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: CHARLOTTE, MI **COOP ID: 201476**

Climate Division: MI 9 **NWS Call Sign:** **Elevation: 902 Feet** **Lat: 42˚33N** **Lon: 84˚50W**

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	28.9	15.0	22.0	64+	1950	25	32.3	1990	-25	1976	18	10.4	1977	1334	0	.0	.0	1.1	18.7	29.8	5.4
Feb	32.3	16.1	24.2	70	1999	12	33.5	1998	-27	1967	12	11.8	1978	1143	0	.0	.0	1.8	14.3	26.6	4.8
Mar	42.8	25.3	34.1	80	1963	29	42.7	1973	-17	1967	1	26.4	1978	960	0	.0	.0	9.0	5.5	25.2	.8
Apr	55.5	35.8	45.7	88	1980	23	51.5	1985	3	1982	7	40.5	1975	581	0	.0	.0	20.9	.4	13.6	.0
May	68.0	46.3	57.2	92+	1962	18	63.8	1991	18	1966	10	49.3	1997	280	37	.0	.3	30.2	.0	2.4	.0
Jun	77.0	55.7	66.4	101	1953	20	70.7	1971	30+	1966	1	62.3	1977	60	100	.0	1.4	30.0	.0	.1	.0
Jul	80.7	59.7	70.2	100+	1988	7	74.1	1988	39+	1963	9	66.4	1992	12	172	.1	3.6	31.0	.0	.0	.0
Aug	78.4	57.9	68.2	102	1964	2	74.1	1995	33+	1976	30	63.1	1976	48	147	@	1.7	31.0	.0	.0	.0
Sep	71.2	50.2	60.7	100	1953	2	65.3	1971	24	1976	24	56.7	1993	156	28	.0	.5	29.9	.0	.8	.0
Oct	59.3	39.5	49.4	90+	1953	3	57.6	1971	14	1960	25	42.5	1976	487	3	.0	.0	26.2	@	9.6	.0
Nov	45.4	30.6	38.0	79	1950	1	43.6	1975	-9	1956	23	29.3	1976	810	0	.0	.0	11.0	2.8	20.5	.0
Dec	33.6	21.0	27.3	69	2001	6	35.6	1982	-21	1962	12	16.3	2000	1170	0	.0	.0	2.5	12.4	28.5	2.4
Ann	56.1	37.8	47.0	102	Aug 1964	2	74.1+	Aug 1995	-27	Feb 1967	12	10.4	Jan 1977	7041	487	.1	7.5	224.6	54.1	157.1	13.4

\+ 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	1.68	1.42	1.80	1985	1	3.68	1998	.41	1984
Feb	1.35	1.04	1.55	2001	24	2.89	1990	.08	1987
Mar	2.39	1.92	2.31	1954	25	5.14	1974	.63	1987
Apr	3.23	3.22	4.69	1975	19	7.77	1975	.78	1982
May	3.16	3.25	2.64	1963	10	7.12	2000	.84	1977
Jun	3.47	3.40	2.92	1973	28	6.34	1986	.17	1988
Jul	3.14	3.33	2.68	1959	23	5.21	1992	.60	1996
Aug	3.71	3.25	3.18	1980	3	8.37	1975	1.34	1984
Sep	3.75	3.49	3.25	1950	11	7.63	1988	.00	1979
Oct	2.76	2.76	2.31	1985	19	6.78	1991	.67	1982
Nov	2.81	2.66	2.26	1990	28	6.31	1990	.83	1986
Dec	2.38	2.55	1.82	1949	21	4.20	1971	.67	1993
Ann	33.83	33.12	4.69	Apr 1975	19	8.37	Aug 1975	.00	Sep 1979

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	13.4	4.8	.7	.2
Feb	10.3	4.0	.5	.1
Mar	11.6	6.0	1.2	.2
Apr	13.1	7.5	1.7	.4
May	11.5	6.2	2.0	.5
Jun	10.7	6.5	2.2	.6
Jul	10.5	6.7	2.3	.6
Aug	10.6	6.7	2.5	.9
Sep	10.6	6.4	2.8	.9
Oct	12.2	6.3	1.6	.6
Nov	12.9	6.6	1.8	.4
Dec	14.4	6.1	1.3	.3
Ann	141.8	73.8	20.6	5.7

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	.40	.55	.80	1.02	1.24	1.47	1.73	2.04	2.44	3.08	3.69
Feb	.28	.40	.60	.78	.96	1.16	1.37	1.64	1.99	2.54	3.07
Mar	.69	.92	1.26	1.56	1.85	2.15	2.48	2.87	3.38	4.18	4.91
Apr	1.10	1.40	1.85	2.23	2.59	2.96	3.37	3.84	4.45	5.39	6.26
May	1.09	1.39	1.82	2.19	2.54	2.91	3.30	3.76	4.36	5.27	6.11
Jun	.99	1.32	1.82	2.25	2.67	3.11	3.60	4.18	4.93	6.10	7.19
Jul	1.15	1.44	1.87	2.22	2.56	2.91	3.28	3.72	4.28	5.14	5.93
Aug	1.34	1.69	2.20	2.62	3.02	3.43	3.88	4.40	5.07	6.10	7.04
Sep	.88	1.41	2.03	2.52	2.98	3.45	3.97	4.56	5.33	6.52	7.61
Oct	.92	1.18	1.56	1.88	2.20	2.52	2.87	3.29	3.82	4.64	5.40
Nov	.96	1.23	1.61	1.94	2.26	2.58	2.93	3.34	3.87	4.68	5.43
Dec	.78	1.00	1.33	1.62	1.89	2.17	2.48	2.84	3.30	4.02	4.68
Ann	27.13	28.49	30.19	31.46	32.58	33.64	34.73	35.92	37.34	39.38	41.12

\+ 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	12.2	10.3	4	3
Feb	8.7	6.2	4	3
Mar	6.5	4.1	1	1
Apr	2.0	.6	#	#
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	.4	.0	#	0
Nov	3.6	2.9	#	#
Dec	10.6	8.6	2	1
Ann	44.0	32.7	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	13.0	1978	26	34.9	1978	25	1978	27	11	1979
Feb	8.5	1990	15	24.5	1985	20	1978	5	17	1978
Mar	13.0	1973	17	15.5	1982	18	1978	9	10	1978
Apr	8.5	1975	3	11.1	1975	8	1982	6	1	1982
May	#	1974	8	#+	1974	0	0	0	0	0
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	.0	0	0	.0	0	0	0	0	0	0
Oct	5.0	1997	27	5.0	1997	5	1997	27	#+	1997
Nov	6.0	1975	27	11.3	1972	6	1975	27	1	1995
Dec	14.0	2000	12	21.0	1978	28	2000	31	16	2000
Ann	14.0	Dec 2000	12	34.9	Jan 1978	28	Dec 2000	31	17	Feb 1978

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	9.5	5.0	1.1	.3	@
Feb	6.6	3.5	.9	.2	.0
Mar	4.1	2.3	.8	.2	@
Apr	1.3	.6	.2	.1	.0
May	.0	.0	.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	.3	.1	.1	@	.0
Nov	2.7	1.3	.3	.1	.0
Dec	8.2	4.5	1.2	.4	@
Ann	32.7	17.3	4.6	1.3	@

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	20.9	16.3	11.4	3.6
Feb	17.0	12.5	9.1	4.4
Mar	7.8	4.0	2.5	.9
Apr	1.1	.5	.2	.0
May	.0	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.2	.1	@	.0
Nov	3.0	1.1	.2	.0
Dec	15.4	8.6	3.0	.4
Ann	65.4	43.1	26.4	9.3

+ 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	6/13	6/06	6/01	5/28	5/24	5/20	5/15	5/10	5/03
32	5/30	5/23	5/18	5/14	5/10	5/06	5/01	4/26	4/20
28	5/12	5/07	5/04	5/01	4/28	4/25	4/22	4/19	4/14
24	4/29	4/24	4/20	4/17	4/14	4/11	4/07	4/03	3/29
20	4/18	4/13	4/10	4/07	4/04	4/01	3/29	3/26	3/21
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	9/03	9/09	9/13	9/16	9/20	9/23	9/26	9/30	10/06
32	9/21	9/25	9/28	10/01	10/03	10/05	10/08	10/11	10/15
28	10/03	10/08	10/12	10/15	10/18	10/21	10/24	10/28	11/02
24	10/11	10/18	10/23	10/27	10/31	11/04	11/08	11/13	11/20
20	10/25	11/01	11/06	11/10	11/14	11/18	11/23	11/28	12/05
16	10/31	11/08	11/14	11/20	11/25	11/30	12/05	12/11	12/20

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	143	134	128	123	118	114	108	102	94
32	168	160	155	150	146	141	137	131	124
28	196	188	182	177	172	168	163	157	148
24	230	220	212	205	199	193	187	179	169
20	251	242	235	229	224	218	212	205	196
16	272	262	254	248	241	235	229	221	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	1334	1143	960	581	280	60	12	48	156	487	810	1170	7041
60	1179	1003	805	434	174	18	0	13	66	343	660	1015	5710
57	1086	919	712	350	124	8	0	5	33	266	571	922	4996
55	1024	863	650	297	95	4	0	1	20	220	512	860	4546
50	869	723	503	180	43	1	0	0	4	125	371	710	3529
32	359	279	109	4	0	0	0	0	0	3	47	251	1052

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	48	60	172	414	780	1031	1184	1122	862	542	227	104	6546
55	0	0	0	16	163	345	471	410	192	46	2	0	1645
57	0	0	0	9	129	288	409	351	145	30	1	0	1362
60	0	0	0	4	87	209	316	266	88	15	0	0	985
65	0	0	0	0	37	100	172	147	28	3	0	0	487
70	0	0	0	0	13	32	69	65	4	0	0	0	183

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	8	66	221	537	791	933	877	621	311	88	17	1	9	75	296	833	1624	2557	3434	4055	4366	4454	4471
45	0	2	34	129	387	641	778	722	473	190	45	4	0	2	36	165	552	1193	1971	2693	3166	3356	3401	3405
50	0	0	14	68	253	492	623	567	330	102	16	1	0	0	14	82	335	827	1450	2017	2347	2449	2465	2466
55	0	0	5	38	149	346	468	413	208	48	4	0	0	0	5	43	192	538	1006	1419	1627	1675	1679	1679
60	0	0	0	12	77	218	315	264	112	15	0	0	0	0	0	12	89	307	622	886	998	1013	1013	1013
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	3	51	144	332	508	617	573	390	188	54	4	0	3	54	198	530	1038	1655	2228	2618	2806	2860	2864

(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