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: COTTONWOOD 2 E, SD **COOP ID: 391972**

Climate Division: SD 5 **NWS Call Sign:** **Elevation: 2,414 Feet** **Lat: 43˚58N** **Lon: 101˚52W**

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	31.5	5.6	18.6	70	1987	12	31.7	1990	-42	1916	12	2.8	1979	1441	0	.0	.0	4.1	13.9	30.6	10.1
Feb	37.7	11.1	24.4	75+	1995	22	36.4	1999	-41	1936	6	9.5	1978	1137	0	.0	.0	7.9	9.9	27.6	5.9
Mar	46.9	20.2	33.6	88+	1946	31	41.6	1986	-33	1998	11	24.4	1996	975	0	.0	.0	14.7	5.1	27.9	2.0
Apr	59.1	30.7	44.9	95	1980	22	51.4	1981	-12+	1936	3	39.4	1983	602	0	.0	.2	23.2	.7	17.1	.0
May	70.0	42.6	56.3	105+	1934	29	62.3	1977	13	1944	5	50.5	1983	288	16	.0	1.2	29.9	.0	3.9	.0
Jun	80.2	52.1	66.2	114	1936	18	75.5	1988	30	1969	14	60.6	1998	81	115	.8	5.9	30.0	.0	.1	.0
Jul	88.4	57.7	73.1	116	1910	14	78.5	1974	34	1971	30	65.2	1992	16	266	4.4	15.7	31.0	.0	.0	.0
Aug	88.1	55.0	71.6	113	1935	7	78.7	1983	27	1910	25	65.7	1992	33	236	3.4	15.6	31.0	.0	.0	.0
Sep	77.8	43.0	60.4	108+	2001	5	67.6	1998	10	1926	25	55.0	1974	190	52	1.0	6.3	29.5	.0	3.4	.0
Oct	63.4	30.6	47.0	98	1910	16	50.4	1973	-7+	1991	30	43.0	1976	559	0	.0	.5	26.4	.3	15.7	.1
Nov	45.1	17.9	31.5	85+	1999	9	42.3	1999	-29	1959	14	16.2	1985	1005	0	.0	.0	12.5	5.8	28.2	1.7
Dec	34.9	8.1	21.5	77	1939	11	32.1	1999	-41	1916	20	3.5	1983	1348	0	.0	.0	5.4	11.3	30.6	7.3
Ann	60.3	31.2	45.8	116	Jul 1910	14	78.7	Aug 1983	-42	Jan 1916	12	2.8	Jan 1979	7675	685	9.6	45.4	245.6	47.0	185.1	27.1

\+ 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/normals/usnormals.html

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1909-2001

(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	.39	.33	2.31	1949	4	1.44	1975	.00	1978
Feb	.52	.41	1.18	1991	18	2.44	1987	.01	1985
Mar	1.15	.92	1.70	1937	24	3.47	1977	.14	1981
Apr	1.71	1.67	2.20	1971	20	5.43	1986	.17	1981
May	2.95	2.94	4.00	1915	26	7.18	1982	.49	1980
Jun	3.07	2.40	3.04	1948	17	6.57	1984	.81	1973
Jul	2.26	1.96	2.46	1923	16	6.44	1997	.22	1991
Aug	1.63	1.50	5.18	1930	16	4.63	1971	.11	1995
Sep	1.12	.64	3.30	1955	20	3.56	1971	.00	1975
Oct	1.33	1.25	2.39	1930	2	4.10	1971	.02	1992
Nov	.65	.59	.93	1992	1	1.62	1985	.00	1982
Dec	.38	.34	.80	1924	31	1.19	1980	.00+	1986
Ann	17.16	16.14	5.18	Aug 1930	16	7.18	May 1982	.00+	Dec 1986

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	3.9	1.2	.1	.0
Feb	4.0	1.7	.2	@
Mar	5.5	3.1	.6	.1
Apr	7.5	4.3	.9	.2
May	10.5	5.8	2.0	.7
Jun	10.8	6.5	1.7	.7
Jul	8.6	4.5	1.6	.5
Aug	6.1	3.3	.8	.5
Sep	5.3	2.5	.6	.2
Oct	5.8	3.0	.9	.3
Nov	4.6	2.1	.3	.0
Dec	3.8	1.3	.0	.0
Ann	76.4	39.3	9.7	3.2

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	.01	.04	.10	.15	.22	.29	.37	.48	.62	.87	1.11
Feb	.03	.06	.12	.19	.27	.37	.48	.63	.84	1.19	1.54
Mar	.13	.22	.38	.54	.71	.90	1.12	1.40	1.77	2.39	2.99
Apr	.27	.42	.67	.90	1.15	1.41	1.72	2.09	2.58	3.39	4.16
May	.60	.87	1.30	1.69	2.09	2.52	3.00	3.59	4.36	5.59	6.75
Jun	.71	1.00	1.44	1.85	2.25	2.68	3.15	3.72	4.47	5.66	6.78
Jul	.47	.68	1.01	1.31	1.61	1.94	2.30	2.74	3.32	4.24	5.12
Aug	.24	.38	.61	.84	1.07	1.33	1.62	1.99	2.47	3.26	4.02
Sep	.02	.09	.23	.39	.57	.78	1.03	1.35	1.81	2.58	3.35
Oct	.07	.14	.30	.48	.69	.93	1.22	1.60	2.13	3.04	3.95
Nov	.06	.14	.24	.34	.44	.54	.66	.80	1.00	1.31	1.60
Dec	.00	.06	.13	.19	.25	.32	.39	.47	.58	.76	.94
Ann	10.82	11.99	13.51	14.69	15.75	16.79	17.87	19.08	20.55	22.73	24.63

\+ 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: 1909-2001
(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	5.5	4.5	2	2	9.0	1992	8	15.4	1975	15	1986	8	10	1986	3.7	2.3	.5	.1	.0	17.8	10.7	5.2	@
Feb	6.8	6.0	2	1	12.0	1991	18	25.0	1987	21	1987	28	11	1978	3.6	2.3	.8	.2	@	11.0	7.2	5.0	.6
Mar	8.2	6.8	2	1	12.0	1975	23	27.5	1977	20+	1987	1	6	1987	3.8	2.8	1.0	.5	.1	9.4	6.1	3.5	1.2
Apr	4.5	2.8	#	#	12.0	2000	20	20.2	1995	11	1995	12	2	1995	1.9	1.6	.7	.3	@	2.2	1.0	.6	@
May	#	.0	#	0	#	1983	12	#	1983	2	1991	3	#+	1991	.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	.2	1985	28	.2	1985	#	1985	28	#	1985	@	.0	.0	.0	.0	.0	.0	.0	.0
Oct	1.4	.0	#	0	7.0	1971	29	13.5	1971	4	1991	30	#+	1999	.6	.5	.2	.1	.0	.5	.1	.0	.0
Nov	5.8	5.8	1	#	7.0	1993	13	26.0	1985	21	1985	30	10	1985	3.2	2.2	.9	.2	.0	7.0	3.1	1.3	.0
Dec	5.5	5.5	2	1	8.0	1983	5	13.5	1996	21	1985	3	15	1985	3.3	2.2	.7	.2	.0	14.0	6.1	2.9	.6
Ann	37.7	31.4	N/A	N/A	12.0+	Apr 2000	20	27.5	Mar 1977	21+	Feb 1987	28	15	Dec 1985	20.1	13.9	4.8	1.6	.1	61.9	34.3	18.5	2.4

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

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	9/04	9/07	9/09	9/11	9/13	9/15	9/17	9/20	9/23
32	9/11	9/14	9/16	9/18	9/19	9/21	9/23	9/25	9/28
28	9/16	9/21	9/25	9/29	10/02	10/05	10/08	10/12	10/17
24	9/22	9/28	10/02	10/06	10/09	10/13	10/16	10/20	10/26
20	10/01	10/07	10/12	10/15	10/19	10/22	10/26	10/30	11/05
16	10/10	10/17	10/21	10/25	10/29	11/02	11/05	11/10	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	130	122	116	111	107	102	97	92	84
32	140	135	132	129	126	123	120	116	112
28	170	163	157	153	149	145	140	135	128
24	185	178	172	168	163	159	154	149	141
20	209	202	196	191	187	182	178	172	164
16	230	222	216	211	206	201	196	191	183

***** 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)

Base	Heating Degree Days (1)												
Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	1441	1137	975	602	288	81	16	33	190	559	1005	1348	7675
60	1286	997	820	453	169	30	2	9	98	405	855	1193	6317
57	1193	919	727	366	112	14	0	4	59	314	765	1100	5573
55	1132	868	667	311	81	8	0	2	39	256	707	1038	5109
50	984	736	522	188	30	1	0	0	10	132	568	889	4060
32	497	337	131	5	0	0	0	0	0	2	177	407	1556

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	80	124	179	393	752	1024	1272	1226	852	467	162	82	6613
55	1	11	2	9	120	342	559	515	201	7	2	0	1769
57	0	6	0	4	89	288	497	455	161	3	0	0	1503
60	0	0	0	1	52	214	407	367	110	1	0	0	1152
65	0	0	0	0	16	115	266	236	52	0	0	0	685
70	0	0	0	0	3	49	150	133	19	0	0	0	354

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	4	22	76	225	530	811	1053	1011	650	293	51	4	4	26	102	327	857	1668	2721	3732	4382	4675	4726	4730
45	0	2	33	134	382	661	898	856	506	180	19	0	0	2	35	169	551	1212	2110	2966	3472	3652	3671	3671
50	0	0	10	68	250	513	743	701	368	95	3	0	0	0	10	78	328	841	1584	2285	2653	2748	2751	2751
55	0	0	2	30	144	370	588	547	244	41	1	0	0	0	2	32	176	546	1134	1681	1925	1966	1967	1967
60	0	0	0	10	72	235	433	400	141	9	0	0	0	0	0	10	82	317	750	1150	1291	1300	1300	1300
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	11	36	84	186	341	509	662	633	427	242	68	18	11	47	131	317	658	1167	1829	2462	2889	3131	3199	3217

(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