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: HANNIBAL WATER WORKS, MO **COOP ID: 233601**

Climate Division: MO 2 **NWS Call Sign:** **Elevation: 712 Feet** **Lat: 39˚43N** **Lon: 91˚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	33.0	16.1	24.6	75	1950	24	36.9	1990	-21	1985	20	10.5	1977	1254	0	.0	.0	3.4	14.1	28.2	4.6
Feb	39.3	21.3	30.3	81	1972	29	39.4	1998	-19	1996	3	16.7	1979	972	0	.0	.0	7.0	8.7	23.1	2.4
Mar	50.9	31.9	41.4	88	1950	26	47.8	1973	-9	1960	5	33.3	1984	732	0	.0	.0	16.6	2.3	16.7	.2
Apr	63.0	43.1	53.1	93+	1987	21	59.6	1981	16	1975	3	47.0	1983	369	10	.0	.1	25.9	.1	3.9	.0
May	72.9	53.4	63.2	93+	1988	15	69.3	1987	30+	1976	3	58.4	1995	145	87	.0	.5	30.8	.0	.1	.0
Jun	81.9	62.4	72.2	103	1988	26	76.9	1971	44	1950	4	67.7	1982	11	225	.1	4.9	30.0	.0	.0	.0
Jul	86.4	66.9	76.7	114	1954	14	81.2	1983	48	1971	30	72.4	1971	0	362	.8	11.3	31.0	.0	.0	.0
Aug	84.5	64.6	74.6	105	1984	30	81.7	1983	43	1986	28	68.9	1992	10	307	.7	7.6	31.0	.0	.0	.0
Sep	77.4	56.1	66.8	101	1954	4	72.0	1998	32	1984	29	60.9	1974	66	119	.0	2.9	30.0	.0	@	.0
Oct	66.4	44.5	55.5	94	1953	2	61.9	1971	21	1972	19	48.7	1976	309	12	.0	.1	29.2	.0	2.4	.0
Nov	51.1	33.3	42.2	82	2000	2	51.7	1999	-6	1964	30	34.8	1996	684	0	.0	.0	15.8	2.0	14.6	.0
Dec	37.5	21.4	29.5	74	1991	9	37.0	1982	-21+	1989	23	14.9	1983	1103	0	.0	.0	5.5	9.5	26.5	2.1
Ann	62.0	42.9	52.5	114	Jul 1954	14	81.7	Aug 1983	-21+	Dec 1989	23	10.5	Jan 1977	5655	1122	1.6	27.4	256.2	36.7	115.5	9.3

\+ 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: 1948-2001

(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	1.75	1.69	1.90	1971	3	4.01	1979	.12	1986
Feb	2.14	1.59	4.37	1997	21	6.35	1997	.31	1991
Mar	3.24	3.15	2.28	1962	20	10.20	1973	.73	1995
Apr	3.78	3.78	2.62	1981	12	8.48	1981	1.08	1971
May	4.83	4.07	3.61	1991	15	10.82	1995	1.01	1992
Jun	3.46	2.76	4.00	1982	9	9.01	1993	.32	1991
Jul	4.32	3.66	5.92	1949	20	18.91	1981	.40	1975
Aug	4.06	3.62	4.79	1981	31	11.37	1995	.44	1984
Sep	3.27	2.79	3.76	1961	13	10.03	1993	.43	1979
Oct	3.24	2.68	4.54	1969	12	8.52	1977	.75	1987
Nov	3.49	3.08	2.43	1964	15	11.50	1985	.25	1999
Dec	2.59	2.25	3.38	1982	3	8.65	1982	.48	1976
Ann	40.17	37.34	5.92	Jul 1949	20	18.91	Jul 1981	.12	Jan 1986

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	8.6	4.5	.8	.3
Feb	7.9	4.5	1.3	.4
Mar	10.1	6.8	2.0	.7
Apr	10.8	7.0	2.7	.8
May	11.5	7.5	3.3	1.3
Jun	10.0	6.4	2.5	.8
Jul	8.9	6.2	2.7	1.6
Aug	8.4	5.9	2.5	1.3
Sep	8.4	5.7	2.1	.9
Oct	9.1	5.6	2.2	1.0
Nov	9.3	6.4	2.7	.8
Dec	9.1	5.0	1.7	.6
Ann	112.1	71.5	26.5	10.5

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	.46	.71	.95	1.19	1.46	1.76	2.13	2.62	3.41	4.17
Feb	.47	.66	.98	1.26	1.55	1.85	2.19	2.60	3.14	4.00	4.81
Mar	.90	1.21	1.67	2.08	2.48	2.90	3.36	3.90	4.61	5.73	6.76
Apr	1.08	1.44	1.98	2.45	2.91	3.39	3.92	4.55	5.36	6.63	7.81
May	1.48	1.94	2.62	3.21	3.78	4.37	5.02	5.78	6.77	8.31	9.73
Jun	.72	1.03	1.54	2.01	2.47	2.97	3.53	4.21	5.10	6.52	7.87
Jul	.75	1.13	1.76	2.35	2.95	3.61	4.36	5.26	6.48	8.43	10.30
Aug	1.03	1.41	2.00	2.52	3.04	3.58	4.18	4.90	5.84	7.32	8.71
Sep	.88	1.19	1.66	2.08	2.48	2.91	3.38	3.94	4.68	5.82	6.89
Oct	.92	1.22	1.69	2.09	2.49	2.90	3.36	3.90	4.60	5.70	6.72
Nov	.58	.88	1.39	1.87	2.36	2.90	3.51	4.26	5.25	6.87	8.42
Dec	.60	.84	1.22	1.56	1.90	2.26	2.66	3.14	3.77	4.77	5.71
Ann	26.57	29.13	32.44	34.99	37.26	39.48	41.78	44.34	47.47	52.04	56.03

\+ 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)

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	7.0	5.0	2	1	9.5	1995	19	31.0	1979	19	1979	14	10	1977	4.0	2.6	.9	.4	.0	10.4	6.3	3.2	.6
Feb	5.7	4.0	2	1	9.0	1978	13	20.8	1975	15	1975	25	10	1979	2.7	2.0	.6	.2	.0	10.7	5.9	3.2	.2
Mar	3.5	1.4	#	#	7.5	1978	3	25.6	1978	18	1978	8	7	1978	1.5	1.2	.4	.1	.0	2.4	1.0	.7	.3
Apr	.9	.0	#	0	5.5	1980	15	9.0	1980	5	1980	15	#+	1997	.4	.3	.1	@	.0	.3	.1	@	.0
May	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.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	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	#	.0	#	0	#	1993	31	#	1993	#	1993	30	#	1993	.0	.0	.0	.0	.0	.0	.0	.0	.0
Nov	1.5	.0	#	0	6.5	1975	27	9.5	1975	9	1975	28	1	1975	.7	.4	.2	.1	.0	.7	.4	.2	.0
Dec	5.5	4.0	1	#	10.0	1987	15	18.2	1973	10	1987	16	4	2000	2.6	1.7	.6	.2	@	5.0	2.6	1.4	.1
Ann	24.1	14.4	N/A	N/A	10.0	Dec 1987	15	31.0	Jan 1979	19	Jan 1979	14	10+	Feb 1979	11.9	8.2	2.8	1.0	@	29.5	16.3	8.7	1.2

+ 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	5/06	5/01	4/28	4/25	4/22	4/19	4/16	4/13	4/08
32	4/27	4/22	4/18	4/16	4/13	4/10	4/07	4/04	3/30
28	4/16	4/12	4/09	4/07	4/04	4/02	3/31	3/28	3/24
24	4/09	4/03	3/30	3/27	3/23	3/20	3/17	3/13	3/07
20	3/29	3/24	3/20	3/16	3/13	3/10	3/06	3/02	2/24
16	3/26	3/18	3/12	3/07	3/02	2/25	2/20	2/14	2/06

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

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	190	183	178	174	170	166	161	156	149
32	212	205	200	195	191	187	183	178	171
28	230	224	219	215	211	208	204	199	193
24	263	253	247	241	235	230	224	217	208
20	279	270	265	260	255	250	245	239	231
16	305	294	286	280	274	267	261	253	242

***** 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	1254	972	732	369	145	11	0	10	66	309	684	1103	5655
60	1099	832	581	242	72	2	0	1	21	186	539	948	4523
57	1006	753	496	179	43	0	0	0	8	128	457	856	3926
55	944	701	440	142	28	0	0	0	4	96	403	796	3554
50	799	572	311	70	9	0	0	0	0	41	282	653	2737
32	330	207	46	0	0	0	0	0	0	0	38	229	850

Base — Cooling Degree Days (1)

Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	99	159	337	632	965	1204	1385	1320	1043	726	344	150	8364
55	0	10	18	84	280	514	672	607	356	110	19	4	2674
57	0	6	12	60	232	454	610	545	301	79	13	1	2313
60	0	0	4	34	169	366	517	453	224	45	5	0	1817
65	0	0	0	10	87	225	362	307	119	12	0	0	1122
70	0	0	0	2	34	110	216	180	50	2	0	0	594

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	13	57	175	423	734	983	1153	1085	816	491	176	36	13	70	245	668	1402	2385	3538	4623	5439	5930	6106	6142
45	3	23	104	294	579	833	998	930	666	349	102	15	3	26	130	424	1003	1836	2834	3764	4430	4779	4881	4896
50	1	6	58	189	431	683	843	775	519	227	54	2	1	7	65	254	685	1368	2211	2986	3505	3732	3786	3788
55	0	1	29	104	290	534	688	620	374	132	24	0	0	1	30	134	424	958	1646	2266	2640	2772	2796	2796
60	0	0	9	53	168	384	533	466	247	60	5	0	0	0	9	62	230	614	1147	1613	1860	1920	1925	1925
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	7	40	110	245	451	664	790	741	523	290	101	24	7	47	157	402	853	1517	2307	3048	3571	3861	3962	3986

(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