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: OWATONNA, MN **COOP ID: 216287**

Climate Division: MN 8 **NWS Call Sign:** **Elevation: 1,150 Feet** **Lat: 44˚06N** **Lon: 93˚14W**

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	20.8	1.9	11.4	58	1981	24	25.1	1990	-35	1977	9	-1.6	1977	1664	0	.0	.0	.1	23.4	30.9	12.6
Feb	27.6	8.9	18.3	65	1981	17	30.3	1987	-34	1996	2	6.7	1978	1309	0	.0	.0	1.1	15.7	27.4	7.5
Mar	40.3	21.7	31.0	81+	1986	31	39.4	2000	-32	1962	1	21.2	1975	1054	0	.0	.0	8.1	6.6	25.7	2.2
Apr	56.5	34.6	45.6	92	1980	21	53.7	1977	0	1982	6	38.0	1975	587	3	.0	.1	22.2	.6	12.6	@
May	69.5	47.1	58.3	96	1978	25	66.7	1977	20	1967	3	51.5	1997	262	53	.0	.8	30.5	.0	1.6	.0
Jun	79.7	57.0	68.4	102+	1985	9	74.1	1988	33	1964	1	62.8	1982	44	144	.2	4.1	30.0	.0	.0	.0
Jul	82.9	61.3	72.1	102+	1995	14	77.5	1983	42	1967	5	64.9	1992	17	238	.2	6.9	31.0	.0	.0	.0
Aug	80.4	59.2	69.8	102	1988	1	76.2	1983	36	1985	18	65.2	1992	31	180	.1	4.1	31.0	.0	.0	.0
Sep	72.2	49.5	60.9	98	1978	7	66.5	1978	23	1974	22	54.9	1993	164	40	.0	1.3	29.8	.0	1.1	.0
Oct	60.0	37.7	48.9	93	1997	4	54.1	1971	13	1972	19	44.2	1976	501	1	.0	@	26.5	.2	9.1	.0
Nov	40.1	22.9	31.5	78	1999	9	41.6	1999	-15	1977	26	23.8	1985	1005	0	.0	.0	7.8	7.7	24.0	.8
Dec	25.4	8.5	17.0	67	1998	2	26.0	1998	-32	1983	19	2.1	1983	1490	0	.0	.0	.6	19.9	30.5	7.9
Ann	54.6	34.2	44.4	102+	Jul 1995	14	77.5	Jul 1983	-35	Jan 1977	9	-1.6	Jan 1977	8128	659	.5	17.3	218.7	74.1	162.9	31.0

\+ 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: 1961-2001

(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	1.01	.77	1.75	1999	13	5.37	1999	.05	1981
Feb	.59	.45	.80	1981	27	2.30	1981	.00+	1996
Mar	1.91	2.08	1.86	1990	14	4.17	1990	.12	1994
Apr	2.94	2.72	2.17	1983	14	6.43	1999	.47	1987
May	3.93	3.69	2.37	1973	1	7.10	1993	1.06	1994
Jun	4.05	3.96	3.50	2001	13	9.08	2000	.85	1988
Jul	4.58	4.19	4.86	1983	1	11.97	1991	.42	1975
Aug	4.43	4.14	4.41	1994	10	10.21	1997	.90	1971
Sep	3.12	2.87	3.23	1973	26	8.25	1986	.57	1990
Oct	2.27	2.34	3.26	1992	7	4.99	1984	.32	1978
Nov	1.82	1.45	1.60	1991	1	4.89	1991	.11	1976
Dec	.99	.98	1.67	1982	28	3.10	1982	.17	1997
Ann	31.64	31.22	4.86	Jul 1983	1	11.97	Jul 1991	.00+	Feb 1996

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	7.2	3.1	.4	.1
Feb	5.3	1.9	.1	.0
Mar	8.4	4.7	1.0	.3
Apr	10.8	6.8	2.1	.3
May	11.7	7.8	2.6	.9
Jun	11.3	7.6	2.7	1.0
Jul	9.9	6.8	3.1	1.3
Aug	10.3	6.7	2.9	1.2
Sep	8.9	5.2	2.0	.8
Oct	8.2	4.8	1.4	.4
Nov	7.3	3.9	1.2	.5
Dec	6.8	2.9	.4	.1
Ann	106.1	62.2	19.9	6.9

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	.10	.17	.31	.45	.60	.78	.98	1.24	1.59	2.17	2.74
Feb	.00	.08	.19	.29	.38	.48	.60	.73	.92	1.22	1.51
Mar	.40	.57	.85	1.11	1.36	1.64	1.95	2.32	2.82	3.60	4.35
Apr	.86	1.14	1.56	1.92	2.28	2.65	3.05	3.53	4.16	5.13	6.03
May	1.66	2.02	2.52	2.93	3.31	3.70	4.12	4.60	5.21	6.14	6.98
Jun	1.31	1.70	2.26	2.75	3.21	3.69	4.22	4.84	5.63	6.87	8.01
Jul	.96	1.38	2.05	2.66	3.28	3.94	4.68	5.57	6.75	8.64	10.42
Aug	1.12	1.54	2.18	2.76	3.32	3.91	4.57	5.36	6.39	8.01	9.53
Sep	.66	.94	1.40	1.82	2.24	2.68	3.19	3.79	4.59	5.87	7.08
Oct	.47	.68	1.01	1.32	1.62	1.95	2.32	2.76	3.35	4.28	5.17
Nov	.23	.38	.64	.89	1.16	1.45	1.80	2.22	2.80	3.74	4.66
Dec	.28	.37	.51	.64	.76	.88	1.02	1.19	1.40	1.73	2.05
Ann	21.56	23.48	25.96	27.85	29.54	31.18	32.88	34.77	37.07	40.42	43.32

+ 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: 1961-2001
(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	8.7	8.0	8	7
Feb	6.5	6.6	8	7
Mar	7.6	7.4	3	2
Apr	3.0	2.0	#	#
May	#	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.0	.0	0	0
Oct	.6	.0	#	0
Nov	4.5	3.0	1	1
Dec	8.3	8.7	5	2
Ann	39.2	35.7	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	9.5	1988	20	24.1	1975	31	1982	26	24	1997
Feb	6.0	1971	5	13.6+	1981	33	1982	7	30	1979
Mar	9.0	1984	4	26.0	1989	27	1979	5	16	1979
Apr	12.1	1984	30	15.2	1983	10	1983	14	2	1983
May	#	1992	25	#+	1992	2	1984	1	#+	1992
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	.0	0	0	.0	0	0	0	0	0	0
Oct	4.0	1976	24	4.6	1976	4	1991	31	#+	1991
Nov	12.0	1978	17	19.7	1983	16	1983	30	5	1978
Dec	9.7	1982	28	15.9	1977	30	1983	31	25	1983
Ann	12.1	Apr 1984	30	26.0	Mar 1989	33	Feb 1982	7	30	Feb 1979

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	6.0	3.7	1.1	.4	.0
Feb	3.8	2.2	.7	.1	.0
Mar	3.6	2.2	1.1	.3	.0
Apr	1.0	.9	.4	.2	.1
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	.2	.1	.0	.0
Nov	2.8	1.8	.6	.2	@
Dec	4.9	3.0	.9	.4	.0
Ann	22.4	14.0	4.9	1.6	.1

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	25.1	19.4	15.6	8.5
Feb	21.3	18.2	15.2	8.2
Mar	13.2	9.8	7.5	3.1
Apr	1.6	.7	.4	@
May	@	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.1	@	.0	.0
Nov	6.4	3.5	1.9	.4
Dec	20.2	12.4	8.4	4.1
Ann	87.9	64.0	49.0	24.3

+ 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	5/31	5/25	5/21	5/17	5/13	5/10	5/06	5/02	4/26
32	5/16	5/12	5/08	5/06	5/03	4/30	4/27	4/24	4/19
28	5/09	5/04	5/01	4/28	4/25	4/23	4/20	4/17	4/12
24	4/27	4/22	4/18	4/15	4/12	4/09	4/06	4/03	3/29
20	4/14	4/11	4/08	4/06	4/04	4/02	3/31	3/28	3/25
16	4/11	4/06	4/02	3/29	3/26	3/23	3/20	3/16	3/10

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	9/07	9/12	9/16	9/19	9/22	9/25	9/28	10/02	10/07
32	9/17	9/21	9/25	9/28	9/30	10/03	10/06	10/09	10/13
28	9/28	10/02	10/06	10/08	10/11	10/13	10/16	10/19	10/23
24	10/06	10/12	10/16	10/19	10/22	10/25	10/29	11/02	11/07
20	10/16	10/22	10/26	10/30	11/02	11/05	11/09	11/13	11/18
16	10/26	11/01	11/05	11/08	11/11	11/15	11/18	11/22	11/28

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	152	145	139	135	131	127	122	117	110
32	166	160	156	153	150	146	143	139	133
28	186	179	175	171	168	164	160	156	149
24	216	208	202	197	192	187	182	177	169
20	229	223	219	215	211	207	204	199	193
16	254	245	239	234	229	225	219	213	205

***** 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	1664	1309	1054	587	262	44	17	31	164	501	1005	1490	8128
60	1509	1169	899	446	164	12	4	8	76	352	855	1335	6829
57	1416	1085	806	367	118	5	0	2	42	270	765	1242	6118
55	1354	1029	745	317	92	2	0	0	26	221	705	1180	5671
50	1199	889	601	209	44	0	0	0	5	120	562	1025	4654
32	669	438	185	15	0	0	0	0	0	3	159	511	1980

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	28	53	155	421	814	1091	1244	1172	866	525	144	44	6557
55	0	0	1	33	193	403	531	459	201	31	0	0	1852
57	0	0	0	23	157	345	469	398	157	18	0	0	1567
60	0	0	0	12	111	263	380	311	102	6	0	0	1185
65	0	0	0	3	53	144	238	180	40	1	0	0	659
70	0	0	0	0	21	62	127	86	10	0	0	0	306

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	54	249	609	877	1024	952	667	327	50	2	0	2	56	305	914	1791	2815	3767	4434	4761	4811	4813
45	0	0	21	149	460	727	869	797	519	210	25	1	0	0	21	170	630	1357	2226	3023	3542	3752	3777	3778
50	0	0	7	84	321	577	714	642	373	118	6	0	0	0	7	91	412	989	1703	2345	2718	2836	2842	2842
55	0	0	1	41	200	430	559	487	248	58	1	0	0	0	1	42	242	672	1231	1718	1966	2024	2025	2025
60	0	0	0	15	110	289	405	337	143	21	0	0	0	0	0	15	125	414	819	1156	1299	1320	1320	1320
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	0	36	163	380	574	686	631	418	199	30	1	0	0	36	199	579	1153	1839	2470	2888	3087	3117	3118

(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