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: GULL LAKE BIOL STA, MI **COOP ID: 203504**

Climate Division: MI 8 **NWS Call Sign:** **Elevation: 910 Feet** **Lat: 42˚24N** **Lon: 85˚23W**

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	31.5	15.8	23.7	66	1950	25	32.6	1990	-21	1951	30	11.9	1977	1281	0	.0	.0	1.1	17.0	29.2	3.7
Feb	35.9	17.4	26.7	70	1999	11	36.3	1998	-19	1996	3	14.8	1978	1074	0	.0	.0	2.4	11.6	25.3	3.0
Mar	47.4	26.1	36.8	79	2000	8	44.7	2000	-10	1967	1	28.8	1978	877	0	.0	.0	11.4	3.2	22.8	.5
Apr	60.7	36.3	48.5	85+	1958	18	54.3	1985	4	1982	7	42.2	1975	498	2	.0	.0	24.1	.1	10.6	.0
May	73.4	47.3	60.4	94	1998	16	67.0	1991	23	1966	10	52.8	1997	213	69	.0	.8	30.8	.0	1.5	.0
Jun	82.0	56.7	69.4	99+	1953	30	74.1	1987	34	1980	10	64.7	1992	36	166	.0	3.2	30.0	.0	.0	.0
Jul	85.5	61.4	73.5	103	1974	14	77.4	1999	40	2001	2	68.4	1992	4	266	.2	5.5	31.0	.0	.0	.0
Aug	82.9	60.1	71.5	100+	1964	2	77.2	1995	37	1964	14	66.0	1992	17	218	.1	2.6	31.0	.0	.0	.0
Sep	75.6	52.7	64.2	100+	1953	1	68.6	1998	29+	1951	29	58.5	1993	96	69	.0	1.0	30.0	.0	.2	.0
Oct	63.3	42.0	52.7	90	1963	6	60.6	1971	18	1976	27	47.2	1988	391	8	.0	.0	28.3	.0	4.8	.0
Nov	48.4	32.6	40.5	79	1950	1	46.7	1999	-7	1950	25	33.6	1995	736	0	.0	.0	13.1	1.5	16.2	.0
Dec	35.9	21.9	28.9	69	2001	5	37.5	1982	-15	1976	31	19.2	1989	1119	0	.0	.0	2.8	10.7	27.5	1.2
Ann	60.2	39.2	49.7	103	Jul 1974	14	77.4	Jul 1999	-21	Jan 1951	30	11.9	Jan 1977	6342	798	.3	13.1	236.0	44.1	138.1	8.4

\+ 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

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	2.12	2.08	3.70	1952	19	4.22	1998	.54	1981
Feb	1.74	1.45	2.10	1997	21	4.41	1997	.09	1987
Mar	2.64	2.35	2.32	1949	31	5.73	1991	.75	1996
Apr	3.82	3.69	2.91	1975	19	6.48	1975	1.14	1971
May	3.50	3.44	3.20	1989	31	9.14	2000	.86	1994
Jun	3.79	3.82	3.61	1978	26	9.28	1979	.27	1984
Jul	3.69	3.56	3.16	1994	5	7.27	1986	1.34	1975
Aug	3.92	3.66	2.63	1972	24	10.43	1975	.45	1976
Sep	4.24	4.53	3.95	1989	8	9.99	1986	.00	1979
Oct	3.10	2.86	2.05	1990	4	7.37	1991	.99	1975
Nov	3.32	2.99	2.35	1990	5	7.61	1990	.49	1986
Dec	2.93	2.82	1.80+	1967	21	5.84	1984	1.16+	1993
Ann	38.81	37.74	3.95	Sep 1989	8	10.43	Aug 1975	.00	Sep 1979

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	14.3	6.0	.9	.2
Feb	10.9	4.8	.7	.2
Mar	11.0	6.4	1.6	.3
Apr	12.8	8.5	2.3	.8
May	11.7	7.6	2.4	.5
Jun	10.5	7.3	2.7	1.0
Jul	9.6	6.4	2.7	.9
Aug	10.5	7.0	2.7	1.0
Sep	11.1	7.0	3.1	1.2
Oct	12.6	7.1	1.9	.6
Nov	12.6	7.5	1.8	.6
Dec	15.1	7.6	1.6	.5
Ann	142.7	83.2	24.4	7.8

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	.63	.83	1.13	1.39	1.65	1.91	2.20	2.54	2.98	3.67	4.31
Feb	.34	.50	.76	.99	1.23	1.48	1.77	2.11	2.57	3.31	4.00
Mar	.96	1.21	1.57	1.86	2.15	2.44	2.76	3.13	3.60	4.32	4.99
Apr	1.69	2.03	2.51	2.89	3.25	3.61	4.00	4.45	5.01	5.86	6.63
May	1.01	1.34	1.84	2.28	2.70	3.14	3.63	4.21	4.95	6.12	7.21
Jun	.98	1.34	1.89	2.38	2.86	3.36	3.92	4.58	5.45	6.81	8.09
Jul	1.31	1.65	2.16	2.58	2.98	3.40	3.85	4.38	5.05	6.09	7.04
Aug	1.03	1.40	1.97	2.47	2.96	3.48	4.05	4.73	5.62	7.02	8.33
Sep	1.04	1.64	2.34	2.89	3.40	3.93	4.49	5.16	6.00	7.31	8.51
Oct	1.13	1.42	1.84	2.19	2.53	2.87	3.24	3.67	4.22	5.06	5.84
Nov	.91	1.23	1.71	2.12	2.53	2.96	3.44	4.00	4.73	5.88	6.95
Dec	.93	1.21	1.62	1.97	2.31	2.67	3.05	3.51	4.09	5.01	5.85
Ann	31.08	32.64	34.61	36.07	37.36	38.59	39.85	41.22	42.87	45.22	47.23

\+ 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	17.0	15.6	6	5	18.0	1978	26	42.1	1978	37	1978	29	16	1977	10.7	6.0	1.8	.5	@	15.4	12.3	8.9	2.8
Feb	7.1	8.6	5	4	7.1	1990	15	18.5	1990	27	1978	1	20	1978	6.2	3.8	1.1	.3	.0	16.1	13.2	9.2	3.3
Mar	5.1	4.3	1	1	8.0	1973	17	14.5	1982	17	1982	4	9	1978	2.1	1.2	.7	.3	.0	4.0	2.4	.6	.0
Apr	1.6	.0	#	0	7.1	1982	6	10.1	1982	7	1982	6	1	1982	.7	.5	.2	.1	.0	.5	.3	.1	.0
May	#	.0	0	0	#	1980	8	#+	1980	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Jun	.0	.0	#	0	.0	0	0	.0	0	#	1994	13	#	1994	.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	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	.4	.0	#	0	4.0	1989	19	4.0	1989	3	1997	27	#+	1997	.2	.2	.1	.0	.0	.1	@	.0	.0
Nov	3.3	2.3	#	#	13.5	2000	21	13.5	2000	17	2000	21	2+	2000	2.0	1.3	.5	.2	@	1.6	.6	.3	.0
Dec	14.0	14.4	3	3	10.0	2000	17	21.4	1987	24	2000	30	14	2000	8.5	5.6	2.0	.8	@	15.4	11.2	6.2	1.6
Ann	48.5	45.2	N/A	N/A	18.0	Jan 1978	26	42.1	Jan 1978	37	Jan 1978	29	20	Feb 1978	30.4	18.6	6.4	2.2	@	53.1	40.0	25.3	7.7

+ 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	6/01	5/26	5/22	5/18	5/14	5/11	5/07	5/03	4/26
32	5/18	5/13	5/10	5/07	5/04	5/01	4/28	4/24	4/19
28	5/04	4/30	4/26	4/24	4/21	4/18	4/16	4/12	4/08
24	4/21	4/17	4/13	4/11	4/08	4/06	4/03	3/31	3/26
20	4/15	4/10	4/07	4/05	4/02	3/31	3/28	3/25	3/21
16	4/08	4/02	3/29	3/25	3/22	3/19	3/15	3/11	3/06

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	9/19	9/22	9/25	9/27	9/29	10/01	10/03	10/06	10/09
32	9/27	10/02	10/06	10/08	10/11	10/14	10/17	10/20	10/25
28	10/10	10/16	10/20	10/23	10/27	10/30	11/02	11/06	11/12
24	10/24	10/29	11/01	11/04	11/07	11/10	11/13	11/17	11/22
20	11/03	11/10	11/14	11/18	11/22	11/26	11/30	12/05	12/11
16	11/14	11/20	11/24	11/28	12/01	12/05	12/08	12/12	12/18

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	156	149	145	141	137	133	130	125	118
32	181	174	168	164	160	156	151	146	139
28	213	205	198	193	188	183	177	171	162
24	233	226	221	216	212	208	204	199	192
20	260	250	244	238	233	228	222	216	206
16	276	268	263	258	253	249	244	238	231

***** 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	1281	1074	877	498	213	36	4	17	96	391	736	1119	6342
60	1126	934	722	355	124	10	0	2	35	258	586	964	5116
57	1033	850	629	277	83	4	0	0	16	191	497	871	4451
55	971	794	569	229	61	2	0	0	8	151	440	809	4034
50	816	657	426	129	25	0	0	0	1	76	304	660	3094
32	317	236	77	2	0	0	0	0	0	0	27	214	873

Base — Cooling Degree Days (1)

Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	59	86	224	496	879	1121	1285	1225	963	640	282	118	7378
55	0	0	2	34	227	432	572	512	282	78	4	0	2143
57	0	0	0	22	187	374	510	450	229	55	2	0	1829
60	0	0	0	10	135	290	417	359	158	30	0	0	1399
65	0	0	0	2	69	166	266	218	69	8	0	0	798
70	0	0	0	0	28	76	133	109	20	1	0	0	367

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	4	14	84	275	617	871	1031	974	716	398	121	17	4	18	102	377	994	1865	2896	3870	4586	4984	5105	5122
45	0	3	45	166	466	721	876	819	567	261	58	5	0	3	48	214	680	1401	2277	3096	3663	3924	3982	3987
50	0	0	21	88	323	571	721	664	418	156	23	1	0	0	21	109	432	1003	1724	2388	2806	2962	2985	2986
55	0	0	4	39	201	423	566	509	284	74	6	0	0	0	4	43	244	667	1233	1742	2026	2100	2106	2106
60	0	0	1	16	108	282	411	354	168	29	0	0	0	0	1	17	125	407	818	1172	1340	1369	1369	1369
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	8	59	172	389	577	697	659	452	228	58	5	0	8	67	239	628	1205	1902	2561	3013	3241	3299	3304

(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