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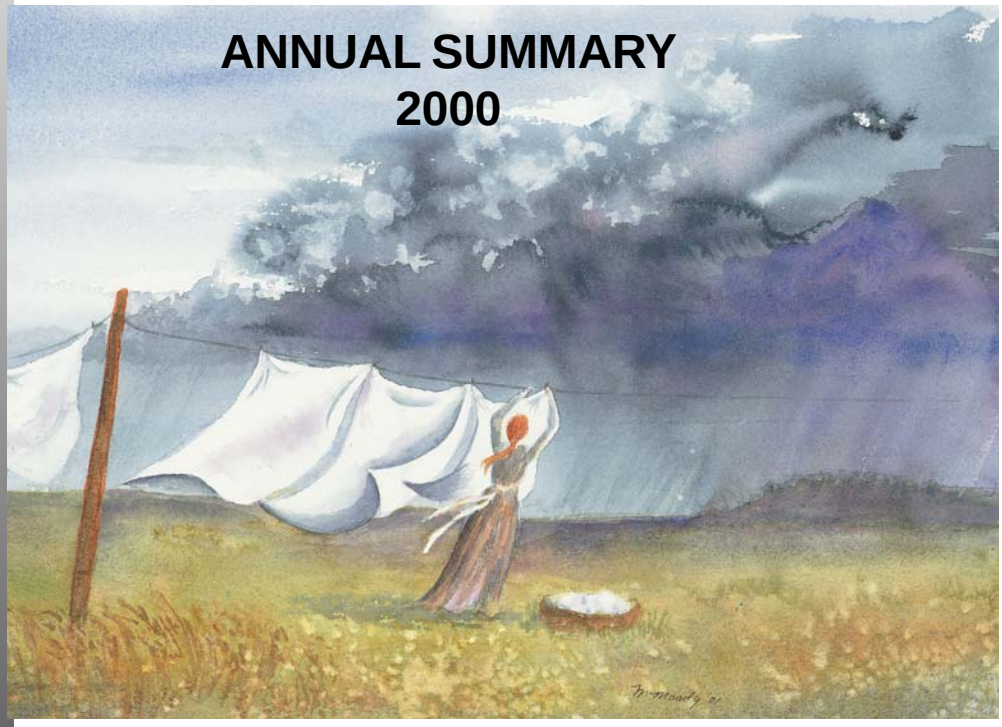
SASKATOON SRC CLIMATOLOGICAL REFERENCE STATION

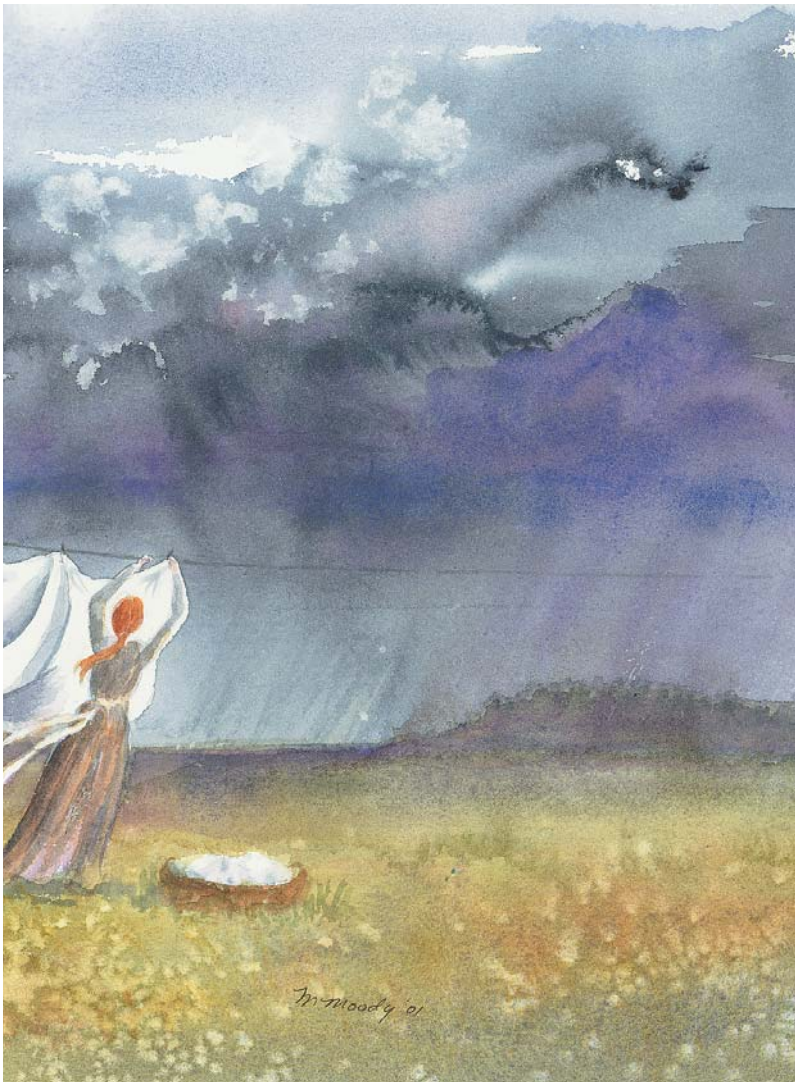
ANNUAL SUMMARY 2000



C. Beaulieu
V. Wittrock

SRC Publication No. 10440-1E01

August 2001



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Information and data contained in this report shall not be published, copied, placed in a retrieval system or distributed whole or in part without prior written consent of the Saskatchewan Research Council. All references made to this report shall be acknowledged.

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`Three Sheets to the Wind` detail 2001
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CLIMATE REFERENCE STATION HISTORY

Meteorological observations were first taken at or near Saskatoon by the Royal Northwest Mounted Police in 1889 beginning with only temperatures recorded. There is some disagreement in the early records as to the exact location of the weather observing point, but the majority of the evidence indicates 52°15'N and 106°20'W, elevation 480 m above sea level as the most probable location. This would place it at Clark's Crossing on the South Saskatchewan River, approximately 16 km northeast of the centre of the City of Saskatoon. There was a settlement at Clark's Crossing at that time as well as ten to fifteen families on either side of the river at present day Saskatoon.

Little is known about the very early observers; however, the records do show that Major T.H. Keenan took the observations from March 1892 until March 1895, and Mr. George Will was the observer from January 1897 until April 1897. It is thought that Thomas H. Copeland was involved in the observational program from 1895 to May 1, 1901, at which time it was taken over by Mr. Eby, Sr. Mr. Eby, Sr. recorded the observations until his death in 1921, at which time his daughter, Miss E.S. Eby, continued to record the observations. Her brother, Mr. J.M. Eby, recorded the observations beginning in April 1931 until the station was closed October 31, 1942. The Eby station recorded temperature, precipitation and weather notes on fog, thunderstorms, winds and any unusual weather phenomena. Reports were made twice daily, morning and evening.

In 1916 a climatological station was established by the Physics Department of the University of Saskatchewan and continuous observations were kept twice daily until January 15, 1965. The long-time observer at this site was Mr. Sidney Cox. The Saskatchewan Research Council took over the program in the fall of 1963 at the newly established Climatological Reference Station at latitude 52°09'N, longitude 106°36'W and elevation 497 m asl *(Christiansen 1970; Environment Canada 1975)*.

The long-time observer (16 years) at this present site was Mr. Joe Calvert, who retired from the program in August, 1983. Ray Begrand succeeded Mr. Calvert until September 1988 when Virginia Wittrock became the primary observer. Carol Beaulieu became the primary observer in 1992.

In the summer of 1992, the CRS began to be converted to an automated system of data collection with the installation of a Campbell Scientific Data Logger and automatic sensors. The following manual data collection duties were turned over to Environment Canada: evaporation, bright sunshine (Campbell-Stokes), snow survey, snow cover, and manual temperature and precipitation programs. Manual temperature, precipitation and snow cover readings are still possible at the site.

WHAT IS THE CLIMATE REFERENCE STATION?

The Saskatchewan Research Council's Climate Reference Station (SRC CRS) at Saskatoon is classified as a principal climatological station with supplementary climatological observations (Environment Canada 1992). A reference climatological station's data are intended for the purpose of determining climatic trends. This requires long periods (not less than thirty years) of homogeneous records, where man-made environmental changes have been or are expected to remain at a minimum. Ideally the records should be of sufficient length to enable the identification of secular changes of climate (World Meteological Organization 1988). At our station, hourly readings are taken of elements which include temperature, precipitation amount, humidity, wind, and atmospheric pressure. Our supplemental observations include rate of rainfall, soil temperature, bright sunshine and solar radiation. High quality and consistent climatological observations are maintained providing data sets to meet the current concerns of the effects of climatic change and increased variability.

Purpose and Benefits

The purpose of the SRC CRS is to provide a record of the observed meteorological elements so that the climate of the area and its changes can be accurately documented and described. Climatological data have assumed new importance as a result of social and environmental issues in which climate is a dominant factor. Climatological information assists in realizing new technological opportunities and social changes. It is necessary and valuable for use in areas such as agriculture, forestry, land use and facility placement, water and energy resources, health and comfort.

The CRS also allows us to:

- evaluate long term climate trends - early warning system for increased frequencies of extreme events such as drought, floods, *etc.;*
- determine the impacts of climate events on society, economy, health, and ecosystems. For example, intense rainfall causing flooding and property damage and heat stress with its implications for health;
- do value-added research;
- be part of regional, national and global networks in an important agricultural and ecological area;
- facilitate development of additional programs - *e.g.* air quality, biodiversity, and climate change monitoring;
- have roles in various programs within SRC including spray drift work, BOREAS, and collaborative research (*e.g.* Western College of Veterinary Medicine and the College of Agriculture, University of Saskatchewan); and.
- provide climate data to governments, universities, insurance agencies, lawyers, agricultural sectors, chemical companies, schools, building science, construction firms, media, transportation studies, accident studies, wildlife studies and interested individuals.

The goals of the Climate Reference Station are first, to maintain the high quality of data gathered over its more than thirty-five years of existence at its current location and, second, to continue to monitor a large variety of elements. These various elements combined with the long-term collection period as well as the stable location allow CRS to be a very valuable climate information collection station.

CLIMATE REFERENCE STATION OUTREACH, 2000

The climate reference station staff were very active in outreach activities in 2000. Presentations on *'How We Measure the Weather'* were conducted at the Climate Reference Station and as well as classroom presentations. The presentations were well received by students and staff with positive post-presentation feedback. Approximately 330 children from 13 schools, grades 2 to 4, and a science camp for girls plus chaperones participated in the programme during 2000. Students received hands-on experience with instruments used to measure temperature, precipitation, wind and radiation. Enthusiastic student volunteers helped demonstrate various instruments. The climate group also participated in the spring science day sponsored by the *Saskatchewan Research Council* and *Innovators in the School* where over 150 students attended short demonstrations on various science related topics.

Students from Dr. John G. Egnatoff Public Elementary School, Saskatoon participate in weather instrument demonstration. September 2000
(Photo credit: SRC)

GENERAL SUMMARY FOR 2000

Data concerning temperature, precipitation, wind speed and direction, bright sunshine, solar radiation, and soil temperature, recorded at the Saskatchewan Research Council (SRC) Climatological Reference Station (CRS), (52°09'N, 106°36'W, 497 m asl) are presented for the year 2000 and compared with the long-term (*circa* 1900-1999) and standard-period (1961-1990) records.

The year 2000 commenced by continuing the warm temperature trend from December 1999. January, February and March posted monthly temperatures well above normal values. March's temperatures were so warm that the mean minimum was higher than the average normal temperature. The rest of the year, with the exception of December, remained near or slightly above normal. December was very cold as evident by the mean temperatures ranging from 4.2°C to 3.7°C below normal. The yearly average temperature exceeded the normal by just under 1°C.

The monthly growing degree-days (5°C base) were below average for the critical agricultural months of May and June. The remainder of the growing season had above normal growing degree-days. The frost-free period began on May 18th (2 days earlier than usual), and lasted 128 days ending on September 22nd (8 days later than usual). The frost-free season has been longer than average for the past seven years. Growing degree-days for the frost-free period were 1442.0 (7.8 units lower than last year). Heating degree-days also indicated a cool, late spring then warming for the months of May and June. Cooling degree-days spiked in July with a hot spell at the end of the month..

Cold spells (temperatures less than or equal to -30°C) occurred 6 times for a total of 12 days with 9 of those days occurring in December. Only the brave (foolhardy) and desperate ventured out for the last days of Christmas shopping when the temperatures were in the midst of a cold spell. Hot spells (temperatures greater than or equal to 30°C) also occurred 6 times for a total of 12 days. July experienced a 6 day episode from the 26th to the 31st. Record temperatures were not set during the year.

Annual precipitation was under the 30-year normal by 45.4 mm (87.4% of normal), slightly greater than 1999. The cumulative precipitation was below normal throughout the year. Precipitation for the growing months of May and June were well below normal but July, with its above average rain throughout the month, compensated a little for the earlier dryness. Fall and early winter returned to arid conditions with October receiving only a trace of precipitation. July was the wettest month (82.4 mm) followed by August. July had the rainiest day (24.2 mm) and had the most intense rainfall (32.0 mm in 3 hours). July's total monthly precipitation amount was 147.9% of normal.

The annual bright sunshine for 2000 was 136.2 hours less than the 30-year average. Normally, Saskatoon receives 53% of the possible bright sunshine but this year only 50% was received. Late winter, early spring and fall months received more than normal bright sunshine with the months of February and October receiving 47.9 and 31.5 hours, more bright sunshine than normal. The cumulative total for April, May, June, July and August was 251.5 hours less than normal (82.5 % of normal).

All months reported lower than average wind speeds for the monthly average for 2000. *Near Gale* (51-62 km/h) winds occurred 29 times and *Gale* winds (63-75 km/h) occurred 8 times. The directions between west and north predominated for the *Near Gale* and *Gale* winds. The windiest month was May with 7 occurrences of winds over 51 km/h. The strongest wind occurred on July 14th, with winds recorded at 73.3 km/h at CRS and 98 km/h at the Saskatoon airport.[1]

[1]Environment Canada, 2000.

WEATHER EVENT SUMMARIES

COLD SPELL less than or equal to -30°C			HOT SPELL greater than or equal to 30°C		
MONTH	DAY	TEMP °C	MONTH	DAY	TEMP °C
January	11	-30.0	June	29	30.6
	13	-30.2	July	14	34.9
	16	-31.5		22	30.7
December	9	-30.1		26	32.5
	10	-30.4		27	31.8
	12	-30.5		28	34.3
	14	-31.5		29	31.8
	16	-31.9		30	30.1
	20	-32.2		31	30.7
	21	-33.3	August	23	34.5
	23	-32.9		24	31.3
	24	-30.3		26	33.8
Extreme	Dec 21	-33.3	Extreme	July 14	34.9

YEAR	LAST SPRING FROST	FIRST FALL FROST	LENGTH OF SEASON (days)
1993	May 17	Sept 14	119
1994	May 9	Oct 4	147
1995	May 22	Sept 19	119
1996	May 12	Sept 29	139
1997	May 14	Oct 5	143
1998	May 13	Sept 30	138
1999	May 9	Sept 27	140
2000	May 17	Sept 23	128
Normal	May 19	Sept 15	118

WETTEST DAYS mm			WETTEST/DRIEST MONTHS mm	
MONTH	DAY	AMOUNT	MONTH	AMOUNT
June	9	14.2	July	82.4
July	2	13.6	August	52.6
	6	24.2		
August	2	23.4		
	7	20.4	October	trace
September	2	13.6		

GREATEST RAINFALL mm			
MONTH	DAY	AMOUNT	PERIOD
July	6	13.8	.5 hour
August	2	13.0	.5 hour
July	6	17.4	1 hour
August	2	14.4	1 hour
August	2	21.2	2 hours
July	6	20.2	2 hours

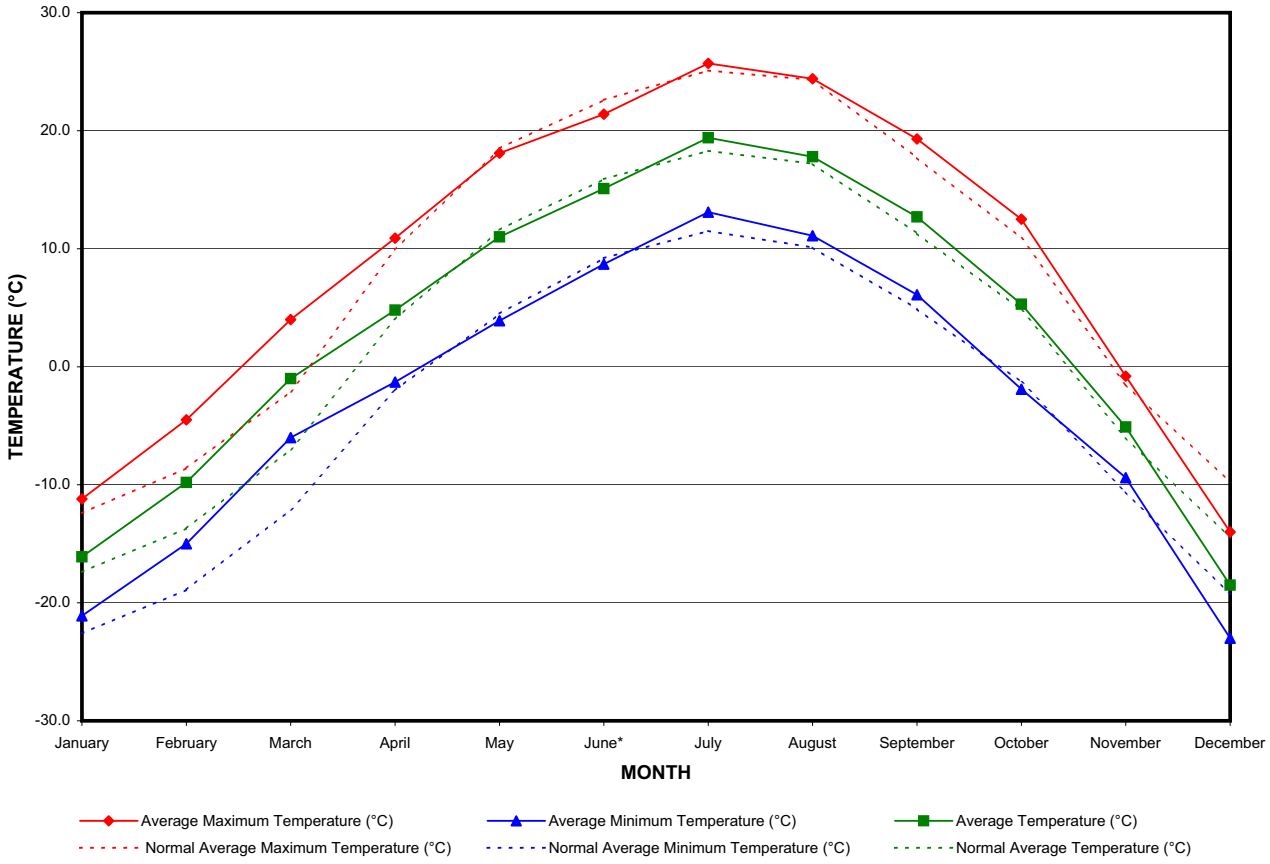
NEAR GALE WINDS 51 - 62 km/h			
MONTH	DAY	SPEED	DIRECTION
January	21	52.1	NW
March	26	53.1	WNW
April	1	56.9	NNW
	13	54.5	N
	26	51.4	W
	28	60.3	SE
May	1	56.4	SW
	6	53.6	SW
	28	51.2	WSW
	30	51.4	WNW
June	8	60.3	E
	9	61.0	E
	20	55.3	NNW
	25	51.2	N
	27	53.6	N
August	18	52.4	SSE
	21	51.5	WNW
	28	55.2	NW
September	1	52.4	SE
	8	51.2	SW
	9	54.9	WNW
	18	55.0	NW
	19	58.6	N
October	3	52.5	NW
	19	54.3	WNW
	20	52.0	SE
	21	51.7	SE
November	3	54.4	NNW
	18	58.6	NW

GALE WINDS 63 - 75 km/h			
MONTH	DAY	SPEED	DIRECTION
April	5	64.5	NNW
May	22	68.6	WNW
	23	61.1	WNW
	25	60.1	NE
July	14	73.3	SSW
	15	67.5	W
September	30	66.3	NW
October	2	73.0	WNW

Monthly Average Temperatures, 2000

MONTH	AVERAGE MAXIMUM TEMPERATURE (°C)		AVERAGE MINIMUM TEMPERATURE (°C)		AVERAGE TEMPERATURE (°C)		EXTREME VALUES FOR TEMPERATURE (°C)	
	2000	Normal	2000	Normal	2000	Normal	Maximum/Date	Minimum/Date
January	-11.2	-12.4	-21.1	-22.6	-16.1	-17.4	2.1/07	-31.5/16
February	-4.5	-8.6	-15.0	-18.9	-9.8	-13.7	4.0/23	-29.9/11
March	4.0	-2.1	-6.0	-12.1	-1.0	-7.0	13.7/23	-19.3/14
April	10.9	9.9	-1.3	-2.0	4.8	4.0	23.8/22	-12.0/14
May	18.1	18.5	3.9	4.5	11.0	11.6	28.3/01	-6.1/12
June*	21.4	22.6	8.7	9.2	15.1	15.9	30.6/29	4.7/08
July	25.7	25.1	13.1	11.5	19.4	18.3	34.9/14	4.9/17
August	24.4	24.3	11.1	10.1	17.8	17.2	34.5/23	4.5/31
September	19.3	17.7	6.1	4.9	12.7	11.3	29.7/17	-2.5/23
October	12.5	10.9	-1.9	-1.3	5.3	4.8	23.9/10	-10.4/06
November	-0.8	-1.5	-9.4	-10.6	-5.1	-6.0	16.0/04	-19.0/08
December	-14.0	-9.8	-23.0	-19.3	-18.5	-14.5	2.2/06	-33.3/21
Average	8.8	7.9	-2.9	-3.9	3.0	2.0		

*Temperatures from 15-20 are from Environment Canada, Saskatoon Airport due to instrument failure .



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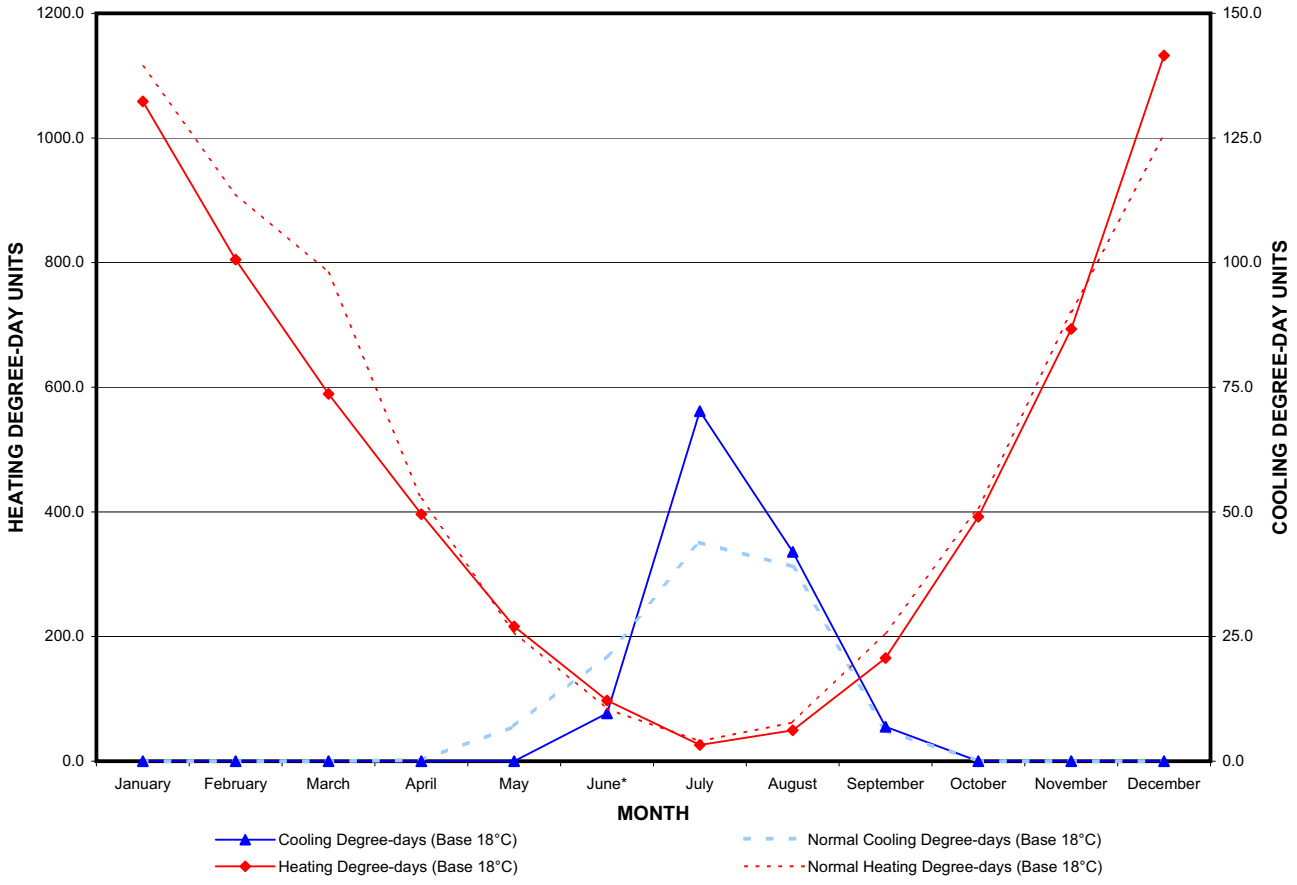
[1]Environment Canada, 2000.

Monthly Heating and Cooling Degree-Days (D-D), 2000

MONTH	HEATING DEGREE-DAYS Base 18°C		COOLING DEGREE-DAYS Base 18°C	
	2000	Normal	2000	Normal
January	1058.6	1114.8	0.0	0.0
February	804.9	909.9	0.0	0.0
March	589.4	784.1	0.0	0.0
April	396.3	420.9	0.0	0.2
May	216.3	206.9	0.0	7.0
June*	97.5	84.0	9.6	21.2
July	26.0	32.0	70.2	43.9
August	49.6	62.4	42.0	39.0
September	165.4	206.2	6.9	6.2
October	392.2	406.5	0.0	0.0
November	693.4	721.5	0.0	0.0
December	1132.4	1004.8	0.0	0.0
Total	5622.0	5954.0	128.7	117.5

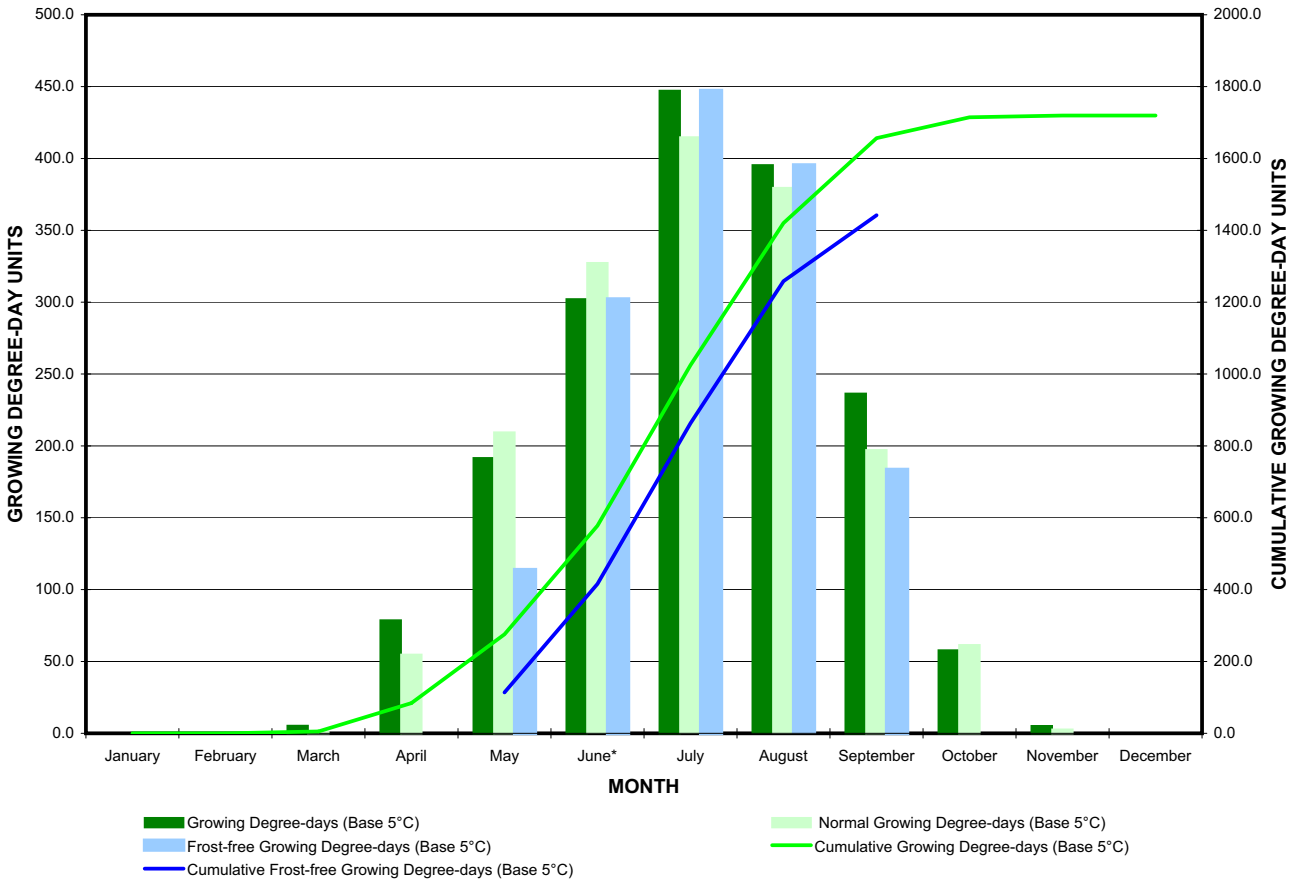
*Temperatures from 15-20 are from Environment Canada, Saskatoon Airport due to instrument failure.



Monthly Growing Degree-Days (D-D), 2000

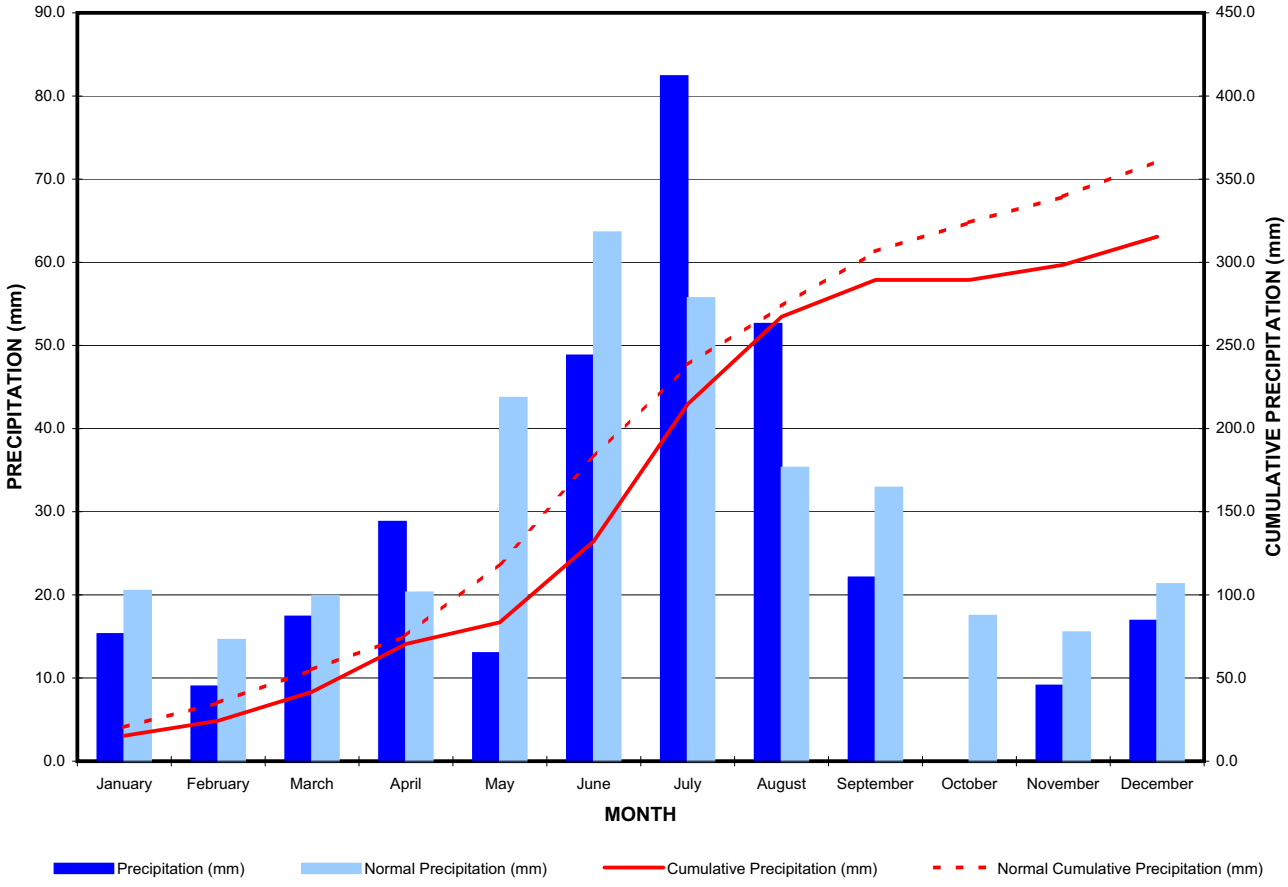
MONTH	GROWING DEGREE-DAYS Base 5°C			FROST-FREE GROWING D-D Base 5°C	
	2000	Normal	Cumulative 2000	2000	Cumulative 2000
January	0.0	0.0	0.0		
February	0.0	0.0	0.0		
March	5.3	1.2	5.3		
April	78.7	54.8	84.0		
May	191.6	209.4	275.6	113.8	113.8
June*	302.1	327.3	577.7	302.1	415.9
July	447.2	414.8	1024.9	447.2	863.1
August	395.4	379.6	1420.3	395.4	1258.5
September	236.4	197.1	1656.7	183.5	1442.0
October	57.8	61.5	1714.5		
November	5.1	2.7	1719.6		
December	0.0	0.0	1719.6		
Total	1719.6	1648.4		1442.0	

*Temperatures from 15-20 are from Environment Canada, Saskatoon Airport due to instrument failure.



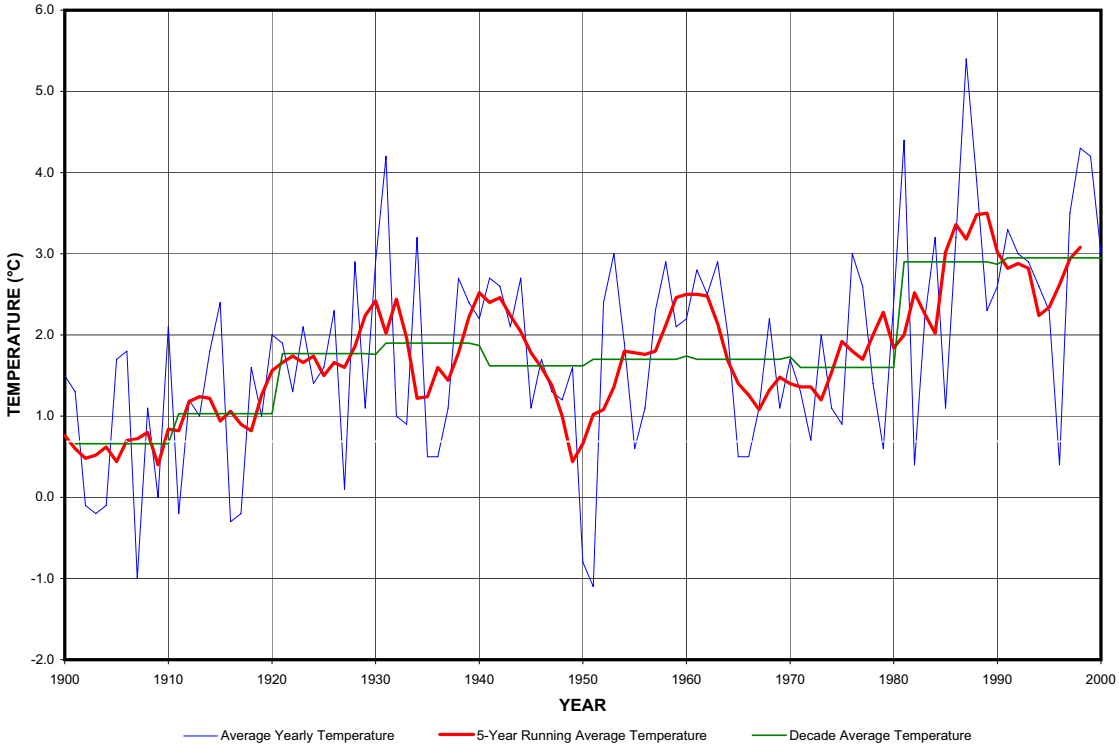
Monthly Precipitation, 2000

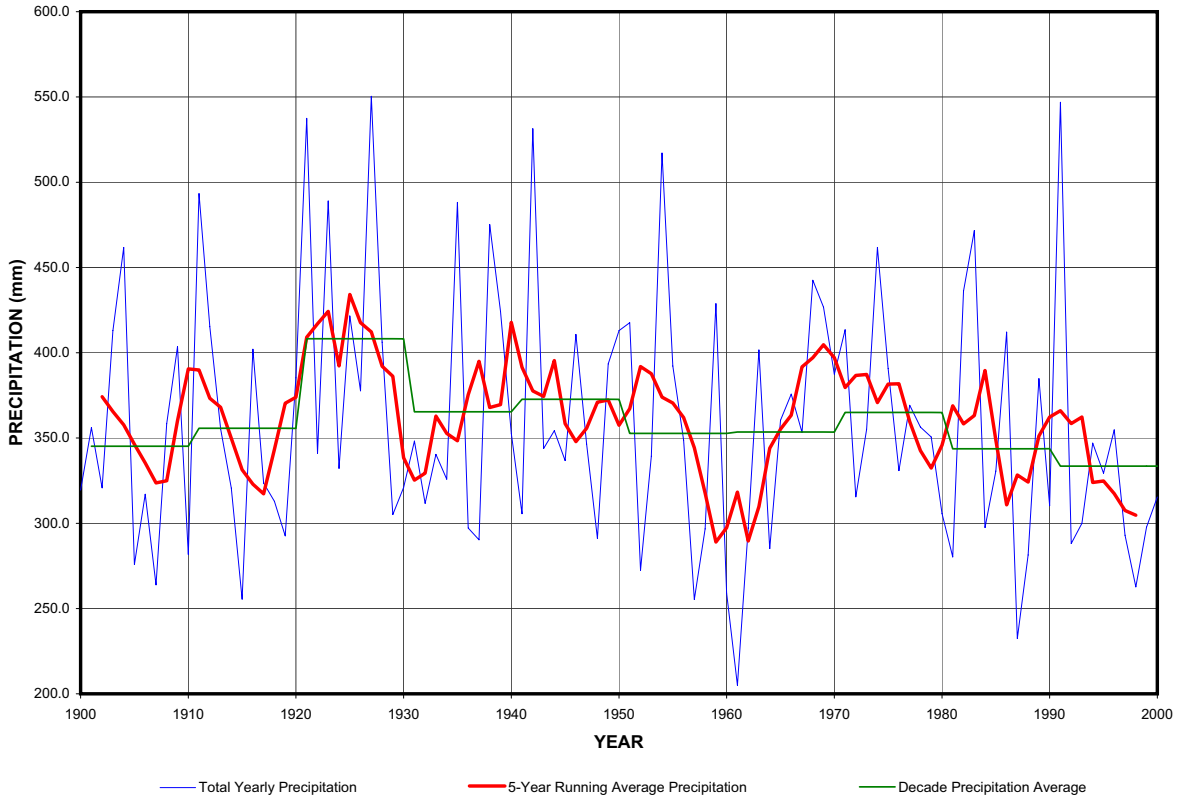
MONTH	PRECIPITATION (mm)		CUMULATIVE PRECIPITATION (mm)		EXTREME VALUE (mm)
	2000	Normal	2000	Normal	Value/Date
January	15.3	20.5	15.3	20.5	2.5/15
February	9.0	14.6	24.3	35.1	3.7/29
March	17.4	19.9	41.7	55.0	6.8/30
April	28.8	20.3	70.5	75.3	9.0/05
May	13.0	43.7	83.5	119.0	4.8/22
June	48.8	63.6	132.3	182.6	14.2/09
July	82.4	55.7	214.7	238.3	24.2/06
August	52.6	35.3	267.3	273.6	23.4/02
September	22.1	32.9	289.4	306.5	13.6/02
October	trace	17.5	289.4	324.0	trace/21&29
November	9.1	15.5	298.5	339.5	3.3/27
December	16.9	21.3	315.4	360.8	5.1/19
Total	315.4	360.8			



Average Annual Temperature and Precipitation Time Series for Saskatoon, 1900-2000

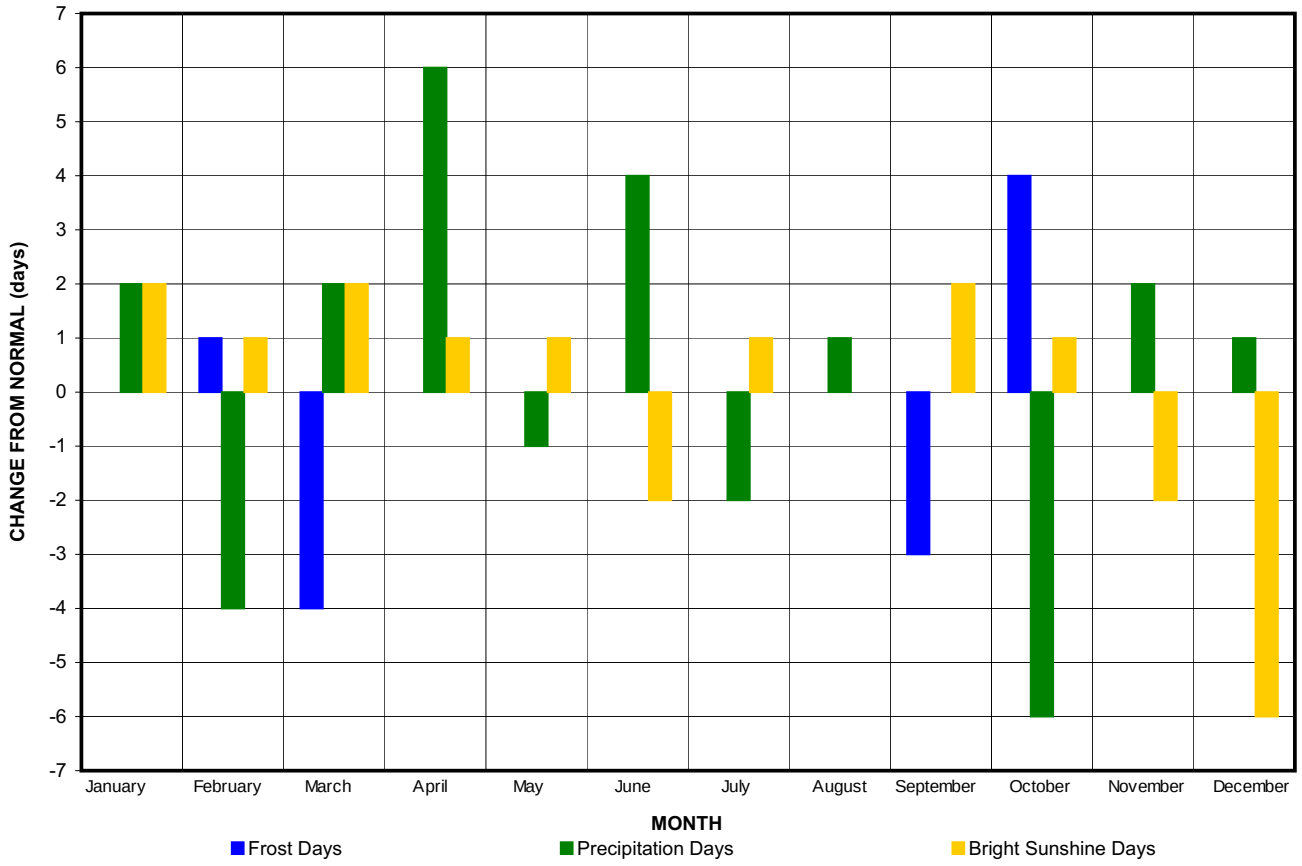
(Provisional)





Number of Days with Frost, Precipitation & Bright Sunshine, 2000

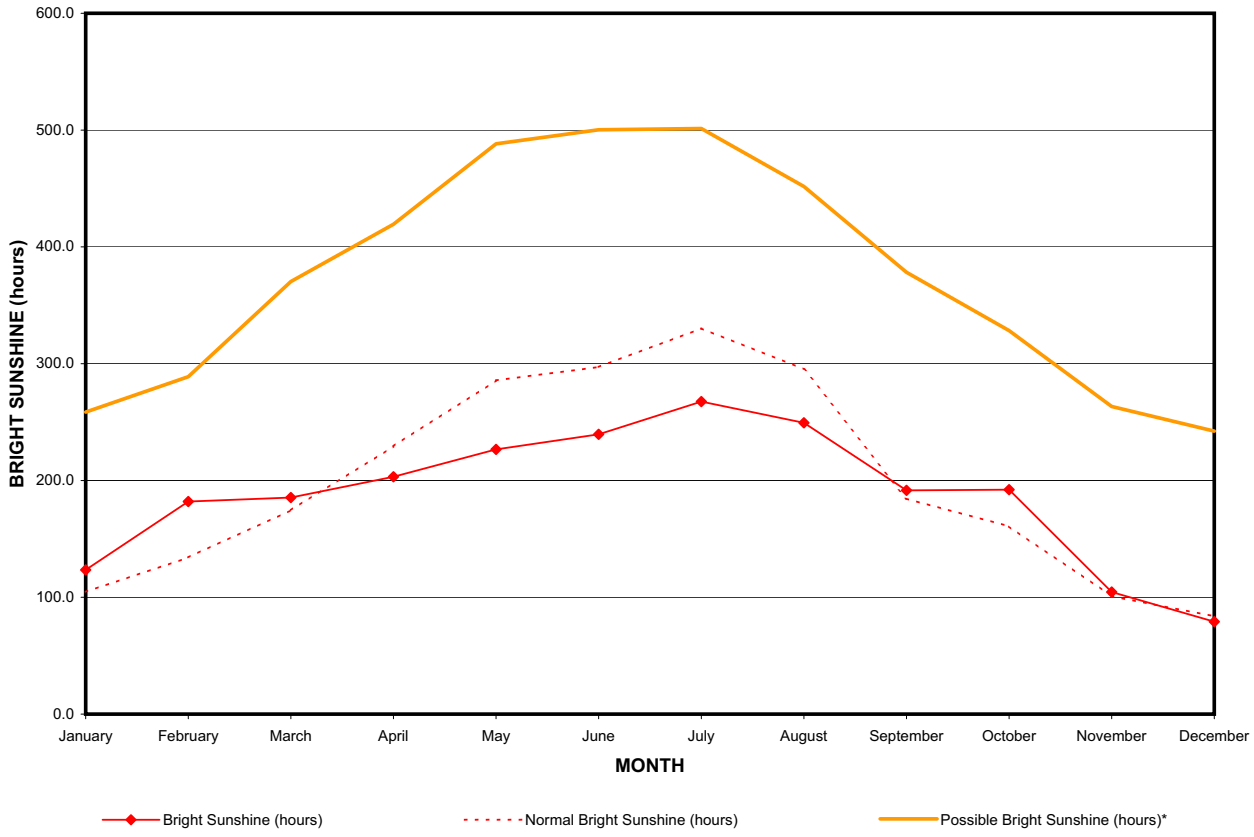
MONTH	NUMBER OF FROST DAYS		NUMBER OF PRECIPITATION DAYS		NUMBER OF BRIGHT SUNSHINE DAYS	
	2000	Normal	2000	Normal	2000	Normal
January	31	31	13	11	26	24
February	29	28	6	10	26	25
March	26	30	11	9	29	27
April	20	20	13	7	28	27
May	6	6	8	9	30	29
June	0	0	16	12	27	29
July	0	0	9	11	31	30
August	0	0	10	9	30	30
September	2	5	9	9	29	27
October	24	20	0	6	28	27
November	29	29	10	8	20	22
December	31	31	13	12	17	23
Total	198	200	118	113	321	320



Monthly Bright Sunshine, 2000

MONTH	BRIGHT SUNSHINE (hours)			
	2000	Normal	Possible*	% of Possible
January	123.5	104.6	258.6	47.8
February	182.0	134.1	288.8	63.0
March	185.4	174.6	370.3	50.1
April	203.2	229.4	419.3	48.5
May	226.6	285.7	488.3	46.4
June	239.5	297.2	500.3	47.9
July	267.6	330.3	501.3	53.4
August	249.4	295.2	451.7	55.2
September	191.6	184.4	378.3	50.7
October	192.2	160.7	328.3	58.5
November	104.5	100.9	263.4	39.7
December	79.1	83.7	242.3	32.7
Total	2244.6	2380.8	4490.8	50.0

* possible Bright Sunshine hours calculated from National Research Council of Canada, Hertzberg Institute of Astrophysics sunrise/sunset table for 2000



Sunrise and Sunset at Saskatoon, 2000

(local time in hours and minutes)

2001	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Date	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
1	9:15	17:06	8:46	17:55	7:52	18:47	6:41	19:41	5:36	20:32	4:52	21:18	4:50	21:30	5:28	20:56	6:18	19:53	7:08	18:43	8:02	17:37	8:53	16:5
2	9:15	17:07	8:45	17:57	7:50	18:49	6:38	19:43	5:34	20:34	4:51	21:19	4:51	21:30	5:30	20:55	6:20	19:51	7:10	18:41	8:04	17:36	8:55	16:5
3	9:15	17:08	8:43	17:58	7:47	18:50	6:36	19:45	5:32	20:36	4:50	21:20	4:52	21:29	5:31	20:53	6:22	19:49	7:11	18:39	8:06	17:34	8:56	16:5
4	9:15	17:09	8:41	18:00	7:45	18:52	6:34	19:46	5:30	20:37	4:49	21:21	4:53	21:29	5:33	20:51	6:23	19:46	7:13	18:36	8:08	17:32	8:57	16:5
5	9:14	17:10	8:40	18:02	7:43	18:54	6:31	19:48	5:28	20:39	4:49	21:22	4:54	21:28	5:34	20:49	6:25	19:44	7:15	18:34	8:10	17:30	8:59	16:5
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31	8:48	17:53			6:43	19:39			4:52	21:17			5:27	20:58	6:17	19:56			8:00	17:39			9:15	17:

National Research Council, Canada, Hertzberg Institute of Astrophysics

Sunrise/set = corresponds to the upper limb of the sun appearing at the horizon

Sunrise and Sunset at Saskatoon, 2001

(local time in hours and minutes)

2001	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Date	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
1	9:15	17:06	8:46	17:55	7:52	18:47	6:41	19:41	5:36	20:32	4:52	21:18	4:50	21:30	5:28	20:57	6:18	19:53	7:08	18:43	8:02	17:37	8:53	16:58
2	9:15	17:07	8:45	17:56	7:50	18:48	6:38	19:43	5:34	20:34	4:51	21:19	4:51	21:30	5:30	20:55	6:20	19:51	7:09	18:41	8:04	17:36	8:55	16:57
3	9:15	17:08	8:43	17:58	7:47	18:50	6:36	19:45	5:32	20:36	4:50	21:20	4:52	21:29	5:31	20:53	6:22	19:49	7:11	18:39	8:06	17:34	8:56	16:57
4	9:15	17:09	8:41	18:00	7:45	18:52	6:34	19:46	5:30	20:37	4:49	21:21	4:53	21:29	5:33	20:51	6:23	19:47	7:13	18:37	8:08	17:32	8:57	16:56
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20	9:03	17:33	8:11	18:30	7:09	19:20	5:58	20:14	5:05	21:02	4:45	21:31	5:11	21:14	5:59	20:20	6:49	19:09	7:41	18:01	8:36	17:08	9:13	16:56
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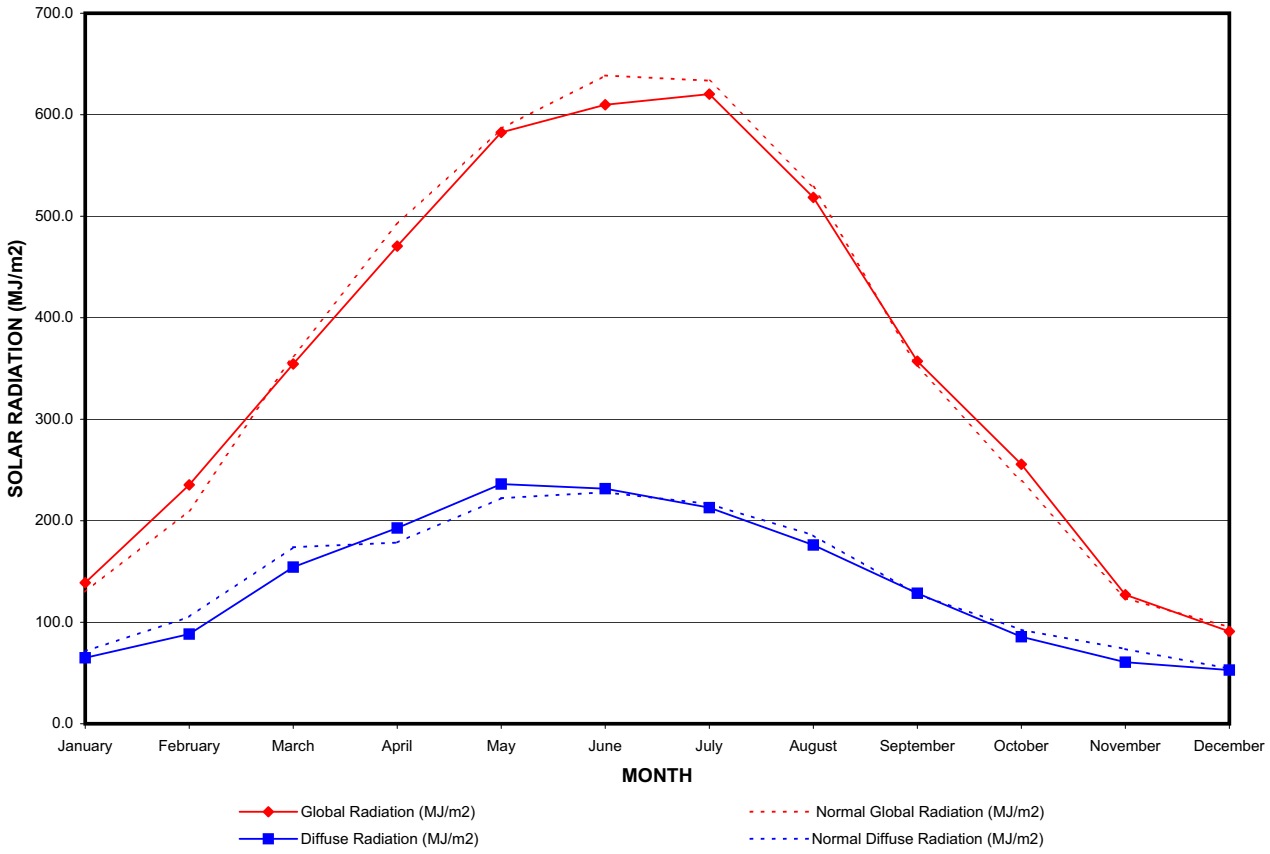
31	8:48	17:53			6:43	19:39			4:52	21:17			5:27	20:58	6:17	19:56			8:00	17:39			9:15	17:04

Source: National Research Council, Canada, Hertzberg Institute of Astrophysics

Sunrise/set = corresponds to the upper limb of the sun appearing at the horizon

Monthly Global and Diffuse Solar Radiation, 2000

MONTH	GLOBAL RADIATION (MJ/m^2)		DIFFUSE RADIATION (MJ/m^2)	
	2000	Normal	2000	Normal
January	138.9	129.9	65.0	71.4
February	235.4	210.1	88.3	105.3
March	354.5	362.4	154.3	173.9
April	470.6	492.2	192.8	178.5
May	582.6	586.3	236.1	222.2
June	609.9	638.7	231.6	228.1
July	620.3	633.5	212.9	216.5
August	518.6	529.0	176.1	185.6
September	357.2	351.8	128.6	127.6
October	255.6	239.1	85.7	92.6
November	127.1	123.7	60.6	73.6
December	91.0	95.2	52.9	54.3
Total	4361.7	4391.9	1684.9	1729.6



Daily Global and Diffuse Solar Radiation (MJ/m^2), 2000

DATE	JAN		FEB		MAR		APR		MAY		JUN		JULY		AUG		SEPT		OCT		NOV		DEC	
	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D
1	2.1	2.1	5.7	3.3	10.6	5.7	4.3	4.2	20.1	5.8	25.7	6.1	16.7	10.0	10.9	7.6	15.7	6.3	9.1	4.9	2.2	2.3	5.5	1.7
2	2.5	2.4	6.0	3.2	11.3	4.2	12.2	6.2	15.1	7.8	27.1	6.6	9.4	8.7	12.1	7.4	1.6	1.6	12.9	2.5	6.7	1.4	3.7	2.4
3	5.3	1.2	7.2	1.4	11.0	4.0	18.2	4.6	22.4	6.3	22.3	9.5	19.7	10.5	21.2	5.8	9.6	6.3	13.6	1.8	6.1	1.6	2.0	2.1
4	1.2	1.3	9.2	1.4	9.8	5.8	16.4	5.3	19.7	5.6	28.3	3.4	18.7	9.1	19.9	8.2	6.1	6.0	8.8	5.2	6.5	1.6	3.8	1.0
5	2.5	2.7	8.7	1.7	5.5	5.1	17.4	3.7	24.9	3.9	26.3	5.2	28.3	3.8	12.1	6.4	10.1	4.2	7.9	5.4	2.2	2.3	1.4	1.4
6	4.2	1.7	8.2	1.5	4.4	4.0	14.2	9.9	16.7	9.1	16.2	11.7	8.1	5.5	22.0	4.9	13.2	6.4	12.5	1.7	3.9	3.9	1.3	1.5
7	2.7	1.8	7.8	3.3	3.8	3.8	15.8	7.7	10.7	9.2	24.7	8.6	24.1	5.7	7.3	6.5	17.9	2.2	12.3	1.7	7.2	2.1	1.9	1.9
8	2.6	2.4	4.4	4.4	13.6	1.9	14.4	6.8	23.2	6.2	22.8	9.0	27.4	3.0	23.8	3.2	13.1	6.8	12.2	1.7	8.1	1.5	1.9	2.2
9	4.0	1.4	5.4	4.8	7.7	7.1	10.3	9.1	23.4	5.8	5.6	5.4	17.9	10.5	21.6	5.2	10.8	5.3	11.2	1.7	2.8	2.9	4.8	1.2
10	4.2	1.6	7.6	1.5	12.8	3.0	14.5	7.5	10.1	8.5	6.9	6.7	21.0	6.0	21.3	5.3	12.8	6.5	10.9	1.7	3.0	3.1	2.9	2.5
11	6.3	1.3	9.4	1.8	12.1	6.3	11.7	7.6	9.4	8.9	11.8	6.4	23.5	8.2	9.0	6.3	16.6	3.4	10.6	3.4	4.3	2.8	5.0	1.1
12	3.0	2.9	8.1	3.5	8.6	7.5	5.6	5.5	25.6	5.4	24.0	6.7	26.9	2.8	18.4	6.1	17.3	2.2	10.9	1.8	7.6	1.4	4.4	1.2
13	4.0	2.3	6.5	4.3	10.0	6.5	19.7	7.6	20.7	9.3	19.8	12.6	26.1	3.1	11.6	7.8	15.5	3.5	5.7	5.3	6.1	1.7	2.9	1.9
14	2.5	2.6	7.6	4.2	15.2	2.0	20.1	8.0	25.4	5.6	21.9	10.3	22.6	4.4	19.0	6.2	16.6	2.3	7.9	4.5	6.4	1.8	2.7	1.6
15	4.6	2.2	5.1	5.2	14.8	2.5	9.3	8.8	10.4	9.0	13.6	9.9	18.2	10.2	22.2	3.0	15.9	2.5	9.0	3.1	2.5	2.7	1.5	1.6
16	2.9	2.8	7.8	4.9	13.8	5.4	11.3	7.9	21.7	9.0	19.5	10.5	17.3	10.2	15.6	7.7	15.2	3.0	8.8	2.9	3.8	2.5	4.6	1.2
17	4.1	2.8	9.6	2.7	14.1	4.5	10.7	6.7	21.1	8.7	23.7	7.2	19.3	10.2	22.0	2.6	12.9	5.5	9.2	1.6	1.8	1.9	1.8	1.8
18	5.6	1.3	9.3	4.3	15.4	2.3	22.0	5.7	16.0	8.1	27.1	5.0	8.2	7.6	21.2	3.9	7.0	5.0	8.3	2.9	2.5	2.5	3.6	2.3
19	4.7	2.4	10.3	2.7	9.2	5.5	21.5	4.2	16.8	8.1	15.2	9.1	16.9	10.8	16.4	5.7	5.6	5.3	7.9	2.5	2.6	2.5	1.1	1.1
20	3.5	3.1	9.6	2.0	11.5	5.9	21.8	3.1	16.4	10.2	7.2	7.1	23.3	10.2	14.6	7.4	13.8	5.6	6.2	3.9	5.6	2.7	4.8	1.2
21	4.4	2.5	10.9	2.5	9.7	6.9	22.1	4.2	20.4	8.0	27.5	4.7	17.9	6.9	20.3	4.4	5.9	5.8	3.2	3.2	6.2	1.6	2.9	2.6
22	3.1	3.2	9.8	1.7	15.9	2.9	21.9	4.2	19.8	6.3	23.2	6.2	25.4	3.9	21.1	3.0	6.2	4.9	9.0	1.4	5.3	1.3	2.0	2.2
23	6.3	2.1	9.4	3.6	13.0	7.7	11.5	8.8	23.1	6.7	18.8	6.3	16.6	7.0	20.7	2.7	14.9	2.1	7.0	3.8	5.3	1.2	4.9	1.2
24	5.5	1.4	4.2	4.2	15.3	4.7	12.6	8.6	17.9	10.2	18.6	9.0	11.5	7.9	18.1	4.7	14.3	2.1	8.3	1.3	3.0	2.1	4.7	1.4
25	8.2	1.4	8.7	3.4	10.5	7.7	17.8	7.1	11.4	7.0	19.7	8.6	18.6	8.3	15.5	6.1	13.4	2.5	8.4	1.8	4.4	1.2	2.4	2.2
26	6.9	1.5	10.8	1.7	17.5	2.2	14.7	10.6	13.2	11.7	21.6	11.3	24.5	4.7	18.2	4.9	7.2	6.1	8.3	1.9	3.9	0.9	1.8	2.0
27	4.1	2.6	12.5	3.8	16.3	5.4	23.7	2.7	25.6	5.8	25.3	5.5	15.6	9.9	18.1	5.4	13.2	2.0	3.0	3.0	0.9	0.9	1.2	1.2
28	7.8	1.4	2.8	3.0	11.7	6.5	20.7	7.2	12.4	8.0	24.3	6.3	24.6	3.0	18.0	5.1	12.0	5.0	2.3	2.3	2.3	2.3	1.7	1.7
29	6.7	1.3	12.8	2.3	4.6	4.6	9.9	6.4	27.3	4.9	22.2	7.4	24.8	2.7	8.3	7.7	10.4	4.9	2.0	2.1	1.9	1.8	1.9	1.9
30	5.6	2.5			13.6	6.0	24.3	2.9	27.2	5.1	19.0	9.3	22.7	5.2	8.5	8.1	12.4	3.3	2.0	2.1	2.0	2.1	2.4	2.1
31	7.8	2.8			11.2	6.7			14.5	11.9			24.5	2.9	9.6	6.8			6.2	2.6			3.5	1.5
TOTAL	138.9	65.0	235.4	88.3	354.5	154.3	470.6	192.8	582.6	236.1	609.9	231.6	620.3	212.9	518.6	176.1	357.2	128.6	255.6	85.7	127.1	60.6	91.0	52.9

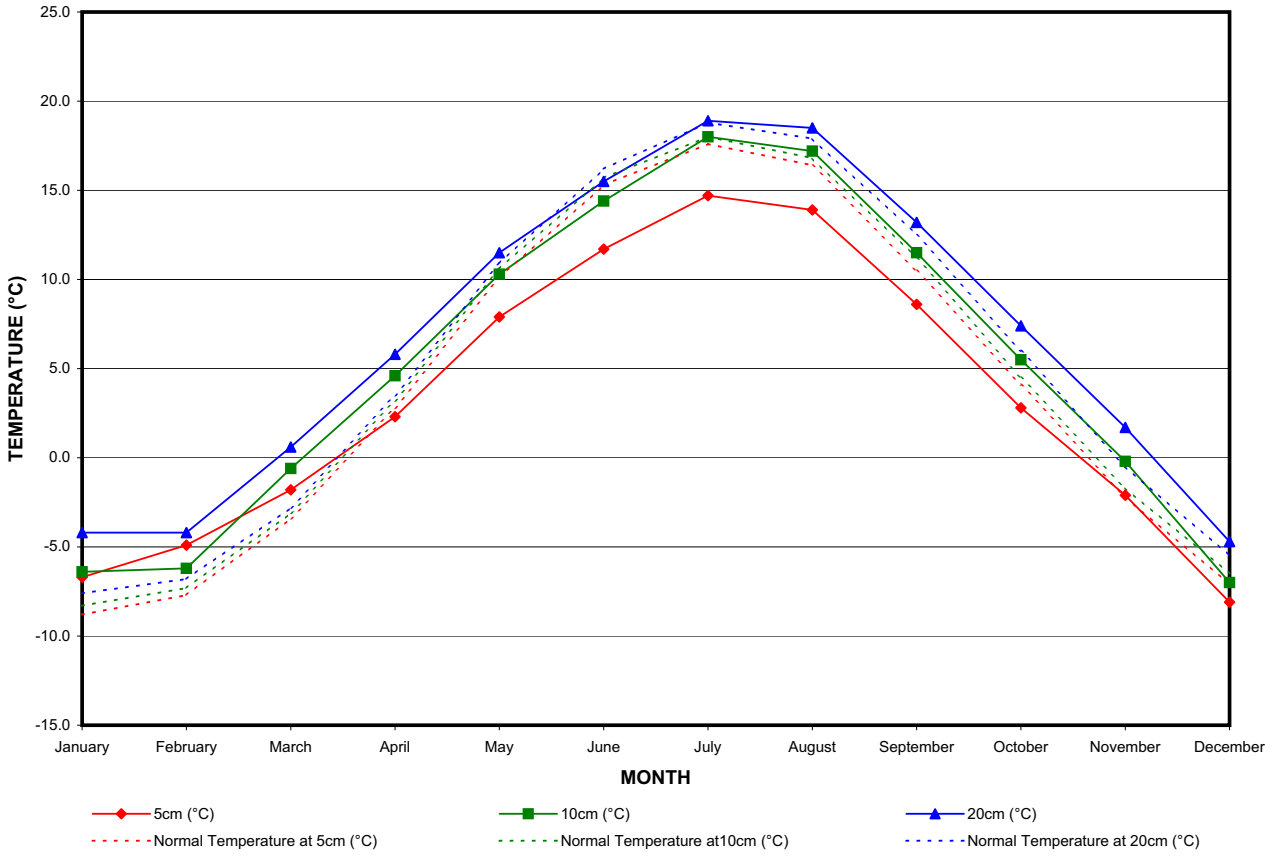
COMMENTS: G= Global Radiation D= Diffuse Radiation

yellow numbers = diffuse radiation greater than global radiation

Average Soil Temperatures at 0900 hours, 2000

(5 to 20 cm depths)

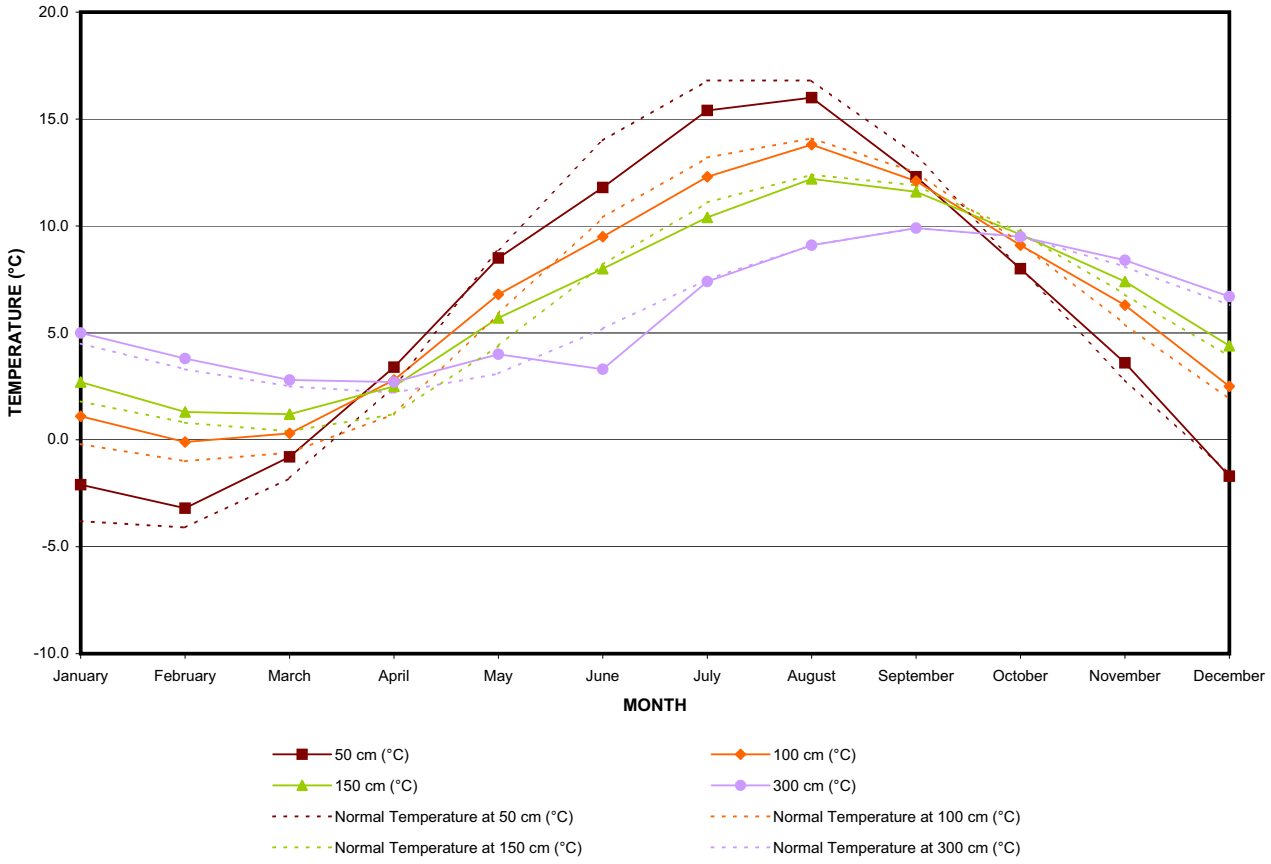
MONTH	50cm (°C)		100cm (°C)		150cm (°C)		300cm (°C)	
	2000	Normal	2000	Normal	2000	Normal	2000	Normal
January	-2.1	-3.8	1.1	-0.2	2.7	1.8	5.0	4.5
February	-3.2	-4.1	-0.1	-1.0	1.3	0.8	3.8	3.3
March	-0.8	-1.8	0.3	-0.6	1.2	0.4	2.8	2.5
April	3.4	2.5	2.8	1.2	2.5	1.2	2.7	2.2
May	8.5	8.9	6.8	5.9	5.7	4.4	4.0	3.1
June	11.8	14.0	9.5	10.4	8.0	8.2	3.3	5.2
July	15.4	16.8	12.3	13.2	10.4	11.1	7.4	7.5
August	16.0	16.8	13.8	14.1	12.2	12.4	9.1	9.1
September	12.3	13.3	12.1	12.5	11.6	11.9	9.9	9.9
October	8.0	8.0	9.1	9.2	9.6	9.7	9.5	9.5
November	3.6	2.8	6.3	5.4	7.4	6.8	8.4	8.1
December	-1.7	-1.6	2.5	1.9	4.4	3.9	6.7	6.3



Average Soil Temperatures at 0900 hours, 2000

(50 to 300 cm depths)

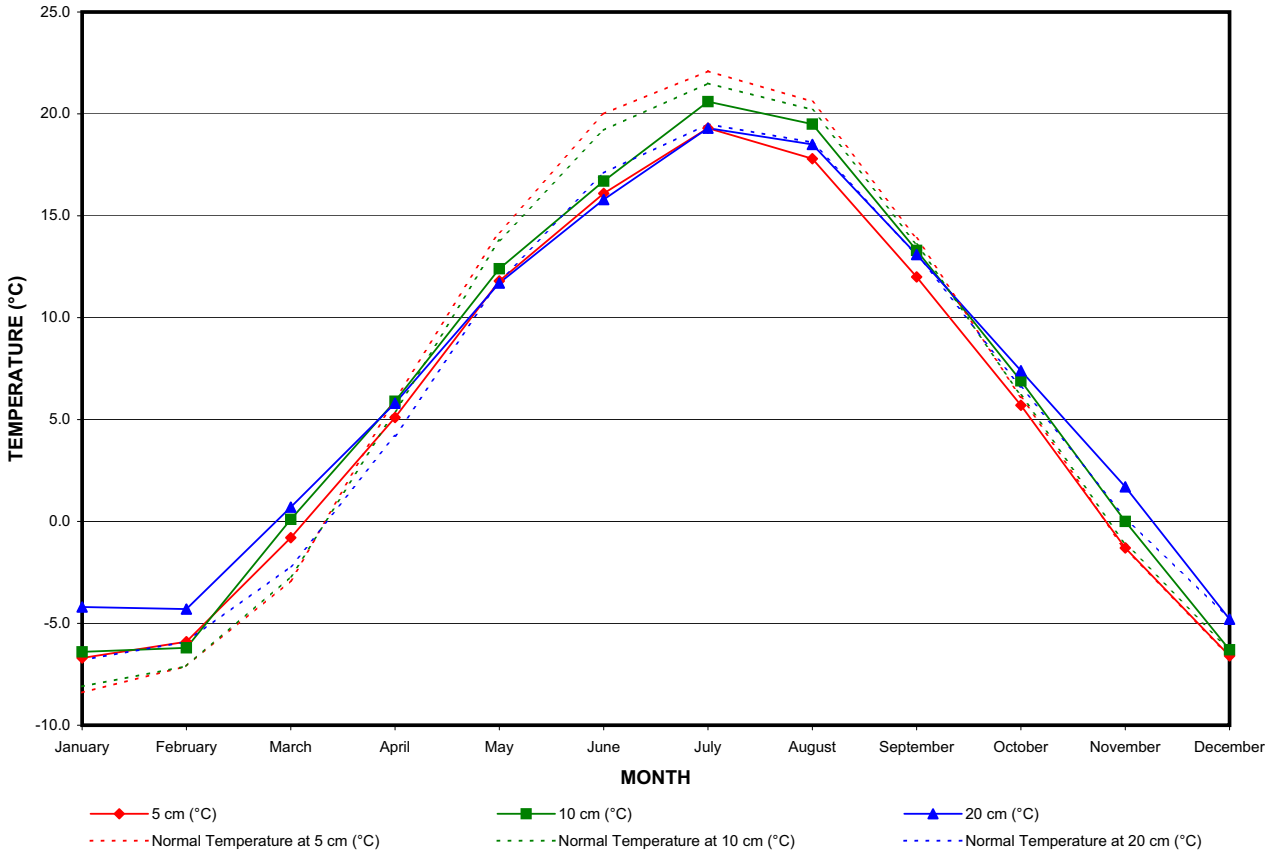
MONTH	50cm (°C)		100cm (°C)		150cm (°C)		300cm (°C)	
	2000	Normal	2000	Normal	2000	Normal	2000	Normal
January	-2.1	-3.8	1.1	-0.2	2.7	1.8	5.0	4.5
February	-3.2	-4.1	-0.1	-1.0	1.3	0.8	3.8	3.3
March	-0.8	-1.8	0.3	-0.6	1.2	0.4	2.8	2.5
April	3.4	2.5	2.8	1.2	2.5	1.2	2.7	2.2
May	8.5	8.9	6.8	5.9	5.7	4.4	4.0	3.1
June	11.8	14.0	9.5	10.4	8.0	8.2	3.3	5.2
July	15.4	16.8	12.3	13.2	10.4	11.1	7.4	7.5
August	16.0	16.8	13.8	14.1	12.2	12.4	9.1	9.1
September	12.3	13.3	12.1	12.5	11.6	11.9	9.9	9.9
October	8.0	8.0	9.1	9.2	9.6	9.7	9.5	9.5
November	3.6	2.8	6.3	5.4	7.4	6.8	8.4	8.1
December	-1.7	-1.6	2.5	1.9	4.4	3.9	6.7	6.3



Average Soil Temperatures at 1600 hours, 2000

(5 to 20 cm depths)

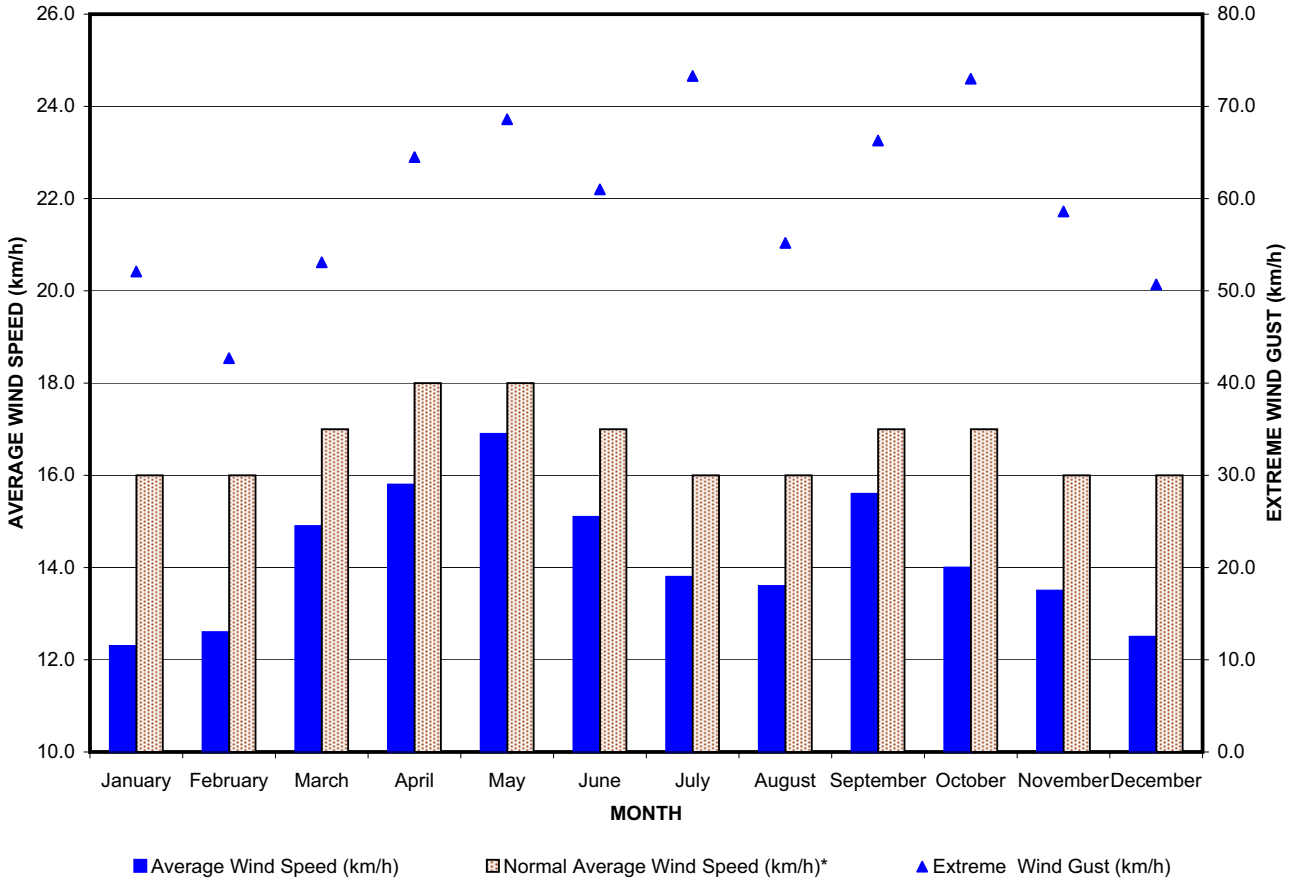
MONTH	5 cm (°C)		10 cm (°C)		20 cm (°C)	
	2000	Normal	2000	Normal	2000	Normal
January	-6.7	-8.4	-6.4	-8.1	-4.2	-6.8
February	-5.9	-7.1	-6.2	-7.1	-4.3	-5.9
March	-0.8	-2.9	0.1	-2.7	0.7	-2.2
April	5.1	6.0	5.9	5.4	5.8	4.2
May	11.8	14.2	12.4	13.8	11.7	11.8
June	16.1	20.0	16.7	19.2	15.8	17.1
July	19.3	22.1	20.6	21.5	19.3	19.5
August	17.8	20.6	19.5	20.2	18.5	18.6
September	12.0	13.9	13.3	13.6	13.1	13.1
October	5.7	6.1	6.9	6.2	7.4	6.6
November	-1.3	-1.4	0.0	-1.1	1.7	0.2
December	-6.6	-6.6	-6.3	-6.3	-4.8	-4.8



Monthly Wind Speed, 2000

MONTH	AVERAGE (km/h)		EXTREME GUST (km/h)		
	2000	Normal*	Direction	2000	Date
January	12.3	16.0	NW	52.1	21
February	12.6	16.0	NW	42.7	29
March	14.9	17.0	WNW	53.1	26
April	15.8	18.0	NNW	64.5	05
May	16.9	18.0	WNW	68.6	22
June	15.1	17.0	E	61.0	09
July	13.8	16.0	SSW	73.3	14
August	13.6	16.0	NW	55.2	28
September	15.6	17.0	NW	66.3	30
October	14.0	17.0	WNW	73.0	02
November	13.5	16.0	NW	58.6	18
December	12.5	16.0	SE	50.7	17

*1961-90 Normals used are from the Environment Canada, Saskatoon Airport station

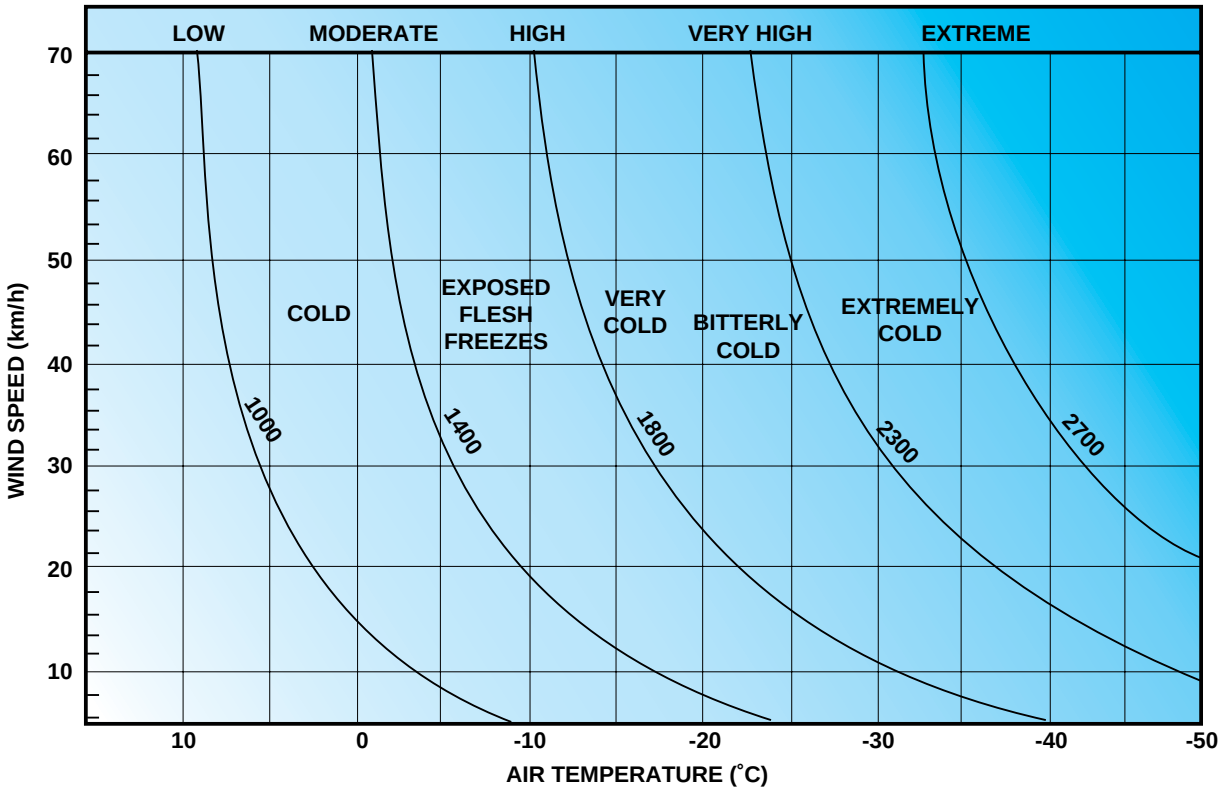


Beaufort Scale for Wind Speed

Beaufort Number	km/h	Beaufort Description	Standard Specification*	Revised Specification**
0	<2	Calm	Smoke rises vertically.	Too calm. People get edgy. Smoke from the BBQ rises straight up, attracting buzzards.
1	2 - 5	Light Air	Direction of wind shown by smoke drift but not by wind vanes.	Leaves on trees don't move. Smoke from BBQ rises at slight angle.
2	6 - 11	Light Breeze	Wind felt on face; leaves rustle; ordinary vane moved by wind.	Leaves on trees move.
3	12 - 19	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag.	Oriental wind chimes get on your nerves.
4	20 - 29	Moderate	Wind raises dust and loose paper; small branches are moved.	Leaves fly all over your yard.
5	30 - 39	Fresh	Small trees begin to sway, crested wavelets form on inland waters.	Leaves fly over to your neighbour's yard. He yells at you but you claim you can't hear him over the wind chimes.
6	40 - 50	Strong	Large branches in motion; whistling heard in overhead wires; umbrellas used with difficulty.	Difficult to walk. Smoke from BBQ blows horizontally, right into your eyes.
7	51 - 62	Near Gale	Whole trees in motion; inconvenience felt when walking against wind.	Trees move moderately. Uncle asks, "Windy enough for you?" Cheeks flap when you yawn. Aluminum patio furniture on the move.
8	63 - 75	Gale	Breaks twigs off trees; wind generally impedes progress.	Clothes blow off clothesline. BBQ blown over - smoke from burning deck blows horizontally. Trees move rapidly.
9	76 - 87	Strong Gale	Slight structural damage occurs.	Trees move slowly - across your lawn. Uncle says, "Windy? This is nothing. When I was young..." Your favourite toque blows off.
10	88 - 102	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	Your favourite shirt blows off. Neighbour's gas BBQ comes through your window. Your newly sodded lawn is now someone else's newly sodded lawn.
11	103 - 117	Violent Storm	Very rarely experienced; widespread damage.	You regret not hiring a pro to build your chimney. Uncle claims, "I've seen worse!" and is carried off by wind. People in trailer parks appear on tonight's news. Your underwear blows off.
12	118 and greater	Hurricane		Your underwear blows off while you're indoors. People from trailer parks fly past your house. Your nose hairs whistle even when you're not breathing. You can't close your eyes. Even if you wanted to.

*Cole, 1980
**Smith, 1995

Windchill Factor
(watts/m^2)



Windchill Formula
WC = windchill in Watts per square metre
u = wind speed in km/h
T = temperature in C

Precise Formula*
WC = (12.12 + 6.114√u - 0.3222 x u) (33-T)

Rounded Version*
WC = (12 + 6 √u - 0.3 x u) (33-T)

Equivalent Temperature*
ET = 33 - ((12 + 6 √u - 0.3 x u) (33-T) / 27.8))

Quick and Dirty Formula**
-(½ u) + T = wind chill in ˚C

Wind Chill	Equivalent Temperature ˚C	
700	-3	Conditions considered comfortable when dressed for skiing
1200	-11	Conditions no longer pleasant for outdoor activities on overcast days
1400	-18	Conditions no longer pleasant for outdoor activities on sunny days
1600	-25	Freezing of exposed skin begins for most people
2300	-50	Conditions for walking become dangerous. Exposed skin freezes in 1-3 minutes. Warm winter clothing essential with facial protection.
2700	-66	Exposed flesh freezes within 30 seconds

*David Phillips,1993. The Day Niagara Falls Ran Dry!
**David Phillips 1996 Weather Flashes

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ANNUAL WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	Annual Summary 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE (1892-1999)
TEMPERATURE	Average annual maximum (°C)	8.8	9.8	7.9
	Extreme annual maximum (°C/date)	34.9/July 14	33.9/Aug 25	41.0/June 1988
	Average annual minimum (°C)	-2.9	-1.4	-3.9
	Extreme annual minimum (°C/date)	-33.3/Dec 21	-34.3/Jan07	-50.0/Feb. 1893
	Annual average (°C)	3.0	4.2	2.0
	Days with frost	198	183	198
	Growing degree-days (5°C base)	1719.6	1634.9	1648.4
	Heating degree-days (18°C base)	5622.0	5105.7	5954.0
	Cooling degree-days (18°C base)	128.7	100.3	117.5
PPT	Annual total (mm)	315.4	297.7	360.8
	Greatest 24-hour (mm/date)	24.2/July 6	23.8/July 15	99.4 June 1983
	Days with recordable precipitation	118	107	113
WIND	Average annual speed (km/h)	14.2	14.5	16.6
	Peak Gust (direction/speed(km/h)/date)	SSW73.3/Oct02	NW71.4/April13	W151/Aug1967/14
RADIATION	Total bright sunshine (hours)	2244.6	2128.1	2380.8
	% of possible bright sunshine	50	47.5	53.8
	Number of days with bright sunshine	321	328	320
	Total global radiation (MJ/m^2)	4361.7	4465.3	4391.9
	Total diffuse radiation (MJ/m^2)	1684.9	1889.1	1729.6

For Your Information

2000

January 4th - Bright Sunshine data missing from 1100h to 1200h due to equipment maintenance; day was overcast.

Jun 15 to 20 - Maximum and minimum temperatures not available from the site due to equipment failure; temperatures from Environment Canada, Saskatoon Airport used in calculations.

1999

February and March - Global and Diffuse radiation sensors were re-calibrated and re-programmed . The diffuse reading for these months are high.
November 24 - datalogger down during afternoon. Maximum and Minimum temperatures were compared with Saskatoon Meteorolgical Service. Radiation data is missing for the afternoon.

Normal and Extreme Values

The normals for CRS are taken from the normals published by Environment Canada for the standard period 1961-1990. Normals used in SRC CRS Annual Summaries 1990-1996 were hand-calculated values determined before the official normals were published.
Extreme values are from the Saskatoon area weather stations and extend to 1882. The earlier records from 1882 to 1901 have major gaps.

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	JANUARY 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	-11.2	-12.0	-12.4	
	Extreme monthly maximum (°C/date)	2.1/07	5.4/30	7.0/1986/11	10.0/1931/30
	Number of recording years			27	~100
	Average monthly minimum (°C)	-21.1	-20.9	-22.6	
	Extreme monthly minimum (°C/date)	-31.5/16	-34.3/07	-43.9/1966/22&1969/29	-48.9/1893/31
	Number of recording years			27	~100
	Monthly average (°C)	-16.1	-16.4	-17.4	
	Days with frost	31	31	31	
	Growing degree-days (5°C base)	0.0	0.0	0.0	
	Heating degree-days (18°C base)	1058.6	1067.3	1114.8	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-14.8			
PRECIPITATION	Monthly total (mm)	15.3	18.9	20.5	
	Greatest 24-hour (mm/date)	2.5/15	2.9/01	15.4/1989/30	30.5/1893 /23
	Number of recording years			27	~100
	Days with recordable precipitation	13	14	11	
	Yearly total to date (mm)	15.3	18.9	20.5	
WIND	Average monthly speed (km/h)	12.3	13.6		16.0
	Peak Gust (direction/speed(km/h)/date)	NW52.1/21	SW51.1/30		W111.0/1986/11
RADIATION	Total bright sunshine (hours)	123.5	94.7	104.6	
	% of possible bright sunshine	47.8	36.6	40.4	
	Number of days with bright sunshine	26	22	24	
	Monthly total global radiation (MJ/m^2)	138.9	126.1	129.9	
	Monthly total diffuse radiation (MJ/m^2)	65.0	70.6	71.4	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	-6.7/-6.4	-8.0/-7.7	-8.8/-8.3	
	10 cm/20 cm	-4.2/-2.1	-6.3/-5.5	-7.6/-3.8	
	50 cm /100 cm	1.1/2.7	-1.0/1.2	-0.2/1.8	
	150 cm/300 cm	5.0	4.7	4.5	

For Your Information

Like 1999, 2000 began with snow but instead of cold temperatures, the mild weather continued. A cold spell of -30°C or more did not occur until the 11th and then appeared again only on two other occasions. Minimum temperatures between -25° and -30°C were recorded on 7 other days. Even with the perceived mild temperatures, the monthly averages ranged only from 1.2° to 1.5°C above normal. Thirteen days of snowfall produced 15.3 mm moisture. The majority of the snowfall occurred from the 12 th to the 18th. Snow cover went from 0, at the beginning of the month, to 8cm by the end. The total bright sunshine hours was 18.9 above normal even though 9 days received less than 1 hour of bright sunshine, 5 of which recorded no bright sunshine.

January has been apply named after the Roman god Janus, protector of gates, doorways and all beginnings. With two heads facing opposite directions, he looks both forward and backwards or to opposite extremes. January can certainly be that weather-wise. In 1934, 500,000 head of Alberta sheep and cattle endured extreme cold and 120cm of snow to survive. On the other extreme, the Calgary Zoo in 1998 placed itself on 'Operation Noah' alert when an ice jam in the Bow River, caused by warm weather then sudden freezing, threatened to flood the zoo facilities.[1] [1]Phillips 1999

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	FEBRUARY 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	-4.5	-4.0	-8.6	
	Extreme monthly maximum (°C/date)	4.0/23	5.1/25	7.5/1988/26&1991/06	12.8/1931/19
	Number of recording years			27	~102
	Average monthly minimum (°C)	-15.0	-13.2	-18.3	
	Extreme monthly minimum (°C/date)	-29.9/11	-26.9/04	-41.1/1972/06	-50.0 /1893/1
	Number of recording years			27	~102
	Monthly average (°C)	-9.8	-8.6	-13.7	
	Days with frost	29	28	28	
	Growing degree-days (5°C base)	0.0	0.0	0.0	
	Heating degree-days (18°C base)	804.9	745.9	909.9	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-14.5			
PRECIPITATION	Monthly total (mm)	9.0	3.5	14.6	
	Greatest 24-hour (mm/date)	3.7/29	1.7/17	14.2/1979/13	30.0/1962/03
	Number of recording years			27	~102
	Days with recordable precipitation	6	4	10	
	Yearly total to date (mm)	24.3	22.4	35.1	
WIND	Average monthly speed (km/h)	12.6	14.8		16.0
	Peak Gust (direction/speed(km/h)/date)	NW42.7/29	SE58.0/06		N106.0/1988/22
RADIATION	Total bright sunshine (hours)	182.0	116.3	134.1	
	% of possible bright sunshine	63.0	41.8	48.2	
	Number of days with bright sunshine	26	23	25	
	Monthly total global radiation (MJ/m^2)	235.4	204.5	210.1	
	Monthly total diffuse radiation (MJ/m^2)	88.3	149.9**	105.3	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	-4.9	-4.7	-7.7	
	10 cm/20 cm	-6.2/-4.2	-4.0/-2.7	-7.3/-6.8	
	50 cm /100 cm	-3.2/-0.1	-3.3/-0.8	-4.1/-1.0	
	150 cm/300 cm	1.3/3.8	0.9/3.1	0.8/3.3	

For Your Information

Spring made an early appearance this year with February registering temperatures 3.3°C to 4.1°C above normal. All days recorded frost but three days had maximum values high enough to produce average temperatures above zero. Snow cover at month's end was at 9 cm but bare spots were visible in many places. Precipitation, falling in the latter half of the month, came as snow, slush and rain. Melting occurred as temperatures rose during the day, but freezing night temperatures caused icy streets and side walks. February's bright sunshine total was 14.8% above normal adding to the springlike conditions. Soil temperature averages were also noticeably above normal.

Although warm weather in February is much welcomed, it can cause problems. In 1997, Calgary had to postpone the World Cup bobsled races due to inclement warm weather. Car owners in Saskatoon during 1998 complained when warm temperatures turned snow to slush. Cars stuck on residential streets and back alleys had to be towed when the snow softened but didn't melt. And just when the residents of southern Saskatchewan and Manitoba thought the spring of 1998 was here and put away winter gear, along came one of the worst storms in history dumping a seasons' worth of snow. Winds blew so hard in Brandon that some roads were snow-covered within minutes of being ploughed.[1]

[1] Philips 1998

**Eppley Pyranometer replaced on Feb. 9. Values between Feb. 9 (1600h) and Feb 10 (1500h) are high.

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	MARCH 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	4.0	0.9	-2.1	
	Extreme monthly maximum (°C/date)	13.7/23	15.2/26	17.0/1986/27	22.8/1910/23
	Number of recording years			27	~101
	Average monthly minimum (°C)	-6.0	-8.0	-12.1	
	Extreme monthly minimum (°C/date)	-19.3/14	-21.7/07	-38.9/1972/02	-43.3/1897/14
	Number of recording years			27	~101
	Monthly average (°C)	-1.0	-3.5	-7.0	
	Days with frost	26	30	30	
	Growing degree-days (5°C base)	5.3	4.0	1.2	
	Heating degree-days (18°C base)	589.8	667.3	784.1	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-4.1			
PRECIPITATION	Monthly total (mm)	17.4	5.8	19.9	
	Greatest 24-hour (mm/date)	6.8 / 30	1.5/04	32.0/1967/30	32.0/1967/30
	Number of recording years			27	~96
	Days with recordable precipitation	11	11	9	
	Yearly total to date (mm)	41.7	28.2	55.0	
WIND	Average monthly speed (km/h)	14.9	15.8		17.0
	Peak Gust (direction/speed(km/h)/date)	WNW53.1/26	E56.4/04		W93.0/1959/18
RADIATION	Total bright sunshine (hours)	185.4	182.5	174.6	
	% of possible bright sunshine	50.1	49.4	47.4	
	Number of days with bright sunshine	29	28	27	
	Monthly total global radiation (MJ/m^2)	354.5	388.7**	362.4	
	Monthly total diffuse radiation (MJ/m^2)	154.3	221.8**	173.9	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	-1.8	-2.8	-3.4	
	10 cm/20 cm	-0.6/0.6	-1.8/-1.0	-3.1/-2.8	
	50 cm /100 cm	-0.8/0.3	-2.0/-0.2	-1.8/-0.6	
	150 cm/300 cm	1.2/2.8	0.6/2.4	0.4/2.5	

For Your Information

March continues the warm weather wave with average maximum and minimum temperatures 6.1°C above normal. Twenty-two days recorded above freezing temperatures with 5 frost free days. Snow on the ground was sparse throughout the month and disappeared by month's end. Although 11 days recorded precipitation, 2 more than normal, the monthly total was 2.5 mm below normal. The yearly deficit, 13.3 mm below normal, was lower than last year's 26.8 mm. Bright sunshine values were 10.8 hours above normal with 5 days receiving less than 1 hour. Soil temperatures at all levels were well above normal. Geese were observed at the site on March 1st followed by a crow the next day. Gophers were active by the 15th and robins had returned to the city by the 20th.

March, on the teetering edge between winter and spring, is a month of great variability. Proverbs abound concerning March weather and the following months. "When March has April weather / April will have March weather" is one to watch out for this year. Farmers may note that "A dry March, wet April and cool May / Fill barn, cellar, and bring much hay." For horticulturists - "March winds and April showers / Bring forth May flowers".[1]

[1] Inwards, 1994 ** Re-calibration of the radiation sensors were completed this month. The diffuse values are high due to reinstallation and reprogramming of the instrument.

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MONTHLY WEATHER SUMMARY

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CRS estbd. 1963

	APRIL 2000		2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		10.9	12.7	9.9	
	Extreme monthly maximum (°C/date)		23.8/22	22.8/24&25	30.6/1977/26	33.3/1952/28
	Number of recording years				27	~101
	Average monthly minimum (°C)		-1.3	0.9	-2.0	
	Extreme monthly minimum (°C/date)		-12.0/14	-5.9/02	-27.8/1979/01	-28.3/1893/05&1954/02
	Number of recording years				27	~101
	Monthly average (°C)		4.8	6.8	4.0	
	Days with frost		20	14	20	
	Growing degree-days (5°C base)		78.7	84.5	54.8	
	Heating degree-days (18°C base)		395.9	334.7	420.9	
	Cooling degree-days (18°C base)		0.0	0.0	0.2	
	Average Grass @ 9:00 am (surface)*		6.7			
PRECIPITATION	Monthly total (mm)		28.8	11.5	20.3	
	Greatest 24-hour (mm/date)		9.0/05	4.6/20	24.6/1985/19	30.2/1955/19
	Number of recording years				27	~101
	Days with recordable precipitation		13	8	7	
	Yearly total to date (mm)		70.5	39.7	75.3	
WIND	Average monthly speed (km/h)		15.8	16.5		18.0
	Peak Gust (direction/speed(km/h)/date)		NNW64.5/05	NW71.4/13		W108.0/1959/06
RADIATION	Total bright sunshine (hours)		203.2	216.8	229.4	
	% of possible bright sunshine		48.5	51.9	54.9	
	Number of days with bright sunshine		28	27	27	
	Monthly total global radiation (MJ/m^2)		470.6	496.2	492.2	
	Monthly total diffuse radiation (MJ/m^2)		192.8	172.5	178.5	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	2.3	2.2	2.8	
		10 cm/20 cm	4.6/5.8	4.4/4.9	3.2/3.5	
		50 cm /100 cm	3.4/2.8	1.9/1.3	2.5/1.2	
		150 cm/300 cm	2.5/2.7	1.4/2.3	1.2/2.2	

For Your Information

April average temperatures were slightly above normal but are very much reflected in the observed higher growing degree-days and lower heating degree-days. Above normal precipitation (8.5 mm) coming as snow and rain showers, was very welcome. As of April 30th annual total precipitation is within 4.8 mm of normal. With 6 precipitation days more than usual, the bright sunshine value was 6.4% less but only 2 days were without bright sunshine. Soil temperatures, with the exception of the 5cm level, are warming up faster than normal this year. It was a bit windy with Near Gale (51-62 km) winds occurring 4 times and Gale (62-75) winds occurring once.

Want to try your hand at forecasting the weather? Beware! It may be dangerous to your health. The first chief of the English Weather Service, possibly the first professional weather forecaster, made forecasts for a few years, then committed suicide. The first chief of the US Weather Bureau, went mad after several years on the job. In 1906, a senate committee was told that the US Weather Bureau had sent more men to insane asylums than any other branch of government. Even Wiarton Willie was not immune. The ground hog received death threats in 1996 and had to be placed in protected custody after the promised early spring did not arrive. As recent as the 1960s, you could be burned at the stake if you were guilty of trying to predict the weather according to British law.[1]

1Phillips 1999 & 1995b

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CRS estbd. 1963

	MAY 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	18.1	16.8	18.5	
	Extreme monthly maximum (°C/date)	28.3/01	29.2/25	35.0/1988/30	37.2/1936/27
	Number of recording years			27	~101
	Average monthly minimum (°C)	3.9	5.3	4.5	
	Extreme monthly minimum (°C/date)	-6.1/12	-1.6/07	-10.0/1967/02	-12.8/1907/06
	Number of recording years			27	~101
	Monthly average (°C)	11.0	11.0	11.6	
	Days with frost	6	2	6	
	Growing degree-days (5°C base)	191.6	191.7	206.9	
	Heating degree-days (18°C base)	216.3	218.0	193.1	
	Cooling degree-days (18°C base)	0.0	2.5	7.0	
	Average Grass @ 9:00 am (surface)*	14.7			
PRECIPITATION	Monthly total (mm)	13.0	39.2	43.7	
	Greatest 24-hour (mm/date)	4.8/22	12.8/18	39.9/1985/04	51.3/1909/30
	Number of recording years			27	~101
	Days with recordable precipitation	8	12	9	
	Yearly total to date (mm)	83.5	78.9	119.0	
WIND	Average monthly speed (km/h)	16.9	16.9		18.0
	Peak Gust (direction/speed(km/h)/date)	WNW68.6/22	NW64.7/18		SW132/1965/17
RADIATION	Total bright sunshine (hours)	226.6	176.4	285.7	
	% of possible bright sunshine	46.4	36.2	58.7	
	Number of days with bright sunshine	30	28	29	
	Monthly total global radiation (MJ/m^2)	582.6	534.1	586.3	
	Monthly total diffuse radiation (MJ/m^2)	236.1	225.1	222.2	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	7.9	8.2	10.1	
	10 cm/20 cm	10.3/11.5	10.2/10.8	10.6/10.9	
	50 cm /100 cm	8.5/6.8	7.7/6.1	8.9/5.9	
	150 cm/300 cm	5.7/4.0	4.8/3.4	4.4/3.1	

For Your Information

May was only slightly cooler than normal with monthly averages of less than 1°C below normal values. Soil temperatures were below average in the upper two levels while the lower three levels showed a slight increase in above normal values. The frost free period began on the 18th, two days ahead of normal. However, on May 30th the temperature dipped precariously close to zero with a temperature of 0.5°C at CRS, and some low-lying areas may have experienced frost. Precipitation, at 29.7% of normal, contributed to the yearly average falling to 68.7% of normal. It was a dull month with 12.3% less bright sunshine than usual even though we had one more day recording bright sunshine than average. The wind, near normal for the month, blew strongly between the 23rd to the 30th with four days recording maximum wind gusts in the Near Gale range (51 - 62 km/h).

High winds are not uncommon for May. Last year, several tornadoes were spotted northwest of the city. In 1971, a blinding dust storm, whipped by winds of up to 113 km/h, roared through Rosthern, SK damaging buildings, fences, trees and motor vehicles. Residents found dust in their cupboards and clothing for days after. A dirt blizzard in 1989 with 90 km/h winds blew huge numbers of tumbleweeds across the prairies. One RCMP officer said they looked like a herd of bouncing antelope.[1] 1Phillips, 1999

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CRS estbd. 1963

	JUNE 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	21.4	20.8	22.6	
	Extreme monthly maximum (°C/date)	30.6/29	28.7/19	41.0/1988/05	40.6/1988/05
	Number of recording years			27	~102
	Average monthly minimum (°C)	8.7	9.1	9.2	
	Extreme monthly minimum (°C/date)	4.7/08	3.3/27	-3.3/1967/06	-3.9/1903.0/09&1917/02
	Number of recording years			27	~102
	Monthly average (°C)	15.1	15.0	15.9	
	Days with frost	0	0	0	
	Growing degree-days (5°C base)	302.1	298.6	327.3	
	Heating degree-days (18°C base)	97.5	103.4	84.0	
	Cooling degree-days (18°C base)	9.6	12.0	21.2	
	Average Grass @ 9:00 am (surface)*	19.9			
PRECIPITATION	Monthly total (mm)	48.8	66.4	63.6	
	Greatest 24-hour (mm/date)	14.2/09	16.6/25	99.4/1983/24	99.4/1983/24
	Number of recording years			27	~102
	Days with recordable precipitation	16	13	12	
	Yearly total to date (mm)	132.3	145.3	182.6	
WIND	Average monthly speed (km/h)	15.1	13.7		17.0
	Peak Gust (direction/speed(km/h)/date)	E61.0/09	WNW70.9/23		S117.0/1986/01
RADIATION	Total bright sunshine (hours)	239.5	229.3	297.2	
	% of possible bright sunshine	47.9	45.9	59.4	
	Number of days with bright sunshine	27	28	29	
	Monthly total global radiation (MJ/m^2)	609.9	610.4	638.7	
	Monthly total diffuse radiation (MJ/m^2)	231.6	230.7	228.1	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	11.7	12.2	15.3	
	10 cm/20 cm	14.4/15.5	14.3/15.0	15.7/16.2	
	50 cm /100 cm	11.8/9.5	11.7/9.7	14.0/10.4	
	150 cm/300 cm	8.0/3.3	8.0/5.2	8.2/5.2	

For Your Information

CRS recorded a cool June, similar to June 1999. The mean maximum temperature was 1.2°C below normal and the mean minimum temperature was 0.5 below normal. These cool temperatures are particularly noticeable in the monthly growing degree-days which were 25.2 less than usual. Growing degree-days for the frost-free period are 415.9. Soil temperatures at all levels were below normal. The decrease from normal ranged from 3.6°C at the 5cm level to 0.2°C at the 150cm level. Although rain occurred on 16 days, the rainfall was 76.7% of normal. Bright sunshine was 11.5% less than normal. This coupled with the low temperatures had people questioning where summer had gone to or if it had ever arrived.

More Canadians are killed or injured by lightning than by any other summertime weather event. Most of the people are involved in a sporting event where grasping a 9 iron, fishing rod or baseball bat makes that person the tallest object in the open space.[1] Throughout the ages, all sorts of strategies to neutralize lightning have been used. In medieval Europe, church bells were rung violently in an effort to keep the lightning from striking the tall church spire. The French outlawed the practise in 1786 after 386 church towers had been struck and 103 bell-ringers had been killed in a space of 33 years.[1] During this time, fashionable French women attached lightning rods to their hats presumedly to prevent injury after being hit by a lightning bolt. A metal wire ran around the ribbon of the hat and connected with a light silver chain which hung down and trailed on the ground, similar to those seen nowadays on oil trucks.[2]

[1] Paruk 2000 [2]Canadian Geographic web page [3]Phillips, 1996

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CRS estbd. 1963

	JULY 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	25.7	23.2	25.1	
	Extreme monthly maximum (°C/date)	34.9/14	30.8/21	38.5/1984/27	40.0/1919/17&1941/19&1946/30
	Number of recording years			27	~102
	Average monthly minimum (°C)	13.1	11.4	11.5	
	Extreme monthly minimum (°C/date)	4.9/17	5.6/07	1.7/1967/02&1978/09	-0.6/1918/25
	Number of recording years			27	~102
	Monthly average (°C)	19.4	17.4	18.3	
	Days with frost	0	0	0	
	Growing degree-days (5°C base)	447.2	383.0	414.8	
	Heating degree-days (18°C base)	26.0	58.8	32.0	
	Cooling degree-days (18°C base)	70.2	38.8	43.9	
	Average Grass @ 9:00 am (surface)*	23.2			
PRECIPITATION	Monthly total (mm)	82.4	86.4	55.7	
	Greatest 24-hour (mm/date)	24.2/06	23.8/15	45.5/1968/29	79.2/1946/03
	Number of recording years			27	~102
	Days with recordable precipitation	9	14	11	
	Yearly total to date (mm)	214.7	231.7	238.3	
WIND	Average monthly speed (km/h)	13.8	13.7		16.0
	Peak Gust (direction/speed(km/h)/date)	SSW73.3/14	WNW58.6/29		E113.0/1955/05
RADIATION	Total bright sunshine (hours)	267.6	276.7	330.3	
	% of possible bright sunshine	53.4	55.1	65.8	
	Number of days with bright sunshine	31	30	30	
	Monthly total global radiation (MJ/m^2)	620.3	677.2	633.5	
	Monthly total diffuse radiation (MJ/m^2)	212.9	234.8	216.5	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	14.7	14.9	17.6	
	10 cm/20 cm	18.0/18.9	17.2/18.0	18.0/18.8	
	50 cm /100 cm	15.4/12.3	14.5/12.2	16.8/13.2	
	150 cm/300 cm	10.4/7.4	10.4/7.1	11.1/7.5	

For Your Information

If you like extremes, July was your month. The first 9 days experienced two-thirds of the total monthly rainfall with the remainder falling mainly on the 17th and 25th. At least 7 thunderstorms were observed. The total yearly rainfall increased to 214.7 mm or less than 9.9% of the normal for the year. Temperatures were above normal with the minimum average showing the greatest deviation of 1.6°C. The variation between the extreme high and low was 30°C. Eight days registered temperatures over 30°C with 6 days occurring in the last days of the month. The extreme cooling degree-days, at 4.8, was 3.1 above normal. At Pine Lake, 60 km east of Red Deer, AB, a devastating tornado touched down causing severe property damage and lost of lives. The "left-over" wind from this system, recorded at 73.3 k/h at CRS, was the maximum gust for the month.[1]

Tornado-like winds can appear anytime as a parasailor found out on Canada Day, 1985. Although the winds were calm at the time, a 'mini-twister' appeared, plucked him off the lake, SE of Calgary, then dumped him in a field half-kilometre away. He struck a barbed wire fence before landing and died on impact. Tornadoes can also be rather helpful. In 1846, a man from Cornwall, ON dug a hole in his garden intending to plant an apple tree. Before he got around to the task, a tornado brought an apple tree from Massena, New York, dropped it into the hole and using the earth piled up by the man, firmly planted the tree for him.[2]

[1]Hollinger 2000 [2]Philips, 1999

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* Grass temperature is taken from a surface probe whose calibration is unknown at present

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	AUGUST 2000		2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		24.4	25.4	24.3	
	Extreme monthly maximum (°C/date)		34.5/23	33.9/25	39.7/1998/06	39.7/1998/06
	Number of recording years				27	~101
	Average monthly minimum (°C)		11.1	11.6	10.1	
	Extreme monthly minimum (°C/date)		4.5/31	5.4/01	-2.8/1976/28	-2.8/1976/28&1901/23
	Number of recording years				27	~101
	Monthly average (°C)		17.8	18.5	17.2	
	Days with frost		0	0	0	
	Growing degree-days (5°C base)		395.4	419.6	379.6	
	Heating degree-days (18°C base)		49.6	30.3	62.4	
	Cooling degree-days (18°C base)		42.0	46.9	39.0	
	Average Grass @ 9:00 am (surface)*		18.8			
PRECIPITATION	Monthly total (mm)		52.6	41.4	35.3	
	Greatest 24-hour (mm/date)		23.4/02	19.4/16	33.8/1998/17	84.3/1945/03
	Number of recording years				27	~101
	Days with recordable precipitation		10	7	9	
	Yearly total to date (mm)		267.3	273.1	273.6	
WIND	Average monthly speed (km/h)		13.6	12.3		16.0
	Peak Gust (direction/speed(km/h)/date)		NW55.2/28	WSW/64.6/22		W151.0/1967/14
RADIATION	Total bright sunshine (hours)		249.4	253.4	295.2	
	% of possible bright sunshine		55.2	55.9	65.2	
	Number of days with bright sunshine		30	31	30	
	Monthly total global radiation (MJ/m^2)		518.6	555.4	529.0	
	Monthly total diffuse radiation (MJ/m^2)		176.1	221.7	185.6	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	13.9	14.9	16.4	
		10 cm/20 cm	17.2/18.5	17.2/18.2	16.8/17.9	
		50 cm /100 cm	16.0/13.8	15.4/13.5	16.8/14.1	
		150 cm/300 cm	12.2/9.1	11.9/8.7	12.4/9.1	

For Your Information

Although August felt cooler than expected, it was slightly warmer than normal by 0.6°C. The perceived coolness was due to daytime temperatures being normal while night-time temperatures were above normal thus pushing up the daily average. The degree-day values all reflected a warm month. However, the extreme cooling degree-day value (base 24) was1.4 below normal, indicating few real hot days. August had 3 days above 30°C compared to 12 days in 1998. Rainfall was 149.0% of normal. Unfortunately, 48.6 out of 52.6 mm came during the first 7 days of the month instead of spread evenly throughout the month. The bright sunshine value was 10% below normal with one day not receiving bright sunshine. The wind speed average was lower than normal. Near Gale winds (51-62k/h) occurred thrice during the month. Soil temperatures ranged from 2.5 °C below normal at the 5cm level to normal at the 300 cm level.

Saskatoon is no stranger to atmospheric debris from forest fires. This year the smoke was not from northern fires but extensive fires burning in Montana. In 1883, the debris was from Krakatoa, Indonesia. The volcanic eruption, heard 5,000 km away, destroyed most of the island and sent dust into the upper atmosphere. From the 26th to the 28th brilliant coloured sunrises and sunsets were seen along with unusual coloured suns and moons. The dust fell around the world, especially in Western Canada.[1] [1]Philips, 1999

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	SEPTEMBER 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	19.3	18.2	17.7	
	Extreme monthly maximum (°C/date)	29.7/17	29.3/23	35.6 /1978 /04	35.6 /1978 /04
	Number of recording years			27	~101
	Average monthly minimum (°C)	6.1	4.3	4.9	
	Extreme monthly minimum (°C/date)	-2.5/23	-5.2/30	-7.8 /1974 /30	-11.1/1908/28
	Number of recording years			27	~101
	Monthly average (°C)	12.7	11.2	11.3	
	Days with frost	2	3	5	
	Growing degree-days (5°C base)	236.4	190.4	197.1	
	Heating degree-days (18°C base)	165.4	204.9	206.8	
	Cooling degree-days (18°C base)	6.9	0.1	6.2	
	Average Grass @ 9:00 am (surface)*	10.3			
PRECIPITATION	Monthly total (mm)	22.1	10.4	32.9	
	Greatest 24-hour (mm/date)	13.6/02	8.8/11	29.6/1980/03	44.2 /1931/12
	Number of recording years			27	~101
	Days with recordable precipitation	9	6	9	
	Yearly total to date (mm)	289.4	283.5	306.5	
WIND	Average monthly speed (km/h)	15.6	14.1		17.0
	Peak Gust (direction/speed(km/h)/date)	NW66.3/30	WNW64.8/29		W148/1967/22
RADIATION	Total bright sunshine (hours)	191.6	219.0	184.4	
	% of possible bright sunshine	50.7	57.7	48.6	
	Number of days with bright sunshine	29	29	27	
	Monthly total global radiation (MJ/m^2)	357.2	412.1	351.8	
	Monthly total diffuse radiation (MJ/m^2)	128.6	127.6	127.6	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	8.6	8.7	10.5	
	10 cm/20 cm	11.5/13.2	11.3/13.1	11.2/12.5	
	50 cm /100 cm	12.3/12.1	12.5/12.2	13.3/12.5	
	150 cm/300 cm	11.6/9.9	11.5/9.7	11.9 /9.9	

For Your Information

September posted slightly higher temperature values than normal. The maximum average was 1.6°C above while the minimum was1.2°C above normal. Five days experienced temperatures greater 25°C. The frost-free growing season ended on Sept. 22nd with 128 days. This is 12 days less than last year but 10 days more than average. The Saskatoon airport, with a late spring frost on May 30th and an early fall frost on Sept. 11th, recorded 103 days for the frost-free growing season.[1] Normally, the frost free period is between May 19th and Sept. 14th. The first snowfall fell on the 21st but melted soon afterwards. Precipitation was below normal by 10.8 mm with 61.5% of the monthly total falling on the 2nd as rain. Bright sunshine was absent for 1 day with the total bright sunshine only 7.2 hours greater than normal. *Near gale* winds (51-62 km/h) occurred on 5 occasions with *gale* winds (63-75 km/h) occurring on the 30th.

As the temperature begins to drop with the change of the season, the comment 'Hot enough fer yer' will change to 'Cold enough fer yer'. The recording of temperature has been done many ways but none so strange as the 'Sourdough Thermometer' invented by Jack McQuesten of the Yukon. It consisted of 4 bottles filled with mercury, coal oil, Jamaica ginger or Perry Davis' Painkiller. The mercury froze at -40°; the coal oil at -45° and the ginger at -51°. The patent medicine, containing alcohol as it's main ingredient, would turn white at -51°, crystallize at -57° and freeze at -60°.[2]

[1]Ryback 2000 [2]Phillips 1995b

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MONTHLY WEATHER SUMMARY

Latitude 52°09'N Saskatoon Longitude 106°36'W

CRS estbd. 1963

	OCTOBER 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	12.5	11.6	10.9	
	Extreme monthly maximum (°C/date)	23.9/10	20.9/24	28.5/1984/08	32.2/1943/05
	Number of recording years			27	~99
	Average monthly minimum (°C)	-1.9	-0.6	-1.3	
	Extreme monthly minimum (°C/date)	-10.4/06	-7.2/01	-21.5/1984/30&31	-25.6/1919/26
	Number of recording years			28	~99
	Monthly average (°C)	5.3	5.5	4.8	
	Days with frost	24	20	19	
	Growing degree-days (5°C base)	57.8	50.6	61.5	
	Heating degree-days (18°C base)	392.2	387.5	406.5	
	Cooling degree-days (18°C base)	0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	0.6			
PRECIPITATION	Monthly total (mm)	trace	4.0	17.5	
	Greatest 24-hour (mm/date)	trace	2.6/31	36.7/1984/16	41.7/1969/03
	Number of recording years			27	~99
	Days with recordable precipitation	0	3	6	
	Yearly total to date (mm)	289.4	287.5	324.0	
WIND	Average monthly speed (km/h)	14.0	13.9		17.0
	Peak Gust (direction/speed(km/h)/date)	wNW73.0/02	N65.0/31		NW138/1967/16
RADIATION	Total bright sunshine (hours)	192.2	133.3	160.7	
	% of possible bright sunshine	58.5	40.4	48.8	
	Number of days with bright sunshine	28	29	27	
	Monthly total global radiation (MJ/m^2)	255.6	230.2	239.1	
	Monthly total diffuse radiation (MJ/m^2)	85.7	132.1	92.6	
SOIL	Average temperature (°C) @ 9:00 am 5 cm	2.8	3.2	4.1	
	10 cm/20 cm	5.5/7.4	5.3/7.1	4.5/6.0	
	50 cm /100 cm	8.0/9.1	7.7/8.9	8.0/9.2	
	150 cm/300 cm	9.6/9.5	9.3/9.3	9.7/9.5	

For Your Information

This October was a textbook description of Indian Summer at its finest. A time after the first killing frost and before the first lasting snowcover when unseasonably warm temperatures and hard frosts are apt to occur on the same day. A time of calm or light winds and possible early morning fog.[1] The warm, sunny, dry days of this October created an illusion of a considerably warmer month than usual. In actual fact, the average monthly temperature was only half a degree above normal. With mostly cloudless nights, the minimum temperatures dropped half a degree below normal offsetting the 1.6°C above normal maximum temperatures. Traces of precipitation were observed twice during the month and heavy fog during the last three days. With the lack of moisture, the yearly precipitation total dropped to 34.6 mm below normal. Only 3 days lacked bright sunshine with 13 days recording over 80% of the possible bright sunshine.

This year, Indian summer continued into November unlike 1955 when Hallowe'en ushered in the beginning of one of the worst winters on record. Near Melfort, 200cm of snow fell between October 31st and March in a succession of blizzards and snowfalls rendering roads impassable even for horses.[2]

[1]Phillips 1993 [2]Phillips 1997

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CRS estbd. 1963

	NOVEMBER 2000	2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)	-0.8	5.1	-1.5	
	Extreme monthly maximum (°C/date)	16.0/04	19.3/07	19.4/1975/04	21.7/1903/03
	Number of recording years			28	~100
	Average monthly minimum (°C)	-9.4	-5.4	-10.6	
	Extreme monthly minimum (°C/date)	-19.0/08	-17.0/28	-33.5/1985/24	-39.4/1893/30
	Number of recording years			28	~100
	Monthly average (°C)	-5.1	-0.1	-6.0	
	Days with frost	29	26	29	
	Growing degree-days (5°C base)	5.1	12.5	2.8	
	Heating degree-days (18°C base)	693.4	544.4	721.5	
	Cooling degree-days (18°C base)	0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*	-11.5			
PRECIPITATION	Monthly total (mm)	9.1	2.8	15.5	
	Greatest 24-hour (mm/date)	3.3/27	1.8/25	19.3/1978/04	27.9/1938/01
	Number of recording years			28	~100
	Days with recordable precipitation	10	4	8	
	Yearly total to date (mm)	298.5	290.3	339.5	
WIND	Average monthly speed (km/h)	13.5	14.1		16.0
	Peak Gust (direction/speed(km/h)/date)	NW58.6/18	WNW64.2/04		W100.0/1976/17
RADIATION	Total bright sunshine (hours)	104.5	118.0*	100.9	
	% of possible bright sunshine	39.7	44.6*	38.1	
	Number of days with bright sunshine	20	28	22	
	Monthly total global radiation (MJ/m^2)	127.1	131.9*	123.7	
	Monthly total diffuse radiation (MJ/m^2)	60.6	58.3*	73.6	
SOIL	Average temperature (°C) @ 9:00 am — 5 cm	-2.1	-1.0	-2.2	
	10 cm/20 cm	-0.2/1.7	0.7/2.7	-1.7/-0.5	
	50 cm /100 cm	3.6/6.3	4.1/6.3	2.8/5.4	
	150 cm/300 cm	7.4/8.5	7.3/8.1	6.8/8.1	

For Your Information

November's temperatures were slightly above normal. Twelve days recorded temperatures above freezing with one frost free day noted on November 4th. The average minimum temperature showed the greatest deviation from normal at 1.2°C. With the slightly warmer month, the heating degree-days were 28.1 points lower than usual. Precipitation, 58.7% of normal, fell 10 times during the month with the 6th and 27th receiving the bulk of the moisture. With the late snow fall, the snow-on-the-ground measurement at month's end equalled 6 cm. Bright sunshine measured at just 3.6 hours more than normal but with 2 fewer days. Thirteen days received less than one hour of bright sunshine and five days received over 80% of the total possible bright sunshine.

With the mild temperatures, it is often hard to realize that the Christmas season is just around the corner. This can be a problem for charities who depend upon the monies collected at this time. In 1998, the Winnipeg Christmas Cheer Board blamed the weather for a $91,000 decrease in charitable donations. They were hoping the beautiful weather with no snow would soon end so people would start feeling the Christmas spirit. The Board had planned to deliver 23,000 hampers to over 50,000 people for Christmas.[1]

*Datalogger was not recording for the afternoon of the 24th due to the installation of new equipment.

[1] Phillips 1999

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CRS estbd. 1963

	DECEMBER 2000		2000 VALUE	1999 VALUE	NORMAL(1961-1990) OR EXTREME VALUE FOR CRS	EXTREME FOR SASKATOON STATIONS
TEMPERATURE	Average monthly maximum (°C)		-14.0	-0.7	-9.8	
	Extreme monthly maximum (°C/date)		2.2/06	8.4/27	9.5/1987/07	14.4/1939/05
	Number of recording years				28	~100
	Average monthly minimum (°C)		-23.0	-11.3	-19.3	
	Extreme monthly minimum (°C/date)		-33.3/21	-29.1/20	-42.2/1973/31	-43.9/1892/22
	Number of recording years				28	~100
	Monthly average (°C)		-18.5	-6.0	-14.5	
	Days with frost		31	29	31	
	Growing degree-days (5°C base)		0.0	0.0	0.0	
	Heating degree-days (18°C base)		1132.4	743.2	1004.8	
	Cooling degree-days (18°C base)		0.0	0.0	0.0	
	Average Grass @ 9:00 am (surface)*		-22.5			
PRECIPITATION	Monthly total (mm)		16.9	7.4	21.3	
	Greatest 24-hour (mm/date)		5.1/19	2.7/03	14.5/1973/23	28.4/1936/02
	Number of recording years				28	100
	Days with recordable precipitation		13	11	12	
	Yearly total to date (mm)		315.4	297.7	360.8	
WIND	Average monthly speed (km/h)		12.5	14.8		16.0
	Peak Gust (direction/speed(km/h)/date)		SE50.7/17	NNW65.1/19		W121/1955/12
RADIATION	Total bright sunshine (hours)		79.1	111.7	83.7	
	% of possible bright sunshine		32.7	46.1	34.5	
	Number of days with bright sunshine		17	25	23	
	Monthly total global radiation (MJ/m^2)		91.0	98.5	95.2	
	Monthly total diffuse radiation (MJ/m^2)		52.9	44.0	54.3	
SOIL	Average temperature (°C) @ 9:00 am	5 cm	-8.1	-4.8	-7.1	
		10 cm/20 cm	-7.0/-4.7	-3.6/-1.7	-6.5/-5.5	
		50 cm /100 cm	-1.7/2.5	-0.1/3.0	-1.6/1.9	
		150 cm/300 cm	4.4/6.7	4.6/6.6	3.9/6.3	

For Your Information

The final month of the twentieth century exited on a cold note. Temperatures were -4.2°C below normal for the average maximum and -3.7°C below normal for the minimum. Fourteen days recorded temperatures below -25°C with nine of those days below -30°C. The higher than normal heating degree-days resulted from the lower than normal temperatures. Unfortunately for cross-country skiers, there was only 10 to 11cm snow-on-the-ground produced by 16.9 mm of December precipitation; 4.4 mm less than usual. Yearly total precipitation was 12.6% (45.4 mm) less than normal. Bright sunshine was 4.6 hours less than normal with 15 days receiving less than 1 hour of bright sunshine. The week between Christmas and New Years was especially dull. The bright spot was calmer than average wind speeds throughout the month allowing outside activities for those sensibly dressed for the cold temperatures.

A Poem by Marion Young[1]

"It's thirty below out here today! Wear something warmer than that." *"This bomber jacket's perfectly warm."* "Alright, but take a hat." *"Hats are for total geeks, Mom. I can't wear that to school."* "Well, wear your nice new boots at least." *"No way, 'cause boots aren't cool."* So out she went - no scarf or mitts! and started the walk to school, Shivering, frozen, chilled to the bone, But totally, totally cool.

[1]Wheaton 1998

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INSTRUMENTS USED AT SASKATOON SRC CRS AND GLOSSARY OF TERMS

(unless otherwise stated, source for definitions of terms is Environment Canada, 1978)

BEAUFORT WIND SCALE was developed by Admiral Sir Francis Beaufort in 1805 and adopted by the British Navy in 1838. It consisted of 13 degrees of wind strength, from calm to hurricane, based upon the effects of various wind strengths upon the amount of canvas carried by the fully rigged frigates of the period. Over the years it has been modified as needed and in 1946 the scale values (Force Numbers) were defined by ranges of wind speed as measured at a height of 10 meters above the surface. In effect, this transformed the 'Beaufort Wind Force Scale' into the 'Beaufort Wind Speed Scale'. This scale is the current standard scale for visual observations of the wind. (Heidorn, 1998)

BRIGHT SUNSHINE is the unobstructed direct radiation from the sun, as opposed to the shading of a location by clouds or by other atmospheric obstructions.

Number of Days is defined as the total number of days when at least 0.1 of an hour of bright sunshine was recorded.

Percentage Possible refers to the ratio of measured bright sunshine hours to the total possible daylight hours in a given period, expressed as a percentage.

Possible daylight hours are taken from the sunrise/set tables provided by the National Research Council of Canada, Herzberg Institute of Astrophysics, Victoria, BC.

Total is the sum of the daily bright sunshine values in hours and tenths of hours as measured by an automated sunshine recorder using voltaic cells.

DEGREE-DAY is an index for various temperature related calculations

Cooling (CDD) is the cooling requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of greater than 18°C is considered uncomfortable and supplementary cooling is required. On a specific day, the amount by which 18°C is less than the daily average temperature defines the number of cooling degree-days for that day.

Mathematically:

CDD = (T - 18°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 18°C, CDD = 0.

Monthly and annual values of CDD are obtained by summing daily values.

Extreme Cooling (XCDD) A temperature of greater than 24°C has been used as an index of potential heat stress. On a specific day, the amount by which 24°C is less than the daily average temperature defines the number of extreme cooling degree-days for that day.

Mathematically:

XCDD = (T - 24°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 24°C, XCDD = 0.

Monthly and annual values of XCDD are obtained by summing daily values.

Growing (GDD) is the growing requirement in order for plant growth to proceed. The air temperature must exceed a critical value appropriate to the plant species in question. For many members of the grass family, including most commercial cereals grown on the prairies, a base temperature of 5.0°C has been established. On a specified day, the difference between the daily average temperature and the 5.0°C base temperature defines the number of growing degree-days.

Mathematically:

GDD = (T - 5.0°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 5.0°C, GDD = 0.

Daily GDD values are summed to provide totals for the appropriate month, growing season or year.

Heating (HDD) is the heating requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of less than 18°C is considered uncomfortable and supplementary heating is required. On a specific day, the amount by which 18°C exceeds the daily average temperature defines the number of heating degree-days for that day.

Mathematically:

HDD = (18°C - T), for that day, where T = daily mean temperature in °C if T is equal to or greater than 18°C, HDD = 0.

Monthly and annual values of HDD are obtained by summing daily values.

EXTREME is the highest or lowest value of a particular element recorded during the period in question.

EXTREME ALL YEARS Temporal comparisons at a point are also of value in some types of climatic studies. Therefore, it is desirable to produce the maximum length of reliable climatic record to carry out studies over a period of time. Data are drawn from the following data sets:

Saskatoon, SRC:1963 to present
Saskatoon, University of Saskatchewan:1916 to 1963
Saskatoon, City:1892 to present

Station locations, exposures and measurement procedures were subject to change during this time period. Data are not adjusted and users are cautioned accordingly.

FROST is recorded on each occasion when the daily minimum temperature is equal to or less than 0°C.

NORMAL VALUE (1961-1990) In climatology it is often useful to make spatial comparisons of particular element values over a common time period. At an interior continental site such as Saskatoon, a period of 30 years is required to produce statistically stable estimates of the more variable elements. To facilitate spatial comparisons, the World Meteorological Organization recommends the standard normal (average) period of thirty years. The current normal period for data analysis is from January 1st, 1961 to December 31st, 1990. Data derived from CRS conform to this standard, except where noted. The normals for CRS are taken from the normals published by Environment Canada for the standard period. Normals used in SRC CRS annual summaries 1990 - 1996 were hand-calculated values determined before the official normals were published.

NUMBER OF RECORDING YEARS Due to missing observations, faulty instrument calibration, lost records, *etc*., only partial data sets are available especially during the period 1892 - 1915. The number of years of useful record is therefore cited.

PRECIPITATION

Day is recorded on occasions when the amount of precipitation in a 24-hour period equals or exceeds 0.2 mm water. An asterisk (*) appearing in the average column denotes the occurrence of measurable precipitation on one or more occasions, and that the calculated 30-year average amounts to less than a trace. The so-called climatological day, beginning at 9 a.m. standard time on the date of reference and ending at 9 a.m. the next morning, was employed in record keeping up to January 1994. On February 1, 1994, after consultation with Environment Canada, record keeping was changed to the 24-hour period of 0000 hours - 2400 hours to conform to their reporting of climatological statistics.

Total is the sum of the daily recorded precipitation. The snowfall component of precipitation is recorded as an equivalent amount of liquid water. For particulars on precipitation measurement procedures and instruments, the reader is referred to the Environment Canada publication "*Manual of Climatological Observation*'s", 2nd Ed., January, 1978. The notation "T" refers to a trace of precipitation (less than 0.2 mm water equivalent). As of August 7, 1993, total precipitation was measured using the Belfort weighing gauge for the winter season and the tipping bucket during frost-free period.

SOIL TEMPERATURE under a short grass surface with normal snow accumulation, is measured according to procedures outlined in the Environment Canada publication "*Soil Temperature*" January l, 1976. Depths below surface at which soil temperature measurements are made are: 5 cm, 10 cm, 20 cm, 50 cm, 100 cm, 150 cm and 300 cm. Since soil temperature is affected by profile structure and water content, extrapolation of the measured data is difficult.

SOLAR RADIATION

Diffuse - Total is radiation reaching the earth's surface after having been scattered from the direct solar beam. The instrument used is an Eppley pyranometer with a shade ring (See SOLAR RADIATION-Global- Total).

Global - Total is the sum of the direct solar and diffuse radiation during the period in question. Measurements are carried out on a horizontal surface near ground level and integrated over the whole celestial dome, summing the diffuse and direct components of the solar beam. The temperature-compensated Eppley pyranometer is used. The standard metric unit of measurement is the megajoule per square metre (MJ/m^2). (To facilitate comparison with past years' data: 1.0 MJ/m^2 = 23.895 langleys). Comparison is provided with a provisional average based on 16 years of data (l975-1990).

SPELLS - Temperature spells are defined as a sequence of days when the daily maximum temperature is higher than or equal to 30°C (hot spell) or the daily minimum temperature is lower than or equal to -30°C (cold spell).

SUNRISE/SUNSET times have been included in this report. They have been acquired from the National Research Council, Canada, Herzberg Institute of Astrophysics.

TEMPERATURE

Average Annual is the average of the daily average temperatures in degrees Celsius (°C) for one year.

Average Daily is defined as the arithmetic mean of the daily maximum temperature in degrees Celsius (°C) and the daily minimum temperature in degrees Celsius (°C) for the day in question.

Average Maximum is the average of the daily maximum temperatures in degrees Celsius (°C) average over the appropriate time periods. For details concerning measurement procedures, the reader is referred to the Environment Canada publication, "*Manual of Climatological Observations"*, 2nd Ed., January, 1978.

Average Minimum is the average of the daily minimum temperatures in degrees Celsius (°C) averaged over the appropriate time periods. Refer to TEMPERATURE-Average Maximum concerning measurement procedures.

Average Monthly is the average of the daily average temperatures in degrees Celsius (°C) for the month under consideration.

WIND CHILL FACTOR is a cooling rate based on air temperature and wind speed. It is an approximate indication of the cooling rate of exposed flesh and whether or not protective covering is necessary. It was devised by P.A. Siple while in the Antarctica in 1941 by measuring the time required for the freezing of 250 grams of water at various wind speeds and air temperatures. Due to the unfortunate misuse of wind chill temperatures, people are often misled to believe that objects will cool down to the given wind chill temperature if left outside. This is not correct as an object will not cool to a lower temperature than its surrounding air temperature. Wind chill is simply a measure of the **rate** at which heat is lost. It is how cold it *feels* not how cold it is. (Maybank, 1970)

WIND SPEED

Average is the average of the hourly wind speeds for the period in question measured in kilometres per hour (km/h). Average hourly wind speeds are obtained from a RM Young Wind Monitor anemometer at a height of 10 m.

Peak Gust refers to the highest instantaneous value recorded by the anemometer system for the period of reference, irrespective of direction and/or duration. Comparison is with published data for Environment Canada, Saskatoon Airport station.

see also **Beaufort Wind Scale**

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