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: WINONA, KS **COOP ID: 148988**

Climate Division: KS 4 **NWS Call Sign:** **Elevation: 3,323 Feet** **Lat: 39˚04N** **Lon: 101˚15W**

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	40.8	14.8	27.8	77	1986	20	39.3	1986	-17+	1984	18	15.5	1979	1153	0	.0	.0	9.8	9.0	30.4	3.1
Feb	46.8	18.9	32.9	82	1982	23	40.9	1999	-19	1982	5	19.8	1978	901	0	.0	.0	13.2	5.7	26.1	1.9
Mar	54.8	25.4	40.1	89+	1986	28	47.3	1986	-5+	1995	3	33.5	1980	773	0	.0	.0	20.0	2.6	23.5	.3
Apr	64.5	34.7	49.6	97	1989	23	57.1	1981	7+	1997	13	44.1	1984	464	2	.0	.4	25.4	.4	10.7	.0
May	73.5	45.7	59.6	101	1996	19	63.7	1987	21	1967	1	52.8	1995	204	37	@	1.2	30.3	.0	1.0	.0
Jun	85.0	56.2	70.6	109	1971	26	75.5	1994	36	1969	2	64.2	1982	36	203	1.8	10.3	30.0	.0	.0	.0
Jul	90.8	62.1	76.5	110	1973	7	81.7	1980	45	1971	30	71.5	1992	1	355	3.8	18.4	31.0	.0	.0	.0
Aug	88.9	60.9	74.9	109	1964	11	82.7	1983	41	1964	23	69.4	1992	10	316	2.4	15.5	31.0	.0	.0	.0
Sep	80.4	51.1	65.8	104	1971	8	71.2	1998	23	1985	30	60.0	1993	87	109	.6	7.2	29.4	.0	.7	.0
Oct	68.7	38.4	53.6	94+	1987	5	56.3	1979	9+	1993	31	47.8	1976	356	2	.0	.8	28.5	.2	6.2	.0
Nov	52.0	25.4	38.7	87	1980	7	48.8	1999	-3	1976	28	31.2	2000	789	0	.0	.0	17.2	2.9	23.1	.2
Dec	43.1	17.4	30.3	86	1964	24	36.0	1980	-18+	1990	30	15.1	1983	1077	0	.0	.0	10.3	6.7	29.8	1.9
Ann	65.8	37.6	51.7	110	Jul 1973	7	82.7	Aug 1983	-19	Feb 1982	5	15.1	Dec 1983	5851	1024	8.6	53.8	276.1	27.5	151.5	7.4

\+ 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

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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	.39	1.23	1960	14	1.11	1973	.00+	1998
Feb	.42	.31	.67+	1998	10	1.20	1997	.00+	1999
Mar	1.19	.86	1.80	1980	28	3.89	1973	.00	1997
Apr	1.50	1.42	1.80	1994	10	3.97	1984	.00	1992
May	3.37	3.11	2.54	1995	23	8.34	1995	.65	2000
Jun	2.73	2.42	3.22	1951	6	5.72	1975	.22	1985
Jul	3.34	2.55	3.10	1998	10	10.22	1998	.96	1989
Aug	2.68	2.07	2.76	1999	6	7.61	1993	.10	1976
Sep	1.27	.91	3.46	1996	7	5.32	1976	.00	1978
Oct	1.18	.88	2.25	2000	29	5.53	1984	.01	1983
Nov	.89	.59	1.20	1972	13	2.56	1975	.00	1989
Dec	.40	.26	.73	1982	28	1.82	1982	.00+	1996
Ann	19.39	18.99	3.46	Sep 1996	7	10.22	Jul 1998	.00+	Feb 1999

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	3.0	1.5	.1	.0
Feb	3.1	1.4	.2	.0
Mar	5.2	3.0	.8	.1
Apr	5.4	3.5	1.0	.2
May	8.8	6.4	2.2	.8
Jun	7.3	5.0	2.0	.6
Jul	7.6	5.7	2.3	.8
Aug	6.5	4.4	1.9	.8
Sep	4.8	2.7	.8	.2
Oct	3.9	2.3	.9	.2
Nov	3.9	2.2	.5	.1
Dec	2.7	1.4	.2	.0
Ann	62.2	39.5	12.9	3.8

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	.04	.11	.18	.25	.33	.41	.52	.67	.92	1.15
Feb	.00	.00	.05	.12	.20	.29	.39	.52	.70	1.00	1.30
Mar	.02	.09	.24	.41	.60	.82	1.10	1.45	1.94	2.78	3.61
Apr	.35	.57	.81	1.01	1.20	1.38	1.59	1.83	2.14	2.61	3.05
May	.92	1.24	1.73	2.15	2.57	3.00	3.49	4.06	4.80	5.97	7.06
Jun	.49	.73	1.13	1.50	1.88	2.29	2.76	3.33	4.08	5.29	6.45
Jul	.82	1.13	1.62	2.05	2.48	2.94	3.44	4.05	4.84	6.09	7.26
Aug	.38	.60	.98	1.36	1.75	2.18	2.67	3.28	4.10	5.44	6.73
Sep	.02	.08	.23	.40	.61	.85	1.14	1.53	2.08	3.01	3.96
Oct	.04	.09	.21	.36	.54	.76	1.04	1.41	1.93	2.84	3.76
Nov	.03	.11	.23	.36	.50	.66	.85	1.09	1.41	1.96	2.49
Dec	.00	.00	.04	.11	.18	.26	.36	.49	.67	.97	1.27
Ann	14.00	15.05	16.39	17.41	18.31	19.18	20.08	21.07	22.27	24.00	25.50

\+ 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)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	5.8	4.8	1	#
Feb	3.7	2.0	1	#
Mar	5.2	3.0	#	#
Apr	3.1	1.0	#	0
May	.0	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.3	.0	#	0
Oct	1.3	.0	#	0
Nov	2.8	2.0	#	#
Dec	4.1	1.8	1	#
Ann	26.3	14.6	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	6.0	1981	30	16.0	1988	13	1984	18	11	1984
Feb	12.0	1978	13	13.5+	1997	9	1997	24	5	1993
Mar	15.0	1999	13	16.5	1999	15	1999	14	1	1999
Apr	11.0	1989	9	14.0	1989	11	1980	3	1	1988
May	1.0	1991	5	1.0	1991	#	1991	5	#	1991
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	5.0	1985	29	5.0	1985	4	1995	21	#+	1995
Oct	20.0	1997	26	20.0	1997	20	1997	27	3	1997
Nov	12.0	1972	13	13.0	1972	10	1983	29	2	2000
Dec	8.5	1978	7	16.0	1979	12	1982	29	5	1983
Ann	20.0	Oct 1997	26	20.0	Oct 1997	20	Oct 1997	27	11	Jan 1984

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	2.3	1.8	.7	.2	.0
Feb	1.5	1.3	.3	.1	@
Mar	1.7	1.1	.6	.4	.1
Apr	.7	.7	.5	.2	.1
May	@	@	.0	.0	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.1	.1	.1	@	.0
Oct	.2	.2	.1	.1	@
Nov	1.1	.9	.3	.1	@
Dec	1.6	1.3	.6	.2	.0
Ann	9.2	7.4	3.2	1.3	.2

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	5.1	2.8	1.1	.1
Feb	3.4	1.5	.2	.0
Mar	1.9	1.0	.6	.1
Apr	.7	.4	.2	.1
May	.0	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	@	@	.0	.0
Oct	.4	.3	.3	.2
Nov	1.6	.7	.2	.0
Dec	3.3	1.4	.1	.0
Ann	16.4	8.1	2.7	.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	5/19	5/15	5/13	5/10	5/08	5/06	5/04	5/01	4/27
32	5/16	5/11	5/07	5/04	5/01	4/28	4/25	4/21	4/16
28	5/01	4/27	4/24	4/21	4/18	4/16	4/13	4/10	4/06
24	4/21	4/16	4/12	4/09	4/07	4/04	4/01	3/28	3/23
20	4/12	4/07	4/03	3/30	3/27	3/24	3/20	3/16	3/10
16	4/06	3/30	3/25	3/21	3/17	3/13	3/09	3/04	2/25

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	9/19	9/23	9/26	9/28	10/01	10/03	10/05	10/08	10/12
32	9/24	9/29	10/03	10/07	10/10	10/13	10/16	10/20	10/26
28	10/08	10/13	10/17	10/20	10/22	10/25	10/28	10/31	11/05
24	10/17	10/21	10/25	10/27	10/30	11/02	11/05	11/08	11/13
20	10/27	10/31	11/04	11/06	11/09	11/12	11/14	11/18	11/22
16	11/04	11/10	11/14	11/17	11/21	11/24	11/27	12/01	12/07

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	163	157	152	148	145	141	138	133	127
32	183	176	170	165	161	157	152	146	139
28	203	197	193	189	186	183	179	175	169
24	226	219	214	210	206	202	198	193	186
20	249	241	235	231	226	222	217	212	204
16	272	264	258	253	248	243	238	232	224

***** 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	1153	901	773	464	204	36	1	10	87	356	789	1077	5851
60	998	761	618	323	106	10	0	2	31	214	639	922	4624
57	905	680	525	246	64	4	0	0	14	142	551	829	3960
55	843	629	466	200	43	2	0	0	7	102	496	767	3555
50	693	499	324	107	12	0	0	0	0	38	360	621	2654
32	241	150	30	0	0	0	0	0	0	0	58	189	668

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	111	173	280	528	856	1158	1378	1329	1013	669	259	135	7889
55	0	8	3	38	186	469	665	616	330	58	7	0	2380
57	0	4	0	24	145	412	603	554	277	36	2	0	2057
60	0	0	0	11	94	328	510	463	204	14	0	0	1624
65	0	0	0	2	37	203	355	316	109	2	0	0	1024
70	0	0	0	0	10	108	210	187	48	0	0	0	563

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	69	153	340	629	930	1142	1086	786	450	123	36	24	93	246	586	1215	2145	3287	4373	5159	5609	5732	5768
45	4	28	79	224	477	780	987	931	642	314	62	10	4	32	111	335	812	1592	2579	3510	4152	4466	4528	4538
50	0	7	35	126	334	631	832	776	497	199	23	0	0	7	42	168	502	1133	1965	2741	3238	3437	3460	3460
55	0	1	10	67	207	484	677	621	360	105	4	0	0	1	11	78	285	769	1446	2067	2427	2532	2536	2536
60	0	0	0	24	109	344	522	469	240	44	0	0	0	0	0	24	133	477	999	1468	1708	1752	1752	1752
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	44	79	146	244	389	588	739	703	493	308	113	44	44	123	269	513	902	1490	2229	2932	3425	3733	3846	3890

(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