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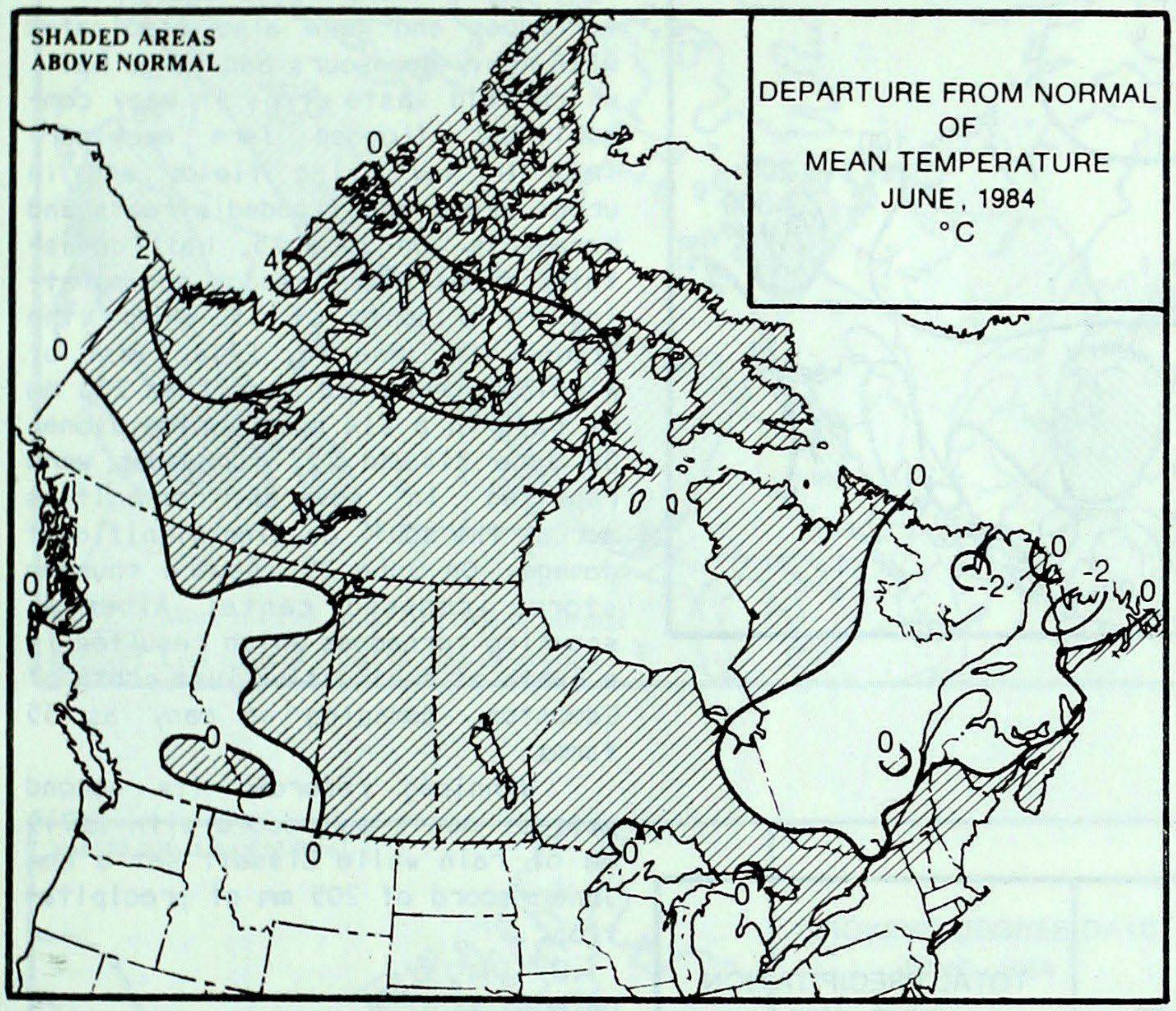
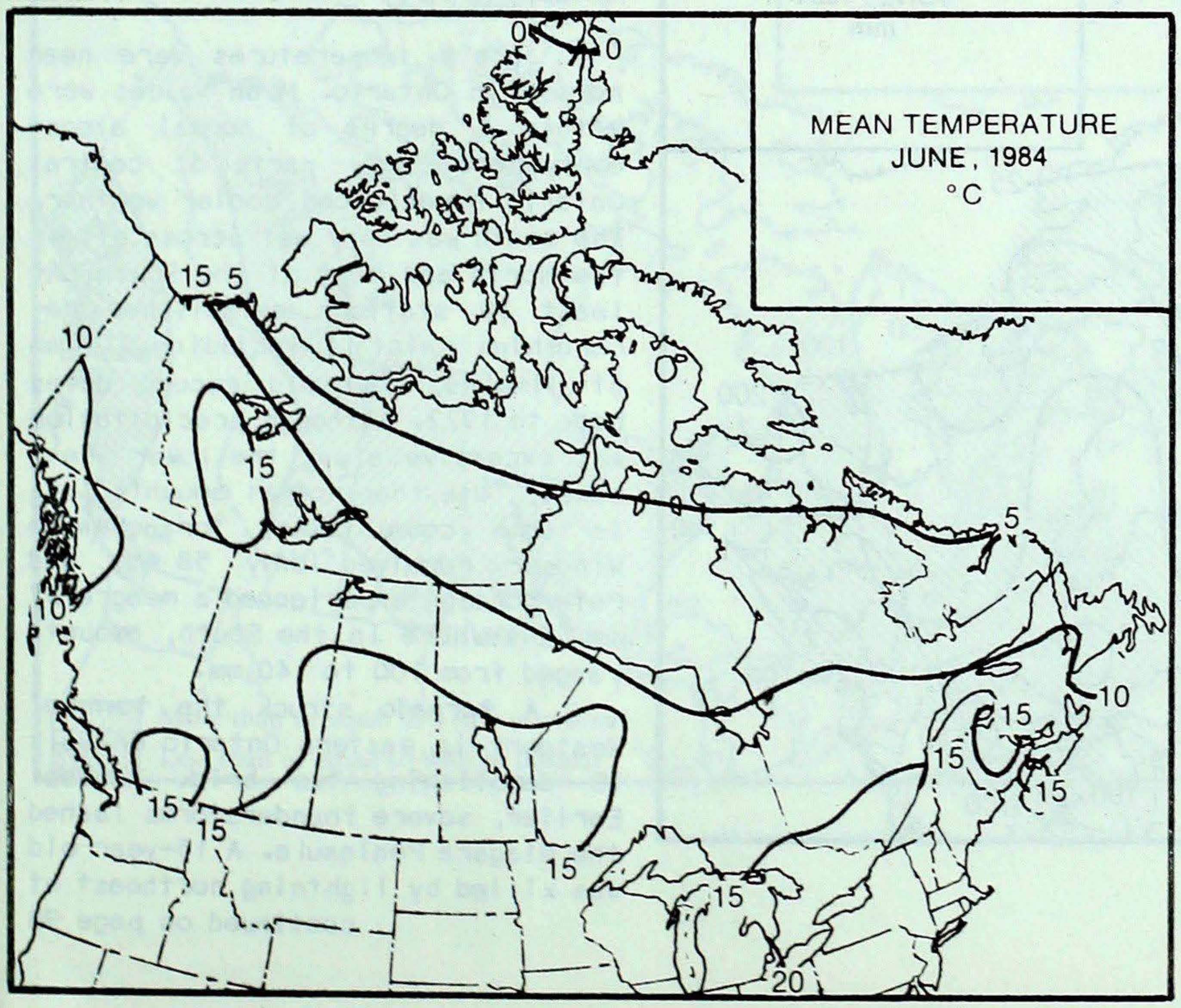


DEPARTURE FROM NORMAL OF MEAN TEMPERATURE JUNE, 1984 °C



MEAN TEMPERATURE JUNE, 1984 °C

ACROSS THE COUNTRY...

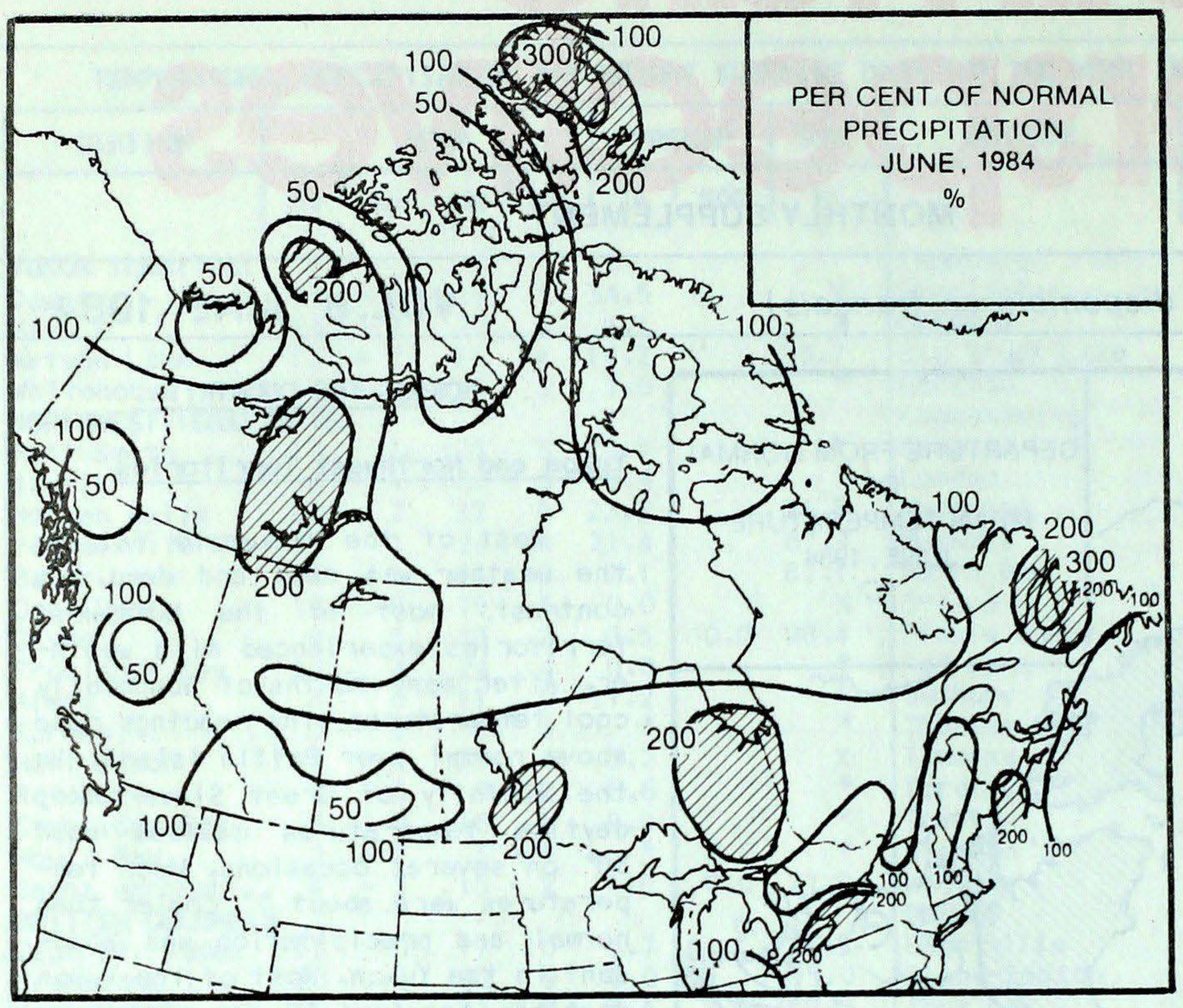
Yukon and Northwest Territories

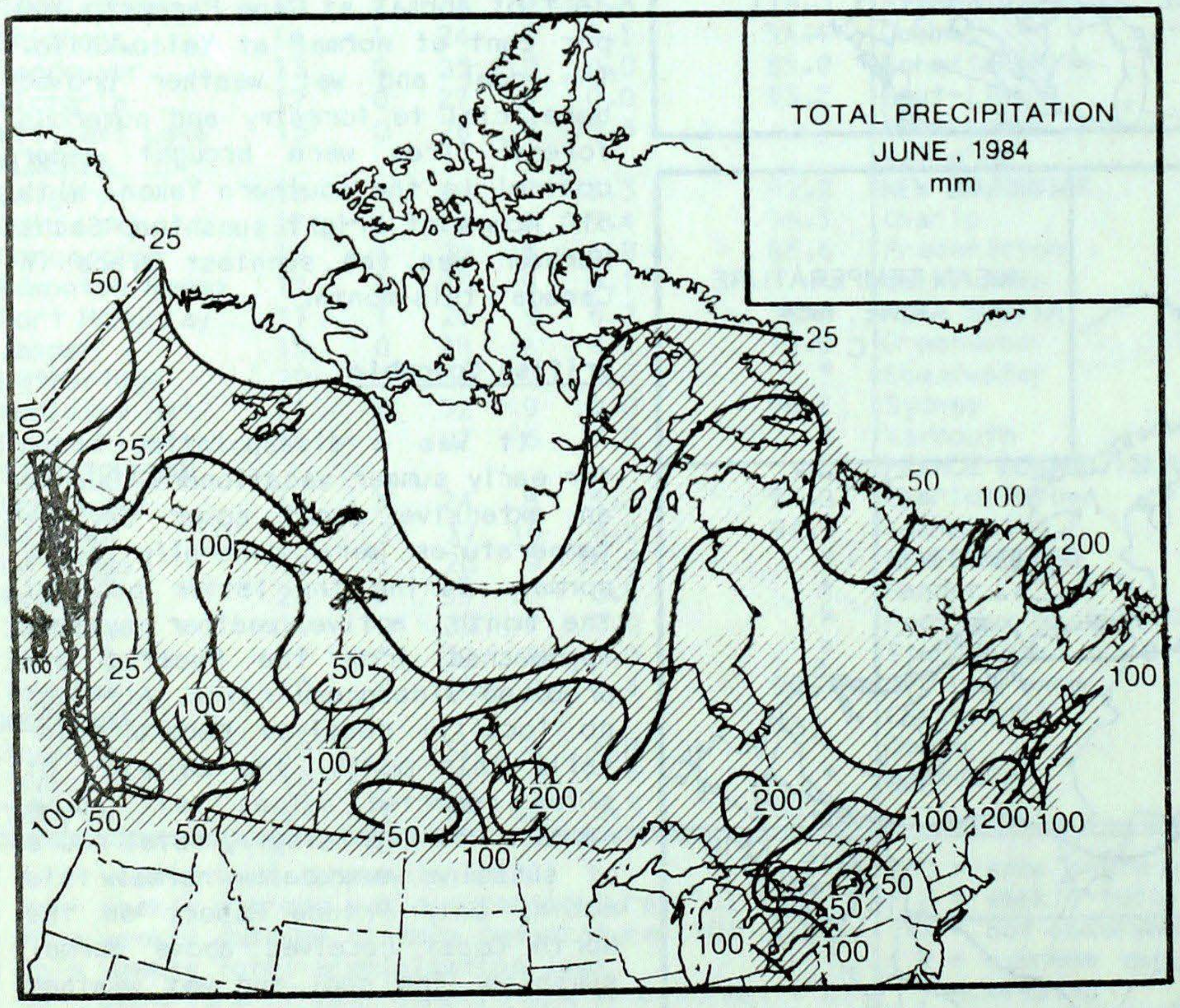
West of the Mackenzie Valley, the weather was cool and damp. In contrast, most of the Northwest Territories experienced mild weather. After many months of abnormally cool temperatures, the readings rose above normal over Baffin Island. In the vicinity of Great Slave Lake, daytime temperatures climbed near 30° on several occasions. Mean temperatures were about 1° cooler than normal and precipitation was abundant in the Yukon. Most of the Yukon stations received 50 per cent more than their normal share; however, Whitehorse received only half its average rainfall. Across the Northwest Territories, precipitation was quite variable ranging from 13 per cent of normal at Cape Parry to 400 per cent of normal at Yellowknife. The cool and wet weather proved beneficial to forestry and numerous forest fires were brought under control in the southern Yukon. With 510 hours of bright sunshine, Sachs Harbour was the sunniest place in Canada this month.

British Colombia

It was a disappointing month for early summer vacationers. Due to an extensive cloud cover daytime temperatures were generally below normal. During the latter part of the month, active weather systems approached from the Pacific and produced widespread rains. Although no locality received record rainfalls this month, the majority of sites reported values well above normal. Not suprisingly, total hours of sunshine were below normal this month; only Prince Rupert on the North Coast received above normal sunshine. The cool and wet weather condition hampered farming and the growth of most agricultural crops was retarted several weeks.

Canada





Prairies

Severe weather was pronounced across most of the agricultural districts, especially during the latter half of the month. Severe thunderstorms struck southern Manitoba and parts of southern Saskatchewan on more than four separate locations. The storms spawned tornadoes and were also assoicated with heavy downpours and large hail, which laid waste crops in many communities, flooded farm machinery left in low lying fields and in urban areas and flooded streets and basements. On June 15, hail devastated crops near Brandon accumulating to a depth of 15 cm on the ground. On June 16, Elie, west of Winnipeg, received more than 200 mm of rain in a six hour period alone. On June 21 and 22, tornadoes were reported in several communities across the south causing significant damage. On June 29, severe thunder storms crossed cental Alberta, spawning tornadoes which resulted in a swath of destruction just north of Edmonton, damaging as many as 35 farms.

Winnipeg recorded its second wettest month on record with 227.9 mm of rain while Bissett set a new June record of 205 mm of precipitation.

Ontario

June's temperatures were near normal in Ontario. Mean values were within 1 degree of normal almost everywhere. Only parts of central Ontario experienced cooler weather. The month was very wet across all of the North and most of the South. At least 10 stations established record-high rainfall including 216 mm at Timmins, the old record dates back to 1922. Although precipitation was excessive along the lower Great Lakes, less than normal amounts fell in some communities; for example Windsor received only 58 mm and Peterborough experienced a meagre 37 mm. Elsewhere in the South, amounts ranged from 100 to 140 mm.

A tornado struck the town of Westport in eastern Ontario on July 18 demolishing two brick houses. Earlier, severe thunderstorms lashed the Niagara Peninsula. A 15-year old was killed by lightning northeast of

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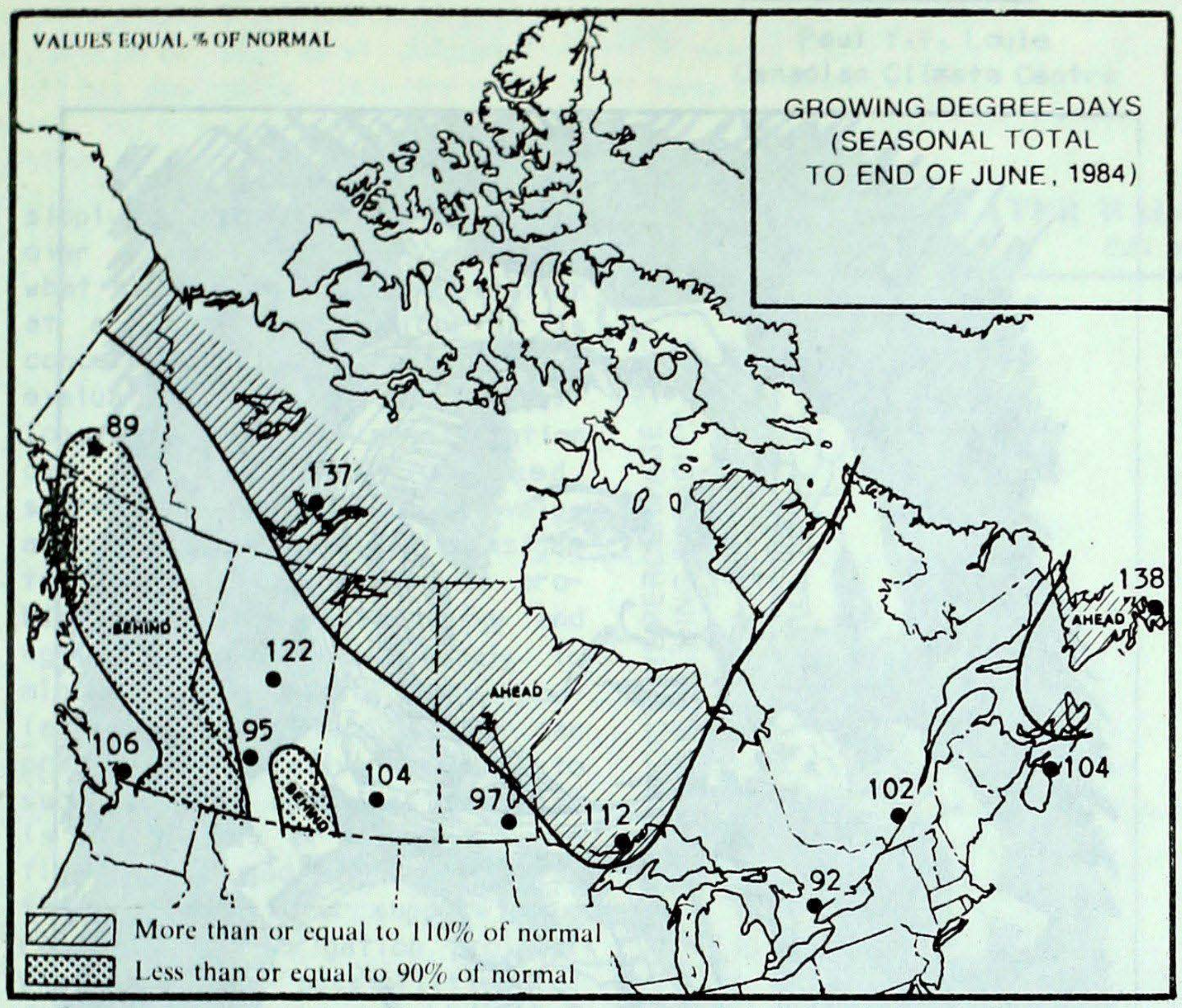
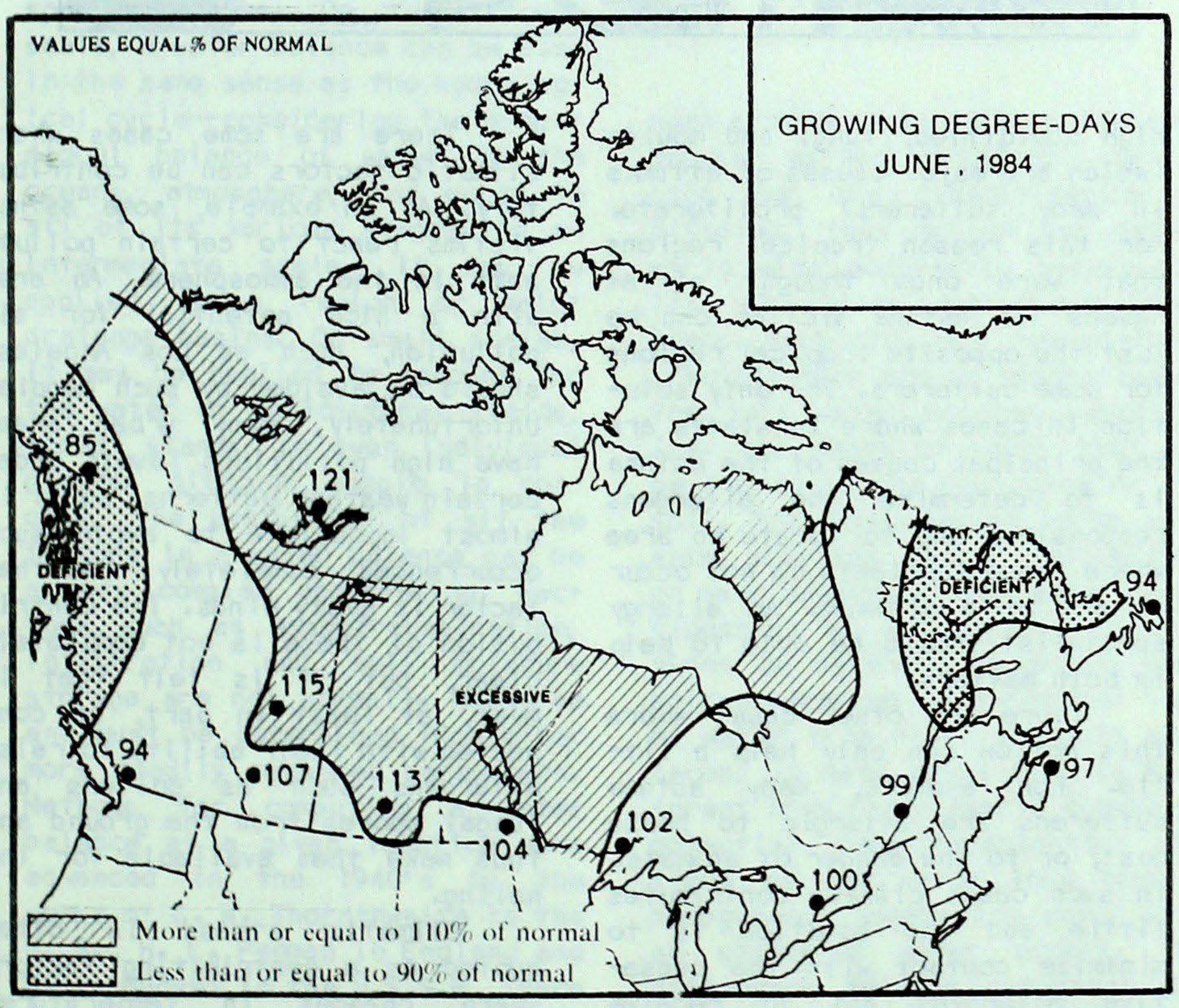
GROWING DEGREE-DAYS





TOTAL TO END OF JUNE

	1984	1983	NORMAL
BRITISH COLUMBIA			
Kamloops	742	887	814
Penticton	652	829	757
Prince George	310	485	393
Vancouver	722	865	698
Victoria	635	797	639
ALBERTA			
Calgary	378	472	400
Edmonton Mun.	544	572	451
Grande Prairie	425	493	428
Lethbridge	481	555	507
Peace River	378	456	415
SASKATCHEWAN			
Estevan	561	552	549
Prince Albert	458	422	443
Regina	526	431	506
Saskatoon	523	538	507
Swift Current	471	441	484
MANITOBA			
Brandon	502	418	513
Dauphin	493	388	484
Winnipeg	527	453	544
ONTARIO			
London	686	601	694
Muskoka	568	519	547
North Bay	514	457	514
Ottawa	690	627	669
Thunder Bay	434	348	386
Toronto	635	597	687
Trenton	634	598	674
Windsor	820	745	846
QUÉBEC			
Baie Comeau	236	288	302
Montréal	695	634	682
Québec	542	517	526
Sept-Iles	212	268	231
Sherbrooke	498	502	583
NEW BRUNSWICK			
Charlo	381	422	398
Fredericton	537	570	521
Moncton	458	545	438
NOVA SCOTIA			
Halifax	433	499	414
Sydney	366	419	305
Yarmouth	419	464	401
PRINCE EDWARD ISLAND			
Charlottetown	433	517	370
NEWFOUNDLAND			
Gander	277	383	245
St. John's	266	204	193
Stephenville	355	445	270

Weather and Asthma

These notes were written by a staff meteorologist who has had personal experience with severe asthma in his family. They have been reviewed by a medical doctor but have not been endorsed by the Medical Association.

The word "asthma" is used to indicate recurrent paroxysmal breathlessness accompanied by wheezing, coughing, and a sense of chest construction. Because each individual case has its own unique combination of contributing factors, attempts to relate climate to asthma frequencies have been inconclusive. In fact, some studies produce results that conflict with those from other studies - the location of the study and the group of asthma sufferers in the sample have a marked effect on the conclusions reached by the investigator. For these reasons general statements can be absolutely wrong when applied to individual cases. There is no substitute for the advice of a doctor who has first-hand knowledge of the individual case.

True asthma can be brought on by many causes. Allergic food reactions are fairly common in children, as are inhalent reactions in adults and children. In many cases respiratory infections can incite as astma attack - attacks caused by such infections can be very difficult to relieve. A complicating effect in many cases are emotions; some attacks are brought on by the emotions, while other cases are made more severe through this factor. To further complicate the picture, there are the imitators of true asthma, such as cardiac "asthma" caused by heart disease.

The most marked influence that climate has on asthma occurrences is ecological - some allergens can exist in some climates and not in others. For example, for a person whose asthma is caused primarily by ragweed, polar regions would be havens because that weed is unknown in those places. For severe attacks of acute asthma, high humidity is part of the treatment, yet in areas with high temperature and high humidities, fungi and moulds (which are major causes of attacks in many sufferers) proliferate. For this reason tropical regions that were once thought of as havens for asthma victims can be just the opposite tropical regions for some sufferers. The only solution in cases where inhalants are the principal causes of the asthma is to determine the allergens responsible and to locate an area where these inhalants do not occur or are at a minimum. An allergy specialist should be able to help in both matters.

There are other cases where this action can only help a little. For example, many asthma sufferers are allergic to house dust, or to the dander of animals. In such cases climate contributes little and the solution is to minimize contact with the causative allergens and to receive injections of desensitizing extracts, where these are known to be effective e.g. pollens, dust, mould.

There are some cases where climatic factors can be contributory. As an example, some asthma victims react to certain pollutants in the atmosphere. An area with a high potential for air pollution, such as Los Angeles, should be avoided by such people. Unfortunately, many urban areas have high pollutions levels under certain weather patterns, so it is almost impossible to avoid such occurrences completely. Another factor is gusty winds. The contribution of these is not completely clear, but it is felt that it must, at least in part, be connected with their ability to raise allergens such as pollens and fungal spores from the ground and thus make them available for inhaling.

Climatic stress is often quoted as a contributing factor. Sharp changes in temperature, humidity and pressure have all been correlated with higher asthma frequencies. However, the physiological connection between such

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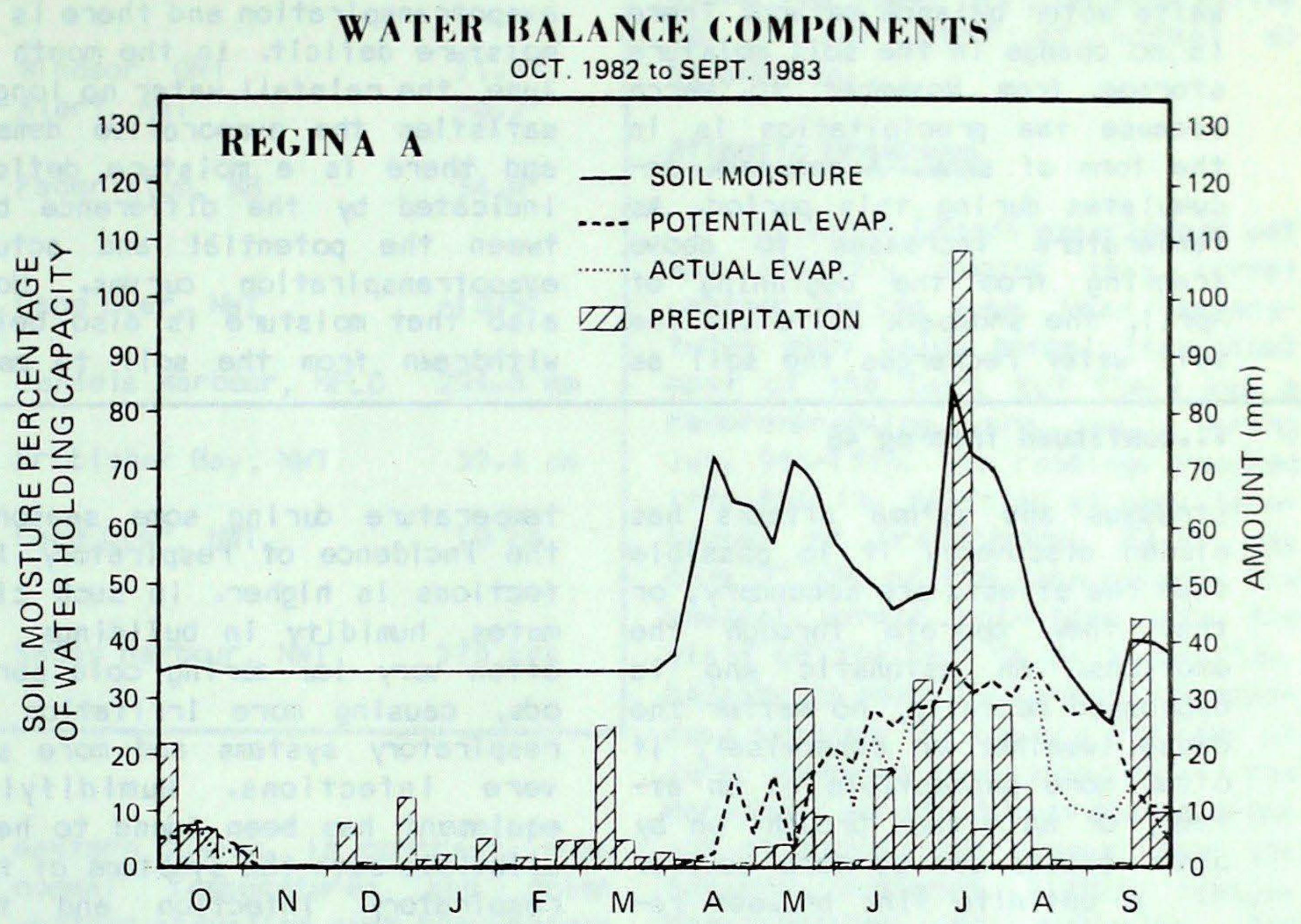
The Climatic Water Balance

Paul Y.T. Louie
Canadian Climate Centre

The climatic water balance, simply stated, is an accounting over a specified time period of what happens to the precipitation at a location or region. It is concerned with a quantitative evaluation over time of the various ways that the precipitation can be dispersed, utilized, stored, or changed. Such an evaluation can provide valuable insight to the solution of various problems. Problems in hydrology and agriculture come immediately to mind as logical fields where knowledge of the water balance can provide quantitative answers to such specific questions as: What is the monthly or annual streamflow in ungauged streams? What is the available water supply for a reservoir or irrigation project? What are the possibilities of flooding or drought for a region?

A water balance can be applied to different temporal and spatial scales. On the largest scale, a water balance can be used in the same sense as the hydrological cycle--considering the annual global balance of water in the oceans, atmosphere, and earth in all of its various stages. On an intermediate scale, it may be applied to a region or major drainage basins. On small scales, it may be applied to account for the water of agricultural fields, forest stands, or even individual plants. Although simple in concept, the evaluation of all the factors in a water balance can be a very complex undertaking. Factors such as evapotranspiration, infiltration and soil moisture storage are not normally measured and must be determined from other more readily measured parameters. Methods for computing a water balance at a given location were advanced in the 1940's by the works of C. W. Thornthwaite in the U. S., H. L. Penman in England and M. I. Budyko in the U.S.S.R. There have since been numerous modifications to these three basic methods.



The Thornthwaite water balance procedure is perhaps the most popular method. Originally developed for the classification of climates, this method has gained world wide popularity because of its simplicity and basic data needs. Requiring only temperature, precipitation and an assumption of the soil water holding capacity, i.e. the depth of water that can be stored in the root zone of the soil, the Thornthwaite water balance provides useful information on many aspects of the water relationships at a location. It provides an estimate of actual evapotranspiration or the actual loss of water from plant and soil surfaces. In many cases this is different from the climatic demand or potential evapotranspiration defined as the water loss from a homogeneous vegetation cover with an unlimited water supply. The difference between potential and actual evapotranspiration provides a quantitative value of the moisture deficit at a location--the amount which available moisture fails to satisfy the climatic demand for water. On the other hand, when precipitation exceeds water demand, excess moisture will infiltrate the soil and first be used to recharge the soil root zone. Any remaining excess water will become water surplus and is available for surface and/or subsurface runoff. During periods when the water need is greater than the precipitation, the water demand is met in part by using stored soil moisture. Tracking the soil moisture storage at a location using a water balance has been found to be a particular useful indicator of the moisture status since it not only accounts for the current water supply and demand at a location but it also integrates the antecedent moisture conditions. The four derived components from the climatic water balance--actual evapotranspiration, water deficit, water surplus, and soil moisture storage--are vital in any effort to understand or use the water resource of a region.

Figure 1 illustrates several of the water balance components computed in weekly time steps for Regina from October 1982 to September 1983 using the Thornthwaite water balance method. There is no change in the soil moisture storage from November to March because the precipitation is in the form of snow. A snowpack accumulates during this period. As temperature increases to above freezing from the beginning of April, the snowpack melts and the melt water recharges the soil as shown by the increasing soil moisture storage. Through April and May, the water from snowmelt and rainfall is sufficient to meet the evaporative demand, actual evapotranspiration is equal potential evapotranspiration and there is no moisture deficit. In the month of June, the rainfall water no longer satisfies the evaporative demand and there is a moisture deficit indicated by the difference between the potential and actual evapotranspiration curves. Note also that moisture is also being withdrawn from the soil to meet some of the evaporative demand and the soil moisture storage is decreased. From July to mid-August, the rainfall water was sufficient to meet the evaporative demand, potential and actual evapotranspiration was equal and there was a recharge of the soil moisture storage. From mid-August to mid-September, moisture deficit conditions again prevailed. In this example, a moisture surplus condition did not occur since the soil moisture storage did not fully recharge to its full water holding capacity.

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stresses and asthma attacks has eluded discovery. It is possible that the effects are secondary, or that they operate through the emotions. An asthmatic who is depressed mentally, no matter the cause (weather or otherwise), if often more susceptible to an attack, or an attack brought on by other causes can be more severe.

A definite link between respiratory infections and asthma occurrences has been noted by several investigators. The most obvious climatic influence here is that such infections are more frequent in some climates than in others. In areas that undergo frequent and sharp changes in temperature during some seasons, the incidence of respiratory infections is higher. In such climates, humidity in buildings, is often very low during cold periods, causing more irritation to respiratory systems and more severe infections. Humidifying equipment has been found to help alleviate both the symptoms of the respiratory infection and the asthma attack that may also occur.

In summary, the link between climate and asthma varies from case to case. Where the principal cause of the asthma is an allergen one must seek a region that minimizes contact with that allergen. This overrides all other climatic considerations. If the major cause of severe attacks is respiratory infections, then a climate in which these are not as numerous could help. However, one must be careful not to trade one cause for another - moving to a less stress-producing climate could also expose a sufferer to a higher incidence of some inhaled allergen that could counteract any benefit that otherwise might be gained. It is therefore most important that an asthmatic who is contemplating a move for medical reasons should consult with a qualified medical practioner who can make recommendations for the individual case.

Reference: DS No. 9-72 Atmospheric Environment Service

CORN HEAT UNITS

Seasonal Accumulation to the end of June

Station	**1984**	**1983**	**Per cent of Normal**
Lethbridge	430	463	115
Brandon	629	550	95
Pilot Mound	643	635	97
Earlton	437	450	101
London	868	771	96
Ottawa	802	792	89
Thunder Bay	451	437	134
Toronto	822	778	94
Trenton	812	776	88
Wiarton	554	580	86
Windsor	1047	1000	97
Montréal	876	841	92
St Agathe	515	545	61
Sherbrooke	660	624	98
Fredericton	576	610	89
Truro	382	409	105
Charlottetown	413	463	101

CLIMATIC EXTREMES - JUNE, 1984

MEAN TEMPERATURE:		
WARMEST	Windsor, ONT	21.3°
COLDEST	Alert, NWT	-0.7°
HIGHEST TEMPERATURE:	Federicton, NB	34.9°
LOWEST TEMPERATURE:	Cape Dyer, NWT	-10.5°
HEAVIEST PRECIPITATION:	Daniels Harbour, NFLD	294.8 mm
HEAVIEST SNOWFALL:	Frobisher Bay, NWT	39.4 cm
DEEPEST SNOW ON THE GROUND ON MAY 31, 1984	Cape Dyer, NWT	10 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	Sachs Harbour, NWT	510 hrs

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Hamilton that also recorded 75 mm of rain in less than 6 hours. A few days later, an additional 87 mm fell at the same location. Sunshine was sparse across northern Ontario by some 30 to 40 hours. Despite the very wet weather in the southwestern region, London received 58 more hours of sunshine than normal and 340 hours of sun provided the brightest June ever at Hamilton.

Québec

June was cool and wet over eastern Québec. In contrast, near normal temperatures and drier weather prevailed over the western areas. Mean temperatures were nearly 3° below normal at Baie Comeau where the monthly average of 11.2° equalled the record-low value for June set in 1972. Elsewhere, mean temperatures ranged from 19° at Hull to 6° in Northern Québec. Except for Gaspé and the lower North Shores, precipitation was near normal. Blanc Sablon received the most, where 186 mm set a record for June. Significant rainfall was recorded at Montréal and Québec City on July 18; At Montréal, 54 mm of rain was less than 1 mm shy of the 24-hour record fall for June.

Hours of bright sunshine ranged from about 125 per cent of normal along the lower St. Lawrence Valley to 79 per cent of normal at Natashquan.

Atlantic Provinces

Atlantic Canada experienced wet and slightly cooler than normal weather during June. Mean temperatures were below normal throughout most of the East, but there was a record-breaking warm spell during July 9th-13th. The readings reached into the low thirties at many locations; at Fredericton, 34.9° was only 1° shy of the June record. The unusual warmth coincided with the visit of the Tall Ships to Halifax, helping to make this event a tremendous success. During the 3rd week of June, damaging frost occurred in the Maritimes as the temperatures dropped to record low values; corn and tobacco suffered freeze damage. Precipitation was excessive, the amounts ranged from 156 per cent of normal at Saint John to 45 per cent of normal at Moncton. At Saint John, 241 mm of rain proved to be of record proportions. Snowfall, a rare occurrence in June, fell in parts of Cape Breton on June 4. Both Shelburne and Sable Island received record amounts of sunshine, 283 and 262 hours respectively. June was rather dull in Newfoundland, hours of bright sunshine were below normal in most locations.

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JUNE 1984

STATION	Temperature C: Mean	Temperature C: Difference from Normal	Temperature C: Maximum	Temperature C: Minimum	Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
BRITISH COLUMBIA													
ABBOTSFORD	14.3	-0.4	28.1	3.8	0.0	0	73.2	113	0	10	153	71	
ALERT BAY	11.6	-0.7	19.4	5.2	0.0	0	52.1	79	0	10	X		192.5
BLUE RIVER	13.0	-0.8	27.2	-2.7	0.0	0	126.3	147	0	16	184	93	X
BULL HARBOUR	MSG	-0.8	MSG	MSG	0.0	0	95.4	123	0	13	X		X
BURNS LAKE													
CAPE ST. JAMES	10.5	-0.1	15.6	7.1	0.0	0	124.8	170	0	16	X		224.3
CAPE SCOTT	10.9	-0.3	16.7	5.8	0.0	0	148.1	141	0	15	X		213.0
CASTLEGAR	15.2	-1.7	31.8	3.2	0.0	0	106.3	185	0	11	209	86	94.7
COMOX	14.4	-0.6	25.0	6.2	0.0	0	39.7	113	0	8	X		107.2
CRANBROOK	13.4	-1.5	28.6	-1.3	0.0	0	76.8	174	0	10	274	284	140.1
DEASE LAKE	9.7	-0.7	20.7	-1.4	TR	0	51.2	117	0	12	188	87	247.8
ETHELDA BAY	10.6	-0.7	18.4	2.2	0.0	0	245.7	195	0	16	X		220.5
FORT NELSON	14.6	0.2	26.3	3.4	0.0	0	102.0	148	0	11	227	*	102.2
FORT ST. JOHN	13.0	-0.5	24.0	3.2	0.0	0	95.2	140	0	9	X		149.4
HOPE	15.3	-0.5	29.1	5.6	0.0	0	83.1	128	0	8	150	67	90.2
KAMLOOPS	17.3	-0.7	30.0	4.8	0.0	0	31.7	106	0	9	225	88	53.1
KELOWNA	15.6	-0.5	29.7	2.2	0.0	0	38.6	151	0	8	219	81	79.6
LANGARA	10.9	0.8	14.7	6.9	0.0	0	129.0	145	0	19	X		217.2
LYTTON	17.2	-0.8	32.6	6.7	0.0	0	33.8	184	0	8	206	77	55.9
MACKENZIE	MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG
MCINNES ISLAND	11.8	-0.2	17.0	7.0	0.0	0	194.1	159	0	18	X		187.3
MERRY ISLAND	15.2	-0.3	22.9	8.1	0.0	0	45.8	103	0	9	195	*	85.1
PENTICTON	16.2	1.0	31.0	1.1	0.0	0	38.9	141	0	5	210	80	71.6
PORT ALBERNI	14.0	-0.3	26.5	3.2	0.0	0	33.1	86	0	10	158	*	121.4
PORT HARDY	11.3	-0.5	19.7	3.7	0.0	0	77.0	109	0	12	167	97	199.7
PRINCE GEORGE	12.4	-0.5	25.6	1.1	0.0	0	66.5	99	0	13	231	89	169.0
PRINCE RUPERT	10.7	0.0	16.2	3.5	0.0	0	146.2	117	0	15	136	90	218.7
PRINCETON	13.7	-0.8	29.7	-1.6	0.0	0	45.6	172	0	8	210	*	X
QUESNEL	13.7	-0.3	27.1	0.8	0.0	0	47.2	75	0	11	X		128.8
REVELSTOKE	16.2	0.4	30.3	2.3	0.0	0	54.6	82	0	10	214	99	66.9
SANDSPIT	11.5	-0.1	16.5	5.7	0.0	0	85.0	164	0	16	151	86	196.9
SMITHERS	11.7	-0.8	26.0	1.2	0.0	0	18.4	46	0	8	217	88	187.7
STEWART													
TERRACE	12.2	-1.5	25.0	6.4	0.0	0	45.2	106	0	11	180	94	159.3
VANCOUVER HARBOUR	15.0		25.6	9.2	0.0	0	94.8		0	9	X		94.7
VANCOUVER INT'L	14.7	-0.4	25.4	7.4	0.0	0	69.0	153	0	8	187	79	101.8
VICTORIA GONZ. HTS	13.1		22.1	7.0	0.0	0	37.6		0	6	242	88	147.7
VICTORIA INT'L	13.8	-0.5	23.5	6.0	0.0	0	46.4	160	0	7	221	86	126.9
VICTORIA MARINE	11.9	-0.6	19.5	4.2	0.0	0	46.8	196	0	7	X		181.7
WILLIAMS LAKE	12.0	-1.0	24.5	1.2	0.0	0	68.2	151	0	12	235	83	185.0
YUKON TERRITORY													
BURWASH	9.6	-0.7	23.0	-3.0	0.0	0	75.5	161	0	10	X		250.4
DAWSON	13.5	-0.7	28.3	-1.3	0.0	0	20.1		0	8	X		135.0
MAYO	14.1	0.7	26.0	0.7	0.0	0	52.7	149	0	10	X		115.8
WATSON LAKE	12.0	-0.7	22.4	0.5	0.0	0	67.9	132	0	10	225	85	179.4
WHITEHORSE	11.3	-0.7	21.8	-1.3	TR	0	14.5	47	0	5	217	80	202.2
NORTHWEST TERRITORIES													
ALERT	-0.7	0.3	7.0	-10.0	6.6	67	5.7	55	TR	2	352	116	560.4
BAKER LAKE	5.8	1.7	23.5	-1.5	TR	0	16.1	77	TR	3	263	100	364.8
CAMBRIDGE BAY	4.6	3.1	19.4	-3.1	TR	0	5.0	38	0	3	418	156	401.6
CAPE DYER	1.1	0.9	12.9	-10.5	8.0	28	14.6	37	10	3	X		506.4
CAPE PARRY	3.6	2.0	18.5	-4.0	0.2	6	1.8	13	0	1	X		430.3
CLYDE	1.8	1.2	12.8	-7.0	13.8	144	13.8	110	TR	3	290	111	485.9
COPPERMINE	4.9	1.1	22.4	-3.5	2.0	77	32.4	191	0	3	472	153	391.5
CORAL HARBOUR	3.2	1.1	17.5	-7.1	6.3	78	32.0	119	0	6	234	83	445.3
EUREKA	3.4	1.6	14.8	MSG	6.6	275	20.9	387	0	6	441	109	437.6
FORT RELIANCE	10.8	1.3	23.1	0.8	0.0	0	25.0	96	0	8	X		216.1
FORT SIMPSON	15.7	1.1	28.7	1.5	0.0	0	59.3	150	0	6	299	106	74.8
FORT SMITH	14.3	0.7	26.9	0.3	0.5	167	56.9	138	0	9	253	*	113.0
FROBISHER BAY	3.6	0.2	14.7	-7.4	39.4	390	67.4	171	0	9	197	113	431.7
HALL BEACH	2.1	2.1	13.3	-8.6	7.6	123	25.3	151	0	6	X		476.8
HAY RIVER	12.3	0.4	28.4	2.0	0.0	0	63.6	237	0	7	X		179.0
INUVIK	13.5	3.4	26.1	-0.1	3.4	155	14.2	60	0	4	393	105	137.1
MOULD BAY	1.8	2.1	9.4	-6.9	0.0	0	2.2	35	TR	1	361	147	486.2
NORMAN WELLS	16.5	2.5	27.5	0.8	0.0	0	48.9	132	0	6	253	81	60.9
POND INLET													
RESOLUTE	1.1	1.7	10.1	-8.0	0.8	11	3.2	26	0	1	373	146	506.5
SACHS HARBOUR	6.1	4.2	16.0	-3.5	TR	0	15.2	208	0	3	510	154	357.1
YELLOWKNIFE	13.7	0.8	23.3	1.5	TR	0	70.6	420	0	10	339	86	128.2
ALBERTA													
BANFF	11.7	0.1	27.5	-1.5	0.0	0	46.0	75	0	MSG	MSG		MSG
BROOKS	15.5	-0.1	36.0	1.5	0.0	0	52.2	79	0	MSG	283	99	MSG
CALGARY INT'L	13.8	0.3	30.2	2.3	0.0	0	73.0	82	0	10	279	105	138.0
COLD LAKE	15.5	1.0	33.9	3.0	0.0	0	46.6	65	0	11	277	98	91.7
CORONATION	14.0	-0.4	34.1	2.3	0.0	0	81.6	142	0	13	270	87	126.4
EDMONTON INT'L	14.0	-0.1	30.0	0.6	0.0	0	66.2	86	0	8	267	93	123.9
EDMONTON MUN.	15.5	0.4	30.5	5.5	0.0	0	84.9	110	0	11	285	105	88.3
EDMONTON NAMAO	14.6	-0.1	29.1	3.4	0.0	0	104.5	134	0	9	X		109.3
EDSON	12.2	-0.3	27.2	-0.7	0.0	0	72.4	60	0	14	230	91	175.0
FORT CHIPEWYAN	14.2	0.0	27.5	0.0	0.0	0	70.8	152	0	MSG	MSG		MSG

MSG = Missing   X = not observed   * = normal missing.

JUNE 1984

STATION	Temperature C				Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
	Mean	Difference from Normal	Maximum	Minimum									
FORT MCMURRAY	15.3	1.3	29.6	1.3	0.0	0	77.6	121	0	9	303	111	95.1
GRANDE PRAIRIE	13.5	−0.2	26.0	1.5	0.0	0	108.8	155	0	10	275	*	133.2
HIGH LEVEL	14.2	−0.2	28.0	0.5	0.0	0	105.3	147	0	10	286	94	112.4
JASPER	12.0	−0.4	25.4	−2.1	0.0	0	59.4	108	0	10	215	*	180.1
LETHBRIDGE	15.2	−0.2	33.5	0.4	0.0	0	50.7	65	0	6	X		101.4
MEDICINE HAT	16.3	−0.3	38.2	3.9	0.0	0	51.6	81	0	6	311	112	77.7
PEACE RIVER	13.7	0.0	25.1	2.0	0.0	0	120.5	202	0	10	X		127.9
RED DEER	13.0	−0.6	30.9	2.3	0.0	0	57.1	68	0	8	X		146.3
ROCKY MTN HOUSE	12.6	−0.2	26.5	−1.3	0.0	0	69.1	66	0	9	X		164.2
SLAVE LAKE	13.6	0.0	25.4	2.3	0.0	0	60.3	62	0	12	306	111	131.4
SUFFIELD	16.4		36.5	2.8	0.0	0	111.6		0	9	266	*	75.7
WHITECOURT	13.0	0.3	26.4	0.9	0.0	0	96.1	105	0	11	X		150.9
SASKATCHEWAN													
BROADVIEW	16.0	0.8	30.3	−0.4	0.0	0	46.6	79	0	11	296	100	77.9
COLLINS BAY	12.7		28.4	−1.6	0.0	0	46.9		0	10	268	*	164.4
CREE LAKE	14.0	0.5	25.5	1.0	0.0	0	67.8	106	0	10	319	120	124.2
ESTEVAN	17.2	0.7	31.1	3.9	0.0	0	87.0	112	0	9	285	94	49.7
HUDSON BAY	15.4		29.7	2.3	0.0	0	76.4		0	8	304	*	87.8
KINDERSLEY	15.7	0.0	37.2	4.5	0.0	0	97.8	171	0	10	X		90.4
LA RONGE	15.5	1.5	33.1	4.4	0.0	0	56.0	62	0	8	X		91.0
MEADOW LAKE	15.1		35.8	2.3	0.0	0	61.7		0	8	296	*	98.3
MOOSE JAW	17.0	0.4	35.5	5.0	0.0	0	31.7	48	0	7	277	97	60.5
NIPAWIN	15.4		30.7	3.8	0.0	0	84.5		0	9	284	*	85.6
NORTH BATTLEFORD	15.5	0.1	35.9	3.4	0.0	0	108.4	180	0	11	MSG		94.2
PRINCE ALBERT	15.8	1.2	32.6	4.1	0.0	0	94.8	137	0	8	293	112	82.4
REGINA	16.6	0.7	32.8	3.7	0.0	0	36.0	45	0	7	274	97	65.7
SASKATOON	16.5	0.8	35.5	3.2	0.0	0	70.0	119	0	7	X		73.4
SWIFT CURRENT	15.5	0.4	36.6	4.5	0.0	0	74.7	99	0	9	273	97	94.3
URANIUM CITY	13.9	0.4	24.4	3.4	0.0	0	40.1	114	0	9	X		120.9
WYNYARD	15.6	0.2	30.7	1.9	0.0	0	67.7	92	0	9	268	92	82.1
YORKTON	16.0	0.5	29.8	0.4	0.0	0	89.5	127	0	8	301	104	73.8
MANITOBA													
BISSETT	16.2	0.8	29.5	2.3	0.0	0	205.0	236	0	13	245	96	71.5
BRANDON	16.4	0.3	30.8	1.7	0.0	0	52.1	68	0	12	X		70.2
CHURCHILL	7.4	1.2	32.2	−1.1	TR	0	34.5	79	0	9	222	95	323.7
DAUPHIN	16.6	0.8	29.1	−0.3	0.0	0	123.8	143	0	7	267	98	61.6
GILLAM	13.0	2.1	31.4	−0.3	0.0	0	45.2	80	0	9	MSG		163.5
GIMLI	16.7		28.0	4.1	0.0	0	103.6		0	10	281	96	61.2
ISLAND LAKE	14.6	0.6	29.5	1.8	0.0	0	101.3	158	0	10	MSG		117.9
LYNN LAKE	14.1	1.6	35.2	−1.1	0.0	0	42.7	63	0	9	282	107	130.8
NORWAY HOUSE	15.7	*	28.5	0.4	0.0	0	44.6		0	6	MSG		89.9
PILOT MOUND	16.2	0.0	30.6	4.3	0.0	0	83.8	106	0	11	MSG		71.1
PORTAGE LA PRAIRIE	17.6	0.6	31.0	5.3	0.0	0	94.5	125	0	12	X		47.8
THE PAS	15.7	1.3	31.2	3.9	0.0	0	74.7	119	0	9	303	111	84.2
THOMPSON	13.9	1.7	31.4	−1.8	0.0	0	48.4	66	0	8	267	102	136.2
WINNIPEG INT'L	17.0	0.2	30.1	3.2	0.0	0	227.9	285	0	13	268	97	57.6
ONTARIO													
ATIKOKAN	12.8	−1.7	28.6	0.1	0.0	0	135.5	138	0	12	X		161.1
EARLTON	15.2	0.0	28.1	1.6	0.0	0	116.4	130	0	15	X		99.7
GERALDTON	14.3		28.2	3.0	0.0	0	142.1		0	15	X		113.2
GORE BAY	15.2	−0.4	25.9	4.6	0.0	0	104.8	180	0	11	X		86.3
HAMILTON RBG	19.5		32.3	7.0	0.0	0	122.5		0	11	340	*	23.3
HAMILTON	18.6	0.7	30.5	8.3	0.0	0	172.3	248	0	10	X		26.9
KAPUSKASING	14.6	0.5	26.8	1.0	0.0	0	199.7	236	0	14	X		115.9
KENORA	17.1	1.0	28.5	4.9	0.0	0	158.2	190	0	12	X		45.5
KINGSTON	17.2	0.8	29.0	4.0	0.0	0	45.4	59	0	3	291	121	45.5
LANSDOWNE HOUSE	14.3	0.8	30.4	MSG	0.0	0	97.0	119	0	13	X		118.2
LONDON	19.1	1.2	30.5	7.5	0.0	0	143.8	195	0	8	303	124	21.0
MOOSONEE	11.3	−0.6	25.9	−1.5	0.0	0	175.4	223	0	16	190	87	200.9
MOUNT FOREST	16.3	0.6	28.0	3.8	0.0	0	115.8	134	0	9	X		78.6
MUSKOKA	16.1	0.2	30.6	1.8	0.0	0	71.1	87	0	8	X		75.3
NORTH BAY	15.8	0.1	26.4	2.8	0.0	0	127.8	150	0	14	X		78.8
OTTAWA INT'L	19.0	−1.3	32.6	5.2	0.0	0	56.6	77	0	4	304	123	22.1
PETAWAWA	16.7	0.4	32.4	2.5	0.0	0	57.8	61	0	6	X		64.8
PETERBOROUGH	16.8	0.1	29.7	1.9	0.0	0	36.9	57	0	3	X		68.3
PICKLE LAKE	15.0	1.1	29.5	0.9	0.0	0	97.4	111	0	12	X		104.1
RED LAKE	15.4	0.3	28.1	1.9	0.0	0	132.8	153	0	11	237	*	97.6
ST. CATHARINES	19.6	1.1	31.5	8.0	0.0	0	132.0	176	0	8	X		22.6
SARNIA	19.5	1.7	31.0	8.6	0.0	0	128.4	156	0	7	317	116	MSG
SAULT STE. MARIE	14.5	0.1	29.8	0.6	0.0	0	107.3	129	0	11	203	79	114.2
SIMCOE	18.7	0.7	30.3	8.0	0.0	0	120.6	169	0	8	X		29.0
SIOUX LOOKOUT	15.7	0.5	28.5	4.4	0.0	0	120.6	132	0	15	X		82.4
SUDBURY	16.1	0.1	29.0	4.2	0.0	0	178.0	215	0	12	210	85	71.7
THUNDER BAY	14.1	0.1	28.4	2.3	0.0	0	120.7	158	0	13	204	*	119.6
TIMMINS	14.6	0.0	27.2	0.0	0.0	0	216.1	241	0	14	X	78	115.8
TORONTO	19.7		30.6	9.8	0.0	0	53.7		0	5	X		15.0
TORONTO INT'L	18.2	0.5	30.7	6.4	0.0	0	48.1	72	0	6	X		40.1
TORONTO ISLAND	18.2		30.5	8.3	0.0	0	53.8		0	0	MSG		24.7
TRENTON	18.1	0.3	29.9	3.1	0.0	0	134.3	211	0	3	X		35.5
TROUT LAKE	15.3	3.3	27.5	2.0	0.0	0	106.6		0	12	200	*	86.6
WATERLOO-WELL	17.8	0.7	29.5	5.8	0.0	0	121.6	164	0	9	X		44.1
WAWA	12.8		27.1	0.0	0.0	0	137.7		0	14	X		158.5
WIARTON	15.9	0.3	28.5	3.7	0.0	0	44.7	67	0	6	274	95	88.9
WINDSOR	21.3	1.6	33.1	10.5	0.0	0	57.8	65	0	7	X		3.5

MSG = Missing   X = not observed   * = normal missing.

JUNE 1984

STATION	Temperature C Mean	Difference from Normal	Maximum	Minimum	Snowfall (cm)	% of Normal Snowfall	Total Precipitation (mm)	% of Normal Precipitation	Snow on ground at end of month (cm)	No. of days with Precip 1.0 mm or more	Bright Sunshine (hours)	% of Normal Bright Sunshine	Degree Days below 18 C
QUEBEC													
BAGOTVILLE	14.9	-0.6	31.4	1.7	0.0	0	96.9	107	0	14	X		100.7
BAIE COMEAU	11.2	-1.6	24.4	-0.8	0.0	0	78.0	110	0	8	221	94	203.5
BLANC SABLON	6.6	-0.6	18.4	-1.7	9.4		185.8	200	0	17	129	*	340.9
CHIBOUGAMAU	13.3		28.0	1.4	0.0	0	75.7		0	14	X		146.5
KUUJJUAQ	7.7	0.8	28.5	-4.2	4.2	117	42.8	84	0	11	198	110	314.3
GASPE	11.9		27.4	-1.0	0.0	0	110.6		0	14	211	*	186.2
INUKJUAK	6.3	1.9	23.1	-1.4	5.4	146	26.8	77	0	6	242	125	351.2
LA GRANDE RIVIERE	10.6	*	6.3	-3.3	TR	0	81.4		0	12	212	*	224.9
MANIWAKI	15.7	-0.2	29.6	1.5	0.0	0	80.8	90	0	9	249	100	89.1
MATAGAMI													
MONT JOLI	12.9	-1.4	27.8	1.0	0.0	0	55.0	88	0	10	233	96	153.4
MONTREAL INT'L	18.4	0.1	29.8	6.3	0.0	0	100.2	122	0	5	310	125	29.2
MONTREAL M INT'L	17.2		31.4	4.1	0.0	0	130.1		0	8	288	*	50.9
NATASHQUAN	9.6	-0.9	18.0	-1.4	TR	0	115.8	129	0	10	179	79	MSG
NITCHEQUON	10.0	0.2	21.2	-1.3	TR	0	74.2	88	0	12	190	88	236.5
KUUJJUARAPIK	6.3	0.2	25.1	-2.5	1.1	23	69.6		0	8	210	*	334.7
QUEBEC	16.2	-0.2	31.7	5.3	0.0	0	120.2	109	0	11	268	120	68.8
ROBERVAL	15.8	0.3	30.5	4.5	0.0	0	94.8	117	0	12	254	*	87.3
STE AGATHE DES MONTS	15.3	0.1	28.6	2.7	0.0	0	88.4	82	0	9	247	104	97.0
ST HUBERT	18.0	-0.2	30.7	2.8	0.0	0	81.9	96	0	4	X		36.6
SCHEFFERVILLE	7.3	-1.3	21.9	-3.4	2.0	28	72.4	98	0	10	175	93	319.9
SEPT-ILES	10.7	-1.0	21.2	-0.2	0.0	0	90.4	100	0	11	204	87	220.9
SHERBROOKE	15.4	-0.2	30.4	-0.7	0.0	0	81.2	83	0	11	262	*	90.1
VAL D'OR	14.3	-0.3	27.8	1.0	0.0	0	111.6	119	0	14	199	82	122.5
NEW BRUNWICK													
CHARLO	13.8	-0.9	32.0	0.1	0.0	0	124.9	147	0	17			
CHATHAM	15.2	-0.5	34.7	1.9	0.0	0	158.0	193	0	14	194	85	108.5
FREDERICTON	15.9	-0.3	34.9	1.1	0.0	0	166.1	195	0	10	213	*	89.2
MONCTON	14.4	-0.6	32.5	-0.7	0.0	0	130.4	145	0	11	197	87	121.6
SAINT JOHN	13.8	0.0	28.3	2.0	0.0	0	241.2	256	0	11	186	92	130.3
NOVA SCOTIA													
EDDY POINT	12.8		25.7	1.0	0.0	0	103.8		0	8	249	113	156.8
GREENWOOD	16.0	0.1	33.3	0.5	0.0	0	113.2	158	0	10	X		89.8
HALIFAX INT'L	14.7	-0.1	31.6	2.4	0.0	0	79.7	89	0	8	X		112.0
SABLE ISLAND	12.2	1.2	19.5	3.3	0.0	0	50.7	54	0	6	262	160	171.6
SHEARWATER	14.2	0.3	28.6	3.1	0.0	0	72.7	87	0	7	249	113	121.3
SYDNEY	12.7	-0.5	29.6	1.5	TR	0	73.6	90	0	11	240	106	167.4
TRURO	14.3	0.1	28.0	0.6	0.0	0	87.2	128	0	10	222	102	120.2
YARMOUTH	13.8	0.4	23.6	4.2	0.0	0	150.6	185	0	6	259	123	126.5
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	14.0	-0.5	29.8	3.3	0.0	0	125.8	157	0	13	X		129.7
SUMMERSIDE	14.3	-0.6	27.7	3.3	0.0	0	114.7	155	0	14	199	83	119.1
NEWFOUNDLAND													
ARGENTIA	8.6		18.0	0.9	0.0	0	87.7		0	13	X		283.5
BATTLE HARBOUR	7.0	0.8	26.4	-2.2	6.3	242	87.0	110	0	13	X		338.7
BONAVISTA	8.3	-1.3	21.0	-1.8	0.0	0	110.0	172	0	13	X		289.5
BURGEO	9.0	-0.5	20.9	1.6	0.4		181.2	132	0	17	X		269.0
CARTWRIGHT	7.0	-1.4	25.8	-2.5	16.9	676	142.7	183	0	18	165	92	330.9
CHURCHILL FALLS	8.5	-1.2	23.0	-5.1	5.6	84	84.5	81	0	13	170	91	286.6
COMFORT COVE	9.0	-2.9	24.5	-0.5	1.2	36	117.5	153	0	16	X		270.7
DANIEL'S HARBOUR	8.1	-1.7	20.4	0.2	7.6		294.8	342	0	19	140	74	298.2
DEER LAKE	10.1	-2.1	23.7	-1.1	0.5		145.8	206	0	15	X		248.8
GANDER INT'L	9.4	-2.4	24.8	-0.1	1.0		115.9	144	0	13	139	76	258.0
GOOSE	9.3	-2.0	26.7	-4.2	16.0		120.6	130	0	13	157	84	261.6
HOPEDALE	4.7	-1.7	23.0	-2.9	7.8	125	71.8	112	0	10	X		400.5
PORT-AUX-BASQUES	9.4	0.4	20.4	2.2	0.2		118.4	115	0	5	X		259.2
ST ANTHONY	5.9	-2.2	19.2	-1.0	14.8		163.7	164	0	18	X		362.1
ST JOHN'S	9.9	-1.0	22.7	-0.8	0.0	0	144.0	168	0	13	125	67	242.5
ST LAWRENCE	9.1	0.8	21.0	2.1	0.0	0	108.1	98	0	16	X		241.7
STEPHENVILLE	11.1	-0.8	21.3	2.1	TR	0	157.4	182	0	16	137	72	212.2
WABUSH LAKE	8.6	-1.3	20.5	-2.3	TR	0	77.6	87	0	14	178	93	283.1

MSG - Missing X - not observed * - normal missing.

JUNE 1984 JUIN

STATION	Temperature °C / *Température °C* — Mean / *Moyenne*	Difference from Normal / *Ecart à la normale*	Maximum / *Maximale*	Minimum / *Minimale*	Snowfall (cm) / *Chute de neige (cm)*	Total Precipitation (mm) / *Précipitation totale (mm)*	% of Normal Precipitation / *% de précipitation normale*	Snow on ground at end of month (cm) / *Neige au sol à la fin du mois (cm)*	No. of days with Precip. 1.0 or more (mm) / *Nombre de jours de préc. 1.0 ou plus (mm)*	Bright sunshine (hours) / *Durée de l'insolation (heures)*	Degree Days above 5°C / *Degrés-jours au-dessus de 5°C* — This Month / *Présent mois*	Since Jan. 1st / *Depuis le 1er janv.*	Mean Dew Point °C / *Point de rosée moyen °C*
AGROCLIMATOLOGICAL STATIONS AGROCLIMATOLOGIQUES													
BRITISH COLUMBIA COLOMBIE-BRITANNIQUE													
Agassiz	15.2	-0.4	28.0	7.0	0.0	94.1	118	0	10	157	306.3	802.9	
Kamloops													
Sidney													
Summerland	15.8	-1.6	30.5	3.0	0.0	31.0	101	0	7	242	325.5	646.5	
ALBERTA													
Beaverlodge	12.8	-0.3	25.0	0.5	0.0	94.0	137	0	8	256	236.3	366.7	
Ellerslie	14.1		29.5	2.5	0.0	53.5		0	12	268	265.2	443.3	
Fort Vermilion													
Lacombe	13.4	-0.3	30.0	1.5	0.0	57.3	71	0	10	248	253.2	425.7	
Lethbridge													
Vauxhall													
Vegreville	14.4	0.2	33.5	0.0	0.0	61.8	84	0	11		285.2	476.7	
SASKATCHEWAN													
Indian Head	16.6	1.0	31.0	1.5	0.0	62.4	84	0	9		351.0	496.0	
Melfort	15.8	0.5	31.0	4.0	0.0	83.0	117	0	10	254	317.0	520.5	
Regina	16.2	0.5	32.5	1.0	0.0	54.9	76	0	7		335.8	538.5	
Saskatoon	16.1		34.0	1.0	0.0	52.0		0	8	272	334.5	605.5	
Scott	14.2	-0.3	36.5	1.0	0.0	82.1	124	0	12		209.3	488.4	
Swift Current South	15.6	0.1	36.5	4.5	0.0	66.7	90	0	11	242	312.4	574.8	
MANITOBA													
Brandon	17.1	0.8	31.5	-1.0	0.0	57.3	71	0	9	290	358.6	602.8	
Glenlea	16.5	-0.4	29.5	4.0	0.0	182.5	206	0	12	251	343.5	609.8	
Morden	17.6	0.2	31.5	5.0	0.0	120.4	159	0	12	256	378.1	669.8	
ONTARIO													
Delhi	19.1	0.8	30.0	5.0	0.0	101.7	143	0	7	321	551.2	728.0	
Elora	17.3		29.6	5.0	0.0	97.2		0	7		366.5	579.5	
Guelph	17.9	0.5	29.6	3.6	0.0	71.1	100	0	6	310	388.5	610.0	
Harrow	21.1	1.4	32.0	10.0	0.0	70.4	93	0	10	302	487.8	797.7	
Kapuskasing													
Merivale													
Ottawa	18.9	0.8	31.0	4.2	0.0	58.3	73	0	7	304	417.5	694.4	
Smithfield	18.0	0.7	24.0	11.9	0.0	84.8	136	0	4		389.7	633.4	
Vineland Station	19.4	1.0	32.0	8.2	0.0	176.2	248	0	8	319	430.9	672.9	
Woodslee													
QUEBEC													
La Pocatiere	14.6	-1.1	29.5	2.5	0.0	40.0	45	0	7	264	285.9	435.5	
L'Assomption	18.0	0.4	31.0	2.5	0.0	79.8	95	0	6	294	389.2	640.8	
Lavaltrie													
Lennoxville													
Normandin	14.7	0.1	25.0	0.0	0.0	83.6	109	0	14	224	293.0	423.1	
St. Augustin													
Ste. Clothilde	18.9	1.2	32.0	5.5	0.0	48.0	56	0	6		417.3	712.4	
NEW BRUNSWICK NOUVEAU-BRUNSWICK													
Fredericton													
NOVA SCOTIA NOUVELLE-ECOSSE													
Kentville	16.2	0.3	32.5	2.0	0.0	83.8	118	0	8	211	336.8	601.0	
Nappan	14.6	-0.1	30.0	2.0	0.0	100.2	128	0	11	203	289.8	481.5	
PRINCE EDWARD ISLAND ILE-DU-PRINCE-EDOUARD													
Charlottetown	14.1	-0.8	30.5	2.0	0.0	124.6	169	0	14	204	274.7	450.2	
NEWFOUNDLAND TERRE-NEUVE													
ST. John's West													

ACID RAIN REPORT ISSUED BY ENVIRONMENT CANADA FOR JULY 8 - 14 1984

LONGWOODS NEAR LONDON-ONTARIO

Longwoods received strongly acidic rain on July 9 and July 11 with pH readings of 4.0 and 3.8 respectively. The rain on July 9 was associated with air which came from Michigan and Ohio while the rain on July 11 was produced in air which passed over Wisconsin and Michigan.

DORSET* MUSKOKA-ONTARIO

Air which passed through Wisconsin, Michigan, Ohio and south-central Ontario brought strongly acidic rain with a pH reading of 4.2 to Dorset on July 10. Information on the rainfall for the rest of the week was not available.

CHALK RIVER OTTAWA VALLEY-ONTARIO

On July 10 and July 11 Chalk River received strongly acidic rain with pH values of 3.9 and 4.1 respectively. The air on July 10 came from Michigan, Ohio and central Ontario and the rain on July 11 was associated with air which passed over Michigan, southern Ontario and the Sudbury basin. Air which passed through northwestern Ontario brought moderately acidic rain with a pH of 4.6 to the region on July 12 and strongly acidic rain with a pH reading of 4.2 on July 13. On July 14 a small amount of strongly acidic rain of pH 4.0 was produced in air which originated in Wisconsin, Michigan and central Ontario.

MONTMORENCY QUEBEC CITY-QUEBEC

Montmorency received strongly acidic rain with a pH reading of 3.7 on July 8. This event was associated with air which passed over northern Ontario and northern Quebec. Information for the rainfall for the rest of the week was not available.

KEJIMKUJIK SOUTHWESTERN NOVA SCOTIA

Air which came from the southeast off of the Atlantic Ocean brought a large amount of slightly acidic rain with a pH value of 4.7 to Kejimkujik on July 8. On July 11 air which passed over southern Quebec, Maine and off of the Atlantic Ocean brought strongly acidic rain of pH 4.0 to the region.

* Dorset data supplied by Ontario Ministry of Environment.

Environmental damage to lakes and streams is usually observed in sensitive areas regularly receiving precipitation with pH less than 4.7. pH readings less that 4.0 are serious.

This report was prepared by the Federal Long-Range Transport of Air Pollutants (LRTAP) Liaison Office. For further information, please contact Dr. H.C. Martin at (416) 667-4803.