

Climatic Perspectives

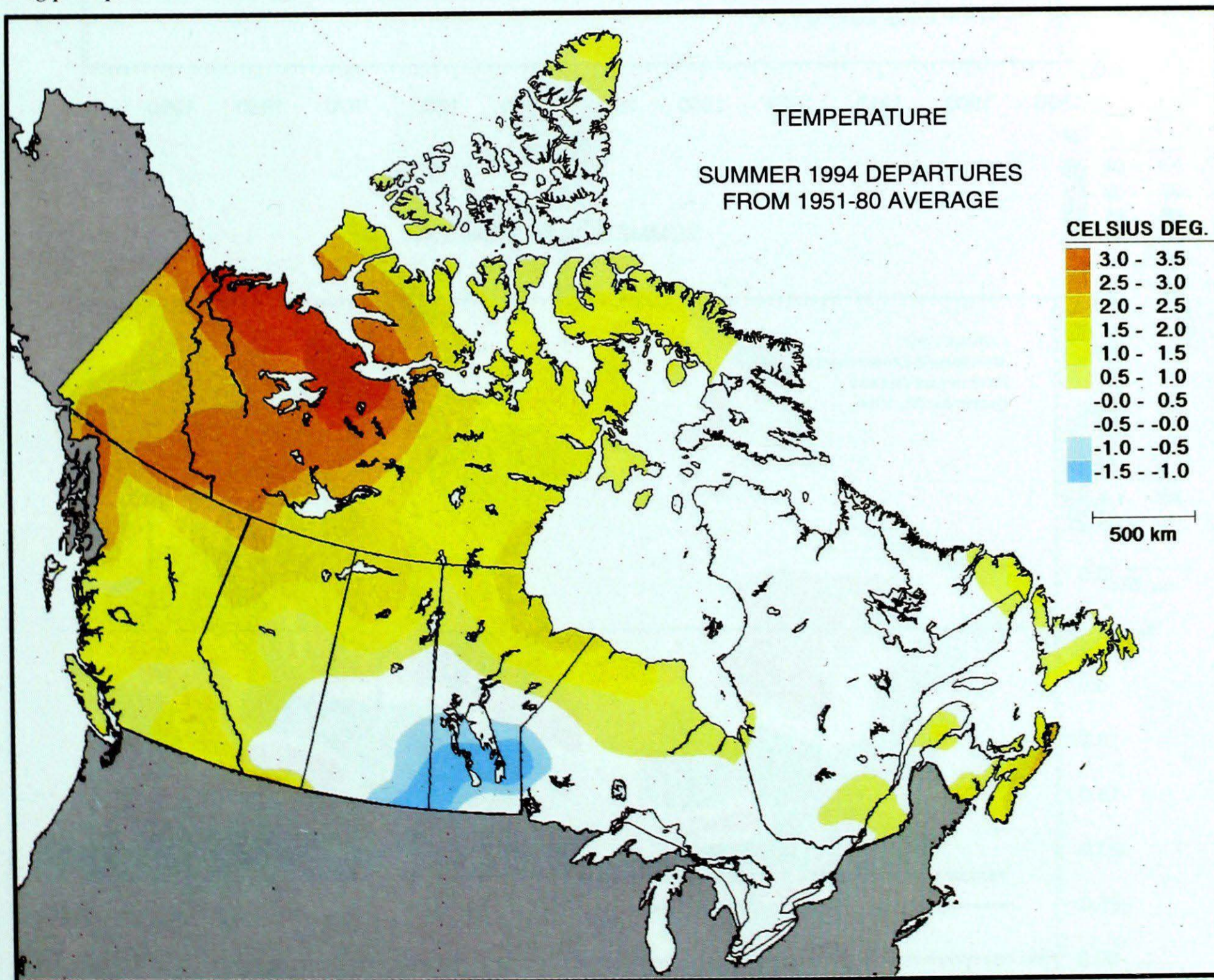
June to August 1994

Seasonal review of Canadian climate and water

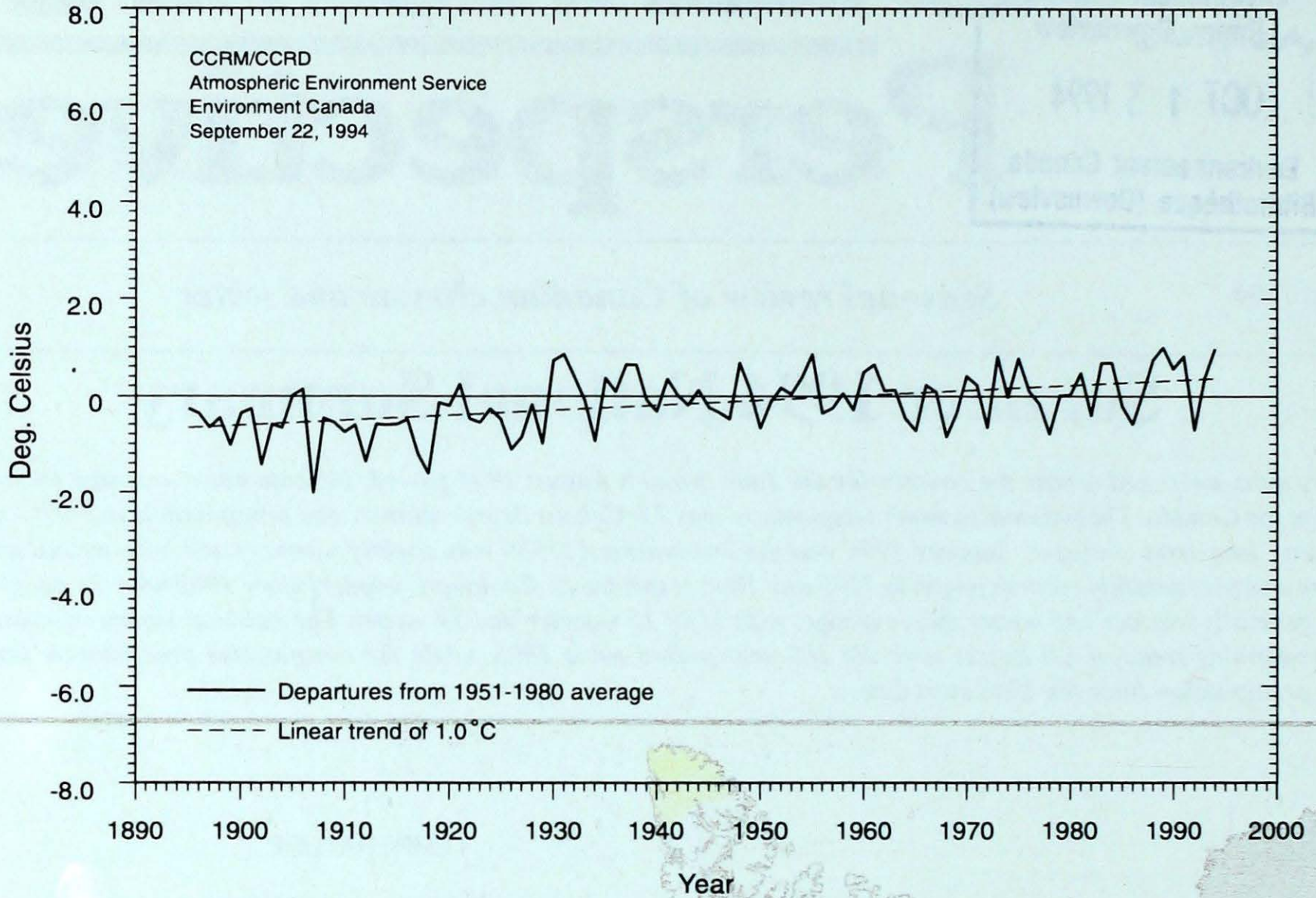
vol. 16

Summer 1994 National Summary

Preliminary data, averaged across the country for the June through August 1994 period, indicate above-average temperatures and precipitation for Canada. The national summer temperature was 1.0 Celsius degree warmer and precipitation was 5% wetter than the corresponding long-term averages. Summer 1994 was the 2nd-warmest (1989 was slightly warmer) and 14th-wettest since national temperature and precipitation records began in 1895 and 1948 respectively. Canadian summers since 1980 with the exception of 1992, have been generally warmer and wetter than average, with 11 of 15 warmer and 14 wetter. The national summer temperature series indicates a warming trend of 1.0 degree over the 100-year period since 1895, while the comparative precipitation series suggests increasing precipitation since the 1948 start date.

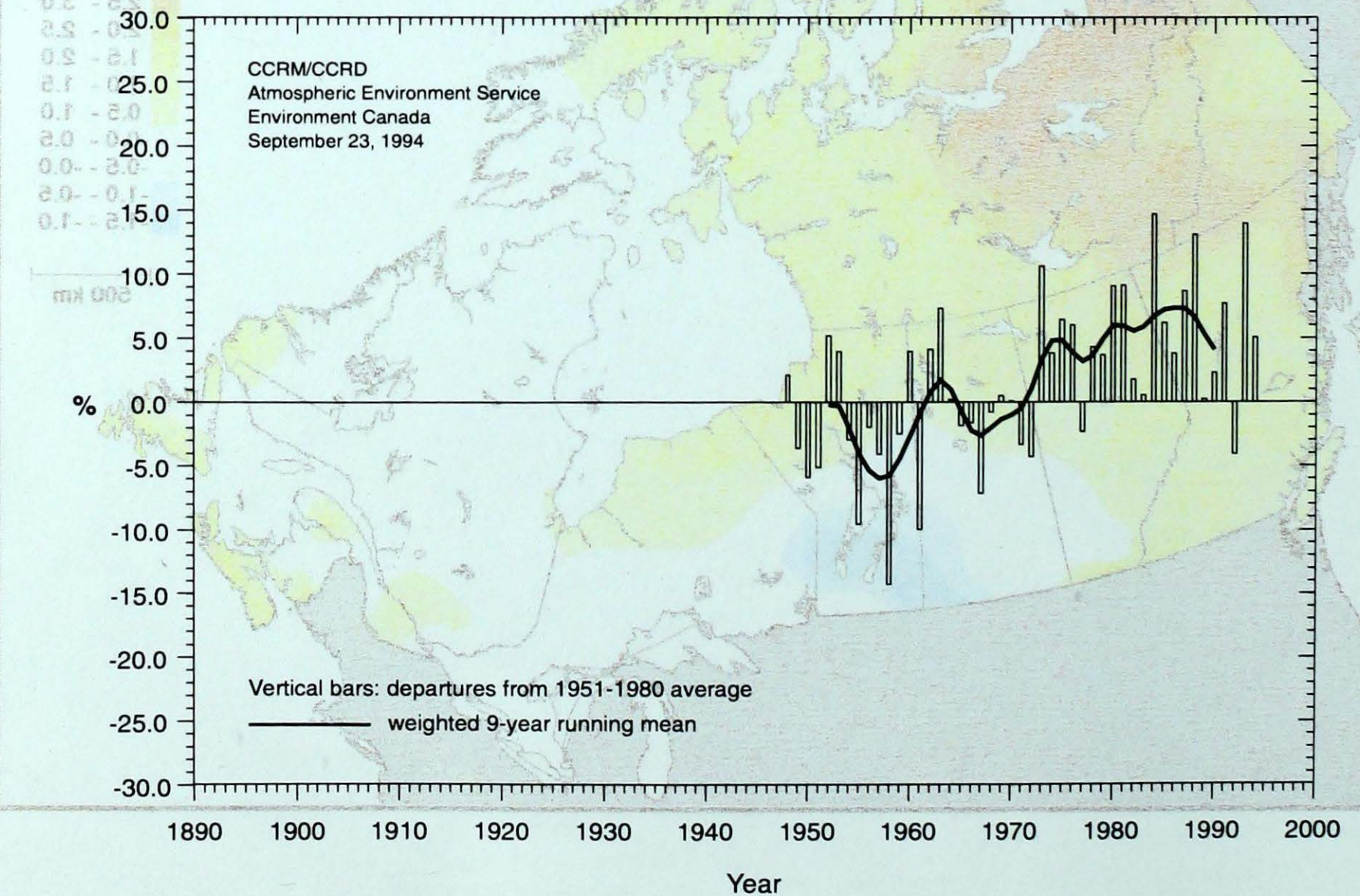


**CANADA
SUMMER TEMPERATURE
1895-1994**



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**CANADA
SUMMER PRECIPITATION
1948-1994**



The national temperature departure pattern for summer 1994 indicated above-average temperatures over about 62% of the total Canadian landmass. This included all of British Columbia and Yukon Territory, most of Alberta and Northwest Territories, Hudson Bay lowland, and much of Atlantic Canada. A small area, only 3% of total, with below-average temperatures occurred over southern Saskatchewan and Manitoba, while the remaining 35% of the Canadian landmass experienced near-average (0.5 degree above or below) summer temperatures.

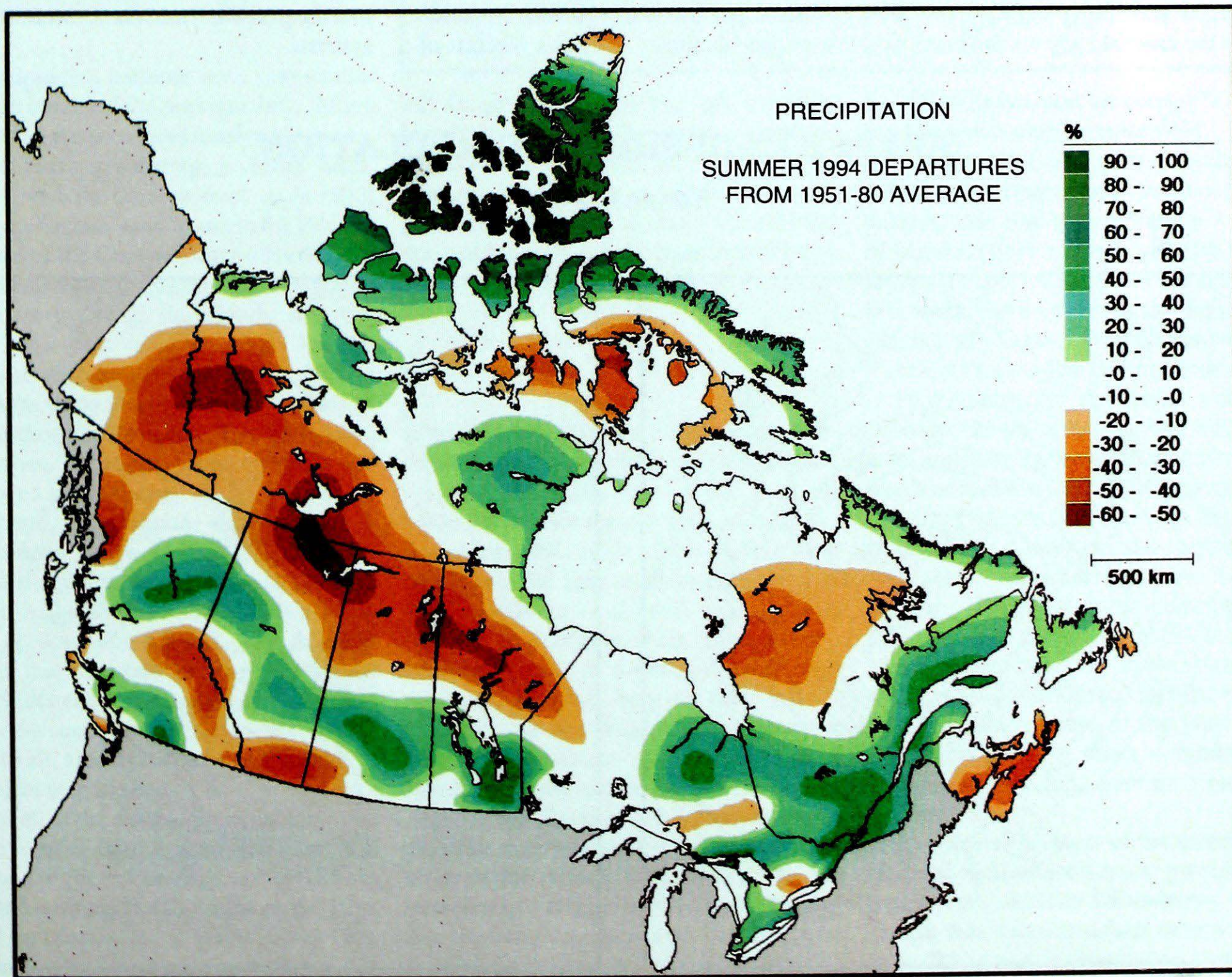
The corresponding national precipitation departure pattern indicated three main areas of above-average precipitation: a broad band from north-central British Columbia southeastwards through central Alberta, Saskatchewan and southeastern Manitoba; a second band from James Bay eastwards to the Eastern Townships of

Quebec and along the north shore of the St. Lawrence River to the Gulf of St. Lawrence; and an area that included most of the Arctic islands, the east coast of Baffin Island and coastal Labrador. These wetter-than-average areas totalled about 37% of the Canadian landmass. Drier-than-average conditions prevailed along the Rockies of southern British Columbia and throughout extreme southern Alberta. A second dry band dominated, from northern British Columbia and the central Yukon, southeastwards through the Great Slave Lake and Lake Athabasca areas and eastwards into northern Manitoba. Ancillary dry areas also existed in north-central Quebec to the lee of Hudson Bay, over Foxe Basin in the eastern Arctic and throughout Nova Scotia, Prince Edward Island and southern New Brunswick. These drier-than-average areas totalled about 33% of the Canadian landmass, while the remain-

ing 30% of the land area experienced near-average (10% above or below) summer precipitation.

Regionally, most areas of Canada experienced above-average summer temperatures this year. Exceptions were the southeastern Prairies, with below-average values; the lower Great Lakes, where temperatures were very near the long-term averages; and south-central Quebec which was only slightly above average. All other regions throughout western and northern Canada, including the High Arctic islands and northern Baffin Island, were much above average. Throughout the Yukon and the Mackenzie Valley, of the Northwest Territories, summer 1994 was the warmest in nearly 100 years, ranging from 2.2 to 2.4 degrees above average. For the 1895-1994 period, a warming trend of 1.5 degrees was calculated for the Mackenzie Valley.

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1994 Summer in Review

A persistent ridge of high pressure over western North America resulted in above-normal temperatures for the western parts of the Northwest Territories, the Yukon, British Columbia, and the northern Prairies. A weak ridge of high pressure south of Newfoundland also resulted in some above-normal temperatures for parts of the Atlantic Provinces. A weak upper trough of low pressure stretching from Davis Strait through Quebec and into Ontario made little impact on the temperatures. Extreme southern parts of Manitoba and Saskatchewan averaged below normal. Elsewhere, temperatures were near normal.

Above-normal sea-surface temperatures off the West Coast were present during the past winter and spring seasons. The presence of the anomalously warm waters may

have been responsible for the enhanced development of weather systems in the north Pacific. These in turn forced warmer-than-normal air over the northern Rockies and helped maintain the ridge. Water temperatures were also above normal over a relatively large area of the Gulf Stream off the East Coast.

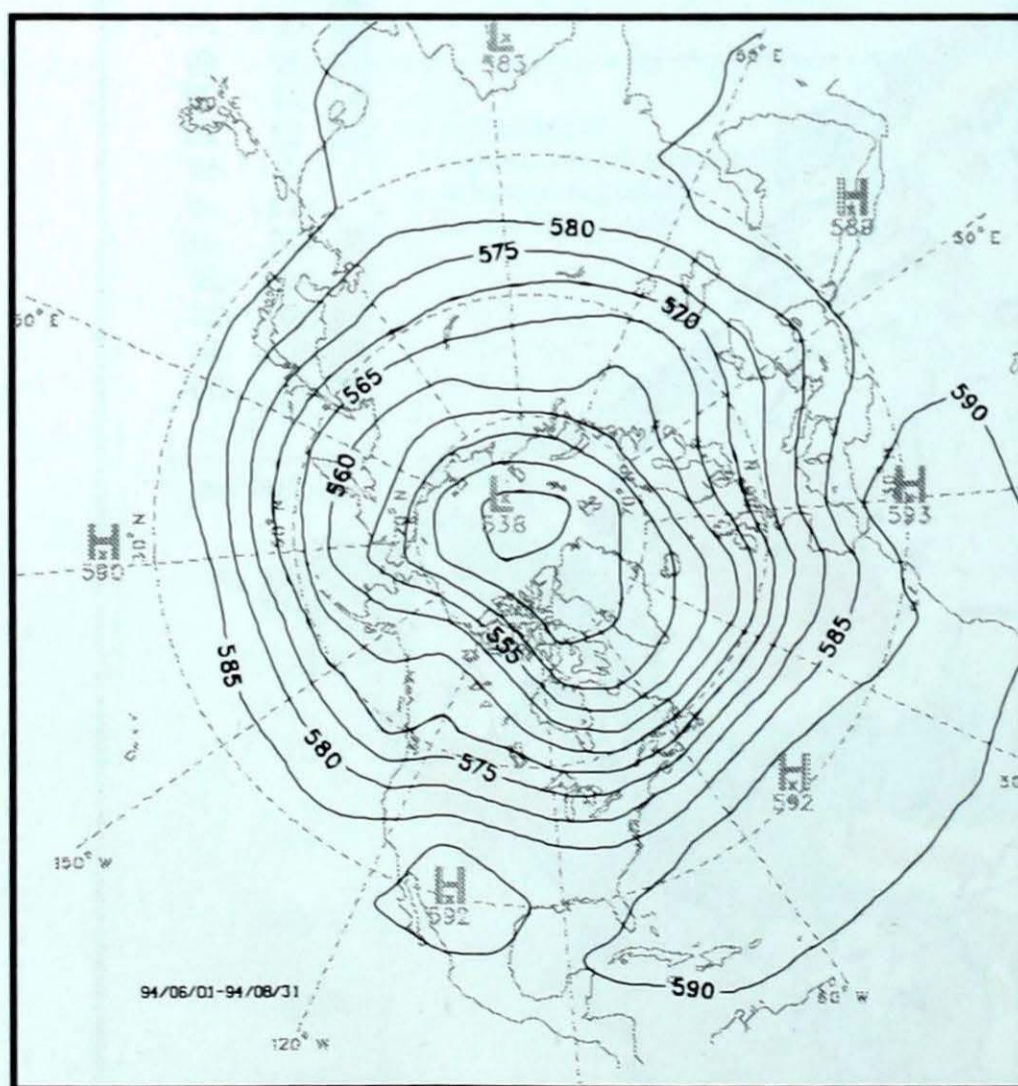
A cold pool of air over the polar regions remained confined to the ice cap. The arctic and polar streams never phased over the summer season and this helped keep the cold air over the Pole. As a result, there were no significant cold spells across the northeast.

Precipitation was above normal across parts of northern B.C., through central Alberta and much of southern Saskatchewan and Manitoba. This was a result of a

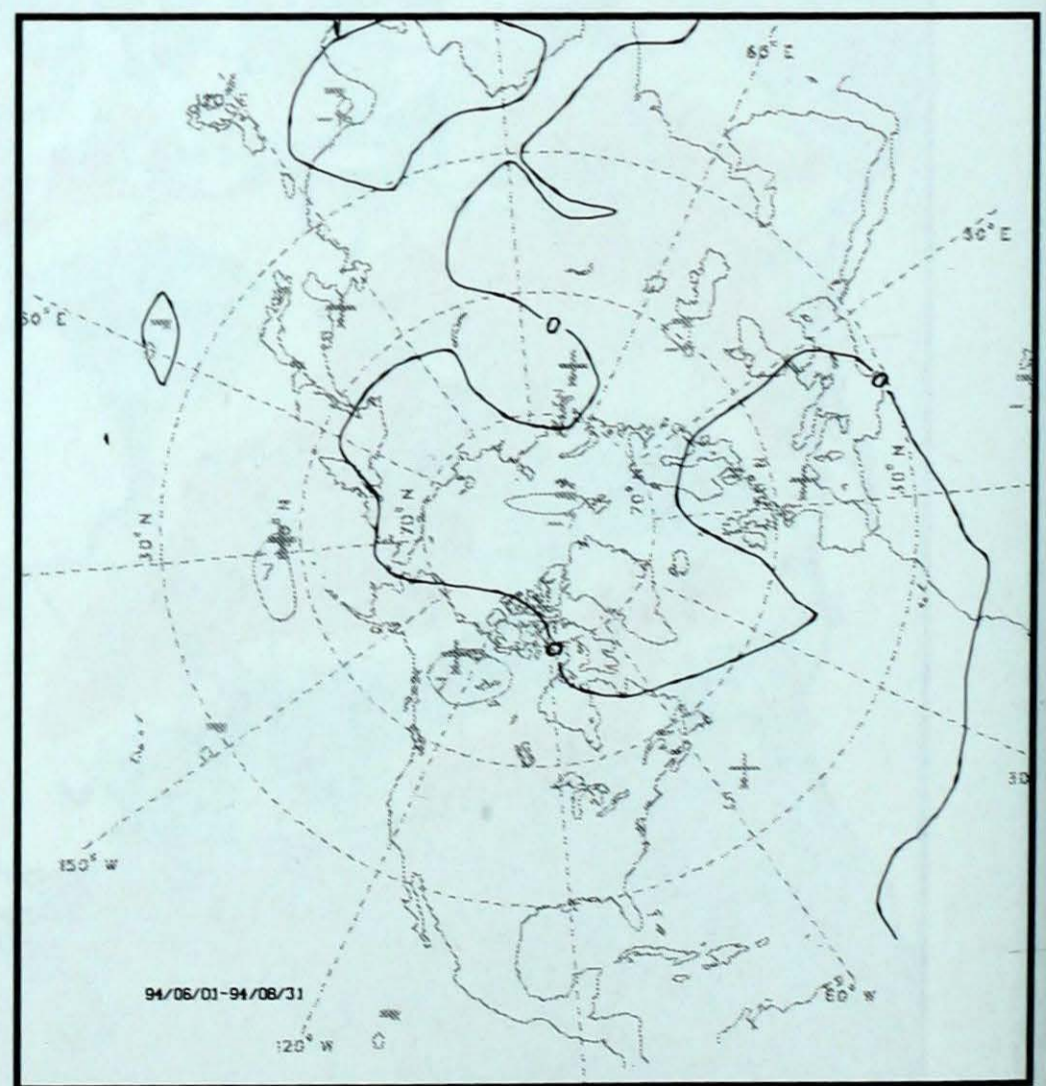
series of weak Pacific disturbances crossing the southern Rockies. It was dry however, over the Yukon, most of the District of Mackenzie and northern parts of Alberta Saskatchewan and Manitoba. The Pacific air simply did not have very much moisture in it after descending from the mountain ranges of Alaska and northern B.C. Moreover, the arctic stream was displaced further north than usual along with associated frontal systems. Parts of the Keewatin and much of the Arctic Archipelago had above-normal precipitation. Some areas around the Great Lakes, the St. Lawrence Basin, and northern Newfoundland also recorded above-normal precipitation. This was associated with disturbances in the steering flow and associated frontal systems.

50-kPa ATMOSPHERIC CIRCULATION

Summer 1994



Mean geopotential heights
5-decametre interval



Mean geopotential height anomaly
5-decametre interval

June

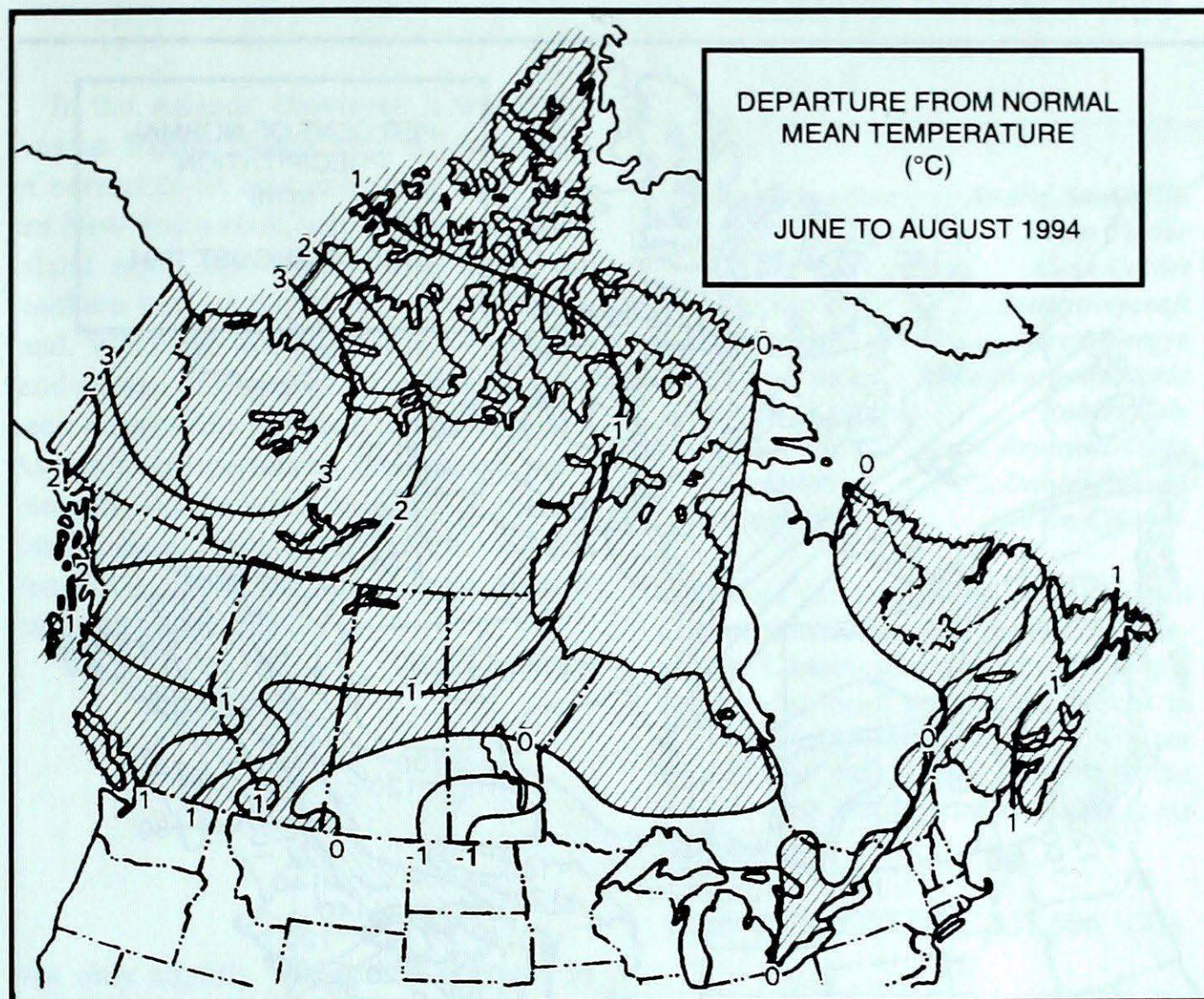
With the exception of a large chunk of the Arctic, mean temperatures for June 1993 were within one Celsius degree of normal over all of Canada. One year later, a similar description could be made of June 1994: temperatures in the central and High Arctic were two to three degrees above normal, while average values across the rest of the country showed little departure. Although there were a few instances of very warm conditions over several parts of the country, most of these hot spells were short in duration. The most significant took place from June 15-18, when daytime highs exceeded 30°C from the Great Lakes to Labrador, breaking numerous daily records. A value of 36°C at Toronto represented the warmest June temperature for that city since 1952. Farther east, Montréal's high of 34°C on the 18th combined with high humidities to produce a humidex value of 45.

Precipitation patterns were also similar to those observed the previous June. Many parts of all ten provinces received in excess of 100 mm representing, in some cases, almost twice the usual amount. As in 1993, the highest totals were found in the Prairies and east of the Quebec-Ontario border.

Several significant storms moved across the country during the month, bringing with them some notable severe weather. The first of these occurred on the 10th in Manitoba when a tornado touched down 50 km northeast of Brandon. Two days later, in Quebec, a tornado ripped out trees and destroyed a house west of Trois-Rivières. In Alberta, funnel clouds were reported in the Edmonton area on the 24th. The wildest weather of the month came on the 29th as golf-ball-sized hail accompanied a tornado in southern Alberta. The thunderstorms that spawned this activity spread into Saskatchewan, producing five more tornadoes and destroying several buildings. In all, nine tornadoes were reported in Saskatchewan in June.

Not all of the notable precipitation came in the form of rain, as snow fell in several portions of the Arctic. Blizzard conditions affected northern Baffin Island on the 10th, and 8 cm of snow fell at Inuvik on the 13th.

Despite the abundance of moisture this month, there were a few areas with significantly dry conditions. Parts of south-cen-



tral Ontario, including the agriculturally-important Niagara Peninsula, received little more than half the normal June amount. In Nova Scotia, where totals were generally 150% of normal, Greenwood managed to receive little more than 50 mm, almost 30 mm below normal.

July

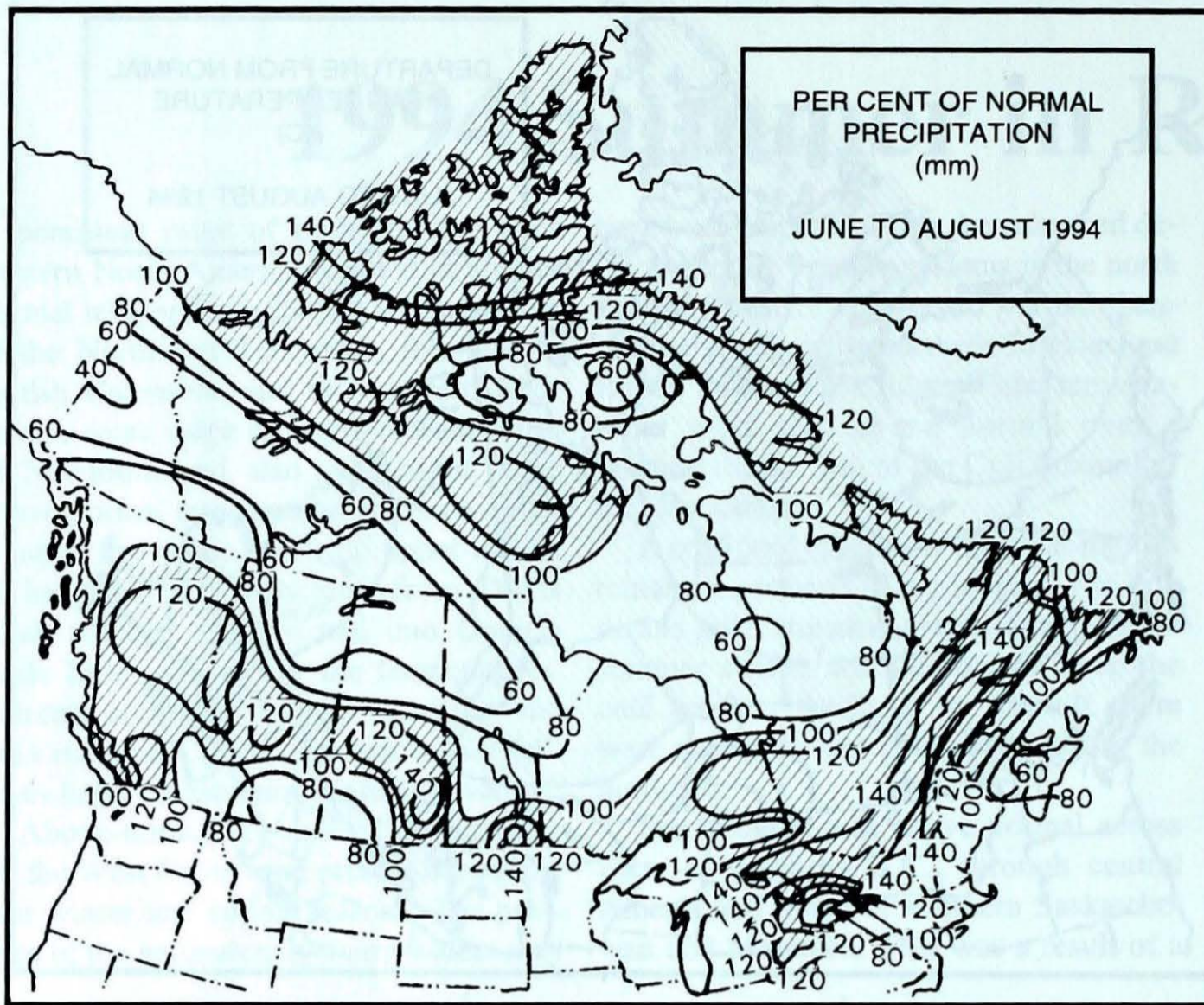
July 1994 was characterized by mean temperatures that were above normal on both the east and west sides of the country, while the interior regions were slightly below normal. For much of the western third of Canada, the first ten days of the month were relatively cool, with temperatures within a degree of normal. However with the development of a strong ridge of high pressure extending from southern British Columbia to the Yukon, much warmer conditions dominated for the last half of July. Most locations in British Columbia, Alberta, and the southern Yukon recorded monthly maximums in the thirties, many were in the mid-thirties, and a few recorded all-time high temperatures. Falling into the latter category were Fort Simpson in the upper Mackenzie Valley (36.6°C) and Kelowna in southeastern British Columbia (39.5°C). On the 22nd, a value of

41.3°C at Lytton was the country's highest temperature during summer 1994.

On the other side of the country, the Atlantic Provinces began the month with temperatures that were generally a couple of degrees above normal, and with the exception of a brief period in the middle of the month, stayed that way through the beginning of August. Despite the warmth, there were only a few daily records set.

Precipitation for the month was quite variable. In three bands, one stretching from northern British Columbia southeastwards across the central Prairies to northwestern Ontario, another from the Great Lakes to Newfoundland and another from the eastern tip of Great Slave Lake to northern Baffin Island, precipitation amounts were above normal. Most significantly wet were two areas around the northern border of Ontario and Quebec and along the north shore of the Gulf of St. Lawrence. In both areas approximately 200 mm of rain fell, more than twice the July normal.

In a few other parts of the country that received well-above-normal precipitation, much of the moisture fell in heavy rainfall events that interrupted an otherwise-dry July. This was the case in southern Manitoba, where rainfalls of nearly 150 mm were accounted for by one or two days



with heavy thunderstorms. At Baker Lake, Northwest Territories, July's total of 80 mm was more than double the normal; however, all of that came on July 22-23 as the result of an unusually slow-moving depression. Similarly, at Fort Simpson, out of a total of 64 mm, 53 mm fell as the result of severe thunderstorms on the 8th and 9th. Such severe weather events masked what was actually a very dry month across much of northern British Columbia, northern Alberta and the southwestern Territories. In these regions, the warm and dry conditions and the frequent occurrence of thunderstorms that were lightning-rich but often rainfall-poor, led to a marked increase in the incidence of forest fires. In southern British Columbia the hot and dry weather also raised the fire hazard. Campfires were banned and logging operations curtailed as several fires burned out of control. In the Penticton area, a major fire burned near the outskirts of the city, destroying several houses.

Several other severe-weather events occurred in July. On four days golf-ball-sized hail was reported in Alberta. In Ontario, a small tornado touched down near Orillia on the 8th, and another near Stratford on the 22nd.

The most significant severe weather occurred in eastern Ontario and southwestern Quebec. On the 2nd, four people were killed as the result of lightning strikes. Seven days later one man was killed, four homes destroyed, and 24 others damaged as the result of a tornado that touched down east of Montréal. Hail, high winds and flooding rains hit Montréal on the 21st and 22nd. To finish off the month, there was some minor damage to the south of the city on the 30th as a tornado briefly touched down.

August

The month of August will be remembered for very warm and dry conditions that covered the western Arctic and much of British Columbia. In the Yukon, monthly means were as much as 4.8 Celsius degrees above normal and eleven locations saw their highest-ever August temperature. At Whitehorse, new daily record-maximum temperatures were set for nine consecutive days. The combination of high temperatures and low precipitation amounts (in some cases, less than 40% of normal) served to exacerbate an already-high fire hazard, making 1994's forest fire season the worst on record.

With temperatures reaching into the low thirties as far north as the Beaufort Sea, and with only a few millimetres of rain in the southern half of the Mackenzie Valley, forest fires were numerous and visibility frequently reduced by smoke. In British Columbia, temperatures were above normal, generally about a degree in the south and three degrees in the north. New record means were set at opposite corners of the province, at Amphritite Point in the southwest (Vancouver Island) and Fort Nelson in the northeast. Precipitation was slightly above normal over most of British Columbia, but with much of it coming as the result of thunderstorms, many locations experienced frequent dry periods and saw only a small alleviation of the fire hazard. Combined with the unusually-large number of fires earlier in the season, the fire total had already surpassed 3,800 by the end of August, just 200 short of the record set in 1970. Battling the 1994 fires has cost over \$68 million.

As can be expected, with thunderstorms producing the lion's share of the precipitation in the west, severe weather incidents were common. Thousands of trees were snapped off near Prince George on the 3rd as the result of a small tornado and several downbursts. Heavy thunderstorms over the next couple of days caused mudslides that closed the Trans-Canada Highway near Field, and produced egg-sized hail that damaged cars, boats, and planes near Salmon Arm. As a result of the latter incident, more than 1,500 insurance claims were made, totalling \$5-10 million. In Alberta, the same storm dropped 84 mm of rain on Grande Prairie in one hour, setting a new record for rainfall intensity and producing some flooding. Through the rest of the month there were several occurrences across all four western provinces of heavy rainfall and hail, at times as large as tennis balls. In one storm on the 18th, on northern Vancouver Island, golf-ball-sized hail covered the ground and damaged cars and greenhouses. On the same day in Manitoba, hail destroyed entire fields of crops near Pilot Mound.

From southern Saskatchewan to Labrador it was a cool August. Mean temperatures were one to two degrees below normal, and with the exception of a few warm spells on the Prairies, daytime temperatures over 30°C were a rarity. Across most of this area, precipitation was above

normal, although there were only a few locations that had extremely high amounts. A few areas, notably the western end of Lake Ontario and the southern Gaspé, had below-normal rainfall. On the 4th, an outbreak of thunderstorms was responsible for one death and several injuries near Hamilton as the result of a lightning strike and for three tornadoes in the Ottawa valley, one rated as an F1 and the others as F2. Another line of thunderstorms on the 28th produced damaging 120 km/h straight-line winds near Lake Ontario and a small tornado near Montréal.

In the Atlantic Provinces it was a dry August. Rainfall totals were as low as 30% of normal in an area extending from eastern New Brunswick, across Prince Edward Island and Cape Breton, and along the southern half of the island of Newfoundland. While the low rainfall in Newfoundland slowed crop growth, it appears to have been responsible for good tourist business. As well, temperatures this month were generally on the warm side, although only Sable Island, Nova Scotia, and the Avalon Peninsula (Newfoundland) were significantly above normal.

Malcolm Geast

... continued from page 3

Throughout most of British Columbia, temperatures were 1.2 degrees above average making 1994 among the warmest 8% of summers there in 100 years. In the northern Prairie Provinces and the central Arctic, temperatures were 0.9 and 1.3 degrees above average. Summer 1994 was among the warmest 8% of summers in the Arctic, since records began in 1922. On the East Coast, Atlantic Canada was 1.1 degrees above average making it among the warmest 9% of summers there in 100 years.

Not surprisingly, regional summer precipitation tended to reciprocate corresponding temperatures, with above-average temperatures generally accompanied by below-average precipitation. In the West, along the coast, throughout the Yukon, Mackenzie Valley and the northern Prairie Provinces, precipitation ranged from 10 to 30% drier than average, while the southern interior of British Columbia

was only slightly wetter than average. In the Mackenzie Valley, summer 1994 was among the driest 7% of summers there since 1928. Atlantic Canada, where temperatures were also warmer than average, was slightly drier than average. On the other hand, the extreme southeastern Prairies, lower Great Lakes, south-central Quebec and central and High Arctic, were all 10 to 30% wetter than average. In areas of the lower Great Lakes, summer 1994 was the 2nd-wettest in 100 years (1952 was 1st, 1992 was 3rd). In south-central Quebec, it was the 2nd-wettest in 57 years (1952 was 1st) making it among the wettest 4% of summers there since 1938.

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The purpose of the publication is to make topical information available to the public concerning the Canadian climate and its socio-economic impact.

The data in this publication are based on unverified reports from approximately 225 Canadian synoptic weather stations. Information concerning climatic impacts is gathered from AES contacts with the public and from the media. Articles do not necessarily reflect the views of Atmospheric Environment Service.

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