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: MANITOWOC, WI **COOP ID: 475017**

Climate Division: WI 6 **NWS Call Sign:** **Elevation: 660 Feet** **Lat: 44˚05N** **Lon: 87˚41W**

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	26.5	10.8	18.7	55	1961	13	28.9	1990	-26+	1982	10	6.4	1977	1438	0	.0	.0	.1	20.2	30.4	7.3
Feb	30.4	15.3	22.9	57	1984	23	33.6	1998	-27	1996	3	13.2	1979	1180	0	.0	.0	.3	15.2	26.7	3.7
Mar	39.9	24.4	32.2	77	1986	29	39.7	2000	-18	1962	1	25.8	1996	1019	0	.0	.0	4.2	6.1	25.1	.4
Apr	52.1	34.1	43.1	90	1980	22	48.6	1987	3	1979	5	38.8	1975	657	0	.0	@	17.4	.3	11.5	.0
May	64.9	44.3	54.6	91	1969	28	60.9	1998	21	1967	8	48.4	1997	339	17	.0	@	29.7	.0	1.4	.0
Jun	74.6	53.6	64.1	97+	1988	1	69.4	1988	35	1980	10	59.0	1982	101	74	.0	1.3	30.0	.0	.0	.0
Jul	79.6	60.1	69.9	101	1995	14	74.3	1999	26	1971	7	65.0	1992	16	166	@	2.3	31.0	.0	.0	.0
Aug	77.6	59.3	68.5	100	1948	24	73.6	1995	40	1971	4	64.3	1992	32	138	.0	1.0	31.0	.0	.0	.0
Sep	69.8	51.6	60.7	97	1983	10	66.2	1998	29+	1993	30	56.0	1993	158	29	.0	.2	29.9	.0	.4	.0
Oct	57.4	40.8	49.1	89	1963	6	55.9	1971	19+	1972	19	45.0	1976	493	1	.0	.0	25.9	@	4.8	.0
Nov	43.5	29.2	36.4	74+	1999	9	42.7	1999	-7	1976	29	29.5	1976	859	0	.0	.0	7.6	3.2	19.2	.1
Dec	31.3	16.7	24.0	64+	2001	6	31.7	1982	-21	1983	24	12.0	2000	1271	0	.0	.0	.9	14.7	28.7	3.9
Ann	54.0	36.7	45.4	101	Jul 1995	14	74.3	Jul 1999	-27	Feb 1996	3	6.4	Jan 1977	7563	425	@	4.8	208.0	59.7	148.2	15.4

\+ 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: 1948-2001

(3) Derived from 1971-2000 serially complete daily data

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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	1.83	1.54	1.75	1999	2	10.24	2000	.06	1981
Feb	1.24	.93	1.77	1966	8	2.79	1971	.26	1995
Mar	1.94	1.67	2.95	1998	31	5.19	1977	.12	1999
Apr	2.85	2.70	2.27	1994	25	7.65	1993	.53	1971
May	2.79	2.56	2.42	1973	28	6.47	1973	.60	1981
Jun	3.26	3.15	3.50	1996	17	8.53	1996	.80	1989
Jul	3.44	2.89	2.98	1952	18	8.12	1991	1.46	1979
Aug	3.73	3.35	4.40	1975	28	9.48	1975	.76	1976
Sep	3.10	2.96	3.40	1986	11	12.56	1986	.16	1979
Oct	2.25	2.31	3.04	1954	3	5.57	1991	.16	1975
Nov	2.30	1.95	2.10	1992	2	6.20	1985	.10	1996
Dec	1.76	1.80	2.29	1959	28	4.10	1971	.10	1993
Ann	30.49	30.63	4.40	Aug 1975	28	12.56	Sep 1986	.06	Jan 1981

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	7.9	4.7	.7	.2
Feb	5.9	3.8	.8	@
Mar	7.1	4.8	1.3	.3
Apr	9.0	6.6	1.9	.5
May	8.8	5.5	1.9	.6
Jun	8.9	6.3	2.2	1.0
Jul	8.9	6.0	2.5	.9
Aug	9.3	7.0	2.8	.8
Sep	9.2	6.1	2.0	.7
Oct	8.0	5.3	1.6	.3
Nov	7.8	5.6	1.5	.4
Dec	7.6	4.6	.9	.3
Ann	98.4	66.3	20.1	6.0

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	.21	.35	.60	.86	1.13	1.43	1.79	2.23	2.84	3.83	4.80
Feb	.24	.35	.53	.70	.87	1.05	1.26	1.51	1.84	2.36	2.87
Mar	.32	.49	.77	1.04	1.31	1.61	1.95	2.36	2.91	3.81	4.66
Apr	1.01	1.27	1.66	1.99	2.31	2.63	2.98	3.39	3.91	4.72	5.46
May	.75	1.01	1.42	1.77	2.12	2.48	2.88	3.36	3.98	4.96	5.87
Jun	.78	1.09	1.56	1.99	2.41	2.85	3.35	3.94	4.72	5.95	7.11
Jul	1.35	1.67	2.12	2.50	2.85	3.21	3.60	4.05	4.63	5.51	6.31
Aug	1.02	1.37	1.91	2.38	2.84	3.33	3.86	4.50	5.32	6.62	7.83
Sep	.49	.76	1.21	1.63	2.08	2.56	3.11	3.79	4.70	6.17	7.58
Oct	.58	.80	1.12	1.41	1.70	1.99	2.33	2.72	3.23	4.04	4.80
Nov	.39	.59	.93	1.24	1.56	1.91	2.31	2.80	3.45	4.50	5.50
Dec	.26	.41	.66	.91	1.16	1.44	1.76	2.16	2.68	3.55	4.37
Ann	22.29	23.89	25.94	27.49	28.86	30.18	31.54	33.04	34.85	37.48	39.74

\+ 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	5.7	4.1	6	6	13.0	1979	24	15.6	1971	41	1979	30	26	1979	2.8	2.2	.9	.3	.1	-9.9	-9.9	-9.9	-9.9
Feb	4.3	3.0	9	6	7.0	1993	21	10.5	1975	57	1979	21	45	1979	2.1	1.8	.6	.3	.0	-9.9	-9.9	-9.9	-9.9
Mar	5.0	2.5	2	1	7.0	1971	19	23.0	1972	13	1972	6	6	1972	1.4	1.2	.5	.2	.0	-9.9	-9.9	-9.9	-9.9
Apr	.6	.0	#	0	5.0	1980	14	6.0	1980	5	1973	10	#+	1996	.2	.2	.1	@	.0	.1	.0	.0	.0
May	#	.0	0	0	#	1980	7	#+	1980	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.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	#	1971	15	#	1971	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sep	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	#	.0	0	0	#	1989	31	#+	1989	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Nov	.8	.0	#	0	4.0	1988	6	5.5	1971	6	1977	29	5	1977	.4	.4	.1	.0	.0	.4	.1	.0	.0
Dec	5.4	4.7	3	1	10.0	1971	30	16.3	1980	14+	1985	25	14	1985	1.5	1.2	.4	.3	.1	-9.9	-9.9	-9.9	-9.9
Ann	21.8	14.3	N/A	N/A	13.0	Jan 1979	24	23.0	Mar 1972	57	Feb 1979	21	45	Feb 1979	8.4	7.0	2.6	1.1	.2	-9.9	-9.9	-9.9	-9.9

+ Also occurred on an earlier date(s) #Denotes trace amounts

(1) Derived from Snow Climatology and 1971-2000 daily data

@ Denotes mean number of days greater than 0 but less than .05

(2) Derived from 1971-2000 daily data

-9/-9.9 represents missing values

Annual statistics for Mean/Median snow depths are not appropriate

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

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	9/21	9/25	9/27	9/30	10/02	10/04	10/07	10/10	10/13
32	9/25	9/30	10/04	10/07	10/09	10/12	10/15	10/19	10/24
28	10/10	10/16	10/19	10/23	10/26	10/29	11/01	11/05	11/11
24	10/25	10/29	11/01	11/03	11/05	11/08	11/10	11/13	11/17
20	10/30	11/05	11/08	11/12	11/15	11/18	11/21	11/24	11/30
16	11/08	11/14	11/18	11/21	11/24	11/27	11/30	12/04	12/09

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	160	153	148	144	141	137	133	128	121
32	177	171	166	162	159	155	152	147	141
28	211	204	199	194	190	186	182	177	169
24	229	224	220	217	214	211	208	204	199
20	253	245	239	234	230	225	220	214	207
16	273	264	258	252	247	242	237	230	221

***** 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	1438	1180	1019	657	339	101	16	32	158	493	859	1271	7563
60	1283	1040	864	507	216	40	1	5	68	343	709	1116	6192
57	1190	956	771	419	156	19	0	1	35	261	619	1023	5450
55	1128	900	709	362	121	11	0	0	20	211	559	961	4982
50	973	760	555	230	56	2	0	0	3	109	415	811	3914
32	449	301	125	7	0	0	0	0	0	0	63	334	1279

Base — Cooling Degree Days (1)

Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	34	45	129	340	701	963	1174	1130	860	531	194	86	6187
55	0	0	0	5	109	284	461	417	191	29	0	0	1496
57	0	0	0	3	82	232	399	356	145	17	0	0	1234
60	0	0	0	1	49	162	307	267	89	6	0	0	881
65	0	0	0	0	17	74	166	138	29	1	0	0	425
70	0	0	0	0	4	22	67	53	5	0	0	0	151

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	28	152	462	733	932	892	628	303	59	4	0	0	28	180	642	1375	2307	3199	3827	4130	4189	4193
45	0	0	7	73	314	583	777	737	478	176	23	1	0	0	7	80	394	977	1754	2491	2969	3145	3168	3169
50	0	0	1	28	189	433	622	582	336	83	6	0	0	0	1	29	218	651	1273	1855	2191	2274	2280	2280
55	0	0	0	6	95	288	467	427	208	31	0	0	0	0	0	6	101	389	856	1283	1491	1522	1522	1522
60	0	0	0	0	40	164	315	275	106	5	0	0	0	0	0	0	40	204	519	794	900	905	905	905
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	11	82	252	444	614	578	367	141	23	1	0	0	11	93	345	789	1403	1981	2348	2489	2512	2513

(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