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: WILLOW RESERVOIR, WI **COOP ID: 479236**

Climate Division: WI 2 **NWS Call Sign:** **Elevation: 1,560 Feet** **Lat: 45˚42N** **Lon: 89˚51W**

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	18.9	-2.7	8.1	51	1981	26	18.8	1990	-45+	1982	18	-3.3	1977	1765	0	.0	.0	.1	27.9	30.9	17.1
Feb	25.4	1.6	13.5	59	1976	25	28.7	1998	-43	1996	3	4.0	1979	1441	0	.0	.0	.5	19.9	27.9	13.5
Mar	35.5	13.3	24.4	71	2000	8	34.3	1973	-40	1962	1	16.5	1996	1258	0	.0	.0	3.2	11.4	29.4	6.5
Apr	49.7	27.4	38.6	88+	1952	29	45.3	1998	-14	1982	7	31.8	1982	793	0	.0	.0	15.5	1.7	22.1	.3
May	64.3	39.8	52.1	89+	1964	22	60.6	1977	15	1966	10	45.1	1983	419	17	.0	.0	28.4	.1	7.4	.0
Jun	72.1	49.7	60.9	96	1963	30	67.0	1995	23	1958	14	54.0	1982	162	39	.0	.3	29.9	.0	.5	.0
Jul	76.4	54.5	65.5	97+	1977	20	69.4	1999	30	1948	1	60.7	1992	64	78	.0	.8	31.0	.0	.0	.0
Aug	74.4	51.9	63.2	96	1948	24	68.3	1995	28	1965	29	58.2	1986	121	63	.0	.3	31.0	.0	.3	.0
Sep	65.2	43.5	54.4	93	1976	8	61.3	1998	18+	1984	30	48.5	1974	328	8	.0	.1	28.9	.0	3.7	.0
Oct	52.9	33.4	43.2	85+	1976	2	51.5	1971	7+	1976	28	37.1	1976	677	0	.0	.0	19.8	.5	15.2	.0
Nov	36.4	20.9	28.7	73	1950	1	37.1	1999	-22	1985	29	20.1	1976	1090	0	.0	.0	4.2	10.9	27.2	1.6
Dec	23.6	5.6	14.6	59+	1998	3	23.6	1997	-35	1989	21	2.6	1985	1563	0	.0	.0	.2	24.9	30.8	11.2
Ann	49.6	28.2	38.9	97+	Jul 1977	20	69.4	Jul 1999	-45+	Jan 1982	18	-3.3	Jan 1977	9681	205	.0	1.5	192.7	97.3	195.4	50.2

\+ 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	1.09	.81	1.29	1997	5	2.93	1997	.17	1981
Feb	.80	.67	1.16	1971	5	2.76	1971	.02	1987
Mar	1.56	1.36	1.35	1973	11	3.56	1977	.22	1978
Apr	2.21	2.30	1.70	1981	4	4.72	1977	.56	1997
May	3.16	3.11	3.22	1960	6	7.32	1973	.56	1986
Jun	3.93	3.73	6.12	1981	14	11.05	1981	1.53	1976
Jul	3.90	3.67	3.76	1958	1	7.35	1999	1.02	1998
Aug	4.31	3.79	3.40	1973	31	10.59	1995	1.26	1981
Sep	4.09	3.99	4.27	1985	8	10.67	1994	.51	1976
Oct	2.51	2.42	2.77	1966	15	5.45	1995	.36	1976
Nov	2.02	1.70	2.32	1964	13	6.25	1991	.15	1981
Dec	1.11	.95	.84	1953	4	2.73	1984	.30	1994
Ann	30.69	32.04	6.12	Jun 1981	14	11.05	Jun 1981	.02	Feb 1987

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	9.2	3.8	.2	@
Feb	6.4	2.9	.2	@
Mar	7.9	4.1	.8	.1
Apr	9.8	5.7	1.2	.3
May	10.4	6.7	2.2	.6
Jun	12.1	8.0	2.3	.7
Jul	11.0	8.0	2.7	.8
Aug	10.3	7.5	2.7	.9
Sep	11.2	7.5	2.3	.9
Oct	10.0	5.8	1.4	.5
Nov	9.0	4.5	1.1	.3
Dec	9.1	3.9	.2	.0
Ann	116.4	68.4	17.3	5.1

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	.23	.33	.49	.64	.78	.94	1.12	1.33	1.61	2.06	2.48
Feb	.07	.13	.24	.35	.47	.61	.77	.98	1.26	1.74	2.20
Mar	.36	.50	.73	.94	1.14	1.36	1.60	1.89	2.27	2.87	3.44
Apr	.73	.94	1.25	1.51	1.76	2.02	2.31	2.64	3.06	3.72	4.33
May	.88	1.18	1.64	2.03	2.42	2.82	3.27	3.80	4.49	5.56	6.57
Jun	1.46	1.82	2.35	2.79	3.21	3.64	4.11	4.65	5.34	6.40	7.37
Jul	1.26	1.63	2.18	2.64	3.09	3.56	4.06	4.66	5.43	6.62	7.72
Aug	1.29	1.70	2.31	2.84	3.36	3.89	4.48	5.18	6.07	7.47	8.77
Sep	.91	1.29	1.89	2.43	2.97	3.55	4.19	4.97	5.98	7.60	9.13
Oct	.83	1.07	1.42	1.71	2.00	2.29	2.61	2.99	3.47	4.22	4.91
Nov	.39	.57	.87	1.14	1.42	1.72	2.05	2.46	3.00	3.87	4.69
Dec	.32	.42	.58	.72	.86	1.00	1.15	1.33	1.57	1.94	2.29
Ann	20.14	22.12	24.69	26.66	28.43	30.16	31.95	33.94	36.38	39.95	43.06

\+ 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	12.2	10.8	12	12	9.0	1980	7	26.3	1976	28	1979	24	23	1979	7.8	5.8	1.4	.4	.0	-9.9	-9.9	-9.9	-9.9
Feb	7.5	8.5	13	15	5.0	1991	24	16.3	1979	30	1971	12	27	1971	5.0	3.3	.9	.1	.0	-9.9	-9.9	-9.9	-9.9
Mar	9.1	7.8	8	3	10.0	1977	4	23.0	1989	31	1972	7	25	1971	4.3	3.1	1.0	.4	.1	-9.9	-9.9	-9.9	-9.9
Apr	3.2	2.6	2	#	8.0	1993	16	14.0	1993	20	1971	6	11	1979	2.0	1.2	.4	.1	.0	5.6	4.1	3.3	1.8
May	.4	.0	#	0	4.5	1979	6	4.5	1979	#+	1997	21	#+	1997	.2	.2	@	.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	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sep	.1	.0	0	0	2.0	1995	22	2.0	1995	0	0	0	0	0	@	@	.0	.0	.0	.0	.0	.0	.0
Oct	.6	.0	#	0	4.0	1979	23	4.0	1979	2	1972	23	#+	1996	.5	.4	.1	.0	.0	.1	.0	.0	.0
Nov	4.2	3.5	#	#	6.0	1994	28	11.0	1978	9	1978	29	3	1979	3.6	2.3	.3	.1	.0	3.0	.8	.4	.0
Dec	11.4	10.4	4	4	7.0	1996	24	26.0	1996	17	1978	31	13	1978	7.1	4.7	.8	.2	.0	-9.9	-9.9	-9.9	-9.9
Ann	48.7	43.6	N/A	N/A	10.0	Mar 1977	4	26.3	Jan 1976	31	Mar 1972	7	27	Feb 1971	30.5	21.0	4.9	1.3	.1	-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	6/28	6/21	6/16	6/12	6/08	6/04	5/31	5/26	5/19
32	6/11	6/05	6/02	5/29	5/26	5/23	5/20	5/16	5/10
28	5/30	5/23	5/19	5/15	5/11	5/08	5/04	4/29	4/23
24	5/16	5/11	5/07	5/04	5/01	4/28	4/25	4/21	4/15
20	4/29	4/24	4/21	4/18	4/15	4/13	4/10	4/06	4/01
16	4/22	4/18	4/14	4/12	4/09	4/06	4/03	3/31	3/26

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	8/15	8/22	8/27	9/01	9/05	9/09	9/14	9/19	9/26
32	8/31	9/06	9/11	9/14	9/18	9/21	9/25	9/30	10/06
28	9/13	9/20	9/25	9/29	10/03	10/07	10/11	10/16	10/23
24	9/29	10/05	10/10	10/14	10/18	10/21	10/25	10/30	11/06
20	10/08	10/15	10/20	10/24	10/28	11/01	11/05	11/10	11/16
16	10/27	11/01	11/04	11/07	11/09	11/12	11/15	11/18	11/23

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	124	112	103	95	88	81	74	65	52
32	142	133	126	120	114	109	103	96	86
28	174	164	156	150	144	138	131	124	113
24	198	188	181	175	169	163	157	150	140
20	220	211	205	200	195	190	185	178	170
16	233	227	222	218	214	210	206	201	194

***** 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)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	1765	1441	1258	793	419	162	64	121	328	677	1090	1563	9681
60	1610	1301	1103	644	291	79	13	48	202	525	940	1408	8164
57	1517	1217	1010	557	227	45	4	23	141	437	850	1315	7343
55	1455	1161	948	500	188	29	1	13	107	381	790	1253	6826
50	1300	1021	793	364	109	8	0	2	45	254	642	1098	5636
32	752	537	294	51	3	0	0	0	0	19	194	568	2418

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	10	20	59	249	625	867	1037	966	670	365	94	29	4991
55	0	0	0	7	97	206	324	266	86	14	0	0	1000
57	0	0	0	4	73	162	266	214	61	8	0	0	788
60	0	0	0	2	45	106	182	146	32	3	0	0	516
65	0	0	0	0	17	39	78	63	8	0	0	0	205
70	0	0	0	0	5	10	18	18	1	0	0	0	52

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	11	106	401	649	806	729	447	171	17	1	0	0	11	117	518	1167	1973	2702	3149	3320	3337	3338
45	0	0	1	54	268	499	651	574	302	86	6	0	0	0	1	55	323	822	1473	2047	2349	2435	2441	2441
50	0	0	0	23	161	354	496	419	184	37	0	0	0	0	0	23	184	538	1034	1453	1637	1674	1674	1674
55	0	0	0	11	83	222	342	274	97	11	0	0	0	0	0	11	94	316	658	932	1029	1040	1040	1040
60	0	0	0	1	36	117	195	145	42	1	0	0	0	0	0	1	37	154	349	494	536	537	537	537
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	10	85	258	396	507	457	265	104	12	0	0	0	10	95	353	749	1256	1713	1978	2082	2094	2094

(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

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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