

# Climatology of the United States

## No. 20

### 1971-2000

**Station: DULUTH INTL AP, MN**

**COOP ID: 212248**

**Climate Division: MN 3**

**NWS Call Sign: DLH**

**Elevation: 1,422 Feet Lat: 46° 50N**

**Lon: 92° 13W**

### 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	17.9	-1.2	8.4	47	1973	25	18.5	1990	-39	1972	15	-3.0	1982	1771	0	.0	.0	.0	28.2	31.0	16.8
Feb	24.4	5.1	14.8	55+	2000	29	29.0	1998	-39	1996	2	3.2	1989	1422	0	.0	.0	.2	21.4	27.8	11.1
Mar	34.2	16.5	25.4	71	1986	31	33.4	2000	-29	1989	2	18.6	1989	1244	0	.0	.0	2.1	14.2	28.6	4.0
Apr	49.0	28.9	39.0	88	1952	27	45.7	1987	-5+	1975	4	32.0	1975	787	0	.0	.0	13.0	2.2	19.4	.1
May	63.4	40.2	51.8	90+	1986	30	57.9	1977	17	1967	3	45.8	1997	421	7	.0	@	27.8	.0	5.1	.0
Jun	71.2	48.5	59.9	94	1995	18	64.7	1995	27	1972	10	54.1	1982	180	28	.0	.2	29.9	.0	.3	.0
Jul	76.3	54.6	65.5	97	1988	7	69.7	1975	35	1988	1	59.0	1992	69	82	.0	1.1	31.0	.0	.0	.0
Aug	73.9	53.5	63.7	95+	1961	30	69.2	1983	32	1986	27	59.1	1977	106	60	.0	.6	31.0	.0	@	.0
Sep	64.5	44.8	54.7	95	1976	7	59.3	1998	23+	1974	22	49.1	1974	331	12	.0	.1	28.3	.0	2.3	.0
Oct	52.5	34.5	43.5	86	1953	2	49.5	1973	8	1976	27	38.2	1988	682	0	.0	.0	17.3	.8	12.4	.0
Nov	35.2	20.7	28.0	71	1999	9	36.2	1999	-23	1964	30	20.3	1995	1124	0	.0	.0	2.6	13.2	26.2	1.7
Dec	22.3	5.6	14.0	55	1962	3	23.2	1979	-34	1983	20	2.0	1983	1587	0	.0	.0	.1	26.1	30.8	11.7
Ann	48.7	29.3	39.1	97	Jul 1988	7	69.7	Jul 1975	-39+	Feb 1996	2	-3.0	Jan 1982	9724	189	.0	2.0	183.3	106.1	183.9	45.4

+ 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/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: 1948-2001

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

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### 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	Median	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	1.12	.83	1.18	1969	23	3.69	1975	.32	1981	11.6	2.9	.4	@	.26	.37	.53	.68	.83	.98	1.15	1.36	1.63	2.07	2.47	
Feb	.83	.62	1.16	1998	27	2.72	1998	.13	1988	9.2	2.8	.2	@	.16	.23	.35	.46	.58	.70	.84	1.00	1.23	1.58	1.92	
Mar	1.69	1.49	2.24	1977	12	4.43	1977	.44	1993	10.7	4.6	.7	.2	.38	.54	.79	1.01	1.23	1.47	1.73	2.05	2.47	3.13	3.76	
Apr	2.09	2.09	1.99	1968	23	4.48	1981	.24	1987	10.4	5.1	1.3	.1	.49	.68	.99	1.26	1.53	1.82	2.14	2.53	3.03	3.83	4.59	
May	2.95	3.00	3.00	1979	9	6.11	1991	.15	1976	11.1	6.4	1.8	.4	.76	1.04	1.47	1.84	2.22	2.61	3.05	3.57	4.25	5.32	6.32	
Jun	4.25	4.44	3.36	1952	23	8.04	1986	.55	1995	12.7	8.4	2.9	.9	1.41	1.81	2.41	2.91	3.39	3.89	4.44	5.07	5.89	7.16	8.33	
Jul	4.20	3.93	3.40	1974	21	8.74	1999	1.09	1989	11.8	7.1	2.5	1.3	1.31	1.71	2.30	2.81	3.30	3.81	4.38	5.03	5.88	7.21	8.44	
Aug	4.22	3.71	3.11	1999	12	10.31	1972	1.26	1997	11.7	6.9	2.6	1.3	1.33	1.73	2.32	2.83	3.33	3.84	4.39	5.05	5.90	7.22	8.44	
Sep	4.13	4.05	3.77	1972	20	9.38	1991	.98	1974	12.8	6.9	2.6	1.0	1.29	1.68	2.26	2.76	3.25	3.74	4.29	4.94	5.77	7.06	8.26	
Oct	2.46	2.28	2.81	1950	1	6.09	1971	.48	1976	10.6	5.2	1.5	.4	.48	.71	1.07	1.40	1.73	2.09	2.50	2.99	3.64	4.68	5.67	
Nov	2.12	1.84	2.26	1998	10	5.08	2000	.19	1976	11.1	4.5	1.3	.4	.33	.52	.82	1.11	1.42	1.74	2.12	2.58	3.20	4.20	5.16	
Dec	.94	.90	1.91	1950	6	2.02	1972	.13	1997	10.3	3.1	.2	@	.21	.30	.44	.56	.69	.82	.97	1.14	1.38	1.75	2.09	
Ann	31.00	31.68	3.77	Sep 1972	20	10.31	Aug 1972	.13+	Dec 1997	134.0	63.9	18.0	6.0	22.27	23.97	26.14	27.78	29.24	30.65	32.11	33.71	35.66	38.48	40.91	

+ 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

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

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Lat: 46° 50N

Lon: 92° 13W

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	19.1	16.2	15	15	16.3	1994	6	35.3	1994	42	1997	5	30	1997	13.6	4.5	1.8	.8	.3	30.8	30.2	27.6	21.8
Feb	10.8	9.9	16	17	8.4	1996	27	23.3	1979	34	1996	28	29	1975	10.0	3.6	1.0	.3	.0	28.0	28.0	27.4	22.2
Mar	13.9	12.9	13	13	12.0	1985	4	30.3	1975	40	1975	28	30	1997	9.7	3.9	1.4	.6	.1	28.1	26.5	24.7	19.2
Apr	6.3	4.3	3	5	11.6	1983	14	23.7	1983	32+	1975	2	17	1975	5.0	1.7	.8	.2	@	10.7	7.7	5.6	3.5
May	.3	.0	#	0	1.5	1991	5	2.9	1991	1+	1991	6	#	2000	.5	.1	.0	.0	.0	.1	.0	.0	.0
Jun	#	.0	#	0	#	1998	1	#	1998	0	0	0	#	1991	.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	.1	.0	0	0	2.4	1991	18	2.4	1991	#+	1991	18	0	0	.2	.0	.0	.0	.0	.0	.0	.0	.0
Oct	1.6	.8	#	0	4.2	1991	31	9.7	1995	3+	1995	22	#	1997	1.6	.6	.2	.0	.0	.7	.1	.0	.0
Nov	14.4	11.3	2	1	24.1	1991	1	50.1	1991	30	1991	2	15	1991	9.5	3.7	1.6	.7	.1	14.2	8.3	5.2	1.6
Dec	13.1	13.5	7	7	11.8	1995	13	32.1	1983	34	1996	31	23	1983	11.8	4.1	1.1	.5	.1	28.2	21.7	17.9	9.7
Ann	79.6	68.9	N/A	N/A	24.1	Nov 1991	1	50.1	Nov 1991	42	Jan 1997	5	30+	Mar 1997	61.9	22.2	7.9	3.1	.6	140.8	122.5	108.4	78.0

+ 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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<b>Freeze Data</b>									
<b>Spring Freeze Dates (Month/Day)</b>									
<b>Temp (F)</b>	<b>Probability of later date in spring (thru Jul 31) than indicated(*)</b>								
	<b>.10</b>	<b>.20</b>	<b>.30</b>	<b>.40</b>	<b>.50</b>	<b>.60</b>	<b>.70</b>	<b>.80</b>	<b>.90</b>
<b>36</b>	6/24	6/17	6/13	6/09	6/05	6/01	5/28	5/23	5/17
<b>32</b>	6/08	6/02	5/28	5/25	5/21	5/18	5/14	5/09	5/03
<b>28</b>	5/24	5/17	5/12	5/08	5/04	4/30	4/26	4/21	4/15
<b>24</b>	5/07	5/02	4/28	4/24	4/21	4/18	4/15	4/11	4/06
<b>20</b>	4/25	4/21	4/17	4/15	4/12	4/09	4/07	4/03	3/30
<b>16</b>	4/15	4/11	4/08	4/05	4/03	4/01	3/29	3/26	3/22
<b>Fall Freeze Dates (Month/Day)</b>									
<b>Temp (F)</b>	<b>Probability of earlier date in fall (beginning Aug 1) than indicated(*)</b>								
	<b>.10</b>	<b>.20</b>	<b>.30</b>	<b>.40</b>	<b>.50</b>	<b>.60</b>	<b>.70</b>	<b>.80</b>	<b>.90</b>
<b>36</b>	8/30	9/04	9/07	9/10	9/13	9/16	9/19	9/23	9/28
<b>32</b>	9/11	9/15	9/18	9/20	9/23	9/25	9/27	9/30	10/04
<b>28</b>	9/22	9/27	9/30	10/04	10/06	10/09	10/12	10/16	10/21
<b>24</b>	9/26	10/04	10/09	10/13	10/17	10/21	10/26	10/31	11/07
<b>20</b>	10/15	10/20	10/24	10/27	10/30	11/02	11/05	11/09	11/14
<b>16</b>	10/23	10/28	10/31	11/03	11/06	11/08	11/11	11/14	11/19
<b>Freeze Free Period</b>									
<b>Temp (F)</b>	<b>Probability of longer than indicated freeze free period (Days)</b>								
	<b>.10</b>	<b>.20</b>	<b>.30</b>	<b>.40</b>	<b>.50</b>	<b>.60</b>	<b>.70</b>	<b>.80</b>	<b>.90</b>
<b>36</b>	125	116	110	105	100	95	89	83	74
<b>32</b>	146	138	133	128	124	119	115	109	102
<b>28</b>	178	170	164	159	155	150	145	139	131
<b>24</b>	205	195	189	183	178	173	167	161	152
<b>20</b>	222	215	209	205	200	196	191	186	178
<b>16</b>	235	229	224	220	216	212	208	203	196

\* 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)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Below													
65	1771	1422	1244	787	421	180	69	106	331	682	1124	1587	9724
60	1602	1267	1076	632	276	81	19	37	189	513	961	1428	8081
57	1509	1183	983	544	205	43	7	16	127	424	871	1335	7247
55	1447	1127	921	486	164	26	2	8	93	366	811	1273	6724
50	1292	987	766	350	83	5	0	1	35	236	662	1118	5535
32	744	507	271	45	1	0	0	0	0	13	210	586	2377

### Cooling Degree Days (1)

Base	Cooling Degree Days (1)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Above													
32	1	8	46	240	611	834	1035	979	671	356	66	5	4852
55	0	0	0	5	62	175	324	272	87	9	0	0	934
57	0	0	0	3	44	133	266	218	63	5	0	0	732
60	0	0	0	1	24	82	185	147	36	2	0	0	477
65	0	0	0	0	7	28	82	60	12	0	0	0	189
70	0	0	0	0	1	6	25	16	3	0	0	0	51

### 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	1	7	95	376	603	798	740	438	166	15	0	0	1	8	103	479	1082	1880	2620	3058	3224	3239	3239
45	0	0	1	43	242	454	643	585	299	84	6	0	0	0	1	44	286	740	1383	1968	2267	2351	2357	2357
50	0	0	0	15	135	308	488	430	182	31	0	0	0	0	0	15	150	458	946	1376	1558	1589	1589	1589
55	0	0	0	4	67	181	333	281	93	8	0	0	0	0	0	4	71	252	585	866	959	967	967	967
60	0	0	0	0	28	88	195	153	38	0	0	0	0	0	0	28	116	311	464	502	502	502	502	502
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	0	0	5	63	225	353	495	449	239	83	9	0	0	0	5	68	293	646	1141	1590	1829	1912	1921	1921

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

- |   |   |
|---|---|
| <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)