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: BENBROOK DAM, TX **COOP ID: 410691**

Climate Division: TX 3 **NWS Call Sign:** **Elevation: 790 Feet** **Lat: 32˚39N** **Lon: 97˚27W**

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	55.1	31.4	43.3	83+	1999	20	50.5	1990	4+	1987	7	33.7	1978	675	0	.0	.0	20.1	1.9	17.1	.0
Feb	60.4	36.3	48.4	94	1996	23	56.6	1976	5+	1985	3	36.3	1978	474	9	.0	.1	21.5	1.2	9.6	.0
Mar	68.2	44.1	56.2	93	1956	28	61.6	1972	12	1980	2	51.5	1996	284	10	.0	.2	29.2	.2	3.2	.0
Apr	75.9	52.2	64.1	97+	1963	11	69.2	1981	28	1975	3	59.5	1973	94	66	.0	.7	29.9	.0	.4	.0
May	83.4	61.4	72.4	101	1967	12	79.1	1996	38	1954	4	68.1	1976	14	244	.0	4.9	31.0	.0	.0	.0
Jun	91.3	68.8	80.1	110	1980	28	85.4	1998	52	1976	21	75.8	1983	0	450	1.7	17.9	30.0	.0	.0	.0
Jul	96.6	72.3	84.5	111	1954	26	90.6	1998	59+	1994	28	80.6	1976	0	603	7.3	27.7	31.0	.0	.0	.0
Aug	96.3	71.6	84.0	108	1964	12	88.7	1999	54	1992	28	78.4	1992	0	588	8.3	26.6	31.0	.0	.0	.0
Sep	88.9	65.0	77.0	110	2000	5	82.9	1977	40	1999	30	69.4	1974	4	362	1.4	15.2	30.0	.0	.0	.0
Oct	79.1	54.5	66.8	99+	1977	1	70.3	1979	22	1993	31	59.2	1976	60	115	.0	2.7	30.8	.0	.1	.0
Nov	66.5	43.5	55.0	89	1975	8	62.1	1999	18+	1979	30	47.8	1976	319	18	.0	.0	27.2	.1	4.2	.0
Dec	57.8	34.5	46.2	88	1955	25	52.4	1984	-6	1989	24	34.6	1983	585	1	.0	.0	23.0	.9	12.3	.1
Ann	76.6	53.0	64.8	111	Jul 1954	26	90.6	Jul 1998	-6	Dec 1989	24	33.7	Jan 1978	2509	2466	18.7	96.0	334.7	4.3	46.9	.1

\+ 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: 1949-2001

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

Issue Date: February 2004

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Precipitation (inches)

Precipitation Totals

	Means/ Medians(1)		Extremes							Mean Number of Days (3)				Precipitation Probabilities (1)									
										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	1.70	1.52	2.20	1974	19	3.99	1979	.00	1986	6.5	3.6	1.0	.4	.15	.34	.62	.87	1.12	1.40	1.71	2.09	2.60	3.43	4.22
Feb	2.19	1.93	3.62	1965	9	7.46	1997	.00	1999	6.2	4.0	1.4	.6	.17	.40	.75	1.07	1.41	1.77	2.19	2.71	3.40	4.52	5.61
Mar	2.67	2.40	3.83	1998	16	7.36	1990	.12	1971	7.0	4.4	1.7	.7	.42	.64	1.03	1.40	1.78	2.20	2.68	3.26	4.05	5.32	6.55
Apr	3.17	2.81	3.56	1979	20	6.73	1979	.31	1983	6.7	4.5	2.3	.9	.61	.90	1.36	1.79	2.22	2.69	3.22	3.85	4.70	6.06	7.34
May	4.58	4.25	4.38	1989	17	10.60	1989	.85	1996	9.6	6.4	3.0	1.4	1.16	1.59	2.26	2.85	3.43	4.04	4.72	5.53	6.59	8.26	9.83
Jun	3.56	2.95	5.35	1986	2	10.65	1986	.15	1980	6.9	5.1	2.4	1.1	.36	.62	1.11	1.60	2.14	2.74	3.45	4.34	5.56	7.57	9.55
Jul	2.29	1.55	5.10	1975	25	8.96	1973	.00	1993	4.9	3.2	1.6	.7	.07	.24	.55	.88	1.24	1.66	2.16	2.80	3.68	5.15	6.61
Aug	2.03	1.44	5.03	1974	27	7.62	1974	.00+	2000	5.0	2.8	1.1	.6	.00	.08	.33	.61	.95	1.35	1.84	2.46	3.35	4.88	6.40
Sep	2.86	3.33	4.80	1964	21	6.21	1988	.00	2000	6.2	4.0	1.8	1.0	.30	.64	1.12	1.53	1.95	2.41	2.92	3.54	4.36	5.68	6.94
Oct	4.14	3.05	6.36	1991	27	12.59	1991	.11	1975	6.6	4.7	2.6	1.5	.28	.54	1.06	1.63	2.27	3.00	3.89	5.02	6.60	9.25	11.89
Nov	2.35	2.17	2.88	1952	24	6.71	1996	.33	1979	6.8	4.3	1.5	.5	.38	.58	.92	1.24	1.57	1.94	2.36	2.86	3.54	4.65	5.70
Dec	2.47	2.07	4.00	1991	21	9.23	1991	.19	1981	6.4	4.0	1.7	.5	.21	.38	.71	1.05	1.43	1.86	2.37	3.01	3.89	5.37	6.83
Ann	34.01	34.33	6.36	Oct 1991	27	12.59	Oct 1991	.00+	Sep 2000	78.8	51.0	22.1	9.9	20.88	23.28	26.43	28.87	31.07	33.23	35.49	38.02	41.13	45.70	49.72

\+ 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: 1949-2001
(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	.1	.0	#	0
Feb	.2	.0	#	0
Mar	.0	.0	#	0
Apr	.0	.0	0	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	0
Nov	.3	.0	#	0
Dec	.2	.0	#	0
Ann	.8	.0	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	.6	1988	7	.6	1988	1	1988	7	#+	1988
Feb	1.1	1988	6	1.4	1988	1	1988	6	#	1988
Mar	.1	1982	6	.1	1982	#+	1989	6	#+	1989
Apr	.0	0	0	.0	0	0	0	0	0	0
May	.0	0	0	.0	0	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	.0	0	0	.0	0	0	0	0	0	0
Nov	3.0	1976	14	4.0	1976	#	1993	27	#	1993
Dec	2.0	1986	12	2.0	1986	#	1990	31	#	1990
Ann	3.0	Nov 1976	14	4.0	Nov 1976	1+	Feb 1988	6	#+	Nov 1993

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	.1	.0	.0	.0	.0
Feb	.2	.1	.0	.0	.0
Mar	.1	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.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	.0	.0	.0	.0	.0
Nov	.2	.2	.1	.0	.0
Dec	.1	.1	.0	.0	.0
Ann	.7	.4	.1	.0	.0

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	@	.0	.0	.0
Feb	@	.0	.0	.0
Mar	.0	.0	.0	.0
Apr	.0	.0	.0	.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	.0
Nov	.0	.0	.0	.0
Dec	.0	.0	.0	.0
Ann	@	.0	.0	.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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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	4/12	4/07	4/03	3/30	3/27	3/24	3/21	3/17	3/12
32	4/06	3/29	3/24	3/19	3/15	3/10	3/06	2/28	2/20
28	3/24	3/15	3/09	3/03	2/26	2/21	2/15	2/09	1/31
24	3/13	3/04	2/25	2/20	2/14	2/09	2/03	1/28	1/18
20	2/27	2/18	2/11	2/06	1/31	1/25	1/18	1/07	0/00
16	2/18	2/09	2/02	1/26	1/20	1/13	1/04	0/00	0/00

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	10/26	10/31	11/03	11/06	11/08	11/11	11/14	11/17	11/22
32	10/30	11/05	11/10	11/13	11/17	11/21	11/25	11/29	12/06
28	11/09	11/16	11/21	11/26	11/30	12/04	12/09	12/14	12/22
24	11/16	11/24	11/30	12/05	12/10	12/15	12/20	12/26	1/04
20	11/29	12/07	12/12	12/17	12/22	12/27	1/03	1/12	0/00
16	12/17	12/24	12/30	1/04	1/09	1/15	1/23	0/00	0/00

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	242	236	232	229	225	222	219	214	209
32	275	266	259	252	247	241	235	228	218
28	309	298	290	283	277	270	263	255	244
24	331	320	312	305	298	292	285	277	265
20	>365	>365	>365	344	330	319	309	299	285
16	>365	>365	>365	>365	358	344	334	324	312

***** 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)												
Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	675	474	284	94	14	0	0	0	4	60	319	585	2509
60	529	348	160	31	2	0	0	0	0	18	203	439	1730
57	443	279	105	12	0	0	0	0	0	7	147	354	1347
55	389	239	76	6	0	0	0	0	0	4	116	302	1132
50	267	154	28	0	0	0	0	0	0	1	56	190	696
32	26	10	0	0	0	0	0	0	0	0	0	9	45

Base	Cooling Degree Days (1)												
Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	376	469	749	962	1253	1440	1626	1611	1348	1078	690	448	12050
55	25	53	112	278	540	750	913	898	658	369	115	28	4739
57	17	38	79	225	478	690	851	836	598	310	87	18	4227
60	10	22	41	153	387	600	758	743	508	228	53	10	3513
65	0	9	10	66	244	450	603	588	362	115	18	1	2466
70	0	0	0	19	129	304	448	433	228	42	4	0	1607

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	190	298	514	723	1000	1198	1374	1359	1106	828	459	241	190	488	1002	1725	2725	3923	5297	6656	7762	8590	9049	9290
45	107	193	371	573	845	1048	1219	1204	956	674	325	136	107	300	671	1244	2089	3137	4356	5560	6516	7190	7515	7651
50	47	109	242	426	691	898	1064	1049	806	522	214	71	47	156	398	824	1515	2413	3477	4526	5332	5854	6068	6139
55	22	53	140	294	537	748	909	894	656	376	123	30	22	75	215	509	1046	1794	2703	3597	4253	4629	4752	4782
60	2	22	65	172	385	598	754	739	510	243	56	4	2	24	89	261	646	1244	1998	2737	3247	3490	3546	3550
Base	Growing Degree Units for Corn (Monthly)												Growing Degree Units for Corn (Accumulated Monthly)											
50/86	139	193	316	455	671	817	909	896	738	533	280	156	139	332	648	1103	1774	2591	3500	4396	5134	5667	5947	6103

(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