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: MONTAGUE 4 NW, MI **COOP ID: 205567**

Climate Division: MI 5 **NWS Call Sign:** **Elevation: 650 Feet** **Lat: 43˚28N** **Lon: 86˚25W**

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	29.3	16.6	23.0	59+	1996	18	30.3	1990	-35	1951	31	14.0	1977	1305	0	.0	.0	.4	18.5	29.7	2.4
Feb	32.0	17.7	24.9	65	2000	26	34.6	1998	-27	1996	4	15.4	1978	1124	0	.0	.0	.9	13.7	26.1	2.4
Mar	41.9	24.6	33.3	78	1981	31	42.1	1973	-17	1978	2	26.4	1978	984	0	.0	.0	7.6	5.2	25.2	.8
Apr	54.4	33.4	43.9	84	1970	29	48.8	1985	0	1982	8	37.9	1975	634	0	.0	.0	20.3	.2	14.8	@
May	66.5	43.0	54.8	88+	1972	22	61.3	1982	18	1986	3	48.2	1997	339	21	.0	.0	30.3	.0	5.1	.0
Jun	74.8	52.3	63.6	98	1957	17	67.8	1987	27	1994	2	58.4	1982	107	64	.0	.3	30.0	.0	.3	.0
Jul	79.1	57.9	68.5	96	1955	27	72.7	1983	37+	1950	14	63.3	1996	28	136	.0	.5	31.0	.0	.0	.0
Aug	77.2	57.2	67.2	97+	1964	3	73.2	1995	32+	1965	29	62.6	1992	52	121	.0	.3	31.0	.0	@	.0
Sep	69.7	50.4	60.1	93	1953	1	63.7	1971	24	1989	27	55.8	1975	167	18	.0	.1	30.0	.0	1.2	.0
Oct	58.5	40.8	49.7	85	1971	2	58.0	1971	17	1976	27	44.5	1988	477	1	.0	.0	26.6	.0	7.0	.0
Nov	45.1	32.0	38.6	74	1950	1	42.8	1975	-14	1950	25	32.6	1995	794	0	.0	.0	9.8	2.1	17.5	.0
Dec	34.0	22.3	28.2	64+	1982	2	36.0	1982	-15	2000	28	19.3	1989	1143	0	.0	.0	1.3	11.7	27.5	.5
Ann	55.2	37.4	46.3	98	Jun 1957	17	73.2	Aug 1995	-35	Jan 1951	31	14.0	Jan 1977	7154	361	.0	1.2	219.2	51.4	154.4	6.1

\+ 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: 1950-2001

(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	1.73	1.44	1.53	1995	14	3.30+	1995	.11	1981
Feb	1.06	.88	1.64	1994	20	2.76	1997	.00+	1987
Mar	2.33	2.26	2.44	1976	5	7.46	1976	.15	1994
Apr	3.14	2.98	2.50	1982	16	5.92	1993	.96	1989
May	2.72	2.46	3.10	1956	6	6.34	2000	.37	1992
Jun	2.81	2.73	2.01	1975	15	6.80	1975	.44	1988
Jul	2.72	2.52	2.55	1958	28	6.14	1991	.52	1979
Aug	4.14	3.48	4.37	1978	19	9.01	1975	1.34	1971
Sep	3.44	3.11	5.54	1986	11	11.84	1986	.03	1979
Oct	3.28	3.02	2.79	1981	1	9.60	1991	.53	1971
Nov	3.15	3.03	2.06	1992	2	7.09	1985	.47	1986
Dec	1.66	1.37	1.78	1982	2	4.82	1982	.45	1976
Ann	32.18	32.30	5.54	Sep 1986	11	11.84	Sep 1986	.00+	Feb 1987

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	10.5	4.1	.7	.1
Feb	7.3	3.2	.4	.1
Mar	8.8	5.9	1.4	.3
Apr	9.8	6.7	2.2	.7
May	9.3	6.2	1.8	.6
Jun	8.9	5.9	2.1	.5
Jul	8.2	5.1	1.8	.7
Aug	9.2	6.6	2.7	.9
Sep	10.2	6.6	2.1	.5
Oct	10.3	6.9	2.2	.7
Nov	10.9	7.3	1.9	.6
Dec	10.3	5.1	.8	.1
Ann	113.7	69.6	20.1	5.8

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	.33	.48	.74	.97	1.21	1.47	1.76	2.11	2.58	3.33	4.05
Feb	.00	.10	.29	.45	.63	.82	1.05	1.32	1.70	2.31	2.91
Mar	.38	.59	.92	1.24	1.57	1.93	2.34	2.84	3.51	4.59	5.62
Apr	1.24	1.53	1.94	2.28	2.60	2.93	3.28	3.69	4.21	5.01	5.74
May	.63	.88	1.28	1.63	1.99	2.37	2.79	3.29	3.96	5.01	6.01
Jun	.84	1.10	1.50	1.85	2.19	2.53	2.92	3.37	3.96	4.88	5.73
Jul	.79	1.05	1.43	1.77	2.10	2.44	2.82	3.27	3.84	4.75	5.59
Aug	1.40	1.79	2.37	2.85	3.32	3.80	4.32	4.93	5.71	6.93	8.04
Sep	.48	.76	1.26	1.73	2.23	2.78	3.42	4.20	5.25	6.97	8.63
Oct	.90	1.21	1.68	2.10	2.50	2.92	3.39	3.95	4.67	5.80	6.86
Nov	.87	1.16	1.62	2.02	2.41	2.81	3.27	3.80	4.49	5.59	6.60
Dec	.44	.60	.84	1.05	1.26	1.47	1.71	2.00	2.37	2.95	3.49
Ann	24.84	26.30	28.15	29.54	30.76	31.93	33.14	34.45	36.04	38.32	40.27

\+ 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: 1950-2001
(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	12.4	11.4	8	6	14.7	1978	26	25.0	1971	31	1982	18	20	1979	8.4	5.8	1.3	.3	.1	-9.9	-9.9	-9.9	-9.9
Feb	8.5	7.9	9	5	7.9	1985	12	27.1	1985	31	1978	9	28	1978	5.3	3.4	.9	.2	.0	-9.9	-9.9	-9.9	-9.9
Mar	4.5	3.0	3	2	9.2	1983	21	15.6	1998	29	1978	5	14	1978	1.9	1.5	.6	.2	.0	4.2	3.0	2.3	.2
Apr	1.6	#	#	#	4.3	1975	3	7.5	1973	7	1982	6	1	1982	.8	.7	.3	.0	.0	.4	.4	.1	.0
May	#	.0	#	0	#	1997	15	#+	1997	#	1997	15	#	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	.2	.0	#	0	2.5	1989	19	2.5	1989	3	1989	19	#+	2000	.1	.1	.0	.0	.0	@	@	.0	.0
Nov	4.0	3.6	#	#	6.5	1981	20	12.2	1995	7	1981	20	3	1995	2.2	1.8	.2	.1	.0	3.2	1.4	.3	.0
Dec	14.7	12.6	3	2	14.1	1977	10	40.1	1977	22	2000	29	12	2000	6.9	5.0	1.2	.4	@	12.7	5.9	3.0	.1
Ann	45.9	38.5	N/A	N/A	14.7	Jan 1978	26	40.1	Dec 1977	31+	Jan 1982	18	28	Feb 1978	25.6	18.3	4.5	1.2	.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	6/21	6/16	6/12	6/09	6/06	6/03	5/31	5/27	5/22
32	6/10	6/04	5/30	5/26	5/23	5/19	5/15	5/11	5/04
28	5/28	5/22	5/18	5/14	5/11	5/07	5/04	4/29	4/23
24	5/10	5/05	5/01	4/28	4/25	4/22	4/18	4/15	4/09
20	4/29	4/24	4/20	4/17	4/14	4/11	4/08	4/04	3/30
16	4/17	4/12	4/08	4/05	4/03	3/31	3/28	3/24	3/19

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	8/25	9/01	9/05	9/09	9/13	9/16	9/20	9/25	10/01
32	9/09	9/15	9/20	9/24	9/27	10/01	10/05	10/09	10/16
28	9/26	10/01	10/05	10/08	10/11	10/14	10/17	10/21	10/26
24	10/12	10/18	10/22	10/25	10/29	11/01	11/04	11/08	11/14
20	11/02	11/07	11/11	11/14	11/17	11/20	11/23	11/27	12/03
16	11/20	11/25	11/28	12/01	12/04	12/06	12/09	12/12	12/17

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	122	114	108	103	98	93	88	82	74
32	153	144	138	132	127	122	116	110	101
28	177	169	163	157	153	148	142	136	128
24	211	203	197	191	186	181	176	170	161
20	238	230	225	221	216	212	208	203	195
16	266	259	253	249	244	240	235	230	222

***** 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	1305	1124	984	634	339	107	28	52	167	477	794	1143	7154
60	1150	984	829	485	219	42	5	13	69	331	644	988	5759
57	1057	900	736	399	161	20	0	4	34	252	554	895	5012
55	995	844	674	343	127	12	0	1	19	204	494	833	4546
50	840	704	523	217	62	2	0	0	3	108	348	678	3485
32	317	254	111	7	0	0	0	0	0	0	25	206	920

Base — Cooling Degree Days (1)

Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	35	53	150	363	705	947	1131	1091	841	547	221	86	6170
55	0	0	0	9	119	268	418	379	170	38	0	0	1401
57	0	0	0	5	91	217	356	320	125	24	0	0	1138
60	0	0	0	2	56	149	268	236	70	10	0	0	791
65	0	0	0	0	21	64	136	121	18	1	0	0	361
70	0	0	0	0	6	17	50	46	2	0	0	0	121

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	4	54	185	467	712	888	850	605	315	82	7	1	5	59	244	711	1423	2311	3161	3766	4081	4163	4170
45	0	1	23	105	323	563	733	695	456	192	34	2	0	1	24	129	452	1015	1748	2443	2899	3091	3125	3127
50	0	0	10	46	199	415	578	540	318	101	14	0	0	0	10	56	255	670	1248	1788	2106	2207	2221	2221
55	0	0	0	21	108	277	423	386	195	44	1	0	0	0	0	21	129	406	829	1215	1410	1454	1455	1455
60	0	0	0	8	50	156	274	240	100	14	0	0	0	0	0	8	58	214	488	728	828	842	842	842
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	2	34	120	295	452	589	555	372	168	38	1	0	2	36	156	451	903	1492	2047	2419	2587	2625	2626

(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