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: RICHMOND WTR WKS, IN **COOP ID: 127370**

Climate Division: IN 6 **NWS Call Sign:** **Elevation: 1,015 Feet** **Lat: 39˚53N** **Lon: 84˚53W**

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	34.1	17.2	25.7	64+	1995	12	36.0	1998	-27	1994	19	9.2	1977	1220	0	.0	.0	3.6	13.2	27.6	4.6
Feb	39.1	20.7	29.9	74	2000	25	39.2	1998	-20	1985	3	14.6	1978	984	0	.0	.0	6.3	8.9	23.4	2.9
Mar	50.5	30.0	40.3	82+	1981	31	47.4	1973	-9+	1978	5	31.7	1984	768	0	.0	.0	15.7	2.4	19.4	.3
Apr	62.0	38.8	50.4	87	1985	22	55.7	1985	14	1982	7	46.1	1982	439	2	.0	.0	25.4	.1	8.2	.0
May	72.6	49.4	61.0	92	1988	31	68.7	1991	26	1974	7	55.1	1997	196	72	.0	.3	30.8	.0	.8	.0
Jun	81.1	58.0	69.6	99+	1971	28	73.3	1984	36	1969	4	64.6	1972	27	163	.0	3.1	30.0	.0	.0	.0
Jul	84.6	61.6	73.1	100	1988	15	77.0	1999	42	1972	6	68.3	2000	4	255	@	5.8	31.0	.0	.0	.0
Aug	82.6	59.3	71.0	100	1988	17	77.4	1995	41+	1976	2	67.1	1992	19	202	@	3.6	31.0	.0	.0	.0
Sep	76.0	51.5	63.8	94+	1973	2	68.7	1998	30	1974	23	58.2	1974	103	66	.0	1.2	30.0	.0	.1	.0
Oct	64.0	40.2	52.1	88+	1971	1	59.0	1984	16	1976	28	44.8	1988	410	9	.0	.0	28.5	.0	6.0	.0
Nov	50.5	32.2	41.4	78	1987	2	46.3	1994	6+	1976	29	32.4	1976	711	0	.0	.0	15.4	1.0	16.0	.0
Dec	38.8	22.8	30.8	72+	1982	2	39.2	1982	-22	1989	22	17.5	1989	1061	0	.0	.0	5.6	8.3	24.9	1.5
Ann	61.3	40.1	50.8	100+	Aug 1988	17	77.4	Aug 1995	-27	Jan 1994	19	9.2	Jan 1977	5942	769	.0	14.0	253.3	33.9	126.4	9.3

\+ 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: 1968-2001

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

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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	2.51	2.21	3.19	1999	21	6.46	1999	.18	1981
Feb	2.27	2.06	1.99	1975	23	5.73	1986	.24	1978
Mar	3.16	2.77	2.12	1991	22	6.72	1973	.83	1999
Apr	3.84	3.78	2.79	2000	7	8.38	1972	1.03	1997
May	4.41	4.12	2.41	1997	31	9.09	1990	1.08	1988
Jun	4.25	4.05	2.57	1998	11	9.38	1998	1.09	1988
Jul	3.79	3.27	4.20	1969	20	10.45	1979	1.09	1982
Aug	3.55	3.03	2.65	1998	5	8.95	1979	.52	1996
Sep	2.54	1.94	2.41	1996	16	6.45	1984	.14	1998
Oct	3.03	2.68	4.53	1986	1	8.66	1986	1.03	1982
Nov	3.29	2.95	2.41	1985	10	8.92	1985	1.11	1976
Dec	2.91	2.70	2.27	1990	30	8.28	1990	.40	1976
Ann	39.55	39.21	4.53	Oct 1986	1	10.45	Jul 1979	.14	Sep 1998

Mean Number of Days (3)

Month	Daily Precipitation >= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	11.1	6.0	1.4	.4
Feb	9.7	5.1	1.4	.3
Mar	11.7	7.0	2.2	.3
Apr	12.3	8.0	2.5	.8
May	12.7	8.1	3.1	1.2
Jun	10.5	7.6	2.9	1.0
Jul	9.6	6.1	2.9	.9
Aug	8.8	5.8	2.4	1.0
Sep	8.0	4.6	1.7	.6
Oct	9.3	5.7	2.1	.5
Nov	10.9	6.4	2.4	.7
Dec	11.5	6.1	1.8	.6
Ann	126.1	76.5	26.8	8.3

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	.66	.89	1.26	1.58	1.89	2.22	2.59	3.03	3.60	4.50	5.34
Feb	.52	.73	1.07	1.36	1.66	1.98	2.33	2.75	3.31	4.19	5.02
Mar	1.17	1.46	1.89	2.24	2.58	2.93	3.30	3.74	4.29	5.15	5.93
Apr	1.41	1.77	2.29	2.72	3.13	3.55	4.01	4.54	5.22	6.27	7.22
May	1.73	2.14	2.72	3.20	3.66	4.12	4.62	5.20	5.94	7.06	8.09
Jun	1.64	2.03	2.60	3.06	3.51	3.96	4.45	5.01	5.73	6.83	7.84
Jul	.92	1.27	1.83	2.32	2.81	3.33	3.91	4.59	5.50	6.92	8.26
Aug	1.01	1.35	1.86	2.30	2.73	3.18	3.68	4.27	5.03	6.22	7.34
Sep	.31	.51	.87	1.23	1.60	2.02	2.50	3.10	3.91	5.24	6.53
Oct	.92	1.21	1.64	2.01	2.37	2.74	3.15	3.63	4.25	5.22	6.12
Nov	1.05	1.36	1.82	2.22	2.60	2.99	3.43	3.93	4.59	5.61	6.55
Dec	.84	1.12	1.53	1.90	2.25	2.62	3.02	3.50	4.12	5.09	6.00
Ann	29.60	31.56	34.06	35.94	37.60	39.19	40.84	42.64	44.82	47.97	50.67

\+ 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: 1968-2001
(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	6.7	5.2	2	1
Feb	4.9	2.4	2	#
Mar	2.3	1.5	#	#
Apr	.7	.0	#	#
May	#	.0	0	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.0	.0	0	0
Oct	.2	.0	#	0
Nov	1.0	.0	#	#
Dec	3.6	2.8	1	#
Ann	19.4	11.9	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	11.0	1996	2	27.7	1978	21	1996	11	10	1977
Feb	9.0	1984	27	16.7	1979	14	1979	14	9	1979
Mar	5.5	1975	14	8.5	1975	6	1978	8	2	1978
Apr	6.0	1974	8	6.4	1973	5	1974	8	#+	2000
May	#	1989	7	#+	1989	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	4.3	1989	19	5.0	1989	2	1989	19	#+	1993
Nov	5.1	1980	17	5.6	1980	5	1980	17	#+	2000
Dec	7.6	1973	20	13.9	1973	7	1995	27	3	1995
Ann	11.0	Jan 1996	2	27.7	Jan 1978	21	Jan 1996	11	10	Jan 1977

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	5.1	2.5	.6	.2	@
Feb	3.9	1.5	.4	.1	.0
Mar	2.1	.8	.2	.1	.0
Apr	.4	.3	.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	.1	.1	@	.0	.0
Nov	1.1	.3	.1	@	.0
Dec	3.5	1.1	.3	.1	.0
Ann	16.2	6.6	1.7	.5	@

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	8.2	4.6	3.0	1.1
Feb	6.3	3.2	2.2	.8
Mar	1.6	.6	.1	.0
Apr	.2	.1	@	.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	.3	.1	@	.0
Dec	5.1	2.4	.8	.0
Ann	21.7	11.0	6.1	1.9

+ 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	5/20	5/15	5/12	5/09	5/06	5/03	5/01	4/27	4/23
32	5/12	5/07	5/03	4/30	4/26	4/23	4/20	4/16	4/10
28	4/30	4/25	4/22	4/19	4/16	4/13	4/10	4/06	4/01
24	4/18	4/13	4/09	4/06	4/04	4/01	3/29	3/25	3/20
20	4/07	4/01	3/28	3/25	3/21	3/18	3/15	3/10	3/05
16	4/01	3/25	3/20	3/15	3/11	3/07	3/03	2/26	2/19

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	9/20	9/24	9/27	9/29	10/01	10/03	10/06	10/08	10/12
32	9/29	10/03	10/06	10/09	10/12	10/14	10/17	10/20	10/24
28	10/08	10/14	10/17	10/21	10/24	10/27	10/30	11/03	11/09
24	10/20	10/25	10/28	11/01	11/03	11/06	11/09	11/13	11/18
20	10/31	11/06	11/11	11/15	11/18	11/22	11/26	11/30	12/07
16	11/08	11/16	11/21	11/26	12/01	12/05	12/10	12/16	12/23

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	163	158	154	150	147	144	141	137	131
32	187	181	176	171	167	163	159	154	147
28	214	206	200	195	190	186	181	175	167
24	235	228	222	217	213	209	204	199	191
20	267	258	252	246	241	236	230	224	215
16	292	282	275	269	263	258	252	245	235

***** 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	1220	984	768	439	196	27	4	19	103	410	711	1061	5942
60	1065	844	613	296	110	6	0	3	40	277	561	906	4721
57	972	760	526	219	72	2	0	0	19	209	473	813	4065
55	910	707	467	172	51	1	0	0	11	169	415	756	3659
50	766	577	330	80	19	0	0	0	2	89	282	611	2756
32	305	198	45	0	0	0	0	0	0	0	23	201	772

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	108	139	301	552	899	1126	1273	1206	953	623	302	164	7646
55	0	4	10	35	237	437	560	493	273	78	5	5	2137
57	0	0	6	21	195	378	498	431	222	56	2	0	1809
60	0	0	0	9	141	292	405	341	153	31	0	0	1372
65	0	0	0	2	72	163	255	202	66	9	0	0	769
70	0	0	0	0	29	68	123	98	19	1	0	0	338

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	24	42	145	337	658	896	1046	985	744	414	155	43	24	66	211	548	1206	2102	3148	4133	4877	5291	5446	5489
45	6	18	83	217	505	746	891	830	594	275	87	21	6	24	107	324	829	1575	2466	3296	3890	4165	4252	4273
50	1	4	41	124	356	596	736	675	445	163	40	6	1	5	46	170	526	1122	1858	2533	2978	3141	3181	3187
55	0	1	22	63	228	446	581	520	305	83	17	0	0	1	23	86	314	760	1341	1861	2166	2249	2266	2266
60	0	0	4	23	124	308	426	365	184	35	2	0	0	0	4	27	151	459	885	1250	1434	1469	1471	1471
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	5	27	94	209	409	597	709	665	474	251	87	22	5	32	126	335	744	1341	2050	2715	3189	3440	3527	3549

(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