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: POWDER RIVER NO 2, WY **COOP ID: 487376**

Climate Division: WY 5 **NWS Call Sign:** **Elevation: 5,700 Feet** **Lat: 43˚02N** **Lon: 106˚59W**

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	32.6	8.3	20.5	60+	1981	24	32.3	1981	-42	1979	1	-.7	1979	1380	0	.0	.0	1.6	12.9	30.7	7.8
Feb	38.5	14.2	26.4	65	1982	22	35.0	1992	-31+	1989	3	11.7	1989	1083	0	.0	.0	3.8	7.6	27.4	4.8
Mar	48.7	21.8	35.3	73+	1986	30	42.2	1986	-18	1996	25	27.9	1996	923	0	.0	.0	14.0	2.7	27.2	.8
Apr	58.3	28.3	43.3	82+	1992	30	49.8	1981	-8	1975	2	33.3	1999	651	0	.0	.0	22.3	.9	20.3	.1
May	68.4	36.9	52.7	96	1969	27	57.9	1994	12	1967	1	46.3	1995	388	5	.0	@	28.8	.1	8.8	.0
Jun	79.9	45.1	62.5	101	1980	27	70.4	1988	24	1969	13	56.7	1975	144	69	.1	3.9	29.9	.0	.8	.0
Jul	88.8	51.2	70.0	109	1981	6	74.2	1980	30	1972	4	62.9	1993	35	189	.5	13.7	31.0	.0	.1	.0
Aug	87.0	49.7	68.4	104	1981	19	73.1	1983	26	1976	27	62.9	1987	47	151	.3	10.9	31.0	.0	.3	.0
Sep	73.9	39.8	56.9	99+	1976	6	62.0	1990	10	1984	25	48.6	1985	271	27	.0	2.1	29.0	.1	5.3	.0
Oct	59.9	30.8	45.4	86+	1992	2	49.6	1988	-5	1983	30	40.6	2000	609	0	.0	.0	24.8	.7	18.6	.2
Nov	41.9	18.1	30.0	77	1965	1	41.7	1999	-30	1985	24	14.6	2000	1050	0	.0	.0	9.7	6.3	27.4	2.4
Dec	34.0	9.3	21.7	63	1965	4	34.4	1980	-45	1990	21	8.2	1983	1344	0	.0	.0	3.1	11.8	30.0	6.7
Ann	59.3	29.5	44.4	109	Jul 1981	6	74.2	Jul 1980	-45	Dec 1990	21	-.7	Jan 1979	7925	441	.9	30.6	229.0	43.1	196.9	22.8

\+ 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/normals/usnormals.html

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1964-2001

(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	.41	.36	.85	1987	6	1.16	1978	.05	1971
Feb	.44	.38	.94	1975	15	1.53	1987	.00	1992
Mar	.91	.81	1.19	1981	28	3.15	1981	.00+	1996
Apr	1.26	1.07	1.18	1966	18	5.12	1974	.00+	1998
May	2.28	2.34	1.79	1978	18	6.72	1978	.14	1998
Jun	1.46	1.10	2.18+	1993	3	5.91	1993	.00	2000
Jul	1.25	1.02	2.18	1979	23	3.30	1973	.00+	2000
Aug	.67	.72	.92	1974	10	1.86	1992	.00+	2000
Sep	.84	.67	1.50	1985	28	2.74	1985	.00+	1983
Oct	.87	.75	1.28+	1998	27	2.95	1998	.03	1988
Nov	.58	.48	1.10	1996	16	1.86	1994	.00+	1998
Dec	.49	.38	.95	1974	18	1.76	1974	.00+	2000
Ann	11.46+	11.25+	2.18+	Jun 1993	3	6.72	May 1978	.00+	Dec 2000

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	4.6	1.7	.1	.0
Feb	3.8	1.4	.2	.0
Mar	6.0	2.9	.3	@
Apr	6.5	3.5	.4	.1
May	8.7	5.1	.9	.3
Jun	5.5	3.0	.8	.2
Jul	4.1	2.5	.9	.2
Aug	4.1	2.1	.3	.0
Sep	3.7	2.3	.5	.1
Oct	4.1	2.4	.4	.1
Nov	3.9	1.8	.2	@
Dec	3.8	1.7	.1	.0
Ann	58.8	30.4	5.1	1.0

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	.06	.09	.15	.21	.27	.33	.40	.49	.62	.82	1.01
Feb	.03	.08	.15	.21	.28	.35	.44	.55	.69	.92	1.15
Mar	.00	.10	.27	.41	.56	.72	.91	1.13	1.43	1.93	2.40
Apr	.00	.00	.34	.56	.77	1.01	1.27	1.60	2.02	2.72	3.39
May	.28	.47	.79	1.11	1.44	1.82	2.25	2.79	3.52	4.71	5.87
Jun	.06	.18	.39	.61	.84	1.10	1.41	1.79	2.33	3.21	4.08
Jul	.00	.14	.36	.56	.77	.99	1.25	1.56	1.98	2.67	3.34
Aug	.00	.00	.07	.21	.35	.49	.66	.86	1.14	1.58	2.04
Sep	.00	.03	.13	.24	.38	.54	.75	1.01	1.38	2.03	2.67
Oct	.09	.15	.27	.39	.52	.67	.84	1.06	1.36	1.86	2.34
Nov	.00	.00	.18	.28	.38	.48	.60	.74	.92	1.21	1.50
Dec	.00	.00	.11	.19	.28	.37	.48	.62	.79	1.09	1.38
Ann	6.17	7.09	8.32	9.29	10.18	11.07	12.00	13.05	14.36	16.32	18.05

\+ 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: 1964-2001
(3) Derived from 1971-2000 serially complete daily data

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Snow (inches)

Snow Totals

Means/Medians (1)

Extremes (2)

Mean Number of Days (1)

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	8.4	8.0	2	1	14.0	2000	27	17.3	1979	19	1979	6	15	1979	3.1	2.6	1.1	.3	.1	12.1	5.3	1.8	.7
Feb	5.9	5.0	2	1	11.0	1979	22	14.0	1979	13+	1995	16	7	1979	2.3	1.9	.7	.4	.1	8.1	3.8	2.0	.2
Mar	9.3	8.6	1	#	7.3	1977	28	27.8	1977	8	1977	30	3	1977	3.6	3.1	1.2	.3	.0	6.1	2.7	1.1	.0
Apr	6.4	4.5	1	#	8.0	1991	12	22.0	1972	13+	1999	2	2	1999	2.8	2.4	1.1	.3	.0	3.0	1.3	.6	.1
May	1.4	.0	#	0	6.0	1979	3	15.0	1979	11	1980	12	1	1980	.5	.5	.1	@	.0	.4	.1	.1	.0
Jun	.0	.0	#	0	1.0	1979	8	1.0	1979	#	1995	8	#	1995	@	@	.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	.8	.0	#	0	7.0	2000	23	10.0	2000	7	2000	23	#+	2000	.2	.2	.1	.1	.0	.1	.1	@	.0
Oct	5.5	4.9	1	#	13.0	1995	22	16.0	1994	15	1998	17	8	1998	1.6	1.4	.8	.4	.1	1.4	1.1	.8	.3
Nov	6.5	7.0	1	1	8.0	1987	15	12.7	1993	18	1996	16	5	1978	2.8	2.4	.9	.3	.0	8.2	4.2	1.2	.2
Dec	5.7	3.1	2	1	5.5	1974	18	24.5	1978	18	1978	29	9	1978	2.5	2.1	.7	.1	.0	8.4	2.9	.0	.0
Ann	49.9	41.1	N/A	N/A	14.0	Jan 2000	27	27.8	Mar 1977	19	Jan 1979	6	15	Jan 1979	19.4	16.6	6.7	2.2	.3	47.8	21.5	7.6	1.5

+ 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	7/04	6/27	6/22	6/18	6/14	6/10	6/06	6/01	5/25
32	6/18	6/12	6/07	6/03	5/30	5/26	5/22	5/17	5/11
28	5/28	5/23	5/20	5/17	5/15	5/12	5/10	5/06	5/02
24	5/16	5/10	5/07	5/03	4/30	4/27	4/24	4/20	4/15
20	5/05	4/29	4/25	4/21	4/17	4/14	4/10	4/06	3/31
16	4/30	4/22	4/17	4/12	4/08	4/03	3/29	3/24	3/16

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	8/19	8/24	8/28	9/01	9/04	9/07	9/10	9/15	9/20
32	8/29	9/03	9/07	9/10	9/13	9/16	9/19	9/23	9/28
28	9/05	9/10	9/14	9/17	9/20	9/23	9/27	9/30	10/06
24	9/14	9/20	9/24	9/28	10/02	10/05	10/09	10/14	10/20
20	9/29	10/05	10/09	10/13	10/16	10/20	10/23	10/28	11/03
16	10/06	10/13	10/17	10/21	10/25	10/28	11/01	11/06	11/12

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	111	101	94	87	81	75	69	61	51
32	134	124	117	111	106	100	94	87	78
28	151	143	137	132	128	123	118	113	105
24	178	170	164	158	154	149	143	137	129
20	209	200	193	187	181	176	170	163	153
16	232	221	213	206	199	193	186	178	167

***** 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	1380	1083	923	651	388	144	35	47	271	609	1050	1344	7925
60	1225	943	768	509	253	68	10	14	163	455	900	1189	6497
57	1132	859	675	427	184	38	3	5	111	365	810	1096	5705
55	1070	803	613	374	144	24	1	3	83	307	752	1034	5208
50	915	663	465	256	70	6	0	0	33	180	614	882	4084
32	415	237	81	25	0	0	0	0	0	7	209	393	1367

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	58	78	181	364	640	915	1178	1127	745	420	149	72	5927
55	0	0	1	22	71	249	466	416	138	7	2	0	1372
57	0	0	0	15	48	203	406	357	107	3	0	0	1139
60	0	0	0	8	24	143	319	273	68	1	0	0	836
65	0	0	0	0	5	69	189	151	27	0	0	0	441
70	0	0	0	0	0	25	96	66	8	0	0	0	195

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	7	50	162	371	663	916	871	537	230	39	3	0	7	57	219	590	1253	2169	3040	3577	3807	3846	3849
45	0	0	14	82	236	513	761	716	396	128	11	0	0	0	14	96	332	845	1606	2322	2718	2846	2857	2857
50	0	0	0	35	129	368	606	562	264	53	1	0	0	0	0	35	164	532	1138	1700	1964	2017	2018	2018
55	0	0	0	10	56	231	452	408	158	16	0	0	0	0	0	10	66	297	749	1157	1315	1331	1331	1331
60	0	0	0	0	15	122	300	261	74	1	0	0	0	0	0	0	15	137	437	698	772	773	773	773
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	5	52	137	267	437	575	563	378	192	39	2	0	5	57	194	461	898	1473	2036	2414	2606	2645	2647

(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

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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