Environment Canada / Environnement Canada

Canadian Climate Centre

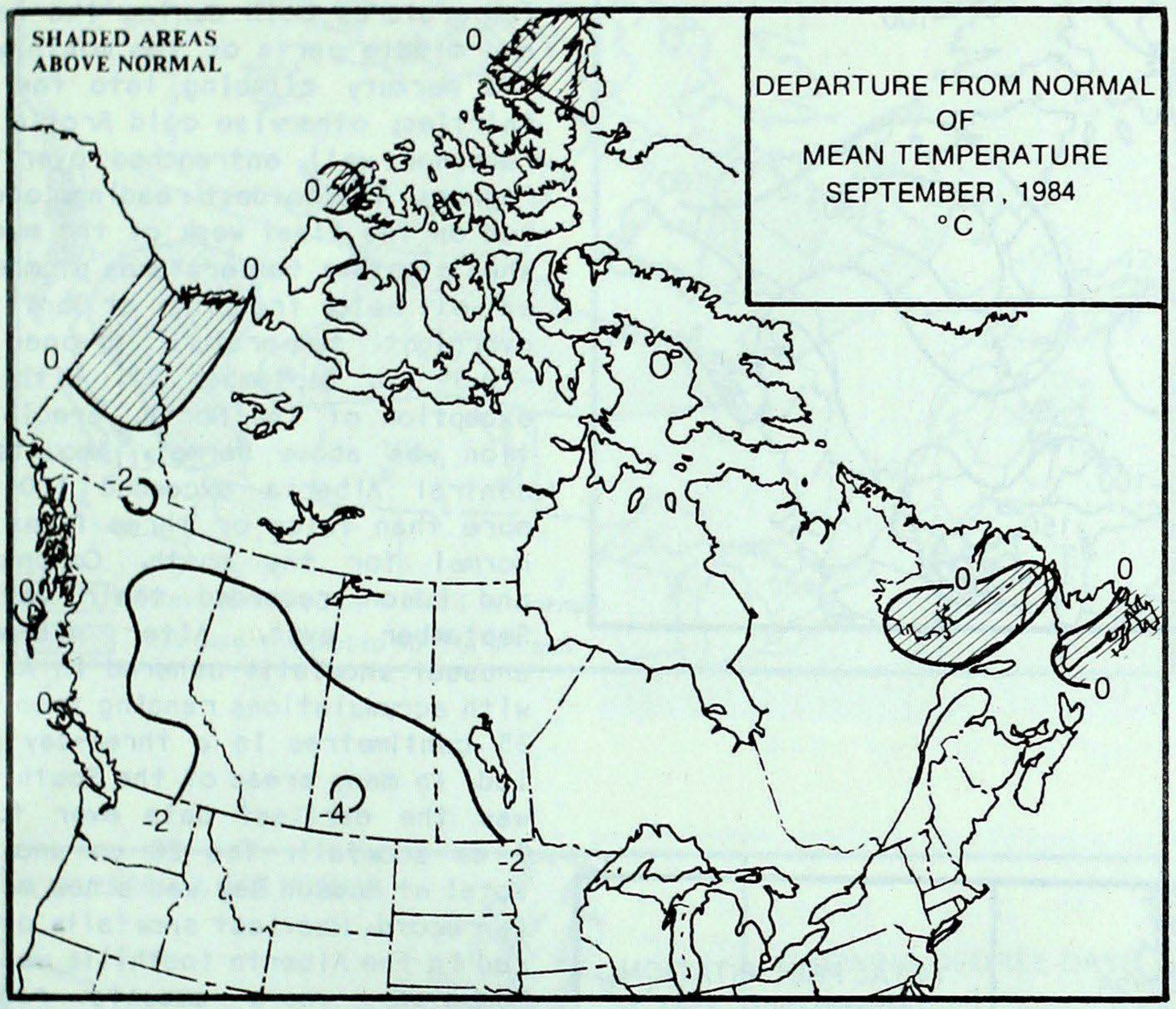
Climatic Perspectives

MONTHLY SUPPLEMENT

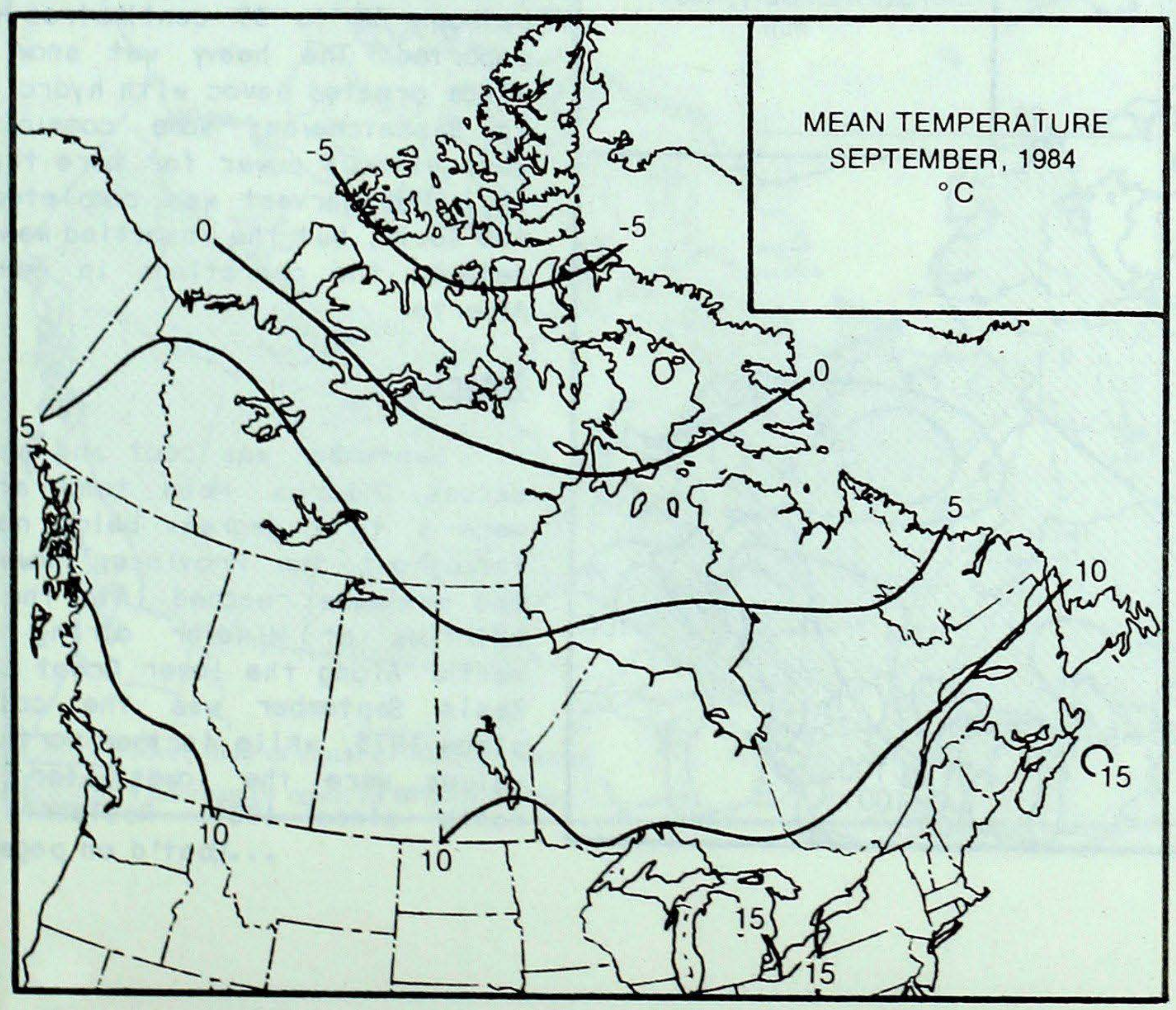
ISSN 0821-6762
UDC: 551.506.1(71)

(Aussi disponible en français)

VOL. 6 SEPTEMBER ,1984



DEPARTURE FROM NORMAL OF MEAN TEMPERATURE SEPTEMBER, 1984 °C



MEAN TEMPERATURE SEPTEMBER, 1984 °C

ACROSS THE COUNTRY...

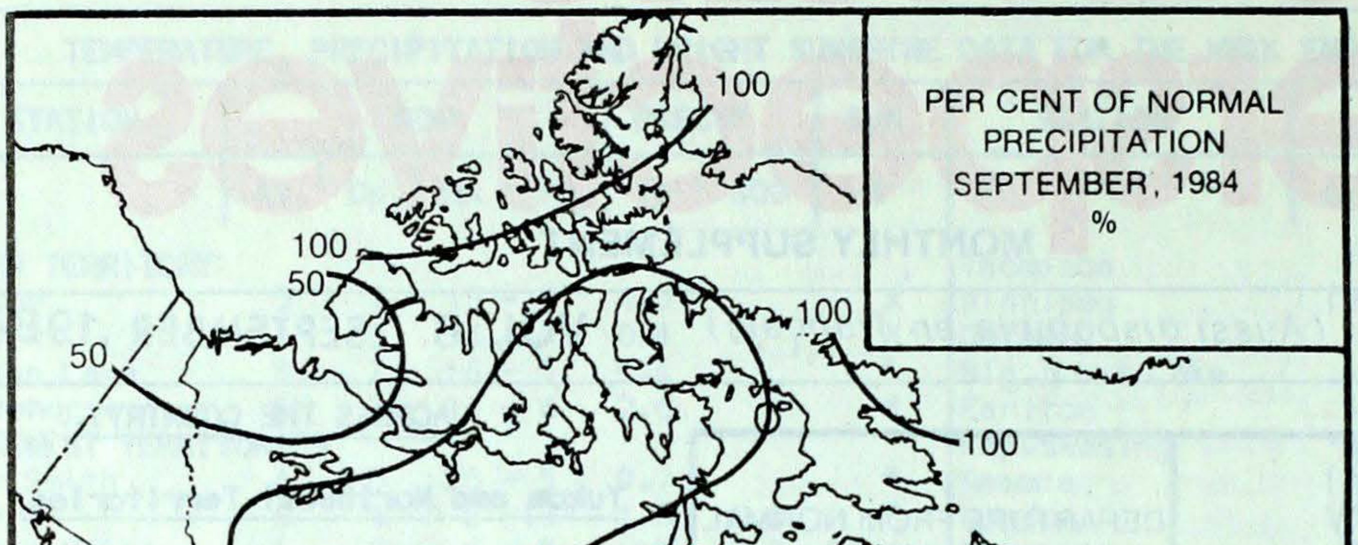
Yukon and Northwest Territories

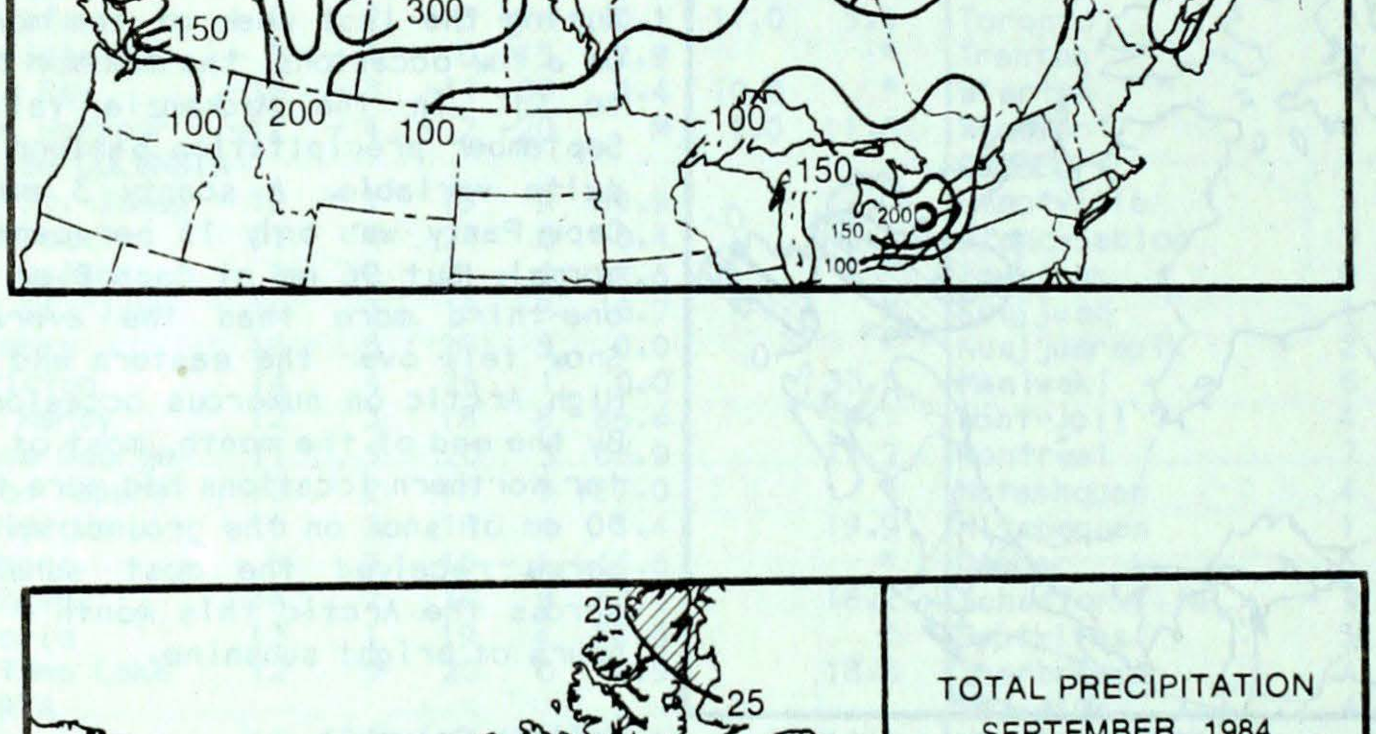
The approach of winter was evident across the Territories as the temperatures continued to cool down. The readings were abnormally cool throughout most of the Northwest Territories and only parts of the Yukon enjoyed warm temperatures during the last week of the month. On a few occasions, the maximum rose to 21° in the Mackenzie Valley. September precipitation pattern was quite variable. A scanty 3 mm at Cape Parry was only 15 per cent of normal, but 96 mm at Cape Dyer was one-third more than the average. Snow fell over the eastern and the High Arctic on numerous occasions. By the end of the month, most of the far northern locations had more than 30 cm of snow on the ground. Whitehorse received the most sunshine across the Arctic this month - 174 hours of bright sunshine.

British Columbia

A changeable and cool weather pattern predominated. Mean temperatures were as much as 3° below normal in the central interior but averaged near normal along the Coast. At several interior localities this was the coldest September on record. Castlegar, in the Kootenays, set a new monthly minimum temperature record of -4.3° on September 28. By the end of the month most interior valley had experienced a killing frost, terminating the growing season. With the exception of the coastal areas, precipitation was above normal. Williams Lake recorded the wettest September on record with 95.1 mm, more than three times the long term normal. Due to the poor Spring weather, the Autumn harvest in the Okanagan fruit belt was delayed approximately two weeks. The apple harvest was in full swing by the end of the month, but due to a low sugar

Canada





grape harvest was just beginning. In the Peace River District 30 per cent of the fields were harvested.

Prairie Provinces

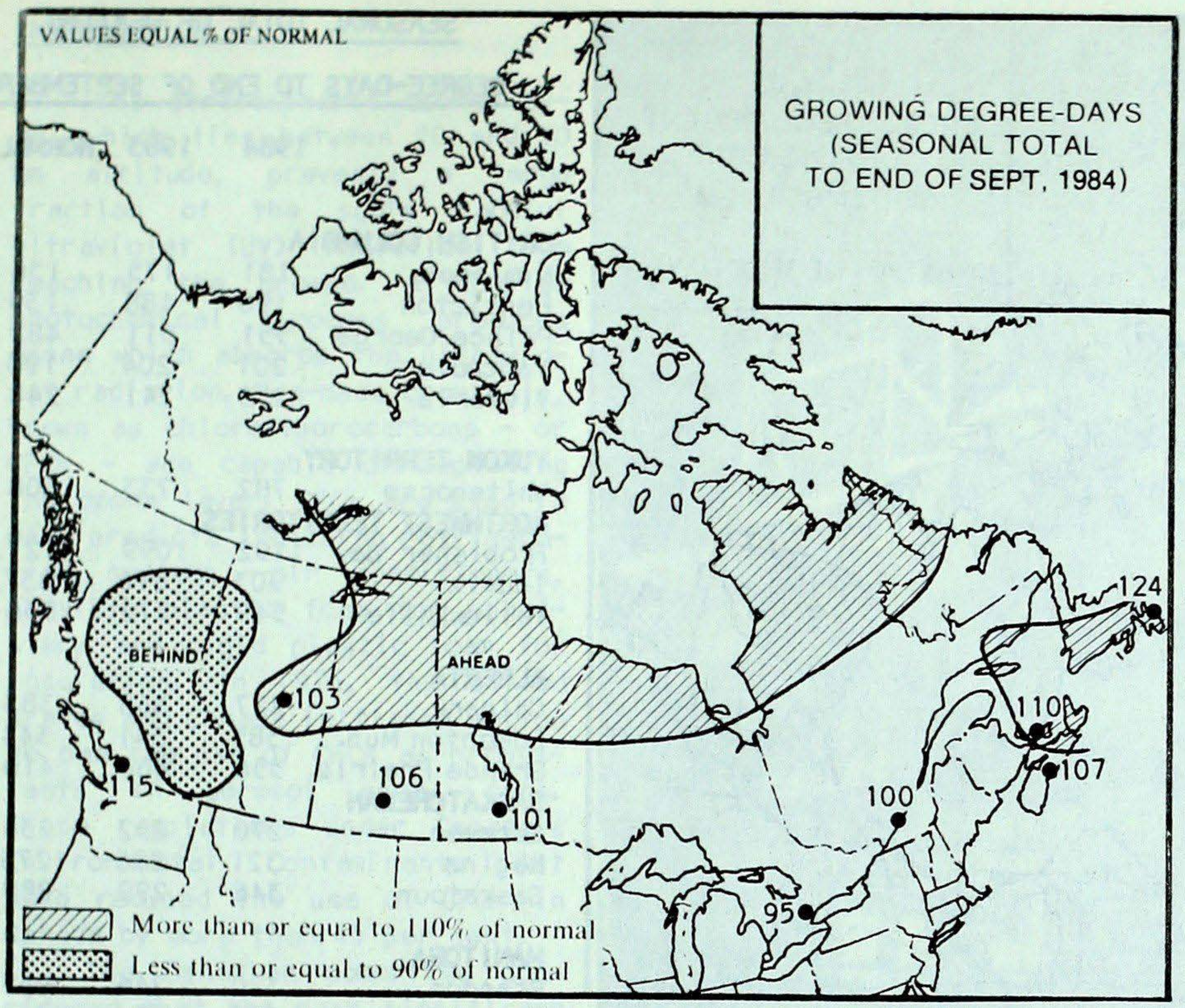
Overall, it was cool and wet with wide ranging temperature extremes. The southern agricultural districts experienced very warm temperatures both during the early and middle parts of the month with the mercury climbing into the low thirties; otherwise cold Arctic air remained well entrenched over all regions. The coldest readings occurred on the final week of the month, when nightime temperatures plummeted well below freezing; at Banff the overnight temperature dropped to -10.5° on September 27. With the exception of the North, precipitation was above normal. Amounts in central Alberta exceeded 100 mm, more than twice or three times the normal for the month. Coronation and Edson recorded their wettest September ever. After mid-month unusual snowfalls ushered in Autumn with accumulations ranging from 5 to 35 centimetres in a three-day period. In many areas of the South this was the earliest data ever for a 2 cm snowfall. The 28 cm snowfall total at Hudson Bay was a new monthly record. Heaviest snowfalls occurred in the Alberta foothills west of Edmonton, where amounts ranging between 30 to 35 centimetres were reported. The heavy wet snow and winds created havoc with hydro lines in Saskatchewan; some communities were without power for more than a day. The harvest was completed in the South, but the unsettled weather delayed the operations in central Alberta.

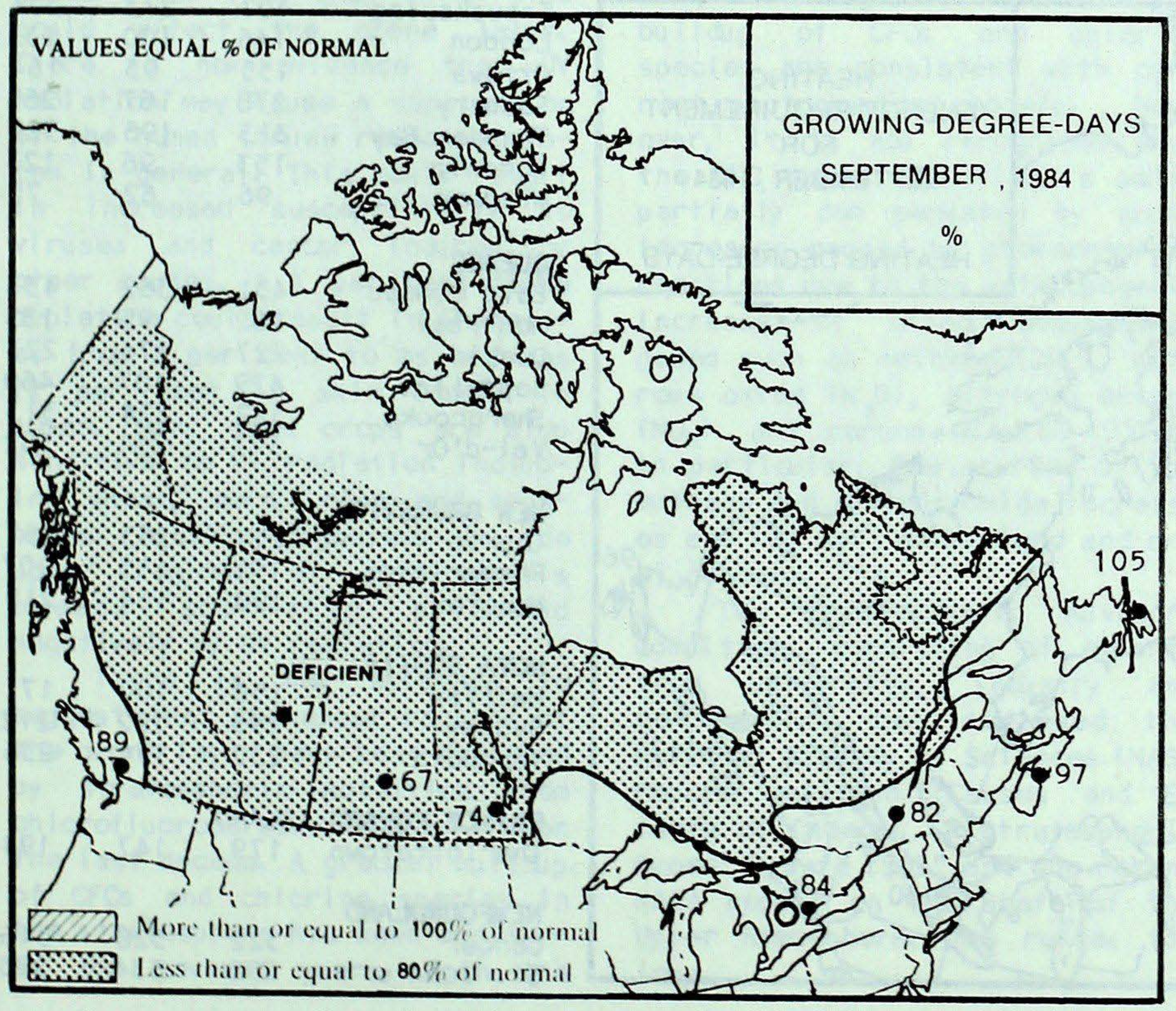
Ontario

September was cool and storm across Ontario. Mean temperature were 1 to 2 degrees below norma throughout the Province; however the maximums reached into the lo thirties at Windsor during mid month. Along the lower Great Lake Basin September was the coldes since 1975, while farther north th values were the lowest for suc month since 1981. Residents i

...Cont'd on page 10

GROWING DEGREE-DAYS



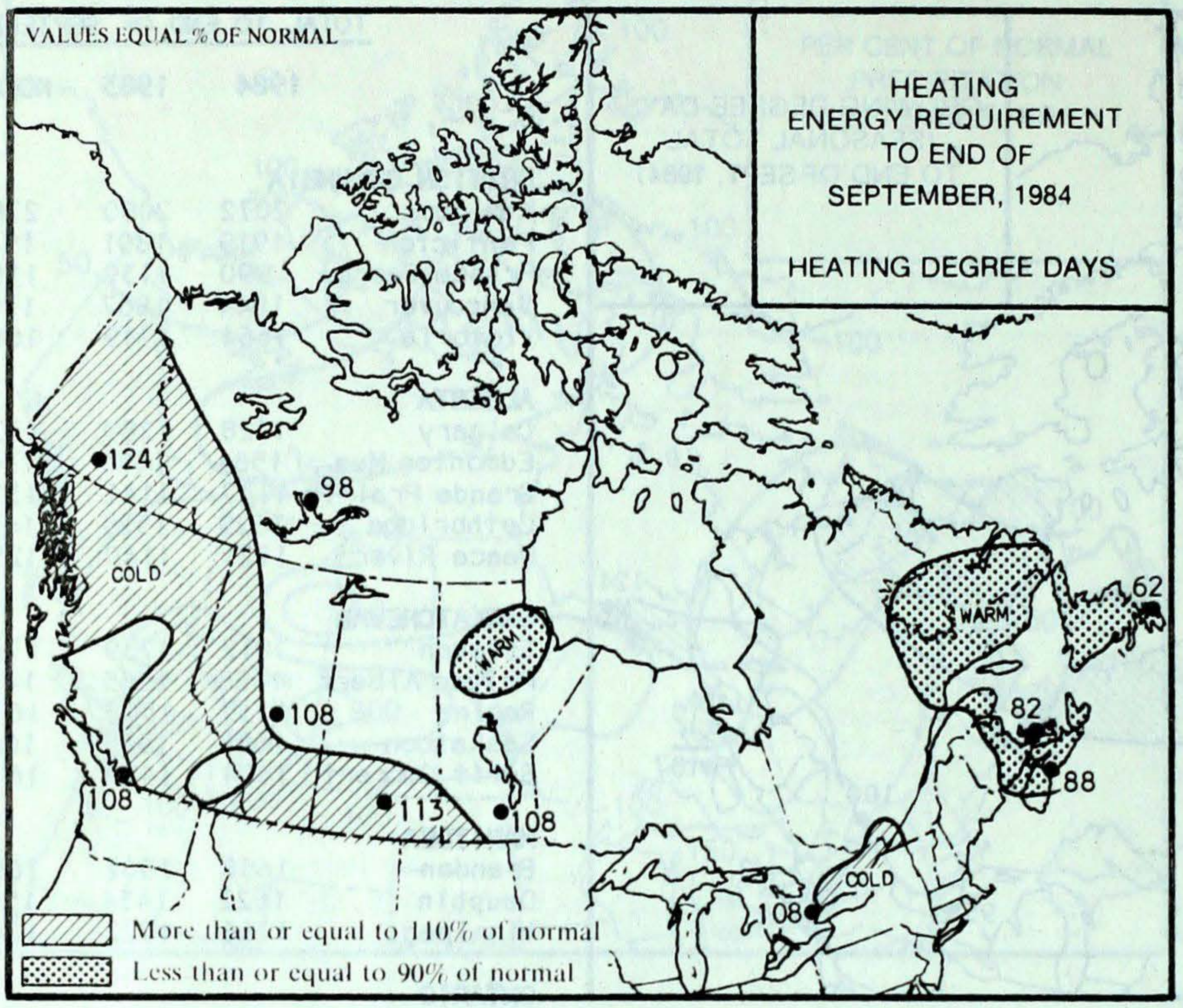


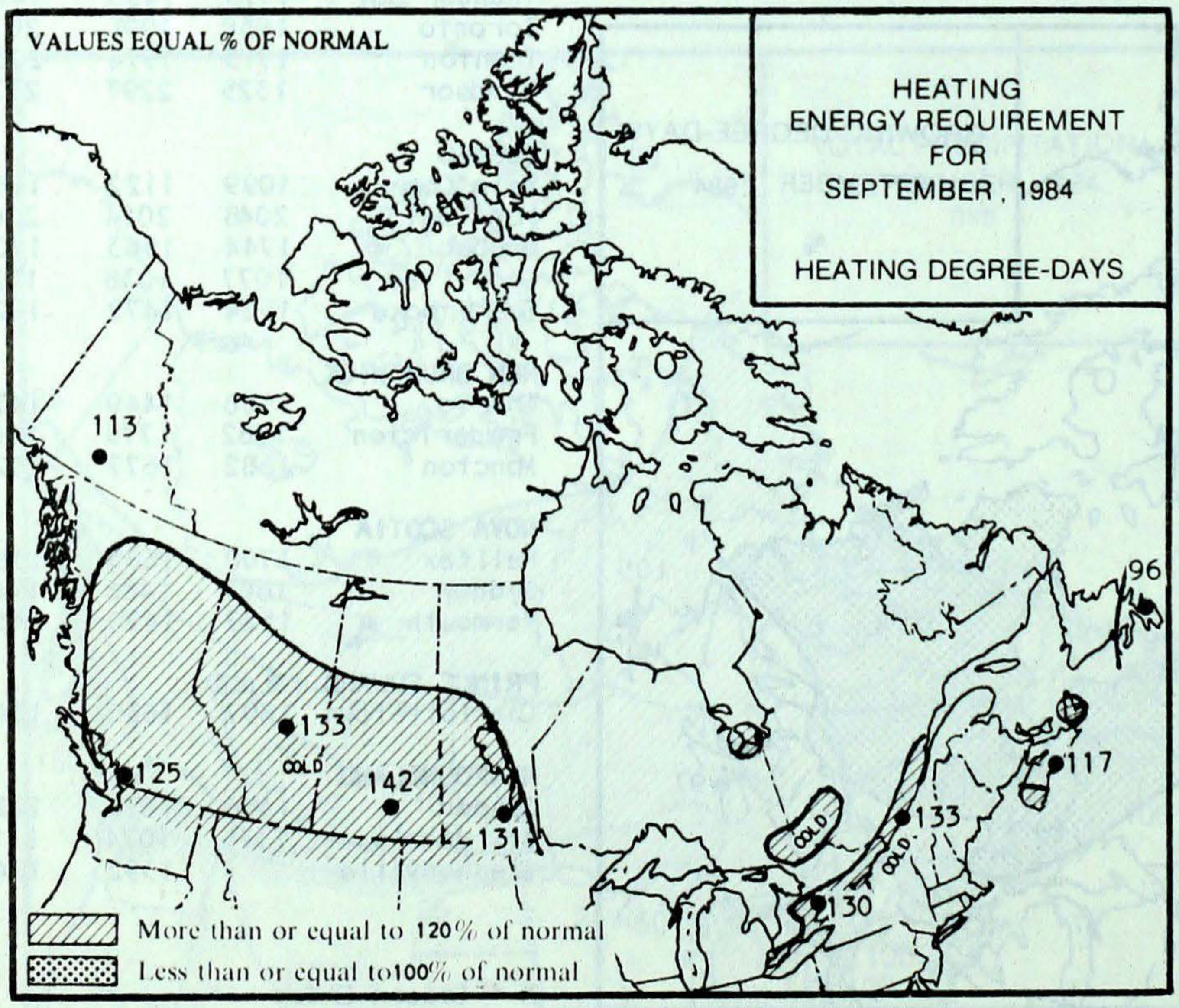
TOTAL TO END OF SEPTEMBER

	1984	1983	NORMAL
BRITISH COLUMBIA			
Kamloops	2072	2080	2783
Penticton	1919	1891	1946
Prince George	990	1139	1190
Vancouver	1844	1867	1799
Victoria	1664	1749	1664
ALBERTA			
Calgary	1328	1289	1334
Edmonton Mun.	1564	1453	1364
Grande Prairie	1137	1141	1313
Lethbridge	1629	1525	1659
Peace River	1121	1140	1252
SASKATCHEWAN			
Estevan	1912	1739	1769
Prince Albert	1488	1365	1434
Regina	1735	1508	1637
Saskatoon	1685	1541	1607
Swift Current	1604	1429	1611
MANITOBA			
Brandon	1658	1502	1653
Dauphin	1622	1434	1585
Winnipeg	1766	1722	1748
ONTARIO			
London	1996	1973	2059
Muskoka	1726	1771	1700
North Bay	1576	1644	1505
Ottawa	2029	2015	1991
Thunder Bay	1479	1453	1406
Toronto	1958	1991	2071
Trenton	1913	1974	2054
Windsor	1325	2297	2379
QUEBEC			
Baie Comeau	1099	1122	1163
Montréal	2048	2014	2062
Québec	1744	1563	1703
Sept-Iles	1077	1038	1029
Sherbrooke	1524	1472	1822
NEW BRUNSWICK			
Charlo	1508	1449	1479
Fredericton	1782	1775	1709
Moncton	1682	1677	1628
NOVA SCOTIA			
Halifax	1700	1685	1585
Sydney	1607	1486	1464
Yarmouth	1527	1490	1459
PRINCE EDWARD ISLAND			
Charlottetown	1697	1656	1548
NEWFOUNDLAND			
Gander	1336	1275	1225
St. John's	1376	1074	1115
Stephenville		1392	1242

X = Season Ended

ENERGY REQUIREMENT





SEASONAL TOTAL OF HEATING DEGREE-DAYS TO END OF SEPTEMBER

	1984	1983	NORMAL
BRITISH COLUMBIA			
Kamloops	181	175	136
Penticton	190	188	139
Prince George	551	511	482
Vancouver	201	204	190
Victoria	273	241	248
YUKON TERRITORY			
Whitehorse	782	733	608
NORTHWEST TERRITORIES			
Frobisher Bay	1192	1099	1121
Inuvik	903	876	837
Yellowknife	549	572	536
ALBERTA			
Calgary	427	368	383
Edmonton Mun.	385	341	344
Grande Prairie	556	466	410
SASKATCHEWAN			
Estevan	270	232	234
Regina	321	286	273
Saskatoon	346	299	288
MANITOBA			
Brandon	320	246	265
Churchill	745	724	764
The Pas	372	289	351
Winnipeg	263	211	234
ONTARIO			
Kapuskasing	407	273	371
London	146	100	132
Ottawa	155	93	164
Sudbury	278	167	268
Thunder Bay	313	196	322
Toronto	153	96	123
Windsor	96	62	75
QUEBEC			
Baie Comeau	431	362	437
Montreal	162	95	133
Quebec	227	174	223
Sept-Iles	429	407	469
Sherbrooke	322	224	313
Val-d'Or	397	266	382
NEW BRUNSWICK			
Charlo	257	253	257
Fredericton	199	155	207
Moncton	198	164	215
NOVA SCOTIA			
Halifax	158	100	171
Sydney	195	192	212
Yarmouth	230	174	236
PRINCE EDWARD ISLAND			
Charlottetown	179	147	194
NEWFOUNDLAND			
Gander	322	328	346
St. John's	256	334	373

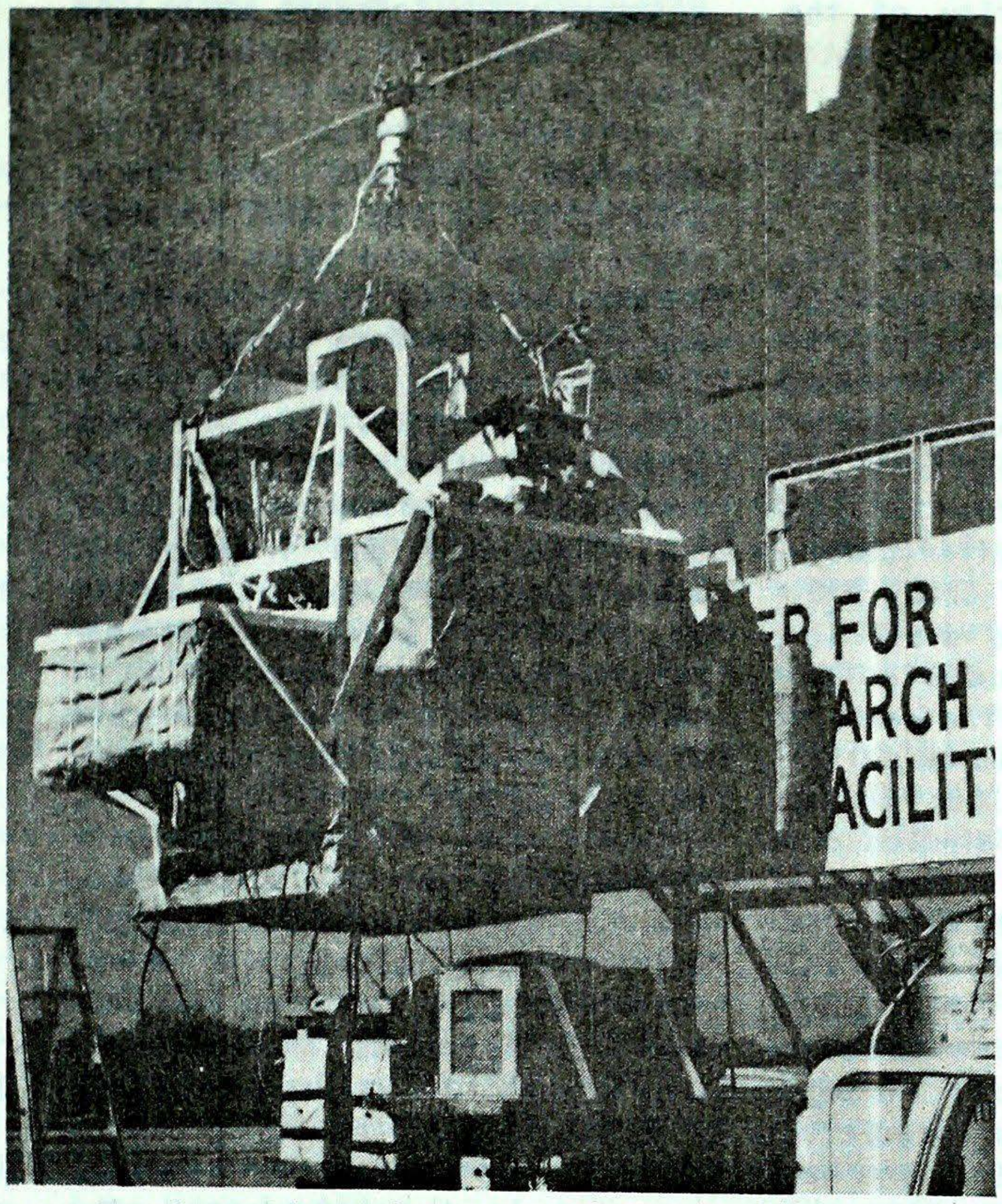
OZONE AND HUMAN HEALTH EFFECTS

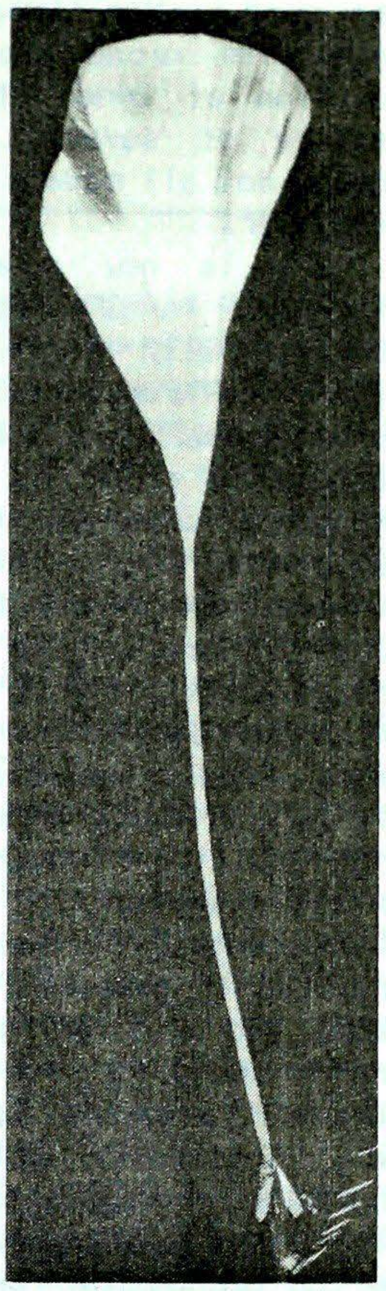
INTRODUCTION

The stratospheric ozone layer, which lies between 20 and 50 km altitude, prevents a large fraction of the sun's harmful ultraviolet (UV) radiation from reaching the ground. A complex photochemical process produces ozone which absorbs the ultraviolet radiation. Man-made chemicals, known as chlorofluorocarbons - or CFCs - are capable of depleting the ozone layer. CFCs are used in many products including refrigeration systems, air conditioners, flexible plastic foam for upholstery and rigid plastic foam for insulation. In 1976, the United States and Canada initiated action to ban the use of CFCs as propellants in aerosol spray cans. These regulations under Canada's Environmental Contaminants Act have reduced the use of CFCs in Canada by more than 45 per cent.

The Canadian committee considered that the most significant recent scientific advances on the problem were on medical effects and on increases in atmospheric gases other than CFCs which also could affect the ozone layer. There is new evidence that UV radiation may cause a suppression of the human immune response system in general. This could result in increased susceptibility to viruses and cancer induced by other causes. A 1 per cent ozone depletion could result in increases from 2 per cent to as high as 12 per cent in skin cancer in human. Many food crops are also sensitive to UV radiation including wheat, corn, rice and soyabeans. Aquatic organisms in the upper regions of the earth's oceans are also affected negatively by UV radiation.

There is new evidence to suggest that the upper regions of the ozone layer have been depleted by stratospheric pollution from chlorofluorocarbons (CFCs) over the last decade. A gradual buildup of CFCs and chlorine species in the stratosphere has been monitored for several years. Both the





Launching of a Stratospheric balloon

observed changes in ozone and the buildup of CFCs and chlorine species are consistent with current photochemical models. However, it is now recognized that the CFC ozone depletion is being partially com pensated by ozone increases caused by photochemical reactions due to the anthropogenic increase of other atmospheric gases such as methane (CH_4), nitrous oxide (N_2O), nitrogen oxides (NO_x) and carbon dioxide (CO_2). In particular, the sources of the methane and nitrous oxide increases are not well understood and are of concern.

The Stratospheric Advisory Committee, consisting of experts from university, industry and government, has reviewed the National Academy of Sciences (NAS) report entitled "Causes and Ef fects of Changes in Stratospheric Ozone: Update 1983" and the recent NASA report on the State of the Upper Atmosphere. The review fol lows.

PREDICTED OZONE CHANGES

Improvements in the knowledge of stratospheric chemistry, atmospheric measurements and models have better defined the stratospheric ozone problem. There has been a refinement in the knowledge of atmospheric chemistry. Although in recent years there have been no major changes in overall chemical schemes, there have been several small but significant changes in key reaction rates. The eventual steady state depletion of total ozone by the continued emissions of CFCs at the 1977 rate, considered in isolation, is predicted to be about 5 per cent assuming other inputs remain fixed, a small change from the 1981 Stratospheric Advisory Committee estimate of 6 per cent. The NAS report estimates that the uncertainty in this estimate is plus or minus 10 per cent. A doubling of the CFC usage rate would lead to an eventual depletion of the ozone layer from CFC usage alone of about 12 per cent, again with an uncertainty of 10 per cent. Non-linearity of the calculated ozone depletion as a function of added chlorine is a feature of several models, although not all models display this behaviour.

It is now recognized that increases in CFC usage must be combined with the increases of other anthropogenically-produced gases in multiple scenario calculations in order to simulate the changes of ozone on the short time scale (10 years) realistically. The combined effect of CFCs, N_2O, NO_x, CO_2 and CH_4 is a small increase in the total ozone column which may persist for the next 20 years. Predictions based on multiple scenario calculations suffer from additional uncertainties due to the uncertainties in the emission scenarios projected for the individual gases. Part of the ozone increase is in the troposphere where NO_x from subsonic aircraft produces ozone through smog processes; this predicted increase in tropospheric ozone has also been experimentally observed in the ozonesonde records. In the long term, the models predict a depletion of ozone at 40 km partly compensated from by an ozone in crease at 25 km. This lower altitude regime is where uncertainties in the chemistry and dynamics of the lower stratosphere introduce additional uncertainties into the total column depletion of ozone.

EFFECTS OF OZONE CHANGES

It is recognized that the climate impacts of the CFC ozone problem are potentially important. The changes expected in the ozone profile (i.e. less ozone at 40 km and more ozone at 25 km) could have important indirect climate consequences. A change in lower stratospheric ozone could lead to a temperature increase which, in turn, could lead to changes in dynamics such as perturbations in circulation and wind fields. The dynamical processes are poorly understood in the lower stratosphere. Many of the gases that can impact ozone are infrared absorbers and contributors to the global warming through the atmospheric greenhouse effect. The combined greenhouse effect of the radiatively active gases such as CFCs, CH_4, N_2O, NO_x and tropospheric ozone may become as large as the CO_2 greenhouse effect in the near future. The direct contribution of CFC--11 ($CFCl_3$) to the Greenhouse effect has already been experimentally observed.

The most serious effect will probably be the biological area due to the increases in biologically active ultraviolet (UVB) solar radiation reaching the surface if decreases in the ozone shield were to occur.

Significant new progress in the human effects area has been reported in the NAS report. The potential biological and health effects of increased UVB radiation are a continuing source of concern. Knowledge of the effects of UVB on land-based and marine life and of the connection between human skin cancer and UVB radiation has improved significantly in the last few years, yet there is a need for more research in these areas.

Excellent progress has been made in molecular studies of UVB damage and repair mechanisms and with studies of photo-induced cancer in animals. A suppression of the immunological response caused by UVB irradiation has been observed in animals and in humans. An important finding is that the depressed response is not confined to the local area of UVB dosage. Thus increased UVB dosage in one area can reduce immune response elsewhere. This can also produce increased susceptibility to viral infections and cancers induced by other environmental factors.

The growth of many plants and of marine organisms such as phytoplankton can be suppressed by relatively small increase in UVB irradiation. It is generally believed that plants and life in the top layer of the oceans are existing close to their tolerable limits of UVB. Therefore, both with regard to land crops and to the marine food chain, there is concern about the adaptability of the systems to increased UVB. The evidence that increased UVB exposure augments the incidence of nonmelanoma skin cancer continues to build. While the evidence of malignant melanoma is clearly related to other factors, especially genetic ones, new data confirm that exposure to UVB radiation is definitely involved. The recent advances in photoimmunology may reveal the role of UVB radiation exposure in the development of malignant melanoma.

SUMMARY

In spite of a new recognition of the immense complexity of the stratospheric ozone problem, excellent progress has been made in modelling, chemistry and measure ments. Increased knowledge of the upper stratosphere, which has yielded confidence in ozone depletion in this region, is accompa nied by the realization that the lower stratosphere is more complicated than originally envisioned. This complication imposes a large uncertainty in our capability to predict the future changes in the total ozone column.

Canadian Climate Centre
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario
CANADA M3H 5T4 (416) 667-4711/4906

Annual subscription rate for weekly issues---
$35.00
Annual subscription rate for one issue per month including monthly supplement--- $10.00

EDITOR: A. Shabbar ASSISTANT EDITOR: A. Caillet STAFF WRITER: A. Radomski

Correspondents: T. Mullane, Ottawa; H. Wahl, Whitehorse; N. Penny, Vancouver; W. Prusak, Edmonton; F. Luciow, Winnipeg; B. Smith, Toronto; J. Miron, Montréal; F. Amirault, Halifax.

Subscription enquiries: Supply and Services Canada, Publishing Centre, Ottawa, Ontario, Canada, K1A 0S9

EAST COAST SEVERE STORMS CATALOGUE

by
P.J. Lewis and M.D. Moran
(Concord Scientific Corporation, Downsview, Ontario)

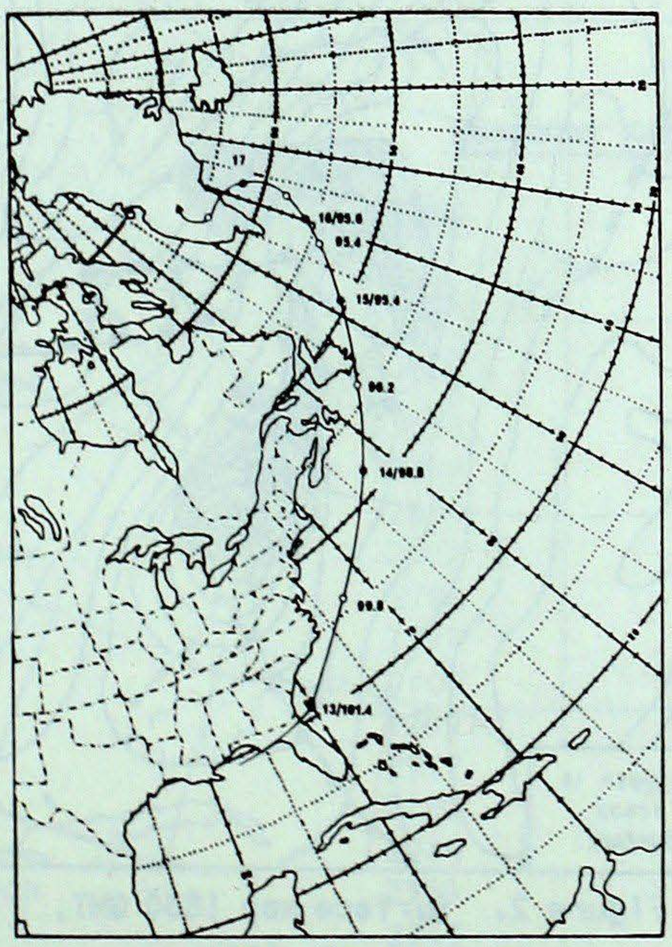
The rapid expansion of offshore oil and gas exploration along Canada's East Coast in recent years has resulted in a pressing need for information on environmental conditions in these waters, particularly information on extreme winds and waves. The tragic sinking of the oil rig "Ocean Ranger" in 1982 off Newfoundland demonstrated just how vulnerable ocean-going drilling vessels can be to the severe storms which regularly cross this region. An accurate understanding of the likelihood and magnitude of the extreme winds and extreme waves accompanying these storms is necessary for the design of safe offshore structures and the development of conservative rig operating procedures.

A catalogue has recently been completed which presents descriptions of 125 of the most severe Canadian East Coast storms which occurred during the period 1957-1983 and which influenced an area bounded by 40°N, 75°N, 45°W and 70°W. This catalogue was prepared for the Hydrometeorology Division of the Canadian Climate Centre in Downsview, Ontario under contract.

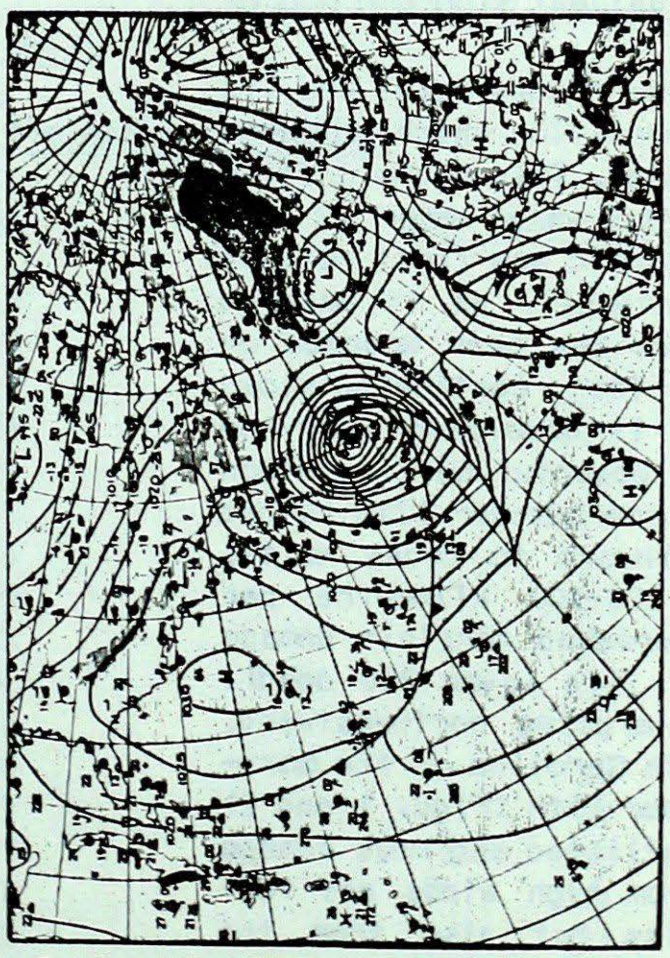
The intent of the catalogue is to emphasize storms which had high sustained wind speeds; storms were selected for inclusion on the basis of maximum reports wind speed. The primary source of wind speed data was an archive of ship and oil rig weather reports stored at the Canadian Climate Centre. Use was also made of data from 6 coastal weather stations and Ocean Weather Station "Bravo". In addition, the uneven distribution of ship observations by year and season was taken into account when the storms were selected so as to provide a representative sample. At least two storms from each calendar month have been included.

Each storm description includes information on the maximum reported wind speed, storm duration, maximum radial extent of storm-force winds, lowest central pressure, source region, storm "type", and any notable effects or damage caused by the storm. A brief synoptic history, a storm track map and one surface pressure analysis are provided for each storm. Also included in the catalogue are decadal (10 years) summaries of the storm track maps and, as an appendix, a listing of all periods of storm-force (48 knots or greater) winds in the study area for the period 1946-1983.

The catalogue has synthesized a considerable amount of information pertaining to recent East Coast storms. It is hoped that it will be of use in identifying "worst case" storms for the design of structures and operating procedures for different industries active in the waters off the Canadian East Coast, and that it will also provide a source of climatological information for severe storms occurring in this region. Copies of the catalogue can be obtained by writing to the Canadian Climate Centre.



Storm Track



Surface Analysis Valid 0000 GMT, February 15, 1982.

Hurricane Hazel - 30th Anniversary

by

John L. Knox
Canadian Climate Centre

Thirty years ago, on the night of Friday October 15, 1954, Metro Toronto and surrounding areas were struck by one of the worst natural disasters in their history. For the past 2 days there had been steady downpours over watersheds already saturated by previous rains, and Brampton (northwest of Toronto) had measured 200 mm (8 inches) in 48 hours! By that evening there were appalling scenes of torrential rivers, washed out bridges, submerged cars, and trees and powerlines felled by gale force winds. The converging water of the lower Humber rose 6 metres in one hour, and, in one of several ensuing tragedies a whole block of houses (on Raymore Drive) were submerged or swept down river with 36 occupants losing their lives. Some 80 kms north of the city the market garden land known as the Holland Marsh became one vast lake of turbulent water and 1,500 members of the community were marooned as they drifted on roof tops, or in bobbing boats, or clung to whatever debris could sustain them. The stark statistics of the tragedy totalled 81 dead, hundreds left homeless, and (in current values) $100,000,000 of damage.

It was Hurricane Hazel and its subsequent evolution which triggered the disaster. This storm originated over the warm water of the tropical Atlantic and first reached hurricane intensity as it entered the Caribbean Sea near Grenada on October 4th. Then, continuing slowly westward it developed into one of the most powerful hurricanes on record, and one October 12th turned sharply northward to cross Haiti, where its 200-300 kilometre per hour winds wreaked terrible damage and loss of life (over 200 dead). Hazel, accelerating northwestward, entered South Carolina on the morning of October 15th (Figs. 1 and 2) and there inflicted enormous damage not only from high winds and torrential rains but also from the

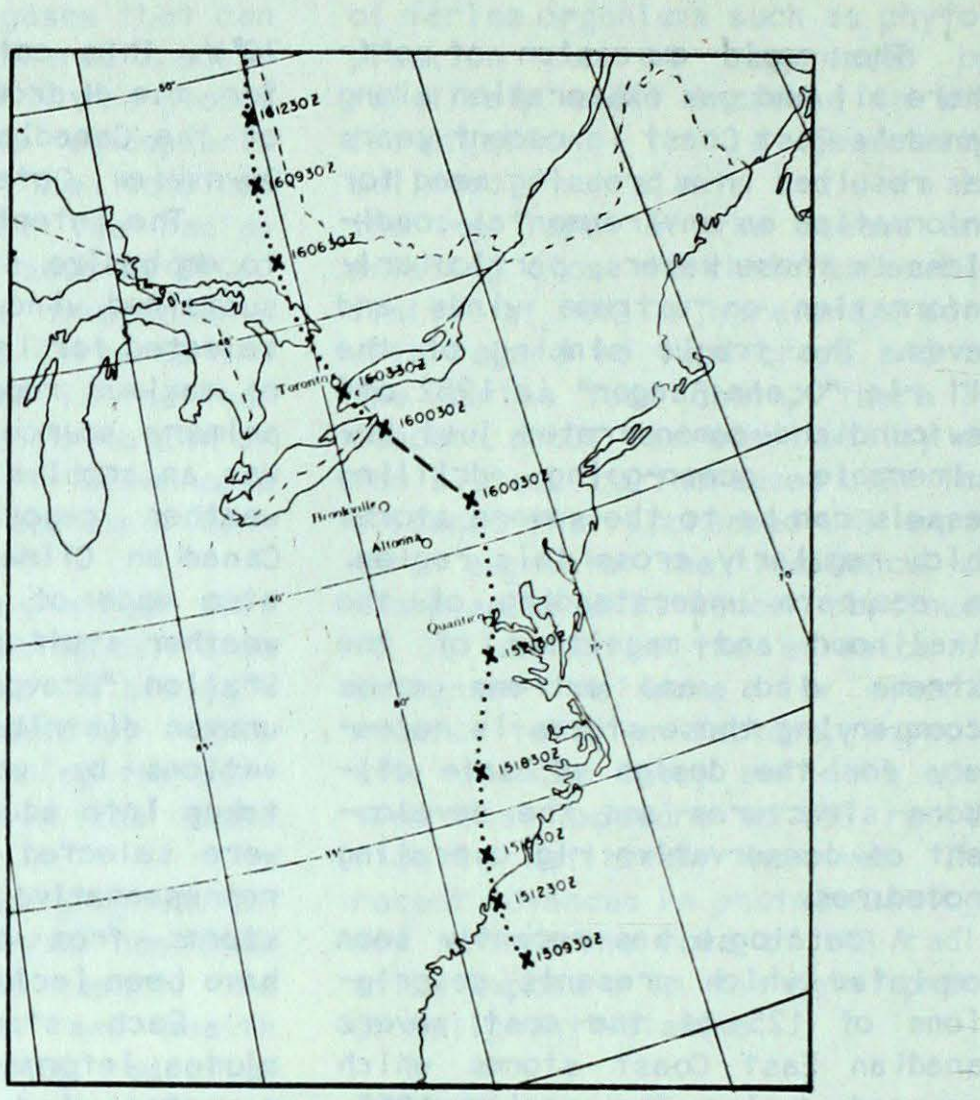


Figure 1. Track of Storm Hazel.

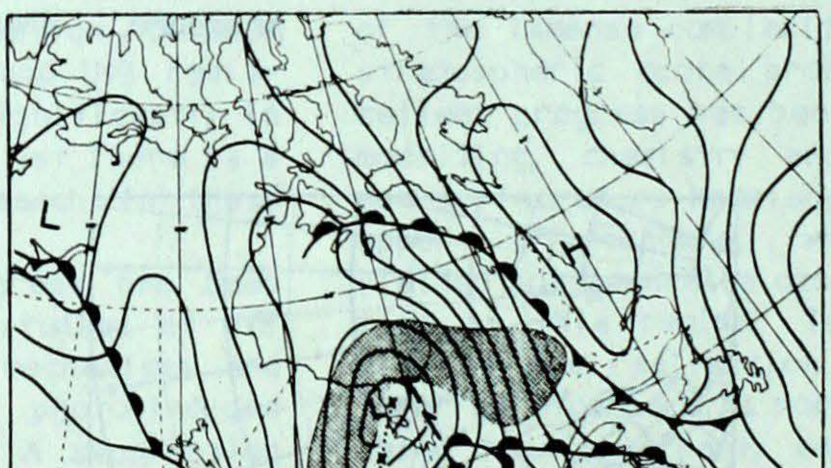


Figure 2. Surface map 1830 GMT, October 15, 1954.

huge tidal waves generated along the Atlantic Coast. Fig. 1 shows the 3-hour locations of Hazel's centre as it raced northward at an average speed of 90 kilometres per hour. By evening a striking transformation from tropical storm (the hurricane died over the Alleghenies) to extratropical storm had been completed, and the centre of a vast vortex of some 500 km radius was located near Buffalo N.Y. It was the reborn Hazel which contributed so much devastation to southern Ontario, the worst of which was described earlier. Fortunately the storm's continued motion into, northern Ontario allowed rapid clearing over the stricken south and Saturday's sunny skies were a relief from the sudden grey of the day before. It was not until well in Saturday that a shocked City became fully aware of the extent of the tragedy.

How well were the public warned? Earlier Friday morning the Ontario Weather Centre (then familiarly known as the Malton Weather Office) recognized that in view of the strong north-south oriented frontal structure (Fig. 2) Hazel (or its extratropical successor) would remain a vigourous storm as it headed for the Province. Consequently a severe weather warning which spelled out in unmistakable terms the dangerous nature of Hazel, and the imminence of gale force winds and heavy rains, was issued at 10 am. This warning received full dissemination by the media-press, radio and T.V. Then, Fred Turnbull, Officer-in-Charge, phoned every agency who might conceivably be concerned (shipping interests, hydro, police, etc.) to ensure they had received the warning and recognized the gravity of the situation.

Betty Kennedy's book 'Hurricane Hazel' is an interesting and for the most part, well researched account of the tragedy. However, she conveys to the reader an impression that the warning was "low-key". Nothing could be further from the truth, and as an example of the response by the media, I have before me the front page of the Toronto Evening Telegram which hit the streets that Friday afternoon. It features a banner headline in bold 1½ inch type:
"HURRICANE 'HAZEL' NEARING TORONTO" with an accompanying lead story which is headed:
"Hurricane Nears, Fear Record Rain"

Why then, in spite of the warnings, were there so many flood victims? There are 2 main reasons. The Province of Ontario did not have in place at that time, river control systems which could respond to such a situation. That has all since changed; dams, dykes and reservoirs have been installed and the Province now carries out continuous monitoring and control of the discharge. The second reason for the loss of life was the existence of residences on low-lying flood-prone river flats. There were heroic efforts that evening by volunteer firemen knocking on doors urging the occupants to safety before the flood crest arrived. But not all heeded. "We don't mind a little water in the basement" said a poker-playing foursome; and they were never heard from again! Zoning regulations now ensure that the Raymore Drive type of tragedy could not be repeated.

Lest we become complacent it should be recognized that the visit of another Hazel - type storm to Southern Ontario is entirely possible, although the impact on the Metro Toronto area would be greatly mitigated. However, since these weather systems are never templates of their predecessors, it is important to recognize that all watersheds in the lower lakes regions would be vulnerable in future Hazel - type storms.

CORN HEAT UNITS

Seasonal Accumulation to the end of September

Station	1984	1983	Per cent of Normal
Lethbridge	1791	1733	104
Brandon	2112	2200	98
Pilot Mound	2218	2367	106
Earlton	2055	2154	121
London	2862	2881	101
Ottawa	2809	2915	102
Thunder Bay	2002	2133	123
Toronto	2796	2895	99
Trenton	2792	2888	95
Wiarton	2400	2601	100
Windsor	3269	3364	99
Montreal	2917	2968	99
St Agathe	2130	2243	81
Sherbrooke	2249	2247	108
Fredericton	2355	2327	104
Truro	2243	2143	124
Charlottetown	2357	2290	105

CLIMATIC EXTREMES - SEPTEMBER 1984

MEAN TEMPERATURE:		
WARMEST	Windsor, ONT	16.3°
COLDEST	Alert, NWT	8.6°
HIGHEST TEMPERATURE:	Medicine Hat, ALTA	33.7°
LOWEST TEMPERATURE:	Eureka, NWT	-22.6°
HEAVIEST PRECIPITATION:	St. Lawrence, NFLD	248.0 mm
HEAVIEST SNOWFALL:	Cape Dyer, NWT	91.6 cm
DEEPEST SNOW ON THE GROUND ON SEPTEMBER, 30 1984:	Cape Dyer, NWT	56 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	Saint John, NB	213 hrs

... (Cont'd from page 2B)

southern Ontario started their furnaces early this year as chilling temperatures spread southward to cover all of the southern areas by the end of the month. Heating degree-days, an indicator of energy requirement were 10 to 20 per cent above normal. Scattered frost was reported north of Lake Superior on September 15 and a more general killing frost covered all of the regions on the last 3 days of the month. Precipitation was about half the normal amount in northern Ontario, but 5 to 15 cm of snow fell in a swath from Kenora to Kapuskasing on the 24th-25th. Geraldton received the most, 20 cm. Locations south of North Bay received precipitation in excess of 100 mm and many places experienced the wettest September in about 7 years; for example 166 mm at Hamilton was 222 per cent of normal. Eastern Ontario was very dry, the amounts ranged from 41 mm at Kingston to a meagre 15 mm at Ottawa where it was the second driest September since record began in 1939.

The month was rather dull. Hours of bright sunshine ranged from 73 hours at Trout Lake to 212 hours at Ottawa. London, after being hit by a damaging wind storm on August 30 had only a short respite until September 2 when a destructive tornado whipped the southern portions of the city. The winds caused extensive property damage including structural damages to 10 large industrial buildings and 65 residences; 3 people were hospitalized with serious injuries.

Québec

The mean monthly temperatures were below normal over the Province of Québec during the month of September except over the extremes eastern portions of the Province and the Fermont region where the deviation from normal varied between 0.6° at Blanc Sablon and Natashquan and 0.1° at Fermont. Elsewhere, the departures ranged from -2.1° at Sherbrooke to -0.1° at Nitchequon. Mean monthly temperatures were about 14° in the Hull-Ottawa region but dropped to 4.0° at Kuujjuaq.

Precipitation totals were less than 70 per cent of normal over southwestern Québec with amounts between 15.4 mm in the Hull-Ottawa region and 66.7 mm at Québec City. However, over New Québec, totals were much above normal with values reaching 184 per cent of normal and an amount of 181.3 mm at Nitchequon.

Significant snowfall was observed north of a line extending from Val-d'Or to the Fermont region with amounts ranging from 0.2 cm at Val-d'Or to 28.9 cm at La Grande Rivière.

Effective sunshine was above normal over the Province for the month except over New Québec. Departures from normal were 131 per cent at Inukjuak but averaged 30 per cent less than normal in northern Québec.

Thousands of Caribou crossing the Caniapiscau river near Kuujjuaq drowned. Heavy September rainfall in northern Québec is partly being blamed for the swollen river near Limestone Falls.

Atlantic Provinces

After a warm August, the weather turned cool in Atlantic Canada. The Maritimes experienced monthly temperatures that were about 2° below normal, but the readings were near normal in Newfoundland. For a brief period during early September, the East Coast experienced summery temperatures as the mercury reached near 27°. A wide range of precipitation fell across the Maritimes. While 30 mm at Charlo was only 33 per cent of normal, over 143 mm at Charlottetown was 161 per cent of the average. Precipitation was abundant in southern and eastern Newfoundland as several disturbances of tropical origin tracked south of the island. At Port-aux-Basques, 97 mm of rain fell in 24 hours on September 1, almost half the monthly amount. And St. Lawrence received 248 mm for the month compared to the normal of 122 mm. Snowfall over Labrador was well below the usual amount; Wabush Lake received a meagre 2 cm. Water flow in the Maritime rivers was generally above normal; however, New Brunswick experienced below average run off.

Sunshine was abundant in New Brunswick and western Nova Scotia where several locations experienced in excess of 200 hours of bright sunshine. During September 15th-16th, tropical storm "Diana" passed just to the south of Nova Scotia. Although no adverse effects were felt on the main land, strong winds were reported at offshore rigs. A drilling rig, east of Sable Island, recorded a peak gust of 130 km/h. The passage of this storm resulted in a loss of one life aboard the Canadian Tall Ship "Belle Blonde".

SEPTEMBER 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
BRITISH COLUMBIA													
ABBOTSFORD	13.6	-0.9	25.4	0.8	0.0	0	107.1	120	0	9	185	107	133.1
ALERT BAY	11.7	-0.9	19.8	3.2	0.0	0	118.9	100	0	14	X		189.2
BLUE RIVER	8.8	-2.2	21.4	-7.2	0.0	0	96.6	114	0	15	132	100	MSG
CAPE ST. JAMES	12.6	-0.3	16.7	8.4	0.0	0	104.1	83	0	13	151	*	163.3
CAPE SCOTT	12.7	0.0	19.4	7.1	0.0	0	153.2	80	0	12	X		160.2
CASTLEGAR	12.0	-2.4	28.7	-4.3	0.0	0	40.0	110	0	5	174	92	180.5
COMOX	12.5	-1.2	19.4	3.0	0.0	0	61.4	119	0	9	X		161.9
CRANBROOK	9.7	-2.6	28.9	-6.0	3.7	925	32.5	110	0	8	182	*	247.5
DEASE LAKE	6.4	-0.7	17.2	-6.9	1.6	114	40.4	87	0	9	140	111	348.7
ETHELDA BAY	11.1	-1.0	20.7	0.2	0.0	0	188.6	73	0	12	X		MSG
FORT NELSON	6.8	-1.9	19.6	-7.0	TR	0	46.0	111	0	8	131	*	336.2
FORT ST. JOHN	6.3	-3.2	16.7	-6.0	2.0	38	58.0	148	0	9	X		349.5
HOPE	14.0	-1.5	25.0	3.1	0.0	0	168.5	164	0	12	164	95	119.4
KAMLOOPS	13.1	-1.8	27.3	-1.6	0.0	0	25.5	119	0	9	168	86	154.9
KELOWNA	11.7	-1.4	28.8	-3.8	0.0	0	29.8	102	0	7	181	88	191.8
LANGARA	12.4	0.3	17.0	7.8	0.0	0	165.4	98	0	21	X		175.2
LYTTON	14.5	-2.0	28.1	0.9	0.0	0	21.9	85	0	2	170	92	113.0
MACKENZIE	6.3	-2.8	17.6	-8.9	0.0	0	73.0	146	0	9	132	99	342.4
MCINNES ISLAND	12.7	-0.2	19.4	6.4	0.0	0	218.6	107	0	15	X		157.6
MERRY ISLAND	14.1	-0.6	20.1	7.9	0.0	0	102.7	164	0	8	192	*	118.3
PENTICTON	12.7	-2.0	29.5	-3.0	0.0	0	9.8	55	0	3	187	88	161.7
PORT ALBERNI	12.8	-1.5	24.0	-0.2	0.0	0	98.6	117	0	11	144	*	158.5
PORT HARDY	11.1	-0.7	20.1	1.5	0.0	0	121.5	89	0	13	131	95	206.9
PRINCE GEORGE	7.7	-2.0	19.4	-8.0	TR	0	80.8	138	0	15	145	90	308.0
PRINCE RUPERT	11.0	-0.4	20.6	0.2	0.0	0	143.9	62	0	16	125	107	208.0
PRINCETON	10.6	-2.3	27.7	-5.3	0.0	0	8.0	44	0	2	195	*	MSG
QUESNEL	9.2	-2.1	22.8	-6.0	0.0	0	84.4	185	0	11	X		261.5
REVELSTOKE	10.7	-2.1	21.2	-1.9	0.0	0	81.3	139	0	12	138	91	218.7
SANDSPIT	11.9	-1.0	16.7	6.4	0.0	0	139.6	155	0	17	115	83	180.4
SMITHERS	7.8	-2.0	19.4	-5.1	0.0	0	71.4	142	0	11	126	96	307.3
STEWART	MSG		MSG	MSG	MSG		MSG		MSG	MSG	MSG		MSG
TERRACE	10.4	-1.5	19.8	0.2	TR	0	102.2	104	0	11	142	113	227.0
VANCOUVER HARBOUR	14.1	-0.5	23.2	6.4	0.0	0	69.9	89	0	8	X		113.8
VANCOUVER INT'L	13.8	-0.4	23.7	4.4	0.0	0	41.6	62	0	7	188	103	126.0
VICTORIA GONZ. HTS	14.0	-0.2	21.8	7.1	0.0	0	30.2	90	0	5	210	102	120.0
VICTORIA INT'L	12.9	-1.0	23.2	4.0	0.0	0	37.2	94	0	6	194	99	150.9
VICTORIA MARINE	12.6	-0.4	23.8	3.7	0.0	0	34.6	56	0	7	X		160.0
WILLIAMS LAKE	7.0	-3.3	21.0	-6.5	0.6	50	95.1	315	0	12	159	85	301.3

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
YUKON TERRITORY													
BURWASH	4.7	-0.4	14.7	-9.0	TR	0	21.6	90	0	6	X		397.7
DAWSON	5.7	0.3	17.7	-8.2	0.0	0	8.0	22	0	2	X		368.2
MAYO	6.9	0.4	16.5	-5.7	TR	0	20.6	68	0	4	X		332.5
WATSON LAKE	5.6	-2.0	16.4	-8.9	0.0	0	30.1	69	0	7	136	108	372.6
WHITEHORSE	6.4	-1.1	14.7	-5.9	0.0	0	20.8	69	0	5	174	128	349.2
NORTHWEST TERRITORIES													
ALERT	-8.6	1.6	3.4	-20.8	36.2	110	31.3	113	29	5	49	59	798.2
BAKER LAKE	0.8	-1.5	12.6	-9.6	8.8	149	30.6	83	TR	7	64	60	520.3
CAMBRIDGE BAY	-1.6	-0.9	6.3	-12.7	1.7	20	6.0	35	TR	2	31	38	587.9
CAPE DYER	-2.5	-1.1	10.4	-17.3	91.6	162	96.4	131	56	13	X		616.0
CAPE PARRY	0.5	-0.2	5.2	-8.8	2.3	16	3.4	15	TR	1	X		553.2
CLYDE	-1.2	-1.0	10.0	-8.5	35.8	122	34.0	97	16	7	80	94	574.7
COPPERMINE	1.6	-0.9	11.5	-9.4	5.8	109	26.4	110	TR	4	97	139	491.4
CORAL HARBOUR	-0.5	-1.4	12.1	-12.5	14.4	145	31.3	92	TR	6	60	56	552.2
EUREKA	-8.4	-0.1	0.2	-22.6	17.8	173	12.9	134	12	3	49	48	790.5
FORT RELIANCE	4.9	-1.2	17.4	-7.0	5.2	208	12.6	42		3	X		394.6
FORT SIMPSON	6.5	-0.8	21.2	-7.2	4.8	84	11.4	36	0	4	180	135	338.4
FORT SMITH	6.4	-1.1	20.5	-5.2	1.6	80	41.8	102	0	6	124	94	350.0
FROBISHER BAY	1.6	-0.8	9.6	-6.0	14.5	104	32.3	70	TR	8	76	95	492.5
HALL BEACH	-1.7	-1.1	6.7	-13.5	8.8	73	11.6	42	3	6	X		590.8
HAY RIVER	6.9	-1.2	21.6	-3.1	0.4	14	40.4	96	0	10	X		332.4
INUVIK	4.1	1.0	15.6	-8.8	0.2	2	9.0	38	0	4	165	151	416.8
MOULD BAY	-5.0	1.5	1.3	-17.0	18.4	137	15.5	112	6	5	21	46	691.8
NORMAN WELLS	6.0	-0.1	17.4	-4.5	0.8	15	14.8	51	TR	5	154	130	359.1
POND INLET	MSG		MSG	MSG	MSG		MSG		9	MSG	X		MSG
RESOLUTE	-6.9	-1.8	2.9	-17.9	14.2	93	9.8	54	9	3	57	97	747.1
SACHS HARBOUR	-2.8	-0.8	2.6	-15.7	5.2	48	7.8	46	1	3	64	81	624.1
YELLOWKNIFE	6.1	-0.6	18.5	-4.2	2.6	72	14.6	48	TR	4	159	105	358.7
ALBERTA													
BANFF	6.9	-2.4	22.5	-10.5	22.0	355	52.6	126	MSG	MSG	X		MSG
BROOKS	9.4	-2.5	31.5	-6.5	TR	0	59.5	143	0	MSG	X		MSG
CALGARY INT'L	7.5	-3.1	26.3	-77.0	20.4	346	108.2	283	0	12	160	82	315.7
COLD LAKE	7.7	-2.1	22.3	-5.2	0.4	16	89.2	199	0	8	123	70	309.1
CORONATION	7.4	-3.1	31.1	-5.0	11.7	403	134.6	412	0	12	142	68	319.9
EDMONTON INT'L	7.6	-2.2	25.2	-6.7	9.2	341	116.3	254	0	9	137	75	312.2
EDMONTON MUN.	8.5	-2.5	24.4	-3.3	9.2	418	101.9	261	0	10	141	77	284.9
EDMONTON NAMAO	7.6	-2.8	23.4	-4.7	10.6	530	91.5	220	0	10	X		310.3
EDSON	6.0	-2.5	21.9	-8.3	3.0	37	149.6	336	0	14	119	73	358.5
FORT CHIPEWYAN	2.1	-5.7	20.0	-5.0	1.6	73	43.8	104	MSG	MSG	X		MSG

X = Not observed * = normal missing MSG = data missing

SEPTEMBER 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	7.4	-1.6	21.2	-5.1	TR	0	24.4	42	0	4	144	101	318.3
GRANDE PRAIRIE	7.0	-2.8	18.3	-6.0	2.5	64	92.3	247	0	12	132	*	331.0
HIGH LEVEL	6.2	-1.9	20.4	-7.3	2.0	154	42.4	125	0	6	146	98	354.8
JASPER	7.0	-2.8	20.4	-8.0	0.6	55	62.7	165	0	11	148	*	331.3
LETHBRIDGE	9.5	-3.2	30.8	-4.1	10.4	121	93.7	252	0	9	155	73	263.2
MEDICINE HAT	9.8	-3.4	33.7	-6.2	3.0	158	52.1	161	0	8	182	91	254.6
PEACE RIVER	6.6	-2.5	21.1	-7.6	0.8	31	60.0	155	0	9	X		342.7
RED DEER	7.0	-3.1	27.2	-8.0	10.3	251	107.3	244	0	11	X		329.7
ROCKY MTN HOUSE	6.5	-3.2	25.6	-9.6	14.7	233	161.9	326	0	13	X		347.0
SLAVE LAKE	6.8	-2.2	18.9	-7.3	5.3	177	81.4	163	0	9	130	80	336.6
SUFFIELD	9.6	-3.2	32.0	-4.8	TR	0	62.7	183	0	7	175	84	260.2
WHITECOURT	6.4	-2.5	21.5	-7.0	4.4	129	131.1	379	0	14	X		349.0
SASKATCHEWAN													
BROADVIEW	8.1	-2.7	29.0	-5.5	4.2	98	89.8	177	0	11	170	91	297.5
COLLINS BAY	5.1	-1.0	17.8	-5.0	11.4	131	56.5	83	0	11	105	*	395.2
CREE LAKE	6.4	-1.0	19.6	-4.4	4.6	58	32.1	58	0	7	159	119	348.8
ESTEVAN	9.6	-2.8	30.0	-3.3	6.4	492	37.7	87	0	7	126	59	255.4
HUDSON BAY	7.5	-2.3	27.1	-6.1	28.0		94.4	179	TR	7	159	*	307.8
KINDERSLEY	8.4	-3.1	32.5	-5.2	10.2		66.6	251	0	9	X		292.8
LA RONGE	8.2	-1.1	22.4	-2.4	4.8	178	55.4	57	0	11	X		294.9
MEADOW LAKE	7.6	-2.6	26.5	-5.2	1.0	34	47.2	111	0	6	124	*	308.3
MOOSE JAW	9.3	-3.2	30.8	-3.5	3.2	139	65.8	184	0	7	160	79	266.1
NIPAWIN	8.0	-2.6	28.2	-5.3	10.0	588	78.9	184	0	9	149	89	300.6
NORTH BATTLEFORD	8.2	-2.8	30.6	-5.7	18.0		72.4	282	0	8	X		295.5
PRINCE ALBERT	7.6	-2.3	27.4	-5.3	11.8	513	80.1	203	0	8	145	87	312.3
REGINA	8.8	-2.9	29.5	-6.6	2.0	111	40.8	111	0	6	156	82	297.7
SASKATOON	8.4	-2.8	31.2	-4.9	8.2	683	58.2	183	0	8	X		290.3
SWIFT CURRENT	7.7	-4.0	23.2	-5.9	6.9	238	57.0	167	0	11	157	81	314.0
URANIUM CITY	6.1	-1.2	17.6	-3.7	1.3	72	42.1	119	0	9	X		356.2
WYNYARD	7.8	-3.2	27.4	-7.2	18.0	391	88.6	222	0	10	157	84	306.8
YORKTON	8.0	-2.9	27.0	-5.3	12.9	496	102.6	220	0	9	159	86	301.6
MANITOBA													
BISSETT	9.2	-1.5	23.8	-4.5	1.2	400	60.6	90	0	6	166	107	263.8
BRANDON	9.0	-2.4	29.1	-5.2	0.9	450	81.3	184	0	10	X		270.4
CHURCHILL	MSG		MSG	MSG	MSG		MSG		MSG	MSG	MSG		MSG
DAUPHIN	9.2	-2.1	28.0	-2.8	3.4	262	MSG		0	12	148	83	MSG
GILLAM	5.9	-0.7	20.5	-5.2	22.2	396	43.8	86	TR	9	X		364.0
GIMLI	10.3	-1.4	26.6	-1.2	8.4	800	84.6	137	0	10	174	104	232.3
ISLAND LAKE	7.9	-1.3	22.9	-2.1	28.0	412	77.1	128	0	8	X		302.6
LYNN LAKE	5.5	-1.2	20.8	-5.0	1.0	11	11.6	16	0	4	110	93	374.7
NORWAY HOUSE	7.3	*	24.4	-7.0	15.6	*	54.6	*	0	10	X		320.7
PILOT MOUND	9.6	-2.3	27.9	-4.5	1.0	500	46.8	82	0	7	X		252.9

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									
PORTAGE LA PRAIRIE	10.4	-2.0	28.2	-1.8	14.4	440	87.9	176	0	11	X		230.9
THE PAS	8.0	-1.8	26.7	-5.2	17.0	133	81.3	142	0	11	155	98	289.4
THOMPSON	5.5	-1.4	22.8	-9.6	13.5	466	55.5	87	0	6	122	96	374.9
WINNIPEG INT'L	10.6	-1.8	27.1	-1.7	6.6	300	62.0	116	0	6	181	98	223.8
ONTARIO													
ATIKOKAN	9.1	-1.1	27.1	-5.4	1.6	533	39.6	49	0	9	148	88	266.6
EARLTON	10.4	-0.7	24.8	-1.7	TR	0	76.9	78	0	12	X		232.1
GERALDTON	8.6	-0.7	23.4	-2.1	20.2	683	66.2	88	0	13	X		281.5
GORE BAY	13.0	-0.8	22.5	2.1	0.0	0	102.3	112	0	12	X		150.9
HAMILTON RBG	15.1	-1.7	26.3	3.0	0.0	0	123.1	169	0	10	168	*	MSG
HAMILTON	14.2	-1.5	24.4	3.3	0.0	0	165.5	222	0	8	X		120.0
KAPUSKASING	9.0	-1.0	23.1	-1.8	6.8	283	88.5	94	0	15	X		270.4
KENORA	10.4	-1.2	23.8	-1.3	9.6	640	45.5	66	0	11	X		228.1
KINGSTON	14.0	-1.4	24.5	1.4	0.0	0	41.2	51	0	7	174	103	126.9
LANSDOWNE HOUSE	7.9	-1.1	20.5	-1.8	2.8	51	69.9	87	0	14	X		304.1
LONDON	14.2	-1.2	26.5	3.6	0.0	0	149.3	190	MSG	9	141	81	119.2
MOOSONEE	8.4	-1.1	25.8	-1.8	4.9	980	80.3	100	0	14	117	97	289.8
MOUNT FOREST	12.0	-1.8	24.8	0.8	0.0	0	102.0	127	0	11	140	84	182.5
MUSKOKA	MSG		MSG	MSG	MSG		123.5	121	0	14	X		MSG
NORTH BAY	10.8	-1.4	24.5	0.6	0.0	0	125.6	108	0	12	134	87	215.6
OTTAWA INT'L	13.6	-0.7	25.6	-1.2	0.0	0	15.4	19	0	7	212	*	135.0
PETAWAWA	11.9	-0.7	27.5	-4.4	MSG		MSG		MSG	MSG	X		MSG
PETERBOROUGH	11.9	-2.1	24.2	-3.4	0.0	0	72.2	99	0	8	X		MSG
PICKLE LAKE	7.7	-1.6	22.1	-2.4	9.8	228	89.4	103	0	16	X		307.7
RED LAKE	8.9	-1.9	23.5	-2.3	3.0	273	51.2	82	0	8	145	*	272.8
ST. CATHARINES	15.4	-1.6	26.5	3.5	0.0	0	138.6	170	0	7	X		96.1
SARNIA	15.1	-1.4	28.8	4.5	0.0	0	97.4	155	0	12	151	77	102.8
SAULT STE. MARIE	11.7	-1.1	23.5	0.2	1.2	200	131.4	138	0	13	163	104	190.1
SIMCOE	14.3	-1.4	26.0	2.8	0.0	0	120.3	145	0	8	X		121.6
SIOUX LOOKOUT	9.5	-1.2	21.4	-1.3	7.0	389	48.7	60	0	9	X		253.7
SUDBURY	10.9	-1.3	24.0	-1.2	TR	0	96.8	91	0	12	143	95	200.2
THUNDER BAY	10.3	-0.8	28.5	-3.4	2.8	*	46.5	52	0	11	148	88	229.8
TIMMINS	9.1	-1.2	23.3	-2.4	0.8	62	83.0	91	0	11	X		268.4
TORONTO	15.6	-1.5	25.5	5.2	0.0	0	81.3	123	0	8	MSG		88.4
TORONTO INT'L	13.9	-1.6	25.7	0.5	0.0	0	74.7	118	0	9	X		132.3
TORONTO ISLAND	15.3	-1.1	25.9	5.4	0.0	0	75.9	109	0	7	X		88.9
TRENTON	13.5	-1.8	25.2	-0.3	0.0	0	44.6	61	0	6	X		139.8
TROUT LAKE	6.4	-1.7	20.6	-3.6	7.3	*	75.8	103	0	10	83	*	347.7
WATERLOO-WELL	12.8	-2.0	24.2	-1.0	0.0	0	100.8	146	0	10	X		158.2
WAWA	9.1	*	24.3	-3.0	0.2	*	144.4	*	0	14	X		266.6
WIARTON	13.2	-1.0	26.6	2.1	0.0	0	132.0	140	0	12	167	99	144.8
WINDSOR	16.3	-1.1	31.3	6.0	0.0	0	67.3	100	0	11	X		83.0

X = Not observed   * = normal missing   MSG = data missing

SEPTEMBER 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	10.1	-1.0	27.5	-1.9	TR	0	46.0	46	0	8	X		236.9
BAIE COMEAU	8.9	-0.9	21.5	-3.4	TR	0	65.0	63	MSG	10	169	*	272.0
BLANC SABLON	9.2	0.6	23.3	0.6	0.0	0	MSG		57	10	142	*	266.7
CHIBOUGAMAU	7.9	-0.9	24.2	-3.0	3.0	136	91.3	80	0	16	111	91	303.3
KUUJJUAQ	4.0	-1.4	18.9	-4.5	19.0	224	76.2	132	1	10	99	100	420.4
GASPE	11.0	-0.3	27.6	-3.0	0.0	0	33.6	47	0	7	167	*	211.0
INUKJUAK	4.6	-0.4	11.0	-2.9	10.4	212	55.0	93	0	15	116	131	403.0
LA GRANDE RIVIERE	5.6	*	20.8	-3.0	28.9	*	99.7	*	TR	19	83	*	372.2
MANIWAKI	11.5	-0.6	23.8	-2.9	TR	0	62.2	65	0	7	177	117	198.1
MATAGAMI	8.7	-0.3	26.1	-1.5	2.2	63	102.7	107	0	13	129	103	278.8
MONT JOLI	10.8	-0.4	25.1	-3.0	0.0	0	46.0	55	0	9	162	105	220.2
MONTREAL INT'L	13.2	-1.6	24.8	-1.2	0.0	0	28.8	33	0	6	190	113	146.7
MONTREAL M INT'L	12.0	*	24.6	-1.5	0.0	0	33.0	*	0	7	209	*	179.9
NATASHQUAN	9.8	0.6	19.4	-2.8	0.0	0	123.6	131	0	12	196	198	243.9
NITCHEQUON	6.2	-0.1	17.2	-3.5	15.1	145	181.3	184	0	22	72	72	355.9
KUUJJUARAPIK	6.2	-0.9	20.0	-1.3	11.2	659	125.4	144	0	22	92	87	353.4
QUEBEC	11.5	-1.1	24.4	0.9	0.0	0	66.7	56	0	8	183	120	195.2
ROBERVAL	10.6	-0.6	24.2	0.8	0.0	0	34.0	37	0	10	164	*	223.6
STE AGATHE DES MONTS	10.5	-0.4	22.1	-2.3	0.0	0	37.6	37	0	5	173	107	224.8
ST HUBERT	13.0	-1.4	26.9	-1.6	0.0	0	24.9	28	0	6	X		153.6
SCHEFFERVILLE	4.5	-0.7	17.1	-2.6	9.4	48	134.0	161	0	17	68	*	405.1
SEPT-ILES	9.0	-0.3	23.4	-1.6	TR	0	87.6	78	0	9	164	104	269.4
SHERBROOKE	10.1	-2.0	26.0	-5.3	0.0	0	48.8	48	0	8	166	*	236.6
VAL D'OR	9.2	-1.2	25.0	0.6	0.2	17	61.8	58	0	12	152	108	265.1
NEW BRUNSWICK													
CHARLO	10.9	-0.2	26.8	-0.9	0.0	0	16.7	17	0	5	195	122	214.1
CHATHAM	12.5	-0.5	29.4	-2.6	0.0	0	30.0	35	0	6	192	107	171.3
FREDERICTON	12.3	-0.9	27.5	0.0	0.0	0	42.7	49	0	8	207	*	172.3
MONCTON	12.3	-0.7	25.6	0.3	0.0	0	106.6	140	0	11	201	121	171.3
SAINT JOHN	12.5	-0.2	24.2	2.0	0.0	0	70.9	63	0	8	213	128	164.5

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
NOVA SCOTIA													
EDDY POINT	13.3	-1.0	23.9	3.0	0.0	0	101.5	116	0	12	172	99	140.2
GREENWOOD	13.0	-0.8	26.3	0.2	0.0	0	109.1	129	0	7	X		153.4
HALIFAX INT'L	13.3	-0.5	25.0	2.6	0.0	0	64.6	69	0	10	X		143.9
SABLE ISLAND	15.1	-0.6	22.1	1.9	0.0	0	132.8	144	0	13	149	95	91.1
SHEARWATER	14.0	-0.5	27.0	4.3	0.0	0	53.1	61	0	10	190	105	123.4
SYDNEY	12.6	-0.7	24.3	2.4	0.0	0	120.1	76	0	11	157	126	163.3
TRURO	12.1	-0.6	24.1	0.5	0.0	0	68.4	90	0	10	163	105	177.4
YARMOUTH	12.8	-0.8	22.3	3.3	0.0	0	66.0	74	0	6	212	121	155.3
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	12.9	-0.6	23.4	3.0	0.0	0	143.6	166	0	12	X		152.6
SUMMERSIDE	13.5	-0.6	24.0	3.5	0.0	0	88.1	112	0	11	184	109	136.4
NEWFOUNDLAND													
ARGENTIA	12.9	-0.4	22.2	4.7	0	0	185.6	222	0	15	X		159.3
BATTLE HARBOUR	8.4	0.1	21.2	-1.0	TR	0	50.3	73	0	10	X		278.3
BONAVISTA	12.0	0.3	23.9	2.9	0	0	154.8	180	0	17	X		180.4
BURGEO	11.5	0.0	19.0	1.0	0	0	155.0	121	0	14	144	97	193.6
CARTWRIGHT	7.6	-0.7	27.0	0.3	TR	0	64.7	72	0	15	101	94	313.9
CHURCHILL FALLS	6.3	0.6	21.2	-2.5	5.6	37	146.6	145	0	19	79	81	350.7
COMFORT COVE	10.3	-0.6	26.3	0.5	TR	0	96.6	108	0	14	X		231.8
DANIEL'S HARBOUR	10.5	-0.3	22.1	1.5	0	0	96.7	105	0	11	112	86	223.7
DEER LAKE	10.1	-0.4	22.5	-3.8	0	0	133.7	146	0	13	X		MSG
GANDER INT'L	10.7	-0.7	25.3	1.4	TR	0	113.4	140	0	14	152	104	236.9
GOOSE	8.5	-0.6	25.0	-1.1	0	0	121.7	137	0	17	110	91	288.7
HOPEDALE	MSG		MSG	MSG	MSG	MSG	MSG	MSG	MSG	MSG	X		MSG
PORT-AUX-BASQUES	12.0	0.7	20.7	4.0	0	0	182.2	158	0	13	175	*	183.9
ST ANTHONY	8.1	0.0	22.6	-1.2	0	0	69.4	52	0	8	X		286.3
ST JOHN'S	12.2	0.6	23.9	0.2	0	0	157.8	135	0	15	165	112	174.3
		0.6											
ST LAWRENCE	11.9	0.1	22.7	1.2	0	0	248.0	195	0	14	X		186.6
STEPHENVILLE	12		21.0	1.7	0	0	156.5	150	0	14	123	93	180.7
WABUSH LAKE	6.3	0.1	19.6	-2.5	2.0	22	11.5	12		17	88	95	351.7

X = Not observed * = normal missing MSG = data missing

SEPTEMBER 1984 SEPTEMBRE

STATION	Temperature °C / Température °C: Mean / Moyenne	Difference from Normal / Écart 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	14.6	-0.9	25.0	4.5	0.0	162.8	154	0	12	189	287.3	1893.0	
Kamloops													
Sidney													
Summerland	13.1	-2.1	28.0	0.5	0.0	6.4	34	0	2	216	240.0	1847.5	
ALBERTA													
Beaverlodge	7.0	-2.5	18.0	-7.0	3.0	76.0	181	0	11	132	79.9	1090.4	
Ellerslie	7.6	-2.5	24.0	-5.5	6.0	106.3	262	0	8	135	108.8	1279.2	
Fort Vermilion													
Lacombe	7.1	-3.0	26.0	-7.0	4.0	102.4	250	0	10		91.2	1190.7	
Lethbridge	9.3	-2.9	31.0	-5.0	5.0	87.3	239	0	9	155	150.5	1655.5	
Vauxhall	9.8	-2.3	32.0	-5.0	T	59.8	175	0	7	158	164.0	1616.5	
Vegreville	7.6	-2.1	26.5	-7.5	0.4	81.5	195	0	13		95.1	1289.0	
SASKATCHEWAN													
Indian Head	8.7	-2.8	28.0	-5.5	18.2	68.2	161	0	13		139.5	1611.5	
Melfort	8.0	-2.3	27.5	-4.0	14.8	73.1	179	0	9	153	118.0	1517.0	
Regina	8.2	-3.0	28.0	-8.5	T	40.4	114	0	8		102.8	1562.0	
Saskatoon	8.3	-3.2	31.0	-6.5	8.9	56.9	177	0	7	152	128.5	1673.0	
Scott													
Swift Current	8.2	-3.6	32.0	-5.0	4.6	50.6	173	0	7	131	132.3	1628.4	
MANITOBA													
Brandon	9.4	-2.4	29.5	-5.5	1.5	78.2	157	0	10	158	148.3	1641.1	
Glenlea	10.0	-2.2	27.0	-6.0	2.2	35.6	71	0	7	172	176.0	1687.8	
Morden													
ONTARIO													
Delhi	13.7	-2.2	26.5	1.5	0.0	131.6	164	0	10	163	281.9	1929.4	
Elora	12.6	-1.6	24.4	-0.2	0.0	93.1	131	0	10		226.4	1663.4	
Guelph	13.1	-1.9	25.1	-0.7	0.0	103.4	163	0	10	164	242.0	1747.5	
Harrow	16.6	-0.9	31.0	5.0	0.0	92.2	139	0	10	161	345.3	2165.0	
Kapuskasing													
Merivale													
Ottawa	13.7	-0.9	25.2	-1.7	0.0	16.3	20	0	7	207	260.1	1943.6	
Smithfield													
Vineland Station	15.6	-1.4	26.1	5.8	0.0	153.8	206	0	12	179	318.0	2003.9	
Woodslee													
QUEBEC													
La Pocatiere	11.8	-0.8	24.0	-1.0	0.0	37.2	39	0	7	193	206.0	1524.2	
L'Assomption	12.6	-1.3	24.5	-1.5	0.0	38.2	43	0	4	181	225.3	1825.6	
Lavaltrie													
Lennoxville													
Normandin	9.7	-0.7	25.0	-2.0	0.0	45.3	47	0	10	137	147.8	1344.8	
St. Augustin													
Ste. Clothilde	13.5	-0.7	26.5	-0.5	0.0	29.8	35	0	9	192	253.7	1979.5	
NEW BRUNSWICK NOUVEAU-BRUNSWICK													
Fredericton													
NOVA SCOTIA NOUVELLE-ECOSSE													
Kentville	13.8	-0.5	26.0	2.5	0.0	100.4	117	0	9	209	265.9	1862.2	
Nappan													
PRINCE EDWARD ISLAND ILE-DU-PRINCE-EDOUARD													
Charlottetown	13.5	-0.6	24.0	3.0	0.0	134.2	161	0	11	193	255.5	1651.4	
NEWFOUNDLAND TERRE-NEUVE													
St. John's West													

ACID RAIN REPORT ISSUED BY ENVIRONMENT CANADA
FOR SEPTEMBER 30 - OCT. 6, 1984

SITE	DAY	pH	AIR PATH TO SITE
Longwoods, near London, Ont.			No precipitation last week.
Dorset,* Muskoka, Ont.	2	5.1	From the west across Wisconsin, Michigan and Lake Huron.
	3	5.1	From the west across Wisconsin, Michigan and Lake Huron.
	4	4.5	From northwestern Ontario over Sudbury region.
Chalk River Ottawa Valley, Ont.	2	4.1	From the west across Wisconsin, Lake Huron, Sudbury Region.
	3	4.6	Northwestern Ontario.
	4	4.4	Northwestern Ontario.
	7	3.8	Michigan, Ohio, New York, southern Ontario.
Montmorency, Quebec City Que.	2	5.7	Northwestern Quebec.
	3	4.5	Wisconsin, across Great Lakes, central Ontario and southern Quebec.
	4	5.3	Northwestern Quebec.
	5	5.8	Northwestern Quebec,
	7	4.1	West across Wisconsin, Michigan, Great Lakes, central Ontario and central Quebec.
Kejimkujik, Southwestern N.S.	1	4.4	From northwest over Gaspé and Cape Breton.
	2	4.5	From northwest over Gaspé and Cape Breton.
	3	3.5	Northern Ontario, Quebec and Maine.
	4	4.3	Northern Ontario, Quebec and Maine.

* Data for Dorset supplied by the 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 than 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.