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: USTA 8 WNW KELLY RANCH, SD **COOP ID: 398528**

Climate Division: SD 1 **NWS Call Sign:** **Elevation: 2,380 Feet** **Lat: 45˚15N** **Lon: 102˚19W**

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	28.0	.3	14.2	62+	1981	23	27.2	1983	-42	1972	28	-.4	1979	1576	0	.0	.0	1.7	17.0	30.7	13.5
Feb	33.8	7.3	20.6	73	1982	21	33.6	1998	-49	1994	9	3.3	1979	1245	0	.0	.0	4.9	12.8	28.0	7.9
Mar	43.8	16.8	30.3	82	1967	29	38.4	1986	-40	1998	10	20.3	1975	1075	0	.0	.0	10.0	6.6	28.8	2.7
Apr	57.8	28.7	43.3	97	1980	21	50.3	1987	-1	1975	2	36.3	1995	653	0	.0	.2	23.0	1.1	18.0	@
May	70.7	40.9	55.8	97+	1980	22	64.2	1977	13	1967	4	50.1	1996	305	21	.0	1.0	30.1	.0	4.7	.0
Jun	80.5	50.6	65.6	107	1988	28	75.4	1988	31+	1969	2	60.0	1993	92	108	.4	3.6	30.0	.0	.1	.0
Jul	87.9	56.5	72.2	110+	1981	7	77.3+	1980	34	1971	30	63.4	1993	32	254	1.7	10.2	31.0	.0	.0	.0
Aug	87.2	52.9	70.1	110	2001	8	78.2	1983	31	1988	27	62.6	1992	54	210	1.9	12.2	31.0	.0	2.8	.0
Sep	75.6	40.7	58.2	109	1959	8	65.0	1998	16	1974	30	53.1	1986	242	35	.4	3.6	29.5	.0	5.5	.0
Oct	61.1	28.4	44.8	100	1963	4	52.2	2000	-11+	1991	31	38.8	1987	628	0	.0	.2	25.4	.4	19.0	.1
Nov	42.3	14.9	28.6	81+	1999	9	39.4	1999	-27	1959	16	10.3	1985	1092	0	.0	.0	9.9	7.3	29.0	2.6
Dec	31.8	3.3	17.6	70	1965	4	28.2	1998	-45	1990	30	-.5	1983	1471	0	.0	.0	2.6	14.9	30.8	9.5
Ann	58.4	28.4	43.4	110+	Aug 2001	8	78.2	Aug 1983	-49	Feb 1994	9	-.5	Dec 1983	8465	628	4.4	31.0	229.1	60.1	197.4	36.3

\+ 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: 1957-2001

(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	.16	.11	.33	1964	23	.42+	1975	.00+	1993
Feb	.36	.25	2.20	1998	24	2.82	1998	.00+	1990
Mar	.78	.55	2.00	1988	11	2.32	1987	.00+	1981
Apr	1.79	1.69	2.38	1975	28	4.12	1999	.10	1981
May	2.77	2.58	2.00	1986	8	5.95	1982	.35	1980
Jun	2.86	2.61	2.50	1987	20	5.31	1999	.92	1978
Jul	2.20	1.65	2.70	1977	6	9.57	1993	.03	1988
Aug	1.68	1.67	3.00	1989	27	5.51	1989	.00	2000
Sep	.95	.50	2.20	1989	21	3.71	1977	.02	2000
Oct	1.18	1.00	1.70	1972	5	4.16	1982	.00+	1988
Nov	.46	.28	.90	1992	1	1.70	1998	.00+	1990
Dec	.36	.20	1.05	1964	2	3.10	2000	.00+	1999
Ann	15.55	14.79	3.00	Aug 1989	27	9.57	Jul 1993	.00+	Aug 2000

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	3.9	1.0	@	.0
Feb	3.3	1.1	.2	.1
Mar	5.5	2.2	.4	.2
Apr	8.0	4.1	1.5	.3
May	8.7	5.3	1.9	.5
Jun	9.0	6.1	1.9	.6
Jul	7.7	4.5	1.5	.5
Aug	6.0	3.3	.8	.4
Sep	4.3	2.3	.6	.2
Oct	4.5	2.8	1.0	.3
Nov	4.1	1.5	.2	.0
Dec	3.5	1.3	.1	@
Ann	68.5	35.5	10.1	3.1

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	.00	.00	.00	.06	.10	.13	.17	.22	.27	.37	.45
Feb	.00	.00	.03	.10	.17	.24	.34	.45	.60	.86	1.12
Mar	.00	.06	.19	.31	.44	.58	.75	.96	1.25	1.74	2.21
Apr	.27	.42	.68	.93	1.18	1.47	1.79	2.19	2.72	3.59	4.42
May	.60	.86	1.26	1.63	2.00	2.39	2.83	3.36	4.06	5.17	6.22
Jun	1.08	1.35	1.73	2.04	2.35	2.65	2.99	3.38	3.87	4.63	5.32
Jul	.18	.32	.61	.92	1.25	1.64	2.10	2.68	3.48	4.83	6.16
Aug	.10	.27	.53	.78	1.04	1.33	1.66	2.08	2.63	3.55	4.44
Sep	.02	.06	.15	.26	.41	.59	.81	1.12	1.56	2.33	3.13
Oct	.00	.09	.29	.47	.67	.89	1.15	1.46	1.90	2.64	3.35
Nov	.00	.00	.05	.13	.21	.31	.42	.57	.77	1.11	1.45
Dec	.00	.00	.02	.07	.14	.21	.31	.43	.61	.91	1.22
Ann	9.40	10.52	11.98	13.13	14.16	15.17	16.23	17.42	18.88	21.03	22.93

\+ 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: 1957-2001
(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	2.1	2	2	4.0	1991	3	6.2	1972	10	1971	15	9	1971	2.1	1.0	.1	.0	.0	18.5	14.7	8.7	.1
Feb	4.1	3.0	2	#	16.0	1987	28	23.5	1987	16	1979	28	10	1979	1.7	1.0	.4	.1	@	9.6	7.4	4.6	2.1
Mar	4.1	2.0	1	#	36.0	1988	11	36.0	1988	16	1979	4	6	1979	2.0	1.5	.6	.3	.1	8.1	5.3	3.6	.3
Apr	2.1	.1	#	0	12.0	1989	27	12.0	1989	9	1975	1	2	1975	.8	.6	.2	.1	.0	1.2	.6	.3	.0
May	.1	.0	#	0	2.0	1979	9	2.0+	1979	#	1999	10	#	1999	@	@	.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	2.0	1984	24	3.0	1984	1	1984	23	#	1984	.1	.1	.0	.0	.0	.1	.0	.0	.0
Oct	.7	.0	#	0	10.0	1991	29	11.0	1991	4	1992	15	#+	1992	.3	.1	@	@	@	.1	.0	.0	.0
Nov	2.9	2.0	#	0	6.0	1986	7	9.5	1986	8	1978	23	4	1978	1.7	.9	.2	@	.0	5.1	3.0	1.6	.0
Dec	3.3	2.0	1	#	6.0	1992	12	10.5	1984	6	1984	31	5	1983	1.9	1.4	.4	.1	.0	11.8	9.2	4.8	.0
Ann	20.1	11.2	N/A	N/A	36.0	Mar 1988	11	36.0	Mar 1988	16+	Mar 1979	4	10	Feb 1979	10.6	6.6	1.9	.6	.1	54.5	40.2	23.6	2.5

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

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	8/05	8/13	8/19	8/24	8/29	9/02	9/07	9/13	9/21
32	8/14	8/22	8/28	9/02	9/07	9/12	9/17	9/23	10/01
28	8/22	8/30	9/04	9/09	9/13	9/18	9/23	9/28	10/06
24	9/13	9/20	9/24	9/28	10/02	10/06	10/10	10/14	10/21
20	9/23	9/30	10/05	10/09	10/13	10/17	10/21	10/26	11/02
16	10/06	10/12	10/16	10/20	10/23	10/27	10/30	11/03	11/09

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	123	111	102	95	89	82	75	66	55
32	143	133	126	119	113	107	101	94	84
28	156	147	140	134	129	124	118	111	101
24	183	175	168	163	158	153	148	142	134
20	209	199	192	187	181	176	170	163	154
16	227	218	213	208	203	198	193	187	179

***** 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	1576	1245	1075	653	305	92	32	54	242	628	1092	1471	8465
60	1421	1105	920	507	189	36	10	20	139	474	942	1316	7079
57	1328	1031	827	422	133	17	3	10	90	383	852	1223	6319
55	1267	979	766	368	102	10	0	5	65	325	792	1161	5840
50	1117	848	615	246	45	1	0	0	23	197	653	1012	4757
32	615	435	181	17	0	0	0	0	0	9	232	517	2006

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	62	114	129	354	739	1006	1245	1179	783	404	130	69	6214
55	1	14	1	15	128	326	532	470	158	7	0	0	1652
57	0	9	0	9	97	273	473	413	124	3	0	0	1401
60	0	0	0	4	60	202	387	330	82	1	0	0	1066
65	0	0	0	0	21	108	254	210	35	0	0	0	628
70	0	0	0	0	5	46	151	119	12	0	0	0	333

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	6	32	197	495	761	959	897	567	229	27	0	0	6	38	235	730	1491	2450	3347	3914	4143	4170	4170
45	0	0	6	109	351	611	804	742	421	127	10	0	0	0	6	115	466	1077	1881	2623	3044	3171	3181	3181
50	0	0	1	51	222	461	649	588	290	56	1	0	0	0	1	52	274	735	1384	1972	2262	2318	2319	2319
55	0	0	0	22	116	317	494	439	173	14	0	0	0	0	0	22	138	455	949	1388	1561	1575	1575	1575
60	0	0	0	6	52	184	343	295	94	3	0	0	0	0	0	6	58	242	585	880	974	977	977	977
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	1	17	47	162	327	478	606	586	389	207	43	5	1	18	65	227	554	1032	1638	2224	2613	2820	2863	2868

(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