



Climate Research Lab

Annual Prince Edward Island Climate Summary - 2014



Figure 1 Road Washout at Huntley, PEI – December 10, 2014

Background

The UPEI Climate Research Lab established five climate stations on Prince Edward Island beginning in September 2013 and has added two privately owned stations in 2014. These stations are located in areas where there is no existing Government of Canada or Province of Prince Edward Island climate monitoring stations. These stations are all equipped with Davis Vantage Pro 2 equipment which has instrumentation which can monitor temperature, precipitation, barometric pressure, relative humidity, wind direction and wind speed.

The UPEI Climate Research Lab maintains or is associated with seven climate stations on Prince Edward Island. The locations of these stations are listed on Table 1.

Station ID	Map ID	Property Owner	Equipment Owner	Community	Latitude	Longitude
IPRINCEE11	A1	D. Jardine	UPEI	Winsloe South	46.299599	-63.176832
IPRINCEE13	A2	R. Davies	UPEI	Flat River	45.983604	-62.850036
IPRINCEE14	A3	R. Gilmour	UPEI	Orwell Cove	46.116888	-62.86668
IPRINCEE15	A4	Gulf Island Peat	UPEI	Foxley River	46.716743	-64.033362
IPRINCEE16	A5	IWMC	UPEI	Dingwell's Mills	46.350204	-62.416938
IPRINCEE17	A6	R. Angus	R. Angus	Cardigan Head	46.24611	-62.66833
IPEBORDE2	A7	G. Read	G. Read	Borden-Carleton	46.248343	-63.687068

An additional nine climate stations on Prince Edward Island have been added to this summary to enable a more complete analysis of climate conditions across the province in 2014. These additional stations are identified on table 2.

Station ID	Map ID	Property Owner	Equipment Owner	Community	Latitude	Longitude
EC8300516	B1	Gov't of Canada	Environment Canada	North Cape	47.058153	-63.997169
EC8300700	B2	Slemon Park Corp	Environment Canada	Slemon Park, Summerside	46.43889	-63.831667
EC8305500	B3	BBEMA	Environment Canada	Maple Plains	46.3028	-63.575567
EC8300497	B4	Gov't of PEI	PEI Dept of Agriculture	New Glasgow	46.4185486	-63.3276520
IPEIELMW2	B5	Bill Jameson	Environment Canada	Elmwood	46.250	-63.333333
EC8300300	B6	Gov't of Canada	Environment Canada	Charlottetown Airport	46.288870	-63.130362
EC8300P001	B7	Gov't of Canada	Agriculture Canada	Harrington CDA	46.343617	-63.169736
EC8300100	B8	Gov't of PEI	PEI Dept of Agriculture	Alliston	46.0604591	-62.5961761
EC8300562	B9	Gov't of Canada	Environment Canada	St. Peter's	46.4446449	-62.5788841
EC8300418	B10	Gov't of Canada	Environment Canada	East Point	46.45227	-61.97164

The location of all stations listed on tables 1 and 2 is provided on a map at the end of this document. As shown on the map, the stations are located throughout the province and can be expected to provide a reasonable distribution of climate conditions across the province.

Data Summary

Data was compiled from the seven UPEI Climate Stations and from ten other climate stations in the province. The data from the ten other stations was obtained from the Environment Canada Climate Archives Website. A summary of the data obtained is provided in table 2.

Table 2 – UPEI 2014 Annual Climate Station Summary Supplemented by 10 Other Stations across PEI

Climate Station Name	Stn ID	Tmean	Tmax	Tmin	Annual PPT (mm)	Avg. Wind Speed kn/h	Max. Wind Speed km/h	Max. Daily PPT (mm)	Max. PPT Date
Dingwells	UPEI	6.3	30.9	-29.8	994.7	8.3	72.4	53.1	Sept. 22
Flat River	UPEI	6.9	30.1	-26.1	970.5	12.7	85.3	49.5	Sept. 22
Orwell Cove	UPEI	6.9	29.2	-24.9	873.4	12.9	86.9	70.6	Sept. 22
Winsloe South	UPEI	6.3	30.4	-25.4	1124.7	7.4	75.6	79.5	Dec. 10
Foxley River	UPEI	6.4	31.6	-25.2	820.9	7.8	85.3	156.2	Dec. 10
Cardigan Head	UPEI	*	30.6	*	*	8.9	61.2	60.2	Sept. 22
Borden	UPEI	6.2	27.6	-23.9	1013.0	18.9	107.8	85.1	Dec. 10
Ch'town Airport	EC	5.9	29.1	-25.8	1424.7		106.0	65.4	Dec. 10
East Point	EC	6.1	27.7	-20.6	1193.8		98.0	61.6	Nov. 18
Alliston		7.0	30.0	-24.0	1475.4		**	59.2	Sept. 21
St. Peter's		6.1	30.3	-23.8	1413.8		91.0	65.3	Sept. 22
North Cape	EC	5.8	31.2	-22.5	1354.3		113.0	131.8	Dec. 10
Summerside	EC	6.3	29.6	-26.7	1069.1		113.0	103.8	Dec. 10
Elmwood		6.6	29.5	-25.5	1614.6	**	**	110.0	Dec. 10
New Glasgow		6.2	29.5	-25.0	1355.2	**	**	98.0	Dec. 10
Maple Plains		6.8	28.3	-27.9	**	**	**	**	**
Harrington		6.0	29.1	-26.0	1336.5		100.0	92.9	Dec. 10
	Stn Code for table 3								
Chtown Normal	C	5.6			1158.3				
SSide Normal	S	5.7			1072.9				
Monticello Normal	M	5.8			1170.2				

O'Leary Normal	O	5.5			1147.8				
East Baltic Normal	E	5.6			1272.0				

* denotes incomplete records at this station during the year

** denotes no instrument to measure parameter at this location

The mean monthly temperature variation from the 30 year normal for 16 climate stations located across PEI are provided in table 3. The annual variation from the 30 year normal is also provided in this table. The colour scheme shows the months when the temperature were cooler than normal to be in light blue and the variation above normal transition from bluish yellow to orangey yellow for the months which were above normal. The normal for each station were taken from the nearest station listed on the Environment Canada weather archive website. March was the only month which was significantly below normal in mean monthly temperature and the months of April, May and June had normal or slightly colder than normal temperatures. The months of January, July, October and December had higher than normal temperatures with December being 3.2 °C above normal when averaged across all 16 reporting stations. The average temperature for 2014 for all 16 stations on PEI was 0.7 °C above normal with a range of 0.3 to 1.4 degrees above normal.

Table 3 – Mean Monthly Temperature Variation from 30 Year Normal – PEI Climate Stations

Station ^{normal}	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Dingwells ^m	0.80	-0.30	-2.70	0.60	-0.40	-0.10	3.00	-0.10	0.10	2.10	-0.20	3.40	0.50
Flat River ^c	2.80	1.50	-1.60	0.40	-0.50	0.20	2.20	0.30	1.10	3.40	1.40	4.40	1.30
Orwell Cove ^c	2.50	1.20	-1.80	0.60	-0.40	0.40	2.70	0.30	1.40	3.40	1.00	3.90	1.30
Winsloe South ^c	1.30	0.90	-2.20	-0.10	-0.80	0.40	2.50	0.00	0.80	2.60	-0.10	2.90	0.70
Foxley River ^o	2.20	1.20	-2.10	0.10	-1.00	0.80	3.10	0.50	0.80	2.30	0.20	3.20	0.90
Cardigan Head ^m	0.00	0.00	0.00	0.00	0.00	0.30	2.90	-0.40	0.10	1.70	-3.40	1.60	Inc
Borden ^s	1.50	0.70	-2.50	-0.40	-1.10	0.10	1.30	0.00	1.50	0.00	0.70	3.60	0.50
Ch'town Airport ^c	0.60	-0.30	-3.40	-0.20	-1.10	-0.20	2.60	-0.10	0.40	2.40	-0.30	2.50	0.30
East Point ^e	1.10	0.30	-2.80	-0.80	-1.70	-0.90	1.80	0.70	0.80	2.80	0.80	3.90	0.50
Alliston ^c	1.90	1.20	-1.80	0.70	0.00	0.60	3.10	1.10	1.50	3.40	0.80	3.70	1.40
St. Peter's ^m	0.80	-0.10	-3.50	0.30	-1.00	-0.40	2.90	-0.10	0.10	2.00	0.20	2.60	0.30
North Cape ^o	1.60	0.00	-3.50	-0.90	-2.20	-0.50	2.80	0.10	0.70	2.50	0.30	2.70	0.30
Summerside ^s	0.60	-0.40	-3.00	0.00	-0.60	0.90	2.20	0.10	1.00	2.90	0.00	3.50	0.60
Elmwood ^c	1.30	1.50	-2.10	0.50	-0.20	0.70	2.80	0.30	0.90	2.90	0.00	3.20	1.00
New Glasgow ^c	1.10	0.40	-3.00	0.30	-0.80	0.30	2.80	-0.10	0.60	2.40	-0.30	3.30	0.60

Harrington^c	0.70	0.00	-3.40	-0.10	-0.90	0.00	2.20	-0.20	0.30	2.50	-0.40	3.00	0.40
Average	1.30	0.49	-2.46	0.06	-0.79	0.16	2.56	0.15	0.76	2.46	0.04	3.21	0.71

The monthly precipitation variation from the 30 year normal for 16 stations across PEI is provided in table 4. Months which have below normal precipitation are shown in light purple for just below normal to a dark pink for months which are much below normal. Months which have above normal precipitation are shown from light blue if slightly above normal to dark blue at much above normal. Months which have a white background either had incomplete data or the heater on the rain gauge was not working during the winter months thus snow and ice pellet amounts are not included in the totals. This included the stations at Dingwells Mills, Orwell Cove, Winsloe South, Foxley River and Borden so the total annual precipitation at these stations is low due to frozen rain gauges during the winter months and precipitation amounts could not be recorded using the equipment available.

Table 4 – Mean Monthly Precipitation Variation from 30 Year Normal – PEI Climate Stations

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Dingwells				29.30	-14.70	-2.30		16.50	7.10	-29.10	48.40		
Flat River		-17.20	23.70	29.60	-31.10	-9.40	-46.60	-37.30	-0.90	-43.60	11.20	-34.80	
Orwell Cove				39.20	-23.90	-28.20	-39.80	-47.70	22.70	-27.60	3.80		
Winsloe South	-65.70			36.40	-20.90	-19.80	-43.10	-2.20	11.50	-29.10	36.10	84.10	-33.60
Foxley River				38.50	-49.30	-17.00	-44.40	-53.90				173.70	
Cardigan Head						-16.30	-45.90	-5.60	34.80	-32.20	-124.10		
Borden	-37.20			15.80	-34.50	-3.90	-6.90	-7.50	-14.50	10.30	-1.40	109.80	-59.90
Ch'town Airport	-13.60	28.60	79.20	50.90	-10.40	-10.80	-35.90	23.30	16.30	-11.40	52.30	97.80	266.30
East Point	-36.40	-25.90	36.10	-4.00	-15.80	-22.70	-56.00	15.70	-19.80	-48.90	101.30	12.40	-78.20
Alliston	19.20	26.10	90.30	52.30	-15.10	11.60	-32.20	60.20	12.00	-15.90	60.80	47.80	317.10
St. Peter's	30.80	37.50	41.00	26.90	-16.60	-26.30	-23.10	38.80	26.60	-29.40	102.00	54.60	243.60
North Cape	84.90	-8.00	5.60	10.50	-42.80	-9.20	-24.00	13.50	-12.20	-21.80	48.90	161.10	206.50
S'side	-37.60	-3.20	13.70	14.60	-42.80	-5.20	-21.30	-15.60	-41.50	-1.80	40.00	120.30	-3.80
Elmwood	-39.00	64.60	131.70	62.70	-12.80	3.20	-18.90	63.70	-7.50	-5.80	77.50	136.90	456.30
New Glasgow	-1.50	34.30	47.60	23.20	-17.90	-8.80	-6.20	25.80	-28.90	0.80	58.30	70.20	196.90
Harrington	-25.20	13.00	46.50	18.80	-22.80	-19.50	-39.30	24.90	-7.20	12.20	63.90	112.90	178.20
Average	-11.63	14.98	48.80	29.65	-24.76	-11.54	-32.24	7.04	-0.10	-18.22	38.60	88.22	126.16

Table 5 lists the significant storms which occurred during the year. A rain storm on December 10th and 11th deposited 156 mm of rain at Foxley River on December 10th, which is the second highest non adjusted rainfall amount recorded during a calendar day in the records which date back to the 1870s. The storm with the highest rainfall amount for a calendar day occurred on September 22, 1942 when a total of 163.8mm was recorded at the Charlottetown Airport.

Table 5- Significant Storm Events in 2014

Date	Event	Precipitation	Winds	Damage	Areas Impacted
January 22	Snowstorm	37.4 cm	Gusts up to 85 km/h at East Point		
February 19	Snowstorm	27.8 cm			
March 26	Snowstorm	48.5 cm	Maximum gust of 113.0 km/h at North Cape and Summerside	Roads blocked, schools and businesses closed	Entire province
July 5	Post Tropical Storm Arthur	12 mm of rain	Up to 100 km/h	Trees down, 3 boats sank	
September 21-22	Rainstorm	Up to 70.6 mm of rain			Mainly eastern PEI
November 18th	Rainstorm	61.6 mm of rain			Eastern PEI
December 10-11th	Rainstorm	Up to 181 mm of rain over 36 hours		50 roads and bridge washouts, flooding of homes. \$9 million in road damage.	Mainly West Prince

Discussion

The year started out with a number of snowfall events and some very cold days. In the period between the beginning of November 2013 and the end of March 2014, P.E.I. received about 417 centimetres of snow. That's the most since 1972, when 425 centimetres fell in the same period. The months from May to October had normal or below normal precipitation with May and July being the driest months. November and December had more than normal precipitation with December being the wettest month of the year. The wet December was due to some intense rainstorms during the month, with the event of December 10 and 11th being one of the most significant rainstorms in the history of weather records in the Province.

The total annual precipitation recorded at the Elmwood station was 1614.6 mm which was 39.4% above normal for this location. This total was also the third highest annual total precipitation amount for any station on PEI that could be found in the climate records for the province. As shown on table 6 the year 2014 was one of top three years for the amount of precipitation received when compared with available provincial records going back to 1872. The years of 1990 and 1979 were the top two years for total precipitation on the record. It is interesting to note that all of the highest annual precipitation numbers are at stations located from the Central to the Eastern portions of the province.

Table 6 – Top 10 Annual Precipitation Totals – PEI Climate Stations 1872 to 2014 (>1500mm)

Station Name	Latitude	Longitude	Year	Total Annual Precipitation mm
East Baltic	46.43	-62.17	1990	1673.3
Bangor	46.35	-62.68	1990	1666.6
Elmwood	46.25	-63.333	2014	1614.6
New Glasgow	46.409	-63.35	1990	1599.6
Alliston	46.067	-62.6	1979	1596.7
Bangor	46.35	-62.68	2002	1593.6
Charlottetown Air	46.389	-63.129	1990	1579.3
East Baltic	46.43	-62.17	1979	1565.4
Stanhope	46.42	-63.08	1990	1563.5
Monticello	46.7	-62.47	1990	1500.6

Summary

The year 2014 was 0.7 °C above normal when averaged across all stations listed in this document. The month of December had the highest average temperature when compared to the 30 year normal whereas March was the coldest when compared to normal values. Three stations in the eastern portion of the province: Orwell Cove, Alliston and Flat River had the highest annual temperature increases when compared to the normal. This may be attributed to there not being a reference station for calculation of 30 year normal values in this area. The reference location used for these sites was at Charlottetown.

The precipitation total for the year was above normal and this can be partially attributed to a number of intense rainfall and snowfall events. The rainstorm on December 10th and 11th was very significant and resulted in nine million dollars in damage to roads and bridges across the western half of the province causing significant hardship for some residents. Tropical Storm Arthur on July 5th also resulted in wind and wave damage with 3 boats sinking in the Charlottetown Harbour and a number of trees were blown down.

The climate extremes for the year for all reporting stations listed in this summary are shown on Table 7.

Table 7 Climate Extremes Prince Edward Island Climate Stations 2014

Parameter	Extreme Value	Date Observed	Station
Daily Tmax (C)	31.6	June 30 th	Foxley River
Daily Tmin (C)	-29.8	January 2 nd	Dingwells Mills
Highest Annual Tmean	7.0	---	Alliston
Lowest Annual Tmean	5.8	---	North Cape
Max Wind Gust (km/h)	113.0	March 26 th	North Cape, Summerside
Max. Daily Ppt (mm)	156.2	December 10 th	Foxley River
Highest Annual Ppt (mm)	1614.6	----	Elmwood

A high temperature record was set for Christmas Day, December 25th when the temperature reached 15.9 C at the UPEI Climate Station at Orwell Corner. The previous high for this date on PEI was 13.0 C at Monticello in 2003.

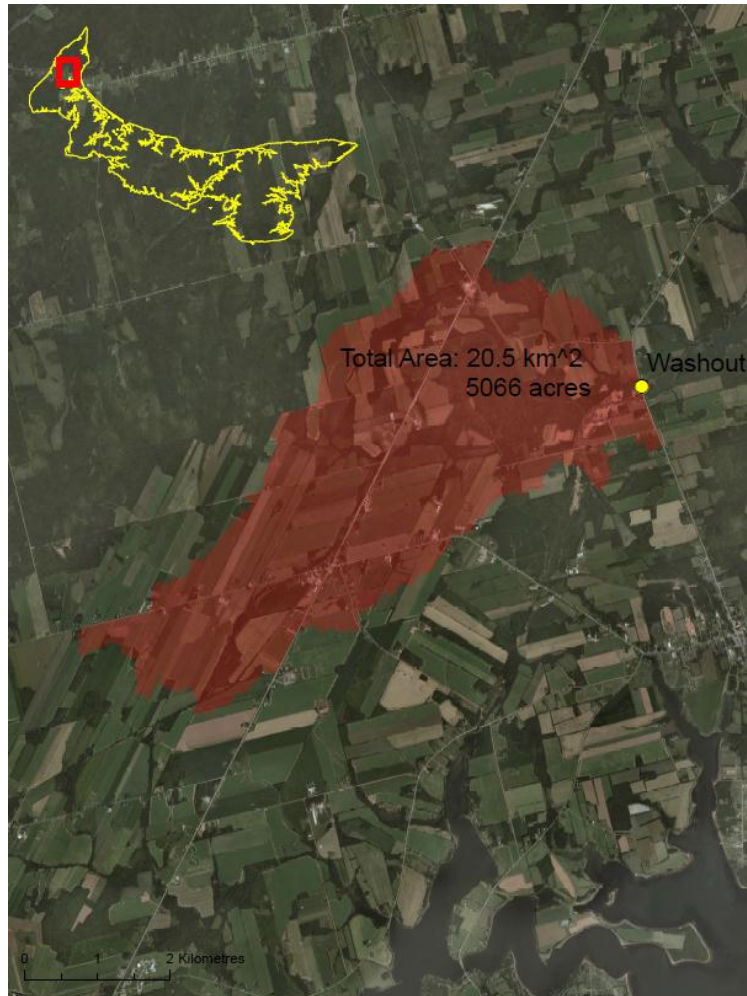


Figure 2 - Huntley River Watershed Upstream of Washout – Dec 10th

The rainfall on December 10th and 11th may have had more impact because it occurred after the ground was frozen contributing to excessive storm water runoff into local streams and rivers. The above map shows a 20.5 km² watershed upstream of the major washout which occurred on Route 152 at Huntley (see photo on the cover page). Assuming a 36 hour rainfall of 182mm, a runoff coefficient of 0.5, the flow to this location would be over 1.24 m³/day. The result would be a lot of hydraulic pressure on the water passage infrastructure. This bridge was installed in the early 1970s and had not experienced a previous washout.

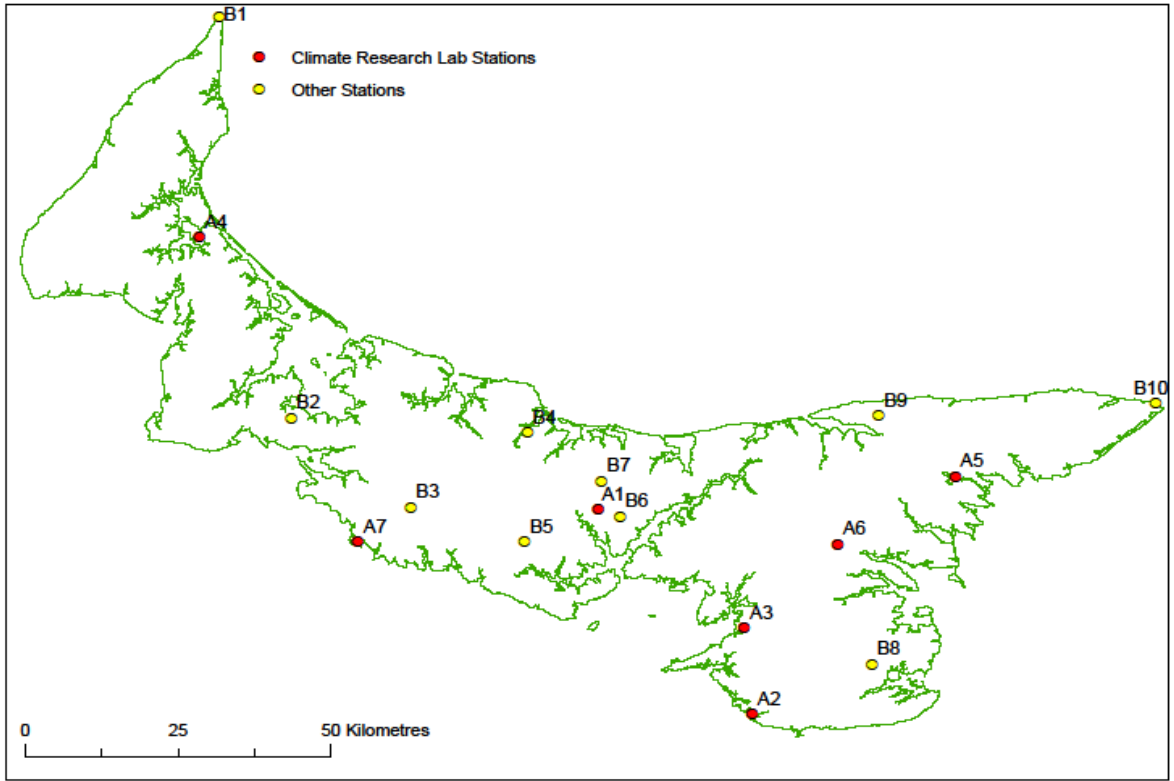


Figure 3 - Map Showing Climate Station Locations

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