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: MUSKEGON COUNTY AP, MI **COOP ID: 205712**

Climate Division: MI 5 **NWS Call Sign: MKG** **Elevation: 625 Feet** **Lat: 43˚10N** **Lon: 86˚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	29.8	17.1	23.5	63	1950	25	31.7	1990	-13	1948	23	14.3	1977	1288	0	.0	.0	.4	18.1	28.9	1.6
Feb	32.5	18.3	25.4	67	1999	11	35.0	1998	-19	1996	4	14.6	1979	1124	0	.0	.0	1.1	14.3	25.7	1.7
Mar	42.5	25.4	34.0	80	1981	31	41.4	1973	-6+	1978	2	27.5	1984	968	0	.0	.0	7.5	5.7	23.5	.3
Apr	54.6	35.1	44.9	86	1970	29	50.2+	1985	1	1982	7	40.0	1982	602	4	.0	.0	20.1	.4	11.0	.0
May	67.0	45.1	56.1	93	1962	29	62.8	1977	23	1966	10	48.9	1997	296	24	.0	.0	30.1	.0	1.6	.0
Jun	75.6	54.2	64.9	98	1995	20	69.8	1995	31	1972	11	59.4	1982	78	86	.0	.6	30.0	.0	.1	.0
Jul	80.0	59.8	69.9	96+	1988	6	74.0	1983	39	2001	2	65.2	1996	15	181	.0	.9	31.0	.0	.0	.0
Aug	78.1	58.8	68.5	99	1964	3	74.1	1995	36	1979	16	63.8	1992	27	145	.0	.6	31.0	.0	.0	.0
Sep	70.3	50.7	60.5	95+	1953	1	64.1	1971	27+	1989	27	56.4	1975	168	44	.0	.1	29.9	.0	.5	.0
Oct	58.7	40.6	49.7	83+	1951	4	57.4	1971	21+	1960	25	44.2	1988	476	3	.0	.0	26.4	.0	5.5	.0
Nov	45.6	31.8	38.7	76	1961	2	45.7	1975	-14	1950	25	32.1	1995	784	0	.0	.0	9.4	2.3	16.3	.0
Dec	34.6	22.6	28.6	64	1982	2	35.6	1982	-15	1976	31	20.2	1989	1117	0	.0	.0	1.6	12.0	26.3	.5
Ann	55.8	38.3	47.1	99	Aug 1964	3	74.1	Aug 1995	-19	Feb 1996	4	14.3	Jan 1977	6943	487	.0	2.2	218.5	52.8	139.4	4.1

+ 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	2.22	2.28	1.56	1960	12	4.66	1982	.77	1981
Feb	1.58	1.32	1.44	1997	21	3.30	1997	.36	1982
Mar	2.36	2.03	4.00	2000	25	6.59	1976	.37	1999
Apr	2.91	2.99	2.66	2001	11	5.00	2000	.72	1989
May	2.95	2.57	2.15	1955	23	7.45	2000	.33	1992
Jun	2.58	2.59	2.52	1996	17	4.99	1994	.47	1988
Jul	2.32	2.28	2.54	1959	18	3.87	1993	1.03	1998
Aug	3.77	3.13	3.45	1993	30	9.88	1975	.95	1976
Sep	3.52	3.28	4.33	1986	11	13.55	1986	.17	1979
Oct	2.80	2.46	3.21	1954	3	7.33	1991	.71	1971
Nov	3.23	3.02	2.12	1990	5	6.61	1985	.62	1986
Dec	2.64	2.55	2.58	1982	2	5.34	1971	.80	2000
Ann	32.88	32.99	4.33	Sep 1986	11	13.55	Sep 1986	.17	Sep 1979

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	17.4	6.8	.7	.2
Feb	13.2	4.8	.6	.1
Mar	12.6	6.2	1.1	.3
Apr	12.5	6.9	1.7	.4
May	10.3	5.7	2.0	.7
Jun	9.4	5.4	1.6	.5
Jul	9.3	5.1	1.5	.3
Aug	9.5	6.3	2.5	.8
Sep	10.2	6.6	2.4	.7
Oct	11.3	6.3	1.8	.4
Nov	14.4	7.6	2.0	.5
Dec	15.9	7.1	1.1	.3
Ann	146.0	74.8	19.0	5.2

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	.89	1.10	1.38	1.62	1.85	2.07	2.32	2.60	2.96	3.51	4.02
Feb	.51	.66	.88	1.07	1.25	1.44	1.65	1.89	2.20	2.68	3.13
Mar	.67	.89	1.23	1.52	1.81	2.11	2.45	2.84	3.35	4.15	4.89
Apr	1.30	1.56	1.92	2.21	2.48	2.75	3.05	3.38	3.81	4.45	5.03
May	.68	.95	1.38	1.77	2.16	2.57	3.03	3.57	4.29	5.44	6.52
Jun	.69	.93	1.30	1.63	1.95	2.29	2.67	3.11	3.69	4.60	5.46
Jul	1.13	1.33	1.60	1.82	2.02	2.22	2.44	2.68	2.99	3.45	3.87
Aug	1.00	1.36	1.91	2.39	2.86	3.35	3.90	4.55	5.40	6.74	7.99
Sep	.61	.92	1.43	1.91	2.41	2.94	3.55	4.29	5.28	6.87	8.40
Oct	.87	1.13	1.53	1.87	2.20	2.54	2.92	3.36	3.93	4.82	5.64
Nov	.95	1.26	1.72	2.12	2.51	2.91	3.35	3.87	4.55	5.61	6.59
Dec	.91	1.16	1.52	1.83	2.13	2.43	2.76	3.14	3.64	4.40	5.11
Ann	25.44	26.93	28.80	30.21	31.45	32.64	33.86	35.20	36.80	39.11	41.09

\+ 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	29.9	26.7	8	5	22.0	1982	10	61.1	1978	33	1979	16	22	1979	17.2	9.7	3.2	1.3	.2	25.6	20.6	16.9	9.0
Feb	14.5	13.7	7	5	13.6	1981	10	26.7+	1989	31	1978	3	21	1985	12.2	5.2	1.7	.6	.1	21.2	17.1	12.9	7.6
Mar	11.3	9.8	2	2	19.8	1976	2	29.0	1971	16+	1978	2	10	1978	7.7	3.4	1.1	.4	@	11.4	7.4	4.1	1.3
Apr	3.1	1.7	#	0	12.0	1982	5	20.4	1982	13	1982	6	2	1982	2.2	.8	.3	.2	@	1.3	.7	.4	.1
May	#	.0	#	0	#	1994	1	#+	1994	#	1976	3	#	1997	.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	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	.6	.0	#	0	4.6	1972	18	4.6	1972	1+	1989	20	#	1989	.4	.1	.1	.0	.0	.1	.0	.0	.0
Nov	8.4	6.9	#	0	8.6	1971	29	25.7	1995	8	2000	21	2	1995	5.8	2.5	1.0	.2	.0	4.1	2.0	.7	.0
Dec	21.0	22.2	3	2	14.4	1985	26	36.9	1976	24	1985	27	9	1983	11.9	7.1	3.0	.7	.2	18.6	11.9	7.4	2.2
Ann	88.8	81.0	N/A	N/A	22.0	Jan 1982	10	61.1	Jan 1978	33	Jan 1979	16	22	Jan 1979	57.4	28.8	10.4	3.4	.5	82.3	59.7	42.4	20.2

+ 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	6/06	5/31	5/26	5/22	5/18	5/14	5/10	5/06	4/29
32	5/26	5/19	5/14	5/10	5/06	5/02	4/27	4/22	4/15
28	5/08	5/04	4/30	4/27	4/24	4/21	4/18	4/15	4/10
24	4/20	4/17	4/14	4/12	4/10	4/08	4/06	4/03	3/31
20	4/16	4/12	4/08	4/05	4/02	3/30	3/27	3/24	3/19
16	4/02	3/29	3/27	3/24	3/22	3/20	3/17	3/14	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	9/10	9/15	9/18	9/21	9/24	9/27	9/30	10/04	10/09
32	9/26	9/30	10/03	10/06	10/09	10/12	10/14	10/18	10/22
28	10/03	10/10	10/14	10/18	10/22	10/25	10/29	11/03	11/09
24	10/21	10/27	10/31	11/04	11/07	11/10	11/14	11/18	11/24
20	11/15	11/19	11/23	11/26	11/28	12/01	12/04	12/07	12/12
16	11/19	11/25	11/30	12/03	12/07	12/10	12/14	12/18	12/24

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	144	138	133	128	124	119	113	104
32	182	173	166	161	156	150	145	139	130
28	203	195	189	184	180	175	170	164	156
24	232	225	219	215	210	206	201	196	188
20	261	253	248	244	239	235	230	225	218
16	278	271	267	263	259	256	252	247	241

***** 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	1288	1124	968	602	296	78	15	27	168	476	784	1117	6943
60	1133	969	808	457	201	32	1	9	64	333	640	973	5620
57	1040	885	715	371	147	15	0	2	32	254	550	880	4891
55	978	829	653	316	116	8	0	0	18	207	491	818	4434
50	823	689	499	193	56	2	0	0	3	111	347	663	3386
32	309	250	95	3	0	0	0	0	0	1	29	197	884

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	24	40	154	399	754	997	1187	1142	866	555	231	59	6408
55	0	0	4	24	126	312	474	429	207	43	4	0	1623
57	0	0	2	17	96	258	412	368	164	29	2	0	1348
60	0	0	1	10	61	184	321	278	109	15	0	0	979
65	0	0	0	4	24	86	181	145	44	3	0	0	487
70	0	0	0	1	5	27	73	53	12	0	0	0	171

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	1	7	59	207	517	767	951	905	637	326	86	13	1	8	67	274	791	1558	2509	3414	4051	4377	4463	4476
45	0	2	27	115	370	617	796	750	487	196	41	3	0	2	29	144	514	1131	1927	2677	3164	3360	3401	3404
50	0	0	10	58	235	468	641	595	341	104	15	0	0	0	10	68	303	771	1412	2007	2348	2452	2467	2467
55	0	0	2	25	133	322	486	441	216	48	3	0	0	0	2	27	160	482	968	1409	1625	1673	1676	1676
60	0	0	0	9	63	189	332	287	116	17	0	0	0	0	0	9	72	261	593	880	996	1013	1013	1013
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	1	33	117	302	482	637	595	383	165	39	1	0	1	34	151	453	935	1572	2167	2550	2715	2754	2755

(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