

Climatology of the United States

No. 20

1971-2000

Station: BILLINGS INTL AP, MT

COOP ID: 240807

Climate Division: MT 5

NWS Call Sign: BIL

Elevation: 3,567 Feet Lat: 45° 48N

Lon: 108° 33W

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	32.8	15.1	24.0	68	1953	11	36.9	1986	-30	1997	12	8.1	1979	1280	0	.0	.0	4.1	12.8	27.4	7.2
Feb	39.5	20.1	29.8	72	1961	10	40.8	1991	-28+	1996	2	13.2	1989	1001	0	.0	.0	7.9	7.7	23.6	3.6
Mar	47.6	26.4	37.0	79+	1986	28	46.0	1986	-19+	1989	4	28.1	1996	876	0	.0	.0	14.8	4.2	22.8	.9
Apr	57.5	34.7	46.1	90	1980	20	54.4	1980	5	1997	12	38.1	1975	575	2	.0	@	22.0	.9	11.4	.0
May	67.4	44.0	55.7	95	1984	30	60.8	1980	14	1954	2	50.4	1996	312	13	.0	.4	28.7	.0	1.6	.0
Jun	78.0	52.5	65.2	105	1984	29	75.7	1988	32+	1969	13	58.2	1998	90	90	.3	4.2	29.9	.0	.0	.0
Jul	85.8	58.3	72.0	105+	1999	24	76.3	1974	41+	1972	19	62.4	1993	20	227	1.2	11.7	31.0	.0	.0	.0
Aug	84.5	57.3	70.9	105	1961	5	77.7	1971	35	1992	25	65.1	1993	25	204	.4	10.7	31.0	.0	.0	.0
Sep	71.8	47.1	59.5	103	1983	1	66.6	1998	22	1984	24	52.4	1985	205	44	@	1.9	28.4	.1	1.2	.0
Oct	58.9	37.2	48.1	90+	1992	1	52.6	1983	-7	1991	30	41.3	1984	516	3	.0	@	25.0	.8	8.8	@
Nov	42.7	25.6	34.1	77+	1999	12	45.3	1999	-22	1959	16	14.4	1985	911	0	.0	.0	11.0	5.9	21.9	1.3
Dec	34.5	17.7	26.1	69+	1980	15	36.4	1979	-32	1983	24	8.1	1983	1195	0	.0	.0	4.3	10.8	27.5	4.5
Ann	58.4	36.3	47.4	105+	1999	Jul 24	77.7	Aug 1971	-32	Dec 1983	24	8.1+	Dec 1983	7006	583	1.9	28.9	238.1	43.2	146.2	17.5

+ 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

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	.81	.68	1.22	1972	2	2.35	1972	.07	1987	8.0	2.4	.2	.1	.11	.17	.29	.40	.52	.65	.80	.98	1.24	1.65	2.04
Feb	.58	.49	.65	2000	25	1.77	1978	.02	1997	6.9	2.0	.1	.0	.07	.12	.20	.28	.36	.46	.57	.70	.89	1.19	1.48
Mar	1.12	1.03	.95+	1973	22	2.05	1985	.18	1978	9.3	3.4	.5	.0	.39	.49	.65	.78	.90	1.03	1.17	1.33	1.54	1.86	2.16
Apr	1.74	1.64	2.53	1978	28	4.12	1978	.31	1985	10.7	5.0	.9	@	.39	.55	.81	1.04	1.27	1.51	1.79	2.11	2.54	3.23	3.88
May	2.48	1.99	2.83	1952	21	7.71	1981	.40	1993	12.0	6.1	1.3	.3	.59	.82	1.18	1.51	1.83	2.17	2.55	3.00	3.59	4.54	5.42
Jun	1.89	1.60	2.91	1997	8	5.62	1991	.43	1988	11.0	5.2	.9	.2	.41	.59	.87	1.12	1.37	1.64	1.94	2.30	2.77	3.53	4.24
Jul	1.28	1.03	2.06	1993	3	5.08	1993	.04	1988	8.1	2.9	.8	.2	.10	.19	.36	.53	.73	.95	1.22	1.55	2.02	2.80	3.56
Aug	.85	.73	1.90	1965	20	2.18	1974	.06	2000	6.6	2.4	.2	.1	.10	.17	.29	.41	.53	.67	.84	1.04	1.31	1.76	2.19
Sep	1.34	1.32	2.19	1966	13	3.78	1978	.08	1990	7.2	3.4	.7	.2	.18	.29	.48	.67	.86	1.08	1.33	1.64	2.06	2.75	3.41
Oct	1.26	1.16	1.67	1971	1	3.80	1971	.01	1987	6.8	3.4	.6	.2	.13	.22	.39	.57	.76	.97	1.22	1.54	1.96	2.67	3.37
Nov	.75	.57	1.11	1968	4	2.34	1978	.17	1971	6.3	2.5	.2	.0	.17	.24	.35	.45	.55	.65	.77	.91	1.10	1.39	1.67
Dec	.67	.41	.97	1978	4	2.00	1973	.09	1979	7.2	2.1	.1	.0	.08	.13	.23	.32	.42	.53	.66	.82	1.04	1.40	1.75
Ann	14.77	14.54	2.91	Jun 1997	8	7.71	May 1981	.01	Oct 1987	100.1	40.8	6.5	1.3	9.25	10.26	11.59	12.62	13.55	14.45	15.40	16.46	17.75	19.66	21.33

+ 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

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Lon: 108° 33W

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	10.3	10.1	3	2	14.0	1972	2	27.6	1972	18	1972	3	14	1979	7.2	3.1	1.1	.4	.1	17.3	11.1	7.0	2.4
Feb	6.5	6.2	2	2	7.7	1978	24	22.4	1978	22	1978	28	17	1978	6.2	2.1	.4	.2	.0	11.1	6.7	4.5	2.0
Mar	10.3	8.2	1	2	9.5	1982	19	25.1	1989	22+	1978	4	7	1978	7.2	3.2	.8	.5	.0	8.4	4.8	2.6	.8
Apr	7.7	6.9	#	1	7.4	1991	11	30.0	1991	12	1991	14	2+	1997	4.3	2.2	1.0	.4	.0	2.9	1.6	.8	.1
May	1.8	.0	#	1	15.0	1981	11	15.6	1981	10	1983	13	1	1983	.8	.4	.2	.1	@	.2	.1	.1	@
Jun	#	.0	#	0	#	1998	5	#	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	#	1992	24	#	1992	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sep	1.3	.0	#	0	6.2	1984	23	9.3	1984	7	1984	24	1	1984	.5	.4	.2	.1	.0	.4	.2	.1	.0
Oct	4.2	3.2	#	0	9.5	1980	15	17.8	1980	12	1980	17	1+	1993	2.2	1.2	.5	.3	.0	1.5	.7	.5	.1
Nov	7.5	5.6	1	1	12.4	1994	17	25.2	1978	17+	1978	20	11	1978	4.8	2.4	.8	.2	@	8.1	4.4	2.9	.9
Dec	8.2	6.2	2	1	13.7	1978	4	22.2	1978	24+	1978	8	14	1978	7.2	2.6	.8	.2	@	15.5	7.3	4.7	1.4
Ann	57.8	46.4	N/A	N/A	15.0	May 1981	11	30.0	Apr 1991	24+	Dec 1978	8	17	Feb 1978	40.4	17.6	5.8	2.4	.1	65.4	36.9	23.2	7.7

+ 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	5/28	5/23	5/19	5/16	5/14	5/11	5/08	5/04	4/29
32	5/17	5/13	5/10	5/07	5/04	5/02	4/29	4/26	4/21
28	5/03	4/28	4/24	4/21	4/19	4/16	4/13	4/10	4/05
24	4/26	4/20	4/16	4/12	4/09	4/06	4/02	3/29	3/24
20	4/18	4/12	4/07	4/03	3/30	3/26	3/22	3/18	3/11
16	4/11	4/04	3/29	3/25	3/21	3/17	3/12	3/07	2/28
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	9/07	9/12	9/15	9/18	9/21	9/24	9/26	9/30	10/05
32	9/18	9/22	9/26	9/28	10/01	10/03	10/06	10/09	10/14
28	9/21	9/27	10/02	10/05	10/09	10/12	10/16	10/20	10/26
24	10/07	10/13	10/17	10/21	10/25	10/29	11/02	11/06	11/13
20	10/16	10/22	10/27	10/31	11/04	11/07	11/11	11/16	11/22
16	10/29	11/04	11/07	11/11	11/14	11/17	11/20	11/24	11/29
Freeze Free Period									
Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	151	144	139	134	130	125	121	115	108
32	168	162	157	153	149	145	141	136	130
28	197	188	182	177	172	167	162	156	148
24	223	214	208	203	198	193	188	182	174
20	243	234	228	223	218	213	207	201	193
16	266	256	249	243	237	232	226	219	209

* 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)

Base	Heating Degree Days (1)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Below													
65	1280	1001	876	575	312	90	20	25	205	516	911	1195	7006
60	1119	854	712	426	178	43	9	17	130	373	781	1050	5692
57	1032	775	620	345	120	22	2	7	87	288	697	959	4954
55	976	722	561	295	89	14	1	4	63	235	641	900	4501
50	831	595	418	187	34	2	0	0	24	126	506	758	3481
32	387	239	73	9	0	0	0	0	0	4	159	317	1188

Cooling Degree Days (1)

Base	Cooling Degree Days (1)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Above													
32	79	126	235	431	726	989	1235	1205	830	522	194	86	6658
55	0	0	3	26	110	308	523	494	200	43	3	0	1710
57	0	0	2	17	80	255	462	433	159	29	2	0	1439
60	0	0	0	8	45	183	372	344	108	14	1	0	1075
65	0	0	0	2	13	90	227	204	44	3	0	0	583
70	0	0	0	0	2	34	112	95	13	0	0	0	256

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	17	44	93	234	487	758	997	963	603	310	79	24	17	61	154	388	875	1633	2630	3593	4196	4506	4585	4609
45	2	15	41	130	344	608	842	808	462	196	36	7	2	17	58	188	532	1140	1982	2790	3252	3448	3484	3491
50	0	2	12	67	215	460	687	653	327	104	11	0	0	2	14	81	296	756	1443	2096	2423	2527	2538	2538
55	0	0	0	29	118	315	532	499	204	49	2	0	0	0	0	29	147	462	994	1493	1697	1746	1748	1748
60	0	0	0	7	47	188	386	354	113	12	0	0	0	0	0	7	54	242	628	982	1095	1107	1107	1107
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	5	31	69	155	287	463	637	618	368	191	49	11	5	36	105	260	547	1010	1647	2265	2633	2824	2873	2884

(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.
Complete documentation for the 1971-2000 Normals is available on the internet from:
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.

- 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/normal.html
U.S. Climate Normals 1971-2000-Products Clim20, www.ncdc.noaa.gov/oa/climate/normal/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