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: EAST TAWAS, MI **COOP ID: 202423**

Climate Division: MI 4 **NWS Call Sign:** **Elevation: 586 Feet** **Lat: 44˚17N** **Lon: 83˚30W**

Temperature (˚F)

Month	Mean (1) Daily Max	Mean (1) Daily Min	Mean (1) Mean	Extremes Highest Daily(2)	Year	Day	Highest Month(1) Mean	Year	Lowest Daily(2)	Year	Day	Lowest Month(1) Mean	Year	Degree Days (1) Base Temp 65 Heating	Cooling	Mean Number of Days (3) Max >= 100	Max >= 90	Max >= 50	Max <= 32	Min <= 32	Min <= 0
Jan	28.8	13.2	21.0	52+	1950	4	29.4	1990	-25	1951	30	12.1	1994	1364	0	.0	.0	.1	19.6	30.2	6.9
Feb	31.0	13.9	22.5	59	2000	27	31.4	1998	-26	1979	17	11.9	1978	1190	0	.0	.0	.5	15.3	27.3	6.1
Mar	40.1	22.7	31.4	75	2000	8	39.8	2000	-19	1962	2	24.5	1972	1042	0	.0	.0	4.9	6.1	27.0	1.5
Apr	52.2	33.6	42.9	91	1990	26	47.5	1986	6	1965	3	36.7	1972	664	0	.0	@	16.5	.5	15.3	.0
May	65.8	43.5	54.7	95	1969	28	60.9	1998	20	1958	7	48.5	1997	338	16	.0	.2	29.6	.0	3.1	.0
Jun	74.7	52.5	63.6	101	1995	20	67.8	1995	28+	1957	8	58.1	1982	110	68	@	1.1	29.9	.0	.2	.0
Jul	79.9	57.8	68.9	102	1995	15	72.9	1999	35	1972	5	63.4	1992	23	141	.1	2.0	31.0	.0	.0	.0
Aug	77.4	57.2	67.3	103	1948	25	72.2	1995	31	1982	29	63.1	1971	50	121	.0	.7	31.0	.0	@	.0
Sep	70.2	49.9	60.1	100	1953	1	64.0	1998	21	1957	28	56.1	1975	165	16	.0	.2	30.0	.0	1.0	.0
Oct	57.8	40.0	48.9	88	1963	6	54.9	1971	12	1969	23	44.6	1980	499	0	.0	.0	25.7	.0	9.4	.0
Nov	44.6	31.1	37.9	78	1950	1	43.6	1975	-1	1950	24	32.0	1995	814	0	.0	.0	8.4	2.2	20.0	.0
Dec	33.7	20.3	27.0	65	1982	4	34.9	1982	-19	1985	25	15.9	1989	1179	0	.0	.0	1.4	12.4	28.7	1.9
Ann	54.7	36.3	45.5	103	Aug 1948	25	72.9	Jul 1999	-26	Feb 1979	17	11.9	Feb 1978	7438	362	.1	4.2	209.0	56.1	162.2	16.4

\+ 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	1.98	1.71	1.60	1978	26	4.09	1999	.45	1977
Feb	1.36	1.41	1.21	1950	15	2.73	1997	.26	1995
Mar	2.14	1.91	1.52	1961	9	4.28	1998	.60	1981
Apr	2.65	2.43	3.52	1991	9	7.77	1991	1.11	1987
May	2.82	2.48	2.47	1959	20	6.59	1983	.40	1988
Jun	3.22	3.09	3.64	1969	26	6.82	1981	.98	1991
Jul	2.84	2.72	3.48	1964	8	5.62	1988	.63	1989
Aug	3.50	3.68	2.53	1955	30	6.56	1977	.65	1998
Sep	3.59	3.37	2.42	1985	6	10.10	1986	.00	1979
Oct	2.51	2.32	3.06	1991	5	6.34	1990	.44	1975
Nov	2.48	2.23	1.52	1948	20	5.93	1992	.44	1976
Dec	2.06	1.96	1.88	1959	28	5.88	1971	.35	1997
Ann	31.15	30.22	3.64	Jun 1969	26	10.10	Sep 1986	.00	Sep 1979

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	10.3	5.0	1.0	.3
Feb	8.6	4.2	.6	.1
Mar	9.3	5.2	1.4	.2
Apr	9.5	6.3	1.7	.4
May	9.9	6.3	1.5	.5
Jun	10.3	6.3	2.0	.5
Jul	9.1	5.7	1.8	.5
Aug	10.1	6.7	2.2	.8
Sep	10.7	6.5	2.2	.8
Oct	10.1	5.5	1.5	.4
Nov	10.5	6.3	1.4	.4
Dec	10.3	5.6	.9	.2
Ann	118.7	69.6	18.2	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	.64	.83	1.10	1.34	1.57	1.80	2.06	2.36	2.75	3.35	3.91
Feb	.47	.60	.79	.95	1.10	1.25	1.42	1.62	1.87	2.26	2.62
Mar	.68	.88	1.18	1.44	1.69	1.95	2.23	2.56	2.99	3.65	4.27
Apr	1.05	1.30	1.64	1.93	2.20	2.47	2.77	3.11	3.55	4.22	4.82
May	.93	1.20	1.60	1.93	2.25	2.58	2.94	3.37	3.91	4.76	5.53
Jun	1.16	1.46	1.90	2.26	2.61	2.97	3.36	3.82	4.40	5.29	6.11
Jul	1.03	1.30	1.68	2.01	2.31	2.63	2.97	3.37	3.88	4.66	5.38
Aug	1.04	1.37	1.87	2.30	2.72	3.16	3.64	4.21	4.94	6.09	7.15
Sep	.75	1.25	1.85	2.33	2.79	3.26	3.78	4.38	5.16	6.38	7.50
Oct	.69	.93	1.29	1.61	1.92	2.24	2.60	3.03	3.58	4.45	5.27
Nov	.62	.85	1.21	1.53	1.85	2.18	2.56	3.00	3.58	4.49	5.34
Dec	.48	.67	.97	1.24	1.51	1.79	2.11	2.49	3.00	3.79	4.54
Ann	25.18	26.39	27.92	29.05	30.04	30.99	31.96	33.02	34.29	36.10	37.64

\+ 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)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	16.5	13.4	7	6
Feb	12.8	11.7	8	6
Mar	10.3	9.1	5	3
Apr	2.6	1.2	#	#
May	.1	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	#	.0	0	0
Oct	.1	.0	#	0
Nov	3.6	1.3	#	#
Dec	8.9	8.0	3	1
Ann	54.9	44.7	N/A	N/A

Extremes (2)

Month	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year
Jan	14.0	1979	14	38.0	1979	35	1979	20	24	1979
Feb	9.5	1994	23	26.2	1974	27	1979	21	25	1979
Mar	11.6	1986	6	27.3	1972	22	1979	1	13	1971
Apr	7.0	1996	4	11.0	1996	12	1971	1	3	1971
May	2.0	1984	14	2.0	1984	2	1984	14	#+	1996
Jun	.0	0	0	.0	0	0	0	0	0	0
Jul	.0	0	0	.0	0	0	0	0	0	0
Aug	.0	0	0	.0	0	0	0	0	0	0
Sep	#	1995	22	#	1995	0	0	0	0	0
Oct	2.0	1997	27	2.0	1997	2	1997	27	#+	1997
Nov	9.5	1995	28	24.4	1995	14	1995	28	3	1995
Dec	9.0	1971	31	20.7	1985	16	2000	26	11	1995
Ann	14.0	Jan 1979	14	38.0	Jan 1979	35	Jan 1979	20	25	Feb 1979

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	8.0	4.9	1.8	.8	.1
Feb	6.5	3.8	1.5	.5	.0
Mar	4.3	2.8	1.2	.6	.1
Apr	1.0	.8	.3	.1	.0
May	.1	.1	.0	.0	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.0	.0	.0	.0	.0
Oct	.1	@	.0	.0	.0
Nov	1.9	1.0	.4	.2	.0
Dec	6.6	3.4	1.6	.4	.0
Ann	28.5	16.8	6.8	2.6	.2

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	26.3	21.2	16.8	6.6
Feb	25.4	21.1	15.6	7.3
Mar	16.8	13.9	9.7	2.9
Apr	1.7	1.1	.6	.0
May	@	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.1	.0	.0	.0
Nov	2.5	1.0	.3	.1
Dec	12.5	6.8	4.3	2.1
Ann	85.3	65.1	47.3	19.0

+ 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	6/20	6/14	6/10	6/07	6/03	5/31	5/27	5/23	5/17
32	6/02	5/27	5/23	5/19	5/16	5/13	5/10	5/05	4/30
28	5/15	5/10	5/06	5/03	4/30	4/26	4/23	4/19	4/14
24	4/26	4/23	4/20	4/18	4/16	4/14	4/11	4/09	4/05
20	4/14	4/10	4/08	4/06	4/04	4/01	3/30	3/28	3/24
16	4/09	4/05	4/02	3/30	3/28	3/25	3/22	3/19	3/15

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	9/02	9/08	9/11	9/15	9/18	9/21	9/24	9/28	10/03
32	9/15	9/20	9/23	9/26	9/29	10/02	10/05	10/09	10/13
28	9/30	10/05	10/09	10/12	10/15	10/18	10/21	10/25	10/30
24	10/11	10/17	10/21	10/25	10/28	11/01	11/04	11/09	11/15
20	10/26	11/01	11/06	11/09	11/13	11/16	11/20	11/24	12/01
16	11/02	11/09	11/14	11/18	11/22	11/26	11/30	12/05	12/12

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	128	121	115	110	106	101	97	91	84
32	153	147	142	139	135	132	128	124	117
28	190	183	177	172	168	164	159	153	146
24	215	208	203	199	195	191	187	182	175
20	241	235	230	226	223	219	215	210	204
16	267	257	250	244	239	233	227	220	211

***** 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	1364	1190	1042	664	338	110	23	50	165	499	814	1179	7438
60	1209	1050	887	514	214	45	3	11	66	350	664	1024	6037
57	1116	966	794	426	154	22	0	4	31	267	574	931	5285
55	1054	910	732	369	119	13	0	0	17	217	514	869	4814
50	899	770	577	237	54	3	0	0	2	115	366	714	3737
32	370	306	136	7	0	0	0	0	0	0	32	246	1097

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	28	40	118	333	701	948	1141	1094	841	525	208	90	6067
55	0	0	0	5	107	271	428	381	168	29	0	0	1389
57	0	0	0	2	80	220	366	323	122	17	0	0	1130
60	0	0	0	1	47	153	276	237	67	6	0	0	787
65	0	0	0	0	16	68	141	121	16	0	0	0	362
70	0	0	0	0	4	20	52	45	2	0	0	0	123

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	25	140	446	691	885	831	580	263	61	5	0	0	25	165	611	1302	2187	3018	3598	3861	3922	3927
45	0	0	8	70	302	541	730	676	432	147	22	1	0	0	8	78	380	921	1651	2327	2759	2906	2928	2929
50	0	0	2	30	177	392	575	521	293	70	4	0	0	0	2	32	209	601	1176	1697	1990	2060	2064	2064
55	0	0	0	12	95	255	420	367	173	26	0	0	0	0	0	12	107	362	782	1149	1322	1348	1348	1348
60	0	0	0	1	44	140	273	222	85	6	0	0	0	0	0	1	45	185	458	680	765	771	771	771
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	17	85	266	430	575	532	346	148	26	1	0	0	17	102	368	798	1373	1905	2251	2399	2425	2426

(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