Environment Canada Environnement Canada

Climatic Perspectives

Monthly review MAY Vol. 9 1987

CLIMATIC HIGHLIGHTS

by
P. Scholefield, CCRM

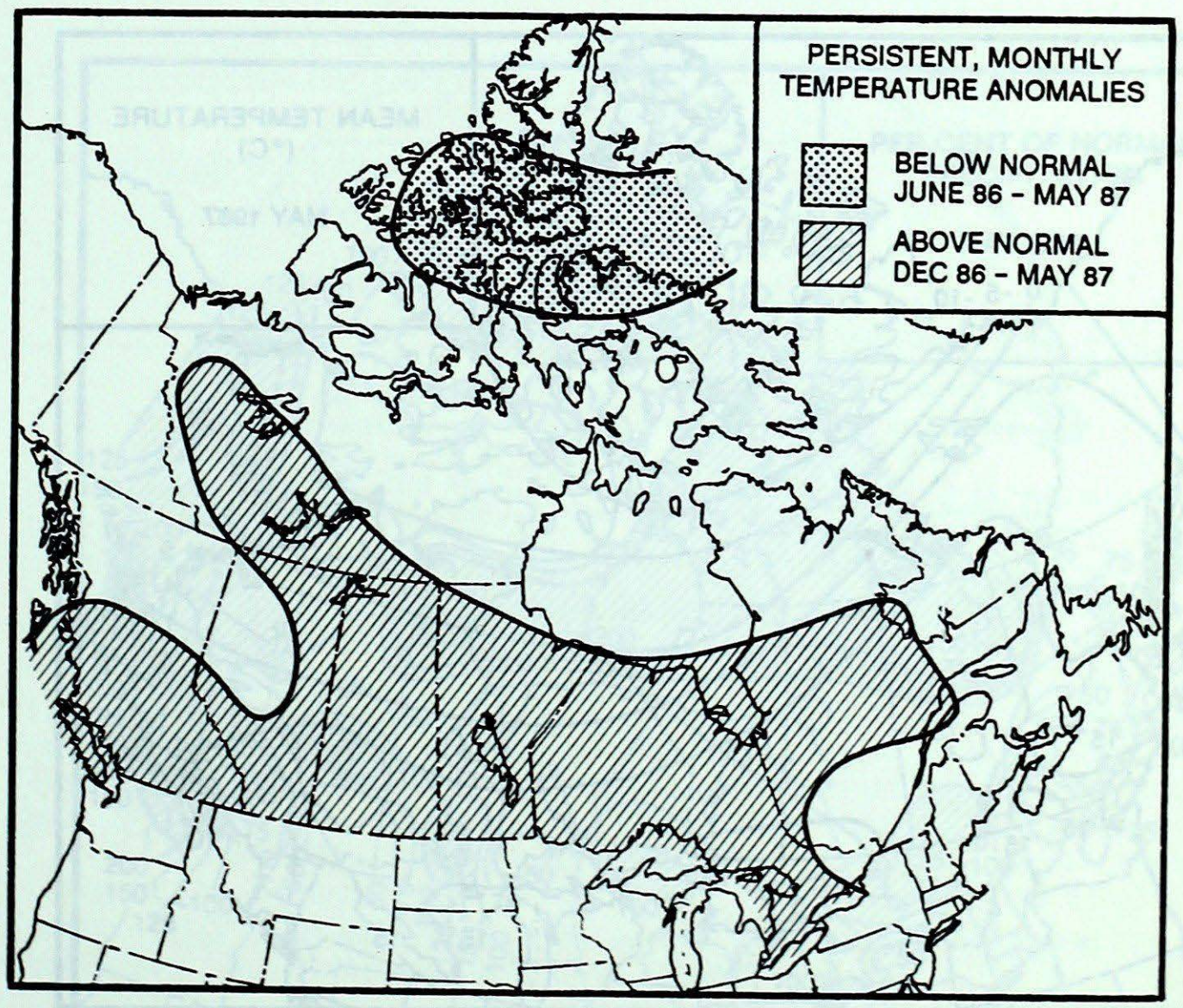
Warm Spell Extends to 6 Months Across Much of Southern Canada

The accompanying map shows the extent of the remarkable stretch of above normal temperatures that many Canadians have experienced over the past six months. For a small region that includes Vancouver and central Vancouver Island, the warm spell extends back 10 months to August, 1986. This has been the second month in a row that the monthly warm temperature anomaly has extended from coast to coast across southern Canada including the Atlantic provinces which had just experienced a lengthy cold spell (10 months long in some places).

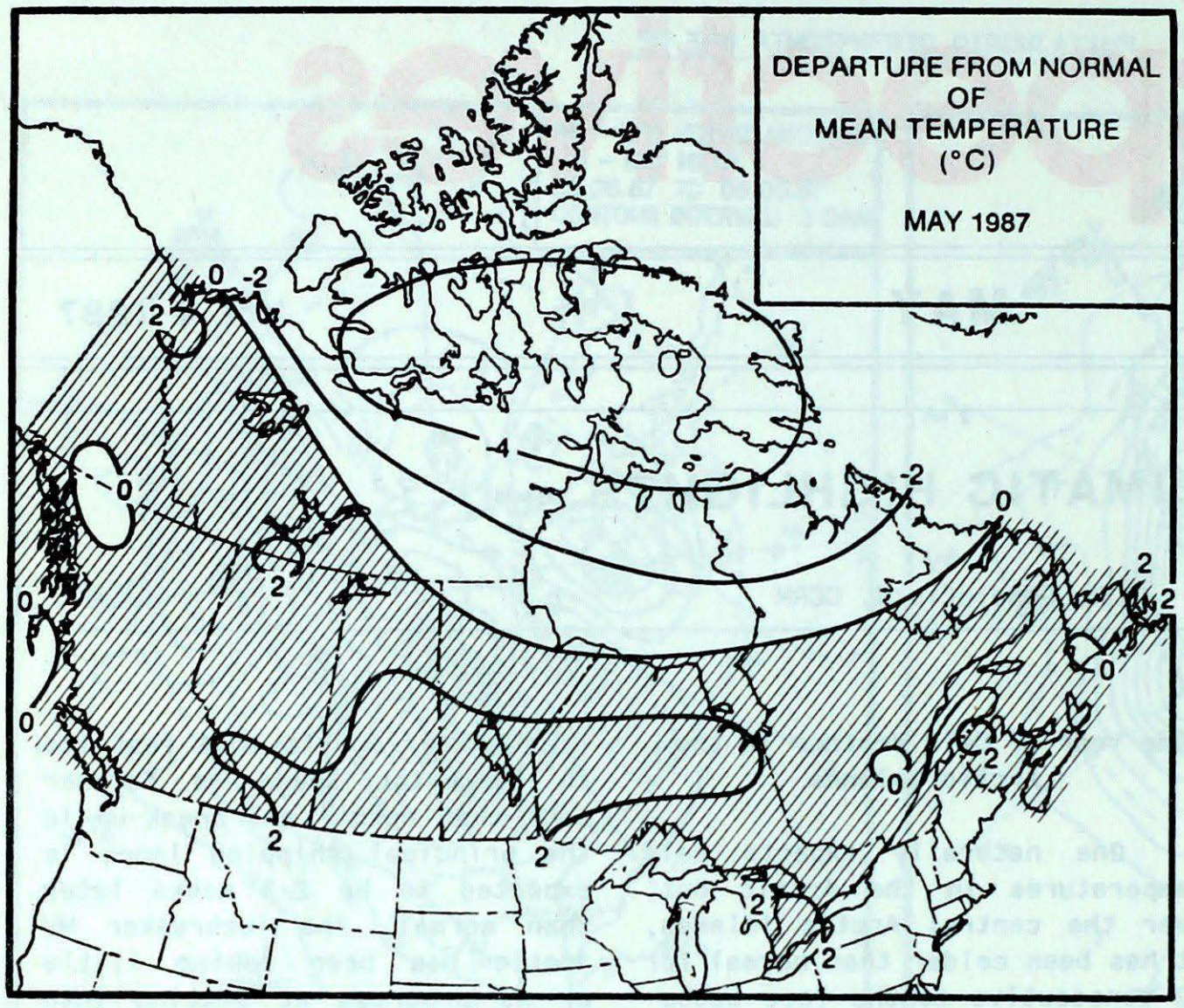
The dry weather associated with this warm spell had created a serious forest fire situation during April which lasted until the arrival of unsettled weather conditions and associated precipitation in the middle of May. The fine weather of this spring has allowed agricultural activities to proceed ahead of schedule in many areas. A potentially record fruit crop has been set in the Okanagan valley of British Columbia. On the Great Lakes, the warmth, dryness and sunshine have contributed to a significant drop in lake levels, which were at dangerously high levels a few months ago (see feature article on page 8B).

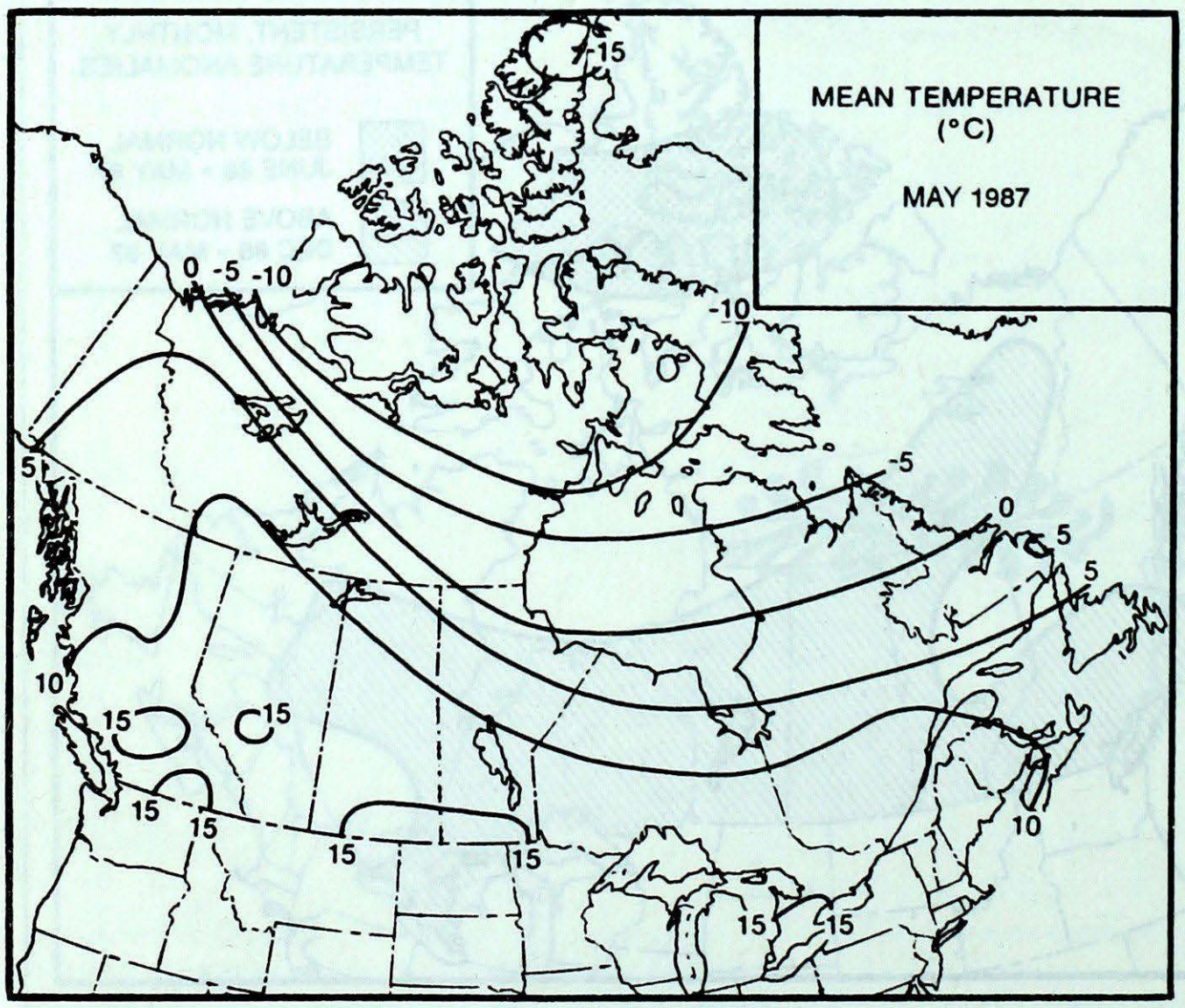
One Year of Cold Weather in the Arctic Islands

One naturally expects cold temperatures in the Arctic but, over the central Arctic islands, it has been colder than normal for 12 consecutive months (see accompanying map). In addition to increasing the interior heating costs, the short summer shipping season could be curtailed. AES's Ice Centre reports that fast ice in Lancaster Sound is further east than normal and break-up in the principal shipping lanes is expected to be 2-3 weeks later than normal. The icebreaker MV Arctic has been making little or no progress at getting into Nanisivik on northern Baffin Island because of the unusually thick ice.



TEMPERATURE





ACROSS THE COUNTRY

Yukon and Northwest Territories

The presence of an anomalous arctic vortex (normally the arctic vortex lies over the Siberian archipelago; see page 5B) which persisted over Baffin Island maintained cloudy skies and generally below normal temperatures over most of the Territories except the Yukon and the western District of Mackenzie. Several systems produced heavy snowfalls often accompanied by blizzard conditions. Blizzard warnings where issued due to the strong winds.

Maximum daily temperature records were set in the Yukon at the beginning and end of the month as temperatures rose above 20°C. Daily minimum temperature records were more common over the far north and Baffin Island where temperatures fell below -30°C at the beginning of the month.

British Columbia

The province experienced variable meteorological conditions during the month. Ridges of high pressure followed by air coming from the southwest produced slightly above normal temperatures, generally above normal precipitation and lots of sunshine.

Temperature anomalies were just marginally above normal (less than +1°C) except higher in the Okanagan-Kootenay regions. Precipitation was generally above normal with an abundance falling in the northeast where anomalies exceeded 260%. Amounts varied considerably and there were three monthly records: maximums at Dease Lake and Langara Island with 265% (61.3 cm) and 247% (227.5 mm) of normal respectively and a minimum of 32% (11.2 mm) of normal at Cranbrook.

This excess of precipitation helped reduce the risk of forest fires. Agricultural crops were still two weeks ahead of normal in the south due to ample sunshine.

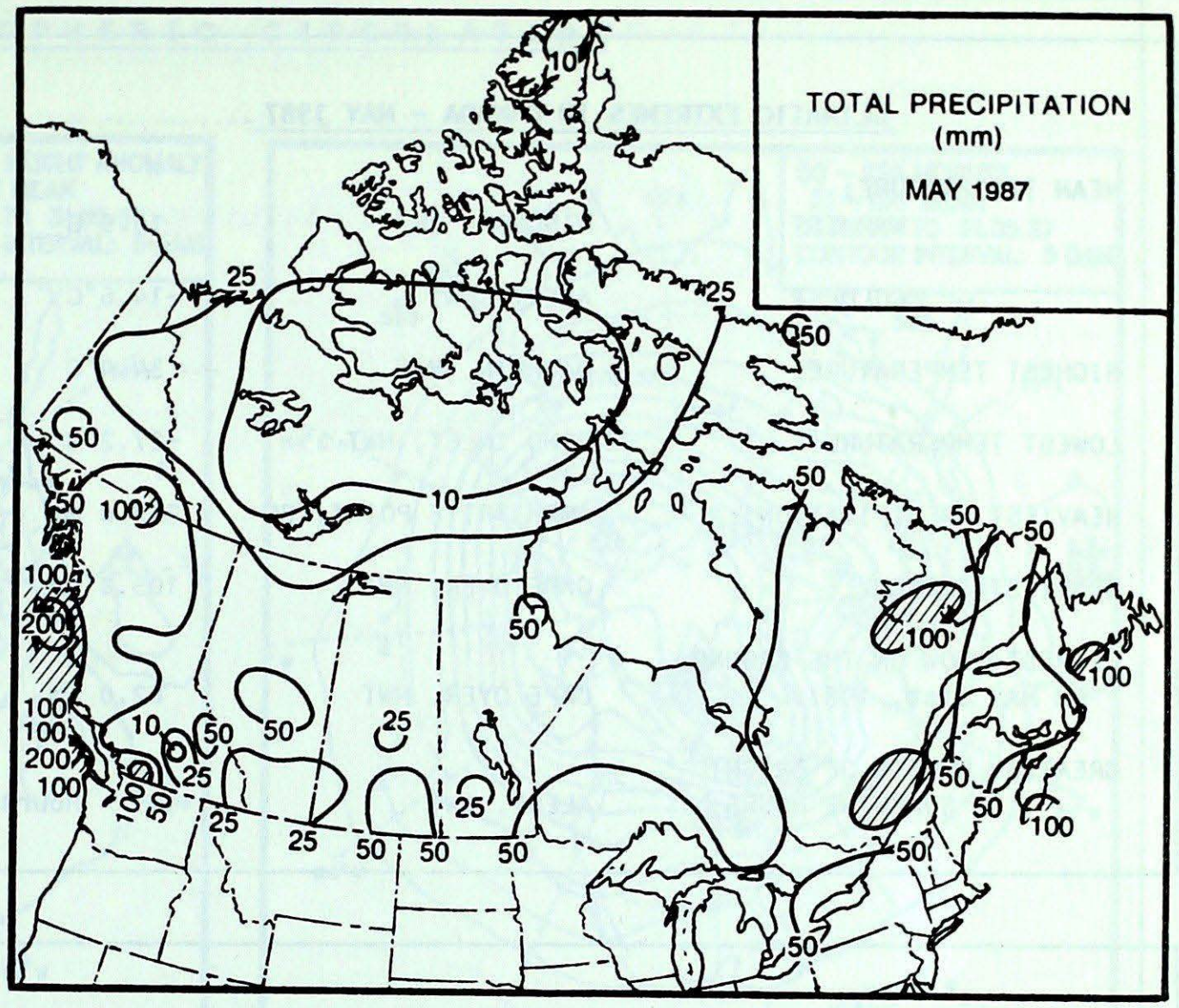
PRECIPITATION

Prairie Provinces

May was the sixth consecutive month with above normal temperatures. Except for northeastern Manitoba, mean temperatures varied from +0.5 to +4°C above normal. There were some extreme fluctuations: Fort McMurray recorded 30.8°C on the 7th; Dauphin and Winnipeg just above 34°C on the 12th and 15th respectively while the mercury plunged to -8.9°C at Edmonton on the 20th and daily minimum records were broken in northern Manitoba on the 21st.

For most areas, precipitation fell mainly during the latter half of the month and monthly totals were generally less than normal. A late spring snowstorm dumped 20 cm of wet snow on Edmonton on the 19th which was the heaviest snowfall during the past 12 months.

Tornadoes were reported near Minnedosa and Rivers, Manitoba on the 28th. Rainfalls during the latter part of the month temporarily relieved the hazardous forest fire situation.

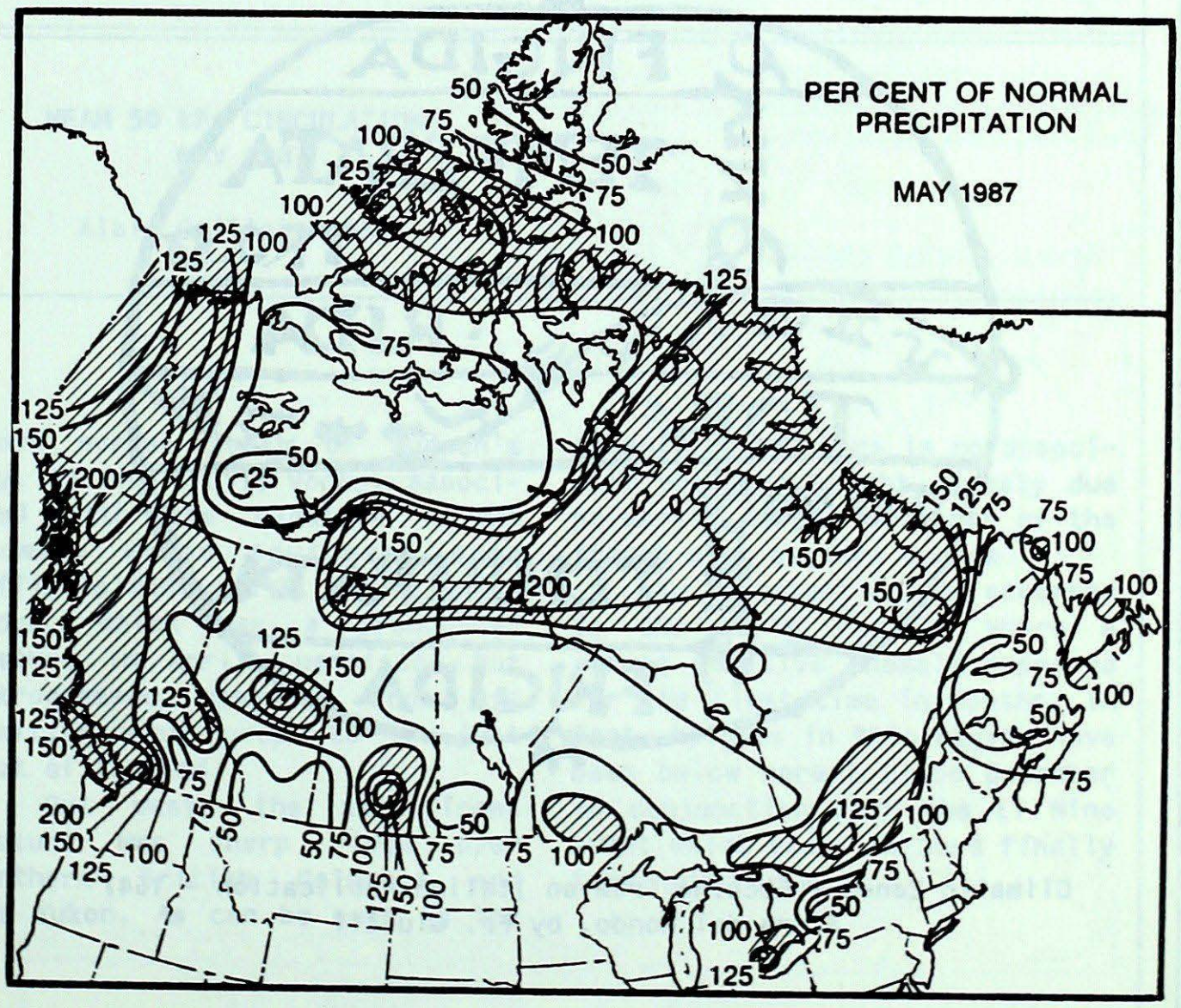


Ontario

It was warmer and drier than normal throughout Ontario in May. Departures from normal temperatures were in the order of +1 to +2°C. These positive anomalies were not dramatic but, nonetheless, in the southern parts of the province, it was the warmest May since 1982. At Toronto and Sarnia it was the warmest May since 1977; the anomalie at Sarnia was +2.4°C! Temperatures climbed above 30°C on several occasions during the last week of the month.

Precipitation amounts were generally lighter than normal and most accumulations occurred during the last week of the month. Kitchener received only 34.4 mm, the lowest May accumulation since 1958. For most of the month, the lack of precipitation and heat created an explosive forest fire threat.

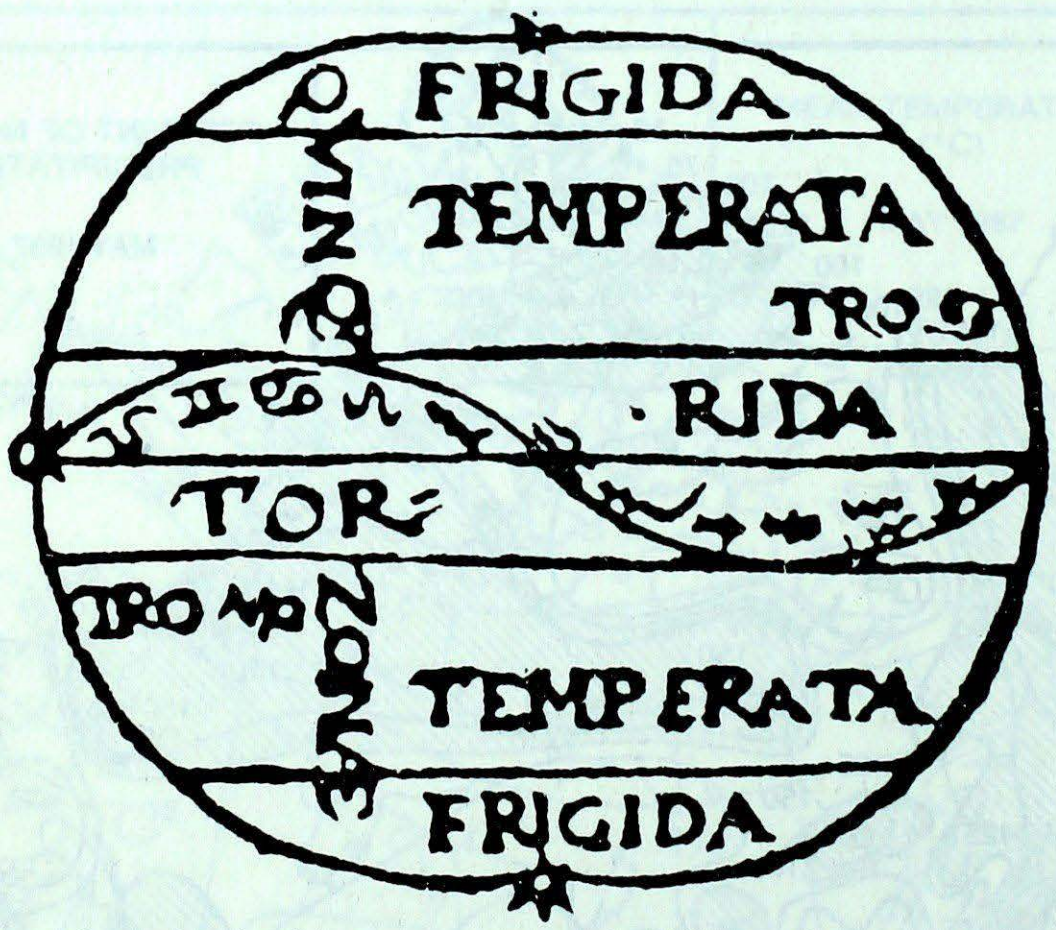
In the agricultural areas, it was the fourth consecutive month with below normal precipitation. Wind erosion of soil became a problem on windy days.



EXTREMES

CLIMATIC EXTREMES IN CANADA - MAY 1987

MEAN TEMPERATURE:		
WARMEST	WINDSOR, ONT	16.9°C
COLDEST	ALERT, NWT	-14.6°C
HIGHEST TEMPERATURE:	DAUPHIN, MAN	34.4°C
LOWEST TEMPERATURE:	POND INLET, NWT	-27.2°C
HEAVIEST PRECIPITATION:	AMPHITRITE POINT, BC	283.6 mm
HEAVIEST SNOWFALL:	CAPE DYER, NWT	105.8 cm
DEEPEST SNOW ON THE GROUND ON MAY 31st, 1987:	CAPE DYER, NWT	82.0 cm
GREATEST NUMBER OF BRIGHT SUNSHINE HOURS:	ALERT, NWT	419 hours



Climatic Zones - Etching from an Italian Publication - 1647
Sfera del Mondo, by Fr. Giuntil

Quebec

Weather was variable throughout the month in the "belle province". Mean monthly temperatures were generally less than normal in the north and above normal in the south. Despite the modest anomalies there were some sharp contrasts in daily temperatures which reached maximum as well as minimum record levels at several locations.

Except for the north and southwest, precipitation was less than normal. Grand Rivière received 31.2 cm of snow, which was a new record for the month of May.

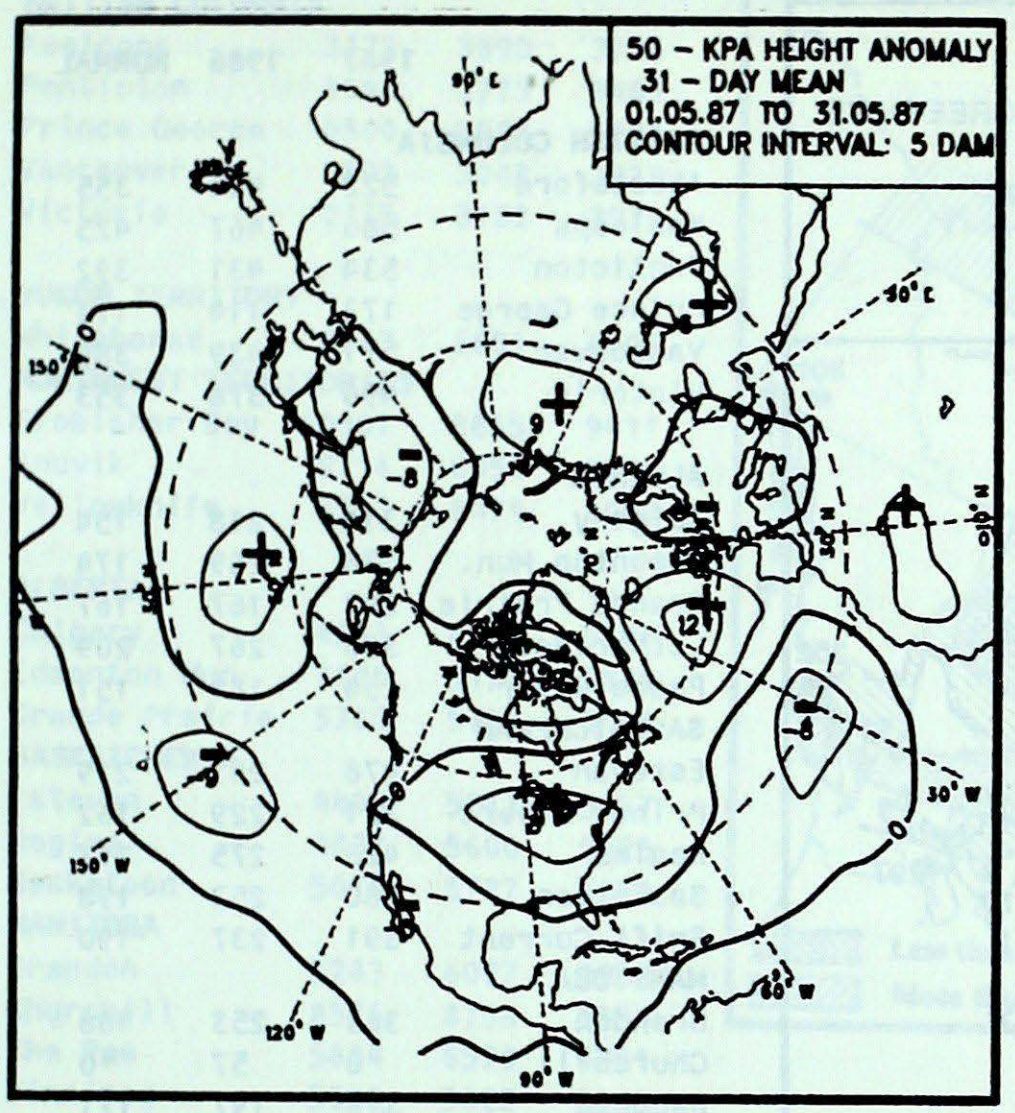
Several violent thunderstorms battered the south at the end of the month. On the 28th, a tornado struck the eastern townships destroying 2 homes and injuring two people. In Montréal on the 29th, exactly the same date as last year when the worst-ever hailstorm occurred, a severe thunderstorm caused thousands of dollars damage due to hail, flooding and uprooted trees. Hail was also reported on the 30th near Mirabel and eastward to Trois Rivières.

Atlantic Provinces

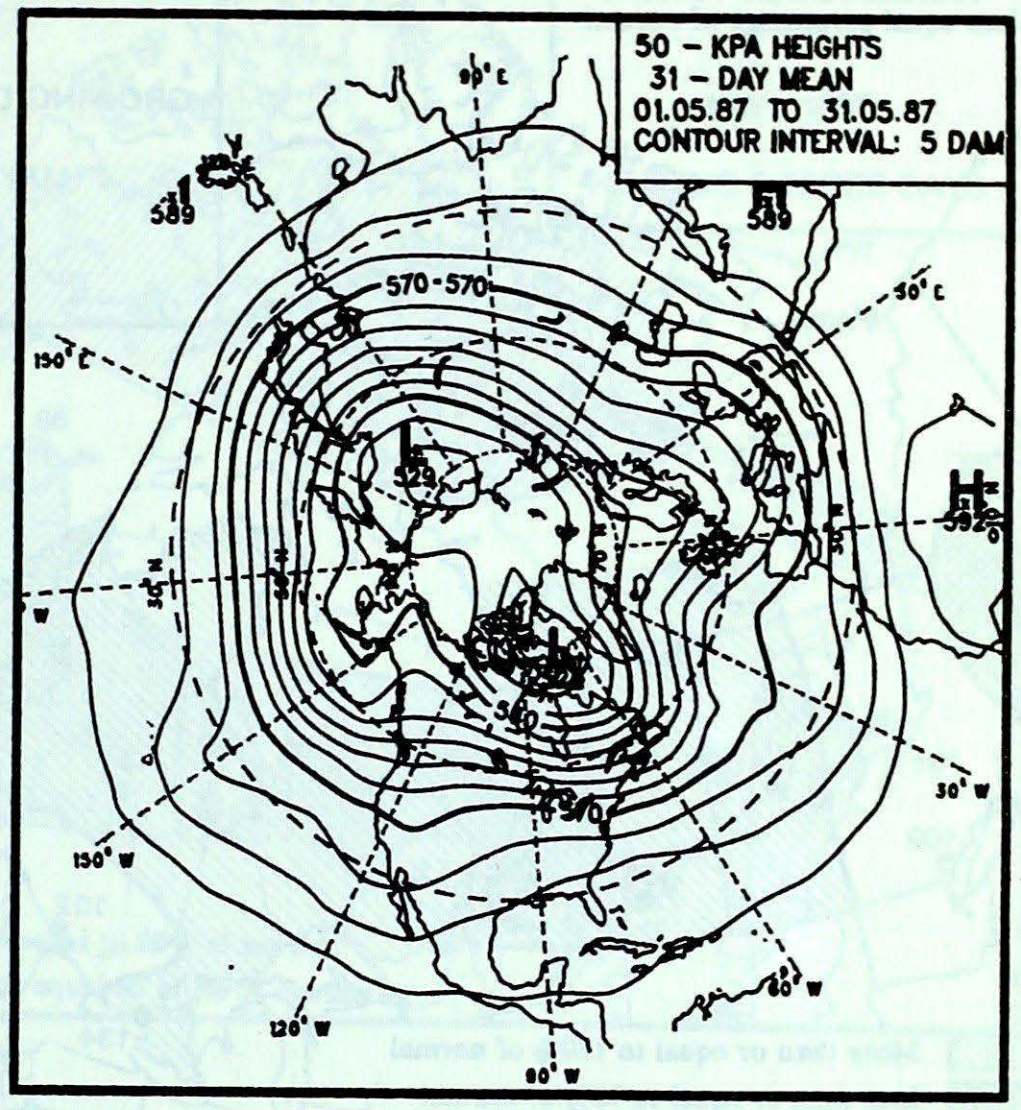
The trend to more pleasant temperatures continued to the east coast. It was the second straight month with above normal temperatures in the Atlantic Provinces after an extended period of cold weather. Only Shelbourne (NS) experienced temperatures slightly below normal. There were some rather large fluctuations particularly in Newfoundland and Labrador where several maximum and minimum daily records were broken.

Precipitation was generally less than normal in the Maritimes and near-normal in Newfoundland and Labrador where they still received some precipitation in the form of snow. A thunderstorm produced hail in the Halifax-Dartmouth region on the 19th.

ATMOSPHERIC CIRCULATION



Mean 50 kPa height-anomaly (dam)
May 1987



Mean 50 kPa heights (dam)
May 1987

MEAN 50 kPa CIRCULATION
MAY 1987

Alain Caillet, CCRM

The upper level (50 kPa) circulation in May continued its spring-time evolution in response to the general warming of the northern latitudes. This resulted in a decrease in the intensity of the circulation and the contour gradient.

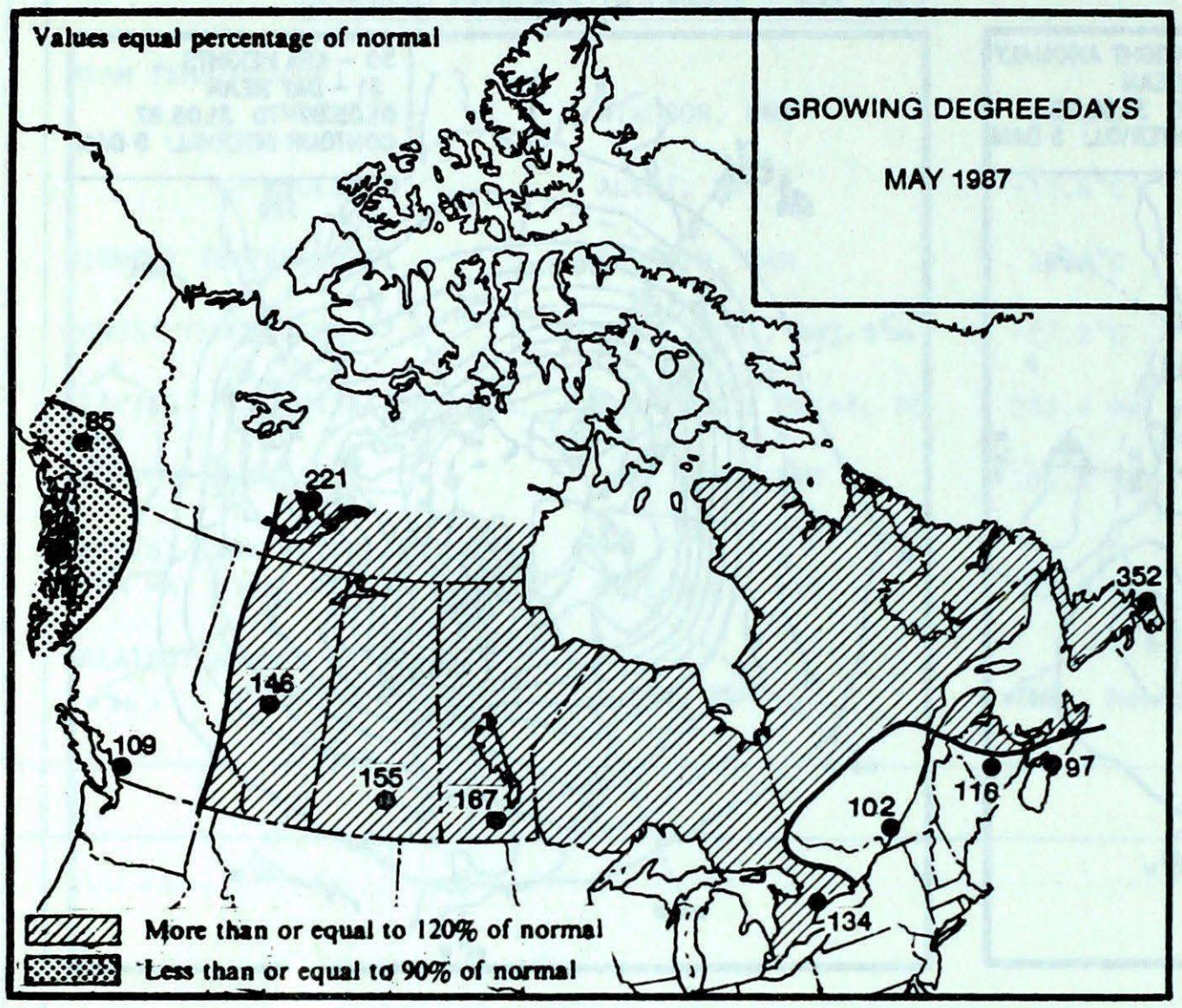
Nonetheless, the gradient of the flow remained relatively strong over eastern Canada for three reasons: 1) as in April, the geopotential heights remained below normal in the Arctic and above normal south of Hudson's Bay; 2) the Arctic vortex associated with the negative height anomaly moved southward over Baffin Island; and 3) the Atlantic ridge, which was a pronounced feature in April, persisted but retrogressed westward from its position over Europe to lie just west of Iceland.

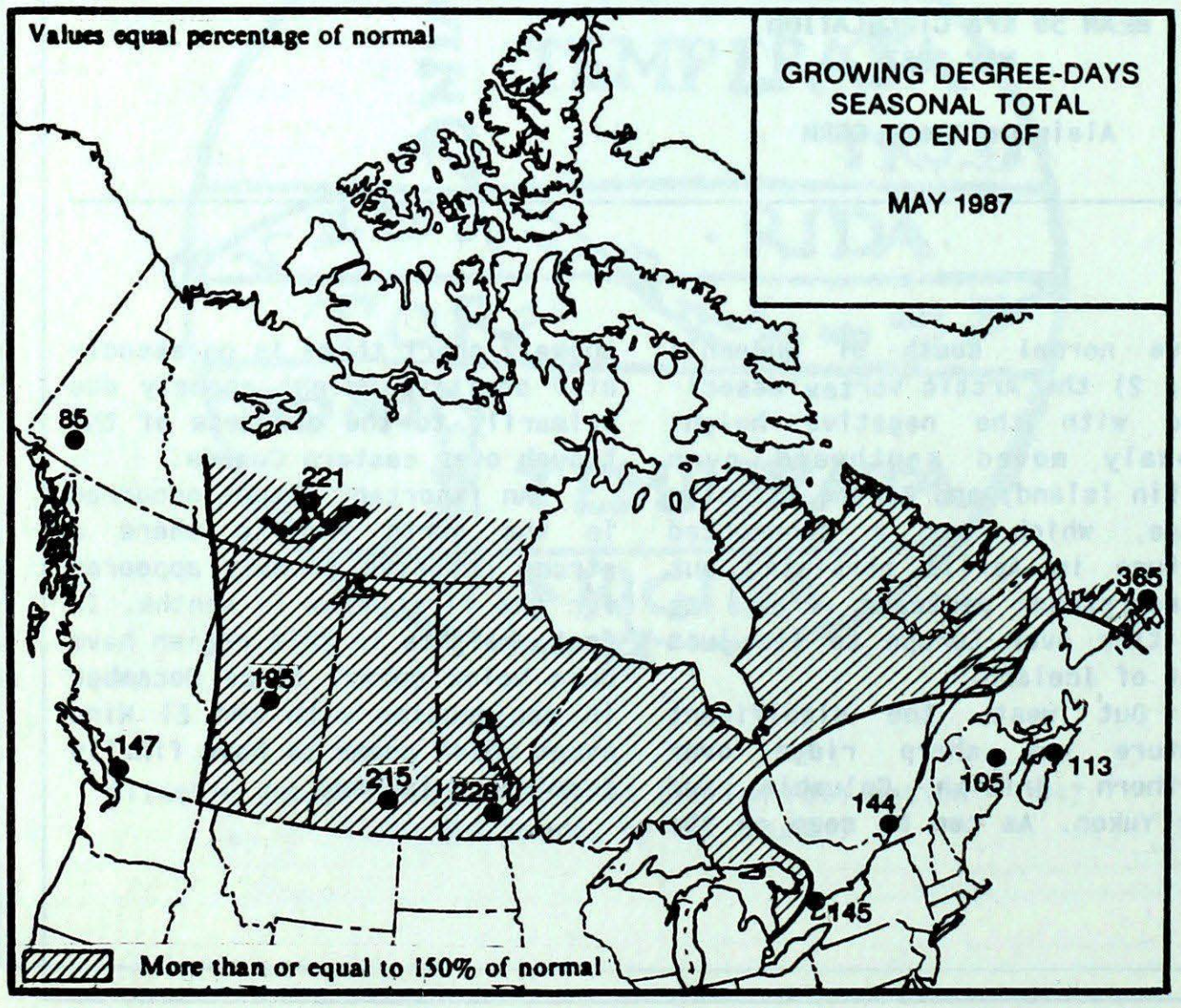
Out west, the significant feature was sharp ridge over northern British Columbia and the Yukon. As can be seen on the anomaly chart there is no associated positive height anomaly due primarily to the deepness of the trough over eastern Canada.

An important change occurred in the north Pacific where a strong positive anomaly appeared for the first time in months. In fact, heights in this region have been below normal since December in conjunction with the El Nino event which seems to have finally terminated in May.

GROWING DEGREES

GROWING DEGREE DAYS



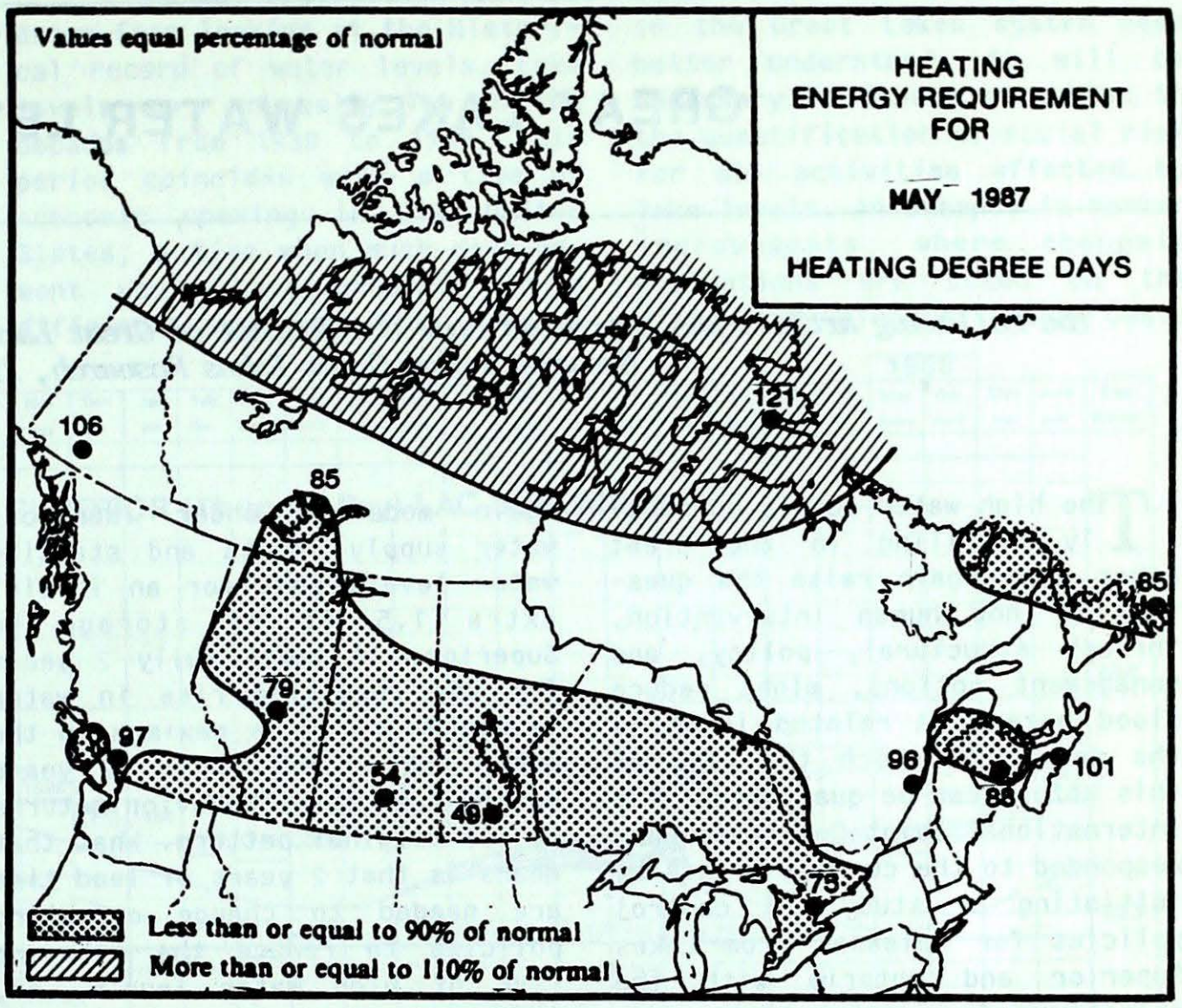


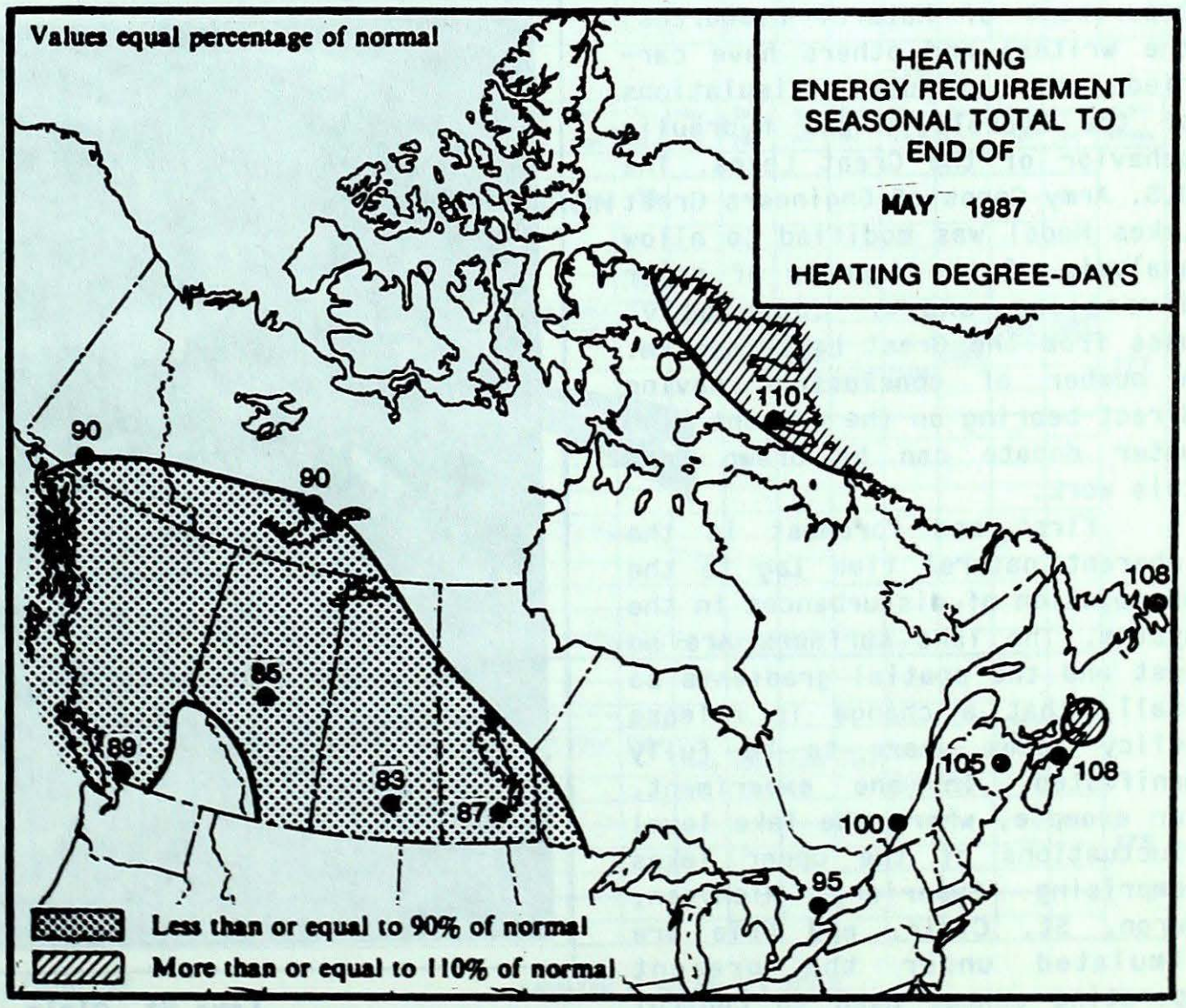
SEASONAL TOTAL OF GROWING DEGREE-DAYS TO END OF MAY

	1987	1986	NORMAL
BRITISH COLUMBIA			
Abbotsford	522	454	355
Kamloops	586	467	425
Penticton	534	431	392
Prince George	173	114	171
Vancouver	571	439	389
Victoria	496	378	353
ALBERTA			
Calgary	314	218	154
Edmonton Mun.	338	269	174
Grande Prairie	247	167	167
Lethbridge	388	267	209
Peace River	254	181	151
SASKATCHEWAN			
Estevan	478	283	219
Prince Albert	321	229	162
Regina	423	275	197
Saskatoon	380	253	198
Swift Current	391	237	190
MANITOBA			
Brandon	383	253	188
Churchill	0	57	0
Dauphin	378	197	171
Winnipeg	451	327	198
ONTARIO			
London	448	382	298
Mount Forest	323	369	191
North Bay	192	322	188
Ottawa	379	437	274
Thunder Bay	207	238	120
Toronto	422	413	292
Trenton	411	411	285
Windsor	532	524	398
QUEBEC			
Baie Comeau	85	100	67
Maniwaki	190	320	187
Montréal	397	414	276
Quebec	189	252	188
Sept-Iles	64	80	34
Sherbrooke	191	336	225
NEW BRUNSWICK			
Charlo	161	144	119
Fredericton	199	224	189
Moncton	168	178	142
NOVA SCOTIA			
Sydney	94	158	64
Truro	151	97	122
Yarmouth	200	220	151
PRINCE EDWARD ISLAND			
Charlottetown	131	171	96
NEWFOUNDLAND			
Gander	106	86	49
St. John's	81	63	27
Stephenville	68	167	74

SEASONAL TOTAL OF HEATING DEGREE-DAYS TO END OF MAI

	1987	1986	NORMAL
BRITISH COLUMBIA			
Kamloops	3172	3890	3716
Penticton	3143	3773	3463
Prince George	4590	5294	5238
Vancouver	2602	3043	2923
Victoria	2775	3102	2974
YUKON TERRITORY			
Whitehorse	6013	6681	6705
NORTHWEST TERRITORIES			
Frobisher Bay	10307	8855	9411
Inuvik	9716	10058	9930
Yellowknife	7571	8474	8409
ALBERTA			
Calgary	4343	4952	5197
Edmonton Mun	4646	5173	5479
Grande Prairie	5380	5790	6005
SASKATCHEWAN			
Estevan	4405	5211	5457
Regina	4837	5600	5825
Saskatoon	5070	5727	5980
MANITOBA			
Brandon	5283	6077	5953
Churchill	8576	8758	8851
The Pas	5884	6529	6721
Winnipeg	5050	5822	5812
ONTARIO			
Kapuskasing	5768	6170	6106
London	3724	3865	3929
Ottawa	4316	4440	4529
Sudbury	4853	5192	5237
Thunder Bay	4995	5567	5499
Toronto	3758	3914	3938
Windsor	3215	3470	3483
QUÉBEC			
Baie Comeau	5669	5897	5705
Montréal	4341	4384	4334
Quebec	4912	5013	4887
Sept-Iles	5877	6063	5825
Sherbrooke	4903	*	5051
Val-d'Or	5704	6021	5905
NEW BRUNSWICK			
Charlo	5247	5320	4959
Fredericton	4735	4752	4510
Moncton	4808	4755	4497
NOVA SCOTIA			
Halifax	4188	4123	3893
Sydney	4655	4543	4186
Yarmouth	3980	3855	3801
PRINCE EDWARD ISLAND			
Charlottetown	4749	4637	4390
NEWFOUNDLAND			
Gander	5044	5006	4726
St. John's	4821	4680	4771





FEATURE

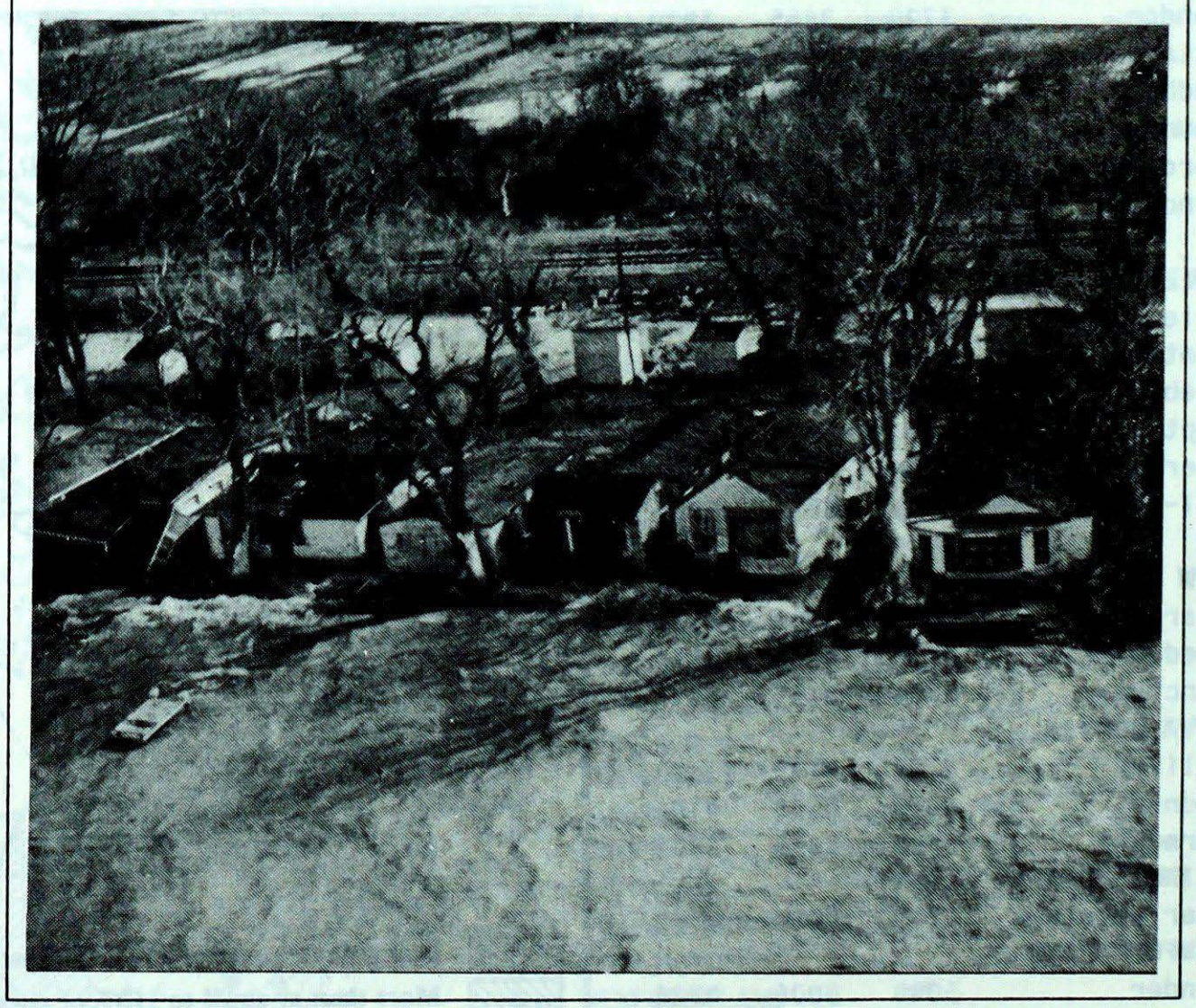
GREAT LAKES WATER LEVELS

The following article was extracted from the Journal of Great Lakes Research 13(1), International Association of Great Lakes Research, 1987:

The high water levels currently revailing in the Great Lakes once again raise the question of how human intervention, through structural, policy, and management options, might reduce flood hazard. A related issue is the degree to which the risk of this hazard can be quantified. The International Joint Commission has responded to the current crisis by initiating a study of control policies for releases from Lakes Superior and Ontario with the objective of reducing high water levels.

In studies sponsored by the University of Wisconsin Sea Grant Institute and the Wisconsin Department of Natural Resources, the writers and others have carried out computer simulations of the hydrologic and hydraulic behavior of the Great Lakes. The U.S. Army Corps of Engineers Great Lakes Model was modified to allow analysis of the impacts of major diversions and/or consumptive uses from the Great Lakes system. A number of conclusions having direct bearing on the present high water debate can be drawn from this work.

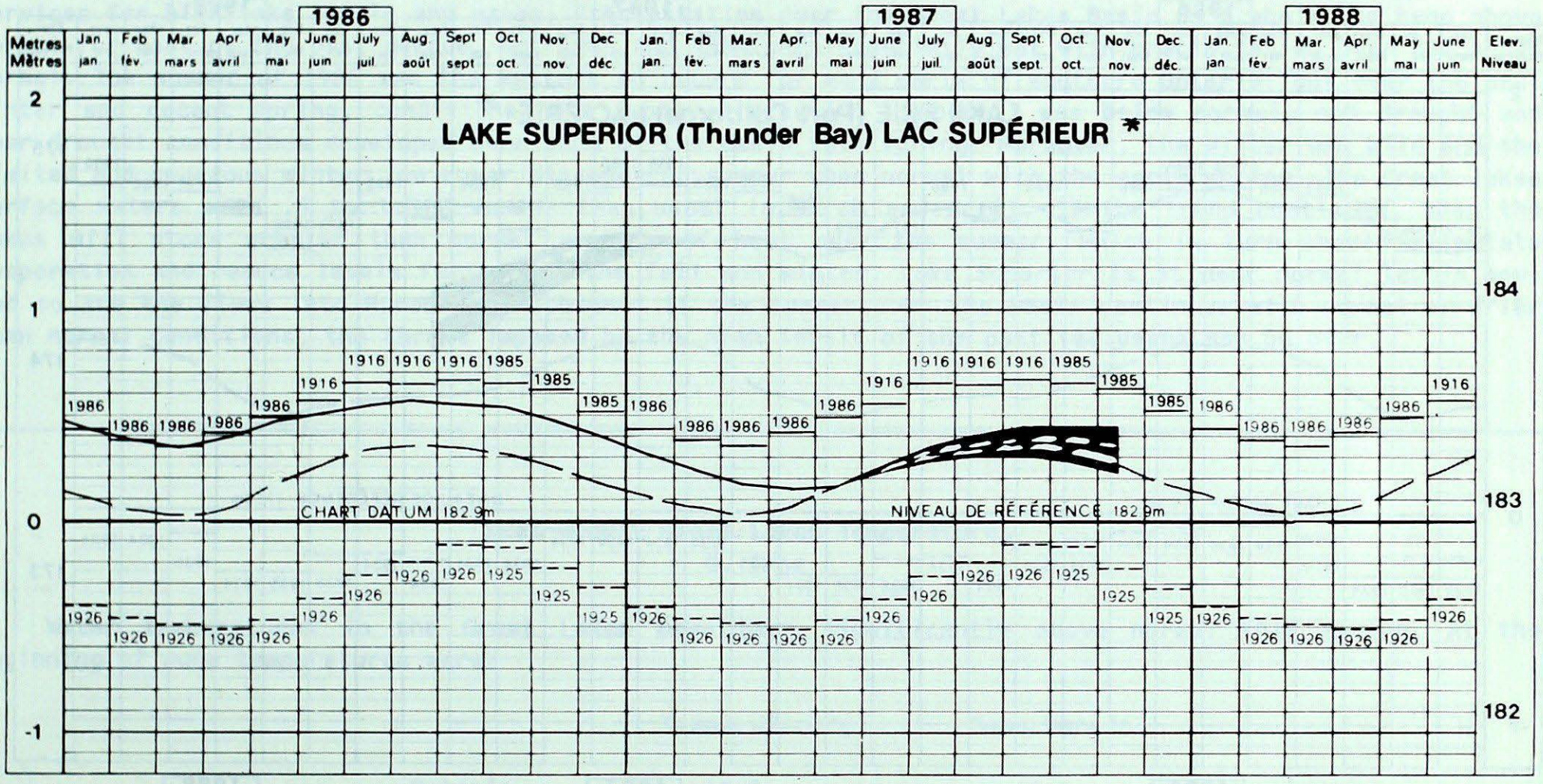
First and foremost is the inherent natural time lag to the propagation of disturbances in the system. The lake surfaces are so vast and the spatial gradients so small, that a change in release policy takes years to be fully manifested. In one experiment, for example, where the lake level fluctuations of the upper lakes comprising Superior, Michigan, Huron, St. Clair, and Erie are simulated under the present operating scheme used to control Lake Superior, the system was again modelled under identical water supply inputs and starting water levels save for an initial extra 1.5 ft of storage in Superior. It takes fully 2 years for the resulting rise in water levels to reach is maximum in the other lakes, and 10 to 12 years before lake level behavior returns to its original pattern. What that means is that 2 years of lead time are needed to change operating policies to reduce the flooding risk of high water levels, or, conversely, that we need a 2-year weather forecast to know when the net basin supply will cause levels to rise. But the available time series of net basin supply to each of the lakes since the beginning of this century exhibits no identifiable memory that would allow such a forecast to be made. What has not been adequately addressed is just how much water level control is possible with altered control policies. The statements above merely relate to the time lag inherent in the system before

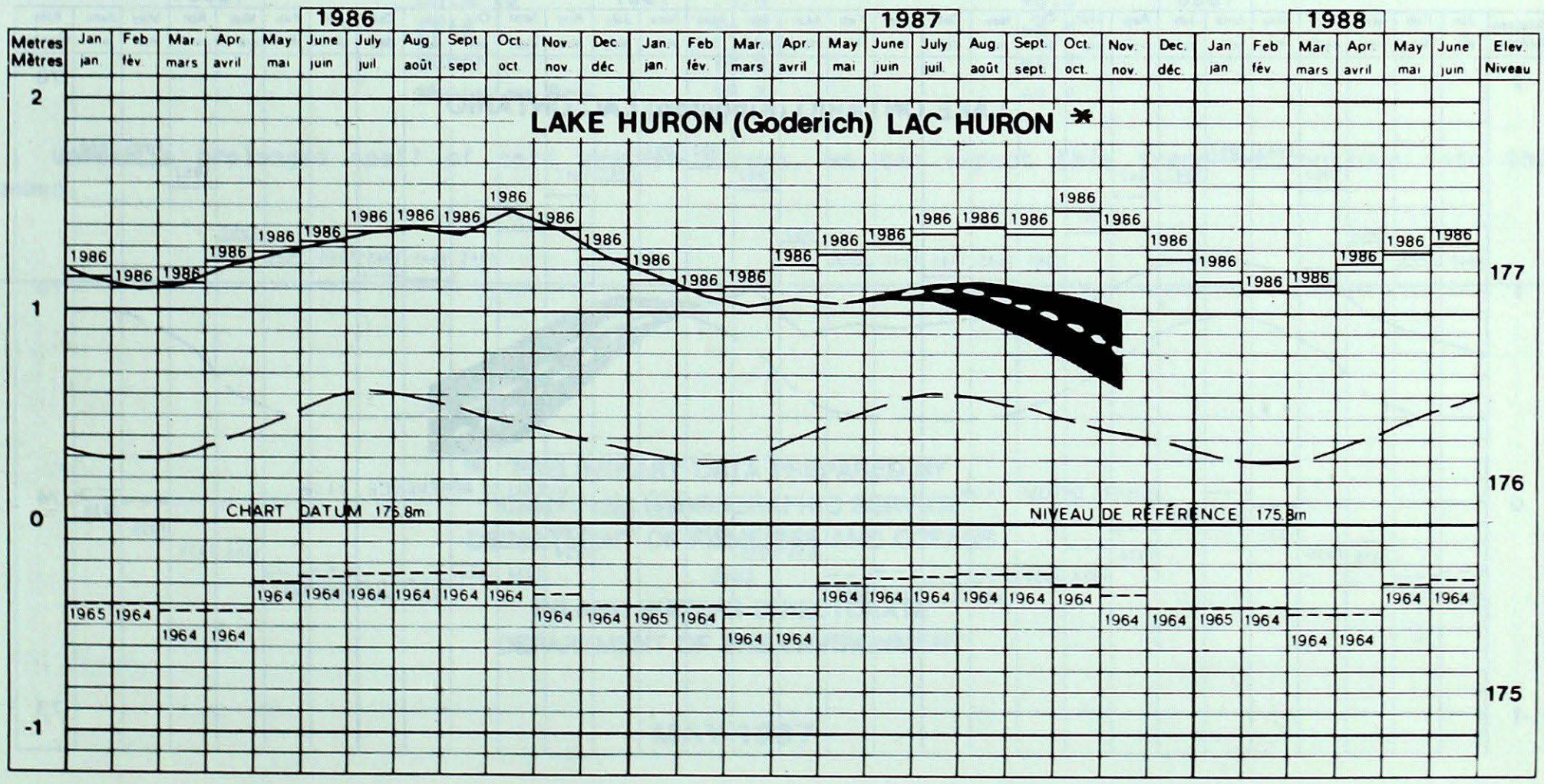


Lake St. Clair - Photo AES 1973

major changes will occur. A related issue is the complementary question concerning periods of low water levels. Given the information base available, how could periods of reduced water supply inputs and resulting low water levels be recognized in time to allow changes in management policies to be implemented.

A second observation can be drawn from looking at the historical record of water levels. Lake levels were unusually low in the decades from 1930 to 1960. This period coincides with a time of economic upswing in the United States, a time when much development would have occurred in a different way had the natural lake level variability inherent in the Great Lakes system been better understood. It will be necessary to devote attention to the quantification of social risk for all activities affected by lake levels. An example is harbor improvements, where economic evaluations are based on the discounted values of future costs





The black area represents the envelope of probable levels if the forecast period weather is wet or dry (1 year in 20)

MONTHLY MEAN LEVELS

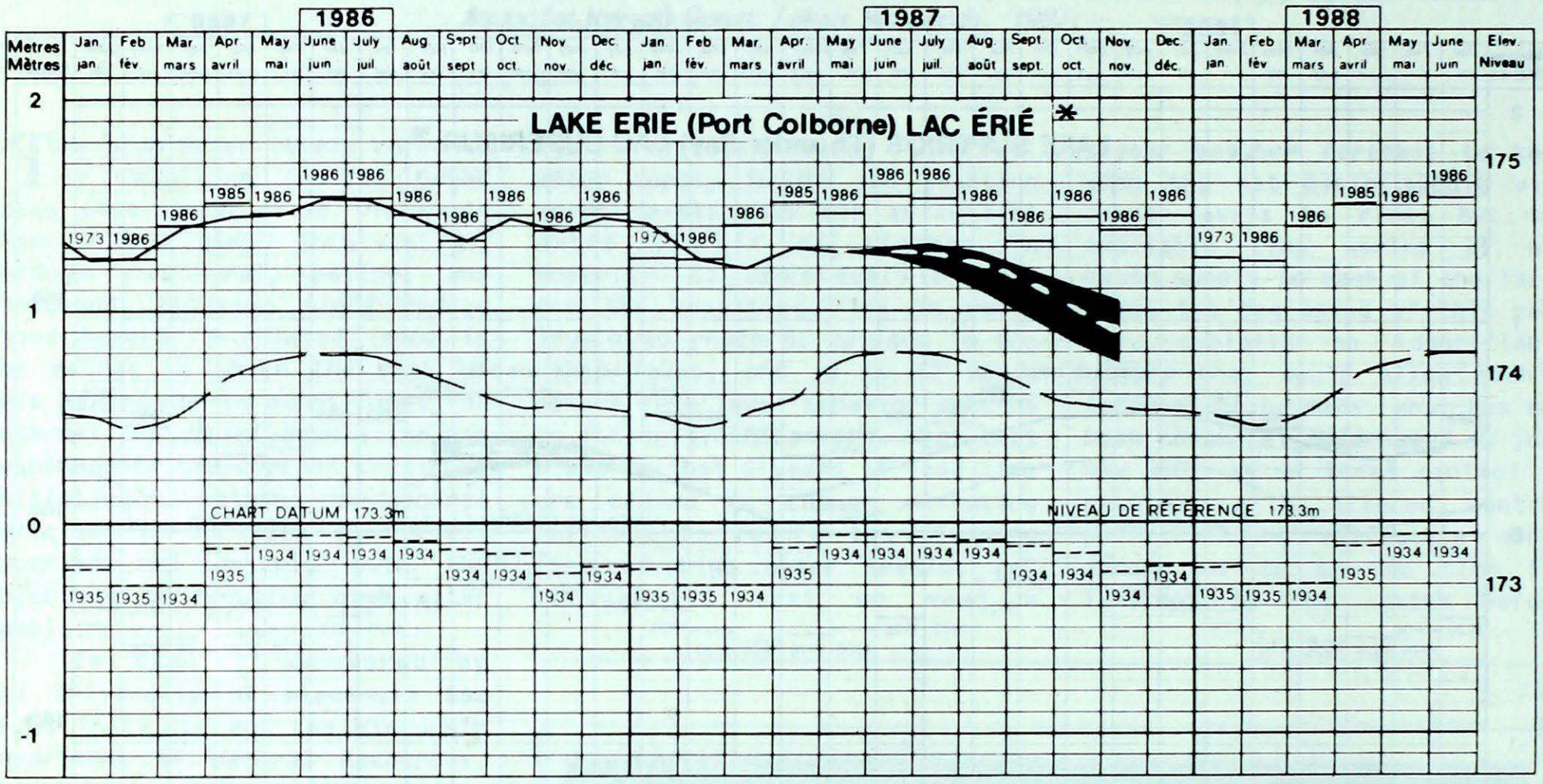
Recorded ———— Maximum ———

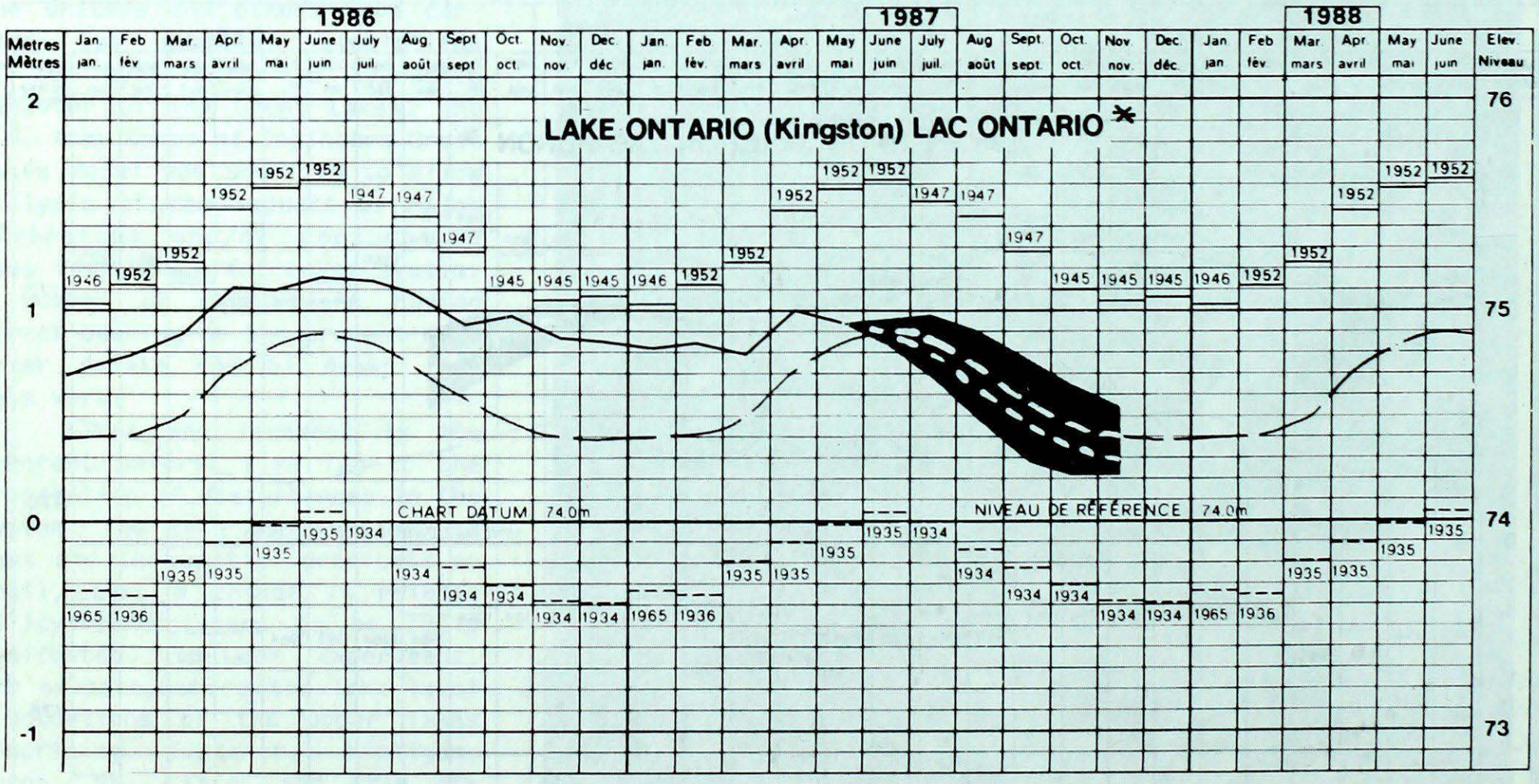
Average — — — Minimum - - -

FEATURE

and benefits. Such risk assessments are compounded moreover by the serial correlation introduced through the hydraulic lags referred to above. It may thus only be possible to compute conditional probabilities based on the present state of the system.

Beyond these observations it is clear that the relationship between Great Lakes water, the economic well-being of the region's populace and industry needs to be better understood. Direct costs and benefits associated with varying water levels can now be estimated for certain more visible groups such as shoreline property owners and the transportation industry. But the economic value of water to other residents and industry is less clear. If public management of Great Lakes water levels is to prove viable in the long run, a fuller understanding of the Great Lakes as an integrated physical and economic resource must be sought.





The black area represents the envelope of probable levels if the forecast period weather is wet or dry (1 year in 20)

MONTHLY MEAN LEVELS

Recorded ———— Maximum ———

Average — — — Minimum — — —

FEATURE

A Note On Recent Great Lakes Levels

Andrej Saulesleja, Hydrometeorology & Marine Division

Water levels on Lakes Superior, Huron, Michigan, Erie and St. Clair reached all time record highs in late 1985 and again in 1986. Fall and winter storms wrought storm surges and high waves and damaged homes, cottages and other shoreline structures. Beaches narrowed and eroded. Governments in Canada and the U.S. responded by developing plans to mitigate and prevent further damage, and with warning and information services for high lake levels and waves. Precipitation over the Great Lakes Basin as a whole has been above normal for most of the past decade, but 1985 and 1986 were especially wet with precipitation over 20% above normal. The summer of 1986 was the wettest on record for many parts of southern Ontario, but over the past winter and recent spring, conditions have improved greatly. Snowfall was below normal, and drought and near drought conditions developed over much of the basin this spring. Moreover, the winter was mild and the limited and spurious winter ice cover disappeared sooner than normal with the early spring. The Great lakes surface waters were .5 to 1.5 C warmer than usual in March and April. If the trend continues, then the lakes will store greater than normal amounts of heat over the summer, which in turn should stimulate evaporation and reduce levels further in the fall and winter. Lake Superior is at near normal levels now, and so are the flows into Huron and Michigan. If the summer over the basin continues with normal or drier than normal conditions, the threat imposed by the high levels of the past few years may be over.

Most Recent Great Lakes Temperatures

G. Irbe

Water temperatures in the Great Lakes have been significantly above normal this spring. At the beginning of June temperatures were:

	Temperature °C	Departure °C
Ontario	14.8	+6.0
Erie	18.7	+4.5
Huron	10.5	+3.7
Georgian Bay	10.8	+4.1

Unless a prolonged spell of cold weather occurs, we can expect this trend to continue into the summer.

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* PRELIMINARY DATA PREPARED BY
CANADIAN HYDROGRAPHIC SERVICE
DEPARTMENT OF FISHERIES AND OCEANS
and
INLAND WATERS DIRECTORATE
DEPARTMENT OF THE ENVIRONMENT

MAY 1987

MAY 1987

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	12.7	0.7	28.2	2.6	0.0		125.8	160	0	13	252	120	160.5
ALERT BAY	10.2	0.0	20.0	3.2	0.0		74.4	124	0	10	X		244.2
AMPHITRITE POINT	10.7	0.3	17.5	5.3	0.0		283.6	218	0	14	X		225.3
BLUE RIVER	10.9	1.2	29.0	3.6	0.0		94.7	192	0	13	204	103	
BULL HARBOUR	9.3	0.2	18.2	2.0			119.9	146	0	16	X		270.7
CAPE SCOTT	9.5	0.1	14.5	4.5			160.6	118	0	16	X		264.3
CAPE ST.JAMES	8.7	0.0	13.5	4.8	0.0		98.3	115	0	15	178	*	286.4
CASTLEGAR	14.7	1.5	31.4	2.6	0.0		49.8	92	0	12	259	111	105.2
COMOX	12.8	1.0	25.0	3.8	0.0		48.4	129	0	11	X		163.1
CRANBROOK	12.5	1.4	29.1	-1.9			11.2	32	0	5	269	*	173.6
DEASE LAKE	5.7	-0.4	18.8	-4.2	8.6	186	61.3	265	0	9	174	82	382.3
ETHELDA BAY	8.8	0.0	16.5	0.1	0.0		249.2	134	0	16	X		286.6
FORT NELSON	10.2	0.6	27.4	-3.2	3.2	54	48.7	116	0	13	274	*	242.6
FORT ST.JOHN	10.5	0.8	25.2	-1.1			48.8	125	0	4	X		231.2
HOPE	13.7	0.7	29.8	3.8	0.0		146.1	204	0	15	237	130	140.7
KAMLOOPS	15.3	1.2	31.4	2.9	0.0		8.2	45	0	3	287	113	94.0
KELOWNA	13.7	1.5	31.9	-0.4	0.0		26.6	95	0	6	283	119	136.7
LANGARA	8.0	-0.1	11.5	2.8	0.0		227.5	247	0	22	X		311.7
LYTTON	15.0	0.6	33.5	3.2	0.0		17.6	135	0	4	271	106	105.5
MACKENZIE	8.1	-0.1	25.0	-6.5	0.2	4	35.6	115	0	6	252	102	307.8
MCINNES ISLAND	10.2	0.5	15.3	6.6	0.0		133.2	94	0	15	X		241.8
PENTICTON	14.7	1.3	32.4	1.6	0.0		17.6	60	0	5	269	109	111.6
PORT ALBERNI	12.1	*	30.1	-0.6	0.0	*	126.6	*	0	10	239	*	186.4
PORT HARDY	9.8	0.5	19.5	2.2	0.0		85.4	124	0	12	189	101	254.3
PRINCE GEORGE	9.8	0.5	25.4	-2.2			60.4	127	0	9	266	105	255.0
PRINCE RUPERT	8.8	0.5	16.4	1.5	0.0		197.2	141	0	17	117	61	287.3
PRINCETON	11.6	0.8	31.2	-1.7	0.2	50	15.6	75	0	6	286	*	
QUESNEL	11.1	0.6	27.6	-2.4	0.0		36.6	95	0	5	X		214.1
REVELSTOKE	13.6	1.1	29.6	1.3	0.0		70.9	135	0	10	233	109	138.6
SANDSPIT	9.4	0.7	14.5	1.3	0.0		116.0	222	0	17	155	73	288.0
SMITHERS	9.2	0.2	22.3	-1.7			16.6	55	0	5	222	98	273.0
TERRACE	9.6	-0.3	22.8	1.6	0.0		61.0	140	0	11	177	98	259.9
VANCOUVER HARBOUR	13.3	0.8	23.6	6.4	0.0		105.1	153	0	9	X		146.1
VANCOUVER INT'L	13.0	0.8	22.6	5.9	0.0		85.8	166	0	11	267	108	153.1
VICTORIA GONZ. HTS	12.8	0.9	24.6	6.2	0.0		21.0	108	0	5	299	108	161.0
VICTORIA INT'L	12.4	0.8	25.6	4.4	0.0		38.4	134	0	7	289	112	173.8
VICTORIA MARINE	11.3	0.9	21.6	2.9	0.0		64.8	165	0	11	X		218.1
WILLIAMS LAKE	9.7	0.7	27.0	-3.0			37.7	119	0	4	268	104	256.9

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YUKON TERRITORY													
BURWASH	5.1	0.2	11.1	-0.9	13.2	70	51.4	230	0	8	X		398.6
DAWSON	7.9	0.5	23.0	-6.0	2.8	133	21.2	141	0	9	X		313.6
MAYO	8.5	1.0	22.7	-3.3	2.2	104	19.2	98	0	5	X		294.2
WATSON LAKE	7.7	0.8	22.0	-4.0	24.4	443	113.8	387	0	12	235	92	345.7
WHITEHORSE	6.5	-0.2	18.0	-4.6			25.2	195	0	7	238	91	357.4
NORTHWEST TERRITORIES													
ALERT	-14.6	-2.9	0.2	-24.0	2.8	21	1.4	13	37	0	419	102	1010.7
BAKER LAKE	-9.7	-3.3	1.9	-22.5	6.4	101	5.4	45	17	0	179	67	859.2
CAMBRIDGE BAY	-13.5	-4.1	-2.1	-24.8	10.0	105	6.3	66	34	3	279	108	975.2
CAPE DYER	-8.9	-2.9	-1.4	-18.5	105.8	197	78.4	159	82	14	X		834.9
CAPE PARRY	-9.8	-3.0	-0.6	-21.0	13.2	110	6.0	65	13	3	X		862.6
CLYDE	-11.5	-4.2	-1.9	-23.7	28.2	164	19.8	117	40	7	216	86	916.2
COPPERMINE	-9.5	-4.2	4.3	-23.0	9.2	113	7.0	58	30	2	204	90	851.1
CORAL HARBOUR	-11.0	-4.7	2.0	-22.1	23.0	157	23.7	140	71	5	278	98	898.5
EUREKA	-12.9	-2.2	-1.4	-30.2	0.4	11	0.4	12	3	0	669	128	959.5
FORT RELIANCE	1.4	-0.6	22.4	-13.1	11.2	207	24.2	179	0	5	X		151.8
FORT SIMPSON	10.0	2.1	28.9	-5.0	0.8	15	4.5	14	0	2	323	117	249.9
FORT SMITH	9.2	1.3	26.8	-8.1	8.4	175	21.0	75	0	7	283	98	275.8
IQALUIT	-7.7	-4.5	1.3	-19.0	41.0	173	32.8	130	32	10	181	91	796.1
HALL BEACH	-12.6	-3.5	-1.5	-25.4	6.6	40	6.4	39	36	3	X		948.8
HAY RIVER	7.7	2.1	24.9	-5.6	9.6	246	18.4	91	0	4	X		317.9
INUVIK	2.8	3.6	15.2	-18.2	50.0	384	38.8	220	0	4	344	116	644.8
MOULD BAY	-13.4	-2.2	0.7	-23.1	17.6	222	9.6	139	52	3	394	118	975.3
NORMAN WELLS	6.8	1.4	27.6	-9.1	7.8	92	21.0	123	0	6	324	*	378.0
POND INLET	-12.4	-3.1	1.2	-27.2	15.4	128	8.8	96	18	3	X		944.2
RESOLUTE	-13.4	-2.5	0.1	-24.8	14.8	160	10.3	127	26	4	342	117	973.4
YELLOWKNIFE	6.1	1.1	24.5	-7.4	0.2	5	5.0	29	0	1	381	114	368.9
ALBERTA													
BANFF	9.7	2.0	25.0	-4.0	2.6	18	24.2	46	0	7	X		
BROOKS	12.9	1.7	29.0	-6.0	0.0		26.8	63	0		292	*	
CALGARY INT'L	11.7	2.3	29.1	-4.8			12.7	26	0	4	312	123	198.1
COLD LAKE	11.8	1.4	29.3	-7.2	15.6	320	35.3	88	0	5	280	102	194.1
CORONATION	11.7	1.4	29.2	-6.8			19.4	53	0	5	298	102	194.1
EDMONTON INT'L	11.2	1.1	30.1	-8.6	20.6	710	79.7	188	0	8	306	107	210.2
EDMONTON MUNI.	12.4	1.1	29.9	-2.7	10.2	329	78.4	184	0	8	326	117	175.9
EDMONTON NAMAO	11.7	0.9	29.4	-6.1	19.7	679	91.8	242	0	8	X		202.3
EDSON	9.5	1.4	29.1	-3.1	19.4	134	73.0	127	0	10	279	113	265.0
FORT CHIPEWYAN	9.9	1.8	26.0	-8.0			41.5	162	0		X		

MAY 1987

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FORT MCMURRAY	11.1	1.4	30.8	-6.9	0.0		25.6	70	0	7	268	96	214.3
GRANDE PRAIRIE	11.1	1.1	26.5	-0.8	0.0		34.0	94	0	7	310	*	215.7
HIGH LEVEL	9.8	0.5	26.5	-3.0	1.0	23	37.4	105	0	9	277	97	235.9
JASPER	9.5	0.8	26.4	-4.8	0.6	19	25.4	76	0	6			264.3
LETHBRIDGE	12.9	1.9	30.4	-3.8	0.0		20.3	39	0	3	308	116	160.0
MEDICINE HAT	14.4	2.1	30.2	-2.3	0.0		18.6	45	0	3	319	117	118.3
PEACE RIVER	10.9	1.3	26.5	-2.2	0.0		25.7	85	0	6	X		228.0
RED DEER	10.6	0.8	29.4	-4.1	3.1	64	27.9	57	0	5	X		227.6
ROCKY MTN HOUSE	9.3	0.1	28.6	-7.5	14.8	170	31.8	52	0	5	X		268.2
SLAVE LAKE	10.2	1.2	24.3	-4.4	0.0		37.6	85	0	8	313	111	240.9
SUFFIELD	14.1	2.4	30.6	-5.7	0.0		9.4	24	0	3	304	109	126.1
WHITECOURT	10.6	1.4	28.6	-2.2	11.2	329	74.3	137	0	11	X		229.9
SASKATCHEWAN													
BROADVIEW	13.7	3.7	32.3	-3.0	0.0		19.2	49	0	5	256	92	148.0
COLLINS BAY	5.9	1.8	22.2	-7.2	20.9	19	47.2	102	0	11	234	*	376.0
CREE LAKE	8.5	2.4	25.6	-5.0	5.6	14	24.4	94	0	7	276	94	292.7
ESTEVAN	15.0	3.6	32.6	1.0	0.0		60.8	110	0	8	255	88	109.1
HUDSON BAY	11.5	1.9	27.4	-4.8	0.0		34.4	86	0	7	273	*	203.0
KINDERSLEY	13.4	2.5	28.3	-4.5			10.2	30	0	4	X		138.2
LA RONGE	10.5	2.5	25.5	-3.8	3.8	56	32.8	80	0	6	X		231.7
MEADOW LAKE	11.8	1.1	29.3	-5.1	2.0	57	26.0	67	0	9	256	*	194.0
MOOSE JAW	14.7	3.2	31.4	0.9			57.7	130	0	8	268	95	114.8
NIPAWIN	12.4	*	30.9	-4.1	0.0	*	36.0	*	0	10	248	*	176.8
NORTH BATTLEFORD	13.1	1.9	28.0	-1.7			42.4	120	0	8	X		143.2
PRINCE ALBERT	12.7	2.7	30.0	-5.1	0.0		19.8	50	0	6	263	97	164.4
REGINA	14.1	3.0	32.0	0.7			70.7	152	0	9	256	92	128.6
SASKATOON	13.9	2.8	30.2	-2.7	0.0		32.4	81	0	6	X		127.7
SWIFT CURRENT	13.4	2.9	29.0	0.1	0.0		30.3	75	0	6	290	104	147.3
WYNYARD	13.2	2.8	31.3	-5.2	0.0		48.9	94	0	9	271	96	155.5
YORKTON	13.4	3.0	32.5	-2.6			41.4	93	0	6	270	95	155.3
MANITOBA													
BRANDON	13.7	3.0	32.9	-2.7	0.0		31.2	65	0	6	X		150.2
CHURCHILL	-2.3	-0.8	20.8	-14.2	65.0	333	69.0	216		10	197	100	604.9
DAUPHIN	13.1	2.8	34.4	-5.3	0.0		19.8	41	0	7	277	104	163.1
GILLAM	5.0	2.3	24.8	-9.2	3.0	17	26.0	77	0	6	X		399.9
GIMLI	13.6	4.4	31.7	0.6	0.0		33.5	54	0	5	289	102	150.5
ISLAND LAKE	9.8	4.3	25.4	-4.7	0.0		26.2	74	0	4	X		256.1
LYNN LAKE	7.4	2.5	23.6	-7.9	12.6	75	22.6	51	0	4	232	85	317.7
NORWAY HOUSE	10.2	*	28.3	-4.0		*	40.6	*	0	6	*		242.9
PORTAGE LA PRAIRIE	14.8	3.6	33.7	-2.0	0.0		41.4	66	0	7	X		121.3

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THE PAS	11.4	3.0	25.3	-4.9			26.8	71	0	5	283	102	205.6
THOMPSON	7.7	2.7	25.4	-10.2			30.6	70	0	6	236	90	312.3
WINNIPEG INT'L	14.8	3.5	34.1	-3.5	0.0		31.6	48	0	7	277	104	123.1
ONTARIO													
ATIKOKAN	11.1	1.9	27.9	-4.5	0.0		102.2	139	0	11	240	100	221.2
BIG TROUT LAKE	7.5	3.0	23.5	-8.6	12.8	*	33.5	74	0	12	215	*	327.8
EARLTON	11.4	1.6	30.3	-4.5	TR		42.8	69	0	8	X		222.8
GERALDTON	9.0	1.3	30.8	-8.5	3.0	24	39.0	81	0	5	X		287.6
GORE BAY	11.7	1.5	27.7	-1.8	0.0		32.4	53	0	8	X		205.3
HAMILTON RBG	15.4	2.3	33.5	1.4	0.0		40.4	57	0	8	287	*	
HAMILTON	14.5	1.9	32.1	-0.8	0.0		36.3	55	0	4	X		144.7
KAPUSKASING	10.1	1.8	29.4	-6.9	7.4	77	38.0	51		7	X		260.4
KENORA	13.9	3.4	31.2	-0.5	TR		70.8	122	0	8	X		123.6
KINGSTON	12.9	1.5	27.5	0.5	0.0		46.8	65	0	8	228	99	169.2
LANSDOWNE HOUSE	9.4	3.5	28.6	-5.7	2.8	20	39.0	71	0	9	X		269.1
LONDON	15.4	3.0	32.4	-1.9	0.0		68.8	102	0	6	264	115	122.6
MOOSONEE	7.8	2.1	28.5	-9.1	6.2	67	59.3	95	0	7	201	101	318.8
MUSKOKA	12.1	1.2	29.0	-2.9	0.0		86.5	111	0	11	X		197.1
NORTH BAY	11.1	0.5	29.0	-3.2			78.9	113	0	11	246	100	226.4
OTTAWA INT'L	13.1	0.3	31.9	-1.5	0.0		67.4	99	0	12	240	*	173.9
PETAWAWA	11.6	0.1	32.9	-6.9			90.4	150	0	9	X		215.4
PETERBOROUGH	13.4	1.3	31.6	-1.8	0.0		41.6	72	0	6	X		166.7
PICKLE LAKE	9.9	2.5	26.9	-7.2	4.2	40	45.8	62	0	8	X		253.1
RED LAKE	11.9	2.7	28.1	-2.3	0.6	10	52.4	108	0	8	285	*	193.9
ST. CATHARINES	14.7	1.7	32.4	0.0	0.0		39.6	53	0	6	X		133.4
SARNIA	15.0	2.6	32.9	-0.6	0.0		46.5	69	0	6	287	115	140.7
SAULT STE. MARIE	11.1	2.0	30.0	-4.4	0.0		81.2	96	0	12	259	100	232.3
SIMCOE											X		
SIOUX LOOKOUT	11.8	2.6	28.2	-2.4	1.0	10	61.2	93	0	7	X		204.4
SUDBURY	11.5	1.0	30.5	-3.4			70.0	104	0	10	241	97	219.0
THUNDER BAY	9.6	0.8	26.6	-5.5			65.4	89	0	10	247	97	259.9
TIMMINS	10.2	1.2	28.6	-6.5	0.7	10	47.5	67	0	7	X		262.4
TORONTO	15.8	2.2	32.7	2.6	0.0		58.4	88	0	7			105.7
TORONTO INT'L	14.7	2.4	33.0	-1.3	0.0		29.6	44	0	7	X		142.3
TORONTO ISLAND													
TRENTON	14.1	1.6	30.9	0.3	0.0		20.2	27	0	7	X		142.5
WATERLOO-WELL	14.2	1.9	32.0	-3.1	0.0		34.4	47	0	7	X		151.4
WAWA	8.8	*	26.4	-6.5		*	60.6	*	0	7		*	288.3
WIARTON	12.2	1.8	29.2	-1.6	0.0		51.3	83	0	7	261	101	195.6
WINDSOR	16.9	2.7	33.3	3.0	0.0		96.2	137	0	8	X		97.2

MAY 1987

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QUEBEC													
BAGOTVILLE	8.9	-0.4	27.0	-5.6	3.6	78	79.3	114	0	13	X		282.3
BAIE COMEAU	7.1	0.3	24.4	-5.3			55.8	71	0	8	210	*	336.6
BLANC SABLON	3.9	1.0	15.5	-4.5			52.0	71	0	7	203	*	
CHIBOUGAMAU	6.8	0.4	25.1	-8.4	11.2	61	101.3	117	0	14	186	81	346.4
GASPE	9.2	2.1	27.5	-5.0	0.0		40.2	57	0	7	257	*	278.7
INUKJUAK	-4.2	-2.6	5.9	-13.0	26.2	236	34.4	147	26	7	151	104	687.6
KUUJJUAQ	-2.0	-2.2	14.5	-10.4	46.0	300	59.2	186	0	9	134	97	615.0
KUUJJUARAPIK	1.2	0.0	25.5	-10.5	18.8	97	30.0	70	0	9	136	74	519.5
LA GRANDE RIVIERE	4.0	*	26.9	-10.8	31.2	*	58.8	*	0	13	202	*	434.8
MANIWAKI	10.9	0.1	32.0	-5.0			71.5	113	0	9	237	96	
MATAGAMI	7.6	0.6	26.5	-8.5	1.8	12	117.2	142	0	10	215	91	323.4
MONT JOLI	9.6	1.5	25.0	-4.3			49.2	78	0	7	218	94	261.0
MONTREAL INT'L	13.0	0.0	30.4	0.5	0.0		55.0	83	0	10	225	93	173.6
MONTREAL M INT'L	11.6	*	29.9	-2.9	0.0	*	71.7	*	0	10	241	*	216.2
NATASHQUAN	5.6	0.7	16.1	-2.1	0.4	6	41.8	45	0	9	247	113	382.9
QUEBEC	11.0	0.2	27.1	-4.4			106.0	121	0	12	240	109	222.6
ROBERVAL	10.6	1.1	29.0	-5.2	2.2	110	81.6	117	0	8	194	*	235.8
SCHEFFERVILLE	1.4	0.2	19.9	-9.6	28.3	113	54.3	109		9	170	*	525.5
SEPT-ILES	6.3	0.4	19.4	-4.0	1.2	20			76	13	215	93	363.0
SHERBROOKE	11.0	0.4	28.7	-5.5			99.4	114	0	13	244	*	236.0
STE AGATHE DES MONTS	10.5	0.7	29.2	-5.2			109.6	135	0	11	214	86	247.4
ST-HUBERT	12.1	-0.7	29.8	-3.5	0.0		70.5	96	0	9	0		202.9
VAL D'OR	9.6	0.8	29.0	-8.0			84.6	133	0	10	235	99	273.2
NEW BRUNSWICK													
CHARLO	9.9	2.0	26.7	-4.8	0.0		41.8	51	0	8	244	116	251.9
CHATHAM	11.0	1.5	27.0	-3.3	0.0		32.3	39	0	6	255	121	218.6
FREDERICTON	11.3	0.5	26.7	-2.6	0.4	36	70.8	85	0	11	263	*	207.2
MONCTON	10.3	0.9	26.2	-3.4	0.6	27	47.3	56	0	10	252	121	238.0
SAINT JOHN	9.6	0.6	23.0	-2.9			74.2	68	0	9	250	122	259.3

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NOVA SCOTIA													
GREENWOOD	11.2	0.7	27.2	-2.8			65.7	88	0	8	X		212.1
HALIFAX INT'L	9.5	0.3	23.5	-0.8			74.7	70	0	8	*		263.9
SABLE ISLAND	6.4	-0.3	11.3	2.1	0.0		58.0	56	0	11	173	105	359.8
SHEARWATER	8.9	0.0	23.7	-0.8			62.5	61	0	8	224	106	281.3
SYDNEY	7.8	0.4	22.3	-2.4			45.8	48	0	8	249	125	315.1
YARMOUTH	9.2	0.0	23.0	1.0	0.0		109.2	118	0	12	251	113	272.4
PRINCE EDWARD ISLAND													
CHARLOTTETOWN	9.0	0.5	23.1	-2.2			44.2	52	0	10	X		280.6
SUMMERSIDE	9.3	0.3	22.5	-1.7			38.6	47	0	9	241	117	268.8
NEWFOUNDLAND													
BATTLE HARBOUR	4.7	2.7	19.1	-6.5	2.0	21	59.1	93		9	X		
BONAVISTA	6.9	2.4	19.7	-2.1	1.2	17	50.6	75	0	8	X		343.7
BURGEO	5.4	-0.3	14.6	-4.0			120.0	95	0	10	*		389.2
CARTWRIGHT	4.0	1.1	21.4	-5.2	10.8	62	27.1	43	0	10	210	154	433.1
CHURCHILL FALLS	3.6	0.7	22.1	-7.3	39.8	222	100.1	175	0	12	188	95	447.7
COMFORT COVE	7.5	1.5	22.6	-4.1	0.8	4	70.6	96	0	9	X		325.0
DANIEL'S HARBOUR	5.3	0.4	16.8	-2.4	0.4	5	49.8	72	0	9	203	110	392.9
DEER LAKE	7.0	0.6	23.1	-5.9	0.2	3	37.9	57	0	7	X		340.1
GANDER INT'L	7.7	1.5	22.3	-5.0	0.4	3	90.6	129	0	8	213	131	318.8
GOOSE	6.5	1.5	26.2	-3.8	7.3	39	46.9	73	0	10	212	120	355.5
PORT-AUX-BASQUES	5.6	0.9	21.2	-1.2	0.0		123.4	104	0	11	253	*	385.4
ST ANTHONY	3.7	1.1	15.8	-5.2	8.2	73	66.6	69	0	9		*	426.3
ST JOHN'S	7.4	2.0	18.8	-3.8	1.2	10	79.8	78	0	12	215	135	330.2
ST LAWRENCE	6.2	1.7	19.4	-2.5		*	72.4	65		11		*	
STEPHENVILLE	6.7	-0.2	19.0	-2.4	0.0	*	57.2	71	0	8	256	*	349.9
WABUSH LAKE	3.4	0.7	22.0	-9.4	50.1	207	110.6	185	0	17	178	*	469.0

AGROCLIMATOLOGICAL STATIONS — MAY 1987

STATION	Temperature C				Snowfall (cm)	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)	Degree days above 5 C	
	Mean	Difference from Normal	Maximum	Minimum							This month	Since jan. 1st
BRITISH COLUMBIA												
AGASSIZ	13.8	0.8	29.0	3.5	0.0	146.9	171	0	15	241	272.3	530.6
KAMLOOPS												
SIDNEY	12.6	*	24.0	5.0	0.0	44.7	*	0	7	255	236.3	501.3
SUMMERLAND	14.8	1.3	33.0	2.5	0.0	23.9	87	0	6	294	309.0	560.0
ALBERTA												
BEAVERLODGE	11.0	1.6	26.0	-1.0	0.0	46.0	112	0	6	291	171.5	224.0
ELLERSLIE												
FORT VERMILLION												
LACOMBE	10.8	0.9	29.5	-3.5	5.0	43.6	90	0	5	303	183.6	252.1
LETHBRIDGE												
VAUXHALL												
VEGREVILLE	11.4	1.3	30.0	-8.2	5.5	35.6	99	0	6		207.3	279.5
SASKATCHEWAN												
INDIAN HEAD	14.3	3.7	33.0	-3.0	0.0	81.6	165	0	7		292.5	435.0
MELFORT	13.0	2.7	31.5	-3.5	0.0	30.7	80	0	10	231	259.5	350.5
REGINA	14.0	3.2	31.0	-2.0	0.0	55.9	129	0	9		273.3	379.3
SASKATOON	14.1	2.9	31.0	-5.0	0.0	33.6	85	0	6	252	285.0	415.0
SCOTT	12.8	2.5	27.0	-2.0	0.0	44.6	136	0	9	287	141.5	230.6
SWIFT CURRENT SOUTH	13.9	3.3	29.0	-0.5	0.0	25.8	71	0	7	258	276.3	433.8
MANITOBA												
BRANDON	14.7	3.7	34.3	-0.4	0.0	37.0	74	0	8		300.9	444.5
GLENLEA	14.3	2.9	34.0	-1.5	0.0	65.6	117	0	9	285	291.8	445.8
MORDEN	15.5	3.6	35.0	-1.0	0.0	47.2	71	0	9	257	403.5	580.5
ONTARIO												
DELHI	14.6	1.8	33.0	-3.5	0.0	27.7	38	0	4	289	305.5	469.3
ELORA	13.8	2.4	31.0	-3.5	0.0	43.2	56	0	7		271.7	406.3
GUELPH	13.7	2.0	31.6	-3.1	0.0	31.9	44	0	9	250	269.9	398.2
HARROW	17.0	2.8	34.0	2.5	0.0	38.7	53	0	9	268	375.1	577.9
KAPUSKASING	10.4	2.1	28.0	-8.5	13.3	46.4	64	0	7	232	*	257.6
MERIVALE												
OTTAWA	13.1	0.3	32.2	-1.0	0.0	79.6	118	0	13	241	252.2	440.6
SMITHFIELD	14.3	2.4	30.5	-1.0	0.0	24.2	31	0	5			495.0
VINELAND STATION	14.6	2.1	32.8	0.7	0.0	29.4	44	0	3	277	298.4	422.8
WOODSLEE												
QUEBEC												
LA POCATIERE	10.2	0.3	24.0	-7.0	0.0	53.8	78	0	9	253	167.4	238.4
L'ASSUMPTION	12.4	0.1	30.5	-5.0	0.0	101.0	140	0	10	231	229.0	366.0
LENNOXVILLE												
NORMANDIN	8.2	0.5	27.0	-7.0	0.6	69.8	97	0	10	205	114.4	178.2
ST. AUGUSTIN												
STE CLOTHILDE	12.5	0.1	31.5	-2.0	0.0	73.4	97	0	10	195	239.0	388.6
NEW BRUNSWICK												
FREDERICTON	11.4	0.8	26.5	-3.0	0.0	74.9	85	0	9	264	19.7	267.2
NOVA SCOTIA												
KENTVILLE	11.3	0.9	27.0	-1.0	0.0	59.4	77	0	9	227		263.8
NAPPAN	10.1	0.9	24.0	-4.0	0.0	53.6	70	0	9	236	150.0	217.3
PRINCE EDWARD ISLAND												
CHARLOTTETOWN	9.5	0.5	24.0	-2.0	0.0	39.9	50	0	10	244	146.0	179.7
NEWFOUNDLAND												
ST. JOHN'S WEST	7.6	1.8	19.0	-4.0	0.0	86.4	81	0	12	194	94.4	107.7