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: RUGBY, ND **COOP ID: 327704**

Climate Division: ND 2 **NWS Call Sign:** **Elevation: 1,550 Feet** **Lat: 48˚21N** **Lon: 100˚00W**

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	15.8	-4.7	5.6	52	1990	10	20.1	1990	-45	1996	19	-11.5	1982	1846	0	.0	.0	@	26.5	30.9	18.8
Feb	23.4	3.5	13.5	62	1988	27	26.4	1998	-47	1996	1	-2.2	1979	1444	0	.0	.0	.5	19.6	28.1	11.9
Mar	35.3	15.6	25.5	74	1963	23	36.4	1973	-33	1998	11	15.4	1996	1227	0	.0	.0	3.6	11.1	29.0	4.6
Apr	54.6	29.8	42.2	96	1980	21	51.4	1987	-8+	1979	6	30.8	1979	688	3	.0	.1	19.1	1.7	17.3	.3
May	69.6	42.3	56.0	100	1980	22	65.7	1977	14	1967	2	48.5	1979	315	34	@	.8	29.6	.0	3.8	.0
Jun	77.6	51.4	64.5	104+	1988	27	75.9	1988	30	1969	12	57.6	1985	127	112	.4	2.6	30.0	.0	.1	.0
Jul	82.0	55.3	68.7	107	1988	27	73.8	1975	38+	1985	29	62.3	1992	46	158	.3	4.1	31.0	.0	.0	.0
Aug	81.4	53.3	67.4	105	1988	6	73.2	1983	30	1982	27	61.6	1977	70	144	.2	4.9	31.0	.0	@	.0
Sep	69.5	42.4	56.0	99+	2001	5	62.0	1998	20+	1984	30	51.0	1985	287	17	.0	1.1	28.8	.0	2.5	.0
Oct	56.2	31.0	43.6	92	1963	4	48.1	1994	-6	1991	30	38.3	1991	663	0	.0	@	21.6	1.0	15.3	.1
Nov	34.2	15.4	24.8	75	1975	5	35.7	1999	-27+	1985	29	11.1	1985	1207	0	.0	.0	3.6	13.4	28.3	3.5
Dec	20.5	.5	10.5	55	1987	10	24.0	1997	-40	1990	26	-3.4	1983	1689	0	.0	.0	.2	24.1	30.9	14.4
Ann	51.7	28.0	39.9	107	Jul 1988	27	75.9	Jun 1988	-47	Feb 1996	1	-11.5	Jan 1982	9609	468	.9	13.6	199.0	97.4	186.2	53.6

\+ 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	.51	.54	1.25	1949	5	1.47	1999	.00+	1988
Feb	.45	.37	1.15	1998	25	3.13	1998	.00+	1987
Mar	.80	.54	2.00+	1985	28	3.76	1983	.00	1986
Apr	1.28	.93	2.25	1997	6	4.28	1984	.09	1977
May	2.25	1.99	1.99	1995	13	7.95	1999	.07	1976
Jun	3.05	3.01	3.31	1990	17	6.32	1990	.75	1986
Jul	3.21	2.65	3.49	1997	12	9.05	1993	.16	1985
Aug	2.28	2.00	2.70	1968	24	7.75	1980	.24	1984
Sep	1.92	1.76	2.52	1981	6	4.49	1980	.30	1993
Oct	1.32	.90	1.61	1959	8	4.57	1994	.00	1987
Nov	.70	.58	1.15	1994	18	2.91	1994	.00+	1987
Dec	.50	.50	1.05	1982	2	1.37	1996	.00+	1987
Ann	18.27	18.41	3.49	Jul 1997	12	9.05	Jul 1993	.00+	Jan 1988

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	5.2	1.8	.1	.0
Feb	4.1	1.4	.2	@
Mar	4.4	2.4	.2	.1
Apr	6.1	3.3	.7	.2
May	9.0	5.5	1.2	.3
Jun	10.8	6.7	2.0	.5
Jul	8.9	6.0	2.0	.8
Aug	7.8	4.6	1.3	.5
Sep	7.9	4.3	1.1	.5
Oct	5.1	2.7	.9	.3
Nov	4.8	2.1	.4	@
Dec	5.0	1.6	.2	@
Ann	79.1	42.4	10.3	3.2

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	.05	.15	.25	.36	.49	.64	.86	1.20	1.55
Feb	.00	.02	.07	.14	.21	.30	.41	.54	.73	1.07	1.40
Mar	.03	.10	.21	.33	.45	.60	.77	.98	1.27	1.75	2.22
Apr	.13	.22	.40	.58	.77	.99	1.24	1.56	2.00	2.73	3.44
May	.38	.58	.90	1.21	1.53	1.87	2.27	2.74	3.38	4.41	5.40
Jun	1.08	1.37	1.79	2.14	2.47	2.81	3.19	3.62	4.18	5.03	5.82
Jul	.39	.65	1.10	1.55	2.02	2.55	3.17	3.93	4.96	6.65	8.30
Aug	.44	.65	.98	1.29	1.60	1.94	2.32	2.78	3.39	4.37	5.30
Sep	.32	.48	.76	1.03	1.30	1.60	1.93	2.35	2.90	3.79	4.64
Oct	.02	.08	.23	.40	.61	.86	1.17	1.58	2.16	3.16	4.17
Nov	.00	.00	.09	.20	.32	.46	.63	.86	1.17	1.71	2.25
Dec	.00	.00	.14	.23	.32	.41	.51	.64	.80	1.07	1.32
Ann	10.77	12.12	13.90	15.29	16.55	17.79	19.09	20.55	22.35	25.01	27.36

\+ 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:
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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	9.2	8.5	7	7
Feb	5.0	4.5	8	6
Mar	4.5	3.6	4	3
Apr	3.5	1.0	#	0
May	.3	.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	2.9	.0	2	1
Dec	4.0	3.5	3	1
Ann	30.4	21.1	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	14.5	1989	6	25.1	1989	19	1999	14	15+	1999
Feb	8.0	1981	27	16.0	1998	21	1975	18	18	1994
Mar	9.5	1985	28	15.1	1995	19	1999	10	12	1999
Apr	15.0	1997	6	15.0	1997	11+	1999	4	2	1999
May	6.0	1991	3	7.0	1991	#	1997	8	#	1997
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	1.0	1995	21	1.0	1995	0	0	0	0	0
Oct	14.0	1985	7	15.0	1991	6	1971	30	#+	1997
Nov	8.5	1996	20	17.3	1998	20	1996	23	8	1996
Dec	7.5	1988	26	10.4	1991	18	1996	7	16	1996
Ann	15.0	Apr 1997	6	25.1	Jan 1989	21	Feb 1975	18	18	Feb 1994

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	3.7	2.3	.6	.2	.1
Feb	3.0	1.6	.3	.1	.0
Mar	1.8	1.3	.4	.1	.0
Apr	.7	.6	.4	.2	@
May	.1	.1	@	@	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	@	@	.0	.0	.0
Oct	.4	.2	.1	.1	@
Nov	2.2	1.6	.6	.2	.0
Dec	3.0	2.1	.4	.1	.0
Ann	14.9	9.8	2.8	1.0	.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	1.0	.8	.7	.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	.1	.0	.0	.0
Nov	-9.9	-9.9	-9.9	-9.9
Dec	-9.9	-9.9	-9.9	-9.9
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	6/07	6/01	5/29	5/25	5/22	5/19	5/16	5/12	5/07
32	5/30	5/25	5/21	5/17	5/14	5/11	5/07	5/03	4/28
28	5/20	5/14	5/10	5/06	5/03	4/29	4/26	4/21	4/16
24	5/07	5/02	4/29	4/26	4/23	4/20	4/17	4/14	4/09
20	4/30	4/24	4/20	4/16	4/13	4/09	4/06	4/02	3/27
16	4/18	4/13	4/10	4/07	4/05	4/02	3/30	3/27	3/22

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	8/22	8/29	9/02	9/06	9/10	9/13	9/17	9/22	9/28
32	9/08	9/12	9/15	9/18	9/21	9/23	9/26	9/29	10/04
28	9/19	9/24	9/28	10/01	10/04	10/06	10/09	10/13	10/18
24	9/23	9/29	10/04	10/07	10/11	10/14	10/18	10/22	10/28
20	10/02	10/08	10/12	10/16	10/19	10/23	10/26	10/31	11/05
16	10/08	10/15	10/19	10/23	10/27	10/31	11/04	11/09	11/15

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	138	129	121	115	110	104	98	91	81
32	150	143	138	133	129	125	120	115	108
28	179	170	164	158	153	148	143	136	128
24	195	186	180	175	170	165	160	154	145
20	214	206	199	194	189	184	178	172	163
16	229	221	215	210	205	200	195	188	180

***** 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	1846	1444	1227	688	315	127	46	70	287	663	1207	1689	9609
60	1691	1304	1072	548	205	61	13	25	170	509	1057	1534	8189
57	1598	1220	979	468	152	35	5	12	114	417	967	1441	7408
55	1536	1164	919	416	121	24	2	6	83	357	907	1379	6914
50	1381	1024	775	302	61	8	0	1	30	223	759	1224	5788
32	850	565	324	53	0	0	0	0	0	13	303	697	2805

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	27	45	121	358	743	975	1135	1097	720	372	86	31	5710
55	0	0	3	32	150	309	423	390	112	4	0	0	1423
57	0	0	1	23	119	261	364	334	83	2	0	0	1187
60	0	0	0	13	80	197	280	254	50	0	0	0	874
65	0	0	0	3	34	112	158	144	17	0	0	0	468
70	0	0	0	0	12	50	74	67	4	0	0	0	207

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	0	10	171	519	757	907	876	513	202	17	0	0	0	10	181	700	1457	2364	3240	3753	3955	3972	3972
45	0	0	2	95	378	607	752	721	371	111	6	0	0	0	2	97	475	1082	1834	2555	2926	3037	3043	3043
50	0	0	0	44	247	457	597	566	240	46	0	0	0	0	0	44	291	748	1345	1911	2151	2197	2197	2197
55	0	0	0	20	144	309	442	413	135	14	0	0	0	0	0	20	164	473	915	1328	1463	1477	1477	1477
60	0	0	0	7	73	184	292	268	63	2	0	0	0	0	0	7	80	264	556	824	887	889	889	889
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	8	128	324	473	589	558	314	138	12	0	0	0	8	136	460	933	1522	2080	2394	2532	2544	2544

(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