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: ESTHERVILLE 2 N, IA **COOP ID: 132724**

Climate Division: IA 1 **NWS Call Sign:** **Elevation: 1,302 Feet** **Lat: 43˚26N** **Lon: 94˚50W**

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	22.9	4.0	13.5	64	1981	25	26.7	1990	-30+	1967	18	.4	1979	1598	0	.0	.0	.4	22.7	30.9	13.3
Feb	29.0	10.2	19.6	65	1981	18	32.4	1987	-29+	1996	2	4.9	1979	1271	0	.0	.0	1.8	16.8	27.5	7.8
Mar	40.7	21.7	31.2	85	1986	30	40.6	2000	-20	1962	1	22.0	1975	1048	0	.0	.0	7.3	8.0	26.4	2.0
Apr	56.4	33.3	44.9	90	1970	29	51.8	1987	7+	1975	2	39.1	1983	607	1	.0	.0	20.6	1.0	12.8	.0
May	70.4	46.3	58.4	98	1967	26	66.2	1977	18	1967	3	51.7	1997	255	49	.0	.6	30.1	.0	1.3	.0
Jun	79.6	56.3	68.0	102	1985	9	73.1	1988	36	1969	3	62.4	1982	44	132	.1	3.3	30.0	.0	.0	.0
Jul	82.8	60.3	71.6	104+	1955	28	75.8	1983	41	1971	30	64.1	1992	14	216	.1	4.7	31.0	.0	.0	.0
Aug	80.2	57.7	69.0	103	1955	1	75.5	1983	36	1950	20	63.6	1992	39	162	.1	2.5	31.0	.0	.0	.0
Sep	72.8	47.6	60.2	99	1976	7	66.1	1978	24	1974	22	55.0	1993	177	32	.0	1.1	29.5	.0	1.1	.0
Oct	60.5	35.7	48.1	93	1997	3	53.8	1973	13+	1967	28	43.0	1976	525	0	.0	.1	25.3	.3	11.4	.0
Nov	41.3	22.7	32.0	80+	1961	16	42.1	1999	-12	1977	26	22.4	1985	990	0	.0	.0	8.3	8.3	25.2	1.1
Dec	27.1	9.5	18.3	67	1998	2	27.0	1998	-25+	1983	19	1.3	1983	1447	0	.0	.0	1.1	19.9	30.6	8.2
Ann	55.3	33.8	44.6	104+	Jul 1955	28	75.8	Jul 1983	-30+	Jan 1967	18	.4	Jan 1979	8015	592	.3	12.3	216.4	77.0	167.2	32.4

\+ 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

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	.67	.49	1.41	1973	4	2.97	1998	.00+	2000
Feb	.48	.30	1.68	1971	19	3.41	1971	.00+	2000
Mar	1.73	1.50	1.51	1985	4	4.07	1998	.00	1999
Apr	3.10	2.81	2.30	1975	27	7.67	1975	.62	1980
May	3.47	3.21	3.50	1951	1	7.36	1993	1.16	1989
Jun	4.65	3.79	3.89	1991	4	13.51	1993	1.42	1988
Jul	3.55	3.07	2.50+	1950	9	10.50	1987	.33	1975
Aug	3.82	3.82	5.80	1962	30	8.44	1980	.17	1999
Sep	2.68	2.29	4.75	1964	9	6.05	1973	.24	1984
Oct	2.15	1.73	2.01+	1992	7	8.35	1998	.12	1989
Nov	1.48	1.25	2.40	1975	21	5.34	1975	.05	1980
Dec	.63	.57	1.11	1984	16	1.96	1973	.00	1998
Ann	28.41	27.87	5.80	Aug 1962	30	13.51	Jun 1993	.00+	Feb 2000

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	5.2	2.0	.3	.1
Feb	4.1	1.3	.2	@
Mar	7.4	4.3	1.1	.2
Apr	10.4	6.2	2.0	.8
May	10.7	6.9	2.5	.6
Jun	10.4	7.3	3.0	1.5
Jul	9.8	6.4	2.5	.9
Aug	9.1	6.4	2.7	1.4
Sep	8.2	5.2	1.7	.5
Oct	6.2	3.9	1.5	.6
Nov	6.1	3.3	1.1	.4
Dec	5.2	2.2	.2	.1
Ann	92.8	55.4	18.8	7.1

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	.00	.06	.16	.27	.42	.59	.82	1.14	1.68	2.24
Feb	.00	.00	.00	.10	.19	.30	.43	.60	.82	1.21	1.58
Mar	.14	.33	.61	.87	1.13	1.41	1.74	2.14	2.67	3.54	4.37
Apr	.77	1.06	1.51	1.91	2.31	2.73	3.19	3.74	4.47	5.61	6.68
May	1.23	1.55	2.03	2.43	2.81	3.20	3.63	4.12	4.76	5.74	6.64
Jun	1.24	1.68	2.36	2.95	3.53	4.13	4.81	5.61	6.65	8.28	9.81
Jul	.72	1.05	1.57	2.04	2.52	3.04	3.62	4.32	5.24	6.72	8.13
Aug	.89	1.25	1.81	2.31	2.81	3.33	3.92	4.63	5.55	7.02	8.39
Sep	.57	.82	1.21	1.57	1.93	2.31	2.74	3.26	3.94	5.03	6.06
Oct	.22	.38	.68	.98	1.30	1.67	2.09	2.62	3.35	4.55	5.73
Nov	.12	.22	.41	.61	.84	1.10	1.41	1.80	2.34	3.24	4.14
Dec	.03	.09	.19	.28	.38	.49	.61	.77	.98	1.34	1.68
Ann	18.77	20.58	22.93	24.73	26.35	27.92	29.55	31.37	33.59	36.83	39.66

\+ 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	7.8	5.0	5	4
Feb	5.1	5.0	4	1
Mar	6.5	6.0	1	#
Apr	2.4	.2	#	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
Oct	.5	.0	#	0
Nov	4.2	4.0	#	#
Dec	7.5	8.0	2	1
Ann	34.0	28.2	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	14.0	1975	11	28.9	1975	27	1979	27	22	1979
Feb	9.0	1991	19	15.0	1971	26	1975	19	22	1975
Mar	10.0	1983	27	18.0	1983	17	1975	15	8	1975
Apr	7.0	1985	4	11.6	1983	3	1989	8	#+	1992
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	#	1985	30	#+	1985	0	0	0	0	0
Oct	4.0	1991	19	4.5	1991	2	1976	24	#+	1997
Nov	12.0	1991	1	14.3	1983	5	1988	30	2+	1997
Dec	8.0	1987	28	14.8	1972	11	1972	20	7	1972
Ann	14.0	Jan 1975	11	28.9	Jan 1975	27	Jan 1979	27	22+	Jan 1979

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	3.5	1.8	.6	.2	@
Feb	3.3	1.5	.4	.1	.0
Mar	2.8	1.9	.8	.2	@
Apr	1.1	.8	.2	.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	.3	.2	@	.0	.0
Nov	2.2	1.3	.4	.2	.1
Dec	3.3	1.8	.6	.3	.0
Ann	16.5	9.3	3.0	1.1	.1

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	-9.9	-9.9	-9.9	-9.9
Feb	-9.9	-9.9	-9.9	-9.9
Mar	-9.9	-9.9	-9.9	-9.9
Apr	.6	.2	.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	.3	.0	.0	.0
Nov	3.3	.7	.1	.0
Dec	12.1	6.7	4.1	1.4
Ann	-9.9	-9.9	-9.9	-9.9

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

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	9/12	9/16	9/18	9/21	9/23	9/25	9/27	9/29	10/03
32	9/21	9/24	9/27	9/29	10/01	10/03	10/05	10/07	10/11
28	9/25	9/30	10/04	10/07	10/10	10/13	10/16	10/20	10/25
24	10/07	10/13	10/17	10/21	10/24	10/27	10/31	11/04	11/10
20	10/13	10/19	10/23	10/27	10/30	11/03	11/07	11/11	11/17
16	10/25	10/31	11/05	11/08	11/12	11/15	11/19	11/24	11/30

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	152	146	142	138	134	131	127	122	116
32	169	163	159	156	152	149	145	141	135
28	196	188	182	177	173	168	163	157	149
24	220	213	208	203	199	195	190	185	178
20	237	228	222	216	211	206	200	194	185
16	256	248	242	237	232	227	222	216	208

***** 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)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	1598	1271	1048	607	255	44	14	39	177	525	990	1447	8015
60	1443	1131	893	462	157	12	0	10	83	374	840	1292	6697
57	1350	1047	800	380	110	4	0	3	46	290	750	1199	5979
55	1288	991	738	328	85	2	0	1	28	239	691	1137	5528
50	1133	858	594	213	38	0	0	0	6	132	551	982	4507
32	613	417	178	12	0	0	0	0	0	4	160	479	1863

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	38	70	153	397	816	1078	1225	1145	845	502	160	55	6484
55	0	0	0	23	188	390	512	433	183	24	1	0	1754
57	0	0	0	14	152	332	450	373	141	13	0	0	1475
60	0	0	0	7	105	249	357	287	88	4	0	0	1097
65	0	0	0	1	49	132	216	162	32	0	0	0	592
70	0	0	0	0	18	52	106	74	7	0	0	0	257

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	0	5	46	221	582	844	983	907	621	293	49	2	0	5	51	272	854	1698	2681	3588	4209	4502	4551	4553
45	0	0	21	128	431	694	828	752	473	178	19	0	0	0	21	149	580	1274	2102	2854	3327	3505	3524	3524
50	0	0	6	69	292	544	673	597	334	94	6	0	0	0	6	75	367	911	1584	2181	2515	2609	2615	2615
55	0	0	1	32	176	396	518	442	212	44	0	0	0	0	1	33	209	605	1123	1565	1777	1821	1821	1821
60	0	0	0	13	93	259	364	291	120	13	0	0	0	0	0	13	106	365	729	1020	1140	1153	1153	1153
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	2	35	144	351	543	656	591	382	192	36	1	0	2	37	181	532	1075	1731	2322	2704	2896	2932	2933

(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:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

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