

# Climatology of the United States

## No. 20

National Climatic Data Center  
Federal Building  
151 Patton Avenue  
Asheville, North Carolina 28801  
www.ncdc.noaa.gov

Station: WATERLOO MUNICIPAL AP, IA

1971-2000

COOP ID: 138706

Climate Division: IA 3

NWS Call Sign: ALO

Elevation: 865 Feet Lat: 42°33N Lon: 92°24W

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	25.8	6.3	16.1	58	1981	24	29.2	1990	-33	1994	20	1.5	1977	1532	0	.0	.0	.4	21.5	30.5	11.1
Feb	31.9	13.2	22.6	66	1981	17	34.5	1998	-31+	1996	2	8.8	1978	1202	0	.0	.0	1.9	14.3	26.3	6.6
Mar	45.0	24.9	35.0	87	1986	29	42.5	2000	-34	1962	1	25.5	1975	946	0	.0	.0	9.8	5.5	23.2	1.1
Apr	59.7	35.8	47.8	100	1980	22	54.0	1985	-4	1982	6	42.3	1982	528	7	@	.1	23.2	.4	10.3	@
May	72.2	48.1	60.2	94	1967	26	66.0	1977	25	1971	3	54.6	1971	205	47	.0	.8	30.7	.0	1.1	.0
Jun	81.7	58.1	69.9	103	1988	21	74.1	1991	38	1964	1	64.2	1982	29	168	.1	3.9	30.0	.0	.0	.0
Jul	85.0	62.2	73.6	105	1988	31	77.4	1983	42	1984	7	67.9	1992	7	261	.2	6.4	31.0	.0	.0	.0
Aug	82.8	59.5	71.2	105	1988	17	77.8	1983	33	1950	20	65.0	1992	20	198	.3	4.2	31.0	.0	.0	.0
Sep	75.3	49.8	62.6	98+	1955	9	68.1	1978	22	1967	29	57.6	1975	155	70	.0	1.6	29.9	.0	1.0	.0
Oct	62.5	37.8	50.2	95+	1963	6	55.5	1971	11	1988	30	44.2	1988	478	7	.0	.2	27.1	.0	9.6	.0
Nov	45.0	25.1	35.1	80	1999	8	42.8	1999	-17	1977	26	27.5	1976	903	0	.0	.0	10.0	5.1	22.5	.6
Dec	30.7	12.5	21.6	67+	1998	4	30.5	1982	-29	2000	25	7.2	1983	1343	0	.0	.0	1.2	16.7	29.6	6.4
Ann	58.1	36.1	47.2	105+	Aug 1988	17	77.8	Aug 1983	-34	Mar 1962	1	1.5	Jan 1977	7348	758	.6	17.2	226.2	63.5	154.1	25.8

+ 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/normal/usnormals.html](http://www.ncdc.noaa.gov/oa/climate/normal/usnormals.html)

Issue Date: February 2004

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1950-2001

(3) Derived from 1971-2000 serially complete daily data

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**NWS Call Sign: ALO**

**Elevation: 865 Feet**

**Lat: 42°33N**

**Lon: 92°24W**

Precipitation (inches)																								
	Precipitation Totals									Mean Number of Days (3)				Precipitation Probabilities (1) Probability that the monthly/annual precipitation will be equal to or less than the indicated amount										
	Means/ Medians(1)		Extremes							Daily Precipitation				Monthly/Annual Precipitation vs Probability Levels These values were determined from the incomplete gamma distribution										
Month	Mean	Med-ian	Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year	>= 0.01	>= 0.10	>= 0.50	>= 1.00	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
Jan	.84	.76	1.46	1971	3	2.19	1996	.18	1976	7.6	2.3	.2	@	.23	.31	.43	.53	.64	.74	.86	1.01	1.19	1.48	1.75
Feb	1.05	.95	1.32	1981	22	3.54	1971	.08	1996	7.2	2.7	.5	.1	.14	.22	.37	.51	.67	.84	1.04	1.28	1.61	2.16	2.68
Mar	2.13	2.03	1.95	1998	30	4.46	1990	.16	1994	9.7	4.6	1.4	.3	.39	.57	.88	1.17	1.47	1.79	2.15	2.59	3.18	4.12	5.02
Apr	3.23	3.06	2.65	1979	20	8.53	1991	.95	1971	10.9	6.9	2.3	.5	1.16	1.46	1.90	2.27	2.62	2.98	3.37	3.83	4.41	5.32	6.14
May	4.15	3.59	3.41	1980	29	9.13	2000	.82	1992	11.6	7.5	2.4	1.1	1.16	1.55	2.15	2.67	3.18	3.71	4.30	4.99	5.89	7.31	8.63
Jun	4.82	4.38	4.35	1980	15	10.11	1993	1.40	1989	11.1	7.6	3.7	1.3	1.80	2.25	2.89	3.43	3.95	4.47	5.04	5.70	6.54	7.84	9.03
Jul	4.20	3.39	5.50	1999	2	12.84	1999	.33	1998	9.3	6.4	3.0	1.2	.82	1.20	1.81	2.38	2.96	3.57	4.27	5.11	6.23	8.02	9.72
Aug	4.08	3.92	4.92	1966	20	10.56	1998	.38	1984	9.4	6.0	2.8	1.2	.73	1.09	1.68	2.24	2.81	3.42	4.12	4.97	6.10	7.92	9.66
Sep	2.95	2.71	3.08	1950	21	7.91	1978	.75	1979	8.8	5.4	2.2	.7	.72	1.00	1.43	1.81	2.19	2.59	3.04	3.57	4.27	5.37	6.41
Oct	2.49	2.41	2.65	1961	29	5.45	1984	.04	1975	8.0	5.0	1.5	.6	.34	.55	.90	1.25	1.61	2.01	2.48	3.05	3.81	5.07	6.28
Nov	2.10	1.88	2.40	1959	4	5.61	1992	.06	1976	8.9	4.1	1.4	.5	.38	.57	.88	1.16	1.45	1.77	2.13	2.56	3.13	4.06	4.94
Dec	1.11	.86	1.68	1982	5	3.77	1982	.12	1998	8.0	3.0	.5	.1	.19	.29	.45	.60	.76	.93	1.12	1.36	1.67	2.18	2.66
Ann	33.15	33.06	5.50	Jul 1999	2	12.84	Jul 1999	.04	Oct 1975	110.5	61.5	21.9	7.6	22.16	24.24	26.92	28.98	30.82	32.61	34.47	36.53	39.04	42.72	45.92

+ 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: 1950-2001

(3) Derived from 1971-2000 serially complete daily data

Complete documentation available from:  
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**Climate Division: IA 3**

**NWS Call Sign: ALO**

**Elevation: 865 Feet**

**Lat: 42°33N**

**Lon: 92°24W**

Snow (inches)																							
Snow Totals															Mean Number of Days (1)								
Means/Medians (1)					Extremes (2)										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	8.2	6.6	4	3	13.2	1971	3	24.2	1996	19	1979	27	13	1971	6.8	2.5	.7	.3	.1	22.5	14.6	10.0	3.6
Feb	7.3	5.8	4	3	8.4	1981	22	15.9	1983	16	1979	12	14	1979	5.7	2.2	.7	.3	.0	18.8	12.9	9.1	4.3
Mar	4.8	4.1	1	1	5.7	1995	6	16.1	1984	10+	1984	21	4+	1979	4.1	1.6	.4	.1	.0	8.4	5.2	2.5	.1
Apr	2.2	.7	#	0	6.2	1973	9	10.3	1973	10+	1973	11	1+	1982	1.5	.7	.2	@	.0	1.2	.6	.3	.1
May	#	.0	#	0	#	1989	6	#+	1989	0	0	0	#	1996	.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	.1	.0	0	0	1.2	1982	20	1.2+	1991	6	1972	20	0	0	.2	.1	.0	.0	.0	@	@	@	.0
Nov	4.3	3.3	1	0	8.5	1972	13	12.9	1986	11+	1991	24	3+	1991	3.9	1.1	.3	.2	.0	3.9	1.8	1.2	.2
Dec	7.5	6.0	2	1	10.4	1985	1	16.9	1977	16+	1985	20	13	1985	6.0	2.2	.7	.2	@	17.6	9.8	4.8	1.2
Ann	34.4	26.5	N/A	N/A	13.2	Jan 1971	3	24.2	Jan 1996	19	Jan 1979	27	14	Feb 1979	28.2	10.4	3.0	1.1	.1	72.4	44.9	27.9	9.5

+ 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	5/23	5/18	5/14	5/11	5/09	5/06	5/03	4/30	4/25
32	5/14	5/09	5/06	5/03	4/30	4/28	4/25	4/21	4/17
28	5/01	4/25	4/21	4/18	4/15	4/12	4/09	4/05	3/31
24	4/19	4/15	4/12	4/10	4/08	4/06	4/03	4/01	3/28
20	4/15	4/11	4/07	4/04	4/02	3/30	3/27	3/24	3/19
16	4/06	3/31	3/27	3/23	3/20	3/17	3/13	3/09	3/03
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	9/09	9/13	9/16	9/18	9/20	9/23	9/25	9/28	10/02
32	9/18	9/22	9/25	9/27	9/30	10/02	10/05	10/08	10/12
28	9/26	10/01	10/04	10/07	10/10	10/13	10/16	10/20	10/25
24	10/08	10/13	10/16	10/19	10/22	10/24	10/27	10/31	11/04
20	10/19	10/24	10/27	10/30	11/02	11/05	11/08	11/11	11/16
16	10/26	10/31	11/04	11/07	11/10	11/13	11/16	11/19	11/24
Freeze Free Period									
Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	154	147	142	138	134	130	126	121	114
32	169	163	159	155	152	148	145	140	134
28	201	193	187	182	178	173	168	162	154
24	213	207	203	199	196	193	189	185	180
20	231	225	221	217	214	210	207	202	196
16	259	250	244	239	234	229	224	217	209

\* 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

Complete documentation available from:

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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	1532	1202	946	528	205	29	7	20	155	478	903	1343	7348
60	1362	1049	776	375	117	4	0	9	52	320	749	1191	6004
57	1269	965	683	295	77	1	0	2	26	244	659	1098	5319
55	1207	909	623	246	56	0	0	0	14	198	601	1036	4890
50	1052	780	481	142	21	0	0	0	2	107	461	883	3929
32	548	355	113	3	0	0	0	0	0	2	102	398	1521

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	12	39	183	478	868	1127	1277	1201	907	558	176	28	6854
55	0	0	6	40	198	438	564	488	248	56	4	0	2042
57	0	0	4	29	157	379	502	427	203	39	2	0	1742
60	0	0	2	17	106	294	409	336	145	22	1	0	1332
65	0	0	0	7	47	168	261	198	70	7	0	0	758
70	0	0	0	2	14	75	133	92	28	2	0	0	346

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	9	73	272	630	897	1038	960	678	332	70	6	0	9	82	354	984	1881	2919	3879	4557	4889	4959	4965
45	0	2	33	167	475	747	883	805	529	214	30	1	0	2	35	202	677	1424	2307	3112	3641	3855	3885	3886
50	0	0	14	89	328	597	728	650	385	121	15	0	0	0	14	103	431	1028	1756	2406	2791	2912	2927	2927
55	0	0	6	45	207	449	573	495	254	59	3	0	0	0	6	51	258	707	1280	1775	2029	2088	2091	2091
60	0	0	0	17	113	303	418	342	149	25	0	0	0	0	0	17	130	433	851	1193	1342	1367	1367	1367
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	2	50	172	385	589	702	641	428	207	44	3	0	2	52	224	609	1198	1900	2541	2969	3176	3220	3223

(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.  
Complete documentation for the 1971-2000 Normals is available on the internet from:  
[www.ncdc.noaa.gov/oa/climate/normal/usnormals.html](http://www.ncdc.noaa.gov/oa/climate/normal/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 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.

- |   |   |
|---|---|
| <ol style="list-style-type: none"><li>a. Temperature/ Precipitation Tables<ol style="list-style-type: none"><li>1. 1971-2000 Monthly Normals</li><li>2. Cooperative Summary of the Day</li><li>3. National Weather Service station records</li><li>4. 1971-2000 serially complete daily data</li></ol></li><li>b. Degree Day Table<ol style="list-style-type: none"><li>1. Monthly and Annual Heating and Cooling Degree Days Normals to Selected Bases derived from 1971-2000 Monthly Normals</li><li>2. Daily Normal Growing Degree Units to Selected Base Temperatures derived from 1971-2000 serially complete daily data</li></ol></li></ol> | <ol style="list-style-type: none"><li>c. Snow Tables<ol style="list-style-type: none"><li>1. Snow Climatology</li><li>2. Cooperative Summary of the Day</li></ol></li><li>d. Freeze Data Table<br/>1971-2000 serially complete daily data</li></ol> |
|---|---|

## References

U.S. Climate Normals 1971-2000, [www.ncdc.noaa.gov/normal.html](http://www.ncdc.noaa.gov/normal.html)  
U.S. Climate Normals 1971-2000-Products Clim20, [www.ncdc.noaa.gov/oa/climate/normal/usnormalsprods.html](http://www.ncdc.noaa.gov/oa/climate/normal/usnormalsprods.html)  
Snow Climatology Project Description, [www.ncdc.noaa.gov/oa/climate/monitoring/snowclim/mainpage.html](http://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](http://www1.ncdc.noaa.gov/pub/data/special/serialcomplete_jam_0900.pdf)