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: UNION, MO **COOP ID: 238515**

Climate Division: MO 3 **NWS Call Sign:** **Elevation: 540 Feet** **Lat: 38˚27N** **Lon: 91˚00W**

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	41.1	20.4	30.8	78+	1950	25	42.5	1990	-26	1977	17	16.5	1977	1062	0	.0	.0	8.9	8.1	26.3	2.4
Feb	47.9	25.2	36.6	85+	1972	29	45.8	1976	-26	1951	2	22.3	1978	797	0	.0	.0	12.4	4.4	20.7	1.1
Mar	58.6	34.5	46.6	88+	1986	29	51.9	1973	-10	1974	24	39.2	1984	572	1	.0	.0	22.8	.6	14.8	.1
Apr	69.7	44.2	57.0	94	1989	26	64.8	1981	17	1954	1	50.9	1983	263	21	.0	.4	28.6	.0	5.0	.0
May	77.8	53.4	65.6	97	1953	26	71.6	1991	28+	1978	2	60.9	1981	97	116	.0	1.5	31.0	.0	.3	.0
Jun	86.1	62.5	74.3	109	1952	29	77.8	1971	35	1972	1	69.6	1974	5	283	.2	9.4	30.0	.0	.0	.0
Jul	90.8	67.2	79.0	118	1954	14	83.8	1980	44	1972	6	75.8	1996	0	434	2.2	18.8	31.0	.0	.0	.0
Aug	89.5	65.1	77.3	109	1984	29	82.6	1995	41+	1986	29	71.6	1992	3	384	1.4	16.1	31.0	.0	.0	.0
Sep	81.8	56.6	69.2	106+	1954	5	74.9	1998	29+	1995	23	62.7	1974	40	166	.2	5.8	30.0	.0	.2	.0
Oct	71.1	44.8	58.0	95+	1980	8	63.0	1971	13	1952	29	51.6	1976	240	23	.0	.4	30.4	.0	4.8	.0
Nov	56.7	35.0	45.9	86	1989	11	52.5	1999	-1	1950	25	37.7	1976	575	0	.0	.0	20.4	.4	14.1	.0
Dec	44.8	25.1	35.0	77	1991	8	42.7	1982	-23	1989	23	21.5	1983	932	0	.0	.0	10.5	4.8	23.2	1.1
Ann	68.0	44.5	56.3	118	Jul 1954	14	83.8	Jul 1980	-26+	Jan 1977	17	16.5	Jan 1977	4586	1428	4.0	52.4	287.0	18.3	109.4	4.7

\+ 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

Means/Medians(1)

Month	Mean	Median
Jan	2.24	1.85
Feb	2.37	1.94
Mar	3.77	3.47
Apr	4.00	3.42
May	4.51	3.48
Jun	4.01	3.53
Jul	3.79	3.89
Aug	3.62	3.44
Sep	3.68	3.09
Oct	3.22	2.97
Nov	4.18	3.66
Dec	3.11	2.75
Ann	42.50	41.05

Extremes

Month	Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year
Jan	2.71	1950	4	6.01	1995	.07	1986
Feb	2.64	1959	10	4.92	1986	.26	1991
Mar	2.52	1977	28	7.36	1973	1.33	1986
Apr	4.35	1996	29	12.44	1994	.95	1977
May	12.15	2000	7	15.83	2000	1.52	1979
Jun	7.56	1957	15	9.15	1985	.90	1988
Jul	4.54	1948	26	8.37	1993	.21	1974
Aug	3.86	1951	21	6.32	1986	.55	1984
Sep	4.75	1993	23	14.77	1993	.05	1979
Oct	2.33	1949	20	6.23	1981	.81	1975
Nov	3.45	1996	7	11.69	1985	.95	1999
Dec	3.47	1982	3	8.67	1987	.61	1980
Ann	12.15	May 2000	7	15.83	May 2000	.05	Sep 1979

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	8.8	4.9	1.3	.5
Feb	7.5	4.7	1.4	.5
Mar	10.7	7.5	2.7	.8
Apr	11.1	7.2	2.6	1.0
May	11.3	7.1	2.8	1.0
Jun	9.3	6.4	2.6	1.2
Jul	8.3	5.9	2.8	1.1
Aug	8.2	5.4	2.4	1.1
Sep	8.3	5.2	2.2	1.2
Oct	8.7	5.7	2.3	.9
Nov	9.7	6.8	2.8	1.3
Dec	8.8	5.4	2.1	.9
Ann	110.7	72.2	28.0	11.5

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	.30	.48	.80	1.11	1.44	1.80	2.22	2.74	3.44	4.59	5.69
Feb	.51	.73	1.07	1.39	1.71	2.05	2.43	2.88	3.49	4.45	5.36
Mar	1.49	1.84	2.34	2.75	3.13	3.53	3.95	4.44	5.07	6.02	6.89
Apr	.98	1.36	1.94	2.46	2.97	3.51	4.12	4.84	5.78	7.27	8.67
May	1.24	1.66	2.32	2.88	3.44	4.03	4.67	5.44	6.43	8.00	9.46
Jun	1.10	1.48	2.06	2.56	3.06	3.57	4.15	4.83	5.71	7.09	8.39
Jul	.67	1.00	1.55	2.07	2.60	3.17	3.83	4.62	5.67	7.38	9.00
Aug	1.16	1.50	2.01	2.44	2.86	3.29	3.77	4.33	5.04	6.16	7.19
Sep	.35	.62	1.11	1.63	2.18	2.81	3.55	4.48	5.76	7.88	9.96
Oct	1.03	1.34	1.79	2.18	2.55	2.94	3.36	3.85	4.49	5.48	6.40
Nov	.98	1.37	1.98	2.53	3.07	3.65	4.30	5.07	6.08	7.68	9.19
Dec	.69	.97	1.43	1.84	2.25	2.69	3.19	3.78	4.56	5.80	6.97
Ann	28.03	30.75	34.28	36.99	39.41	41.78	44.23	46.96	50.30	55.18	59.43

\+ 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	6.1	3.0	1	#
Feb	4.4	3.2	1	#
Mar	2.6	.7	#	#
Apr	.6	.0	#	0
May	.0	.0	0	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.0	.0	0	0
Oct	#	.0	#	0
Nov	1.4	.0	#	#
Dec	3.7	2.0	1	#
Ann	18.8	8.9	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	11.5	1982	31	24.2	1979	14	1979	31	7	1979
Feb	11.0	1984	27	19.7	1993	16	1982	11	9	1982
Mar	8.0	1989	6	11.8	1978	13	1978	9	4	1978
Apr	5.0	1980	14	6.0	1980	5	1980	14	#+	2000
May	.0	0	0	.0	0	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	.0	0	0	.0	0	0	0	0	0	0
Oct	#	1993	31	#+	1993	#+	1996	23	#+	1996
Nov	8.2	1975	27	8.9	1975	9	1975	27	1	1980
Dec	8.4	1973	20	18.2	1973	10	1973	21	4	2000
Ann	11.5	Jan 1982	31	24.2	Jan 1979	16	Feb 1982	11	9	Feb 1982

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	3.3	2.0	.6	.2	@
Feb	2.0	1.2	.6	.1	@
Mar	1.2	.8	.3	.2	.0
Apr	.3	.3	.1	@	.0
May	.0	.0	.0	.0	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.0	.0	.0	.0	.0
Oct	.0	.0	.0	.0	.0
Nov	.6	.5	.1	.1	.0
Dec	2.3	1.3	.4	.2	.0
Ann	9.7	6.1	2.1	.8	@

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	8.0	5.0	3.2	.7
Feb	5.5	4.1	2.9	1.2
Mar	1.7	1.1	.7	.2
Apr	.2	.1	@	.0
May	.0	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.0	.0	.0	.0
Nov	.8	.2	.1	.0
Dec	4.5	2.6	1.6	.1
Ann	20.7	13.1	8.5	2.2

+ 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	5/18	5/12	5/08	5/05	5/02	4/29	4/26	4/22	4/17
32	5/08	5/02	4/28	4/25	4/22	4/19	4/15	4/11	4/06
28	4/23	4/18	4/14	4/11	4/08	4/06	4/03	3/30	3/25
24	4/13	4/08	4/04	4/01	3/29	3/26	3/23	3/19	3/14
20	4/06	3/30	3/25	3/21	3/18	3/14	3/10	3/05	2/26
16	3/22	3/14	3/08	3/04	2/27	2/23	2/18	2/13	2/05

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	9/24	9/27	9/29	10/02	10/04	10/07	10/10	10/15
32	9/26	10/01	10/04	10/07	10/09	10/12	10/15	10/18	10/22
28	10/06	10/12	10/15	10/18	10/21	10/24	10/28	10/31	11/06
24	10/22	10/28	11/01	11/04	11/08	11/11	11/14	11/18	11/24
20	10/29	11/05	11/09	11/14	11/17	11/21	11/25	11/30	12/07
16	11/08	11/15	11/20	11/24	11/28	12/02	12/06	12/11	12/18

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	170	164	159	156	152	148	145	140	134
32	190	183	178	174	170	166	162	157	150
28	218	210	204	200	195	191	186	180	173
24	243	236	231	227	223	219	214	209	203
20	272	263	256	250	244	239	233	226	216
16	302	292	285	279	273	267	261	253	243

***** 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	1062	797	572	263	97	5	0	3	40	240	575	932	4586
60	907	663	428	153	40	1	0	0	10	131	432	777	3542
57	816	585	345	102	20	0	0	0	3	83	351	691	2996
55	761	533	294	75	12	0	0	0	1	58	299	634	2667
50	615	411	188	27	3	0	0	0	0	19	190	492	1945
32	209	108	13	0	0	0	0	0	0	0	12	131	473

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	171	235	465	748	1042	1268	1457	1404	1116	806	427	222	9361
55	9	16	33	133	341	578	744	691	428	151	24	12	3160
57	2	12	22	101	287	518	682	629	370	113	15	7	2758
60	0	7	12	62	214	428	589	536	286	68	7	0	2209
65	0	0	1	21	116	283	434	384	166	23	0	0	1428
70	0	0	0	5	49	154	280	243	79	4	0	0	814

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	41	101	256	509	788	1025	1208	1152	869	555	226	72	41	142	398	907	1695	2720	3928	5080	5949	6504	6730	6802
45	14	52	162	367	633	875	1053	997	719	408	138	31	14	66	228	595	1228	2103	3156	4153	4872	5280	5418	5449
50	7	21	91	244	478	725	898	842	569	268	75	14	7	28	119	363	841	1566	2464	3306	3875	4143	4218	4232
55	0	9	44	145	328	575	743	687	424	158	33	2	0	9	53	198	526	1101	1844	2531	2955	3113	3146	3148
60	0	1	21	75	200	426	588	533	289	75	10	0	0	1	22	97	297	723	1311	1844	2133	2208	2218	2218
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	38	81	178	329	511	689	808	769	572	364	155	53	38	119	297	626	1137	1826	2634	3403	3975	4339	4494	4547

(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