

Climatology of the United States

No. 20

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: SANTIAGO 3 E, MN

1971-2000

COOP ID: 217502

Climate Division: MN 5

NWS Call Sign:

Elevation: 1,020 Feet Lat: 45° 33N

Lon: 93° 46W

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	21.9	.3	11.1	55	1981	24	24.7	1990	-41	1994	19	-.8	1977	1671	0	.0	.0	.1	24.4	31.0	16.0
Feb	29.6	7.5	18.6	59	2000	29	31.1	1998	-39	1996	2	8.6	1972	1299	0	.0	.0	.9	15.9	27.7	10.3
Mar	41.0	19.9	30.5	80	1968	30	39.1	2000	-34	1962	1	20.6	1975	1071	0	.0	.0	6.4	6.8	27.5	3.1
Apr	58.3	32.8	45.6	96	1980	21	53.6	1987	-2	1975	1	37.7	1975	587	3	.0	@	22.3	.4	15.9	.1
May	72.2	45.1	58.7	95+	1987	16	66.1	1988	16	1967	3	52.6	1983	246	50	.0	.7	30.7	.0	3.8	.0
Jun	79.8	53.5	66.7	104	1988	25	73.8	1988	31	1989	15	61.7	1982	67	116	.1	2.9	30.0	.0	.2	.0
Jul	84.0	58.2	71.1	105+	1988	15	77.6	1988	37	1969	1	64.3	1992	24	212	.4	5.5	31.0	.0	.0	.0
Aug	81.3	56.0	68.7	101	1989	4	75.2	1983	34	1967	19	64.2	1992	38	151	.1	3.6	31.0	.0	.0	.0
Sep	72.2	46.8	59.5	97	1978	7	64.6	1998	18	1974	22	54.0	1993	188	23	.0	.6	29.7	.0	2.8	.0
Oct	59.8	35.7	47.8	90	1992	2	53.4	1973	5	1976	27	42.7	1976	535	0	.0	@	25.5	.1	13.9	.0
Nov	39.8	21.9	30.9	75	1999	8	39.7	1999	-24	1964	30	23.3	1996	1023	0	.0	.0	6.1	8.8	26.5	1.7
Dec	26.2	7.4	16.8	62	1998	1	26.2	1997	-41	1983	19	2.9	1983	1495	0	.0	.0	.3	22.1	30.8	10.9
Ann	55.5	32.1	43.8	105+	Jul 1988	15	77.6	Jul 1988	-41+	Jan 1994	19	-.8	Jan 1977	8244	555	.6	13.3	214.0	78.5	180.1	42.1

+ 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/normal/usnormals.html

Issue Date: February 2004

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1959-2001

(3) Derived from 1971-2000 serially complete daily data

092-A

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No. 20
1971-2000**

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Station: SANTIAGO 3 E, MN

COOP ID: 217502

Climate Division: MN 5

NWS Call Sign:

Elevation: 1,020 Feet Lat: 45°33N

Lon: 93°46W

Precipitation (inches)																								
	Precipitation Totals									Mean Number of Days (3)				Precipitation Probabilities (1) Probability that the monthly/annual precipitation will be equal to or less than the indicated amount										
	Means/ Medians(1)		Extremes							Daily Precipitation				Monthly/Annual Precipitation vs Probability Levels These values were determined from the incomplete gamma distribution										
Month	Mean	Med-ian	Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year	>= 0.01	>= 0.10	>= 0.50	>= 1.00	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
Jan	1.11	1.07	1.10	1997	4	3.42	1975	.00	1990	5.0	3.0	.7	.2	.10	.22	.41	.57	.74	.92	1.12	1.38	1.71	2.26	2.78
Feb	.86	.81	1.10	1977	23	2.38	1979	.06	1997	3.8	2.4	.5	@	.06	.11	.22	.34	.47	.62	.81	1.04	1.37	1.93	2.48
Mar	1.71	1.41	1.50	1989	4	4.29	1977	.09	1987	5.6	4.0	1.2	.2	.37	.53	.78	1.01	1.23	1.48	1.75	2.07	2.50	3.18	3.82
Apr	2.37	2.25	2.18	1969	27	5.87	1986	.00	1987	6.3	5.1	1.8	.4	.30	.60	1.00	1.34	1.68	2.04	2.44	2.92	3.56	4.58	5.55
May	3.22	3.20	2.65	1973	24	7.42	1991	.90	1994	8.5	6.7	2.5	.6	1.10	1.40	1.85	2.22	2.58	2.95	3.36	3.83	4.44	5.38	6.24
Jun	4.44	3.92	3.58	1983	21	9.94	1990	.14	1988	9.5	7.5	3.0	1.2	1.16	1.58	2.22	2.79	3.35	3.93	4.58	5.35	6.36	7.95	9.43
Jul	4.15	3.49	3.74	1997	22	11.93	1972	1.45	1980	8.8	6.6	2.9	1.2	1.34	1.74	2.32	2.81	3.29	3.78	4.32	4.96	5.77	7.03	8.20
Aug	4.59	4.53	3.65	1977	31	9.46	1989	1.03	1976	8.8	6.9	3.1	1.3	1.70	2.13	2.75	3.26	3.75	4.26	4.80	5.44	6.24	7.49	8.63
Sep	2.87	2.27	3.20	1985	9	8.87	1985	.39	1976	7.8	5.7	2.0	.6	.55	.80	1.23	1.61	2.01	2.43	2.91	3.49	4.26	5.50	6.68
Oct	2.48	1.85	3.30	1973	10	6.84	1984	.19	1976	5.8	4.6	1.7	.6	.30	.50	.85	1.20	1.56	1.97	2.45	3.03	3.83	5.14	6.41
Nov	1.86	1.79	2.00	1996	16	6.23	1996	.07	1980	4.9	4.0	1.4	.5	.14	.27	.51	.76	1.05	1.37	1.76	2.26	2.94	4.09	5.22
Dec	.89	.86	1.40+	1984	16	2.37	1982	.03	1980	4.4	2.8	.4	.1	.07	.13	.25	.37	.51	.66	.85	1.08	1.41	1.95	2.48
Ann	30.55	32.44	3.74	Jul 1997	22	11.93	Jul 1972	.00+	Jan 1990	79.2	59.3	21.2	6.9	19.30	21.38	24.10	26.19	28.08	29.93	31.85	34.00	36.63	40.50	43.88

+ 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: 1959-2001

(3) Derived from 1971-2000 serially complete daily data

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

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Station: SANTIAGO 3 E, MN

COOP ID: 217502

Climate Division: MN 5

NWS Call Sign:

Elevation: 1,020 Feet

Lat: 45°33N

Lon: 93°46W

Snow (inches)																							
Snow Totals															Mean Number of Days (1)								
Means/Medians (1)					Extremes (2)										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	11.9	11.0	12	10	12.0	1982	23	40.0	1982	38	1982	25	25	1984	4.5	4.3	2.1	.8	.1	28.0	27.2	24.6	15.9
Feb	7.1	5.0	13	11	8.0	1991	24	20.5	1979	37+	1979	21	33	1975	3.0	2.8	1.3	.4	.0	26.1	25.6	24.1	15.6
Mar	8.7	8.0	7	6	12.0	1985	4	21.0	1989	38	1979	4	21	1979	2.7	2.7	1.4	.6	.1	16.9	13.8	11.7	7.9
Apr	2.1	.0	#	#	7.0	1994	29	12.0	1983	12	1975	4	6	1975	.8	.8	.4	.1	.0	1.6	1.1	.5	.3
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	#	.0	0	0	#	1972	29	#	1972	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	.2	.0	#	0	3.0	1991	31	3.0	1991	3	1991	31	#+	1991	.1	.1	@	.0	.0	@	@	.0	.0
Nov	7.6	5.0	2	1	12.0	1983	23	26.0	1983	22	1983	30	7	1991	2.5	2.5	1.1	.5	.1	6.8	4.7	3.1	.7
Dec	8.6	7.3	6	5	17.0	1982	28	23.0	1982	33	1983	23	27	1983	4.0	3.7	1.1	.4	@	24.1	19.2	12.8	6.4
Ann	46.2	36.3	N/A	N/A	17.0	Dec 1982	28	40.0	Jan 1982	38+	Jan 1982	25	33	Feb 1975	17.6	16.9	7.4	2.8	.3	103.5	91.6	76.8	46.8

+ 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

Complete documentation available from:

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No. 20 1971-2000

Station: SANTIAGO 3 E, MN

COOP ID: 217502

Climate Division: MN 5

NWS Call Sign:

Elevation: 1,020 Feet

Lat: 45°33N

Lon: 93°46W

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	6/16	6/10	6/05	6/01	5/29	5/25	5/21	5/16	5/10
32	6/05	5/29	5/24	5/20	5/16	5/12	5/08	5/03	4/26
28	5/19	5/13	5/09	5/06	5/03	4/29	4/26	4/22	4/16
24	5/04	4/28	4/24	4/21	4/18	4/15	4/11	4/07	4/02
20	4/18	4/15	4/12	4/10	4/08	4/06	4/04	4/02	3/29
16	4/13	4/09	4/05	4/02	3/30	3/28	3/25	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	8/30	9/03	9/06	9/09	9/11	9/13	9/16	9/19	9/23
32	9/11	9/14	9/16	9/18	9/20	9/22	9/24	9/26	9/29
28	9/16	9/20	9/23	9/26	9/28	10/01	10/04	10/07	10/11
24	9/23	9/29	10/03	10/07	10/11	10/14	10/18	10/22	10/28
20	10/03	10/09	10/14	10/18	10/22	10/25	10/29	11/03	11/09
16	10/12	10/19	10/24	10/28	11/01	11/05	11/09	11/14	11/21
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	120	114	109	105	100	95	90	82
32	151	142	136	131	126	121	116	110	102
28	169	161	156	152	148	144	140	135	128
24	203	193	186	180	175	169	164	157	147
20	216	209	204	200	195	191	187	182	175
16	241	232	226	220	215	210	204	198	189

* 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

Complete documentation available from:

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Station: SANTIAGO 3 E, MN

COOP ID: 217502

Climate Division: MN 5

NWS Call Sign:

Elevation: 1,020 Feet Lat: 45° 33N Lon: 93° 46W

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	1671	1299	1071	587	246	67	24	38	188	535	1023	1495	8244
60	1516	1159	916	446	150	21	6	9	88	385	873	1340	6909
57	1423	1075	823	367	104	9	0	2	48	300	783	1247	6181
55	1361	1019	762	318	79	4	0	0	30	249	723	1185	5730
50	1206	879	616	210	35	0	0	0	6	141	577	1030	4700
32	674	425	191	16	0	0	0	0	0	4	163	514	1987

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	26	50	143	422	827	1039	1211	1136	825	492	129	42	6342
55	0	0	1	34	193	354	498	424	165	24	0	0	1693
57	0	0	0	23	156	298	436	363	124	13	0	0	1413
60	0	0	0	12	108	220	349	277	73	5	0	0	1044
65	0	0	0	3	50	116	212	151	23	0	0	0	555
70	0	0	0	0	18	46	111	66	4	0	0	0	245

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	1	27	214	572	794	954	877	570	257	27	1	0	1	28	242	814	1608	2562	3439	4009	4266	4293	4294
45	0	1	9	124	419	644	799	722	424	149	11	0	0	1	10	134	553	1197	1996	2718	3142	3291	3302	3302
50	0	0	2	63	281	494	644	567	288	79	3	0	0	0	2	65	346	840	1484	2051	2339	2418	2421	2421
55	0	0	1	31	165	345	489	412	172	31	0	0	0	0	1	32	197	542	1031	1443	1615	1646	1646	1646
60	0	0	0	12	86	213	335	264	88	9	0	0	0	0	0	12	98	311	646	910	998	1007	1007	1007
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	1	22	155	370	511	632	570	365	173	19	0	0	1	23	178	548	1059	1691	2261	2626	2799	2818	2818

(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:
www.ncdc.noaa.gov/oa/climate/normal/usnormals.html

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.
Complete documentation for the 1971-2000 Normals is available on the internet from:
www.ncdc.noaa.gov/oa/climate/normal/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 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.

- | | |
|---|---|
| <ol style="list-style-type: none">a. Temperature/ Precipitation Tables<ol style="list-style-type: none">1. 1971-2000 Monthly Normals2. Cooperative Summary of the Day3. National Weather Service station records4. 1971-2000 serially complete daily datab. Degree Day Table<ol style="list-style-type: none">1. Monthly and Annual Heating and Cooling Degree Days Normals to Selected Bases derived from 1971-2000 Monthly Normals2. Daily Normal Growing Degree Units to Selected Base Temperatures derived from 1971-2000 serially complete daily data | <ol style="list-style-type: none">c. Snow Tables<ol style="list-style-type: none">1. Snow Climatology2. Cooperative Summary of the Dayd. Freeze Data Table
1971-2000 serially complete daily data |
|---|---|

References

U.S. Climate Normals 1971-2000, www.ncdc.noaa.gov/normal.html
U.S. Climate Normals 1971-2000-Products Clim20, www.ncdc.noaa.gov/oa/climate/normal/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