Climate Reference Station
Conservation Learning Center
RM of Prince Albert #461
ANNUAL SUMMARY 2014

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

SRC Publication No. 13000-1E15
March 2015

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COVER PHOTOGRAPHS
SRC Climate Reference Station at Conservation Learning Centre
24 July 2014
Photo credit: V. Wittrock

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Enquiries concerning the SRC Climatological 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://blog.src.sk.ca/environment/crs-weather-summaries/

SASKATCHEWAN RESEARCH COUNCIL

Climate Reference Station Supporters, 2014

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Prince Albert Model Forest

CAMPBELL SCIENTIFIC — WHEN MEASUREMENTS MATTER

Conservation LEARNING CENTRE

SRC Publication No. 13000-1E15

Climate Reference Station History

The Saskatchewan Research Council's Climate Reference Station (CRS) at the Conservation Learning Centre (CLC) is situated approximately 16km east of MacDowall, approximately 11km north of St. Louis and 18km south of Prince Albert, Saskatchewan. The oldest recordings of meteorological data in the area are south of the North Saskatchewan River at Prince Albert beginning in 1884 and lasting until 1942. In 1953, the present day Prince Albert station was established at the airport north of the river and east of the city. Other nearby stations recording intermittent data were at MacDowall (1914-2003) and Hoey (south of St. Louis) (1986-2012) with MacDowall recording both precipitation and temperature and Hoey only recording precipitation.

The SRC Climate Reference Station at CLC was established in 2011 and began producing a full array of climate data January 2012. The array consists of temperature, precipitation, humidity, barometric pressure, wind, solar radiation, and soil moisture and temperature. The site is a self-contained unit with power generated from solar panels while the data is retrieved from the data logger by an internet connection via the cellular network.

Activities Associated with the CRS at CLC in 2014

The CLC is a research and demonstration farm. Its outreach program for grades 3 to 11 students,science clubs or other interested groups offers hands-on activities related to soil, water, air, and wildlife habitat.[1] The SRC Climate Reference Station is included in the program exposing participants to the CRS's suite of instruments. The station emphasizes the importance of climate in the practical world of farming and ecology.

Important events in 2014 included the installation of an automated shadow band for the diffuse radiation Sensor (January), replacement of the Multiplexer (January), replacement bright sunshine recorder (February), and replacement snow depth sensor (December).

The 2014 field day at CLC occurred on July 24th. Virginia Wittrock gave an on-site presentation to approximately 50 participants explaining the importance of the CRS, potential usages of the data as well as how the data had been utilized since it's installation in 2011.

[1]Conservation Learning Centre 2011

Conservation Learning Centre
24 July 2014
Photo: V. Wittrock

Conservation Learning Centre
20 Feb 2014
Photo: DE&M, SRC

What is the Climate Reference Station?

The Saskatchewan Research Council's Climate Reference Station (SRC CRS) at the Conservation Learning Centre is classified as a principal climatological station with supplementary climatological observations.[1] A reference climatological station's data are intended for the purpose of determining climatic trends which require 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. As the Climate Reference Station is in its infancy, data for trend analyses are not available. At the station, half-hourly readings are taken of elements which include temperature, precipitation amount, humidity, wind, and atmospheric pressure. Our supplemental observations include rainfall intensity, soil temperature, soil moisture, snow depth, bright sunshine and solar radiation. High quality and consistent climatological observations are maintained which will provide 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 meteorological 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, health and comfort.

The CRS will allows us to:

- Evaluate long term climate trends after operating for a standard period - early warning system for increased frequencies of extreme events such as drought, floods, etc.;
- Determine the impacts of climate events on society, economy, health, and ecosystems - e.g. intense rainfall causing flooding and property damage, heat stress with its implications for health;
- Conduct value-added research;
- Be part of regional, national and global networks in an important agricultural and ecological area;
- Facilitate development of additional programs - e.g. air quality, biodiversity, and climate change monitoring;
- Have roles in various programs within SRC and collaborative research with other agencies
- Provide climate data to accident studies, agricultural sectors, authors, building science, chemical companies, construction firms, governments, insurance agencies, lawyers, media, recreation facilities, schools, tourism groups, transportation studies, universities, wildlife studies, and interested individuals.

Goals

The goals of the Climate Reference Station are first, to gather high quality of data at its current location and, second, to monitor a large variety of elements. These various elements combined with a long-term collection period as well as the stable location will allow CRS to be an extremely valuable climate information collection station.

[1]*Environment Canada 1992*

SRC Publication No. 13000-1E15

Summaries for 2014
Overview

Data, including temperature, precipitation, wind speed and direction, bright sunshine, solar radiation, soil temperature and moisture, was recorded during 2014 by the Saskatchewan Research Council's (SRC) Climate Reference Station (CRS) at the Conservation Learning Centre (CLC) (53.03 N, 105.77 W), located in the Rural Municipality of Prince Albert #461, Saskatchewan.

The third full year of operation at SRC's CRS at the Conservation Learning Centre had some very interesting weather phenomena. The 2013-14 winter (December, January and February) was very cold with 34 days having temperatures below -30°C. If November and March are included, the number of cold spell days is extended to 43. These cold temperatures resulted in heating degree-days of 3406.8, which is more than 270 calculated from the 2012-13 winter. Two hot spells of over 30 °C were recorded in 2014, with the frost-free season being 120 days and having 105.6 cooling degree-days from May to September. The frost-free season was 11 days longer in 2013, but it also had seven days with above 30 °C temperatures.

Snow-on-ground was not as extreme in 2013-14 compared to the 2012-13 winter. The snowpack's greatest depth was recorded at 50 cm in early March and was gone by April 22. The snow pack in 2012-13 reached a depth of 83 cm in early April and was not fully melted until early May. The wettest month was June with 111.4 mm recorded, but September and October were quite dry with only 17.1 mm recorded over the two months, resulting in great harvest weather.

Three strong wind events were recorded in 2014 with January 15 having winds of over 95 km/h. April and May recorded near gale winds (over 50 km/h).

The combined cold winter and wind speed resulted in high-risk wind chills calculated 23 times and very high-risk calculated four times in 2014. The combination of wind and cold temperatures brought the wind chill value down to -50 °C on January 5.

The snow pack and cold air temperatures in the winter/early spring of 2013-14 contributed to colder soils. In 2013, the 50 cm soil depth barely went below 0 °C, while in 2014; this level went down to -0.6 °C. The soils at the 10 cm level did not go back above zero until May. The 10 cm level did not go below zero again until mid-November.

Automated shade ring for diffuse pyranometer
17 Jan 2014
photo credit: DE&M, SRC

Temperature 2014

Noted 2014 Temperature Events	
Cold Spell (less than or equal to -30°C)	
Date	Temperature (°C)
January 1	-37.8
January 2	-36.2
January 4	-30.7
January 5	-33.8
January 6	-36.5
January 7	-36.7
January 8	-38.6
January 22	-32.4
January 27	-32.4
February 9	-32.2
February 10	-33.7
February 12	-33.8
February 20	-30.5
February 21	-32.7
February 24	-30.8
February 25	-32.7
February 26	-31.5
February 27	-36.8
February 28	-34.1
March 1	-35.8
March 2	-30.2
March 3	-34.2
March 4	-30.7
March 7	-34.4
November 26	-32.4
December 2	-30.1
December 26	-30.4
December 27	-33.0
December 28	-33.5
Hot Spell (Greater than or equal to 30°C)	
May 23	31.3
August 14	30.1
Last Spring Frost	
14-May	-2.5
First Fall Frost	
12-Sep	-0.3
Frost-free Season Length	
120 Days	

	Average Maximum (°C)	Average Minimum (°C)	Average Mean (°C)	2014 Extreme Values (°C)		Growing Degree-days	Heating Degree-days	Cooling Degree-days	Extreme Cooling Degree-days
	2014	2014	2014	Max/Date	Min/Date	base 5°	base 18°	base 18°	base 24°
January	-10.3	-23.2	-16.8	8.1/15	-38.6/08	0.0	1078.3	0.0	0.0
February	-15.1	-26.9	-21	0.7/18	-36.8/27	0.0	1092.4	0.0	0.0
March	-4.3	-18.4	-11.4	10.1/17	-35.8/01	0.0	910.3	0.0	0.0
April	4.6	-4.8	-0.1	15.9/30	-21.9/01	9.4	542.9	0.0	0.0
May	16.1	4.1	10.2	31.3/23	-3.5/03	176.4	249.5	6.3	0.0
June	19.5	10.2	14.9	27.5/28	3.1/07	296.2	101.8	8.0	0.0
July	24.3	13.1	18.7	28.8/31	9.6/13	425.4	12.5	34.9	0.0
August	23.8	13.0	18.4	30.1/14	5.4/25	416.5	39.7	53.2	0.0
September	17.7	6.0	11.9	29.2/23	-0.3/12	207.1	187.3	3.2	0.0
October	11.1	1.3	6.2	23.2/21	-4.3/30	78.1	364.7	0.0	0.0
November	-6.9	-13.9	-10.4	8.0/01	-32.4/26	0.0	852.6	0.0	0.0
December	-6.4	-14.6	-10.5	7.1/11	-33.5/28	0.0	884.9	0.0	0.0
Average	6.2	-4.5	0.8		Total Sum	1609.1	6316.9	105.6	0.0

Daily Maximum

2014	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-22.5	-13.0	-22.3	-5.0	16.3	17.6	22.5	24.2	20.3	14.8	8.0	-16.2
2	-10.0	-11.5	-13.6	0.8	6.8	22.5	22.8	25.2	18.7	8.4	2.4	-10.9
3	-9.0	-16.5	-13.7	6.6	3.9	24.8	25.2	26.8	17.9	3.6	1.7	-7.9
4	-23.2	-20.5	-16.6	1.7	6.5	19.2	27.4	27.4	19.2	6.2	1.6	-6.9
5	-29.2	-16.5	-12.1	5.4	7.1	12.1	25.8	27.8	17.0	10.2	3.6	-6.8
6	-24.8	-15.2	-6.9	3.7	8.3	12.3	25.8	25.5	19.1	11.0	3.1	-8.1
7	-20.3	-10.8	-13.8	9.3	7.8	18.2	23.5	28.5	23.6	11.6	3.1	-8.0
8	-12.1	-19.9	-4.6	12.7	14.5	16.5	23.0	25.9	8.5	6.9	-3.6	-8.4
9	-7.7	-19.6	2.0	8.9	17.9	15.6	27.2	20.4	8.1	13.0	-9.2	2.6
10	-5.0	-21.4	4.4	8.8	10.6	12.6	24.5	23.3	6.7	18.7	-9.9	5.0
11	-4.8	-18.2	-1.1	2.2	7.8	20.7	22.3	27.9	10.1	18.4	-7.7	7.1
12	-7.0	-22.2	6.6	-2.7	10.5	23.7	20.4	29.5	14.0	16.7	-10.1	5.2
13	-6.5	-19.1	6.1	-2.3	9.8	20.8	20.9	26.2	10.9	17.5	-10.3	0.3
14	-7.5	-11.6	-4.4	-2.4	17.0	19.4	24.0	30.1	15.8	17.6	-11.9	-1.7
15	8.1	-16.9	-7.2	-1.6	16.5	12.9	25.6	25.8	21.0	13.6	-8.2	-2.8
16	0.5	-8.9	9.5	-1.9	20.1	14.5	27.8	24.7	19.3	8.6	-7.1	-5.5
17	4.0	-3.1	10.1	2.1	17.1	19.1	25.6	24.5	14.6	7.6	-7.9	-6.9
18	2.0	0.7	3.9	0.0	17.8	20.9	22.5	28.5	19.1	17.6	-7.3	-6.1
19	-5.9	-12.2	5.8	3.9	14.7	18.1	22.9	26.3	21.5	19.5	-7.8	-7.4
20	-16.9	-15.6	2.9	7.2	19.0	18.8	21.9	20.0	19.5	20.3	-3.9	-6.3
21	-7.4	-12.6	-11.9	13.2	23.7	19.1	24.4	18.4	26.2	23.2	1.4	-4.2
22	-19.7	-14.7	-10.9	15.2	28.1	21.1	25.1	18.7	28.7	11.4	-5.1	-5.1
23	-1.0	-20.2	-5.4	9.9	31.3	21.6	25.0	15.8	29.2	12.5	-11.6	-4.3
24	2.4	-17.2	-9.8	1.8	26.4	21.6	24.8	13.6	24.6	10.6	-7.6	-3.5
25	-0.6	-17.1	-6.1	1.7	20.3	23.5	19.4	17.3	25.2	8.1	-10.6	-5.3
26	-10.0	-13.5	-5.8	4.1	14.4	22.8	20.2	23.6	23.5	6.8	-16.9	-12.9
27	-23.5	-14.8	-3.8	7.5	18.9	25.6	21.8	27.5	11.8	3.6	-12.2	-14.6
28	-13.0	-19.8	-3.0	2.1	18.0	27.5	25.1	22.3	7.9	0.3	-17.1	-23.2
29	-11.2		2.9	8.4	22.1	23.8	28.1	22.3	14.5	0.8	-21.2	-21.5
30	-21.9		-4.7	15.9	21.7	17.7	27.6	19.5	13.7	1.1	-23.5	-11.5
31	-15.8		-9.2		24.9		28.8	19.5		4.8		-3.8

Temperature 2014

Daily Minimum

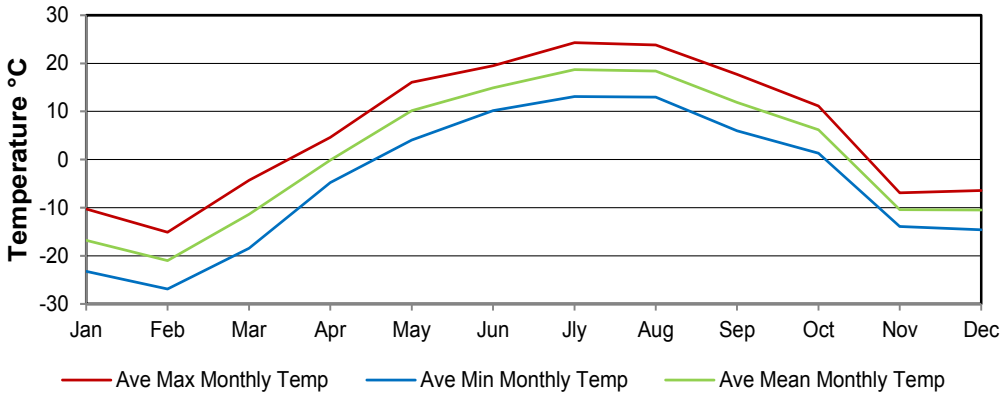
2014	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-37.8	-18.5	-35.8	-21.9	1.9	9.6	13.1	17.1	8.1	6.3	-1.9	-27.7
2	-36.2	-20.8	-30.2	-9.4	-1.5	6.4	12.5	12.9	8.7	0.6	-0.3	-30.1
3	-23.9	-24.8	-34.2	-10.3	-3.5	9.0	14.0	13.1	10.4	-2.8	-0.7	-29.8
4	-30.7	-27.2	-30.7	-10.8	-2.4	10.4	16.6	17.1	7.6	-2.4	-2.3	-13.1
5	-33.8	-28.3	-22.3	-6.6	1.5	4.8	14.3	15.3	9.3	0.9	-0.8	-17.0
6	-36.5	-24.7	-24.9	-3.2	-0.8	3.7	13.1	16.9	9.5	2.2	-3.6	-14.0
7	-36.7	-24.9	-34.4	-1.5	-2.3	3.1	13.8	16.3	8.3	-1.2	-3.7	-11.0
8	-38.6	-27.3	-21.1	-1.7	-1.2	4.9	14.2	13.8	5.4	-3.3	-11.8	-19.3
9	-14.9	-32.2	-12.5	-0.5	3.7	5.7	13.6	11.8	1.2	-0.4	-13.8	-10.5
10	-11.8	-33.7	-5.4	-0.7	-1.3	7.4	14.9	9.6	1.9	0.6	-14.0	-0.1
11	-9.0	-29.3	-13.2	-3.6	-2.0	5.1	13.3	13.9	2.3	6.3	-13.0	0.5
12	-14.4	-33.8	-14.4	-8.0	0.7	6.1	12.2	13.1	-0.3	3.6	-18.8	-3.9
13	-19.9	-27.5	-4.4	-11.9	-0.1	11.5	9.6	14.9	4.3	1.1	-19.5	-4.6
14	-20.5	-19.1	-13.4	-15.5	-2.5	8.0	9.6	16.2	0.0	3.6	-20.2	-3.6
15	-7.5	-25.0	-15.2	-8.0	4.9	10.0	10.5	16.5	1.8	2.5	-14.7	-7.3
16	-18.0	-22.0	-8.4	-11.1	8.4	10.3	11.9	14.0	3.9	3.8	-12.7	-7.0
17	-4.1	-15.8	-9.0	-9.7	7.7	11.0	16.1	17.5	3.6	1.6	-13.6	-8.7
18	-7.5	-18.0	-5.9	-2.8	5.7	12.3	14.3	15.5	6.6	3.1	-13.0	-8.5
19	-21.0	-20.5	-8.2	-2.6	6.3	14.0	13.7	15.0	9.8	2.8	-18.1	-9.6
20	-29.0	-30.5	-12.0	-4.1	4.5	13.3	12.2	14.8	6.5	2.9	-18.8	-9.5
21	-21.5	-32.7	-20.2	0.1	4.1	12.5	10.0	12.3	3.8	11.4	-5.1	-7.0
22	-32.4	-22.6	-23.0	0.5	9.5	13.9	11.2	11.2	8.1	4.7	-11.8	-6.4
23	-27.1	-28.0	-24.7	1.8	12.1	14.6	13.6	11.4	9.8	0.3	-19.8	-7.9
24	-13.4	-30.8	-16.6	-1.0	13.1	11.6	14.4	10.1	9.5	3.9	-16.1	-6.8
25	-13.8	-32.7	-22.5	-1.4	11.6	13.1	11.3	5.4	13.3	1.0	-19.3	-25.6
26	-27.9	-31.5	-13.0	-0.3	9.3	15.3	13.5	5.4	10.3	0.3	-32.4	-30.4
27	-32.4	-36.8	-14.9	0.3	7.2	13.7	12.5	11.9	4.7	-0.6	-19.1	-33.0
28	-29.3	-34.1	-19.7	-0.2	7.2	13.7	12.9	12.3	1.6	-2.8	-21.4	-33.5
29	-22.1		-15.5	-0.2	9.9	16.6	13.5	12.3	0.0	-1.6	-28.8	-29.1
30	-25.5		-21.1	0.9	8.6	15.1	15.6	6.2	10.2	-4.3	-28.6	-26.8
31	-22.4		-24.2		7.8		15.6	10.5		-3.7		-11.5

Daily Mean

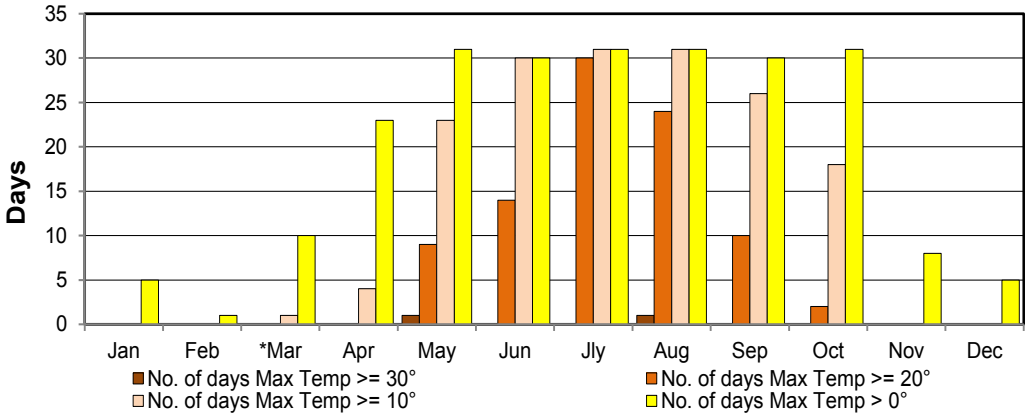
2014	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-30.2	-15.8	-29.1	-13.5	9.1	13.6	17.8	20.7	14.2	10.6	3.1	-22.0
2	-23.1	-16.2	-21.9	-4.3	2.7	14.5	17.7	19.1	13.7	4.5	1.1	-20.5
3	-16.5	-20.7	-24.0	-1.9	0.2	16.9	19.6	20.0	14.2	0.4	0.5	-18.9
4	-27.0	-23.9	-23.7	-4.6	2.1	14.8	22.0	22.3	13.4	1.9	-0.4	-10.0
5	-31.5	-22.4	-17.2	-0.6	4.3	8.5	20.1	21.6	13.2	5.6	1.4	-11.9
6	-30.7	-20.0	-15.9	0.3	3.8	8.0	19.5	21.2	14.3	6.6	-0.3	-11.1
7	-28.5	-17.9	-24.1	3.9	2.8	10.7	18.7	22.4	16.0	5.2	-0.3	-9.5
8	-25.4	-23.6	-12.9	5.5	6.7	10.7	18.6	19.9	7.0	1.8	-7.7	-13.9
9	-11.3	-25.9	-5.3	4.2	10.8	10.7	20.4	16.1	4.7	6.3	-11.5	-4.0
10	-8.4	-27.6	-0.5	4.1	4.7	10.0	19.7	16.5	4.3	9.7	-12.0	2.5
11	-6.9	-23.8	-7.2	-0.7	2.9	12.9	17.8	20.9	6.2	12.4	-10.4	3.8
12	-10.7	-28.0	-3.9	-5.4	5.6	14.9	16.3	21.3	6.9	10.2	-14.5	0.7
13	-13.2	-23.3	0.9	-7.1	4.9	16.2	15.3	20.6	7.6	9.3	-14.9	-2.2
14	-14.0	-15.4	-8.9	-9.0	7.3	13.7	16.8	23.2	7.9	10.6	-16.1	-2.7
15	0.3	-21.0	-11.2	-4.8	10.7	11.5	18.1	21.2	11.4	8.1	-11.5	-5.1
16	-8.8	-15.5	0.6	-6.5	14.3	12.4	19.9	19.4	11.6	6.2	-9.9	-6.3
17	0.0	-9.5	0.6	-3.8	12.4	15.1	20.9	21.0	9.1	4.6	-10.8	-7.8
18	-2.8	-8.7	-1.0	-1.4	11.8	16.6	18.4	22.0	12.9	10.4	-10.2	-7.3
19	-13.5	-16.4	-1.2	0.7	10.5	16.1	18.3	20.7	15.7	11.2	-13.0	-8.5
20	-23.0	-23.1	-4.6	1.6	11.8	16.1	17.1	17.4	13.0	11.6	-11.4	-7.9
21	-14.5	-22.7	-16.1	6.7	13.9	15.8	17.2	15.4	15.0	17.3	-1.9	-5.6
22	-26.1	-18.7	-17.0	7.9	18.8	17.5	18.2	15.0	18.4	8.1	-8.5	-5.8
23	-14.1	-24.1	-15.1	5.9	21.7	18.1	19.3	13.6	19.5	6.4	-15.7	-6.1
24	-5.5	-24.0	-13.2	0.4	19.8	16.6	19.6	11.9	17.1	7.3	-11.9	-5.2
25	-7.2	-24.9	-14.3	0.2	16.0	18.3	15.4	11.4	19.3	4.6	-15.0	-15.5
26	-19.0	-22.5	-9.4	1.9	11.9	19.1	16.9	14.5	16.9	3.6	-24.7	-21.7
27	-28.0	-25.8	-9.4	3.9	13.1	19.7	17.2	19.7	8.3	1.5	-15.7	-23.8
28	-21.2	-27.0	-11.4	1.0	12.6	20.6	19.0	17.3	4.8	-1.3	-19.3	-28.4
29	-16.7		-6.3	4.1	16.0	20.2	20.8	17.3	7.3	-0.4	-25.0	-25.3
30	-23.7		-12.9	8.4	15.2	16.4	21.6	12.9	12.0	-1.6	-26.1	-19.2
31	-19.1		-16.7		16.4		22.2	15.0		0.6		-7.7

Temperature 2014

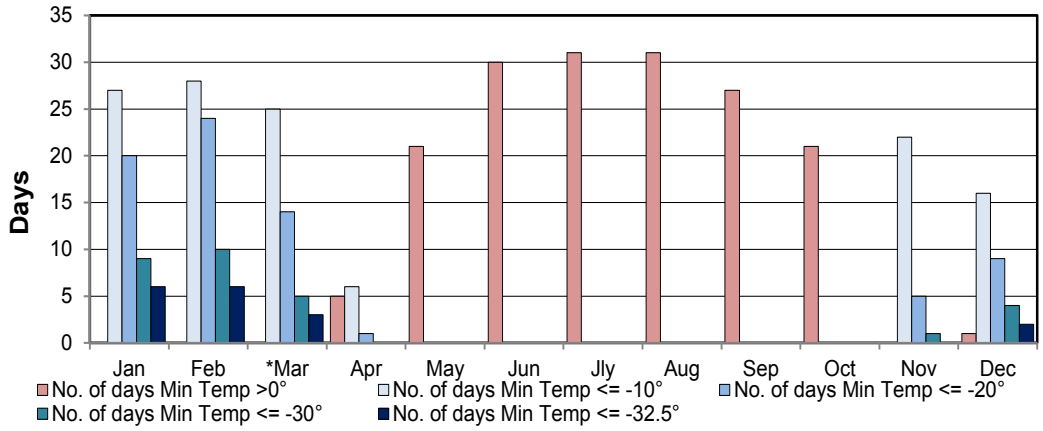
Monthly Comparison



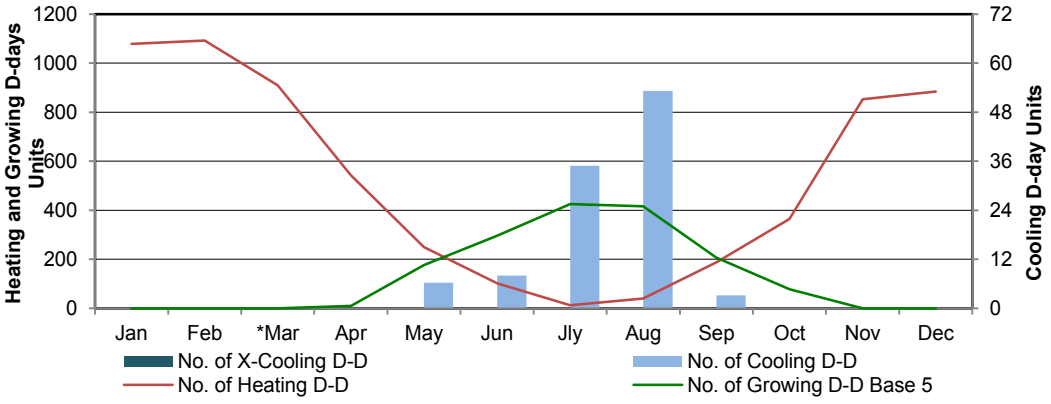
Maximum temperature relative to a set points



Minimum temperature relative to set points



Degree-days Monthly



Precipitation 2014

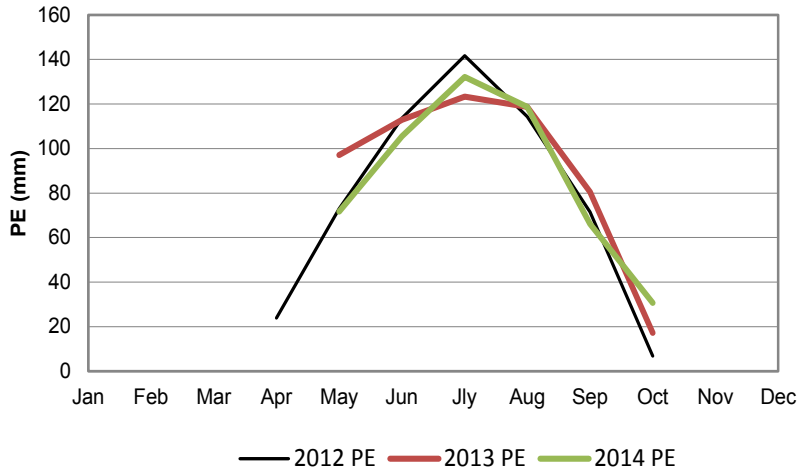
Extreme Precipitation Events		
Period	Date	Amount
0.5 Hour	July 18	13.4mm
0.5 Hour	August 19	7.4mm
1 Hour	July 18	16.4mm
1 Hour	August 20	12.0mm
2 Hours	July 18	23.4mm
2 Hours	August 20	18.6mm
6 Hours	August 20	30.2mm
6 Hours	July 18	30.0mm
12 Hours	August 20	36.4mm
12 Hours	July 18	36.2mm
24 Hours	August 19-20	45.8mm
24 Hours	June 18-19	38.8mm
Daily	June 19	37.4mm
Daily	August 20	35.4mm
More than one day	June 18-23	51.6mm
Longest wet spell*	April 23-29	7 Days
Longest dry spell	Sept 15-Oct 1	17 Days

* Weighing Gage Value

Ranking By Driest Month			
Amount (mm)		**% of Possible Days**	
January	8.9	March	9.7
December	4.7	October	12.9
October	6.1	*May	12.9
March	7.3	April	13.3
February	9.9	*August	16.2
September*	11.0	*September	23.3
November	34.2	February	28.6
May*	46.8	January	32.3
April	52.5	December	45.2
August*	69.6	November	46.6
July*	87.8	*July	48.4
June*	111.4	*June	53.3

**Tipping Bucket value*

Potential Evapotranspiration (PE) using the Thornthwaite Method[1]



Month	2012 PE (mm)	2013 PE (mm)	2014 PE (mm)
Jan			
Feb			
Mar			
Apr	24.0		
May	73.0	97.1	71.6
Jun	113.6	112.9	105.4
Jly	141.7	123.3	132.2
Aug	114.4	118.7	118.7
Sep	71.5	80.6	66.2
Oct	6.8	17.2	30.7
Nov			
Dec			
Total	545.0	549.9	524.9

[1] Thornthwaite and Mather 1955
Thornthwaite 1948

Weighing Gauge, AES Standard Manual Gauge, Tipping Bucket and Snow Depth Sensor
photo credit: V. Wittrock
June 2014

Precipitation 2014

Month	AMOUNT (mm)		Month end Snow-on-Ground (cm)	Days with Measurable Precipitation	
	Individual 2014	Cumulative 2014		Individual 2014	Cumulative 2014
January	8.9	8.9	43.0	8	8
February	9.9	18.8	48.0	6	14
March*	7.3	26.1	42.0	8	22
April	52.5	78.6	52.0	13	35
May	46.8	125.4	0.0	8	43
June	111.4	236.8	0.0	17	60
July	87.8	324.6	0.0	10	70
August	69.6	394.2	0.0	12	82
September	11.0	405.2	0.0	8	90
October	6.1	411.3	0.0	7	97
November	34.2	445.5	M	21	118
December	4.7	450.2	11.0	9	127
Total	450.2			127	

*M=missing due to instrument malfunction

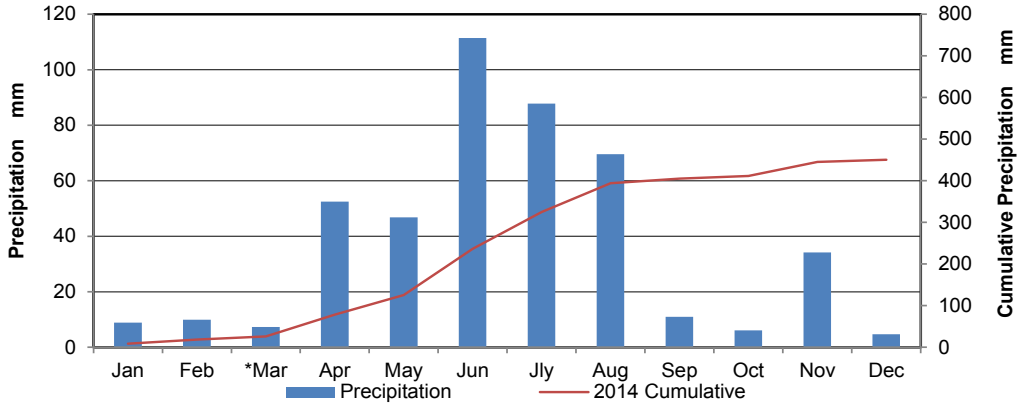
Daily Precipitation Values

2014	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.2	4.8	0.0	0.0	0.0
2	0.0	0.3	0.0	0.0	0.0	0.0	12.6	0.0	0.2	0.3	7.2	0.0
3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	8.9	0.0
4	0.0	0.0	4.2	0.0	0.0	9.2	1.6	0.0	0.0	0.2	0.0	0.0
5	0.0	0.0	0.0	0.0	2.4	0.8	0.0	0.0	0.0	0.0	1.9	0.0
6	0.0	0.0	1.6	0.3	0.0	0.2	9.0	0.4	0.4	0.0	4.4	0.0
7	0.5	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3	0.0
8	0.2	0.0	0.3	0.0	0.0	4.2	0.0	2.6	1.8	0.0	0.0	0.0
9	0.3	0.0	0.0	0.0	0.0	1.8	0.0	0.6	0.0	0.0	0.0	0.0
10	0.0	0.0	0.2	0.0	0.0	1.0	1.2	0.0	0.0	0.0	0.2	0.0
11	3.4	3.4	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
12	0.0	1.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
13	0.0	0.9	0.4	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.1	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0
15	0.0	0.0	0.0	0.0	0.2	7.0	0.0	0.0	0.0	0.2	0.0	0.0
16	0.0	3.5	0.2	0.0	0.0	4.8	0.0	0.0	0.0	0.7	0.1	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	8.2	2.6	0.0	0.0	0.3	0.0
18	0.0	0.0	0.2	7.4	0.0	3.8	28.2	0.0	0.0	0.0	0.0	0.0
19	0.9	0.0	0.0	0.3	1.4	36.2	0.0	10.6	0.0	0.0	0.1	0.0
20	0.0	0.0	0.0	0.0	0.0	6.2	0.0	35.4	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.4	0.0	0.0	0.3	0.0
22	0.0	0.0	0.0	0.0	0.4	3.6	0.0	0.0	0.0	1.5	3.7	0.0
23	0.0	0.0	0.0	7.3	0.0	0.2	0.0	0.0	0.0	0.0	0.4	0.0
24	0.0	0.0	0.0	3.8	0.0	0.0	19.6	0.0	0.0	0.0	1.0	0.0
25	3.1	0.0	0.0	1.3	0.0	0.0	4.0	0.0	0.0	0.0	0.4	0.0
26	0.3	0.0	0.0	0.2	18.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	4.1	9.0	0.0	0.0	0.0	0.0	2.7	0.1	0.0
28	0.0	0.0	0.0	10.9	0.0	0.6	2.8	0.4	0.0	0.5	3.5	0.0
29	0.0		0.0	9.2	13.2	15.8	0.0	0.2	0.0	0.0	0.4	0.0
30	0.0		0.0	0.0	0.0	14.4	0.0	7.6	0.0	0.0	0.0	0.0
31	0.0		0.0		1.6		0.0	8.6		0.0		0.0
Total	8.9	9.9	7.3	52.5	46.8	111.4	87.8	69.6	11.0	6.1	34.2	0.0

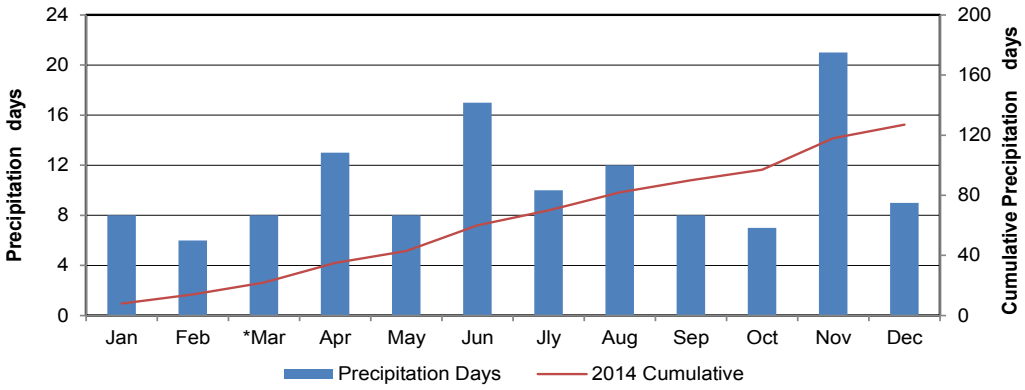
Storm clouds by Wakaw, SK photo credit: V Wittrock 24 July 2014

Precipitation 2014

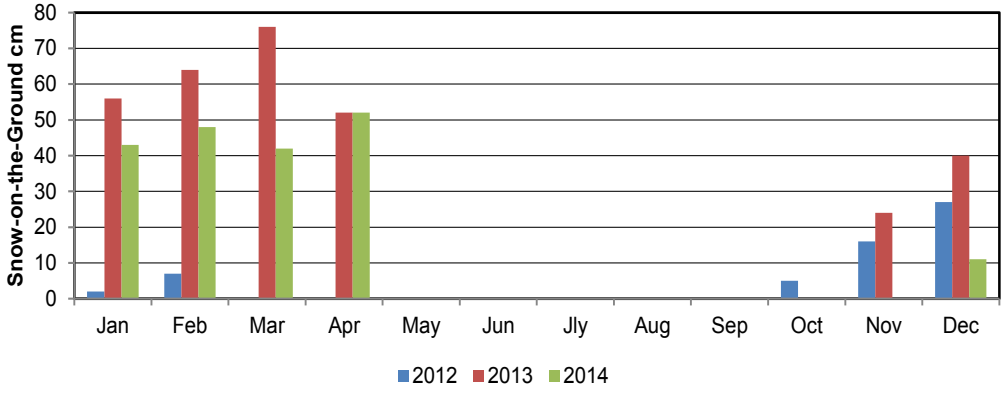
Monthly



Monthly Days



End of the Month Snow-on-the Ground



*November 2014 Snow depth data unavailable

Radiation 2014

Sunrise & Sunset Tables for Conservation Learning Center, 2014 & 2015[1]

2014	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	9:18	16:56	8:47	17:47	7:50	18:42	6:36	19:39	5:29	20:32	4:42	21:20	4:41	21:33	5:20	20:58	6:13	19:52	7:05	18:40	8:02	17:31	8:55	16:49
2	9:17	16:57	8:45	17:49	7:48	18:44	6:34	19:40	5:27	20:34	4:42	21:21	4:41	21:33	5:22	20:56	6:15	19:50	7:06	18:37	8:04	17:29	8:56	16:49
3	9:17	16:59	8:43	17:51	7:45	18:45	6:32	19:42	5:25	20:36	4:41	21:22	4:42	21:32	5:23	20:54	6:16	19:47	7:08	18:35	8:05	17:27	8:58	16:48
4	9:17	17:00	8:42	17:53	7:43	18:47	6:29	19:44	5:23	20:38	4:40	21:24	4:43	21:32	5:25	20:52	6:18	19:45	7:10	18:33	8:07	17:25	8:59	16:47
5	9:16	17:01	8:40	17:55	7:41	18:49	6:27	19:46	5:21	20:39	4:39	21:25	4:44	21:31	5:27	20:50	6:20	19:43	7:12	18:30	8:09	17:24	9:00	16:47
6	9:16	17:02	8:38	17:57	7:39	18:51	6:24	19:48	5:19	20:41	4:39	21:26	4:45	21:31	5:28	20:48	6:21	19:40	7:14	18:28	8:11	17:22	9:02	16:47
7	9:15	17:04	8:36	17:59	7:36	18:53	6:22	19:49	5:18	20:43	4:38	21:26	4:46	21:30	5:30	20:47	6:23	19:38	7:15	18:25	8:13	17:20	9:03	16:46
8	9:15	17:05	8:34	18:01	7:34	18:55	6:20	19:51	5:16	20:45	4:38	21:27	4:47	21:29	5:32	20:45	6:25	19:35	7:17	18:23	8:15	17:18	9:04	16:46
9	9:14	17:07	8:32	18:03	7:31	18:57	6:17	19:53	5:14	20:46	4:37	21:28	4:48	21:28	5:33	20:43	6:27	19:33	7:19	18:21	8:17	17:17	9:05	16:46
10	9:14	17:08	8:31	18:05	7:29	18:58	6:15	19:55	5:12	20:48	4:37	21:29	4:49	21:27	5:35	20:41	6:28	19:31	7:21	18:18	8:19	17:15	9:07	16:45
11	9:13	17:10	8:29	18:07	7:27	19:00	6:13	19:57	5:10	20:50	4:36	21:30	4:50	21:27	5:37	20:39	6:30	19:28	7:23	18:16	8:20	17:13	9:08	16:45
12	9:12	17:11	8:27	18:09	7:24	19:02	6:10	19:58	5:09	20:51	4:36	21:30	4:51	21:26	5:38	20:37	6:32	19:26	7:24	18:14	8:22	17:12	9:09	16:45
13	9:11	17:13	8:25	18:11	7:22	19:04	6:08	20:00	5:07	20:53	4:36	21:31	4:52	21:25	5:40	20:34	6:33	19:23	7:26	18:12	8:24	17:10	9:10	16:45
14	9:10	17:14	8:23	18:13	7:20	19:06	6:06	20:02	5:05	20:55	4:36	21:32	4:54	21:24	5:42	20:32	6:35	19:21	7:28	18:09	8:26	17:09	9:11	16:45
15	9:10	17:16	8:21	18:15	7:17	19:08	6:04	20:04	5:04	20:56	4:35	21:32	4:55	21:22	5:44	20:30	6:37	19:18	7:30	18:07	8:28	17:07	9:11	16:45
16	9:09	17:18	8:18	18:17	7:15	19:10	6:01	20:06	5:02	20:58	4:35	21:33	4:56	21:21	5:45	20:28	6:39	19:16	7:32	18:05	8:30	17:06	9:12	16:45
17	9:08	17:19	8:16	18:19	7:12	19:11	5:59	20:07	5:01	20:59	4:35	21:33	4:58	21:20	5:47	20:26	6:40	19:14	7:34	18:03	8:32	17:04	9:13	16:46
18	9:06	17:21	8:14	18:20	7:10	19:13	5:57	20:09	4:59	21:01	4:35	21:33	4:59	21:19	5:49	20:24	6:42	19:11	7:35	18:00	8:33	17:03	9:14	16:46
19	9:05	17:23	8:12	18:22	7:08	19:15	5:55	20:11	4:58	21:03	4:35	21:34	5:00	21:18	5:50	20:22	6:44	19:09	7:37	17:58	8:35	17:02	9:14	16:46
20	9:04	17:25	8:10	18:24	7:05	19:17	5:52	20:13	4:56	21:04	4:36	21:34	5:02	21:16	5:52	20:19	6:46	19:06	7:39	17:56	8:37	17:00	9:15	16:47
21	9:03	17:26	8:08	18:26	7:03	19:19	5:50	20:15	4:55	21:06	4:36	21:34	5:03	21:15	5:54	20:17	6:47	19:04	7:41	17:54	8:39	16:59	9:16	16:47
22	9:02	17:28	8:06	18:28	7:00	19:20	5:48	20:16	4:53	21:07	4:36	21:34	5:05	21:14	5:56	20:15	6:49	19:01	7:43	17:52	8:40	16:58	9:16	16:48
23	9:00	17:30	8:04	18:30	6:58	19:22	5:46	20:18	4:52	21:09	4:36	21:34	5:06	21:12	5:57	20:13	6:51	18:59	7:45	17:49	8:42	16:57	9:16	16:48
24	8:59	17:32	8:01	18:32	6:56	19:24	5:44	20:20	4:51	21:10	4:37	21:34	5:08	21:11	5:59	20:11	6:52	18:57	7:47	17:47	8:44	16:56	9:17	16:49
25	8:58	17:34	7:59	18:34	6:53	19:26	5:42	20:22	4:50	21:11	4:37	21:34	5:09	21:09	6:01	20:08	6:54	18:54	7:48	17:45	8:45	16:55	9:17	16:50
26	8:56	17:36	7:57	18:36	6:51	19:28	5:39	20:24	4:49	21:13	4:37	21:34	5:11	21:08	6:03	20:06	6:56	18:52	7:50	17:43	8:47	16:54	9:17	16:50
27	8:55	17:38	7:55	18:38	6:48	19:30	5:37	20:25	4:47	21:14	4:38	21:34	5:12	21:06	6:04	20:04	6:58	18:49	7:52	17:41	8:49	16:53	9:18	16:51
28	8:53	17:40	7:52	18:40	6:46	19:31	5:35	20:27	4:46	21:15	4:39	21:34	5:14	21:04	6:06	20:01	6:59	18:47	7:54	17:39	8:50	16:52	9:18	16:52
29	8:52	17:41			6:44	19:33	5:33	20:29	4:45	21:17	4:39	21:34	5:15	21:03	6:08	19:59	7:01	18:45	7:56	17:37	8:52	16:51	9:18	16:53
30	8:50	17:43			6:41	19:35	5:31	20:31	4:44	21:18	4:40	21:33	5:17	21:01	6:09	19:57	7:03	18:42	7:58	17:35	8:53	16:50	9:18	16:54
31	8:48	17:45			6:39	19:37			4:43	21:19			5:18	20:59	6:11	19:54			8:00	17:33			9:18	16:55

2015	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	9:18	16:56	8:47	17:47	7:51	18:41	6:37	19:38	5:30	20:32	4:43	21:20	4:40	21:33	5:20	20:58	6:12	19:53	7:04	18:40	8:01	17:32	8:54	16:50
2	9:17	16:57	8:46	17:49	7:48	18:43	6:35	19:40	5:28	20:34	4:42	21:21	4:41	21:33	5:21	20:56	6:14	19:50	7:06	18:38	8:03	17:30	8:56	16:49
3	9:17	16:58	8:44	17:51	7:46	18:45	6:32	19:42	5:26	20:36	4:41	21:22	4:42	21:32	5:23	20:54	6:16	19:48	7:08	18:36	8:05	17:28	8:57	16:48
4	9:17	16:59	8:42	17:53	7:44	18:47	6:30	19:44	5:24	20:37	4:40	21:23	4:43	21:32	5:25	20:53	6:18	19:46	7:10	18:33	8:07	17:26	8:59	16:48
5	9:16	17:01	8:40	17:55	7:41	18:49	6:27	19:45	5:22	20:39	4:40	21:24	4:44	21:31	5:26	20:51	6:19	19:43	7:11	18:31	8:09	17:24	9:00	16:47
6	9:16	17:02	8:38	17:56	7:39	18:51	6:25	19:47	5:20	20:41	4:39	21:25	4:45	21:31	5:28	20:49	6:21	19:41	7:13	18:28	8:11	17:22	9:01	16:47
7	9:16	17:03	8:37	17:58	7:37	18:52	6:23	19:49	5:18	20:42	4:38	21:26	4:45	21:30	5:30	20:47	6:23	19:38	7:15	18:26	8:13	17:20	9:03	16:46
8	9:15	17:05	8:35	18:00	7:34	18:54	6:20	19:51	5:16	20:44	4:38	21:27	4:46	21:29	5:31	20:45	6:24	19:36	7:17	18:24	8:14	17:19	9:04	16:46
9	9:14	17:06	8:33	18:02	7:32	18:56	6:18	19:53	5:14	20:46	4:37	21:28	4:48	21:28	5:33	20:43	6:26	19:34	7:19	18:21	8:16	17:17	9:05	16:46
10	9:14	17:08	8:31	18:04	7:30	18:58	6:16	19:54	5:13	20:48	4:37	21:29	4:49	21:28	5:35	20:41	6:28	19:31	7:20	18:19	8:18	17:15	9:06	16:45
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12	9:12	17:11	8:27	18:08	7:25	19:02	6:11	19:58	5:09	20:51	4:36	21:30	4:51	21:26	5:38	20:37	6:31	19:26	7:24	18:14	8:22	17:12	9:08	16:45
13	9:12	17:12	8:25	18:10	7:23	19:04	6:09	20:00	5:07	20:53	4:36	21:31	4:52	21:25	5:40	20:35	6:33	19:24	7:26	18:12	8:24	17:10	9:09	16:45
14	9:11	17:14	8:23	18:12	7:20	19:05	6:06	20:02	5:06	20:54	4:36	21:31	4:53	21:24	5:41	20:33	6:35	19:22	7:28	18:10	8:26	17:09	9:10	16:45
15	9:10	17:16	8:21	18:14	7:18	19:07	6:04	20:03	5:04	20:56	4:35	21:32	4:55	21:23	5:43	20:31	6:36	19:19	7:29	18:08	8:27	17:07	9:11	16:45
16	9:09	17:17	8:19	18:16	7:15	19:09	6:02	20:05	5:03	20:57	4:35	21:32	4:56	21:22	5:45	20:29	6:38	19:17	7:31	18:05	8:29	17:06	9:12	16:45
17	9:08	17:19	8:17	18:18	7:13	19:11	6:00	20:07	5:01	20:59	4:35	21:33	4:57	21:20	5:47	20:27	6:40	19:14	7:33	18:03	8:31	17:05	9:13	16:45
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20	9:04	17:24	8:11	18:24	7:06	19:16	5:53	20:12	4:57	21:04	4:35	21:34	5:01	21:17	5:52	20:20	6:45	19:07	7:39	17:56	8:36	17:01	9:15	16:46
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25	8:58	17:33	8:00	18:34	6:54	19:25	5:42	20:21	4:50	21:11	4:37	21:34	5:09	21:10	6:00	20:09	6:54	18:55	7:48	17:46	8:45	16:55	9:17	16:49
26	8:57	17:35	7:57	18:35	6:51	19:27	5:40	20:23	4:49	21:12	4:37	21:34	5:10	21:08	6:02	20:07	6:56	18:52	7:50	17:44	8:47	16:54	9:17	16:50
27	8:55	17:37	7:55	18:37	6:49	19:29	5:38	20:25	4:48	21:14	4:38	21:34	5:12	21:06	6:04	20:04	6:57	18:50	7:52	17:42	8:48	16:53	9:18	16:51
28	8:54	17:39	7:53	18:39	6:47	19:31	5:36	20:27	4:47	21:15	4:38	21:34	5:13	21:05	6:06	20:02	6:59	18:48	7:54	17:40	8:50	16:52	9:18	16:52
29	8:52	17:41			6:44	19:33	5:34	20:28	4:46	21:16	4:39	21:34	5:15	21:03	6:07	20:00	7:01	18:45	7:55	17:37	8:51	16:51	9:18	16:53
30	8:50	17:43			6:42	19:35	5:32	20:30	4:44	21:18	4:40	21:34	5:16	21:02	6:09	19:57	7:02	18:43	7:57	17:35	8:53	16:50	9:18	16:54
31	8:49	17:45			6:39	19:36			4:44	21:19			5:18	21:00	6:11	19:55			7:59	17:34			9:18	16:55

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

Radiation 2014

	Bright Sunshine Hours			Bright Sunshine Days			
Month	**2014 # of Hours**	**Possible hours[1]**	**% of Possible hrs**	**2014 # of Days**	**With 1 or > hours**	**With 5 or > hours**	**With 10 or > hours**
Jan	*	254.3	*	*	*	*	*
Feb	145.0	276.6	52.4	22	21	15	3
Mar	241.0	369.3	65.3	17	29	23	13
Apr	191.1	420.9	45.4	24	23	18	11
May	261.2	492.6	53.0	29	28	23	13
Jun	209.6	505.9	41.4	29	27	17	11
Jly	342.5	507.5	67.5	31	31	29	21
Aug	260.0	455.7	57.1	30	30	23	14
Sep	214.8	379.7	56.6	29	28	22	8
Oct	155.9	327.3	47.6	29	27	16	1
Nov	45.1	259.8	17.4	20	16	1	0
Dec	25.2	236.5	10.7	13	9	1	0
Total	2091.4*	4486.1	46.6*	273*	269*	188*	95*

[1] National Research Council, Canada, Hertzberg Institute of Astrophysics
* Missing January due to Instrument Malfunction

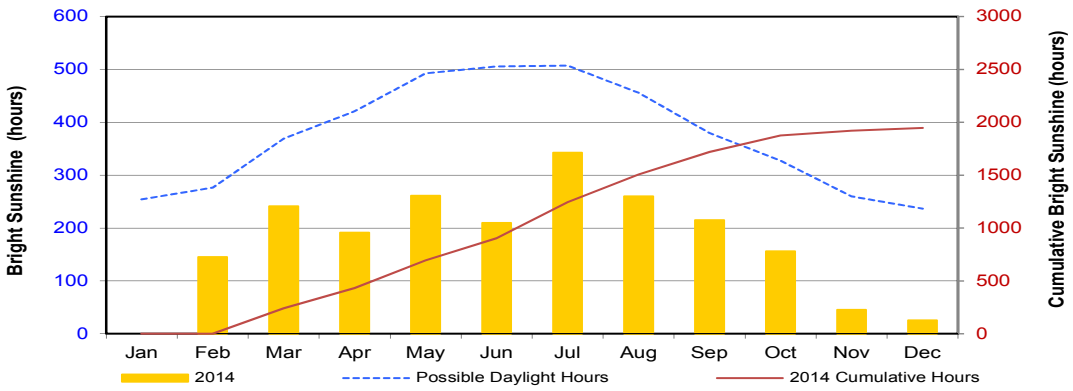
Global and Diffuse Radiation (MJ/m²)

2014	January		February		March		April		May		June		July		August		September		October		November		December	
Date	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	5.6	1.1	3.9	3.7	12.8	2.2	10.8	9.6	14.9	8.7	26.7	8.9	26.1	8.4	14.9	9.1	17.5	5.5	11.3		6.9	1.5	3.4	2.4
2	1.8	1.7	3.7	3.6	12.8	1.9	16.7	9.0	12.0	8.5	24.1	8.5	11.9	6.5	24.8	7.3	14.3	9.1	5.7		0.7	0.6	3.8	1.5
3	3.0	1.4	5.0	4.3	11.7	4.4	20.2	3.7	17.9	11.5	25.7	5.0	26.6	8.5	19.7	10.7	11.6	6.2	5.7		3.3	2.8	2.2	2.0
4	3.5	1.4	6.8	3.3	8.2	7.4	11.0	9.1	14.3	11.4	14.5	8.6	23.4	10.1	21.4	7.3	17.3	6.6	3.9	Shade	2.9	2.8	3.0	2.5
5	3.4	1.6	4.8	4.5	11.0	4.5	20.7	5.3	5.5	4.6	9.6	7.4	14.6	9.1	21.3	7.1	16.7	6.0	11.0	ring mal-	4.3	2.2	2.4	2.0
6	2.3	2.2	7.4	2.6	7.8	5.4	17.7	10.5	12.2	9.1	22.4	8.7	21.5	7.1	20.4	7.3	16.5	6.3	6.4	adjusted	3.3	2.9	1.7	1.6
7	1.7	0.7	6.1	4.2	15.3	3.4	21.0	4.1	20.5	9.4	22.1	10.1	24.2	8.7	20.8	9.5	14.5	7.6	11.9		2.2	2.1	1.9	1.7
8	2.5	2.4	9.2	2.0	11.3	7.4	18.9	7.4	19.8	6.9	22.6	7.2	26.8	6.7	18.4	10.7	6.5	5.7	11.4		3.8	3.3	2.0	1.9
9	2.2	2.1	8.6	2.7	11.5	6.4	18.7	4.3	21.4	8.1	10.1	7.9	25.6	8.6	17.7	11.1	13.5	8.0	9.3		4.1	2.5	3.2	1.4
10	3.3	2.0	8.3	3.1	14.3	2.1	18.5	4.0	26.1	5.0	9.3	8.1	27.2	5.7	18.1	11.4	7.9	6.7	8.1	3.8	4.1	3.2	3.3	0.7
11	2.2	2.1	7.1	4.8	11.3	6.8	14.6	8.9	18.6	11.3	27.2	6.2	24.4	9.2	22.0	7.0	12.2	9.8	9.8	2.9	4.2	2.6	2.4	1.3
12	2.4	2.3	4.4	4.2	14.4	3.1	16.6	12.9	20.1	10.7	26.9	7.6	27.5	6.8	22.8	7.4	15.1	7.2	10.7	1.3	4.4	2.8	2.7	1.4
13	2.4	2.3	5.2	4.7	10.1	7.4	23.0	10.7	27.0	5.3	22.1	11.6	28.9	4.9	17.4	11.2	7.8	5.9	9.5	1.9	5.7	1.2	0.8	0.7
14	3.7	2.6	5.8	5.4	12.2	7.6	23.7	4.2	28.1	4.1	20.3	10.6	28.5	4.9	20.9	6.7	11.9	6.7	6.6	5.2	4.9	1.9	1.4	1.3
15	3.2	2.1	9.1	3.4	9.7	8.7	16.3	12.7	10.8	8.8	5.6	4.9	26.4	6.6	16.6	8.5	12.1	6.2	7.0	3.7	4.2	2.7	1.3	1.2
16	4.5	1.4	4.9	4.6	14.9	3.0	23.8	3.9	17.5	8.0	11.2	9.6	19.9	8.6	16.9	9.5	15.9	4.9	5.7	3.9	5.0	1.8	1.7	1.7
17	3.4	1.1	7.7	4.6	15.1	5.2	18.1	11.1	23.9	10.2	19.2	11.1	20.0	9.5	14.0	10.0	7.9	6.9	5.6	3.3	4.4	2.3	1.7	1.7
18	3.4	2.2	9.3	2.4	15.4	5.4	5.9	5.3	13.9	10.4	13.2	9.8	14.4	8.8	19.4	7.6	10.2	6.6	7.6	3.0	2.8	2.6	1.1	1.1
19	4.2	2.2	9.2	4.2	13.8	7.7	16.1	13.5	6.1	5.4	5.6	4.8	9.4	8.1	14.5	6.0	11.1	6.1	9.2	1.0	3.1	2.8	1.2	1.2
20	5.3	1.8	10.7	3.1	9.6	8.2	16.9	10.3	27.9	4.2	10.0	7.9	25.7	7.5	7.2	6.3	12.5	6.0	9.0	1.3	2.3	2.2	1.2	1.1
21	3.4	3.1	11.2	2.2	17.8	2.8	22.6	3.8	22.4	10.1	11.1	8.5	23.4	9.9	13.7	9.7	15.2	4.0	7.1	2.1	1.1	1.1	0.9	0.9
22	6.5	1.1	8.9	5.6	18.1	2.9	20.8	7.1	22.5	9.3	17.2	9.3	24.7	8.5	14.0	9.7	15.2	4.8	1.3	1.3	1.4	1.3	0.8	0.8
23	2.7	2.6	11.3	2.2	18.5	3.6	5.7	4.9	22.2	8.7	21.9	9.2	23.1	9.7	10.6	9.2	13.3	5.7	4.5	2.4	3.3	2.6	1.2	1.1
24	3.1	2.6	12.2	2.1	18.6	3.2	5.1	4.6	25.3	7.5	29.9	3.7	11.2	5.4	5.6	5.0	11.4	6.2	6.6	3.5	2.2	1.7	1.2	1.2
25	3.2	3.0	12.7	2.1	16.7	7.5	9.6	8.6	16.9	9.9	22.2	8.4	16.6	9.2	19.5	6.5	13.0	6.5	7.5	2.4	2.7	2.6	2.5	0.9
26	6.0	1.2	12.2	1.8	17.4	5.2	4.5	4.0	2.9	2.5	13.7	8.9	15.7	10.2	17.3	9.0	13.5	6.8	5.4	3.8	5.3	1.2	1.7	1.6
27	6.2	1.1	8.2	6.2	18.4	4.4	2.3	2.1	19.2	9.1	22.7	8.2	19.0	9.9	15.5	6.8	7.6	6.3	1.9	1.8	2.0	1.9	2.6	0.8
28	4.6	3.2	10.9	6.2	20.3	2.8	6.9	6.2	21.6	7.5	22.0	9.3	21.1	9.9	10.1	6.2	7.4	6.3	3.5	2.7	1.8	1.7	2.8	0.9
29	6.3	1.3			12.8	9.8	19.2	9.8	12.4	8.1	12.4	8.9	25.2	5.9	21.4	4.8	13.2	9.4	2.0	1.9	4.1	1.1	2.7	2.0
30	5.5	3.8			15.6	10.1	25.5	3.3	26.2	6.5	8.4	6.8	24.5	6.5	7.8	6.4	2.6	2.4	6.5	2.4	4.5	1.5	2.0	1.8
31	10.8	6.9			20.1	4.4			49.7	13.9			49.3	13.1	24.2	11.5			11.4	5.5			4.7	3.9
Total	122.3	66.6	224.8	103.8	437.5	164.9	471.4	214.9	599.8	254.7	529.9	245.7	706.8	252.5	528.9	256.5	365.4	192.4	223.1	61.1	105.0	63.5	65.5	46.3

Radiation 2014

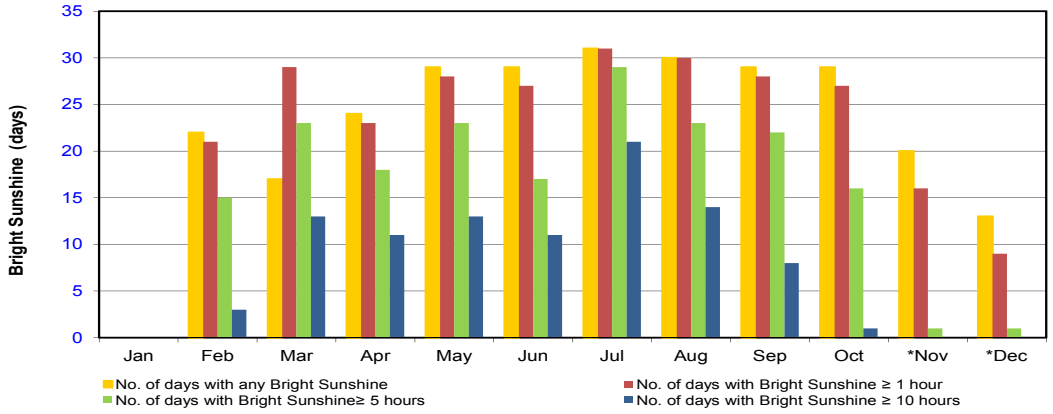
Bright Sunshine Hours

Missing January due to Instrument Malfunction



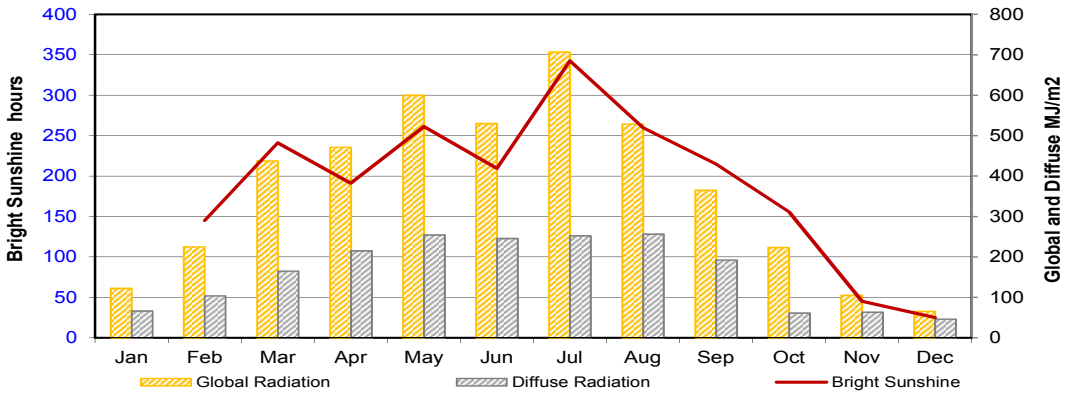
Bright Sunshine Days

Missing January due to Instrument Malfunction



Monthly Comparison Bright Sunshine Hours, Global & Diffuse Radiation

Missing January Bright Sunshine due to Instrument Malfunction



Wind 2014

	Average		Highest instantaneous Wind Speed		
	(km/h)	"1/2 hr Maximum" Average	Speed (km/h)	Direction	Day
January	14.0	19.9	95.3	NW	15
February	11.7	16.0	36.9	N	27
March	10.7	14.7	33.5	N	20
April	12.9	17.7	55.9	NW	9
May	12.7	18.4	53.1	NNW	1
June	12.5	18.2	43.7	N	30
July	10.3	15.7	38.3	N	6
August	8.8	14.0	39.9	WSW	8
September	11.3	16.8	40.6	WNW	1
October	12.2	17.6	36.7	NW	2
November	13.6	18.9	40.0	N	16
December*	9.7	14.1	31.1	SW	30

** Missing Dec 20 to 24 data due to hoar frost build-up on Anemometer*

Extreme Daily Winds (km/h)		
Date	Wind Speed/ Direction	Beaufort Designation*
January 15	95.3 NNW	Whole Gale
April 9	55.9 NW	Near Gale
May 1	53.1 NNW	Near Gale

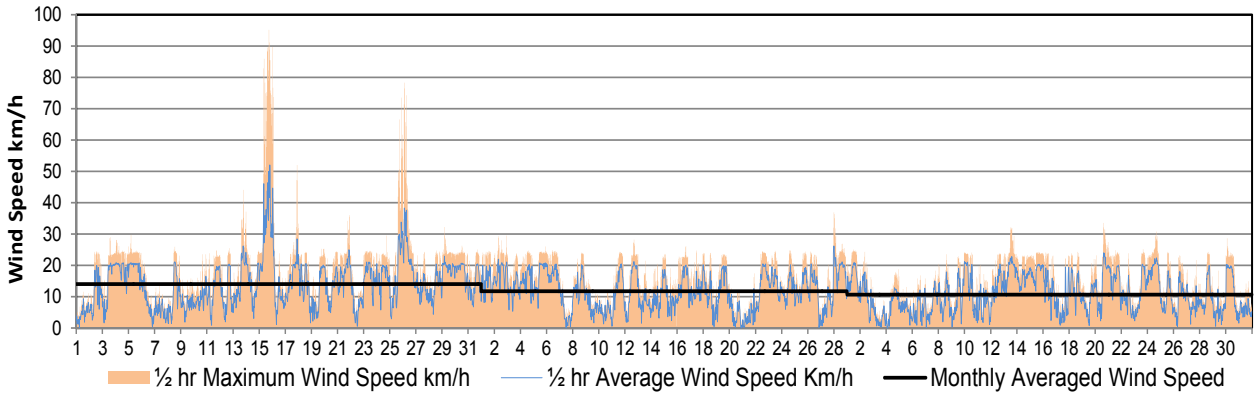
Beaufort Wind Scale*	
High wind,Near Gale	50-61 km/h
Gale	62-74 km/h
Strong Gale	75-88 km/h
Storm, Whole Gale	89-102 km/h
Violent Storm	103-117 km/h
Hurricane Force	> 118 km/h

*Environment Canada, Meteorological Service of Canada, 2014. Beaufort Wind Scale Table.

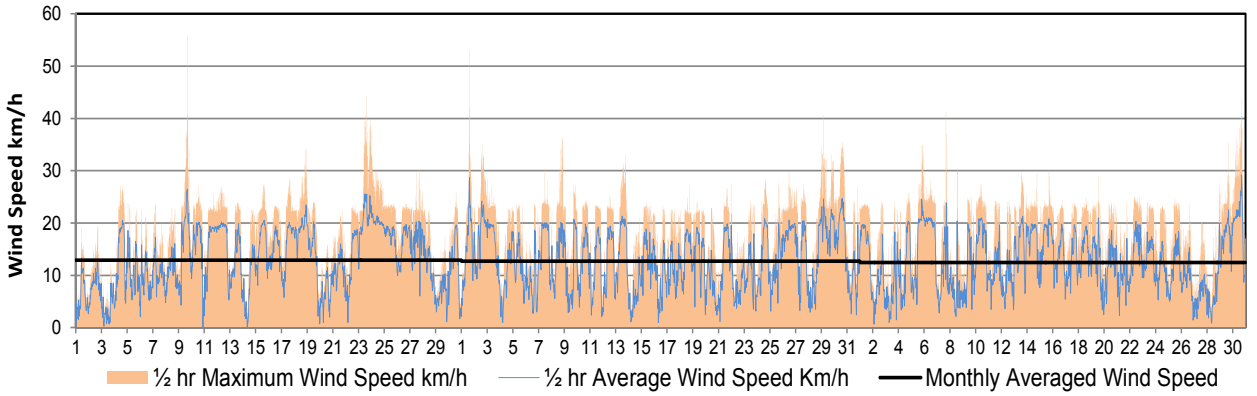
Hoar frost coated Anemometer and 10 meter tower (top), Temperature and RH Sensor (middle) and Meter Stick (bottom)
23 Dec 2014
photo credit: R. Jansen

Wind
Daily Wind Speed and Maximum Gust Wind Speed

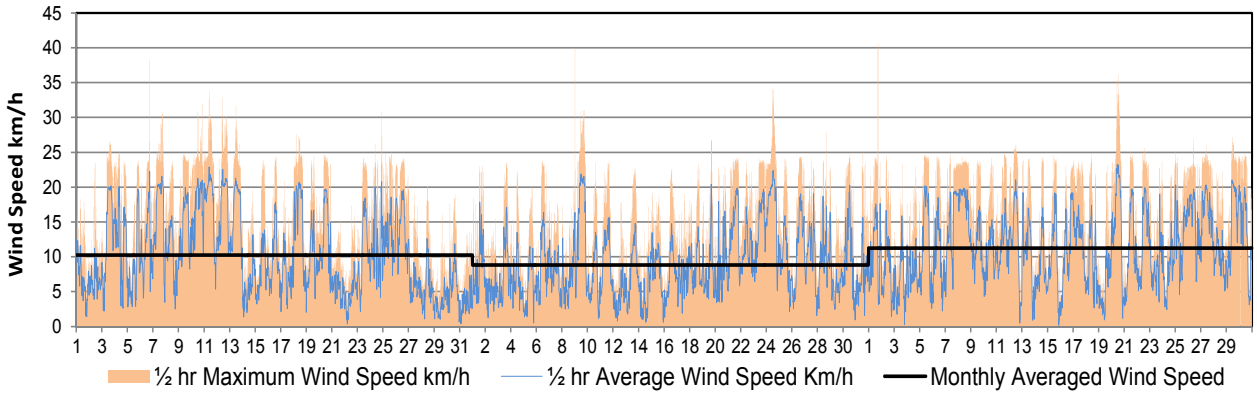
January
February
March



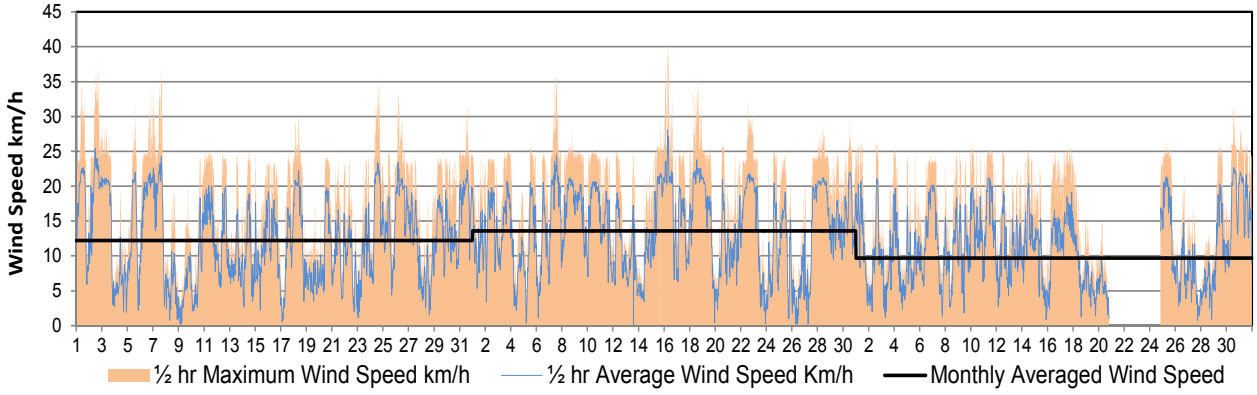
April
May
June



July
August
September



October
November
December



** Missing Dec 20 to 24 data due to hoar frost build-up on Anemometer*

Wind 2014

Windchill Calculation Chart[1]												
	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	-31	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-45	-51	-57	-64	-70
30	0	-7	-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	-70	-76
55	-2	-9	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-37	-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	-59	-66	-73	-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 minutes.
-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 hazardous. Exposed skin can freeze in 2 minutes or less.

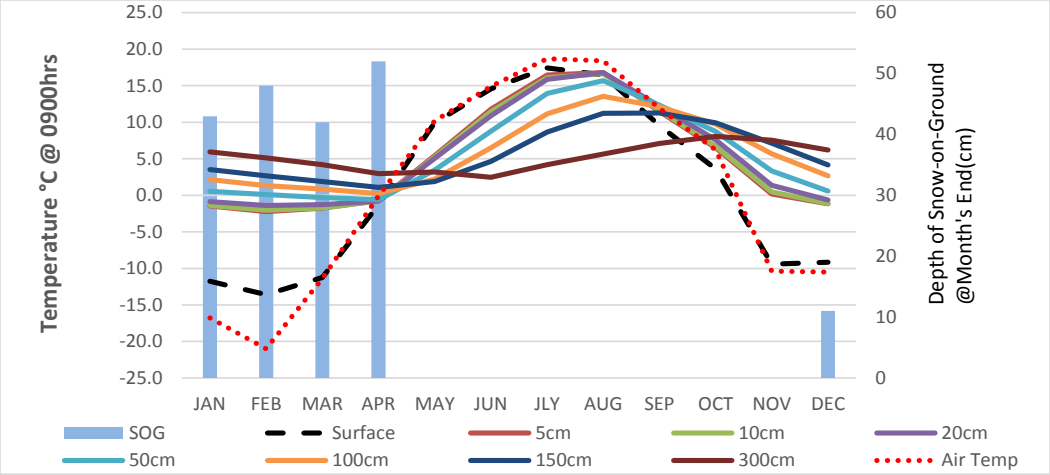
1: Environment Canada, 2011, 2013

Maximum Daily Wind Chill Value When Temperature < 0°C												
	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC
1	-47	-29	-49	-27	-1						-6	-40
2	-45	-32	-42	-15	-7					-5	-6	-37
3	-36	-34	-43	-14	-11					-6	-6	-39
4	-45	-37	-35	-15	-5					-5	-7	-19
5	-50	-39	-27	-11	-3					-2	-5	-22
6	-49	-37	-33	-7	-5					-2	-7	-23
7	-45	-32	-41	-6	-7					-4	-10	-19
8	-48	-37	-29	-4	-5					-5	-21	-23
9	-20	-43	-17	-5					-2	-1	-22	-17
10	-17	-42	-9	-5	-5				-1	-2	-24	-5
11	-16	-39	-17	-10	-5				-1		-21	-3
12	-22	-42	-19	-15	-2				-5		-26	-8
13	-28	-36	-11	-18	-5					-2	-27	-10
14	-30	-27	-23	-19	-4				-3		-25	-10
15	-13	-34	-25	-14					-1		-25	-14
16	-24	-30	-16	-19					-1		-20	-15
17	-16	-23	-12	-15					-1	-3	-22	-17
18	-13	-23	-11	-9						-2	-22	-16
19	-33	-29	-12	-9							-24	-15
20	-37	-38	-21	-8							-24	-16
21	-33	-38	-31	-4							-12	-10
22	-40	-34	-31	-1							-21	-6
23	-40	-41	-32	-4						-2	-24	-6
24	-21	-41	-27	-7							-21	-13
25	-22	-43	-30	-7						-4	-28	-34
26	-39	-37	-20	-5						-6	-39	-37
27	-45	-46	-20	-5						-5	-28	-40
28	-40	-45	-26	-6					-2	-6	-33	-41
29	-34		-20	-3					-3	-8	-38	-39
30	-38		-28	-3						-10	-41	-39
31	-32		-30							-11		-20

Soil Temperatures and Depth of Snow-on-the-Ground at Month's End

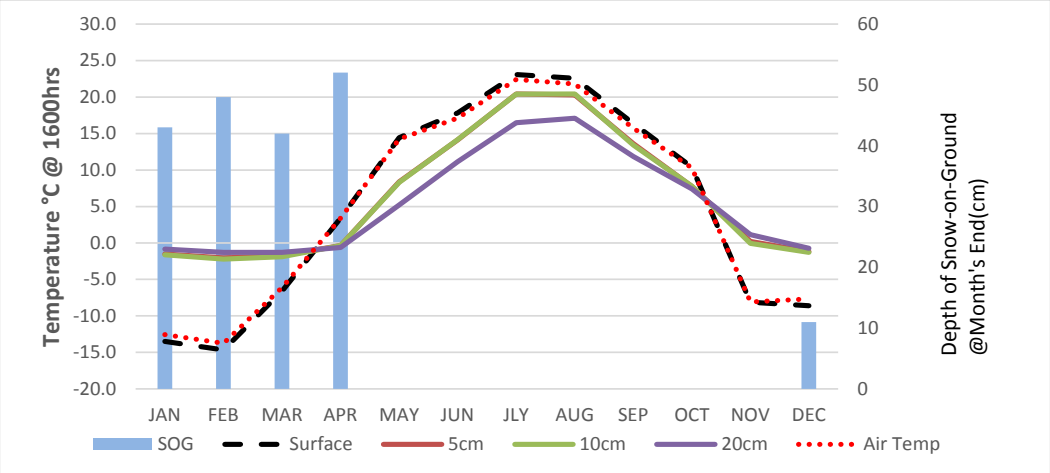
	Mean Air Temp @ 0900h (°C)	SOIL TEMPERATURES @ 0900 (°C)								Mean Air Temp @ 1600h (°C)	SOIL TEMPERATURES @ 1600 (°C)				SOG at Month's end (cm)
		Surface	5cm	10cm	20cm	50cm	100cm	150cm	300cm		Surface	5cm	10cm	20cm	
JAN	-16.8	-11.8	-1.5	-1.4	-0.9	0.6	2.2	3.5	5.9	-12.6	-13.5	-1.5	-1.6	-0.8	43
FEB	-21.0	-13.6	-2.2	-2.0	-1.4	0.1	1.3	2.7	5.1	-13.7	-14.7	-2.0	-2.2	-1.3	48
MAR	-11.4	-11.2	-1.7	-1.7	-1.3	-0.3	0.9	1.9	4.2	-6.1	-6.6	-1.7	-1.9	-1.3	42
APR	-0.1	-1.3	-0.7	-0.8	-0.8	-0.6	0.2	1.1	3.0	3.4	3.4	-0.3	-0.4	-0.6	52
MAY	10.2	9.9	5.4	5.2	5.0	3.4	2.2	1.9	3.2	14.3	14.4	8.4	8.3	5.2	0
JUN	14.9	14.6	11.8	11.4	10.9	8.8	6.5	4.7	2.5	17.1	17.8	14.1	14.2	11.1	0
JLY	18.7	17.4	16.5	16.1	15.9	13.9	11.2	8.7	4.2	22.4	23.1	20.4	20.4	16.5	0
AUG	18.4	16.5	16.8	16.6	16.8	15.7	13.5	11.2	5.6	21.8	22.6	20.3	20.4	17.1	0
SEP	11.9	9.6	11.5	11.6	12.2	12.3	12.1	11.3	7.1	15.8	16.4	13.6	13.4	11.8	0
OCT	6.2	3.6	6.5	6.7	7.6	8.7	9.7	9.9	8.1	10.3	10.4	7.7	7.8	7.4	0
NOV	-10.4	-9.4	0.2	0.5	1.4	3.3	5.7	7.2	7.5	-8.1	-8.1	0.2	-0.1	1.1	M
DEC	-10.5	-9.2	-1.2	-1.1	-0.6	0.6	2.7	4.1	6.2	-7.7	-8.6	-1.2	-1.3	-0.7	11

M=November SOG data missing due to instrument malfunction



Monthly Soil Temperatures @ 0900hrs (9:00am)

*Nov 2014 Snow-on-ground data unavailable



Monthly Soil Temperatures @ 1600hrs (4:00pm)

*Nov 2014 Snow-on-ground data unavailable

Instruments used at Climate learning center and Glossary of Terms

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

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

BRIGHT SUNSHINE is the unobstructed direct radiation from the sun, as opposed to the shading of a location by clouds or by other atmospheric obstructions. Number of Days is defined as the total number of days when at least 0.1 of an hour of bright sunshine was recorded. Percentage Possible refers to the ratio of measured bright sunshine hours to the total possible daylight hours in a given period, expressed as a percentage. Possible daylight hours are taken from the sunrise/set tables provided by the National Research Council of Canada, Herzberg Institute of Astrophysics, Victoria, BC. Total is the sum of the daily bright sunshine values in hours and tenths of hours as measured by an automated sunshine recorder using voltaic cells.

DEGREE-DAY is an index for various temperature related calculations

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

Mathematically:CDD = (T - 18°C), for that day, where T = daily mean temperature in °C if T is equal to or less than 18°C, CDD = 0. Monthly and annual values of CDD are obtained by summing daily values.

Growing (GDD) is the growing requirement in order for plant growth to proceed. The air temperature must ex ceed 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 > 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.

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 the Climate Learning Centre, 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 period of operation at CLC is not yet long enough to produce normals.

(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 = mTa 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 of 0000 hours - 2400 hours 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.

Measurable precipitation is when the amount equals or exceeds 0.2 mm of water or water equivalent.

Dry day is when no measurable precipitation is recorded.

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). A weighing gauge is used for the winter season and a 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/m2).

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).

Precipitation spells, for this report, are defined as when more than one day is (wet spell) or is not (dry Spell) measured.

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.

(Environment Canada 2004b)

WAVES Temperature waves are defined as a sequence of three or more days when the daily maximum / 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 kilometers 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. See also **Beaufort Wind Scale**

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