CLIMATE REFERENCE STATION
SASKATOON
ANNUAL SUMMARY 2016

V. Wittrock & S. Dunn
Saskatchewan Research Council
Air and Climate

SRC Publication No. 10440 - 1E17
February 2017

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Saskatoon, SK S7N 2X8

COVER PHOTOGRAPHS
Climate Station in summer and winter 2016 (25 Feb, 11 Jul and 26 Aug)
photo credit: V. Wittrock

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ACKNOWLEDGEMENTS

The 2016 data were compiled and recorded by Virginia Wittrock with assistance from Shaw Dunn and others. Wittrock is responsible for the data monitoring of the site while instrument maintenance was carried out by personnel of the Development Engineering and Manufacturing Business Unit (Ryan Jansen and Ken Babich) of the Saskatchewan Research Council (SRC). Grounds maintenance (lawn mowing) is managed by SRC Facilities Managment Business Unit (Philip Rees and Joshua Janzen). Consultations with Terri Lang, John Cragg and others from Environment Canada, Saskatoon, SK were most helpful in verifying and comparing data. Editorial assistance was provided by Suzanne Johnston, Communications Business Unit, SRC.

Enquiries concerning the SRC Saskatoon Climate Reference Station (CRS), its data, measurement programs and publications or becoming a supporter are most welcome. For further information contact:

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Monthly data sheets and annual summaries: http://src.nu/crsdata

SASKATCHEWAN RESEARCH COUNCIL

CLIMATE REFERENCE STATION SUPPORTERS, 2016

WE GRATEFULLY ACKNOWLEDGE THE SUPPORT OF THE FOLLOWING:

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WHEN MEASUREMENTS MATTER

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SINCE 1830

UNIVERSITY OF SASKATCHEWAN

Prince Albert Model Forest

Agriculture and Agri-Food Canada
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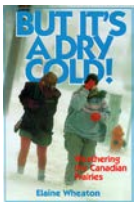


SRC'S SASKATOON CLIMATE REFERENCE STATION HISTORY

Meteorological observations at or near Saskatoon were first taken by the Northwest Mounted Police in 1889 with the recording of temperature. There is some disagreement in the early records as the exact location of the weather observing point, but the majority of the evidence indicates 52 15'N, 106 20'W, elevation 480m 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. At that time, there was a settlement at Clark's Crossing as well as 10 to 15 families on either side of the river where Saskatoon is now located.

Little is known about the very early observers; however, the records do show that Major T.H. Keenan took observations from March 1892 until March 1895, and Mr. George Will was the observer from January 1897 until April 1897. It is thought that T.H. Copeland was involved in the observational program from 1895 to 1 May 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 (E.S. Eby) continued to record the observations. Her brother (J.M. Eby) recorded the observations beginning in April 1931 until the station closed on 31 October 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 climate reference station was established by the University of Saskatchewan and continuous observations were kept twice daily until 15 January 1965. The longtime observer was Mr. Sidney Cox. The SRC took over the program in the fall of 1963 and moved it to a new location 52 09'N, 106 36'W and elevation 497 m above sea level[1]. The first observer was Terry Beck followed three years later by Orville Olm[2]. In 1967, Joe Calvert became the primary observer until his retirement in 1983. Ray Begrand succeeded Mr. Calvert until 1988 when Virginia Wittrock became the primary observer. Carol Beaulieu became primary observer in 1992 until her retirement summer of 2014. Virginia Wittrock is project manager (1992 to present) and primary observer with assistance from Shaw Dunn (2014 to present).

In the summer of 1992, Saskatoon 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 updating, replacing, re-installing and adding of new sensors began in 2009 and was completed in 2012. Elements presently recorded at the Saskatoon CRS are temperature (maximum and minimum), precipitation, relative humidity, snow depth, wind (speed and direction), solar radiation (bright sunshine, global and diffuse), barometric pressure, grass level temperature, soil temperature (seven levels), and soil moisture.

[1]Christiansen 1970; Environment Canada 1975; [2]Olm 2001

Mr. James Eby was one of the original members of the Temperance Colony Society. He filed his homestead in 1882 and returned with his family in 1883. He was the first president of the school board and served as the township supervisor for Nutana. While riding a horse in 1890, he was struck by lightning and was a partial invalid thereafter. In 1901, he and his daughter moved to Nutana where he served as a Federal Meteorologist for the next 20 years until his death in 1921 at the age of 77. He was buried, next to his wife, in the Nutana pioneer cemetery.[1]

[1]Ladd, 2008

photo: C. Beaulieu

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[1]. A climate reference 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[2]. At CRS Saskatoon, half-hourly readings are taken of elements (temperature, precipitation amount, humidity, wind and atmospheric pressure). Supplemental observations include rainfall intensity, soil temperature, bright sunshine, solar radiation (diffuse and global), snow depth, relative humidity, barometric pressure, soil moisture and grass level temperature. 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 observed meteorogical elements in order 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 areas such as agriculture, forestry, land use and facility placement, water and energy resources, as well as health and comfort.

The CRS allows us to:

- Evaluate long-term climatic trends – early warning system for increased frequencies of extreme events such as floods, droughts, etc.;
- Determine the impacts of climate events on society, economy, health and ecosystems – e.g., intense rainfall causing flooding and property damage, heat stress with its health implications;
- Do value-added research;
- Be part of regional, national and global networks in important agricultural and ecological areas;
- 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, Boreal Ecosystem At mospheric Study (BOREAS), and collaborative research with the Western College of Veterinary Medicine and the College of Agriculture, University of Saskatchewan; and
- Provide climate data to various industries, government organizations, non-government organizations, media outlets, institutions of learning, and interested individuals.

Goals

The goals of the CRS are first to maintain the high quality of data gather over its fifty plus 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 Saskatoon to be an extremely valuable climate information collection station.

[1]Environment Canada 1992 [2]World Meteorological Organization 1988

ACTIVITIES ASSOCIATED WITH THE SASKATOON CLIMATE REFERENCE STATION, 2016

The Saskatoon Climate Reference Station (CRS) had another busy year of activities. We continued to share important climate information from the CRS through monthly e-mails, media interviews, presentations and various social media. Monthly and annual climate information from both SRC's Saskatoon and Conservation Learning Centre CRSs is available online (http://src.nu/crsdata). Over the last 29 years, SRC provided hands-on experience with our weather instruments to approximately 250 students, and gave presentations highlighting Saskatoon's climate: past, present and future. Summer of 2016 we hosted two groups: in June, we hosted students and staff from Saskatchewan Polytechnic's Water Resources Engineering Technology and in July, we were one of the stops for the International Rangeland Congress field day. On-site tours are not always possible, therefore we encourage you to undertake a virtual tour of our Saskatoon CRS at: http://src.nu/1OLBg5H.

2016 was a fairly normal year for maintenance and equipment replacement. We did replace our soil moisture sensor because the gophers decided to snack on the instrument's wiring. The result was the instrument became unusable. Spring and fall general maintenance was carried out on various instruments.

Site tour: Saskatchewan Polytechnic Students
June 2016
Photo: V. Wittrock

Site Tour: Part of the International Rangeland Congress
July 2016
Photo: E. Taman-Athmer

All-Season Precipitation Gauge General Maintenance
May 2016
Photos: V. Wittrock

SUMMARY FOR 2016

Data, including temperature, precipitation, wind speed and direction, bright sunshine, solar radiation, soil temperature, snow depth and soil moisture levels was recorded at the Saskatchewan Research Council's (SRC) Climate Reference Station (CRS) (52 09'N, 106 36'W, 497m asl) in Saskatoon during 2016. It is compared in this report with the long-term (circa 1900-2015) and standard-period/normal (1981-2010) record.

SRC's Climate Reference Station (CRS) in Saskatoon recorded its 53rd year of climate information in 2016. This year was all about the record-breaking high daily, monthly and annual minimum temperatures. The warm winter of 2015-2016 (Thanks, El Niño!) resulted in the fourth highest maximum temperature and winter's second highest minimum temperature. The warm temperatures continued into spring with again, the maximum being the fourth warmest with the spring minimum average temperature the warmest on record by 0.5°C. Summer and autumn maximum temperatures were closer to average, but the seasonal minimum temperatures continued to be well above normal, with summer being the fifth warmest and autumn being the warmest on record by 0.2°C. The result of these record-breaking minimum temperatures was that the 2016 average annual high minimum temperature was above zero (0.1°C) for the first time in the last 53 years. The second highest average annual minimum temperature was in 2015 at -0.7°C.

Daily temperature records were broken in February, March, April, May, June, October and November. Of all these months, November broke the record for breaking temperature records with 31. The unique records included November having the 'greatest number of days…' with temperatures ≥ 10°C and the 'greatest number of days…' with temperature ≥ 20°C. In fact, not in the 53 years of recording temperature information has the November daily temperature gone above 20°C before. November also set three new records with the 'least number of days…' including not having any days with temperatures ≤ -10°C.

Even though 2016 was a very warm year, we still had temperature fluctuations typical of the Canadian Prairies. Our coldest day was January 16 with a temperature of -31.0°C and May 4 was the hottest day in the spring at 32.9°C. This equates to a 63.9°C variation. The Saskatoon CRS has not recorded -40°C temperatures (excluding wind chill) since 2004.

2016 tied 2015 for the highest number of days that were frost-free (198 days). The number of continuous frost-free days during the growing season was 144 (20 more than normal). We came close to freezing on September 22 (0.4°C), but stayed above the 0°C mark. The number of growing degree-days continues to increase compared to the 1991-2010 average. In addition, the average number of heating degree-days continued to decrease with 2016 having the second lowest number of heating degree-days since 1963. The number of cooling degree-days also increased this year compared to the last 53 years, thanks to the high maximum temperatures in May and June and to the high minimum temperature from May to September.

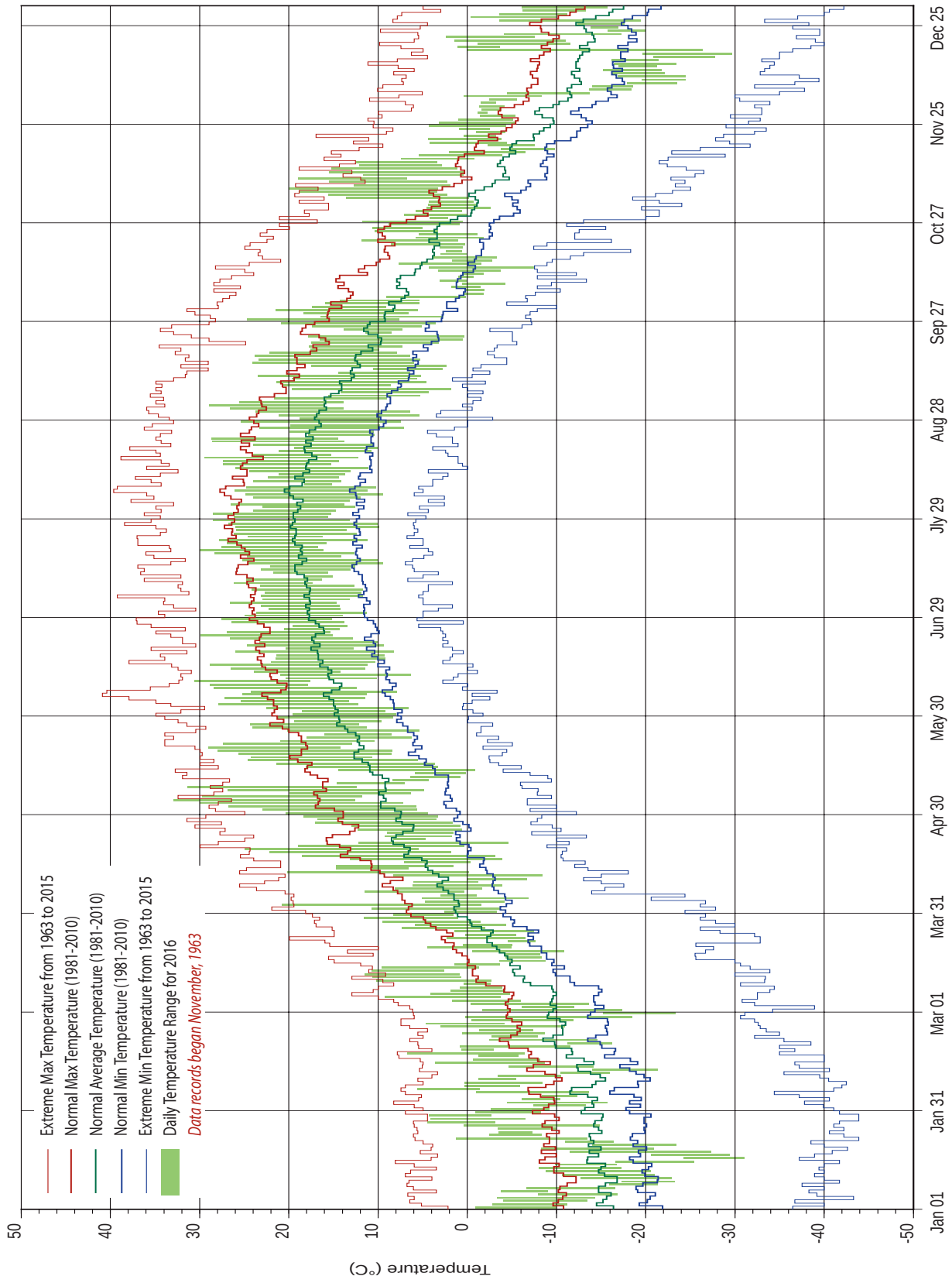
Unlike other parts of Saskatchewan, Saskatoon received an average amount of precipitation over the year. Winter and spring were below normal. April received the second lowest amount of precipitation in 53 years. The 2015-2016 snowpack only got to a depth of 14 cm (January 17), while the spring snowfall (March 2–25) resulted in a snowpack of 10 cm. October's Thanksgiving snowfall resulted in a maximum depth of 13 cm (October 6) but the snow only stayed for six days (Oct 5-10, inclusive).

October was the record-setting month for bright sunshine, or lack thereof, at 19% of possible bright sunshine hours and 39% of normal. This low amount of bright sunshine corresponds with high precipitation and foggy days experienced. Only two days in October had relative humidity below 50%.

Saskatoon was not overly windy in 2016. Below average wind speed was recorded every month. Only three times in 2016 were "strong gale" winds recorded (February 7, March 13 and April 6). The high minimum temperatures and the not overly windy conditions resulted in only two days with wind chills in the "high-risk" category.

The high air temperatures resulted in well above the monthly average 9 a.m. soil temperatures. Only October had below normal monthly values. The winter of 2015-2016 resulted in the 50 cm soil depth not going below 0°C and the upper soil temperatures were 5.5 to 6°C above average.

DAILY TEMPERATURE



TEMPERATURE

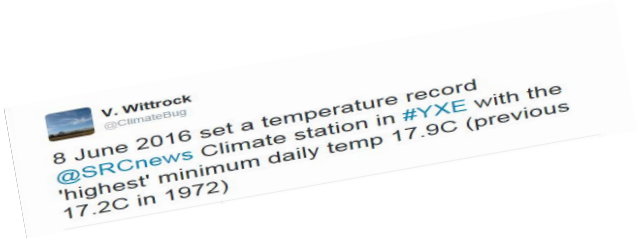
2016 TEMPERATURE RECORDS °C

TYPE			DATE		NEW RECORD	OLD RECORD	YEAR	DAY
			Month	Day				
DAILY	Maximum	*Highest*	March	10	10.2	9.5	1995	
			March	12	11.5	9.2	2007	
			April	2	20.8	19.5	1992	
			April	19	25.0	24.4	1980	
			May	3	30.0	28	1985	
			May	4	32.9	26.5	1992	
			May	8	31.3	28.9	1976	
			November	6	20	16.8	2009	
			November	8	15.5	11.5	1999	
			November	9	19	12	1981	
			November	11	15.5	13	1981	
		Lowest	May	12	5.9	6	1983	
			October	5	0.3	1.7	1974	
			October	6	0.3	1.1	1970	
	Minimum	*Highest*	February	6	-1.4	-2.1	1996	
			February	9	-5.4	-6.5	2006	
			February	18	-2.9	-2.9	1998	
			March	13	2.6	1.2	2012	
			May	4	12.6	11.1	1977	
			May	5	11.8	11.4	2001	
			May	8	12.4	10.5	1985	
			June	8	17.9	17.2	1972	
			June	9	17.6	15.6	1976	
			October	25	5	5	1972	
			November	8	2.3	0.6	1970	
			November	9	6.8	-0.6	2010	
			November	13	2.9	-0.5	1981	
			November	14	3.4	1.2	2001	
			November	29	-2.2	-2.3	2004	
			December	19	-3.6	-4	1988	
	Mean	*Highest*	February	6	2.1	1.5	1996	
			February	18	-1.1	-1.8	1998	
			March	10	3.8	2.9	2012	
			March	12	6.2	4.7	1977	
			March	13	6.7	6.2	2012	
			April	19	15.3	15.1	1980	
			May	4	22.8	18.4	1977	
			May	5	20.8	19.5	1992	
			May	8	21.9	18.4	1977	
			June	9	24.1	23.9	1996	
			November	6	11.7	9.3	2009	
			November	8	8.9	5.1	1999	
			November	9	12.9	4.6	2001	
			November	11	7.9	5.8	1981	
			November	13	7.5	5.3	1990	
			November	14	8	6.9	2001	
	Highest Temperature of the Highest Maximum Daily Temperature for the month		November	6	20	19.4	1975	4
	Highest temperature of the Lowest Minimum Daily Temperature for the month		November	9	6.8	6.1	1975	5
			November	18	-9.8	-10.8	1981	30
	Highest temperature of the Lowest Mean Daily Temperature for the month		March	1	-9.5	-10.7	2012	2
			June	11	13.7	13	1987	4
			July	11	16.8	16.2	2006	31
			November	9	12.9	12.5	1975	5

TEMPERATURE

2016 TEMPERATURE RECORDS °C con't						
TYPE				DATE Month	NEW RECORD	OLD RECORD	YEAR
Frost-Free Days			*Highest*	November	11	7	2005
Heating Degree Days			*Lowest*	November	456.6	505.8	2009
Growing Degree Days			*Highest*	November	45.4	16.4	1975
Monthly	Max	*Ext*	Highest	November	7.1	6.7	2009
	Avg	*Ext*	Highest	November	2.8	1.1	2009
	Min	*Ext*	Highest	November	-1.5	-3.7	1981
Most Number of Days during a month when...			Max Temp >=10°C	November	12	8	1981
			Max Temp >=20°C	November	1	0	1963-2015
Least No. of Days during a month when...			Min Temp <= 2°C	November	23	27	2015
			Min Temp <= -2°C	November	15	18	1970
			Min Temp <= -10°C	November	0	1	1981

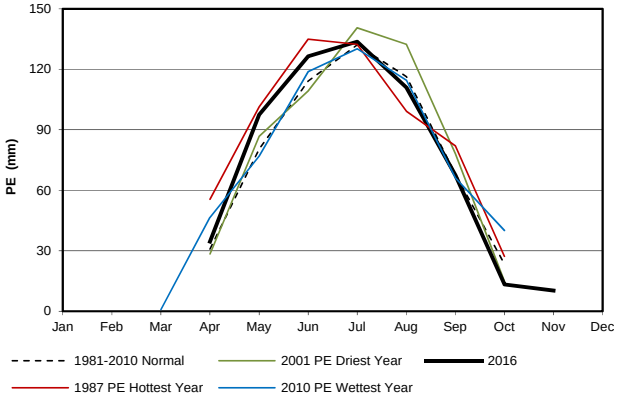
Avg = Average Ext = Extreme



2016 EXTREME TEMPERATURES			
COLD SPELL (less than or equal to -30°C)		HOT SPELL (greater than or equal to 30°C)	
DATE	TEMPERATURE °C	DATE	TEMPERATURE °C
January 16	-31.0	May 3	30.0
Coloured cells indicate extremes for the year		May 4	32.9
		May 8	31.3
		June 9	30.6
		July 19	30.0

POTENTIAL EVAPOTRANSPIRATION (PE) using the Thornthwaite Method[1]

MONTH	PE (mm) 2016	PE (mm) 2010 WettestYear	PE (mm) 2001 Driest Year	PE(mm) 1987 Hottest Year	PE (mm) 1981-2010 Normal
Jan	0	0	0	0	0
Feb	0	0	0	0	0
Mar	0	0.9	0	0	0
Apr	34.5	46.5	28.5	55.5	30.9
May	97.5	77.0	86.8	101.4	80.5
June	126.4	118.8	109.3	135.0	114.2
July	133.7	130.2	140.6	132.5	132.1
Aug	111.0	114.6	132.4	99.2	116.3
Sept	67.4	66.1	78.1	82.1	67.9
Oct	13.3	40.1	14.8	27.3	23.4
Nov	10.3	0	0	0	0
Dec	0	0	0	0	0
Total	594.4	594.3	590.4	632.9	565.4

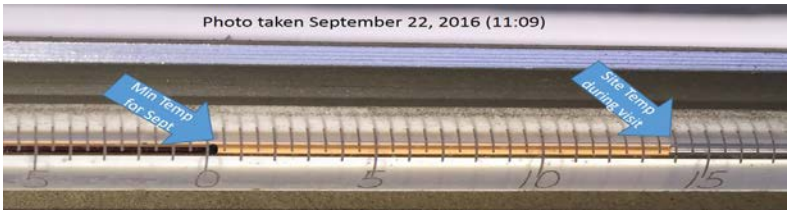


[1]*Thornthwaite and Mather 1955*
Thornthwaite 1948

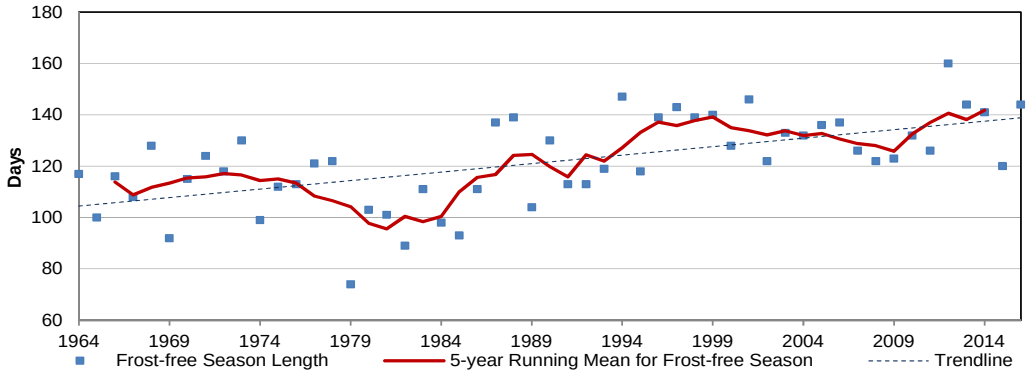
Temperature Sensors Top (Automated) Bottom (Minimum thermometer housed in Stevensen Screen)
Spring 2016
Photos: V. Wittrock

DATES & DURATION OF THE FROST-FREE SEASON

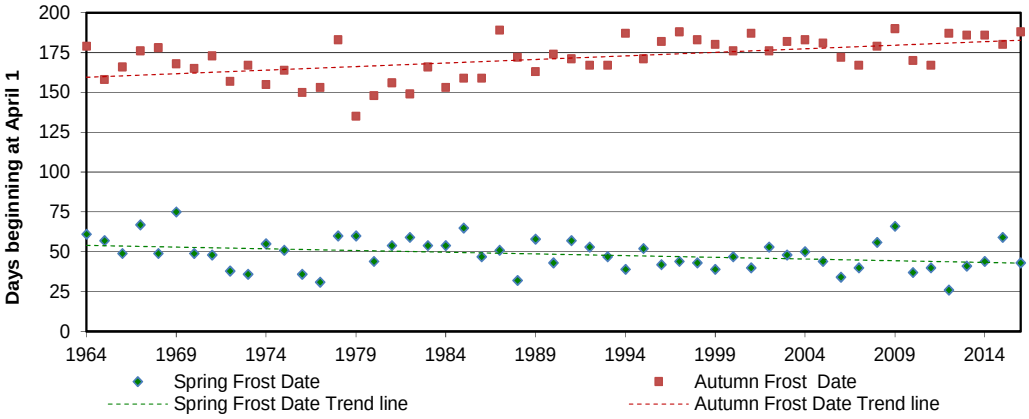
YEAR	LAST SPRING FROST	FIRST FALL FROST	Frost-free Season Length
1964	May 31	Sept 26	117
1965	May 27	Sept 05	100
1966	May 19	Sept 13	116
1967	Jun 06	Sept 23	108
1968	May 19	Sept 25	128
1969	Jun 14	Sept 15	92
1970	May 19	Sept 12	115
1971	May 18	Sept 20	124
1972	May 08	Sept 04	118
1973	May 06	Sept 14	130
1974	May 25	Sept 02	99
1975	May 21	Sept 11	112
1976	May 06	Aug 28	113
1977	May 01	Aug 31	121
1978	May 30	Sept 30	122
1979	May 30	Aug 13	74
1980	May 14	Aug 26	103
1981	May 24	Sept 03	101
1982	May 29	Aug 27	89
1983	May 24	Sept 13	111
1984	May 24	Aug 31	98
1985	Jun 04	Sept 06	93
1986	May 17	Sept 06	111
1987	May 21	Oct 06	137
1988	May 02	Sept 19	139
1989	May 28	Sept 10	104
1990	May 13	Sept 21	130
1991	May 27	Sept 18	113
1992	May 23	Sept 14	113
1993	May 17	Sept 14	119
1994	May 09	Oct 04	147
1995	May 22	Sept 18	118
1996	May 12	Sept 29	139
1997	May 14	Oct 05	143
1998	May 13	Sept 30	139
1999	May 09	Sept 27	140
2000	May 17	Sept 23	128
2001	May 10	Oct 04	146
2002	May 23	Sept 23	122
2003	May 18	Sept 29	133
2004	May 20	Sept 30	132
2005	May 14	Sept 28	136
2006	May 04	Sept 19	137
2007	May 10	Sept 14	126
2008	May 26	Sept 26	122
2009	June 05	Oct 07	123
2010	May 07	Sept 17	132
2011	May 10	Sept 14	126
2012	April 26	Oct 04	160
2013	May 11	Oct 04	144
2014	May 14	Oct 03	141
2015	May 29	Sept 27	120
2016	May 13	Oct 05	144
1981-2010 Normal	May 18	Sept 20	124



September 2016's minimum temperature measured on a thermometer
September 22, 2016 (11:09 am)
Photo: V. Wittrock



Frost-free Growing Season Duration



Frost-free Growing Season End Points

Discontinous Snowcover
10 March 2016
Photo: V. Wittrock

TEMPERATURE RANKINGS

AVERAGE ANNUAL TEMPERATUES °C

MAXIMUM TEMP		MINIMUM TEMP		MEAN TEMP	
1987	11.6	2016	0.1	1987	5.4
2001	10.8	2015	-0.7	2016	5.3
1981	10.5	1987	-0.8	2015	4.8
2016	10.4	2006	-1.3	2001	4.6
2015	10.2	2012	-1.3	1981	4.5
1988	10.1	1999	-1.4	1998	4.3
1998	10.1	2010	-1.5	1999	4.2
1999	9.8	1981	-1.5	2006	4.2
2006	9.6	1998	-1.5	2012	4.0
2011	9.6	2005	-1.6	1988	3.9
1976	9.5	2001	-1.6	2011	3.8
1997	9.5	2011	-2.1	2005	3.8
2003	9.3	2007	-2.2	2010	3.7
2012	9.3	1988	-2.3	1997	3.5
2005	9.1	1997	-2.4	2003	3.4
1986	9.0	2003	-2.5	1991	3.2
1991	8.9	1993	-2.5	1986	3.2
2010	8.9	1991	-2.5	2007	3.2
2000	8.8	1992	-2.5	1976	3.0
1984	8.7	1986	-2.6	1992	3.0
1990	8.7	2004	-2.8	2000	3.0
1977	8.6	2002	-2.9	1984	2.9
1980	8.6	2014	-2.9	1993	2.8
2007	8.6	1984	-2.9	2004	2.8
1992	8.5	2000	-2.9	2002	2.8
2008	8.5	1964	-2.9	1964	2.7
2002	8.5	1994	-3.2	1994	2.7
1994	8.5	1983	-3.2	2008	2.6
2004	8.4	2008	-3.3	1990	2.6
1989	8.3	2013	-3.3	1977	2.5
1964	8.2	1995	-3.4	1980	2.4
1993	8.1	1968	-3.4	2014	2.4
1995	7.9	1976	-3.5	1989	2.3
1973	7.8	1990	-3.6	1995	2.3
1968	7.7	1977	-3.6	1983	2.2
2009	7.7	1989	-3.8	2013	2.2
2013	7.7	1980	-3.8	1968	2.2
1983	7.7	2009	-3.8	2009	2.0
2014	7.6	1973	-4.0	1973	1.9
1978	7.4	1970	-4.0	1970	1.7
1970	7.3	1978	-4.6	1978	1.4
1974	7.1	1969	-4.6	1971	1.2
1971	7.1	1971	-4.6	1974	1.2
1967	7.0	1974	-4.7	1967	1.1
1985	6.9	1967	-4.7	1969	1.1
1975	6.9	1985	-4.8	1985	1.1
1969	6.8	1972	-4.8	1975	0.9
1979	6.5	1975	-5.1	1972	0.6
1966	6.4	1996	-5.2	1979	0.6
1965	6.3	1965	-5.3	1965	0.5
1982	6.2	1982	-5.3	1966	0.4
1996	6.1	1979	-5.3	1996	0.4
1972	6.1	1966	-5.5	1982	0.4

SEASONAL MAXIMUM AVERAGE TEMPERATURES °C

WINTER (DJF)		SPRING (MAM)		SUMMER (JJA)		AUTUMN (SON)	
2012	-1.9	1977	12.9	2001	26.5	1987	13.1
1987	-3.6	1987	12.7	2003	26.3	2011	12.6
2006	-4.7	1988	12.6	1984	26.1	2009	12.1
2016	-4.8	2016	12.5	1988	26.0	1994	11.8
1998	-4.8	1981	12.1	1970	25.9	2001	11.8
2000	-5.4	1998	12.0	2006	25.6	2008	11.8
1992	-5.7	2001	11.9	1998	25.6	1999	11.4
2002	-6.0	2015	11.7	1997	25.6	2015	11.3
1964	-6.6	1994	11.5	1981	25.3	1981	11.1
1983	-7.1	2010	11.4	1989	25.3	1997	11.0
1988	-7.2	1993	11.4	2002	25.3	2005	11.0
2004	-7.2	1980	11.3	2015	25.1	1976	10.8
1986	-7.3	1986	11.1	1983	25.0	1980	10.8
1976	-7.3	2000	11.0	1996	24.9	2016	10.8
1981	-7.4	2012	10.9	1991	24.8	1974	10.6
1977	-7.4	1992	10.8	1964	24.6	1979	10.6
2015	-7.4	1991	10.5	2008	24.5	2004	10.5
2007	-7.7	1976	10.4	2016	24.5	1998	10.4
2003	-8.0	1984	10.2	2007	24.5	1967	10.4
2005	-8.0	1999	10.1	1979	24.5	2000	10.3
1975	-8.0	2007	10.1	1995	24.4	1988	10.3
1999	-8.0	2006	10.1	2011	24.4	2013	10.1
1984	-8.1	1968	10.0	2012	24.4	1975	9.9
1995	-8.1	2004	10.0	1967	24.3	1989	9.8
1990	-8.2	1985	10.0	1978	24.2	2007	9.8
1991	-8.6	1990	10.0	1965	24.2	1990	9.7
1989	-8.7	2005	9.9	1969	24.1	1968	9.7
2013	-9.2	1973	9.9	1990	24.1	2010	9.6
2001	-9.3	1978	9.7	1987	24.0	2003	9.4
1970	-9.3	2003	9.4	1972	24.0	1970	9.3
2011	-9.5	2008	9.1	1976	23.8	2014	9.2
1980	-9.5	1972	9.1	1973	23.8	1983	9.2
2010	-9.8	1971	8.6	2000	23.8	1992	8.8
1968	-9.8	1969	8.3	2013	23.7	1971	8.8
2008	-10.1	1995	8.3	1971	23.6	1964	8.8
1973	-10.3	1989	8.2	1986	23.6	1978	8.7
1997	-11.0	1964	8.2	1994	23.5	1977	8.7
1967	-11.1	1966	8.1	1980	23.5	1966	8.6
1993	-11.5	1997	7.6	1975	23.2	1995	8.6
1985	-11.6	2011	7.5	1999	23.1	1993	8.4
2009	-11.7	2009	7.4	2014	23.1	1982	8.3
2014	-11.8	1983	7.0	2010	23.0	2012	8.2
1994	-12.1	2014	6.8	1977	23.0	1969	8.0
1996	-12.2	1982	6.7	2009	22.9	2002	7.8
1974	-12.6	2013	6.4	1966	22.8	2006	7.5
1966	-13.1	1996	6.3	1982	22.6	1986	7.3
1982	-13.3	1970	6.1	2005	22.6	1965	7.3
1971	-13.4	2002	5.8	1985	22.4	1973	7.3
1978	-14.5	1965	5.7	1974	22.4	1991	7.0
1965	-14.8	1979	4.8	1992	22.4	1972	6.6
1972	-14.9	1974	4.7	1968	22.0	1996	6.2
1969	-15.2	1975	4.4	2004	21.6	1984	5.6
1979	-15.5	1967	4.4	1993	21.1	1985	4.5

TEMPERATURE RANKINGS

SEASONAL MINIMUM AVERAGE TEMPERATURES °C

WINTER (DJF)		SPRING (MAM)		SUMMER (JJA)		AUTUMN (SON)	
2012	-12.6	2016	0.8	2012	12.9	2016	1.5
2016	-12.6	1993	0.3	2015	12.6	2015	1.3
2006	-13.2	2010	0.2	2006	12.5	2009	1.3
1998	-13.4	2012	0.0	2003	12.5	2005	0.4
1987	-13.6	1987	-0.2	2016	12.4	2011	0.3
1992	-14.9	1977	-0.5	1988	12.3	2008	0.1
1964	-15.0	1999	-0.5	1970	12.3	1998	0.1
2002	-15.5	1985	-0.7	2002	12.2	1981	0.0
1983	-15.6	1994	-0.8	1991	12.2	2001	-0.1
2000	-15.8	2015	-0.8	2013	12.0	1967	-0.2
2015	-16.0	1981	-1.0	2014	11.9	1968	-0.2
2004	-16.7	1992	-1.0	2011	11.8	1997	-0.3
1999	-16.8	2006	-1.0	2001	11.7	1987	-0.3
2007	-17.0	1988	-1.0	2007	11.7	2004	-0.4
1981	-17.1	1986	-1.1	1989	11.6	1994	-0.5
1995	-17.2	2000	-1.1	1998	11.6	1999	-0.6
1986	-17.3	2001	-1.2	2010	11.5	1992	-0.7
2003	-17.5	2007	-1.3	1997	11.5	2010	-0.7
1988	-17.8	2005	-1.4	2008	11.3	1980	-0.9
1976	-17.8	1990	-1.5	1984	11.2	2014	-1.0
1984	-17.8	1973	-1.7	1996	11.2	1983	-1.0
2005	-17.8	1978	-1.7	1983	11.2	1970	-1.1
2011	-18.3	1991	-2.0	1964	11.0	2007	-1.1
2013	-18.4	1968	-2.0	2005	11.0	1964	-1.4
1975	-18.5	1998	-2.0	1972	11.0	1988	-1.4
1970	-18.7	1984	-2.2	2000	11.0	1979	-1.4
1977	-18.8	2003	-2.3	1981	10.9	2013	-1.5
1989	-18.9	1972	-2.4	1995	10.8	2000	-1.7
2001	-19.0	2004	-2.5	1990	10.7	1989	-1.8
2010	-19.1	1980	-2.6	1999	10.7	1969	-1.9
1990	-19.1	2008	-3.2	1987	10.6	2012	-1.9
1991	-19.3	1976	-3.3	1994	10.6	1971	-2.1
2008	-19.5	1983	-3.7	1965	10.5	2002	-2.2
1980	-19.6	1969	-3.8	1976	10.5	2003	-2.2
1968	-20.0	1995	-3.8	1971	10.3	1977	-2.4
1973	-20.3	1966	-3.9	2009	10.3	1974	-2.4
1993	-20.5	1964	-3.9	1973	10.0	1975	-2.5
1994	-20.8	2011	-3.9	1979	10.0	1993	-2.5
1967	-21.1	1971	-4.0	1966	9.9	1995	-2.6
1997	-21.3	2014	-4.2	1993	9.9	1972	-2.7
2009	-21.4	1997	-4.3	1975	9.8	2006	-2.8
1996	-21.9	1982	-4.3	2004	9.7	1978	-2.9
2014	-22.0	1989	-4.3	1978	9.7	1986	-3.1
1974	-22.6	1996	-4.9	1980	9.6	1990	-3.4
1985	-22.9	2013	-4.9	1982	9.6	1976	-3.6
1971	-23.1	1970	-5.0	1986	9.6	1982	-3.7
1982	-23.6	2009	-5.6	1974	9.6	1991	-3.7
1966	-23.6	1965	-5.8	1967	9.5	1984	-3.8
1969	-24.0	1979	-6.1	1969	9.4	1966	-4.3
1965	-24.0	1974	-6.5	1968	9.2	1996	-4.3
1978	-24.5	1975	-6.5	1992	8.8	1965	-4.4
1972	-25.0	1967	-6.9	1977	8.8	1973	-4.6
1979	-25.2	2002	-7.6	1985	8.2	1985	-6.0

SEASONAL MEAN AVERAGE TEMPERATURES °C

WINTER (DJF)		SPRING (MAM)		SUMMER (JJA)		AUTUMN (SON)	
2012	-7.3	2016	6.6	2003	19.4	2009	6.7
1987	-8.6	1987	6.2	1988	19.2	2011	6.5
2016	-8.7	1977	6.2	2001	19.1	1987	6.4
2006	-8.9	1993	5.8	1970	19.1	2015	6.3
1998	-9.1	2010	5.8	2006	19.1	2016	6.2
1992	-10.3	1988	5.8	2015	18.9	2008	5.9
2000	-10.6	1981	5.6	2002	18.8	2001	5.8
2002	-10.8	2015	5.4	1984	18.7	2005	5.7
1964	-10.8	2012	5.4	2012	18.7	1994	5.7
1983	-11.4	1994	5.4	1998	18.6	1981	5.5
2015	-11.7	2001	5.4	1997	18.5	1999	5.4
2004	-12.0	1986	5.0	1991	18.5	1997	5.4
1981	-12.3	1998	5.0	1989	18.5	1998	5.3
1986	-12.3	1992	4.9	2016	18.4	1967	5.1
2007	-12.4	2000	4.9	1983	18.1	2004	5.0
1999	-12.4	1999	4.8	1981	18.1	1980	5.0
1988	-12.5	1985	4.7	2011	18.1	1968	4.8
1976	-12.6	2006	4.5	2007	18.1	1979	4.6
1995	-12.7	2007	4.4	1996	18.1	1988	4.4
2003	-12.7	1980	4.4	2008	17.9	2010	4.4
2005	-12.9	1991	4.3	2013	17.9	2007	4.4
1984	-13.0	2005	4.3	1964	17.8	2000	4.3
1977	-13.1	1990	4.3	1995	17.7	2013	4.3
1975	-13.3	1973	4.1	2014	17.6	1970	4.2
1990	-13.7	1978	4.0	1972	17.5	1974	4.1
2013	-13.8	1968	4.0	2000	17.4	2014	4.1
1989	-13.8	1984	4.0	1990	17.4	1983	4.1
2011	-14.0	2004	3.8	1965	17.4	1992	4.1
1991	-14.0	2003	3.6	1987	17.3	1989	4.0
1970	-14.0	1976	3.5	1979	17.3	1975	3.8
2001	-14.2	1972	3.4	1976	17.2	1964	3.7
2010	-14.5	2008	2.9	2010	17.2	1976	3.6
1980	-14.6	1971	2.3	1994	17.1	2003	3.6
2008	-14.8	1969	2.2	1978	17.0	1971	3.4
1968	-15.0	1995	2.2	1971	17.0	1977	3.2
1973	-15.4	1964	2.2	1973	17.0	1990	3.2
1993	-16.0	1966	2.1	1999	16.9	2012	3.1
1967	-16.1	1989	2.0	1967	16.9	1969	3.1
1997	-16.2	2011	1.9	2005	16.8	1995	3.0
1994	-16.5	1997	1.7	1969	16.7	1978	2.9
2009	-16.6	1983	1.6	1986	16.6	1993	2.9
2014	-16.9	2014	1.3	2009	16.6	2002	2.8
1996	-17.1	1982	1.2	1980	16.6	2006	2.4
1985	-17.3	2009	0.9	1975	16.5	1982	2.3
1974	-17.6	1996	0.7	1966	16.4	1966	2.2
1971	-18.3	2013	0.7	1982	16.2	1986	2.1
1966	-18.4	1970	0.5	1974	16.0	1972	1.9
1982	-18.5	1965	-0.1	1977	15.9	1991	1.6
1965	-19.4	1979	-0.7	2004	15.7	1965	1.5
1978	-19.5	1974	-0.9	1992	15.6	1973	1.3
1969	-19.6	2002	-0.9	1968	15.6	1984	0.9
1972	-20.0	1975	-1.0	1993	15.5	1996	0.9
1979	-20.4	1967	-1.3	1985	15.3	1985	-0.8

TEMPERATURE

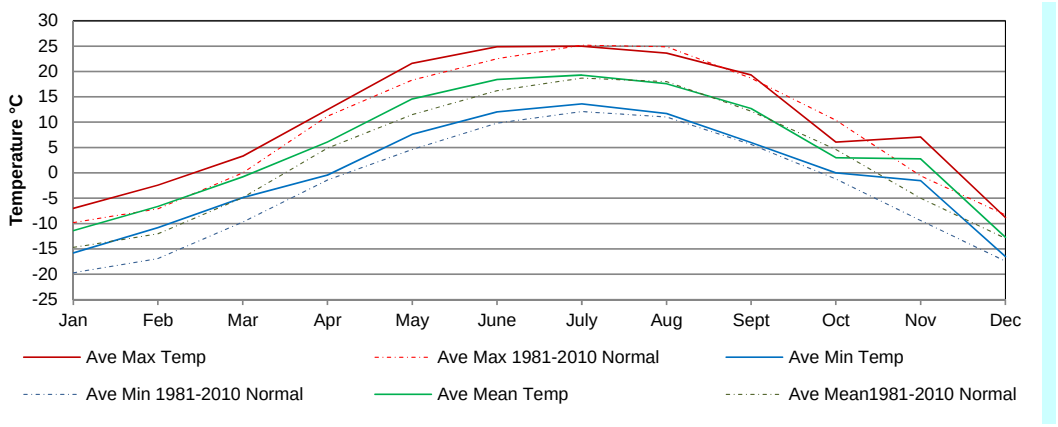
MONTH	AVERAGE MAXIMUM TEMPERATURE (°C)		AVERAGE MINIMUM TEMPERATURE (°C)		AVERAGE TEMPERATURE (°C)		EXTREME VALUES TEMPERATURE (°C)				EXTREME VALUES FOR SASKATOON STATIONS	
	2016	Normal	2016	Normal	2016	Normal	Max	Date	Min	Date	Max/Date	Min/Date
January	-7.0	-9.8	-15.8	-19.7	-11.4	-14.7	4.5	27	-31.0	16	11.0/1980/23$_{SWT}$	-48.9/1893/31$_{SM}$
February	-2.4	-7.1	-10.8	-16.9	-6.6	-12.0	6.7	17	-23.3	29	12.8/1931/19$_{SE}$	-50.0/1893/01$_{SM}$
March	3.3	0.0	-4.9	-9.7	-0.8	-4.9	11.6	29	-17.3	1	22.8/1910/23$_{SE}$	-43.3/1897/14$_{SM}$
April	12.5	11.2	-0.4	-1.4	6.1	4.9	25.0	19	-8.4	11	33.3/1952/28$_{SA\,US}$	-30.5/1979/01$_{SWT}$
May	21.6	18.3	7.6	4.6	14.6	11.5	32.9	4	-0.9	13	37.2/1936/27$_{SE}$	-12.8/1907/06$_{SE}$
June	24.9	22.5	12.0	9.8	18.4	16.2	30.6	9	6.4	11	41.5/1988/06$_{S2}$	-3.9/1917/02$_{US}$
July	25.0	25.2	13.6	12.1	19.3	18.7	30.0	19	9.5	15	40.0/1919,1941,1946$_{SE\,SA\,US}$	-0.6/1918/25$_{SE}$
August	23.6	24.9	11.7	11.0	17.6	18.0	29.4	16	5.4	29	39.7/1998/06$_{SRC}$	-2.8/1901/23SM&1976/28$_{SRC}$
September	19.3	18.7	6.0	5.6	12.7	12.2	29.0	1	0.4	22	35.6/1978/04$_{SRC}$	-11.1/1908/28$_{SE}$
October	6.1	10.4	0.0	-1.2	3.0	4.6	17.4	1	-7.4	13	32.2/1943/05$_{SA\,US}$	-25.6/1919/26$_{SE\,US}$
November	7.1	-0.6	-1.5	-9.4	2.8	-5.0	20.0	6	-9.8	18	21.7/1903/03$_{SE}$	-39.4/1893/30$_{SM}$
December	-8.8	-8.3	-16.5	-17.4	-12.7	-12.9	2.4	22	-29.6	17	14.4/1939/05$_{SE}$	-43.9/1892/22$_{SM}$
Average	10.4	8.8	0.1	-2.7	5.3	3.0						

Normal = 1981-2010

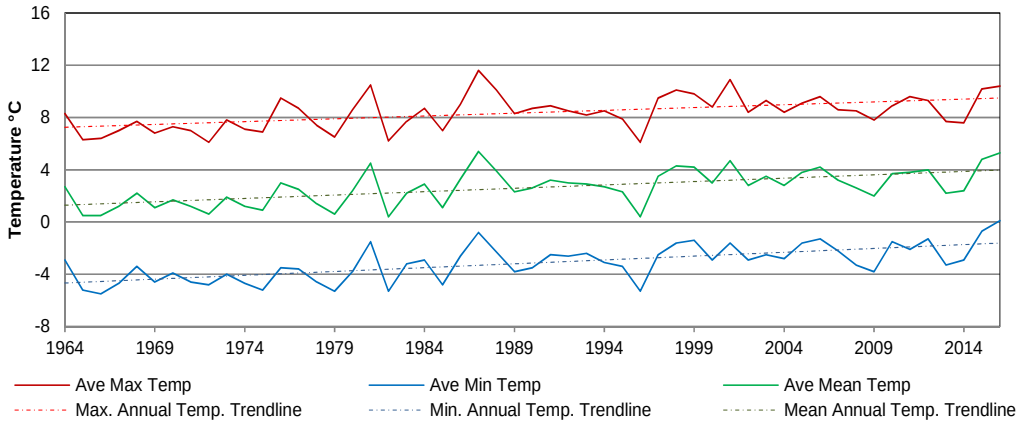
SE = Saskatoon Eby 1901-1942
US = University of Saskatchewan 1915-1964
SWT = Saskatoon Water Treatment Plant 1974 -
SRC = Saskatchewan Research Council 1963-

SA = Saskatoon Diefenbaker Int'l Airport 1942-
S2= Saskatoon 2 1977-1990
SM = Saskatoon stations circa 1889 -1901 (RNWMP *etal)*

Monthly

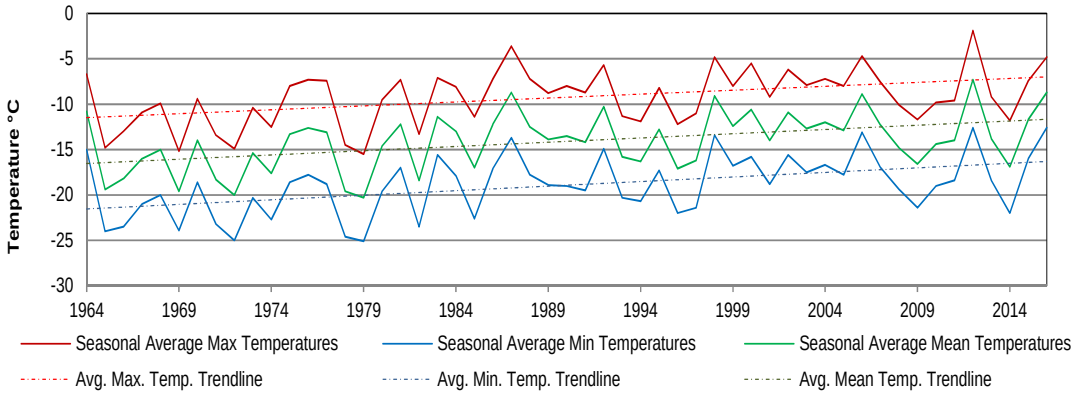


Annual

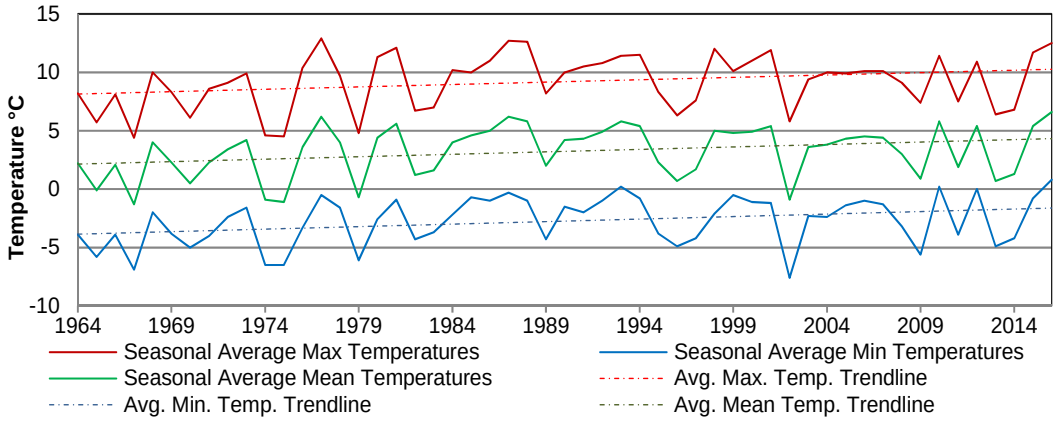


SEASONAL TEMPERATURES for 1964 to 2016

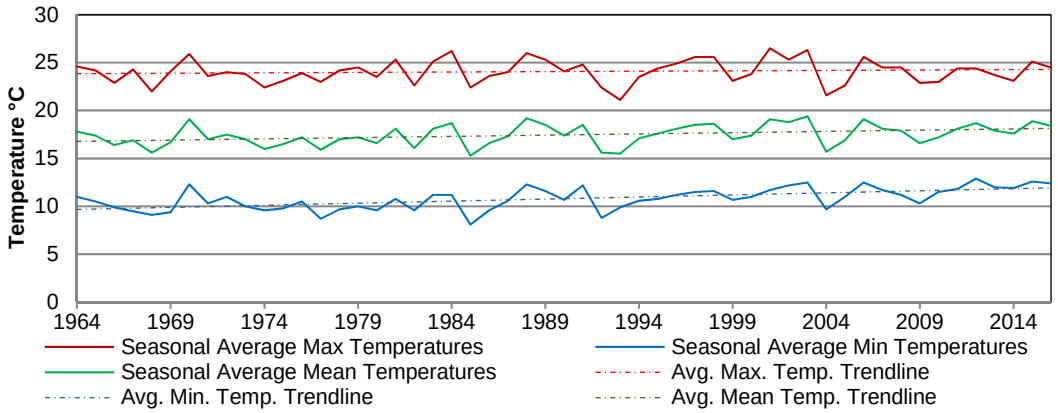
Winter (DJF)



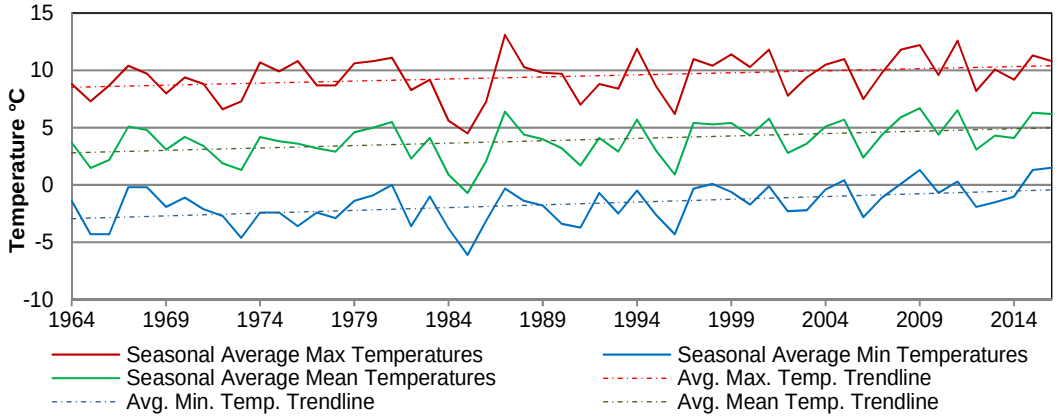
Spring (MAM)



Summer (JJA)

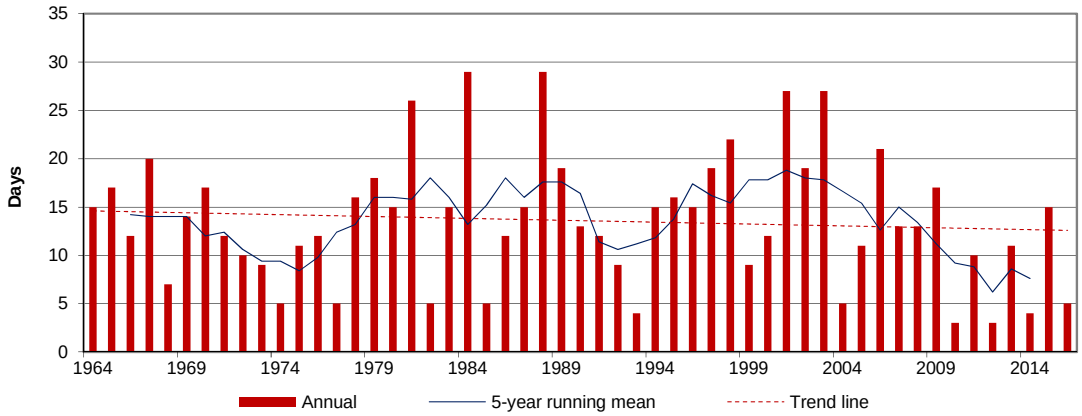


Autumn(SON)

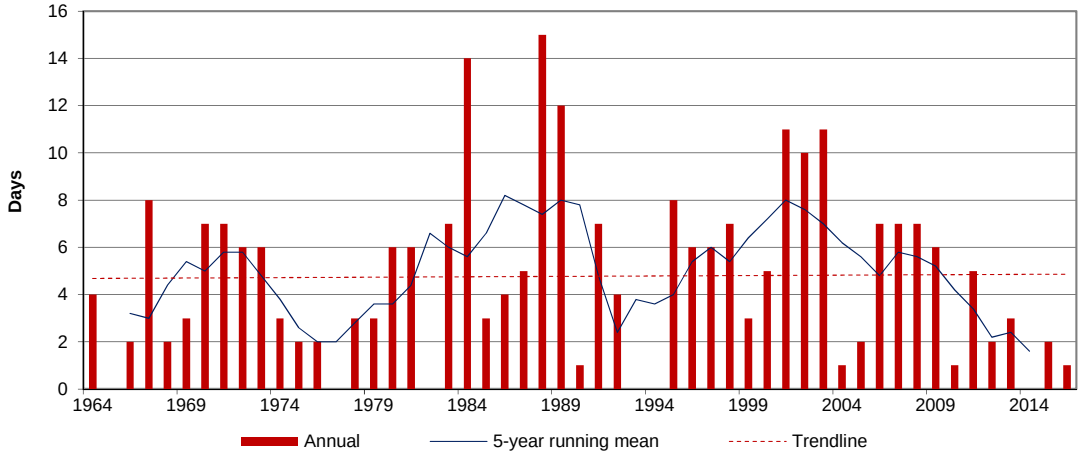


DAYS WITH TEMPERATURES GREATER THAN A SET POINT

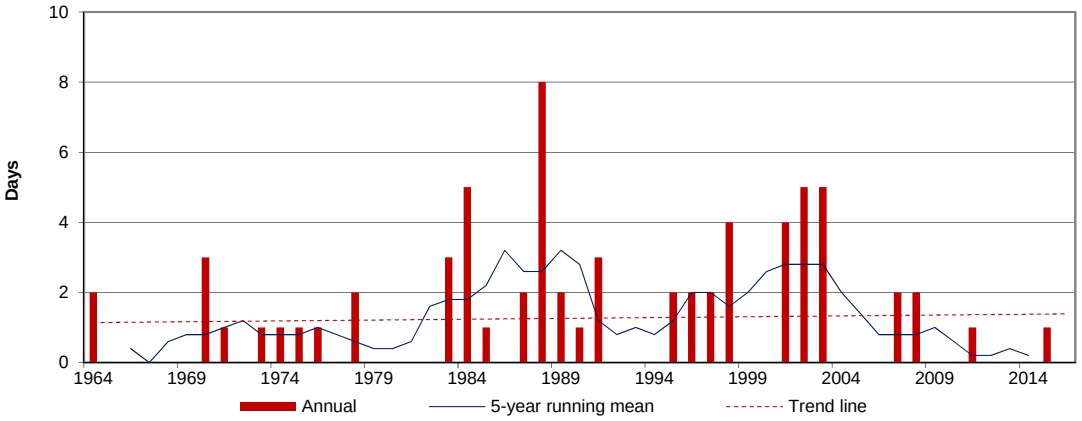
30°C or Greater



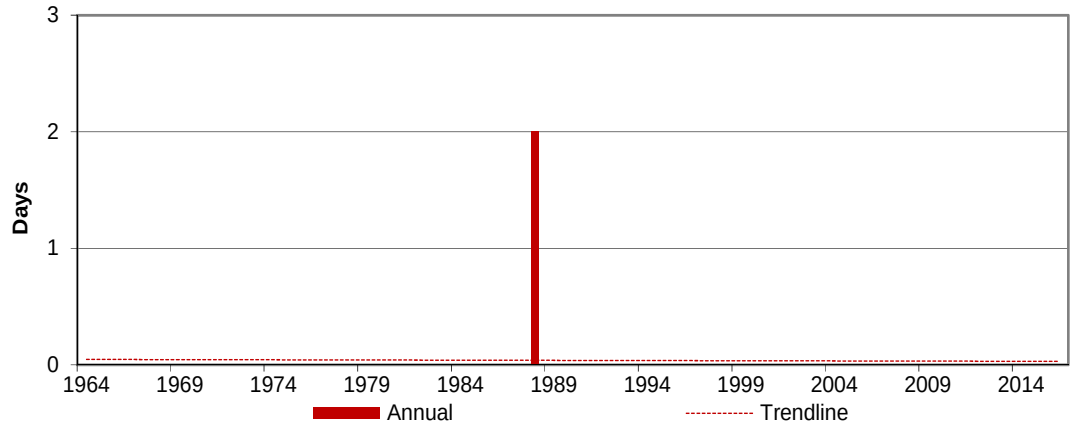
32°C or Greater



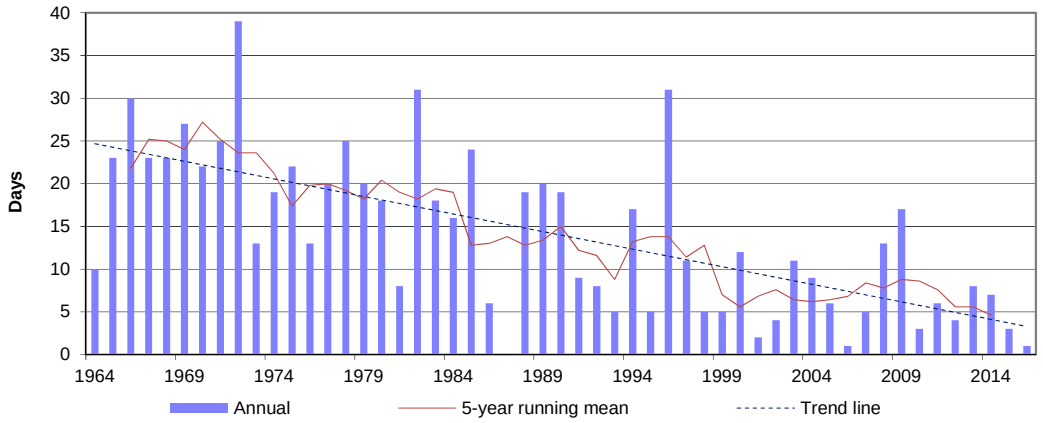
35°C or Greater



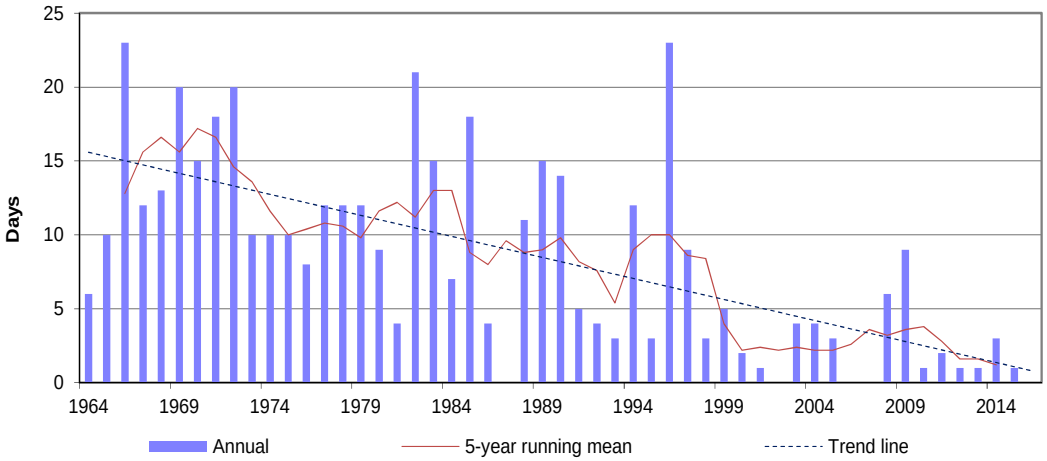
40°C or Greater



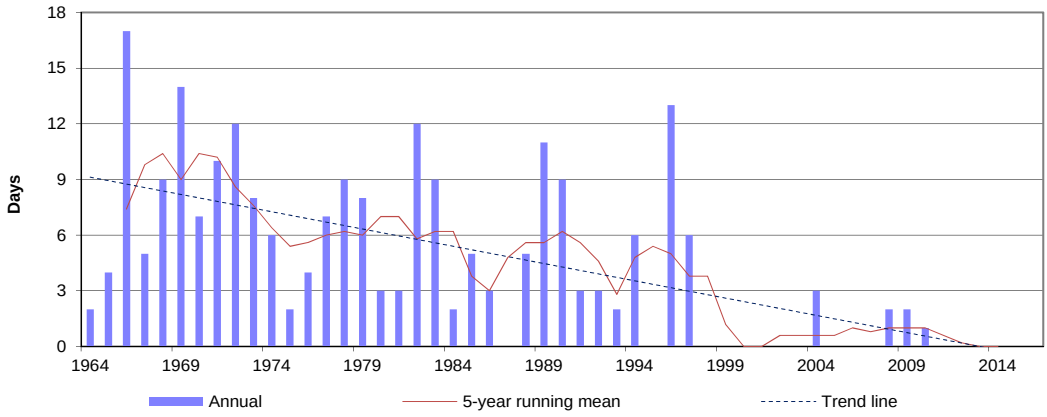
DAYS WITH TEMPERATURES LESS THAN A SET POINT



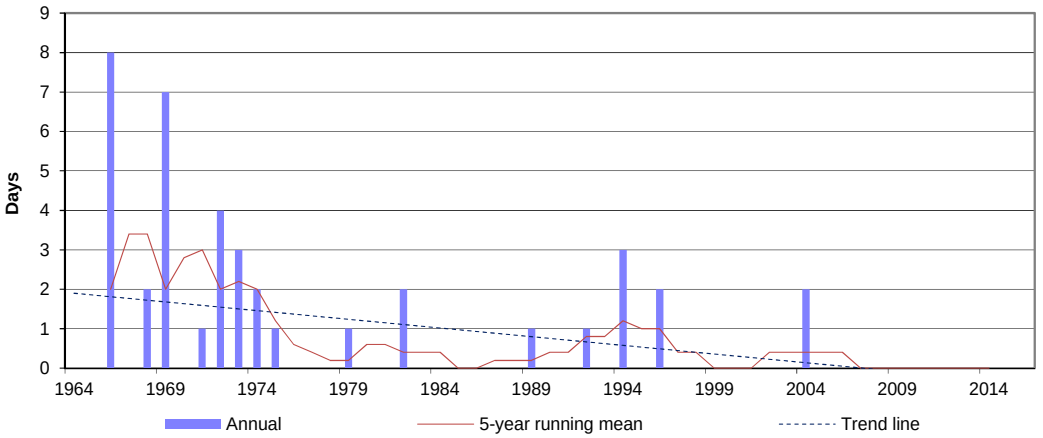
Minus 30°C or Less



Minus 32.5°C or Less



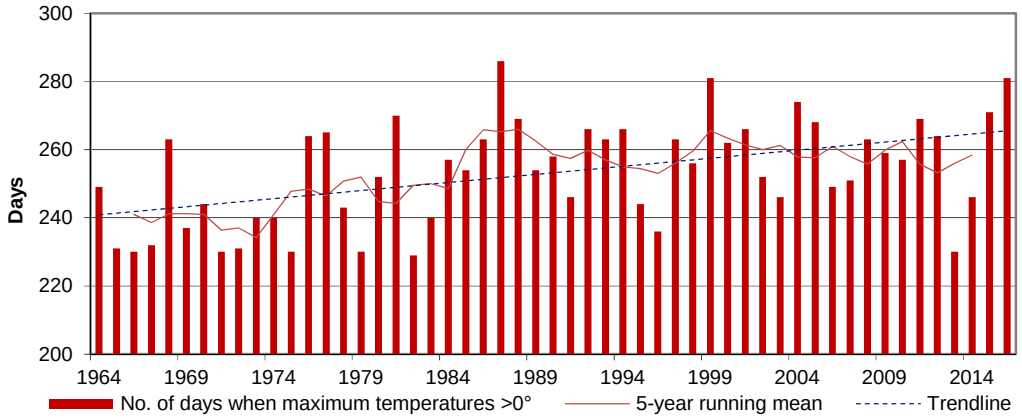
Minus 35°C or Less



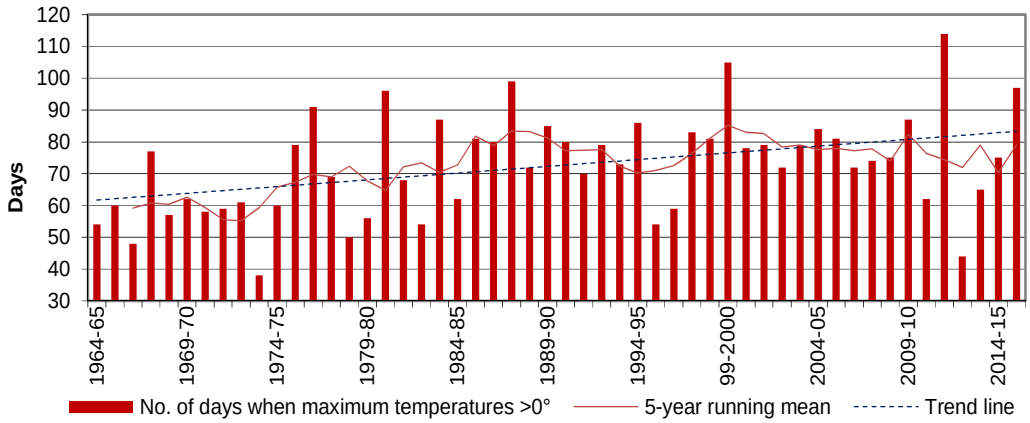
Minus 40°C or Less

DAYS WITH TEMPERATURES GREATER THAN 0°C

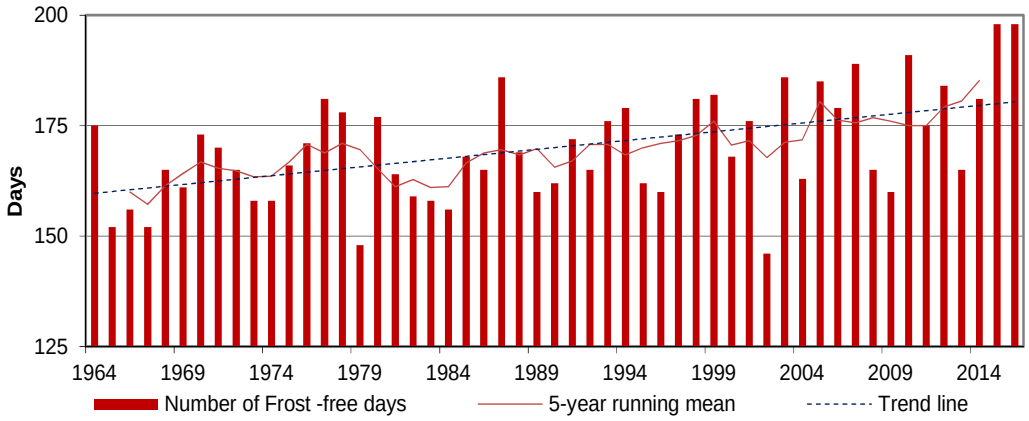
Maximum Temperature greater than 0°C (Thaw Days) Jan 1st to Dec 31st



Maximum Temperature greater than 0°C (Thaw Days) Oct 1st to Mar 31st (Cold Season)



Minimum Temperature greater than 0°C (Frost-free Days)

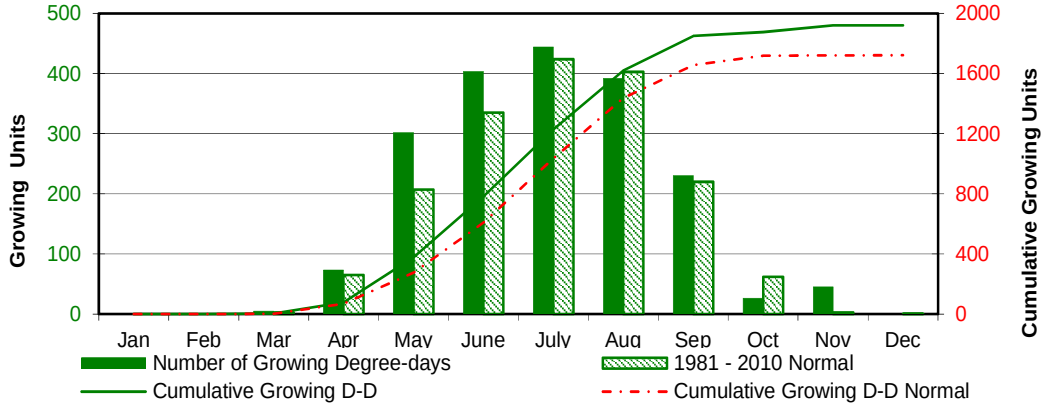


Corn field by CRS Saskatoon
August 2016
photo: V. Wittrock

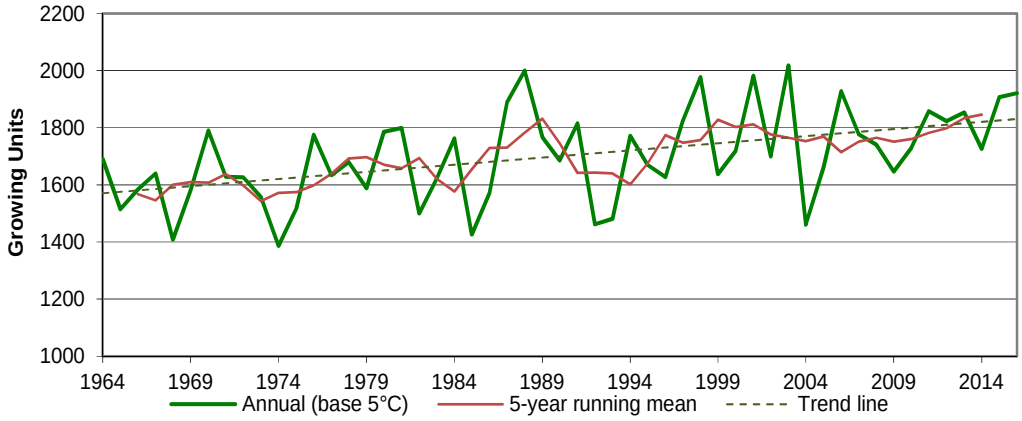
DEGREE-DAYS

MONTH	GROWING DEGREE-DAYS Base 5°C			HEATING DEGREE-DAYS Base 18°C			COOLING DEGREE-DAYS Base 18°C			EXTREME COOLING DEGREE-DAYS Base 24°C		
	2016	Cumulative	Normal	2016	Cumulative	Normal	2016	Cumulative	Normal	2016	Cumulative	Normal
January	0.0	0.0	0.0	912.5	912.5	1015.1	0.0	0.0	0.0	0.0	0.0	0.0
February	0.0	0.0	0.0	714.7	1627.2	848.2	0.0	0.0	0.0	0.0	0.0	0.0
March	4.9	4.9	3.0	583.9	2211.1	708.8	0.0	0.0	0.0	0.0	0.0	0.0
April	73.1	78.0	65.2	357.6	2568.7	402.4	0.0	0.0	0.2	0.0	0.0	0.0
May	301.7	379.7	206.9	122.9	2691.6	209.3	18.3	18.3	6.3	0.0	0.0	0.1
June	403.4	783.1	334.8	26.4	2718.0	81.4	39.8	58.1	24.8	0.1	0.1	1.5
July	444.4	1227.5	424.0	4.5	2722.5	30.7	45.9	104.0	51.7	0.0	0.1	2.9
August	391.9	1619.4	402.8	36.8	2759.3	50.0	25.7	129.7	49.8	0.0	0.1	3.5
September	230.1	1849.5	219.9	166.1	2925.4	182.5	6.2	135.9	7.6	0.0	0.1	0.1
October	26.3	1875.8	62.2	463.5	3388.9	415.1	0.0	135.9	0.1	0.0	0.1	0.0
November	45.4	1921.2	2.9	456.6	3845.5	690.1	0.0	135.9	0.0	0.0	0.1	0.0
December	0.0	1921.2	0.1	951.9	4667.6	957.5	0.0	135.9	0.0	0.0	0.1	0.0

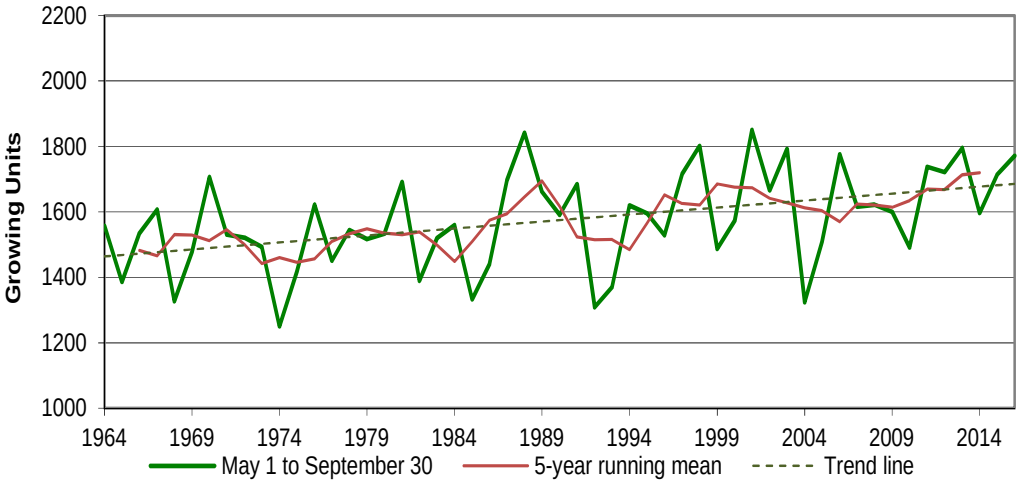
Growing Degree-days Monthly



Growing Degree-days Annual

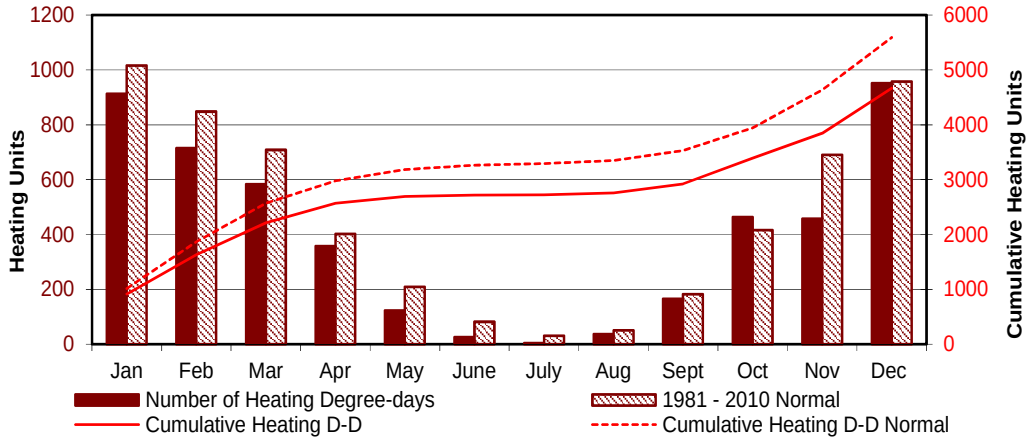


Growing Degree-days May 1 to September 30

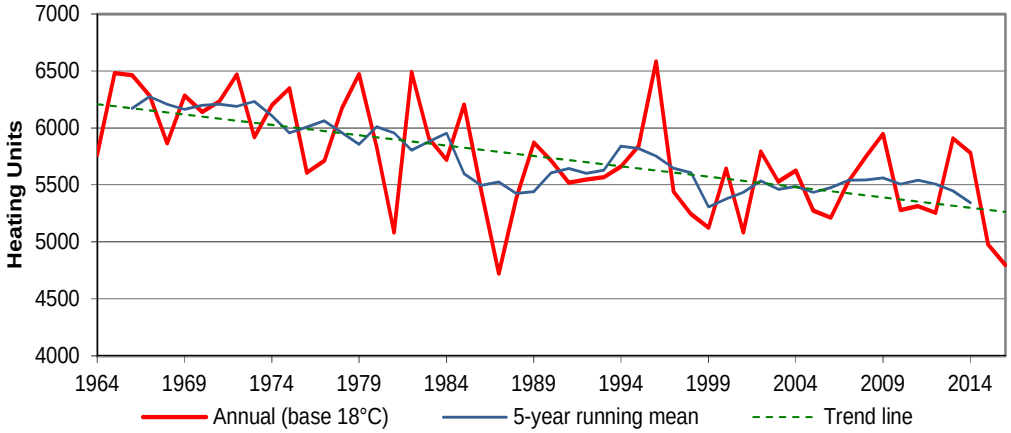


DEGREE-DAYS

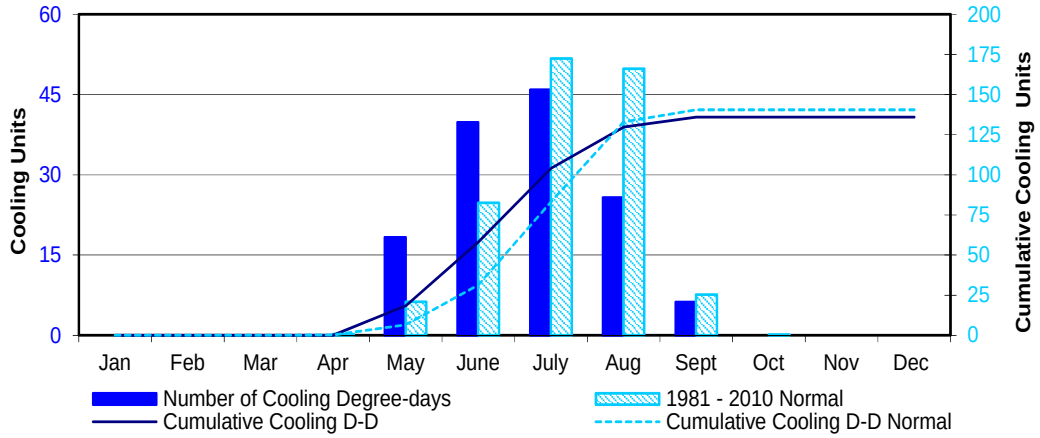
Heating Degree-days Monthly



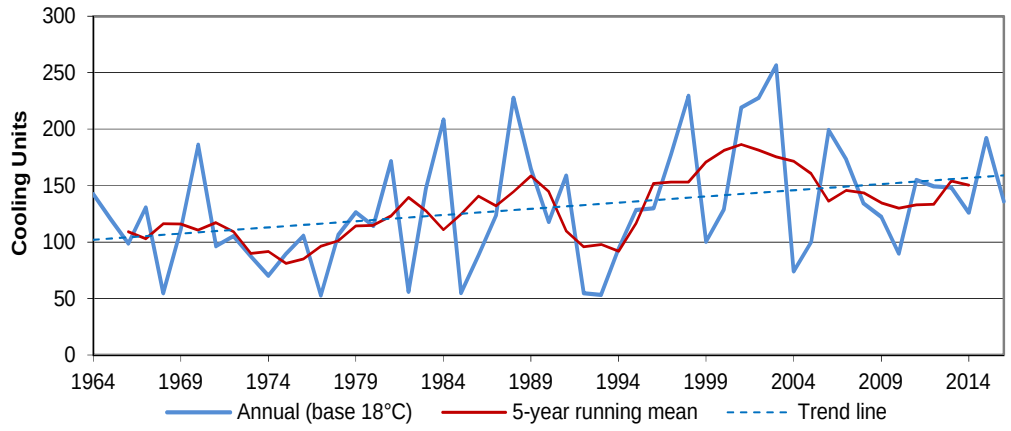
Heating Degree-days Annual



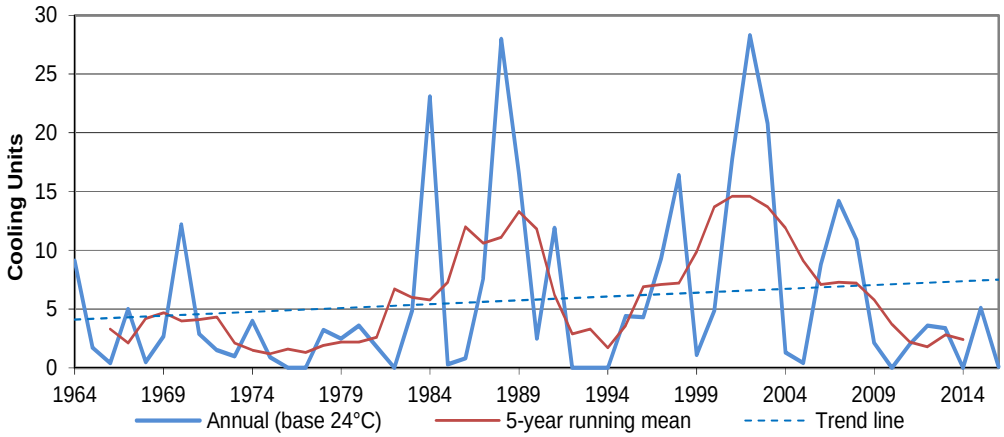
Cooling Degree-days Monthly



Cooling Degree-days Annual



DEGREE-DAYS



Extreme Cooling Degree-days Annual

TEMPERATURE GRID °C

Maximum Temperature °C Daily

2016	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-0.9	-7.4	-1.7	10.8	23.0	22.5	22.2	23.0	29.0	17.4	4.4	-1.3
2	-2.8	-4.5	-6.1	20.8	26.8	27.9	23.1	26.5	25.5	16.0	4.3	-1.5
3	-4.0	-6.1	-0.4	4.8	30.0	25.4	26.6	18.5	21.6	14.3	13.6	-2.4
4	-3.3	-8.4	1.7	5.1	32.9	27.2	23.0	24.0	15.6	9.1	15.6	0.4
5	-7.9	-1.0	9.3	3.0	29.7	25.2	23.1	24.9	14.2	0.3	18.8	-4.5
6	-3.7	5.6	4.1	11.5	19.9	24.2	22.7	26.1	19.7	0.3	20.0	-13.6
7	-6.6	0.3	1.9	8.1	26.9	28.4	24.1	24.8	20.6	1.8	12.7	-14.0
8	-15.9	0.3	0.9	6.1	31.3	28.9	23.2	18.3	21.4	0.6	15.5	-17.9
9	-17.3	-1.2	0.4	6.0	14.6	30.6	26.1	24.0	19.7	3.1	19.0	-19.5
10	-12.7	-3.4	10.2	0.0	8.4	20.3	24.8	22.3	23.5	1.0	11.7	-16.8
11	-10.6	-10.4	10.6	8.3	6.4	21.0	18.4	21.1	14.4	0.5	15.5	-16.2
12	-8.8	-14.0	11.5	20.2	5.9	23.9	21.7	24.4	10.5	3.3	15.2	-15.2
13	-8.0	-4.6	10.7	14.7	14.4	26.5	23.1	26.0	17.5	4.3	12.1	-16.9
14	-9.8	3.6	9.6	14.7	18.1	28.9	22.1	27.4	24.1	7.7	12.5	-16.4
15	-16.6	-0.6	1.5	7.1	21.4	22.0	24.5	27.4	23.4	1.7	7.4	-16.1
16	-24.2	-1.2	-3.6	13.1	24.6	21.5	25.2	29.4	23.8	3.8	5.4	-20.8
17	-20.6	6.7	-4.3	18.5	24.2	21.4	24.7	24.1	22.1	3.0	2.0	-19.6
18	-11.5	0.7	-4.1	22.2	25.6	26.0	28.3	21.1	17.6	2.4	-3.8	0.1
19	-8.3	0.9	-0.5	25.0	28.0	20.4	30.0	19.4	17.8	3.1	-2.2	1.1
20	-14.0	-11.2	4.5	19.0	29.0	24.7	27.6	24.0	17.5	8.6	4.2	-1.1
21	-11.0	-2.4	0.5	12.2	27.4	23.3	26.9	28.6	16.5	11.9	4.4	1.5
22	1.3	-2.7	-4.5	8.3	21.0	26.6	27.8	28.7	17.9	5.8	0.4	2.4
23	-2.5	0.6	2.3	9.3	18.0	29.9	24.6	17.8	11.4	5.4	-1.0	-4.1
24	-3.5	-1.3	0.2	9.0	16.0	27.0	26.1	19.9	13.9	10.4	0.9	-15.7
25	-3.4	3.0	1.5	12.3	20.2	20.5	25.9	23.3	17.4	10.6	4.3	-13.8
26	0.4	4.7	7.3	13.0	24.1	19.6	26.0	19.8	20.9	8.8	3.2	-12.3
27	4.5	-0.5	5.9	17.1	24.3	26.4	26.8	25.4	24.7	11.8	1.0	-3.6
28	4.1	0.2	9.5	16.8	19.4	27.6	28.5	18.8	16.4	4.2	-1.4	-0.4
29	4.3	-15.2	11.6	18.3	21.2	25.0	26.1	21.1	18.3	7.1	-1.1	-3.6
30	-0.9		8.3	20.3	19.6	23.7	28.5	23.7	21.5	5.8	-1.6	-6.1
31	-2.6		2.6		18.5		24.0	26.6		4.6		-6.1

SRC CRS Saskatoon
13 June 2016
Photo: V. Wittrock

TEMPERATURE GRID °C

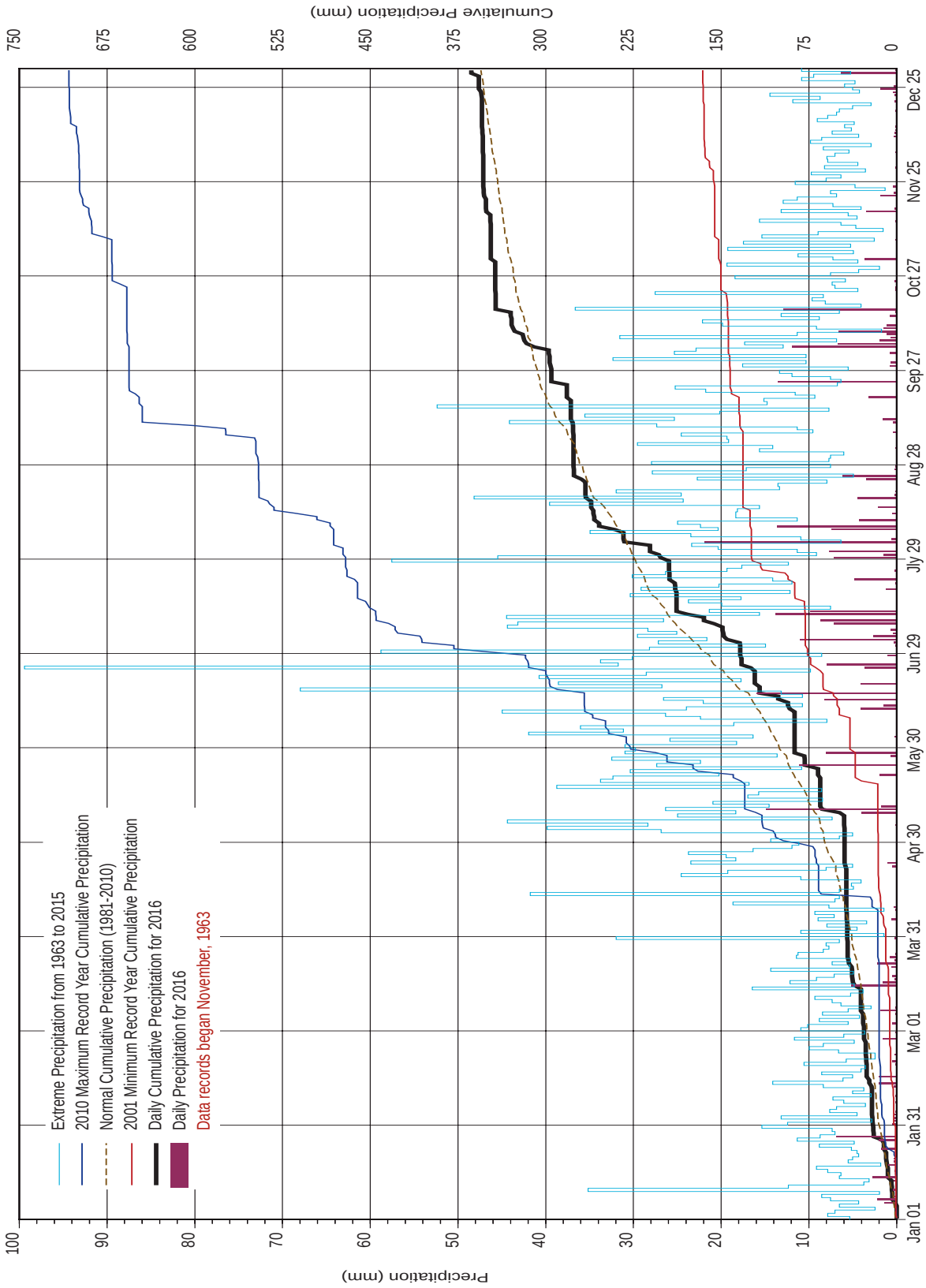
Minimum Temperature °C Daily

2016	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-10.0	-13.2	-17.3	-3.6	5.7	6.6	14.2	12.6	16.0	9.1	-1.1	-4.1
2	-11.1	-15.7	-12.0	-1.5	5.8	12.2	14.3	13.8	13.9	5.4	-0.7	-3.2
3	-13.4	-10.4	-13.6	-4.1	7.2	13.3	14.7	13.2	9.0	5.4	-0.1	-5.5
4	-14.3	-12.3	-6.0	-6.8	12.6	11.5	13.2	12.0	5.3	0.2	2.3	-8.3
5	-16.8	-13.6	-3.7	-1.0	11.8	11.3	11.7	9.5	4.4	-1.8	3.4	-13.7
6	-9.0	-1.4	-4.8	0.4	6.3	7.9	11.9	11.2	1.9	-1.9	3.3	-18.3
7	-16.5	-5.9	-4.2	-1.6	4.9	12.4	11.7	10.3	8.6	-1.5	1.9	-18.5
8	-21.3	-8.4	-3.9	-3.9	12.4	17.9	12.7	15.2	4.6	-4.2	2.3	-23.5
9	-23.2	-5.4	-2.6	-1.2	7.0	17.6	17.3	14.1	5.7	0.0	6.8	-24.4
10	-22.9	-10.5	-2.7	-6.7	4.4	10.1	16.3	14.4	5.2	-0.7	0.5	-24.4
11	-21.0	-15.9	0.7	-8.4	0.8	6.4	15.1	13.7	6.4	-1.8	0.3	-22.1
12	-20.5	-21.3	0.9	-0.1	0.2	14.2	15.6	13.1	2.8	-3.7	1.1	-21.8
13	-17.2	-14.1	2.6	6.6	-0.9	11.5	13.1	11.1	2.4	-7.4	2.9	-21.2
14	-16.7	-8.7	-1.3	1.6	3.3	11.2	12.6	15.3	6.0	-1.5	3.4	-23.4
15	-25.4	-8.1	-3.6	-0.3	3.7	10.3	9.5	14.4	5.3	-2.8	-0.8	-21.4
16	-31.0	-5.7	-8.8	-3.9	5.6	9.2	10.1	12.2	6.4	-3.3	-3.9	-27.7
17	-29.4	-6.4	-8.3	-3.1	10.7	9.3	14.1	15.3	7.9	0.1	-6.5	-29.6
18	-27.3	-2.9	-8.1	1.9	8.5	8.2	12.7	10.8	9.9	0.6	-9.8	-26.3
19	-20.9	-11.5	-10.8	5.5	8.4	12.8	16.1	10.0	7.3	0.6	-7.5	-3.6
20	-23.4	-16.2	-4.9	0.4	14.2	9.4	16.8	10.5	3.2	0.3	-4.4	-11.5
21	-16.4	-14.5	-5.0	-4.6	13.0	10.1	15.8	13.8	0.5	1.1	-3.8	-11.0
22	-13.4	-7.9	-7.6	4.7	10.4	12.9	11.2	14.5	0.4	-1.8	-3.2	-7.5
23	-8.3	-8.6	-6.5	1.8	6.2	15.1	16.2	10.4	8.5	-1.1	-4.2	-17.2
24	-7.3	-7.3	-5.5	1.6	8.5	15.4	12.4	10.5	7.3	3.3	-2.5	-19.9
25	-10.0	-10.9	-7.4	0.7	5.4	14.3	13.5	7.1	5.1	5.0	-4.3	-16.9
26	-14.8	-4.1	-2.0	0.8	11.3	13.5	9.9	9.8	3.6	0.9	-5.3	-17.6
27	-3.1	-11.9	-4.3	1.7	12.1	13.8	10.1	7.5	7.7	0.6	-5.1	-19.4
28	-6.5	-18.5	-1.5	3.5	9.7	15.2	13.2	9.7	2.7	2.2	-5.3	-10.0
29	-2.7	-23.3	1.0	3.3	8.3	14.0	15.6	5.4	6.6	0.0	-2.2	-11.2
30	-8.2		1.6	4.4	8.0	11.3	15.3	6.4	5.6	0.6	-3.8	-13.2
31	-9.1		-3.2		9.2		14.8	13.9		-2.6		-15.7

Average Temperature °C Daily

2016	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-5.5	-10.3	-9.5	3.6	14.4	14.6	18.2	17.8	22.5	13.3	1.7	-2.7
2	-7.0	-10.1	-9.1	9.7	16.3	20.1	18.7	20.2	19.7	10.7	1.8	-2.4
3	-8.7	-8.3	-7.0	0.4	18.6	19.4	20.7	15.9	15.3	9.9	6.8	-4.0
4	-8.8	-10.4	-2.2	-0.9	22.8	19.4	18.1	18.0	10.5	4.7	9.0	-4.0
5	-12.4	-7.3	2.8	1.0	20.8	18.3	17.4	17.2	9.3	-0.8	11.1	-9.1
6	-6.4	2.1	-0.4	6.0	13.1	16.1	17.3	18.7	10.8	-0.8	11.7	-16.0
7	-11.6	-2.8	-1.2	3.3	15.9	20.4	17.9	17.6	14.6	0.2	7.3	-16.3
8	-18.6	-4.1	-1.5	1.1	21.9	23.4	18.0	16.8	13.0	-1.8	8.9	-20.7
9	-20.3	-3.3	-1.1	2.4	10.8	24.1	21.7	19.1	12.7	1.6	12.9	-22.0
10	-17.8	-7.0	3.8	-3.4	6.4	15.2	20.6	18.4	14.4	0.2	6.1	-20.6
11	-15.8	-13.2	5.7	0.0	3.6	13.7	16.8	17.4	10.4	-0.7	7.9	-19.2
12	-14.7	-17.7	6.2	10.1	3.1	19.1	18.7	18.8	6.7	-0.2	8.2	-18.5
13	-12.6	-9.4	6.7	10.7	6.8	19.0	18.1	18.6	10.0	-1.6	7.5	-19.1
14	-13.3	-2.6	4.2	8.2	10.7	20.1	17.4	21.4	15.1	3.1	8.0	-19.9
15	-21.0	-4.4	-1.1	3.4	12.6	16.2	17.0	20.9	14.4	-0.6	3.3	-18.8
16	-27.6	-3.5	-6.2	4.6	15.1	15.4	17.7	20.8	15.1	0.3	0.8	-24.3
17	-25.0	0.2	-6.3	7.7	17.5	15.4	19.4	19.7	15.0	1.6	-2.3	-24.6
18	-19.4	-1.1	-6.1	12.1	17.1	17.1	20.5	16.0	13.8	1.5	-6.8	-13.1
19	-14.6	-5.3	-5.7	15.3	18.2	16.6	23.1	14.7	12.6	1.9	-4.9	-1.3
20	-18.7	-13.7	-0.2	9.7	21.6	17.1	22.2	17.3	10.4	4.5	-0.1	-6.3
21	-13.7	-8.5	-2.3	3.8	20.2	16.7	21.4	21.2	8.5	6.5	0.3	-4.8
22	-6.1	-5.3	-6.1	6.5	15.7	19.8	19.5	21.6	9.2	2.0	-1.4	-2.6
23	-5.4	-4.0	-2.1	5.6	12.1	22.5	20.4	14.1	10.0	2.2	-2.6	-10.7
24	-5.4	-4.3	-2.7	5.3	12.3	21.2	19.3	15.2	10.6	6.9	-0.8	-17.8
25	-6.7	-4.0	-3.0	6.5	12.8	17.4	19.7	15.2	11.3	7.8	0.0	-15.4
26	-7.2	0.3	2.7	6.9	17.7	16.6	18.0	14.8	12.3	4.9	-1.1	-15.0
27	0.7	-6.2	0.8	9.4	18.2	20.1	18.5	16.5	16.2	6.2	-2.1	-11.5
28	-1.2	-9.2	4.0	10.2	14.6	21.4	20.9	14.3	9.6	3.2	-3.4	-5.2
29	0.8	-19.3	6.3	10.8	14.8	19.5	20.9	13.3	12.5	3.6	-1.7	-7.4
30	-4.6		5.0	12.4	13.8	17.5	21.9	15.1	13.6	3.2	-2.7	-9.7
31	-5.9		-0.3		13.9		19.4	20.3		1.0		-10.9

DAILY PRECIPITATION



PRECIPITATION

2016 PRECIPITATION RECORDS					
TYPE	DATE		NEW RECORD	OLD Record	YEAR
	Month	Day			
Greatest Daily Precipitation (mm)	March	15	5.2	4.9	2013
	June	16	15.9	13.2	2004
	August	3	21.9	6.4	1968
	August	24	6.2	5.0	1914
	September	23	13.5	6.4	1969
	October	9	6.6	1.8	1977
	December	30	6.3	5.3	1965
# of days with > 5mm	October		4	4	1991
Shortest maximum length of dry spell	2016		12	13	2006

EXTREME PRECIPITATION EVENTS		
PERIOD	DATE	AMOUNT (mm)
½ hour*	July 9	9.6
Next ½ hour*	May 24	6.6
1 hour*	August 2	11.3
Next 1 hour*	July 9	9.6
2 hours*	August 2	11.4
Next 2 hours*	August 3	11.2
6 hours*	August 3	17.4
Next 6 hours*	June 16	14.6
12 hours*	August 3	21.0
Next 12 hours*	June 16	14.6
24 hours*	August 3	21.2
Next 24 hours*	August 8	19.4
Greatest amount over more than one day	October 4 - 11	31.5
2nd greatest amount over more than one day	July 11-12	23.6
Longest wet spell	October 4-11	8 days (31.5)
Next longest wet spell	July 1-6	6 days (15.1)
Longest dry spell	April 10 - 21	12 days
Next longest dry spell	April 24 - May 4	11 days

**recorded by the tipping bucket gauge*

All - season Precipitation Weighing Gauge
13 June 2016
Photo: V. Wittrock

RANKING BY DRIEST MONTH			
% OF NORMAL PRECIPITATION		PRECIPITATION AMOUNT (mm)	
APR	10.9	APR	2.5
SEP	55.9	FEB	7.7
JUN	70.0	DEC	10.2
NOV	76.1	NOV	10.2
DEC	80.3	MAR	14.1
FEB	82.8	JAN	20.4
MAR	102.2	SEP	20.7
MAY	107.6	MAY	42.4
JUL	130.7	OCT	46.5
JAN	131.6	JUN	46.6
AUG	140.2	AUG	65.2
OCT	242.2	JUL	77.1

PRECIPITATION

RANKING BY					
Total Number of Dry Days*		Maximum Length of Dry Spell*		Maximum Length of Wet Spell*	
2001	282	1976	48	2003	21
1964	280	1993	40	1968	14
1984	278	2000	40	1969	14
1988	275	1965	37	1997	12
1965	271	1980	36	2013	11
1966	267	1997	36	2014	11
1986	267	2002	35	1977	10
1997	267	1964	31	1980	10
1981	266	1984	30	1989	10
1987	266	2009	30	2004	10
1967	265	2010	29	2008	10
1994	264	1966	28	1983	9
1968	260	1974	28	1986	9
1990	260	2012	28	2010	9
2015	259	1968	27	1965	8
1998	259	2004	25	1972	8
1985	258	2013	25	1974	8
1993	258	1972	23	2005	8
1995	258	1973	23	2009	8
1999	258	1996	23	2011	8
2002	258	1977	22	2016	8
1996	256	1987	22	1973	7
2003	255	1978	21	1976	7
1976	251	1982	21	1982	7
1992	250	2001	21	1992	7
2000	248	2015	21	1993	7
2009	246	1969	20	2000	7
2008	245	1986	20	2002	7
1980	244	1999	20	2012	7
2012	244	2011	20	1964	6
2014	244	1967	19	1966	6
1971	243	1981	19	1970	6
2013	243	1988	19	1975	6
1989	241	2008	19	1978	6
1970	240	1994	18	1979	6
1979	239	1995	18	1981	6
2011	239	2003	18	1988	6
1972	238	1975	17	1991	6
1977	238	1979	17	1994	6
2007	237	1985	17	1996	6
1975	235	1998	17	2006	6
1991	234	2014	17	2007	6
1983	233	2005	17	1971	5
2010	233	1983	16	1985	5
2005	231	1990	16	1987	5
1974	229	1991	16	1990	5
1982	229	1992	16	1995	5
2006	227	1971	15	1998	5
1978	224	2007	15	1999	5
2016	222	1989	14	2015	5
1969	218	1970	13	1967	4
2004	208	2006	13	1984	4
1973	200	2016	12	2001	4

**For this report, a dry day is defined as a day on which precipitation is not recorded; a dry spell is 2+ consecutive days of no precipitation; a wet spell is 2+ consecutive days of precipitation.*

Tipping Bucket rain gauge
13 June 2016
Photo: V. Wittrock

Thanksgiving Snowstorm
7 October 2016
Photo: V. Wittrock

PRECIPITATION RANKINGS

RANKING BY WETTEST YEAR (mm)

ANNUAL (JAN-DEC)		WINTER (DJF)		SPRING (MAM)		SUMMER (JJA)		AUTUMN (SON)	
2010	707.4	1969	98.1	2010	216.1	2010	316.4	2006	203.4
1991	546.9	1972	92.2	2012	184.3	2005	269.4	1969	151.8
2006	517.5	1974	92.2	1977	164.1	2012	266.0	2010	151.1
2012	501.1	2007	74.7	2014	162.4	2004	260.0	1984	137.0
2005	486.8	1980	73.0	1974	148.0	1991	251.6	1978	111.4
1983	471.6	1976	69.5	1991	147.3	1971	248.8	2005	109.4
1974	462.7	1965	69.3	1985	134.3	2007	231.0	1991	105.4
2014	452.7	1975	67.3	1983	125.2	1968	225.9	2015	99.2
1968	443.1	1973	63.2	1975	119.6	1966	222.0	1983	96.2
1982	436.2	1978	63.0	1982	110.8	1970	216.5	1973	88.2
1969	427.4	1979	61.3	1994	109.4	1983	215.8	1986	87.2
1971	414.6	1971	60.4	2006	101.8	2009	212.8	1982	81.5
2007	413.9	1989	57.9	1989	101.7	1982	208.4	1964	77.4
1986	411.3	1986	57.2	1968	97.6	2002	206.8	2016	77.4
2004	404.5	1990	55.6	1997	88.2	1965	206.6	1967	76.8
1973	393.3	1992	55.0	1979	87.3	2014	206.2	1996	74.4
1975	392.3	1966	54.7	1990	87.2	1974	205.5	1993	73.1
1970	388.8	1968	53.8	1986	82.5	1986	196.2	2002	72.8
1989	384.8	1970	52.7	1967	78.0	1999	194.2	1968	71.3
1966	376.9	1985	52.3	1987	73.6	2008	191.2	1998	70.0
1977	370.5	1981	52.2	1973	73.1	2016	188.9	1980	66.6
2016	363.6	1996	51.0	1978	72.8	2011	186.6	1992	65.9
1965	358.8	1997	48.0	1972	71.6	2013	185.3	2011	65.7
1978	358.1	1964	47.9	1976	69.1	2006	183.8	1977	65.4
1967	354.3	2005	45.4	1969	68.5	2000	183.8	2014	64.9
1979	352.0	1994	45.1	1964	65.8	1976	169.4	1989	64.5
1994	341.4	1977	43.1	1970	65.7	1994	165.6	2008	64.4
2015	340.7	1983	41.1	1995	65.4	1995	164.4	1997	61.6
1996	340.6	2013	41.1	2007	64.7	2015	156.4	1981	61.4
1976	331.8	1991	40.3	1993	62.2	1973	156.1	2009	56.5
1985	330.6	2009	38.8	2005	62.1	1996	154.4	1970	56.4
1995	327.7	1967	37.9	2003	61.8	1993	151.0	1985	55.2
2011	320.6	1982	37.0	1966	61.2	1989	149.9	1979	53.4
2002	320.0	1988	35.9	1971	61.1	1988	148.9	1995	52.6
2009	319.3	2014	34.9	2000	59.2	1975	144.5	2003	51.2
2013	318.4	2011	32.3	2016	59.0	1990	144.5	1965	50.9
1972	317.9	2016	32.1	1996	58.8	1978	142.5	1966	50.2
2000	315.4	2006	32.0	1984	57.2	1967	139.9	2004	50.0
2008	313.8	2000	31.7	1999	56.5	1979	135.9	1975	48.8
1990	309.8	1995	31.3	1988	55.6	1998	133.4	2007	45.3
1980	305.9	1999	31.3	1992	55.5	1972	133.3	1974	40.0
1993	300.0	1987	30.6	2004	55.4	2003	126.2	1988	38.1
1999	297.7	2004	29.3	1981	54.3	1981	124.9	1971	34.2
1984	293.1	2003	29.2	2015	54.2	1980	120.3	1990	33.9
1997	291.4	2015	29.1	2013	51.0	1997	116.4	1972	32.3
1992	288.1	2001	23.1	1965	43.2	1992	115.6	2013	31.6
1988	285.7	2010	22.5	1980	42.2	1969	105.5	2000	31.2
1964	282.7	1998	22.4	2011	41.3	1987	92.6	2012	29.1
1981	279.8	1993	22.0	2001	34.0	1985	91.8	2001	28.5
1998	263.3	2008	21.6	1998	29.8	2001	91.2	1987	27.4
2003	257.7	1984	19.2	2008	29.8	1977	81.9	1976	21.8
1987	232.4	2012	13.5	2002	20.3	1964	73.9	1994	21.0
2001	165.8	2002	12.1	2009	19.0	1984	70.2	1999	17.2

ANNUAL RANKING BY DAYS WITH PRECIPITATION

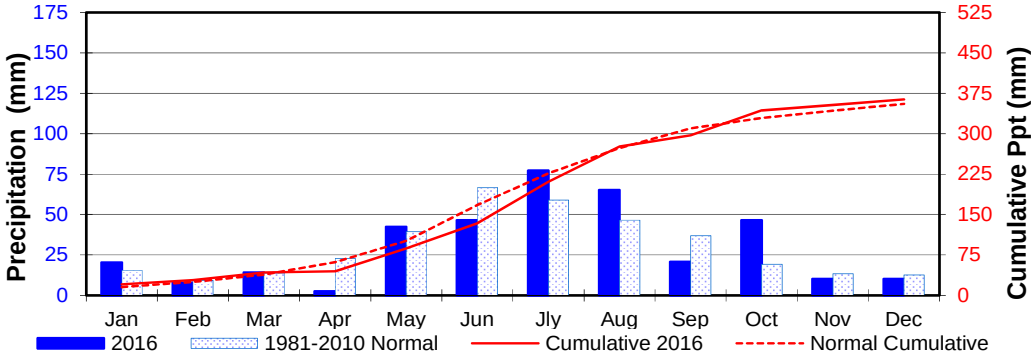
ANNUAL (JAN-DEC)		WINTER (DJF)		SPRING (MAM)		SUMMER (JJA)		AUTUMN (SON)	
2004	158	1969	61	2004	44	2010	45	2006	38
1969	147	1974	57	2012	39	1978	43	1978	36
2016	143	1972	48	1979	37	2012	43	2007	36
1978	139	1979	48	1974	36	1982	42	2004	34
2006	139	2009	43	1983	36	1991	42	1992	33
1974	136	1976	41	2005	36	2004	42	1969	32
1982	136	1983	41	2006	36	2014	41	1970	32
2005	135	1970	40	1975	35	1994	41	1983	32
1983	132	1971	40	1982	34	2005	40	2016	32
2010	132	1978	40	1997	32	2016	40	1989	31
1991	131	2011	40	2000	32	1976	39	2014	30
1975	130	2016	39	1977	31	1973	38	1977	30
1977	129	2005	37	1993	31	1974	38	1991	30
1972	128	2014	36	1999	31	1981	38	2010	30
2007	128	1973	36	1969	30	1986	37	1984	29
1973	127	1980	36	1989	30	1972	36	2002	29
2011	127	1981	36	1995	30	1989	36	1985	28
1970	126	2006	36	2003	30	2002	36	1967	27
1979	126	1982	34	2007	30	2008	36	2008	27
1989	124	1975	33	2011	30	2009	36	1973	25
1980	123	1991	33	2013	29	1966	35	1975	25
2013	123	2003	33	2014	28	1975	35	2003	25
1971	122	1977	31	2010	28	1980	35	1965	24
2014	121	1992	30	1987	27	1987	35	1981	24
2008	121	1997	30	1990	27	1993	35	1996	24
2012	120	2000	30	1991	27	2000	35	1998	24
2009	119	2007	30	2016	27	2006	35	2001	24
2000	118	2015	30	1970	26	2013	35	2011	24
1992	116	2004	29	1971	26	1996	34	2015	24
1976	115	2010	29	1973	26	1997	34	1971	23
1981	113	1965	27	1985	25	1999	34	1980	23
1996	110	1989	27	2008	25	1968	33	1986	23
2003	110	1990	27	1984	24	1977	33	2009	23
1985	107	1998	27	1996	24	1992	33	1968	22
1995	107	1966	26	2009	24	1988	32	1972	22
1999	107	1967	26	1972	23	1990	32	1993	22
2002	107	1986	26	1976	23	1995	32	2005	22
1968	106	2008	26	1978	22	1971	31	2012	22
1993	106	1968	25	1980	22	1983	31	1979	21
1998	106	1999	25	1986	22	2007	31	1995	20
1990	105	1964	24	1998	22	1965	29	2013	20
2015	104	1993	24	2002	22	1964	28	1982	19
1987	102	1996	24	2015	22	1970	28	1988	19
1994	101	2013	24	1967	21	1979	28	2000	19
1967	100	1988	23	1981	21	1998	28	1964	18
1966	98	1994	23	1992	20	1969	27	1990	18
1986	98	2001	23	1994	20	2015	27	1966	17
1997	98	1985	22	2001	20	2003	26	1994	15
1965	94	1995	21	1968	19	1967	25	1987	14
1988	91	1987	19	1988	19	1985	25	1997	14
1984	88	2012	19	1966	18	2011	25	1974	13
1964	86	1984	18	1965	16	2001	23	1999	13
2001	84	2002	16	1964	14	1984	18	1976	9

PRECIPITATION

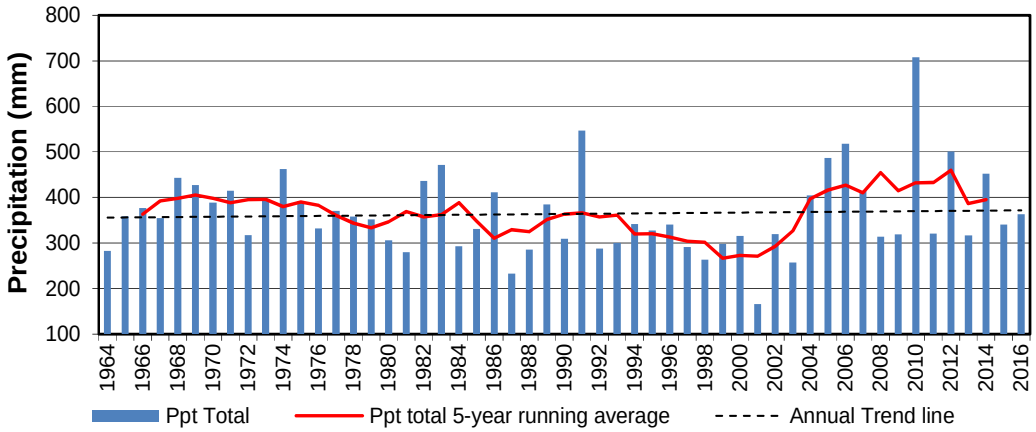
MONTH	MONTHLY PRECIPITATION (mm)				EXTREME VALUES (mm)		
	2016	NORMAL	CUMULATIVE 2016	% OF CUMULATIVE NORMAL	CRS Maximum	CRS Minimum	SASKATOON AREA Maximum
January	20.4	15.5	20.4	46.5	48.6/1969	2.6/2001	66.1/1911[SE]
February	7.7	9.3	28.1	108.5	40.2/1979	2.5/1984	43.7/1924[SE]
March	14.1	13.8	42.2	85.2	57.1/1967	0.8/2010	59.0/1927[SE]
April	2.5	22.9	44.7	120.8	81.1/2010	2.4/1988, 89	86.1/1955[US]
May	42.4	39.4	87.1	80.4	145.3/1977	0.2/2002	178.0/1977[SWT]
June	46.6	66.6	133.7	57.6	171.0/2005	13.0/1985	186.8/1942[S]
July	77.1	59.0	210.8	79.2	125.9/1971	13.0/1984	162.9/1928[SE]
August	65.2	46.5	276.0	87.0	105.2/2007	7.0/2001	178.9/1954[NRC]
September	20.7	37.0	296.7	93.0	128.4/2006	0.8/1995	128.4/2006[SRC]
October	46.5	19.2	343.2	97.5	69.8/1969	0.0/2000	69.8/1969[SRC]
November	10.2	13.4	353.4	98.3	48.2/1973	0.4/2009	57.3/1940[SE]
December	10.2	12.7	363.6	95.9	43.0/1977	1.2/1997	59.2/1956[SA]
Total	363.6	355.2			707.4/2010	165.8/2001	707.4/2010[SRC]

SM	Saskatoon stations circa (NWMP et al)	1889-1901
SE	Saskatoon Eby	1901-42
US	University of Saskatchewan	1915-64
S	Saskatoon	1941-42
SA	S'toon Diefenbaker Int'l Airport	1942-2008
NRC	National Research Council	1952-66
SRC	Sask. Research Council	1963-
SWT	S'toon Water Treatment Plant	1974-2006
SC	Saskatoon Central Ave	1974-89
S2	Saskatoon 2	1977-90
K	Saskatoon Kernen Farm	1993-2004
KCS	Saskatoon Kernen Farm CS	1996-2008
RCS	Enivonment Canada	2008-

Monthly



Annual

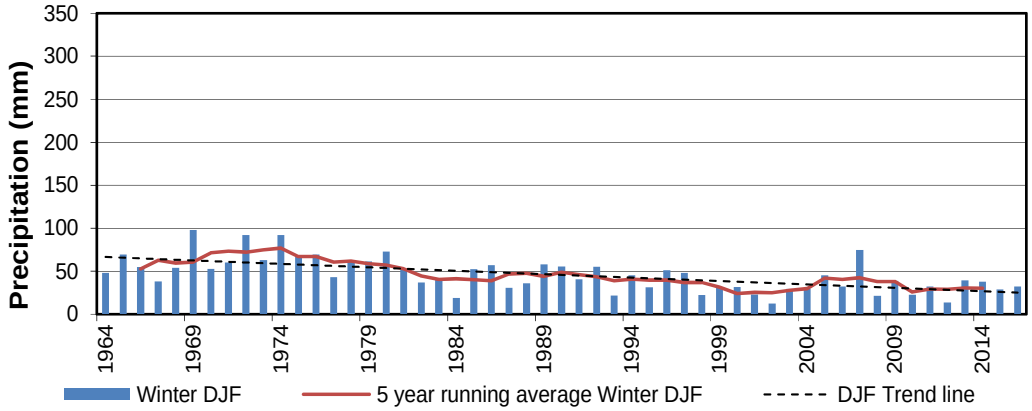


Snow depth sensor
25 February 2016
Photo: V. Wittrock

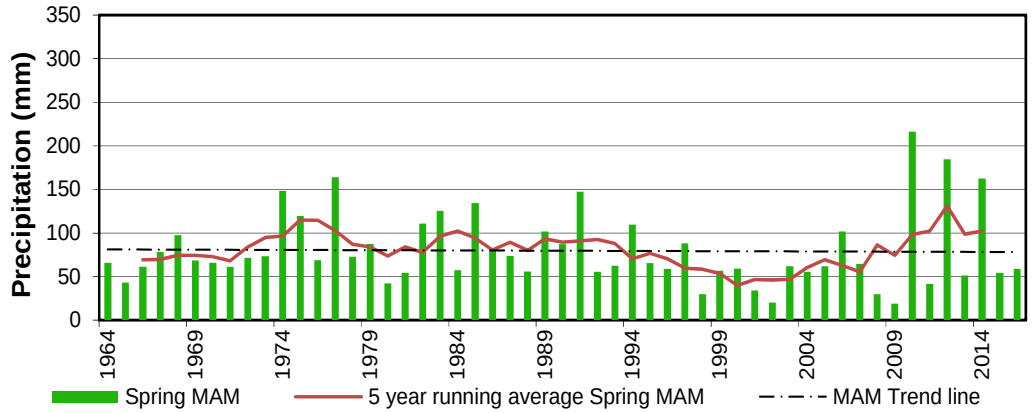
All season precipitation gauge
25 February 2016
Photo: V. Wittrock

SEASONAL PRECIPITATION for 1964 to 2016

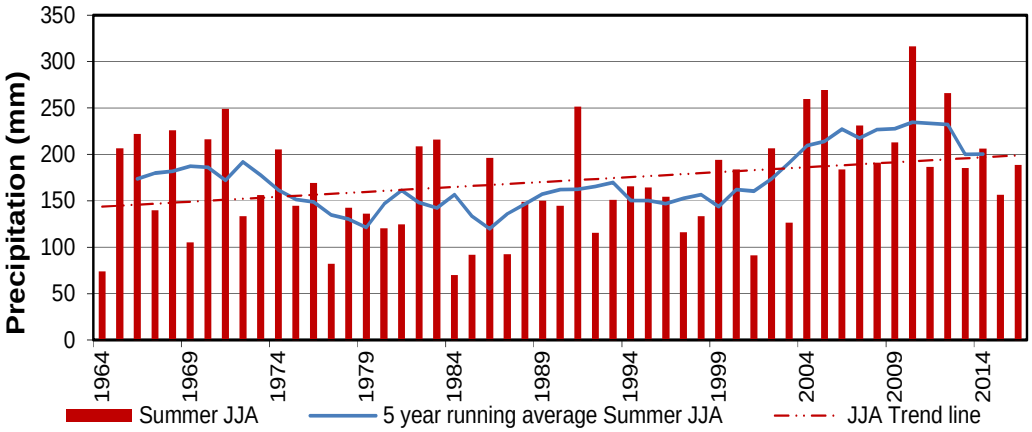
Winter



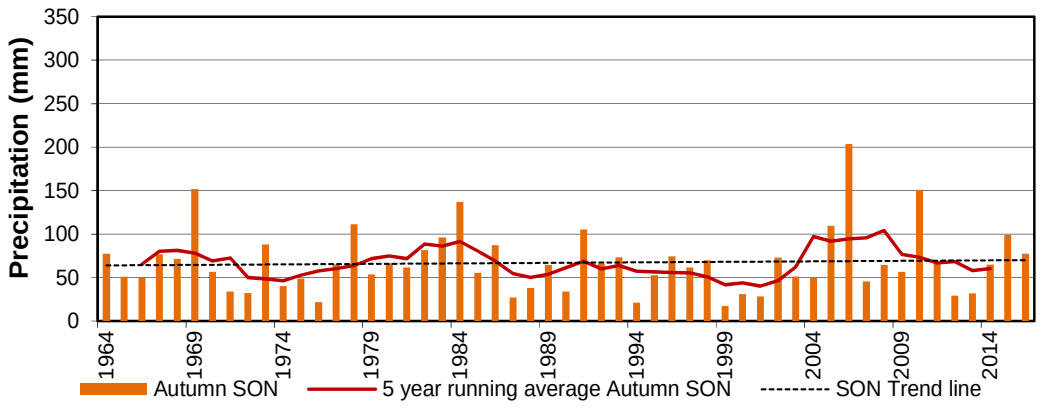
Spring



Summer



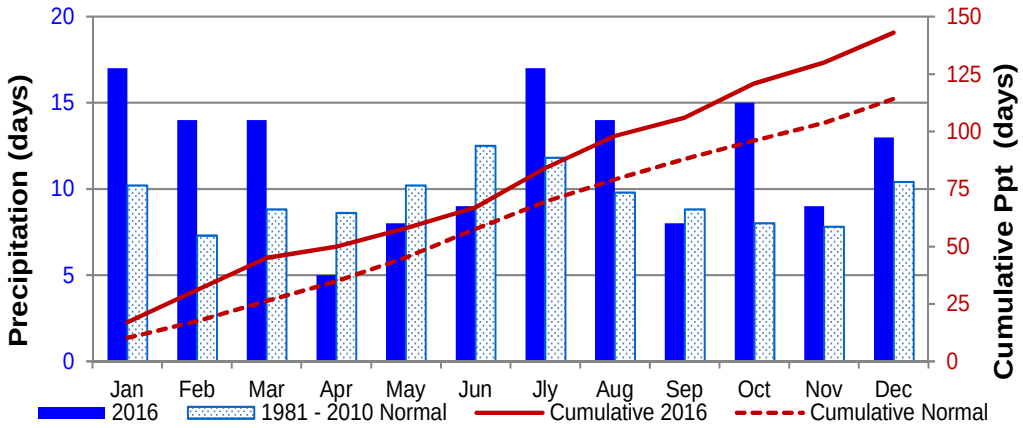
Autumn



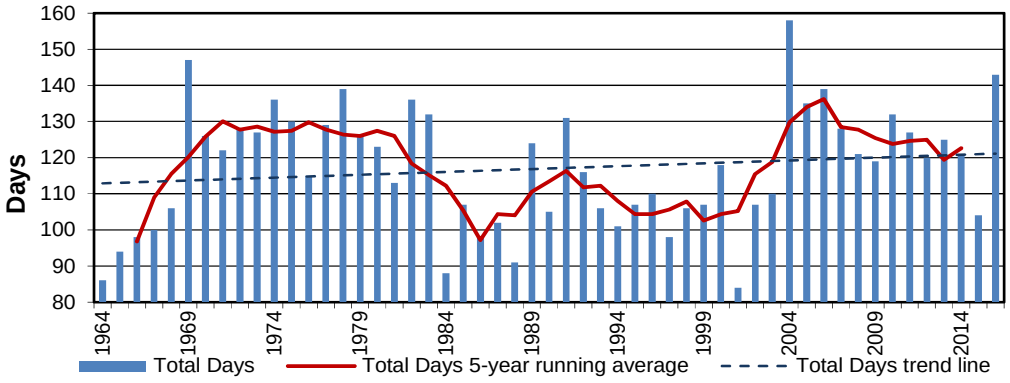
PRECIPITATION

MONTH	NUMBER OF DAYS WITH MEASURABLE PRECIPITATION					EXTREME VALUES	
	2016	CUMULATIVE 2016	Normal	CUMULATIVE NORMAL	% OF CUMULATIVE NORMAL	CRS Maximum	CRS Minimum
January	17	17	10.2	10.2	98.0	25/1974	3/2001
February	14	31	7.3	17.5	178.1	20/1969	2/1984
March	14	45	8.8	26.3	113.6	19/2004	2/1990,92,94 2007
April	5	50	8.6	34.9	93.0	17/2003	2/1964
May	8	58	10.2	45.1	39.2	19/1989	1/2002
June	9	67	12.5	57.6	72.0	21/1991	7/1964&1968
July	17	84	11.8	69.4	84.7	19/1986	4/1984
August	14	98	9.8	79.2	81.6	18/2002	2/2001
September	8	106	8.8	88.0	79.5	19/1977	2/1995
October	15	121	8.0	96.0	100.0	16/2004	0/2000
November	9	130	7.8	103.8	115.4	18/1970	1/1986,74,76, 90
December	13	143	10.4	114.2	76.9	19/1977	2/1997
Total	143		114.2			158/2004	84/2001

Monthly Days



Annual Days

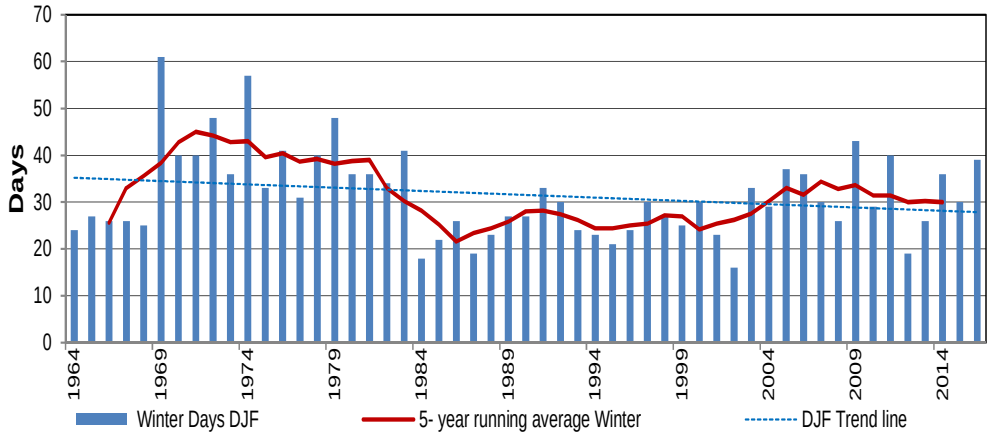


Saskatoon Climate Reference Station (no snow)
19 April 2016
Photo: V. Wittrock

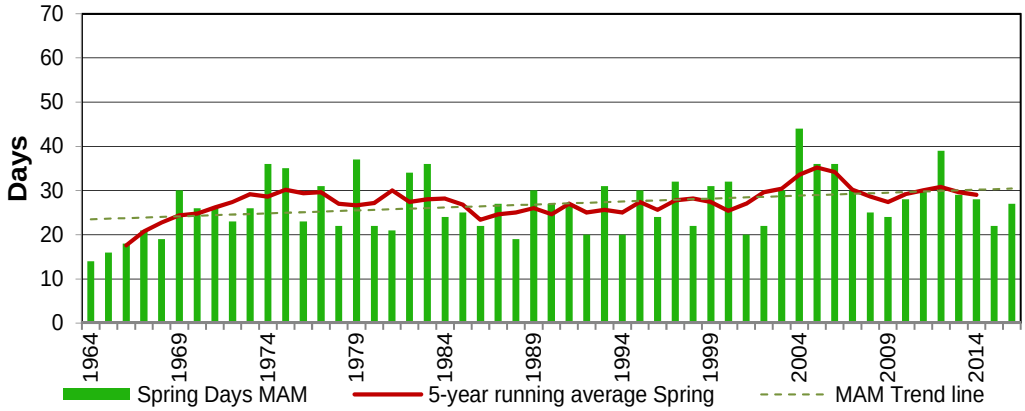
interesting cloud formation
20 July 2016
Photo: V. Wittrock

SEASONAL PRECIPITATION DAYS for 1964 to 2016

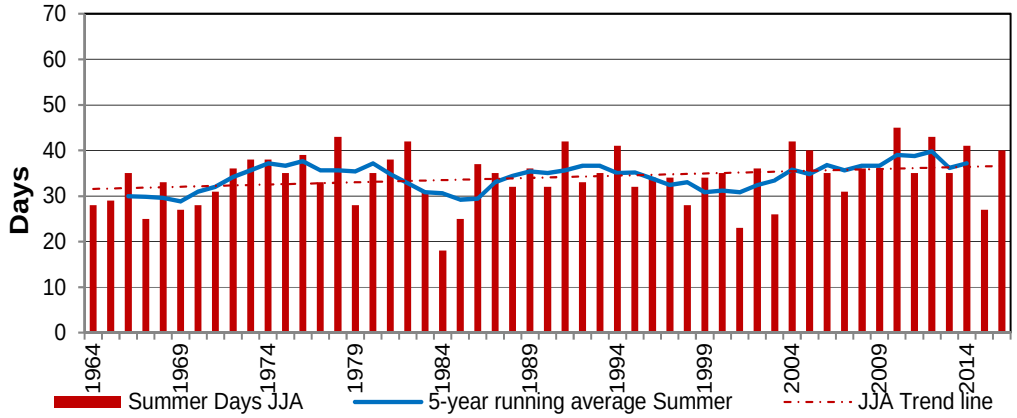
Winter Days



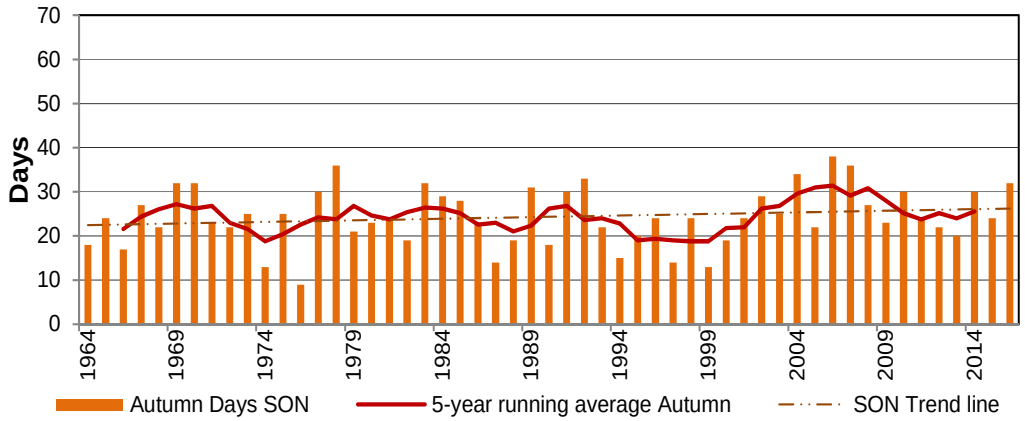
Spring Days



Summer Days



Autumn Days



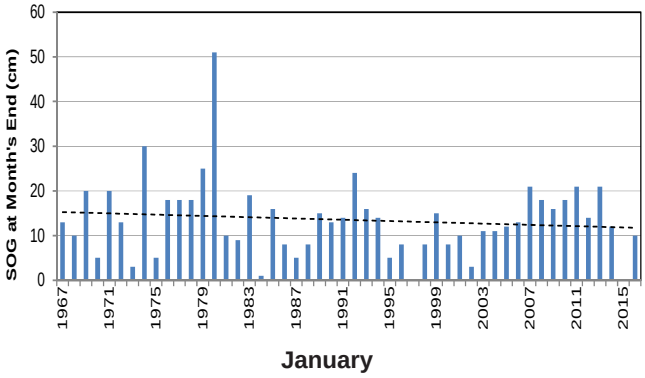
PRECIPITATION GRID mm

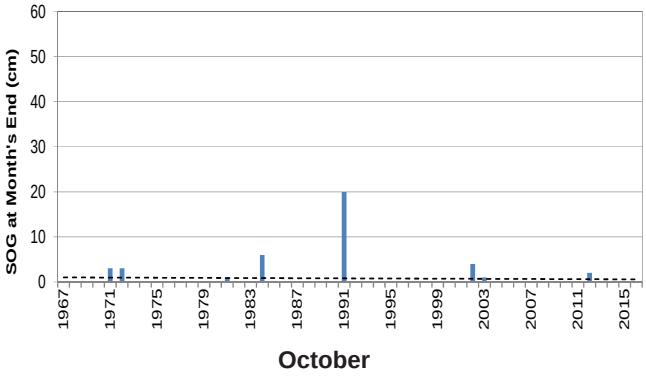
Precipitation Daily

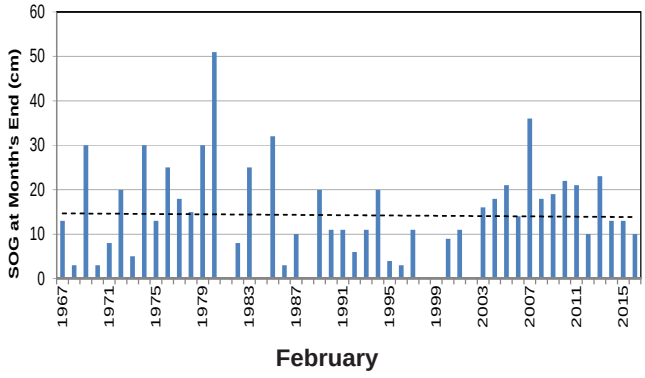
2016	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	3.7	0.0
2	0.0	0.2	0.0	0.0	0.0	0.2	0.3	0.0	0.1	0.8	0.0	0.0
3	0.0	0.2	0.5	0.0	0.0	0.0	11.0	21.9	0.0	0.0	0.0	0.0
4	0.0	0.1	0.0	0.0	0.0	0.0	2.6	0.6	0.0	11.9	0.0	0.0
5	0.0	0.0	0.0	0.6	0.1	0.0	0.4	0.0	0.0	6.7	0.0	0.1
6	1.4	0.0	0.1	0.0	0.0	0.0	0.7	0.0	0.0	1.9	0.0	0.0
7	2.2	0.1	1.8	0.0	0.0	0.0	0.0	7.4	0.4	0.7	0.1	0.0
8	0.3	0.0	0.1	0.1	0.0	0.0	7.1	13.6	0.0	1.1	0.0	0.0
9	0.0	0.1	0.0	0.3	4.0	0.0	8.7	0.0	0.0	6.6	0.0	0.0
10	0.4	0.0	0.0	0.0	14.9	0.0	0.0	4.3	0.4	1.5	0.0	0.3
11	0.0	0.0	0.0	0.0	1.7	4.1	13.8	0.0	1.6	1.1	0.0	0.2
12	0.1	0.3	0.0	0.0	0.0	1.5	9.8	0.5	0.0	0.0	0.0	0.1
13	0.3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
14	2.7	0.0	0.0	0.0	0.0	8.2	0.0	2.1	0.0	0.8	0.0	0.0
15	0.0	2.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
16	0.2	0.0	1.6	0.0	0.0	15.9	0.0	0.0	0.0	12.9	3.5	0.0
17	0.0	0.0	0.2	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.2	0.0
18	0.9	0.0	0.5	0.0	0.0	0.0	0.0	0.2	3.2	0.0	0.0	0.1
19	0.3	0.1	0.0	0.0	0.0	4.1	1.2	0.1	0.0	0.0	0.0	0.0
20	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.1	0.0	0.6	0.0	1.9	0.0	0.1	0.0	0.0	0.0	1.8	0.2
22	0.0	0.2	2.2	0.5	0.0	0.0	4.8	0.0	0.0	0.1	0.3	0.0
23	1.7	0.0	0.2	1.0	0.0	0.0	0.0	3.5	13.5	0.1	0.0	0.2
24	0.0	0.0	0.8	0.0	11.1	3.7	0.0	6.2	0.0	0.0	0.4	0.4
25	0.0	0.0	0.1	0.0	0.0	7.9	0.2	0.0	0.0	0.2	0.0	1.8
26	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3
27	6.9	1.6	0.0	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	8.0	1.0	0.0	0.0	0.8	0.0	0.0	0.0
29	0.1	0.1	0.0	0.0	0.0	0.0	7.1	0.0	0.7	0.0	0.0	0.0
30	0.0		0.2	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.1	6.3
31	0.5		0.0		0.0		7.7	0.0		0.0		0.1

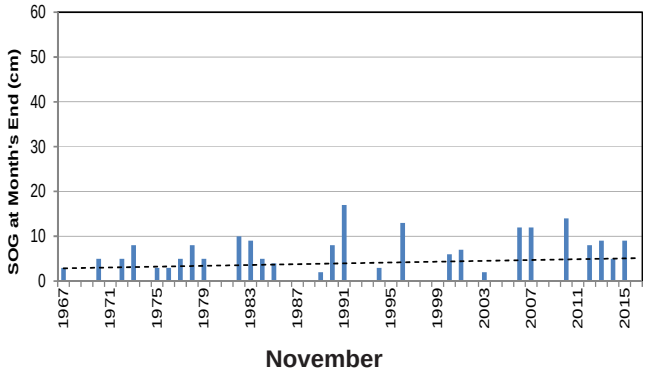
Explaining the finer points of the All Season Precipitation Weighing Gauge
20 July 2016
Photo: E. Taman-Athmer

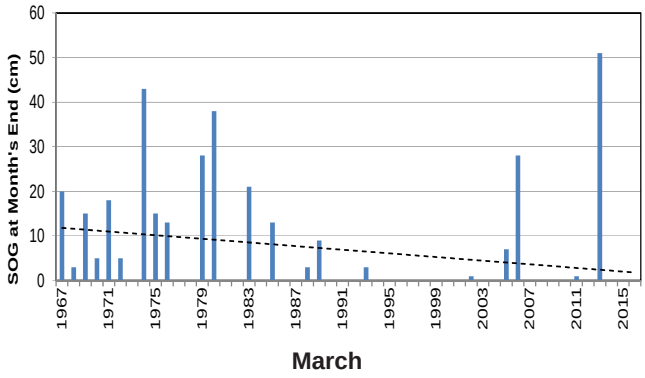
SNOW-ON-THE-GROUND (SOG) ON LAST DAY OF MONTH

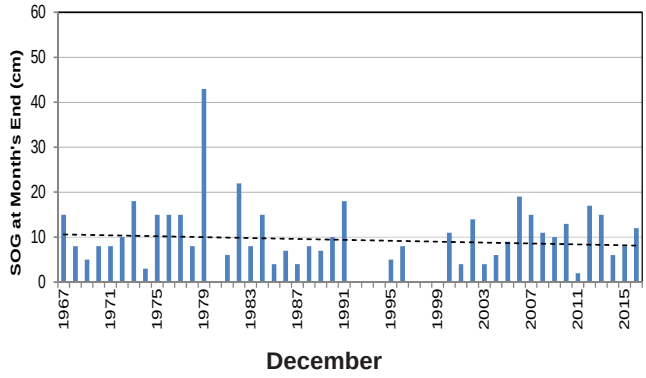


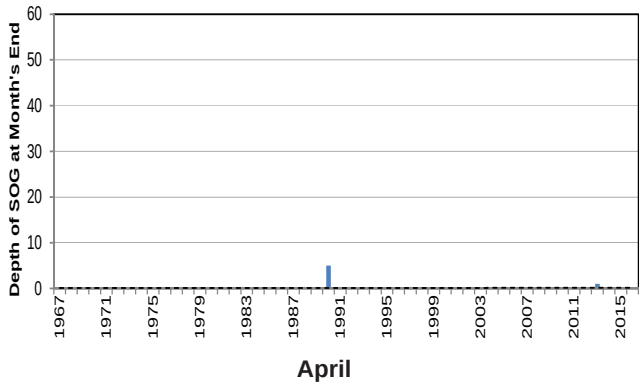












Installing Meter Sticks for Manual Snow Depth Measurements 3 October 2016
Photo: V. Wittrock

RADIATION

Sunrise/Sunset Tables for Saskatoon, 2016 & 2017[1]

2016	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	17:05	8:47	17:53	7:51	18:47	6:40	19:42	5:35	20:33	4:51	21:18	4:51	21:30	5:29	20:56	6:19	19:53	7:08	18:43	8:03	17:37	8:54	16:58
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2017	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
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31	8:48	17:53			6:43	19:40			4:52	21:17			5:27	20:58	6:17	19:55			8:01	17:39			9:15	17:04

[1]National Research Council, Canada, Hertzberg Institute of Astrophysics

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

Kipp and Zonen Bright Sunshine recorder
13 June 2016
Photo: V. Wittrock

Diffuse Radiation Instruments
13 June 2016
Photo:V. Wittrock

RADIATION

MONTH	BRIGHT SUNSHINE (HOURS)							BRIGHT SUNSHINE DAYS				
	2016	NORMAL	% OF NORMAL	POSSIBLE SUNSHINE*	% OF POSSIBLE	2016 CUMULATIVE (HOURS)	NORMAL CUMULATIVE (HOURS)	2016 NUMBER OF DAYS	NORMAL NUMBER OF DAYS	2016 CUMULATIVE (DAYS)	NORMAL CUMULATIVE (DAYS)	2016 WITH MORE THAN 1 HOUR
JAN	116.7	101.0	115.5	259.0	45.1	116.7	101.0	28	23.4	28	23.4	20
FEB	117.5	132.6	88.6	278.6	42.2	234.2	233.6	23	23.9	51	47.3	20
MAR	154.8	182.0	85.1	369.0	42.0	389.0	415.6	26	27.4	77	74.7	24
APR	260.9	227.2	114.8	418.1	62.4	649.9	642.8	30	27.6	107	102.3	28
MAY	282.7	256.9	110.0	487.3	58.0	932.6	899.7	30	29.3	137	131.6	28
JUNE	326.9	258.2	126.6	500.1	65.4	1259.5	1157.9	30	28.0	167	159.6	30
JULY	293.3	298.8	98.2	502.0	58.4	1552.8	1456.7	31	30.3	198	189.9	29
AUG	272.3	271.3	100.4	452.9	60.1	1825.1	1728.0	30	29.9	228	219.8	29
SEP	220.2	197.4	111.6	379.5	58.0	2045.3	1925.4	29	27.3	257	247.1	28
OCT	61.1	156.1	39.1	329.6	18.5	2106.4	2081.5	19	26.7	276	273.8	12
NOV	125.9	97.0	129.8	264.3	47.6	2232.3	2178.5	22	22.5	298	296.3	20
DEC	99.2	85.7	115.8	242.4	40.9	2331.5	2264.2	26	22.6	324	318.9	22
TOTAL	2331.5	2264.0	103.0	4482.9	52.0			324	318.9			290

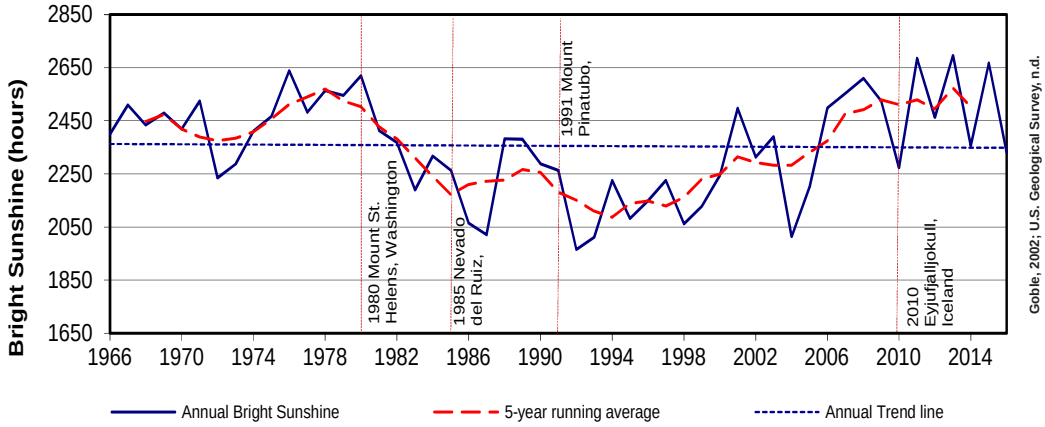
** National Research Council, Canada, Hertzberg Institue of Astrophysics*

Global and Diffuse Radiation (MJ/m²)

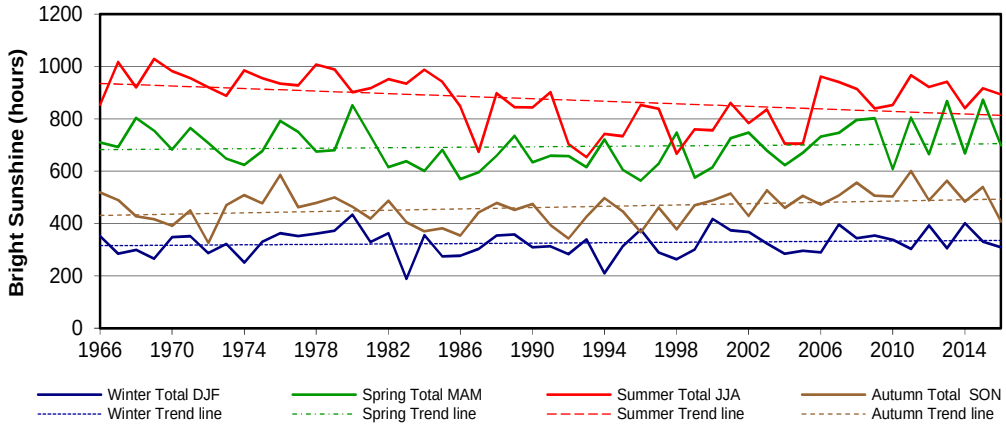
DATE	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse	Global	Diffuse
1	3.9	0.7	2.9	2.5	11.2	2.6	16.0	5.2	23.6	4.6	23.6	6.5	12.4	8.7	18.8	7.5	9.9	5.3	5.5	3.4	2.2	1.8	1.8	1.5
2	3.7	0.7	4.2	2.9	6.8	4.7	19.0	1.7	24.3	3.8	24.6	7.8	13.9	7.6	25.3	3.4	11.1	4.3	11.5	2.0	2.1	1.7	0.5	0.4
3	4.0	0.7	4.2	2.6	6.0	4.9	10.5	5.8	24.2	3.7	22.4	6.9	22.2	8.1	3.6	2.7	19.7	1.9	8.3	4.3	6.1	2.3	1.4	1.1
4	3.5	0.9	4.6	3.2	8.3	5.5	14.7	5.4	25.9	2.4	28.6	3.3	22.5	6.5	22.7	5.0	11.2	6.5	1.5	1.3	5.1	2.0	3.5	1.3
5	2.9	2.0	6.8	2.9	12.3	2.8	6.6	5.1	22.8	5.9	25.5	4.2	17.8	6.7	22.4	3.7	8.8	6.6	3.6	3.0	7.0	0.9	1.3	1.1
6	1.5	1.2	4.6	3.1	11.5	3.9	16.4	4.2	23.7	5.1	28.2	4.1	19.7	8.6	24.5	2.6	16.6	4.1	6.3	5.2	6.9	2.2	2.4	1.6
7	2.6	2.2	7.1	1.1	3.2	2.7	19.2	3.6	21.4	7.6	19.3	7.7	24.3	6.2	13.0	6.6	12.4	5.1	8.1	5.7	6.7	0.9	3.1	1.8
8	1.9	1.7	3.9	3.2	3.9	3.3	15.4	5.9	24.5	5.0	26.6	4.1	11.2	7.3	3.7	2.9	15.5	5.4	5.9	4.8	3.4	2.4	4.4	1.3
9	3.1	2.2	3.8	2.9	4.0	3.4	6.1	4.4	5.0	3.8	25.5	4.4	22.3	6.0	17.3	6.7	15.8	3.7	3.5	2.9	6.1	1.1	4.5	1.0
10	2.4	1.7	3.3	2.8	11.1	4.1	18.2	6.4	3.0	2.4	15.9	9.4	15.0	8.2	10.7	6.4	12.1	5.6	3.2	2.7	5.8	0.9	5.1	1.0
11	3.0	2.3	5.3	3.9	14.1	1.2	21.0	3.3	10.1	7.4	16.4	8.0	4.3	3.3	12.7	6.0	8.2	4.7	5.6	3.9	6.1	1.2	1.8	1.3
12	2.3	1.9	8.8	2.6	11.1	4.1	19.5	2.6	10.3	7.7	29.5	2.7	7.1	5.3	18.6	6.2	12.0	5.6	10.6	3.4	6.0	1.1	3.5	1.7
13	2.4	2.1	2.8	2.3	12.1	2.8	6.5	4.4	23.5	6.6	29.3	3.2	23.4	7.6	21.7	3.6	18.1	2.1	11.2	2.9	4.2	1.6	3.2	1.3
14	2.9	2.4	7.8	2.0	10.9	4.1	18.7	4.7	21.9	7.4	26.9	4.7	24.8	6.8	19.3	2.3	17.5	1.3	2.7	2.2	5.3	1.0	3.0	1.6
15	2.9	2.5	2.4	1.7	5.2	3.8	11.3	7.4	24.8	6.3	26.9	6.6	26.3	3.9	22.2	3.3	16.8	1.7	5.2	4.1	5.4	0.9	3.8	1.6
16	6.2	1.1	5.6	4.3	11.2	7.4	23.5	1.9	26.6	4.4	12.6	5.2	27.6	5.5	22.0	3.0	16.8	1.6	1.2	1.0	3.3	2.0	5.3	1.2
17	7.1	1.1	8.6	2.1	7.2	5.9	23.3	2.0	18.6	7.4	30.1	3.5	21.6	8.7	17.4	6.9	8.0	5.3	2.7	2.2	6.5	1.2	5.3	0.9
18	2.1	1.8	3.4	2.9	10.2	7.6	23.2	2.0	21.4	8.2	25.0	6.6	26.8	5.4	20.1	3.7	7.7	4.6	2.8	2.3	6.0	1.2	2.2	1.6
19	5.5	1.4	3.9	3.2	16.6	3.3	23.4	2.7	25.5	5.5	17.1	6.2	24.2	2.7	14.0	6.8	15.8	1.6	2.3	1.9	2.4	2.0	1.5	1.2
20	5.6	2.0	6.2	4.0	14.9	4.5	22.6	3.7	24.0	8.7	27.5	3.7	27.6	2.9	21.2	2.9	14.0	2.8	6.0	3.3	4.9	0.7	3.7	0.6
21	5.3	2.6	4.4	3.7	8.2	5.8	23.2	2.7	22.6	7.7	18.0	9.0	23.1	3.9	19.2	4.9	11.2	4.7	8.8	1.7	1.3	1.1	2.7	1.2
22	5.1	2.5	11.2	3.8	10.4	8.1	9.3	5.0	18.3	6.7	27.9	4.3	22.3	4.4	18.5	5.0	13.1	3.5	2.0	1.7	0.9	0.7	2.8	1.6
23	3.9	2.5	10.1	1.9	8.5	5.9	12.6	7.6	18.5	6.5	26.6	3.8	17.4	5.8	9.5	5.7	1.7	1.4	2.7	2.2	1.6	1.4	2.1	1.3
24	2.2	1.9	11.1	4.6	8.8	6.9	10.0	7.6	7.8	5.7	25.2	5.0	26.1	3.0	11.3	6.1	3.6	2.8	5.6	2.9	1.7	1.5	2.3	1.6
25	2.7	2.3	9.7	4.4	9.8	7.4	17.2	8.9	18.0	8.2	11.5	6.1	25.3	2.7	22.1	3.2	14.2	2.7	5.1	3.4	3.7	2.2	2.3	1.7
26	4.0	2.9	11.0	1.6	13.0	4.7	12.9	8.9	22.0	7.1	12.5	9.2	23.3	6.4	11.8	6.6	14.6	1.1	5.4	2.2	5.2	1.0	3.1	1.3
27	5.1	1.3	4.1	3.4	16.3	4.2	22.5	6.7	18.9	5.4	24.8	4.6	25.5	3.2	18.3	5.1	14.3	1.3	3.1	2.3	2.4	1.6	1.6	1.4
28	5.1	2.3	7.2	3.8	15.9	3.2	23.8	4.2	9.9	6.1	21.5	4.6	24.4	3.5	13.6	6.7	8.4	3.3	1.7	1.4	0.4	0.3	2.6	1.5
29	5.7	1.8	12.3	1.5	16.4	3.5	25.1	2.4	27.0	4.3	25.2	5.3	17.0	6.6	20.4	2.2	9.8	4.1	2.9	2.3	0.4	0.4	3.6	0.7
30	5.5	0.9			7.7	4.6	24.8	2.5	22.3	9.3	28.1	4.0	16.9	6.4	18.6	3.3	12.6	1.6	2.1	1.7	1.3	1.1	2.2	1.8
31	4.9	2.9			12.7	5.8			18.7	10.3			19.3	5.5	16.8	5.6			2.2	1.8			2.3	1.9
TOTAL	119.0	56.5	181.3	84.9	319.5	142.7	516.5	138.9	609.1	191.2	702.8	164.7	635.6	177.4	531.3	146.6	371.5	106.3	149.3	86.1	120.4	40.4	88.9	41.1
1971-2000 NORMAL	129.9	71.4	210.1	105.3	362.4	173.9	492.2	178.5	586.3	222.2	638.7	228.1	633.5	216.5	529.0	185.6	351.8	127.6	239.1	92.6	123.7	73.6	95.2	54.3
1981-2010 NORMAL	126.9	68.7	213.0	104.0	371.9	162.9	486.9	186.2	603.5	218.5	625.7	224.4	650.6	209.9	542.1	179.0	374.1	123.2	239.0	96.7	127.2	63.4	100.0	50.0

RADIATION

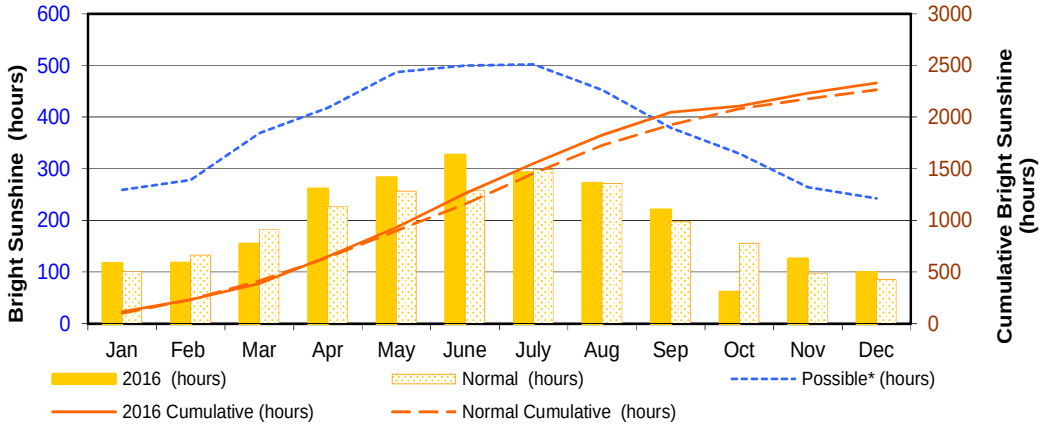
Annual Bright Sunshine Hours



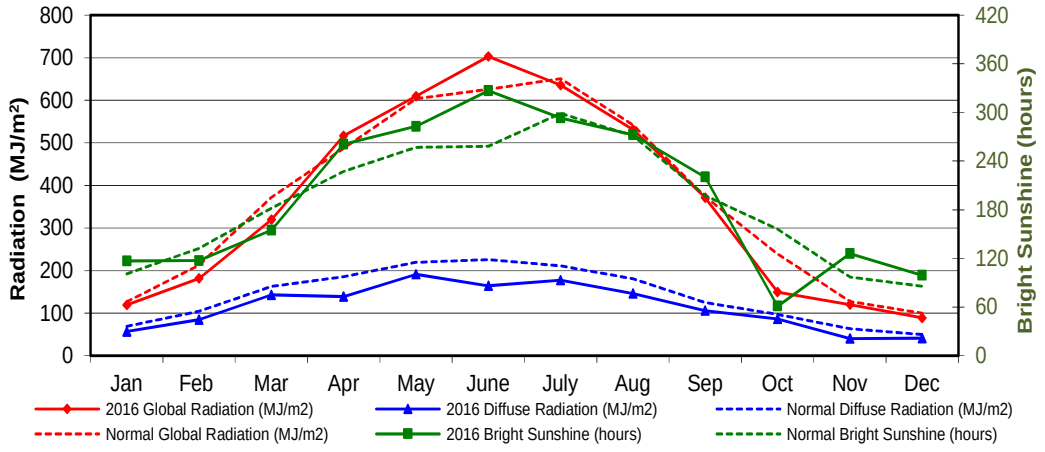
Seasonal Bright Sunshine Hours



Monthly Bright Sunshine Hours



Monthly Comparison Bright Sunshine Hours, Global & Diffuse Radiation



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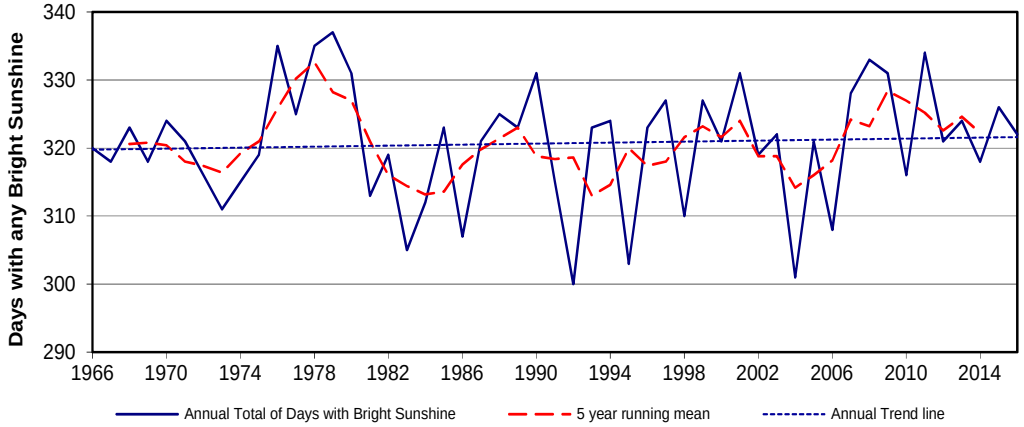
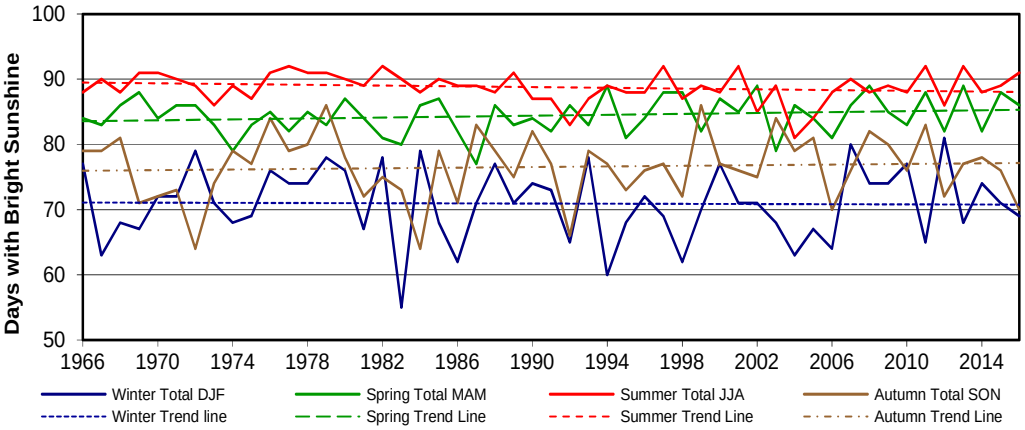
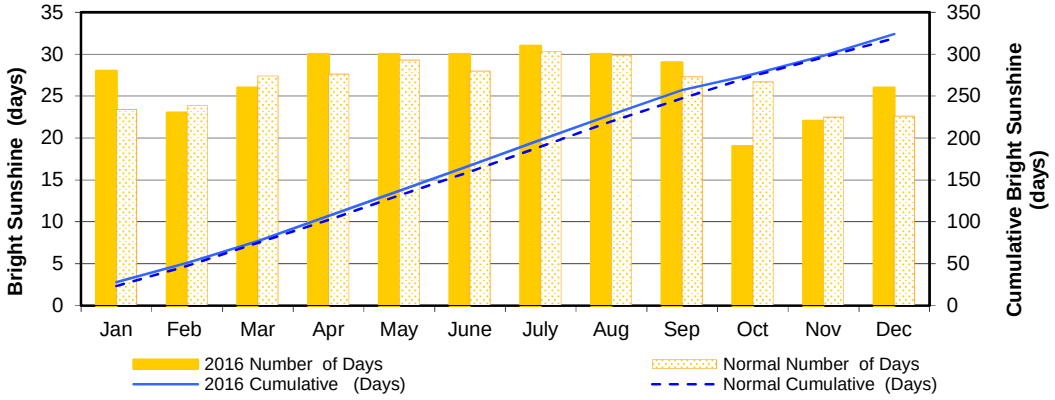


Annual Bright Sunshine Days



Seasonal Bright Sunshine Days



Monthly Bright Sunshine Days

Panoramic View of Climate Reference Station, Saskatoon
May 2015
photo: E. Thiessen

RADIATION
Bright Sunshine Ranking

% OF ACTUAL TO POSSIBLE HOURS BRIGHT SUNSHINE

% ANNUAL		WINTER % DJF		SPRING % MAM		SUMMER % JJA		AUTUMN % SON	
2011	59.9	1980	55.0	2015	68.5	1969	70.7	2011	61.7
2013	59.9	2000	52.8	1980	66.7	1967	69.8	1976	60.3
2015	59.5	2014	51.4	2013	64	1978	69.2	2013	58
1976	58.8	2007	50.9	2011	63.1	1979	67.9	2008	57.3
1980	58.3	2012	49.7	1968	63.0	1984	67.9	2015	55.5
2008	58.1	1979	47.9	2009	62.8	1974	67.7	1966	53.3
1978	57.2	2001	47.8	2008	62.2	1970	67.5	2001	52.9
2007	57.0	1996	47.7	1976	62.1	2011	66.4	1974	52.2
1979	56.8	2002	47.1	1971	60.1	2006	66.1	2007	52.1
1971	56.3	1982	46.6	1969	59.2	1975	65.6	2009	52.1
2009	56.3	1978	46.4	1977	58.8	1971	65.6	2005	52.1
1967	56.0	1976	46.0	2002	58.6	1982	65.4	2010	51.8
2006	55.7	1989	45.8	1998	58.6	1985	64.8	1979	51.3
2001	55.7	2009	45.3	2007	58.6	2013	64.7	1994	51.1
1977	55.4	1971	45.2	1989	57.6	2007	64.7	2012	50.4
1969	55.3	1966	45.1	1981	57.6	1976	64.2	2000	50.3
1975	55.0	1977	45.0	2006	57.4	1983	64.2	1967	50.2
2012	54.8	1984	44.9	2001	56.9	1977	63.8	1982	50.0
1968	54.2	1988	44.8	1994	56.6	2012	63.5	2014	49.7
1970	53.9	1970	44.6	1966	55.7	1968	63.3	1988	49.3
1981	53.8	2008	43.5	1972	55.4	1972	63.3	1978	49.1
1974	53.8	1993	43.4	2016	54.6	1981	63.1	2003	49.1
1966	53.5	2010	43.3	1967	54.4	2015	63.0	1975	48.9
1989	53.1	1975	42.4	1970	53.6	2008	62.9	1990	48.7
1988	53.0	2015	42.3	1979	53.4	1980	62.0	2006	48.5
1982	52.8	1981	42.2	1985	53.4	1991	61.9	1973	48.3
2014	52.5	2003	41.6	2003	53.3	1988	61.8	1980	47.7
2003	52.1	1973	41.2	1975	53.1	2016	61.4	1977	47.6
2016	51.9	1991	40.2	1978	53.0	1973	61.1	1997	47.5
2002	51.6	1995	40.2	2005	52.4	2001	59.2	2004	47.4
1984	51.6	1990	39.7	2014	52.4	2010	58.7	1989	46.5
1990	51.0	2013	39.1	2012	52	1996	58.7	1971	46.2
1973	51.0	2016	39.1	1991	51.7	1966	58.7	1995	45.8
2010	50.7	1987	38.9	1988	51.6	1986	58.2	1987	45.5
1985	50.5	2011	38.8	1992	51.5	1989	58.1	1999	44.2
1991	50.5	1999	38.5	1973	50.8	1990	58.0	2002	44.1
2000	50.0	1968	38.0	1983	50.1	2009	57.8	1968	44.0
1972	49.8	2005	37.9	1990	49.8	2014	57.8	1993	43.8
1997	49.6	2006	37.1	1997	49.3	1997	57.7	1981	43.1
1994	49.6	1997	37.0	1974	49.0	2003	57.4	1969	42.9
2005	49.1	1967	36.5	2004	48.7	2002	53.8	2016	42.0
1983	48.9	1972	36.3	1982	48.3	1999	52.2	1983	41.5
1996	47.9	2004	35.9	1993	48.2	2000	52.1	1991	40.4
1999	46.5	1992	35.9	2000	48.1	1994	51.0	1970	40.2
1995	46.5	1986	35.6	2010	47.6	1995	50.5	1985	39.3
1986	46.0	1985	35.1	1995	47.6	2004	48.5	1998	38.9
1998	46.0	1969	34.0	1984	47.0	2005	48.5	1984	38.1
1987	45.1	1998	33.7	1987	46.8	1992	48.4	1996	37.7
1993	44.9	1974	32.2	1999	45.2	1987	46.3	1986	36.4
2004	44.8	1994	26.9	1986	44.7	1998	45.8	1992	35.3
1992	43.8	1983	24.2	1996	44.1	1993	44.9	1972	33.6

DAYS WITH BRIGHT SUNSHINE

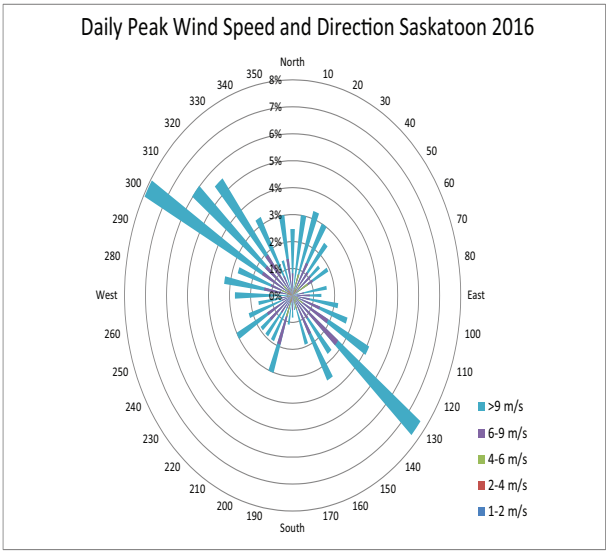
ANNUAL		WINTER DJF		SPRING MAM		SUMMER JJA		AUTUMN SON	
1979	337	2012	81	1994	89	1977	92	1979	86
1976	335	2007	80	2002	89	1982	92	1999	86
1978	335	1972	79	2008	89	1997	92	1976	84
2011	334	1984	79	2014	88	2001	92	2003	84
2008	333	1979	78	1969	88	2011	92	1987	83
1980	331	1982	78	1997	88	2013	92	2011	83
1990	331	1993	78	1998	88	1969	91	2014	64
2001	331	1966	77	2011	88	1970	91	1990	82
2009	331	1988	77	2013	88	1976	91	2008	82
2014	319	2000	77	2015	88	1978	91	1968	81
2007	328	1976	76	1980	87	1979	91	2005	81
1997	327	1980	76	1985	87	1989	91	1978	80
1999	327	1977	74	2000	87	2016	91	2009	80
2015	326	1978	74	1968	86	1967	90	1966	79
1977	325	1990	74	1971	86	1971	90	1967	79
1988	325	2008	74	1972	86	1980	90	1974	79
1970	324	2009	74	1984	86	1983	90	1977	79
1994	324	1991	73	1988	86	1985	90	1985	79
1968	323	1970	72	1992	86	2007	90	1988	79
1985	323	1971	72	2004	86	1972	89	1993	79
1989	323	1996	72	2007	86	1974	89	2004	79
1993	323	1973	71	2016	86	1981	89	1980	78
1996	323	1987	71	1976	85	1986	89	1975	77
2013	323	1989	71	1978	85	1987	89	1991	77
2003	322	2001	71	2001	85	1994	89	1994	77
2016	322	2002	71	2009	85	1999	89	1997	77
1971	321	2015	71	1966	84	2003	89	2000	77
1987	321	1999	70	1970	84	2009	89	2013	77
2000	321	1975	69	1981	84	2015	89	1996	76
2005	321	1997	69	1990	84	1966	88	2001	76
2012	321	2016	69	1996	84	1968	88	2007	76
1966	320	1968	68	2005	84	1984	88	2010	76
1975	319	1974	68	1967	83	1988	88	2015	76
1982	319	1985	68	1973	83	1995	88	1982	75
2002	319	1995	68	1975	83	1996	88	1989	75
1967	318	2003	68	1979	83	2000	88	2002	75
1969	318	2013	68	1989	83	2006	88	1973	74
1972	316	1969	67	1993	83	2008	88	1971	73
2010	316	1981	67	2010	83	2010	88	1983	73
1974	315	2005	67	1977	82	1975	87	1995	73
1991	315	1992	65	1986	82	1990	87	1970	72
1981	313	2011	65	1991	82	1991	87	1981	72
1984	312	2006	64	1999	82	1993	87	1998	72
1973	311	1967	63	2012	82	1998	87	2012	72
1998	310	2004	63	1982	81	1973	86	1969	71
2006	308	1986	62	1995	81	2012	86	1986	71
1986	307	1998	62	2006	81	2002	85	2006	70
1983	305	1994	60	1983	80	2005	84	2016	70
1995	303	2014	74	1974	79	1992	83	1992	66
2004	301	1983	55	2003	79	2014	89	1972	64
1992	300	2010	44	1987	77	2004	81	1984	64

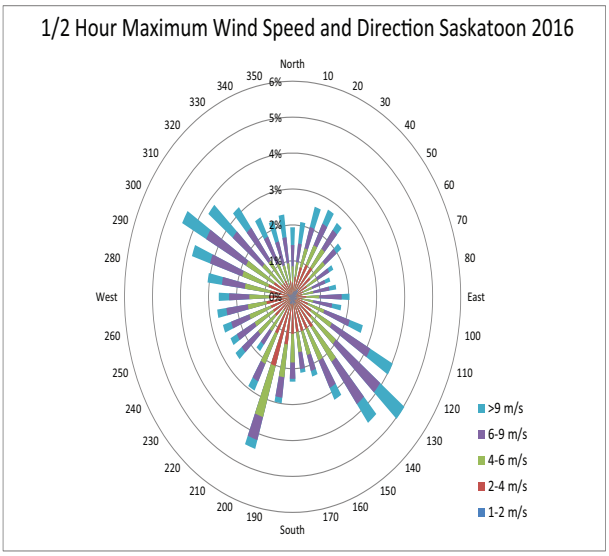
WIND

MONTH	AVERAGE WIND SPEED (km/h)			HIGHEST INSTANTANEOUS WIND SPEED (km/h)						
	2016 Average	Normal*	2016 1/2 Hr. Max Average	2016 for CRS (Speed / direction / date)			Since 1953 (Saskatoon Diefenbaker Int'l. Airport) (Speed / direction / day / year)			
January	12.3	16	18.0	57.0	WNW	27	111	W	11	1986
February	13.8	16	20.0	75.1	NW	7	106	N	22	1988
March	15.6	17	22.8	81.8	W	13	93	W	18	1959
April	17.6	18	26.7	79.7	NW	6	108	W	06	1959
May	16.0	18	24.8	67.1	SSW	21	132	SW	17	1965
June	15.8	17	24.7	71.7	NW	19	117	SW	01	1986
July	11.6	16	19.5	64.9	NNW	3	113	E	05	1955
August	11.7	16	19.5	52.1	W	1 & 31	151	W	14	1967
September	11.8	17	19.3	55.9	WNW	18	148	W	22	1967
October	14.9	17	22.5	60.6	NNE	4	138	NW	16	1967
November	13.7	16	20.8	49.2	N	28	100	W	17	1967
December	14.2	16	21.0	54.3	WNW	12	121	W	12	1955

*1961-90 Normals used are from the Environment Canada, Saskatoon Diefenbaker International Airport station, 1993

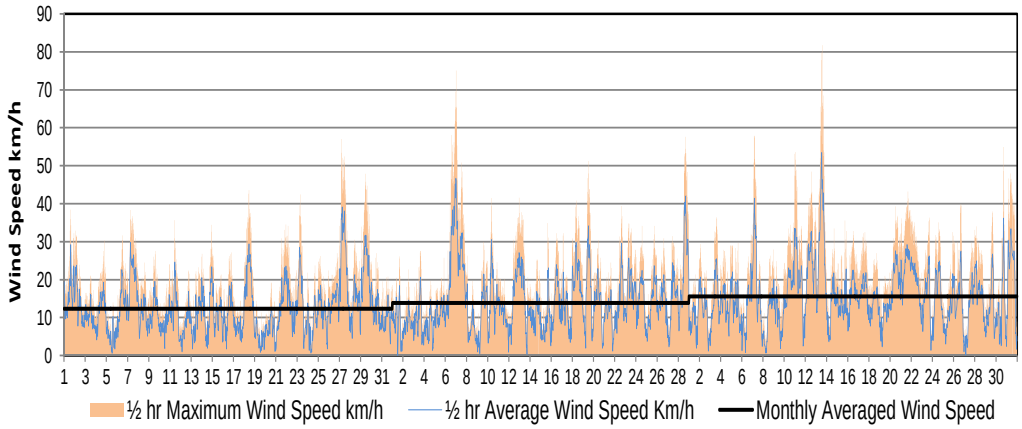
10 Metre Tower with Wind Speed and Direction
13 June 2016
photo: V. Wittrock



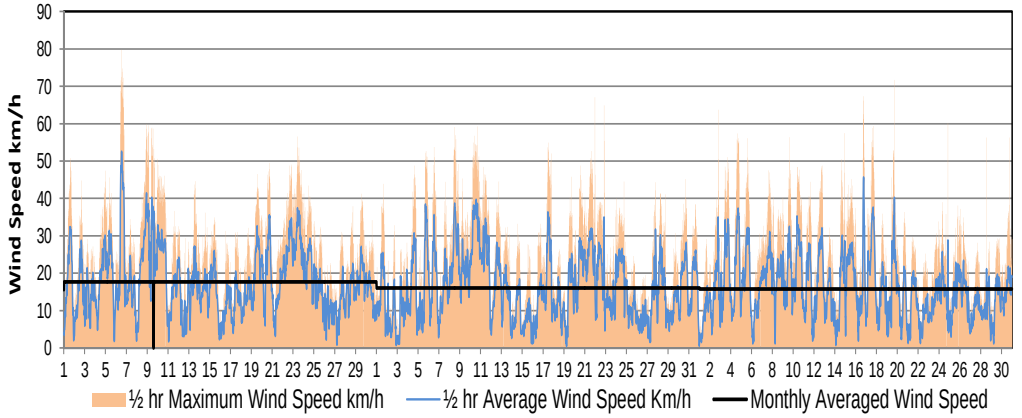


WIND
Daily Wind Speed and Maximum Gust Wind Speed

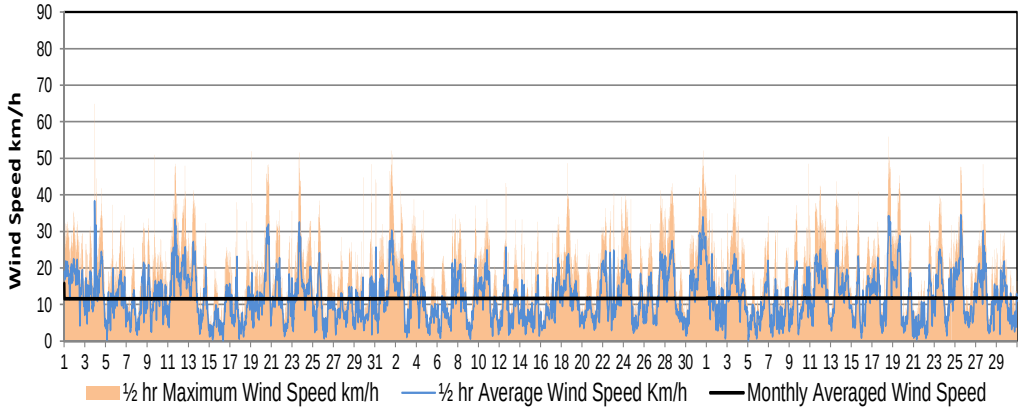
Jannuary
February
March



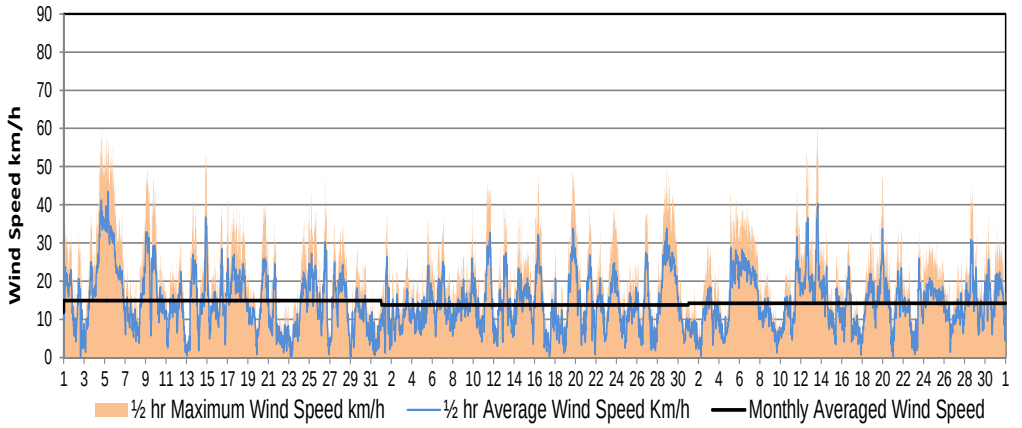
April
May
June



July
August
September



October
November
December



WIND

EXTREME DAILY WINDS (km/h)

Month	Day	WIND SPEED/ DIRECTION	BEAUFORT WIND SCALE DESIGNATION*
January	27	57 WNW	Near Gale
February	6	69.5 NNW	Gale
	7	75.1 NW	Strong Gale
	19	51.2 N	Near Gale
	28	57.6 NNE	Near Gale
March	7	57.9 E	Near Gale
	10	53.1 W	Near Gale
	11	53.6 SW	Near Gale
	13	81.8 W	Strong Gale
	30	55 N	Near Gale
April	1	50.8 NW	Near Gale
	6	79.7 NW	Strong Gale
	8	59.8 SE	Near Gale
	9	59.5 SE	Near Gale
	10	50.6 NNW	Near Gale
	23	56.6 ESE	Near Gale
May	5	52.7 N	Near Gale
	6	53.8 NNW	Near Gale
	8	59.1 SSW	Near Gale
	10	59.3 NNE	Near Gale
	17	54.9 SSW	Near Gale
	21	67.1 SSW	Gale
	22	64.9 WSW	Gale
June	2	63.7 WSW	Gale
	3	51.1 NW	Near Gale
	4	57.4 NW	Near Gale
	5	56.2 N	Near Gale
	9	56.4 WSW	Near Gale
	14	57.5 WNW	Near Gale
	16	67.4 WSW	Gale
	17	59.4 WNW	Near Gale
	19	71.7 NW	Gale
	24	60.1 WNW	Near Gale
	28	56.3 WSW	Near Gale
	30	56.3 SSE	Near Gale
July	3	64.9 NNW	Gale
	9	50.9 SSE	Near Gale
	19	51.9 WNW	Near Gale
	23	51.6 WNW	Near Gale
August	1	52.1 W	Near Gale
	31	52.1 SE	Near Gale
September	18	55.9 WNW	Near Gale
October	4	60.6 NNE	Near Gale
	5	57.3 N	Near Gale
	14	53.3 W	Near Gale
December	12	54.3 WNW	Near Gale

*Near Gale >=50 but < 62 *Gale >=62 but <75
*Strong Gale >=75 but <89 *Storm >=89 but <103
*Violent Storm >=103 but <117

WINDCHILL CALCULATION CHART [1]

T°C / km/h Speed	5°	0°	-5°	-10°	-15°	-20°	-25°	-30°	-35°	-40°	-45°	-50°
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	**-58**
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	**-57**	**-63**
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	**-60**	**-66**
20	1	-5	-12	-18	-24	-30	-37	-43	-49	**-56**	**-62**	**-67**
25	1	-6	-12	-19	-25	-32	-38	-44	-51	**-57**	**-64**	**-70**
30	0	-6	-13	-20	-26	-33	-39	-46	-52	**-59**	**-65**	**-72**
35	0	-7	-14	-20	-27	-33	-40	-47	-53	**-60**	**-66**	**-73**
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	**-61**	**-68**	**-74**
45	-1	-8	-15	-21	-28	-35	-42	-48	**-55**	**-62**	**-69**	**-75**
50	-1	-8	-15	-22	-29	-35	-42	-49	**-56**	**-63**	**-69**	**-76**
55	-2	-8	-15	-22	-29	-36	-43	-50	**-57**	**-63**	**-70**	**-77**
60	-2	-9	-16	-23	-30	-36	-43	-50	**-57**	**-64**	**-71**	**-78**
65	-2	-9	-16	-23	-30	-37	-44	-51	**-58**	**-65**	**-72**	**-79**
70	-2	-9	-16	-23	-30	-37	-44	-51	**-58**	**-65**	**-72**	**-80**
75	-3	-10	-17	-24	-31	-38	-45	-52	**-59**	**-66**	**-73**	**-80**
80	-3	-10	-17	-24	-31	-38	-45	-52	**-60**	**-67**	**-74**	**-81**

Approximate Thresholds

-10	Low	Risk of hypothermia if outside for long periods without adequate protection.
-28	Risky	Risk of frostnip/frostbite on extremities. Exposed skin can freeze in 10 - 30 min.
-40	High Risk	High risk of frostbite. Exposed skin can freeze in 5 - 10 minutes.
-48	Very High Risk	Serious risk of frostbite. Exposed skin can freeze in 2 - 5 minutes.
-55	Extreme Risk	Outdoor conditions are hazardous. Exposed skin can freeze in 2 minutes or less.

1: Environment Canada, 2004b

EXTREME DAILY WIND CHILL WHEN TEMPERATURE <0°C

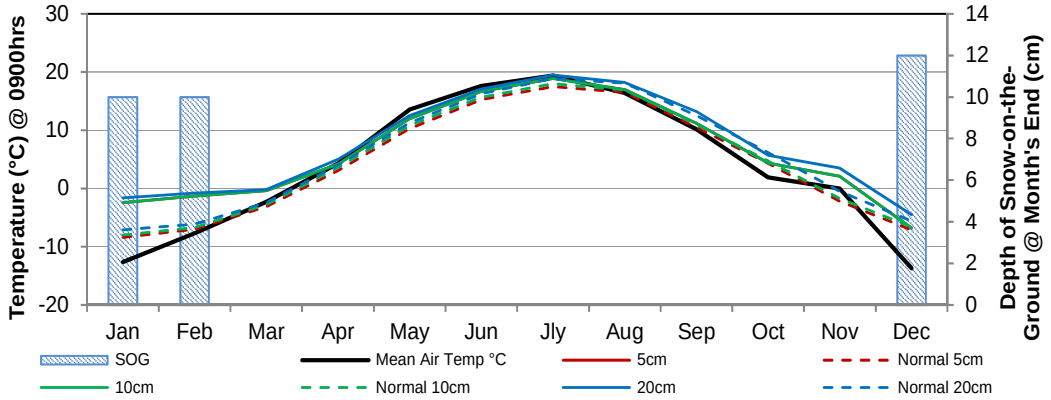
	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-16	-19	-24	-7							-3	-9
2	-18	-23	-16	-6							-6	-10
3	-21	-17	-18	-11								-12
4	-22	-19	-13	-12								-14
5	-24	-21	-11	-8						-10		-25
6	-15	-6	-8							-10		-31
7	-26	-13	-11	-4						-7		-30
8	-29	-15	-7	-11						-8		-34
9	-31	-11	-9	-9								
10	-32	-18	-9	-16						-6		
11	-28	-22		-14						-8		
12	-26	-32		-4						-10		
13	-24	-25			-7					-11		
14	-28	-15	-5							-7		
15	-34	-13	-9	-6						-9	-7	
16	-42	-14	-17	-7						-8	-8	
17	-39	-10	-17	-5							-11	-40
18	-39	-9	-15								-16	-37
19	-28	-17	-15								-16	-11
20	-31	-25	-12								-10	-17
21	-25	-21	-14	-8							-10	-18
22	-22	-16	-17							-5	-9	-14
23	-17	-15	-14							-4	-11	-28
24	-15	-15	-11								-8	-32
25	-18	-18	-12								-11	-28
26	-23	-10	-7								-10	-26
27	-7	-21	-7								-10	-29
28	-13	-31	-8								-12	-16
29	-9	-34									-10	-17
30	-14										-9	-22
31	-15		-7							-6		-23

SOIL TEMPERATURES AND DEPTH OF SNOW-ON-THE-GROUND @ MONTH END

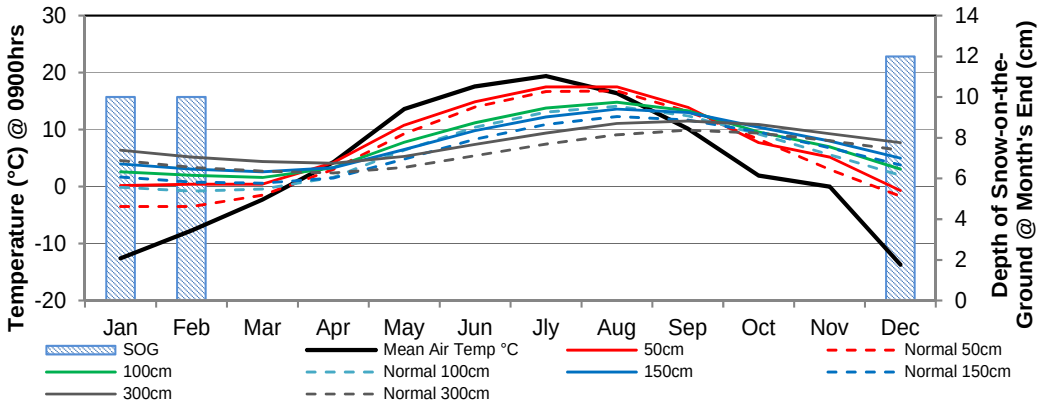
MONTH	Mean Air Temp @ 0900h (°C)	SOIL TEMPERATURES (°C) @ 0900h														Mean Air Temp @ 1600h (°C)	SOIL TEMPERATURES (°C) @ 1600h					
		5cm		10cm		20cm		50cm		100cm		150cm		300cm			5cm		10cm		20cm	
		2016	NORM	2016	NORM	2016	NORM	2016	NORM	2016	NORM	2016	NORM	2016	NORM		2016	NORM	2016	NORM	2016	NORM
January	-12.6	-2.4	-8.4	-2.4	-8.0	-1.6	-7.1	0.2	-3.5	2.6	-0.1	4.0	1.7	6.4	4.6	-8.8	-2.3	-8.4	-2.0	-7.8	-1.6	-6.2
February	-7.7	-1.3	-7.0	-1.3	-6.7	-0.8	-6.1	0.4	-3.5	2.0	-0.8	3.1	0.8	5.2	3.4	-4.1	-1.3	-7.1	-1.0	-6.6	-0.8	-5.2
March	-2.3	-0.4	-3.1	-0.4	-2.8	-0.2	-2.4	0.4	-1.5	1.6	-0.4	2.6	0.6	4.4	2.7	2.3	-0.2	-2.9	-0.2	-2.6	-0.2	-1.8
April	4.3	4.2	3.1	4.2	3.6	5.0	4.0	4.2	3.0	3.3	1.6	3.3	1.5	4.1	2.4	11.4	7.7	6.0	6.2	5.5	4.5	4.6
May	13.6	12.0	10.3	12.0	10.8	12.5	11.3	10.8	9.3	7.8	6.4	6.5	4.8	5.3	3.4	20.2	16.8	14.2	15.2	13.6	12.7	12.0
June	17.6	16.7	15.3	16.7	15.7	17.1	16.3	14.9	14.0	11.2	10.4	9.8	8.3	7.4	5.4	23.7	21.5	20.0	20.1	19.0	17.4	17.1
July	19.4	18.9	17.5	18.9	18.0	19.5	18.9	17.5	16.7	13.8	13.1	12.2	10.9	9.4	7.5	23.6	23.5	22.1	22.2	21.3	19.7	19.5
August	16.4	17.0	16.5	17.0	16.9	18.2	18.1	17.5	16.8	14.8	14.1	13.6	12.3	11.1	9.1	22.2	21.4	20.6	20.3	20.0	18.3	18.6
September	10.2	11.2	10.5	11.2	11.0	13.2	12.5	13.9	13.2	13.3	12.4	13.0	11.7	11.5	9.9	18.3	15.0	13.9	14.1	13.4	13.1	13.1
October	1.9	4.4	4.3	4.4	4.7	5.7	6.2	7.7	8.3	9.6	9.2	10.4	9.6	10.9	9.4	5.2	5.3	6.1	5.4	6.4	5.6	6.9
November	0.0	2.1	-2.2	2.1	-1.7	3.5	-0.5	5.2	3.0	7.0	5.6	8.0	6.8	9.3	8.1	6.1	3.0	-1.4	3.1	-1.2	3.4	0.3
December	-13.7	-6.8	-7.1	-6.8	-6.6	-4.5	-5.6	-0.7	-1.7	3.1	2.0	5.0	3.8	7.7	6.4	-10.6	-6.2	-6.6	-5.6	-6.3	-4.5	-4.6

Normal temperatures (1971-2000) for our site are provided by Environment Canada 2004a

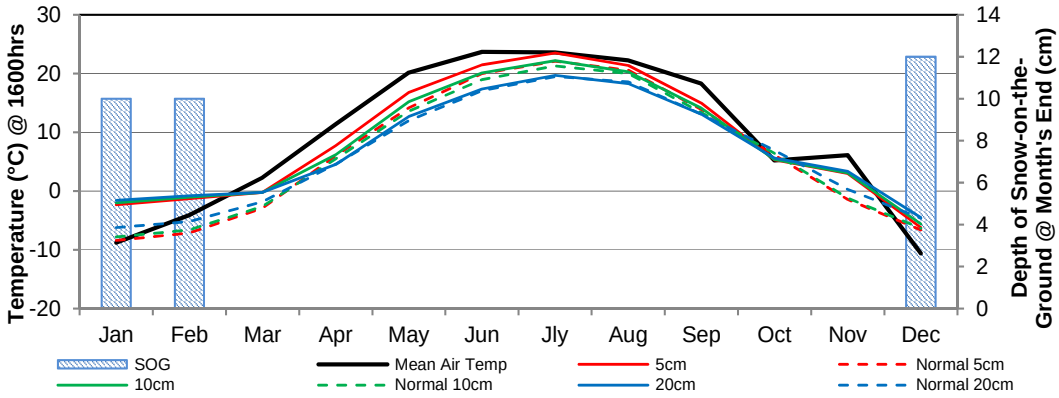
Monthly Soil Temperatures @ 0900h



Monthly Soil Temperatures @ 0900h



Monthly Soil Temperatures @ 1600h



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 (hours of illumination) 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. A temperature base of 24° C is sometimes used as an index of extreme cooling degree-days to indicate potential heat stress. (Environment Canada 2012)

Mathematically:CDD = (T - 18°C), for that day, where T = daily mean temperature in °C if T is equal to or less than18°C, CDD = 0.

Monthly and annual values of CDD 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 mainly from the following data sets:

SRC:1963 to present
Saskatoon Airport: 1942 to present
University of Saskatchewan:1916 to 1963
Eby station: 1901-1941
NWMP: circa1892 to circa 1900 (sporadic)

Station locations, exposures and measurement procedures were subject to change during this time period. Data are <u>not adjusted</u> 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 (1981-2010) 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 at CRS is from January 1st, 1981 to December 31st, 2010. Data derived from CRS conform to this standard, except where noted. The normals for CRS have been calculated using the data collected during this standard period. Where gaps existed, data from the nearest climate station were used and referenced as to being used. (Environment Canada, 1993, 2002, 2004a)

POTENTIAL EVAPOTRANSPIRATION (Thornthwaite Method) is the amount of water which will be lost from a surface completely covered with vegetation if there is sufficient water in the soil at all times for the use of the vegetation. It is computed by means of an empirical formula involving mean monthly temperature and average length of day.

Mathematically: $PET = mT^a$ where PET = Potential of Evapotranspiration; m = % of day length for the month as compared to the year; T = Temperature °C when T is less than or equal to 0; otherwise T = O; and a = yearly heat index. (Thornthwaite and Mather, 1955)

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. 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 a weighing gauge for the winter season and the tipping bucket during frost-free period.

SEASONS Meteorologists prefer to divide the year into four 3-month periods based primarily on temperature. Thus winter is defined as December (previous year), January, and February (DJF); spring as March, April and May (MAM); summer as June, July and August (JJA); and fall as September, October and November (SON). (Lutgens and Tarbuck, 1992)

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 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.

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 describes a sensation, the way we feel as a result of the combined cooling effect of temperature and wind. This feeling can't be measured using an instrument, so a mathematical formula was developed in 1939 that related air temperature and wind speed to the cooling sensation. This formula was revised in 2001 by a team of scientists and medical experts from Canada and the U.S. with the Canadian Department of National Defence contributing human volunteers. The new index is based on the loss of heat from the face.

Mathematically: $WC = 13.12 + (0.6215 \times T) - (11.37 \times V^{0.16}) + (0.3965 \times T \times V^{0.16})$; where WC = wind chill; T= air temperature °C; V= standard wind speed km/h. (Environment Canada 2004b).

WAVES - Temperature waves are defined as a sequence of three or more days when the daily maxiumum/minimum temperatures are higher/lower than, or equal to, a set temperature. For a heat wave the temperature is 32°C. (Environment Canada 2005).

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**

REFERENCES AND BIBLIOGRAPHY

Christiansen, E.A. (ed) 1970. Physical Environment of Saskatoon, Canada. Saskatchewan Research Council Saskatoon, SK in cooperation with National Research Council of Canada, Ottawa, ON.

Environment Canada. 1975. 1974 Annual Meteorological Summary. Atmospheric Environment Service, Environment Canada. Saskatoon, SK.

Environment Canada, Atmospheric Environment Service (AES), 1976. Soil Temperature. AES, Downsview, ON

Environment Canada, Atmospheric Environment Service (AES), 1978. Manual of Climatological Observations, 2nd Ed.AES, Downsview, ON

Environment Canada. 1992. Atmospheric Environment Service Guidelines for Co-operative Climatological Autostation. Atmospheric Environment Service, Environment Canada, Downsview ON.

Environment Canada, Atmospheric Environment Service (AES). 1993. Canadian Climate Normals 1961-1990. Canadian Climate Centre, Downsview ON.

Environment Canada, Meteorological Service of Canada, 2002. Canadian Daily Climate Data on CD-ROM - Western Canada. Climate and Water Products Division, Downsview, ON.

Environment Canada, Meteorological Service of Canada, 2004a. Climate Data Online/Climate Normals and Averages. http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html (accessed 2004, 2007).

Environment Canada, Meteorological Service of Canada, 2004b. Wind Chill Calculation Chart. http://www.msc.ec.gc.ca/education/windchill/windchill_chart_e.cfm (accessed April, 2009).

Environment Canada, Meteorological Service of Canada, 2005. Fact Sheet - Summer Severe Weather Warnings. http:/www.on.ec.gc.ca/severe-weather/summerwx_factsheet-e.html (accessed Feb 2008).

Environment Canada, Meteorological Service of Canada, 2012. Calculation of the 1971 to 2000 Climate Normals for Canada. http://climate.weather.gc.ca/climate_normals/normals_documentation_e.html (accessed Feb 2014).

Goble, R. J., 2002. Volcanoes. In: Introduction to Geology/Physical Geology. http://www.class.unl.edu/geol100/Review2.html (accessed June, 2002)

Heidorn, K., 1998. The Weather Legacy of Admiral Sir Francis Beaufort In: Weather People and History. http://irishculture.about.com/gi/dynamic/offsite.htm?site=http://www.islandnet.com/%257Esee/weather/history/beaufort.htm (accessed July 30, 2001).

Ladd, M.G., 2008. Ladds of New England: Ancestral line of Merle G. Ladd. http://www.laddfamily.com (accessed April 29, 2009)

Lutegens, F. K. and E.J. Tarbuck, 1992. The Atmosphere: An Introduction to Meteorology, 5th Ed.. Prentice Hall, New Jersey.

National Research Council of Canada, Herzberg Institute of Astrophysics, n.d. Sunrise - Sunset Tables for Saskatoon http://www.hia-iha.nrc-cnrc.ca/sunrise_e.html (accessed January 2013, 2014).

Olm, O. 2001. Personal Communication 17 September 2001 with C. Beaulieu. Saskatchewan Research Council, Saskatoon, SK.

Thornthwaite, C.W. 1948. An Approach toward a Rational Classification of Climate. Geographical Review. 38(1):55-94. http://links.jstor.org/sici?sici=0016-7428%28194801%2938%3A1%3C55%3AAATARC%3E2.0.CO%3B2-O

Thornthwaite, C.W. and J.R. Mather. 1955. The Water Balance. Publication in Climatology. 8(1). Drexel Institute of Technology Laboratory of Climatology, Centerton, New Jersey.

U.S. Geological Survey. Cascades Volcano Observatory, n.d. Deadliest Volcanic Eruptions Since 1500 A.D. http://vulcan.wr.usgs.gov (accessed March 27, 2002)

World Meteorological Organization (WMO). 1988. Technical Regulations: General Meteorological Standards and Recommended Practices, 1988 ed., Supplement No. 2 (IV. 1996), WMO – No. 49. Geneva, Switzerland.