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: SAINT PAUL 4 N, NE **COOP ID: 257515**

Climate Division: NE 5 **NWS Call Sign:** **Elevation: 1,775 Feet** **Lat: 41˚16N** **Lon: 98˚28W**

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	33.9	13.0	23.5	74	1981	24	34.3	1992	-33	1963	27	8.1	1979	1288	0	.0	.0	3.9	13.7	30.7	6.2
Feb	40.0	18.1	29.1	79	1995	25	38.4	1992	-27	1994	9	13.1	1979	1006	0	.0	.0	8.4	9.3	26.1	3.5
Mar	50.6	27.5	39.1	89	1986	30	44.5	2000	-17	1960	4	32.6	1996	805	0	.0	.0	15.9	2.9	22.4	.6
Apr	63.1	38.1	50.6	95	1989	27	56.7	1981	6	1975	3	43.4	1983	436	4	.0	.4	25.5	.1	8.2	.0
May	72.6	49.6	61.1	100+	1989	30	66.7	1977	21	1967	4	56.2	1995	182	60	@	.8	30.9	.0	.6	.0
Jun	82.5	59.3	70.9	107	1988	22	76.4	1988	35	1950	4	64.8	1982	24	200	.3	5.8	30.0	.0	.0	.0
Jul	86.5	64.0	75.3	111	1954	11	79.3	1974	42	1971	30	70.0	1992	2	319	.9	11.1	31.0	.0	.0	.0
Aug	84.9	62.3	73.6	105+	1983	16	80.3	1983	37	1950	20	68.1	1974	15	282	.3	8.5	31.0	.0	.0	.0
Sep	77.2	52.3	64.8	103	1990	1	72.4	1998	22	1984	29	60.2	1974	102	93	.1	4.1	29.8	.0	.8	.0
Oct	65.2	40.2	52.7	93+	1990	6	55.8	1975	11	1997	27	47.7	1976	385	3	.0	.1	27.9	.1	7.5	.0
Nov	47.2	27.0	37.1	80	1980	6	45.6	1999	-11	1964	30	26.5	1985	837	0	.0	.0	13.3	4.0	23.4	.5
Dec	36.3	17.0	26.7	73+	1970	8	33.5	1979	-29+	1989	23	8.2	1983	1188	0	.0	.0	4.9	11.0	30.3	3.4
Ann	61.7	39.0	50.4	111	Jul 1954	11	80.3	Aug 1983	-33	Jan 1963	27	8.1	Jan 1979	6270	961	1.6	30.8	252.5	41.1	150.0	14.2

\+ 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	.42	.40	.95	1993	21	1.40	1993	.00	1986
Feb	.59	.45	1.73	1971	19	2.03	1971	.03	1996
Mar	1.97	1.75	2.80	1979	22	6.63	1987	.00	1994
Apr	2.53	2.29	2.43	1984	20	7.65	1984	.13	1989
May	4.15	4.04	4.62	1951	31	9.28	1982	.89	1975
Jun	3.72	3.48	4.25	1954	17	7.53	1990	.20	1981
Jul	3.24	2.42	4.85	1950	8	13.54	1993	.62	1980
Aug	2.66	2.07	3.30	1992	5	7.87	1977	.50	1976
Sep	2.42	1.48	2.30	1973	28	7.47	1985	.00	1984
Oct	1.53	1.37	2.64	1968	15	4.27	1984	.02	1988
Nov	1.26	1.02	3.07	1996	16	4.76	1996	.00	1989
Dec	.54	.46	.83	1952	19	1.30	1973	.02	1980
Ann	25.03	24.39	4.85	Jul 1950	8	13.54	Jul 1993	.00+	Mar 1994

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	3.2	1.4	.1	.0
Feb	2.9	1.8	.2	@
Mar	5.1	3.9	1.2	.5
Apr	7.0	4.6	1.7	.6
May	9.3	6.9	2.7	1.4
Jun	7.6	5.9	2.5	1.1
Jul	8.1	5.9	2.0	1.0
Aug	7.0	4.8	1.9	.7
Sep	5.3	3.8	1.7	.6
Oct	4.8	3.3	1.0	.3
Nov	3.8	2.5	.9	.2
Dec	2.9	1.4	.3	.0
Ann	67.0	46.2	16.2	6.4

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	.03	.07	.14	.20	.27	.34	.42	.52	.66	.88	1.10
Feb	.04	.08	.16	.24	.33	.43	.56	.71	.94	1.31	1.68
Mar	.07	.22	.50	.79	1.10	1.46	1.88	2.42	3.15	4.38	5.59
Apr	.37	.58	.95	1.30	1.66	2.06	2.52	3.08	3.84	5.08	6.26
May	1.53	1.92	2.48	2.95	3.39	3.84	4.34	4.91	5.64	6.76	7.79
Jun	.76	1.09	1.64	2.14	2.65	3.19	3.80	4.53	5.50	7.06	8.53
Jul	.64	.94	1.41	1.85	2.29	2.77	3.30	3.95	4.80	6.18	7.48
Aug	.52	.76	1.15	1.50	1.87	2.26	2.70	3.23	3.94	5.07	6.15
Sep	.12	.34	.70	1.06	1.44	1.86	2.36	2.98	3.82	5.21	6.57
Oct	.12	.22	.42	.63	.86	1.13	1.45	1.86	2.42	3.36	4.29
Nov	.03	.10	.26	.44	.64	.87	1.16	1.53	2.04	2.92	3.79
Dec	.05	.08	.16	.23	.31	.41	.52	.65	.85	1.16	1.48
Ann	16.13	17.78	19.94	21.60	23.10	24.55	26.07	27.76	29.83	32.86	35.51

\+ 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	2.7	2.3	1	1	10.0	1993	10	10.0	1993	16	1993	21	10	1974	1.7	1.4	.4	.2	.1	7.1	2.6	.2	.0
Feb	3.9	3.5	1	#	12.0	1984	16	12.0	1984	13	1978	15	9	1978	1.5	1.4	.6	.2	.1	5.6	2.2	.9	.0
Mar	3.2	3.0	1	#	7.0	1982	3	13.5	1984	10	1978	7	3	1978	1.2	1.2	.4	.2	.0	1.3	.6	.1	.0
Apr	1.0	.0	#	0	4.0	1984	1	8.0	1997	5	1997	12	1	1997	.4	.4	.1	.0	.0	.5	.2	.1	.0
May	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.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	.1	.0	0	0	2.0	1985	29	2.0	1985	0	0	0	0	0	@	@	.0	.0	.0	.0	.0	.0	.0
Oct	.5	.0	#	0	6.0	1980	27	6.0	1980	3	1997	26	#+	1997	.2	.1	.1	@	.0	.1	.1	.0	.0
Nov	3.3	2.0	#	#	14.0	1983	27	14.0	1983	10	1975	30	3	2000	1.2	1.1	.3	.2	@	3.1	2.2	.9	.0
Dec	4.6	3.0	1	#	10.0	1974	15	15.2	1973	14	1973	31	5	1975	1.9	1.6	.6	.3	@	7.8	3.4	1.3	.5
Ann	19.3	13.8	N/A	N/A	14.0	Nov 1983	27	15.2	Dec 1973	16	Jan 1993	21	10	Jan 1974	8.1	7.2	2.5	1.1	.2	25.5	11.3	3.5	.5

+ 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	5/16	5/12	5/09	5/07	5/05	5/02	4/30	4/27	4/23
32	5/12	5/07	5/04	5/01	4/28	4/25	4/22	4/19	4/14
28	4/28	4/24	4/20	4/17	4/15	4/12	4/09	4/06	4/01
24	4/19	4/14	4/10	4/07	4/04	4/01	3/29	3/25	3/20
20	4/10	4/05	4/02	3/29	3/26	3/23	3/20	3/17	3/11
16	4/02	3/27	3/23	3/19	3/16	3/12	3/09	3/05	2/27

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

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	162	156	151	147	144	140	136	132	125
32	179	172	167	162	158	153	149	143	136
28	202	195	191	186	183	179	175	170	163
24	226	218	211	206	201	196	191	184	176
20	247	239	233	227	222	218	212	206	198
16	273	262	255	249	243	237	231	223	213

***** 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	1006	805	436	182	24	2	15	102	385	837	1188	6270
60	1133	871	650	298	96	5	0	3	40	244	687	1033	5060
57	1040	793	559	224	59	2	0	1	19	173	598	940	4408
55	979	740	501	181	41	1	0	0	11	132	541	878	4005
50	827	612	360	92	13	0	0	0	1	58	404	735	3102
32	348	249	55	0	0	0	0	0	0	0	78	285	1015

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	83	168	273	558	901	1166	1340	1290	982	642	231	119	7753
55	1	15	7	48	229	477	627	577	303	60	4	0	2348
57	0	11	2	32	185	418	565	516	251	40	1	0	2021
60	0	5	0	15	129	331	472	425	182	18	0	0	1577
65	0	0	0	4	60	200	319	282	93	3	0	0	961
70	0	0	0	0	21	99	181	162	38	0	0	0	501

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	2	34	119	343	662	936	1101	1042	744	397	83	7	2	36	155	498	1160	2096	3197	4239	4983	5380	5463	5470
45	0	10	60	220	508	786	946	887	595	265	34	0	0	10	70	290	798	1584	2530	3417	4012	4277	4311	4311
50	0	1	26	128	357	636	791	732	450	152	9	0	0	1	27	155	512	1148	1939	2671	3121	3273	3282	3282
55	0	0	5	62	230	486	636	577	315	71	2	0	0	0	5	67	297	783	1419	1996	2311	2382	2384	2384
60	0	0	0	29	120	338	482	425	197	25	0	0	0	0	0	29	149	487	969	1394	1591	1616	1616	1616
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	13	39	99	223	402	612	741	698	475	260	66	13	13	52	151	374	776	1388	2129	2827	3302	3562	3628	3641

(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

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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