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 DONALD, KS **COOP ID: 145127**

Climate Division: KS 1 **NWS Call Sign:** **Elevation: 3,364 Feet** **Lat: 39˚47N** **Lon: 101˚22W**

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	39.5	14.7	27.1	76	1990	11	38.5	1986	-20+	1984	18	15.0	1979	1175	0	.0	.0	9.3	9.1	30.1	3.8
Feb	45.1	18.9	32.0	81	1970	18	39.8	1999	-21	1982	5	19.5	1978	924	0	.0	.0	12.4	5.5	26.0	2.2
Mar	53.1	25.0	39.1	90	1963	28	46.4	1986	-21	1960	3	33.1	1980	804	0	.0	.0	19.1	2.3	23.1	.5
Apr	62.9	33.8	48.4	95	1989	23	53.9	1981	7	1997	13	41.6	1983	501	1	.0	.2	25.3	.3	10.7	.0
May	72.0	44.5	58.3	103	2000	30	63.0	1998	20	1967	2	51.8	1995	240	30	.1	1.3	30.4	.0	1.1	.0
Jun	84.0	54.9	69.5	108	1963	29	75.6	1988	35+	1998	6	62.8	1982	43	176	1.5	9.6	29.9	.0	.0	.0
Jul	90.1	60.9	75.5	109+	1990	2	78.9	1980	43	1959	1	70.8	1992	1	326	4.3	18.3	31.0	.0	.0	.0
Aug	87.9	58.8	73.4	108+	1969	13	79.4	2000	44+	1993	31	68.0	1992	14	273	2.4	15.7	31.0	.0	.0	.0
Sep	79.5	49.7	64.6	104+	1971	7	71.1	1998	21	1985	30	58.8	1993	105	92	.4	7.4	29.5	.0	.7	.0
Oct	67.8	37.5	52.7	95	1997	3	55.3	2000	9+	1993	31	47.6	1976	385	1	.0	.7	28.5	.2	7.1	.0
Nov	50.1	24.9	37.5	84	1980	6	47.1	1999	-7+	1976	28	29.9	1985	824	0	.0	.0	16.3	3.1	23.2	.3
Dec	41.9	17.3	29.6	79	1964	23	36.2	1980	-26	1989	22	13.7	1983	1097	0	.0	.0	10.1	6.5	29.6	2.2
Ann	64.5	36.7	50.6	109+	Jul 1990	2	79.4	Aug 2000	-26	Dec 1989	22	13.7	Dec 1983	6113	899	8.7	53.2	272.8	27.0	151.6	9.0

\+ 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: 1954-2001

(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	.59	.54	1.55	1994	27	1.70	1994	.00	1986
Feb	.59	.38	.94	1971	18	2.37	1971	.01	1972
Mar	1.54	1.18	2.05	1980	28	4.70	1973	.00	1997
Apr	2.01	1.60	3.63	1981	19	5.11	1981	.05	1992
May	3.86	3.24	4.65	1988	3	11.13	1981	.37	2000
Jun	3.56	3.26	5.32	1978	5	8.51	1989	.04	1976
Jul	3.17	2.76	3.71	1966	19	7.75	1993	.90	1975
Aug	2.38	1.84	3.26	1962	1	7.86	1992	.28	1976
Sep	1.39	1.20	2.70	1963	21	6.83	1973	.00	1974
Oct	1.29	.96	2.02	1982	1	4.89	2000	.00	1999
Nov	.97	.81	2.05	1975	19	3.11	1975	.00	1989
Dec	.49	.33	1.18	1991	12	2.12	1982	.00+	2000
Ann	21.84	21.94	5.32	Jun 1978	5	11.13	May 1981	.00+	Dec 2000

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	3.8	1.6	.2	.1
Feb	4.7	1.8	.3	.0
Mar	7.6	3.5	1.0	.2
Apr	8.1	4.0	1.3	.4
May	10.6	6.5	2.4	.9
Jun	9.0	5.8	2.0	1.0
Jul	9.1	5.9	2.3	.7
Aug	8.0	4.8	1.6	.5
Sep	5.6	3.0	.9	.3
Oct	5.0	2.6	.8	.3
Nov	5.1	2.4	.5	.1
Dec	3.2	1.4	.2	@
Ann	79.8	43.3	13.5	4.5

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	.05	.11	.20	.29	.38	.47	.59	.72	.91	1.20	1.49
Feb	.03	.06	.13	.20	.30	.40	.54	.71	.95	1.37	1.79
Mar	.05	.17	.38	.61	.85	1.13	1.46	1.88	2.47	3.44	4.40
Apr	.37	.54	.84	1.11	1.39	1.69	2.04	2.46	3.01	3.90	4.75
May	.85	1.20	1.77	2.28	2.79	3.34	3.95	4.68	5.65	7.19	8.64
Jun	.42	.70	1.20	1.69	2.22	2.81	3.50	4.35	5.50	7.41	9.25
Jul	.96	1.26	1.71	2.10	2.48	2.87	3.30	3.81	4.46	5.48	6.43
Aug	.53	.75	1.10	1.41	1.73	2.06	2.44	2.89	3.48	4.43	5.32
Sep	.07	.19	.39	.60	.82	1.06	1.35	1.71	2.19	3.00	3.80
Oct	.02	.09	.24	.42	.62	.86	1.16	1.55	2.10	3.04	3.99
Nov	.06	.16	.31	.46	.61	.77	.96	1.20	1.52	2.04	2.54
Dec	.00	.00	.07	.16	.25	.35	.47	.62	.82	1.15	1.48
Ann	15.50	16.72	18.29	19.49	20.54	21.57	22.63	23.80	25.21	27.27	29.05

+ 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: 1954-2001
(3) Derived from 1971-2000 serially complete daily data

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Snow (inches)

Snow Totals

Means/Medians (1)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	7.8	6.5	2	1
Feb	5.8	4.3	2	1
Mar	10.1	8.0	1	#
Apr	5.4	4.0	#	#
May	.3	.0	0	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.7	.0	#	0
Oct	2.1	.5	#	0
Nov	6.3	5.0	1	#
Dec	4.5	2.4	2	#
Ann	43.0	30.7	N/A	N/A

Extremes (2)

Month	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year
Jan	15.0	1994	27	17.7	1994	20	1983	2	9	1984
Feb	12.0	1984	18	20.0	1984	14+	1993	18	9	1993
Mar	13.5	1981	7	40.8	1987	28	1987	30	5	1987
Apr	12.0	1988	2	22.5	1994	17	1980	2	3	1980
May	4.0	1978	6	4.0	1978	0	0	0	0	0
Jun	.0	0	0	.0	0	0	0	0	0	0
Jul	.0	0	0	.0	0	0	0	0	0	0
Aug	.0	0	0	.0	0	0	0	0	0	0
Sep	12.0	1995	21	12.0	1995	11	1995	21	#	1995
Oct	13.0	1997	26	16.0	1997	16	1997	26	2	1997
Nov	12.0	1975	19	22.0	1983	19	1983	29	5	1975
Dec	10.1	1982	24	18.0	1973	22	1982	30	11	1983
Ann	15.0	Jan 1994	27	40.8	Mar 1987	28	Mar 1987	30	11	Dec 1983

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	3.6	2.2	.9	.4	.1
Feb	3.3	2.1	.6	.2	@
Mar	3.6	2.6	1.2	.7	.1
Apr	1.6	1.4	.7	.4	.1
May	.1	.1	@	.0	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.2	.1	.1	.1	@
Oct	.8	.6	.3	.1	@
Nov	2.7	1.8	.9	.3	.1
Dec	3.1	1.9	.6	.3	@
Ann	19.0	12.8	5.3	2.5	.4

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	12.7	7.6	4.5	2.1
Feb	8.9	5.5	3.3	.9
Mar	4.6	2.6	1.6	.5
Apr	1.6	1.1	.6	.2
May	.0	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.1	@	@	@
Oct	.6	.4	.2	.1
Nov	4.9	2.3	1.2	.6
Dec	8.6	4.9	3.2	1.5
Ann	42.0	24.4	14.6	5.9

+ 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	5/23	5/19	5/17	5/14	5/12	5/10	5/07	5/04	5/01
32	5/15	5/11	5/09	5/07	5/05	5/03	5/01	4/28	4/25
28	5/05	4/29	4/26	4/22	4/20	4/17	4/13	4/10	4/05
24	4/21	4/16	4/13	4/10	4/07	4/04	4/02	3/29	3/25
20	4/12	4/06	4/03	3/30	3/27	3/24	3/21	3/17	3/12
16	4/05	3/30	3/26	3/22	3/18	3/15	3/11	3/06	2/28

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	9/15	9/20	9/23	9/26	9/29	10/01	10/04	10/08	10/12
32	9/24	9/29	10/02	10/05	10/08	10/11	10/14	10/18	10/23
28	10/02	10/07	10/11	10/14	10/17	10/20	10/23	10/27	11/01
24	10/11	10/16	10/20	10/23	10/26	10/28	10/31	11/04	11/09
20	10/22	10/27	10/31	11/03	11/06	11/09	11/13	11/16	11/22
16	11/01	11/06	11/10	11/13	11/17	11/20	11/23	11/27	12/03

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	156	150	146	143	139	136	132	128	122
32	175	168	164	160	156	152	148	143	137
28	199	192	188	184	180	176	172	167	161
24	220	214	209	205	201	197	193	188	181
20	247	239	233	228	223	219	214	208	200
16	267	258	253	247	243	238	233	227	219

***** 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	1175	924	804	501	240	43	1	14	105	385	824	1097	6113
60	1020	784	649	357	135	13	0	3	41	238	674	942	4856
57	927	702	556	277	87	5	0	1	19	161	584	849	4168
55	865	650	494	228	62	3	0	0	11	118	527	787	3745
50	713	520	348	126	22	0	0	0	1	45	389	638	2802
32	250	162	31	0	0	0	0	0	0	0	66	199	708

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	98	162	250	491	813	1123	1348	1282	977	639	232	125	7540
55	0	7	0	28	162	436	635	569	298	44	3	0	2182
57	0	2	0	17	125	378	573	507	247	26	0	0	1875
60	0	0	0	8	80	296	480	417	179	10	0	0	1470
65	0	0	0	1	30	176	326	273	92	1	0	0	899
70	0	0	0	0	8	86	181	152	38	0	0	0	465

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	24	65	148	330	622	923	1134	1074	775	441	111	33	24	89	237	567	1189	2112	3246	4320	5095	5536	5647	5680
45	1	22	76	209	468	774	979	919	627	306	58	7	1	23	99	308	776	1550	2529	3448	4075	4381	4439	4446
50	0	2	34	120	325	624	824	764	484	189	20	0	0	2	36	156	481	1105	1929	2693	3177	3366	3386	3386
55	0	0	8	61	199	475	669	610	350	98	4	0	0	0	8	69	268	743	1412	2022	2372	2470	2474	2474
60	0	0	0	24	105	332	514	457	229	39	0	0	0	0	0	24	129	461	975	1432	1661	1700	1700	1700
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	30	70	137	236	382	585	731	690	486	304	104	45	30	100	237	473	855	1440	2171	2861	3347	3651	3755	3800

(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