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: LOWELL, MA **COOP ID: 194313**

Climate Division: MA 2 **NWS Call Sign:** **Elevation: 110 Feet** **Lat: 42˚39N** **Lon: 71˚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	14.1	23.6	68	1950	26	30.8	1990	-17	1994	27	14.8	1994	1285	0	.0	.0	2.1	13.7	29.5	3.5
Feb	36.5	17.7	27.1	73	1997	23	34.4	1984	-13	1996	5	18.4	1993	1062	0	.0	.0	3.1	9.3	26.7	2.1
Mar	45.9	24.8	35.4	89	1998	29	40.9	2000	-3+	1980	1	29.4	1984	919	0	.0	.0	11.0	2.4	24.9	.1
Apr	58.0	35.1	46.6	94+	1990	28	50.4	1976	15	1954	4	42.9	1972	554	0	.0	.1	25.5	.1	12.2	.0
May	69.8	44.7	57.3	96+	1987	31	61.7	1991	28+	1992	6	54.2	1990	247	7	.0	.7	30.7	.0	.8	.0
Jun	78.8	54.1	66.5	100	1952	26	70.6	1999	37+	1980	12	61.5	1980	52	96	.0	1.8	30.0	.0	.0	.0
Jul	84.5	60.2	72.4	102	1952	23	75.6	1994	47+	1962	6	68.4	1992	2	231	@	5.0	31.0	.0	.0	.0
Aug	81.9	58.6	70.3	103	1948	26	74.3	1973	38+	1965	31	66.8	1987	9	171	.0	2.5	31.0	.0	.0	.0
Sep	73.6	49.7	61.7	100	1953	2	66.2	1999	26	1979	20	58.3	1986	128	27	.0	.3	30.0	.0	.3	.0
Oct	61.8	38.1	50.0	89	1963	7	56.5	1971	20	1988	31	46.0	1974	467	0	.0	.0	29.7	.0	7.6	.0
Nov	49.4	30.6	40.0	81	1950	2	45.7	1999	1+	1989	24	36.1	1976	749	0	.0	.0	14.7	.6	18.0	.0
Dec	38.0	21.0	29.5	76	1998	8	36.1	1998	-10	1989	24	15.3	1989	1101	0	.0	.0	4.0	7.8	28.0	.7
Ann	59.3	37.4	48.4	103	Aug 1948	26	75.6	Jul 1994	-17	Jan 1994	27	14.8	Jan 1994	6575	532	@	10.4	242.8	33.9	148.0	6.4

\+ 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

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: LOWELL, MA **COOP ID: 194313**

Climate Division: MA 2 **NWS Call Sign:** **Elevation: 110 Feet** **Lat: 42˚39N** **Lon: 71˚22W**

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	3.79	3.43	3.60	1979	26	12.79	1979	.60	1980
Feb	2.90	3.03	2.13	1981	26	7.33	1981	.00	1987
Mar	3.52	3.03	2.47	1968	18	8.71	1983	.46	1981
Apr	3.84	3.43	3.24	2000	22	11.51	1987	.58	1999
May	3.37	3.41	2.47	1954	9	7.58	1984	.75	1987
Jun	3.68	3.10	4.03	1998	14	11.17	1998	.70	1979
Jul	3.24	3.27	3.31	1996	14	6.63	1996	.77	1987
Aug	3.26	2.72	5.48	1991	20	9.36	1991	.52	1996
Sep	3.64	2.87	6.97	1954	11	8.38	1999	.78	1984
Oct	3.93	3.67	5.11	1996	21	10.82	1996	.53	1994
Nov	4.34	4.21	3.02	1963	7	9.75	1983	1.32	1976
Dec	3.63	3.55	2.74	1986	19	8.23	1973	.87	1980
Ann	43.14	42.00	6.97	Sep 1954	11	12.79	Jan 1979	.00	Feb 1987

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	10.0	6.9	2.4	.9
Feb	9.0	5.7	2.0	.7
Mar	10.9	7.0	2.7	.7
Apr	10.7	7.1	2.7	.8
May	12.0	7.5	2.5	.8
Jun	11.3	7.0	2.2	.8
Jul	10.0	6.5	2.2	.6
Aug	9.3	6.1	2.0	.8
Sep	9.1	6.0	2.3	1.0
Oct	8.6	6.5	2.3	.9
Nov	10.3	7.1	2.9	1.3
Dec	10.4	7.0	2.7	.8
Ann	121.6	80.4	28.9	10.1

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	.88	1.24	1.79	2.29	2.79	3.31	3.90	4.60	5.52	6.98	8.36
Feb	.89	1.30	1.76	2.10	2.42	2.75	3.09	3.49	3.99	4.75	5.45
Mar	1.26	1.60	2.08	2.48	2.86	3.26	3.68	4.18	4.82	5.80	6.70
Apr	1.17	1.53	2.08	2.55	3.00	3.47	3.99	4.60	5.39	6.62	7.75
May	1.10	1.42	1.89	2.29	2.67	3.07	3.51	4.02	4.68	5.70	6.64
Jun	.75	1.09	1.63	2.12	2.62	3.15	3.75	4.48	5.44	6.97	8.42
Jul	1.34	1.64	2.05	2.40	2.72	3.04	3.39	3.80	4.31	5.09	5.80
Aug	.65	.95	1.43	1.86	2.31	2.78	3.32	3.97	4.82	6.19	7.49
Sep	1.05	1.39	1.92	2.37	2.81	3.27	3.77	4.37	5.15	6.36	7.49
Oct	1.20	1.58	2.13	2.61	3.08	3.56	4.09	4.71	5.52	6.77	7.94
Nov	1.77	2.16	2.73	3.19	3.63	4.07	4.55	5.10	5.79	6.86	7.83
Dec	.94	1.28	1.81	2.27	2.73	3.21	3.74	4.38	5.21	6.52	7.74
Ann	33.45	35.39	37.84	39.67	41.29	42.83	44.42	46.16	48.26	51.26	53.83

\+ 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

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Services

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: LOWELL, MA **COOP ID: 194313**

Climate Division: MA 2 **NWS Call Sign:** **Elevation: 110 Feet** **Lat: 42°39N** **Lon: 71°22W**

Snow (inches)

Snow Totals

Means/Medians (1)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	14.3	13.1	5	3
Feb	10.4	6.7	4	2
Mar	5.8	3.1	1	#
Apr	2.6	.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	#	0
Nov	2.4	1.2	#	#
Dec	7.5	5.0	1	1
Ann	43.0	29.1	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	15.0	1983	16	37.1	1996	30	1996	13	14	1996
Feb	13.7	1983	12	29.0	1983	30	1983	13	16	1987
Mar	14.5	1993	14	36.5	1993	18+	1994	4	9	1994
Apr	16.4	1997	1	19.2	1997	16	1997	1	2	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	.3	2000	30	.3	2000	2	1979	11	#+	2000
Nov	5.0	1985	29	7.5	1980	6	1987	12	1	1987
Dec	16.2	1997	24	22.9	1995	17	1992	14	8	1981
Ann	16.4	Apr 1997	1	37.1	Jan 1996	30+	Jan 1996	13	16	Feb 1987

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	5.6	4.2	2.0	1.1	.1
Feb	4.3	2.8	1.4	.4	.2
Mar	2.7	2.1	.8	.3	.1
Apr	.5	.4	.2	.2	.1
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
Nov	1.2	.8	.4	.1	.0
Dec	2.9	1.9	.8	.4	.1
Ann	17.2	12.2	5.6	2.5	.6

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	17.4	13.4	9.6	4.6
Feb	15.4	9.9	7.6	3.9
Mar	7.1	4.7	3.8	1.5
Apr	.7	.6	.4	.2
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	1.7	.8	.2	.0
Dec	7.5	3.4	2.2	.7
Ann	49.8	32.8	23.8	10.9

+ 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

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

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: LOWELL, MA **COOP ID: 194313**

Climate Division: MA 2 **NWS Call Sign:** **Elevation: 110 Feet** **Lat: 42˚39N** **Lon: 71˚22W**

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	5/08	5/05	5/02	4/28	4/23
32	5/10	5/06	5/03	5/01	4/28	4/26	4/23	4/20	4/16
28	5/01	4/27	4/24	4/22	4/20	4/18	4/15	4/12	4/09
24	4/15	4/12	4/09	4/07	4/04	4/02	3/31	3/28	3/25
20	4/06	4/02	3/30	3/27	3/25	3/22	3/19	3/16	3/12
16	3/29	3/25	3/22	3/19	3/17	3/14	3/12	3/09	3/04

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	9/17	9/20	9/23	9/25	9/27	9/29	10/01	10/03	10/07
32	9/24	9/29	10/03	10/06	10/09	10/12	10/15	10/19	10/24
28	10/03	10/09	10/14	10/18	10/21	10/25	10/29	11/02	11/09
24	10/23	10/28	11/01	11/04	11/07	11/10	11/14	11/18	11/23
20	11/07	11/12	11/16	11/20	11/23	11/26	11/29	12/03	12/09
16	11/18	11/23	11/27	11/30	12/03	12/06	12/09	12/13	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	158	152	148	145	141	138	134	130	124
32	183	176	171	167	163	159	155	149	142
28	205	198	192	188	184	180	175	170	163
24	235	229	224	220	216	212	208	203	197
20	265	257	252	247	243	238	233	228	220
16	281	274	269	265	261	257	252	247	240

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

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: LOWELL, MA **COOP ID: 194313**

Climate Division: MA 2 **NWS Call Sign:** **Elevation: 110 Feet** **Lat: 42˚39N** **Lon: 71˚22W**

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	1285	1062	919	554	247	52	2	9	128	467	749	1101	6575
60	1130	922	764	404	123	12	0	0	46	318	599	946	5264
57	1037	838	671	316	68	4	0	0	21	237	509	853	4554
55	975	782	609	259	42	1	0	0	11	188	449	791	4107
50	820	642	455	137	7	0	0	0	1	92	306	639	3099
32	306	197	65	1	0	0	0	0	0	0	18	191	778

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	44	59	170	437	783	1034	1252	1185	889	556	259	113	6781
55	0	0	0	5	112	345	539	472	210	32	0	0	1715
57	0	0	0	2	76	288	477	410	160	18	0	0	1431
60	0	0	0	0	38	206	384	317	96	7	0	0	1048
65	0	0	0	0	7	96	231	171	27	0	0	0	532
70	0	0	0	0	1	30	99	63	3	0	0	0	196

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	9	10	60	212	543	808	1003	941	669	345	116	23	9	19	79	291	834	1642	2645	3586	4255	4600	4716	4739
45	1	0	25	106	391	658	848	786	519	210	54	3	1	1	26	132	523	1181	2029	2815	3334	3544	3598	3601
50	0	0	7	44	238	508	693	631	373	108	20	0	0	0	7	51	289	797	1490	2121	2494	2602	2622	2622
55	0	0	2	16	116	359	538	476	233	39	5	0	0	0	2	18	134	493	1031	1507	1740	1779	1784	1784
60	0	0	0	5	43	221	383	323	117	11	0	0	0	0	0	5	48	269	652	975	1092	1103	1103	1103
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	3	10	48	143	322	511	672	623	417	217	64	11	3	13	61	204	526	1037	1709	2332	2749	2966	3030	3041

(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