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: FORT MADISON, IA **COOP ID: 133007**

Climate Division: IA 9 **NWS Call Sign:** **Elevation: 530 Feet** **Lat: 40˚37N** **Lon: 91˚20W**

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	31.9	16.3	24.1	67	1957	22	35.5	1990	-23+	1982	10	11.4	1979	1269	0	.0	.0	2.2	13.9	28.9	5.9
Feb	37.2	21.9	29.6	71+	1954	15	40.0	1976	-21+	1975	9	14.3	1978	994	0	.0	.0	5.0	9.8	24.0	3.0
Mar	49.3	33.0	41.2	81	1967	31	48.7	1973	-11	1962	1	33.7	1978	740	0	.0	.0	14.9	2.4	17.2	@
Apr	61.9	43.8	52.9	89	1987	29	58.5	1981	11	1982	6	47.7	1982	371	7	.0	.0	25.8	.1	4.4	.0
May	72.8	54.8	63.8	93	1953	30	70.0	1977	22	1966	11	58.7	1997	134	97	.0	.3	30.9	.0	.2	.0
Jun	81.8	64.5	73.2	104	1988	25	78.1	1971	41	1956	2	67.4	1982	10	255	.1	3.7	30.0	.0	.0	.0
Jul	86.3	69.9	78.1	104	1966	14	83.4	1983	47+	1971	30	73.4	1992	0	405	.5	9.8	31.0	.0	.0	.0
Aug	83.8	67.6	75.7	104	1983	18	83.7	1983	42	1977	13	69.9	1992	8	340	.4	6.6	31.0	.0	.0	.0
Sep	76.6	58.7	67.7	100	2000	2	72.4	1998	31+	1984	26	62.0	1993	52	131	@	1.9	30.0	.0	.1	.0
Oct	64.6	46.5	55.6	92	1953	2	62.5	1971	15	1972	19	50.4	1988	305	13	.0	@	28.9	.0	2.9	.0
Nov	48.9	34.1	41.5	81	1968	1	48.7	1999	-5	1964	30	34.6	1976	706	0	.0	.0	14.4	1.8	16.0	.1
Dec	35.8	21.9	28.9	70+	1970	4	39.3	1982	-19+	1983	19	15.4	1983	1120	0	.0	.0	3.5	9.8	26.8	3.1
Ann	60.9	44.4	52.7	104+	Jun 1988	25	83.7	Aug 1983	-23+	Jan 1982	10	11.4	Jan 1979	5709	1248	1.0	22.3	247.6	37.8	120.5	12.1

\+ 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: 1952-2001

(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	1.32	1.15	1.55	1965	1	3.28	1999	.00	1981
Feb	1.57	1.25	1.94	1997	21	4.84	1997	.27	1972
Mar	3.03	2.81	3.38	1985	4	6.70	1973	.24	1971
Apr	3.65	3.60	3.00	1983	2	7.88	1973	.56	1985
May	4.92	4.58	4.06	1996	27	12.24	1996	1.69	1988
Jun	4.26	3.31	4.88	1993	24	10.52	1993	.23	1991
Jul	4.44	3.60	4.04	1961	19	12.88	1993	.34	1988
Aug	3.56	3.30	8.50	1959	6	7.71	1977	.94	2000
Sep	3.81	3.17	4.33	1961	13	8.73	1986	.00	1979
Oct	2.77	2.26	3.30	1969	13	7.73	1998	.96	1988
Nov	2.96	2.72	3.10	1990	27	8.38	1985	.18	1999
Dec	2.25	2.40	3.00	1982	2	6.26	1982	.13	1976
Ann	38.54	38.01	8.50	Aug 1959	6	12.88	Jul 1993	.00+	Jan 1981

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	7.4	3.7	.6	.2
Feb	7.0	3.8	.9	.4
Mar	10.1	5.8	1.9	.5
Apr	11.8	7.2	2.5	.6
May	11.9	8.1	3.4	1.4
Jun	10.0	6.9	2.9	1.3
Jul	9.4	6.6	2.9	1.4
Aug	9.2	6.3	2.6	1.1
Sep	8.1	5.7	2.9	1.1
Oct	8.8	5.2	1.8	.7
Nov	9.1	5.5	2.2	.6
Dec	8.2	4.6	1.2	.6
Ann	111.0	69.4	25.8	9.9

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	.11	.26	.47	.66	.86	1.08	1.32	1.63	2.03	2.68	3.30
Feb	.34	.48	.71	.92	1.13	1.35	1.60	1.90	2.30	2.93	3.52
Mar	.48	.74	1.18	1.60	2.03	2.50	3.04	3.70	4.58	6.01	7.38
Apr	1.16	1.51	2.02	2.46	2.89	3.32	3.80	4.37	5.09	6.22	7.27
May	1.71	2.17	2.85	3.42	3.96	4.53	5.14	5.86	6.77	8.19	9.49
Jun	.84	1.23	1.85	2.43	3.01	3.63	4.34	5.19	6.31	8.12	9.83
Jul	.90	1.30	1.95	2.55	3.15	3.79	4.52	5.40	6.56	8.42	10.18
Aug	1.19	1.53	2.02	2.44	2.85	3.26	3.72	4.25	4.93	5.99	6.97
Sep	.95	1.50	2.12	2.61	3.07	3.54	4.04	4.63	5.38	6.54	7.61
Oct	.68	.94	1.35	1.70	2.06	2.43	2.85	3.35	4.00	5.03	6.00
Nov	.39	.63	1.05	1.46	1.89	2.37	2.93	3.62	4.54	6.06	7.53
Dec	.44	.64	.97	1.28	1.58	1.92	2.29	2.74	3.34	4.31	5.22
Ann	24.88	27.43	30.74	33.30	35.59	37.82	40.15	42.75	45.92	50.57	54.64

\+ 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: 1952-2001
(3) Derived from 1971-2000 serially complete daily data

Complete documentation available from:
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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	4.2	3.5	2	1
Feb	3.8	2.5	1	#
Mar	1.6	.0	#	0
Apr	.4	.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	#	0
Nov	.4	.0	#	0
Dec	4.4	3.3	1	#
Ann	14.8	9.3	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	10.0	1995	19	10.0	1995	17	1999	2	9	1979
Feb	6.0	1986	23	13.0+	1993	11	1994	25	5	1979
Mar	6.0	1999	8	10.1	1984	8	1978	3	5	1978
Apr	6.0	1997	10	10.0	1997	5	1997	11	1	1997
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	1.0	1997	26	1.0	1997	1	1997	26	#	1997
Nov	2.0	1976	27	2.0+	1993	8	1975	26	#+	1998
Dec	8.5	1987	15	13.0	1973	13	2000	29	6	2000
Ann	10.0	Jan 1995	19	13.0+	Feb 1993	17	Jan 1999	2	9	Jan 1979

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	3.3	2.1	.6	.2	@
Feb	2.0	1.4	.4	.2	.0
Mar	1.1	.6	.1	.1	.0
Apr	.1	.1	.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
Nov	.3	.2	.0	.0	.0
Dec	2.8	1.9	.7	.2	.0
Ann	9.6	6.3	1.9	.7	@

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	13.6	5.4	1.9	.2
Feb	4.5	2.2	1.2	.2
Mar	1.5	.4	.3	.0
Apr	.2	.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	.1	.0	.0	.0
Nov	.6	.0	.0	.0
Dec	4.8	3.1	1.9	.4
Ann	25.3	11.3	5.4	.8

+ 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	5/11	5/06	5/02	4/29	4/25	4/22	4/19	4/15	4/10
32	4/30	4/25	4/21	4/17	4/14	4/11	4/07	4/03	3/29
28	4/14	4/11	4/08	4/06	4/04	4/02	3/31	3/29	3/25
24	4/09	4/03	3/31	3/28	3/25	3/22	3/19	3/15	3/10
20	4/03	3/27	3/22	3/17	3/13	3/09	3/05	2/28	2/21
16	3/26	3/18	3/11	3/06	3/01	2/24	2/19	2/12	2/04

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	9/22	9/27	10/01	10/04	10/06	10/09	10/12	10/16	10/21
32	10/03	10/09	10/13	10/16	10/20	10/23	10/27	10/31	11/06
28	10/15	10/21	10/25	10/29	11/01	11/04	11/08	11/12	11/18
24	10/27	11/01	11/04	11/07	11/10	11/12	11/15	11/19	11/23
20	11/01	11/07	11/11	11/15	11/18	11/22	11/25	11/30	12/06
16	11/07	11/14	11/19	11/23	11/27	12/01	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	185	177	172	168	163	159	154	149	142
32	212	204	198	193	188	183	178	172	164
28	230	223	218	214	210	206	202	197	190
24	251	243	238	233	229	225	220	215	207
20	279	269	261	255	249	243	237	229	219
16	306	294	285	277	270	263	256	247	235

***** 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	1269	994	740	371	134	10	0	8	52	305	706	1120	5709
60	1114	854	586	242	65	2	0	0	14	183	557	965	4582
57	1021	776	501	176	37	0	0	0	5	125	473	872	3986
55	960	724	444	138	24	0	0	0	2	94	418	814	3618
50	815	594	312	65	7	0	0	0	0	40	292	671	2796
32	344	226	46	0	0	0	0	0	0	0	38	245	899

Base — Cooling Degree Days (1)

Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	98	156	329	626	986	1235	1428	1355	1070	731	322	149	8485
55	0	10	14	74	297	545	715	642	382	111	13	5	2808
57	0	7	9	52	248	485	653	580	324	81	8	0	2447
60	0	0	1	28	183	396	560	487	244	46	2	0	1947
65	0	0	0	7	97	255	405	340	131	13	0	0	1248
70	0	0	0	1	41	136	258	208	56	2	0	0	702

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	5	32	140	383	710	971	1148	1078	800	463	136	19	5	37	177	560	1270	2241	3389	4467	5267	5730	5866	5885
45	0	10	76	256	555	821	993	923	650	321	72	6	0	10	86	342	897	1718	2711	3634	4284	4605	4677	4683
50	0	0	38	149	405	671	838	768	503	200	31	2	0	0	38	187	592	1263	2101	2869	3372	3572	3603	3605
55	0	0	13	78	269	521	683	613	360	108	9	0	0	0	13	91	360	881	1564	2177	2537	2645	2654	2654
60	0	0	2	34	152	373	528	458	233	50	2	0	0	0	2	36	188	561	1089	1547	1780	1830	1832	1832
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	2	17	81	219	435	655	797	739	514	271	73	7	2	19	100	319	754	1409	2206	2945	3459	3730	3803	3810

(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