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: MC LEOD 3 E, ND **COOP ID: 325754**

Climate Division: ND 9 **NWS Call Sign:** **Elevation: 1,075 Feet** **Lat: 46˚24N** **Lon: 97˚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	16.0	-5.5	5.3	55	1987	12	20.5	1990	-40	1972	15	-9.8	1982	1854	0	.0	.0	.1	24.9	31.0	17.7
Feb	23.3	1.9	12.6	66	1958	25	25.8	1987	-41+	1996	2	-3.4	1979	1468	0	.0	.0	1.0	17.8	27.8	11.0
Mar	35.9	16.0	26.0	80	1963	31	36.5	2000	-27	1962	1	17.2	1975	1212	0	.0	.0	5.3	8.3	27.8	3.5
Apr	54.7	30.7	42.7	99	1980	21	50.5	1987	-7	1975	1	33.6	1975	670	1	.0	.2	21.6	.7	16.3	.1
May	69.7	44.6	57.2	99	1969	27	64.9	1977	19+	1961	1	50.3	1979	276	33	.0	1.0	30.4	.0	3.5	.0
Jun	78.1	54.0	66.1	100+	1968	3	73.7	1988	31	1969	20	60.2	1982	80	112	.0	3.2	30.0	.0	@	.0
Jul	83.0	58.7	70.9	108	1948	8	75.0	1975	37	1967	3	64.4	1992	23	205	.5	6.8	31.0	.0	.0	.0
Aug	82.0	56.5	69.3	106	1976	18	74.2	1983	33+	1968	14	63.4	1977	42	173	.5	5.7	31.0	.0	.0	.0
Sep	71.0	45.6	58.3	102	1983	2	64.5	1978	16	1965	26	53.1	1985	228	27	@	1.8	29.6	.0	2.2	.0
Oct	57.4	32.6	45.0	97	1963	5	50.2	1973	6+	1976	27	40.7	1976	620	0	.0	.1	24.6	.3	12.7	.0
Nov	36.0	16.6	26.3	78	1978	2	36.6	1999	-28	1985	29	14.7	1985	1162	0	.0	.0	5.7	10.7	27.7	2.1
Dec	21.5	1.9	11.7	57+	1999	29	22.4	1979	-36+	1990	26	-3.7	1983	1653	0	.0	.0	.6	22.2	30.9	12.2
Ann	52.4	29.5	41.0	108	Jul 1948	8	75.0	Jul 1975	-41+	Feb 1996	2	-9.8	Jan 1982	9288	551	1.0	18.8	210.9	84.9	179.9	46.6

+ 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	.65	.60	1.77	1997	4	2.61	1997	.05	1990
Feb	.51	.34	.94	1959	14	1.75	2000	.09	1985
Mar	1.01	.85	1.19	2000	9	2.17	1995	.21	1974
Apr	1.30	.97	2.65	1957	19	7.67	1986	.04	1987
May	2.63	2.48	2.30	1998	12	5.95	1972	.26	1990
Jun	3.39	2.78	4.05	1998	27	9.61	1975	.42	1974
Jul	3.54	3.44	3.45	1974	3	7.63	1995	.57	1985
Aug	2.32	2.02	3.93	1959	25	5.12	1974	.53	1976
Sep	2.05	1.65	3.54	1971	4	5.23	1999	.21	1974
Oct	1.78	1.44	2.66	1984	14	6.52	1984	.00+	1999
Nov	.94	.73	1.44	1977	9	4.13	1977	.00+	1999
Dec	.42	.36	1.01	1949	7	1.24	1996	.00+	1989
Ann	20.54	20.18	4.05	Jun 1998	27	9.61	Jun 1975	.00+	Nov 1999

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	4.6	2.0	.2	@
Feb	3.8	1.8	.1	.0
Mar	4.4	2.8	.5	.1
Apr	5.2	3.3	.7	.3
May	7.3	5.3	1.8	.6
Jun	8.5	5.6	2.4	.8
Jul	7.9	5.5	2.3	1.0
Aug	6.3	4.5	1.6	.4
Sep	5.7	3.6	1.4	.4
Oct	5.6	3.3	1.3	.5
Nov	4.1	2.3	.6	.2
Dec	3.6	1.5	.1	.0
Ann	67.0	41.5	13.0	4.3

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	.07	.12	.21	.30	.40	.51	.64	.80	1.01	1.37	1.71
Feb	.05	.09	.16	.23	.30	.39	.49	.62	.79	1.08	1.36
Mar	.23	.32	.47	.60	.73	.88	1.03	1.22	1.47	1.87	2.25
Apr	.08	.16	.32	.49	.69	.93	1.21	1.57	2.08	2.93	3.79
May	.55	.79	1.18	1.53	1.88	2.26	2.68	3.19	3.87	4.95	5.96
Jun	.59	.89	1.38	1.84	2.32	2.83	3.42	4.14	5.09	6.62	8.09
Jul	.81	1.14	1.66	2.12	2.59	3.08	3.63	4.29	5.16	6.54	7.84
Aug	.61	.83	1.16	1.46	1.75	2.06	2.40	2.80	3.33	4.15	4.93
Sep	.32	.49	.79	1.07	1.37	1.69	2.05	2.50	3.11	4.09	5.03
Oct	.00	.05	.24	.48	.77	1.13	1.57	2.14	2.96	4.38	5.82
Nov	.00	.00	.12	.28	.46	.65	.88	1.17	1.58	2.24	2.90
Dec	.00	.03	.10	.17	.24	.31	.40	.52	.67	.93	1.18
Ann	11.99	13.52	15.55	17.13	18.57	19.98	21.47	23.13	25.19	28.24	30.92

\+ 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	7.4	6.7	8	5	10.5	1996	17	18.5	1971	48	1997	12	41	1997	2.9	1.9	.9	.3	.1	27.1	21.2	15.8	2.0
Feb	5.3	4.4	7	4	6.0	1979	15	19.7	1979	36	1997	1	25	1997	2.5	1.4	.5	.2	.0	22.2	15.6	12.4	5.8
Mar	4.6	3.5	4	2	8.0	1975	23	17.0	1975	25	1979	5	14	1993	1.4	1.1	.4	.1	.0	9.1	5.9	4.6	1.8
Apr	1.4	.0	#	#	4.0	1990	28	6.5	1992	9	1975	1	2	1975	.6	.5	.2	.0	.0	1.3	.6	.2	.0
May	#	.0	#	0	#	1990	1	#+	1990	#+	1990	1	#+	1990	.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	#	1995	21	#+	1995	#	1995	21	#	1995	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	.5	.0	#	0	2.0	1971	30	3.0	1971	2	1992	18	#+	1997	.3	.3	.0	.0	.0	.4	.0	.0	.0
Nov	4.7	3.3	2	1	14.0	1996	17	22.7	1977	25	1993	27	11	1996	2.0	1.5	.5	.3	.1	7.2	3.7	2.0	1.1
Dec	5.4	2.7	4	2	9.0	1992	30	27.0	1996	33	1996	20	27	1996	2.6	1.8	.6	.3	.0	17.5	9.6	6.3	2.4
Ann	29.3	20.6	N/A	N/A	14.0	Nov 1996	17	27.0	Dec 1996	48	Jan 1997	12	41	Jan 1997	12.3	8.5	3.1	1.2	.2	84.8	56.6	41.3	13.1

+ Also occurred on an earlier date(s) #Denotes trace amounts

(1) Derived from Snow Climatology and 1971-2000 daily data

@ Denotes mean number of days greater than 0 but less than .05

(2) Derived from 1971-2000 daily data

-9/-9.9 represents missing values

Annual statistics for Mean/Median snow depths are not appropriate

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

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	9/05	9/08	9/11	9/13	9/15	9/17	9/19	9/21	9/25
32	9/14	9/17	9/20	9/22	9/24	9/26	9/28	10/01	10/05
28	9/19	9/23	9/26	9/28	10/01	10/03	10/06	10/08	10/13
24	9/27	10/02	10/06	10/09	10/12	10/15	10/18	10/22	10/27
20	10/05	10/11	10/15	10/19	10/23	10/26	10/30	11/03	11/09
16	10/20	10/24	10/28	10/31	11/02	11/05	11/08	11/11	11/16

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	137	130	124	119	115	111	106	100	93
32	156	149	145	140	137	133	129	124	117
28	173	166	161	156	152	147	143	138	130
24	199	190	185	180	175	170	165	159	151
20	220	212	206	201	196	192	187	181	173
16	238	231	225	221	217	212	208	203	195

***** 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	1854	1468	1212	670	276	80	23	42	228	620	1162	1653	9288
60	1699	1328	1057	525	170	29	5	12	123	466	1012	1498	7924
57	1606	1244	964	442	119	14	0	4	76	376	922	1405	7172
55	1544	1188	902	390	91	7	0	2	52	318	862	1343	6699
50	1389	1048	750	271	41	1	0	0	15	191	712	1188	5606
32	852	588	291	32	0	0	0	0	0	8	262	667	2700

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	21	44	102	354	779	1021	1205	1155	789	410	90	38	6008
55	0	0	0	21	157	339	492	443	151	7	0	0	1610
57	0	0	0	14	123	285	430	384	115	3	0	0	1354
60	0	0	0	7	81	210	342	299	72	1	0	0	1012
65	0	0	0	1	33	112	205	173	27	0	0	0	551
70	0	0	0	0	10	45	104	84	7	0	0	0	250

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	21	202	577	814	988	932	593	258	26	0	0	0	21	223	800	1614	2602	3534	4127	4385	4411	4411
45	0	0	3	116	428	664	833	777	449	152	10	0	0	0	3	119	547	1211	2044	2821	3270	3422	3432	3432
50	0	0	1	59	291	514	678	622	309	80	1	0	0	0	1	60	351	865	1543	2165	2474	2554	2555	2555
55	0	0	0	27	179	370	523	467	191	32	0	0	0	0	0	27	206	576	1099	1566	1757	1789	1789	1789
60	0	0	0	10	91	230	369	315	103	10	0	0	0	0	0	10	101	331	700	1015	1118	1128	1128	1128
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	17	150	371	524	648	609	375	173	21	0	0	0	17	167	538	1062	1710	2319	2694	2867	2888	2888

(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