	.0
Mar	7.7	3.1	.5	.1
Apr	8.6	5.1	1.2	.2
May	10.5	6.7	1.4	.3
Jun	11.9	8.0	2.7	1.1
Jul	11.7	8.2	3.3	1.0
Aug	10.5	6.9	2.1	.7
Sep	11.3	6.6	2.2	.6
Oct	9.7	5.3	1.4	.4
Nov	8.5	4.4	.7	.2
Dec	9.3	2.9	.2	@
Ann	114.3	62.1	16.1	4.7

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	.18	.26	.39	.51	.63	.76	.91	1.08	1.32	1.70	2.05
Feb	.06	.11	.19	.27	.36	.46	.57	.72	.91	1.24	1.56
Mar	.22	.32	.47	.60	.74	.89	1.06	1.25	1.52	1.94	2.33
Apr	.40	.57	.86	1.12	1.38	1.66	1.98	2.36	2.87	3.68	4.45
May	.81	1.05	1.42	1.74	2.05	2.37	2.72	3.14	3.67	4.50	5.27
Jun	1.88	2.29	2.85	3.32	3.75	4.19	4.66	5.21	5.90	6.95	7.90
Jul	1.60	2.07	2.75	3.33	3.89	4.47	5.10	5.84	6.79	8.27	9.63
Aug	1.20	1.54	2.03	2.45	2.85	3.27	3.72	4.25	4.92	5.97	6.94
Sep	1.12	1.42	1.86	2.24	2.60	2.97	3.37	3.84	4.44	5.37	6.23
Oct	.61	.83	1.17	1.47	1.77	2.08	2.43	2.84	3.38	4.23	5.03
Nov	.39	.54	.78	.99	1.20	1.43	1.68	1.98	2.37	2.99	3.57
Dec	.24	.31	.42	.51	.60	.69	.80	.91	1.07	1.31	1.53
Ann	21.23	22.57	24.26	25.53	26.65	27.72	28.83	30.04	31.51	33.61	35.42

\+ 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: 1962-2001
(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	11.2	9.0	14	13
Feb	6.1	5.6	16	15
Mar	8.5	7.3	11	8
Apr	2.8	1.5	2	#
May	.0	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	#	.0	#	0
Oct	.6	.0	#	0
Nov	9.5	6.5	2	2
Dec	10.5	10.1	7	7
Ann	49.2	40.0	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	15.0	1997	5	33.5	1975	43	1975	31	29	1975
Feb	5.8	1995	15	14.3	1981	45	1975	16	42	1975
Mar	13.2	1985	4	21.0	1975	42	1972	10	30	1972
Apr	9.0	1983	14	12.0	1972	28	1975	3	10	1996
May	.3	1979	6	.3	1979	#+	1997	13	#+	1997
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	#	1974	21	#	1974	#	1995	21	#	1995
Oct	3.0	1984	30	3.6	1990	3	1995	21	#+	2000
Nov	16.4	1991	1	32.4	1991	19	1991	2	9	1991
Dec	6.6	1982	28	16.7	1983	21	1978	31	16	1983
Ann	16.4	Nov 1991	1	33.5	Jan 1975	45	Feb 1975	16	42	Feb 1975

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	7.7	3.8	1.1	.5	.0
Feb	5.2	2.7	.5	@	.0
Mar	3.9	2.4	.7	.3	.1
Apr	1.3	.9	.3	.1	.0
May	@	.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	.6	.2	.1	.0	.0
Nov	5.1	3.3	1.1	.4	.1
Dec	8.5	4.1	.6	.1	.0
Ann	32.3	17.4	4.4	1.4	.2

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	31.0	31.0	30.6	25.2
Feb	27.2	27.2	26.6	19.3
Mar	18.1	14.7	12.8	9.1
Apr	4.1	3.2	2.7	1.2
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	.3	@	.0	.0
Nov	12.1	7.2	3.3	1.0
Dec	28.7	23.8	17.6	6.5
Ann	121.5	107.1	93.6	62.3

+ 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	7/21	7/13	7/08	7/04	6/29	6/25	6/21	6/16	6/08
32	6/27	6/21	6/16	6/13	6/09	6/06	6/02	5/29	5/23
28	6/10	6/05	6/01	5/29	5/27	5/24	5/21	5/17	5/12
24	5/19	5/14	5/11	5/08	5/05	5/03	4/30	4/26	4/22
20	5/11	5/06	5/02	4/29	4/26	4/23	4/19	4/15	4/10
16	4/28	4/23	4/20	4/17	4/14	4/11	4/08	4/05	3/31

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

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	83	72	64	58	52	45	39	31	20
32	111	103	97	92	87	82	76	70	62
28	132	126	122	118	115	111	108	103	97
24	168	161	157	153	150	146	143	138	132
20	193	185	180	175	170	165	161	155	147
16	214	207	202	197	193	189	185	180	173

***** 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	1898	1501	1275	791	423	176	74	127	349	705	1179	1697	10195
60	1743	1361	1120	641	289	87	17	52	217	551	1029	1542	8649
57	1650	1277	1027	553	220	50	6	25	151	461	939	1449	7808
55	1588	1221	965	495	180	32	1	14	113	402	879	1387	7277
50	1433	1081	810	356	98	9	0	2	46	269	729	1232	6065
32	879	601	315	44	1	0	0	0	0	19	253	696	2808

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	4	24	64	243	611	846	1019	955	645	337	65	22	4835
55	0	0	0	4	76	188	307	256	68	8	0	0	907
57	0	0	0	2	55	146	250	204	46	4	0	0	707
60	0	0	0	0	31	93	168	138	22	1	0	0	453
65	0	0	0	0	9	32	70	58	4	0	0	0	173
70	0	0	0	0	2	8	16	16	0	0	0	0	42

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	9	105	406	631	785	726	430	163	14	0	0	0	9	114	520	1151	1936	2662	3092	3255	3269	3269
45	0	0	0	50	266	481	630	571	295	80	5	0	0	0	0	50	316	797	1427	1998	2293	2373	2378	2378
50	0	0	0	19	158	333	475	417	177	32	0	0	0	0	0	19	177	510	985	1402	1579	1611	1611	1611
55	0	0	0	5	84	200	323	268	88	7	0	0	0	0	0	5	89	289	612	880	968	975	975	975
60	0	0	0	0	38	103	183	145	39	1	0	0	0	0	0	0	38	141	324	469	508	509	509	509
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	0	9	98	283	403	504	462	269	105	11	0	0	0	9	107	390	793	1297	1759	2028	2133	2144	2144

(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