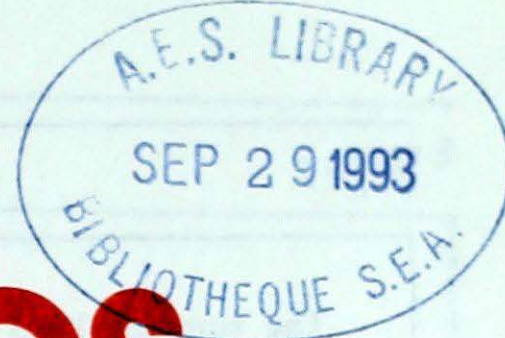




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Monthly Review + Summer 1993 Review

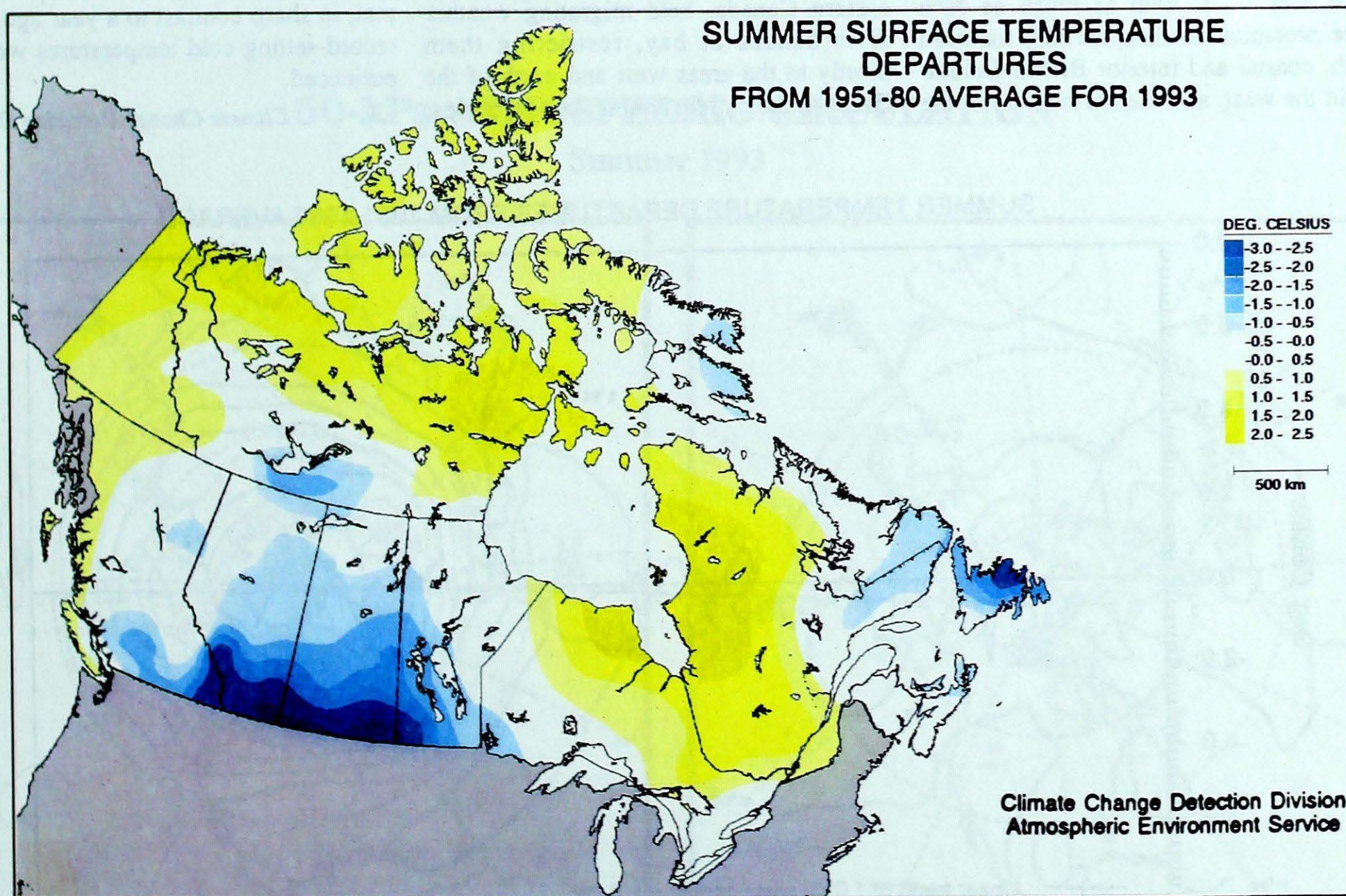
AUGUST - 1993

Vol. 15

Summer 1993

A national summary

Preliminary data for summer 1993 show that the June through August period this year was 0.3°C warmer than normal for the nation - this occurred, despite very cool temperatures across much of western Canada and in the Newfoundland-Labrador area in the east. The national trend shows that summers have warmed by 1.0°C over the 99 years of record. On a country-wide basis, summer 1993 ranked as the 23rd warmest summer since national records began in 1895. It is also noteworthy that eight summers since 1980 have been warmer than normal, while last year, summer 1992, was the 13th coldest on record.



The summer 1993 temperature map shows a broad band of above-normal temperatures extending from the high Arctic and Yukon Territory, southeastward over Hudson's Bay, into the Ottawa Valley and southeastern Québec. Temperatures over this vast area were 1 to 2 degrees warmer than normal. However, on either side of the band, temperatures were below normal by 1 to 3 degrees. The cool regions include southern British Columbia, extending eastward across the southern Prairie Provinces and into northwestern Ontario, and throughout much of Newfoundland and Labrador.

Cloudy skies and heavy precipitation were common in many areas of Canada during summer 1993. In particular, large portions of the southern Prairie Provinces, received more than double their normal summer precipitation, and the critical grain growing areas endured several weeks of cloudy, cool and excessively wet weather. Other wet areas, with as much as 50% more precipitation than normal, included north, coastal and interior British Columbia in the west, and the north shore of the

St. Lawrence River, the Gulf of St. Lawrence, and southern Newfoundland, in the east. The Mackenzie Valley in the northwest, on the other hand, was dry receiving only half of the normally expected summer precipitation. Fortunately for much of eastern Canada, precipitation was widely distributed in both space and time, and along with abundant sunshine and warm temperatures, this ensured long spells of ideal summer-like conditions.

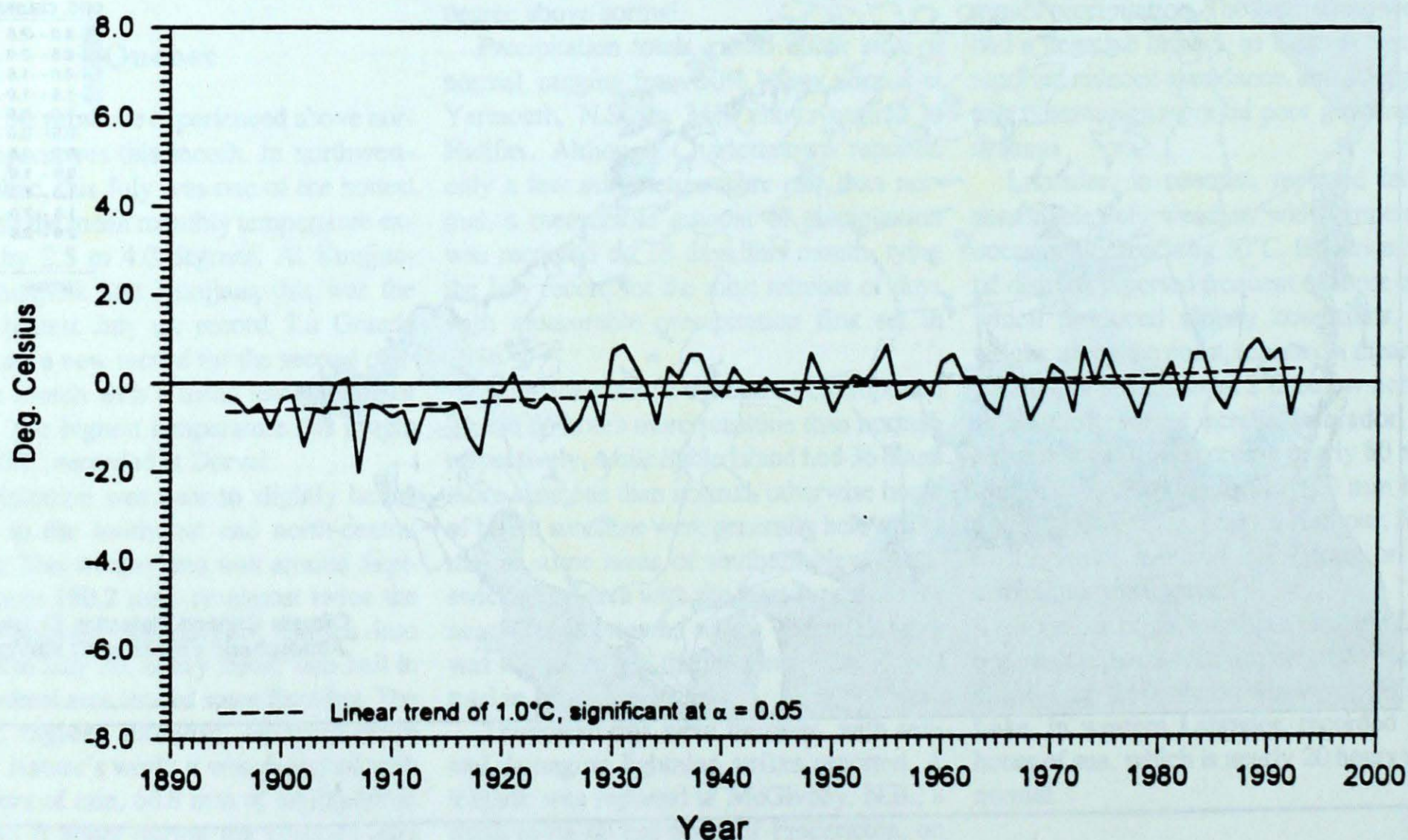
Over the summer, the large-scale atmospheric circulation consisted of a persistent upper level trough of low pressure lying over western North America and a weak, but likewise persistent, high pressure ridge centred over the Great Lakes Basin of eastern Canada. This pattern resulted in a southwesterly airflow over central North America, which pumped large amounts of moisture and extensive cloudiness, into western Canada. On the other hand, the high pressure ridging over southeastern Canada, held migrating weather disturbances at bay, restricting them mostly to the areas west and north of the Great Lakes. Seasonable temperatures,

abundant sunshine and ample precipitation throughout much of southeastern Canada was the result.

Across the southern Prairie Provinces, summer 1993 was in the coldest 2% of summers there since 1895, and in the southern interior of British Columbia it was in the coldest 6%. The below-normal temperatures in southern British Columbia, extended west to the lower coastal mainland. It was the second summer in a row with considerably below-normal temperatures throughout the Prairie Provinces, as well as in most areas of Atlantic Canada, in the east. In the west and north, summer 1993 was in the warmest 9% of summers in northwestern British Columbia and Yukon Territory, and in the warmest 5% throughout most of the Canadian Arctic. In the James Bay region of Ontario and Québec, and in the lower Great Lakes/St. Lawrence River area, summer 1993 was a few tenths of a degree warmer than normal, in sharp contrast to a year ago, when record-setting cold temperatures were experienced.

Climate Change Detection Division

SUMMER TEMPERATURE DEPARTURES FROM 1951-1980 AVERAGE



Summer '93 Atmospheric Circulation

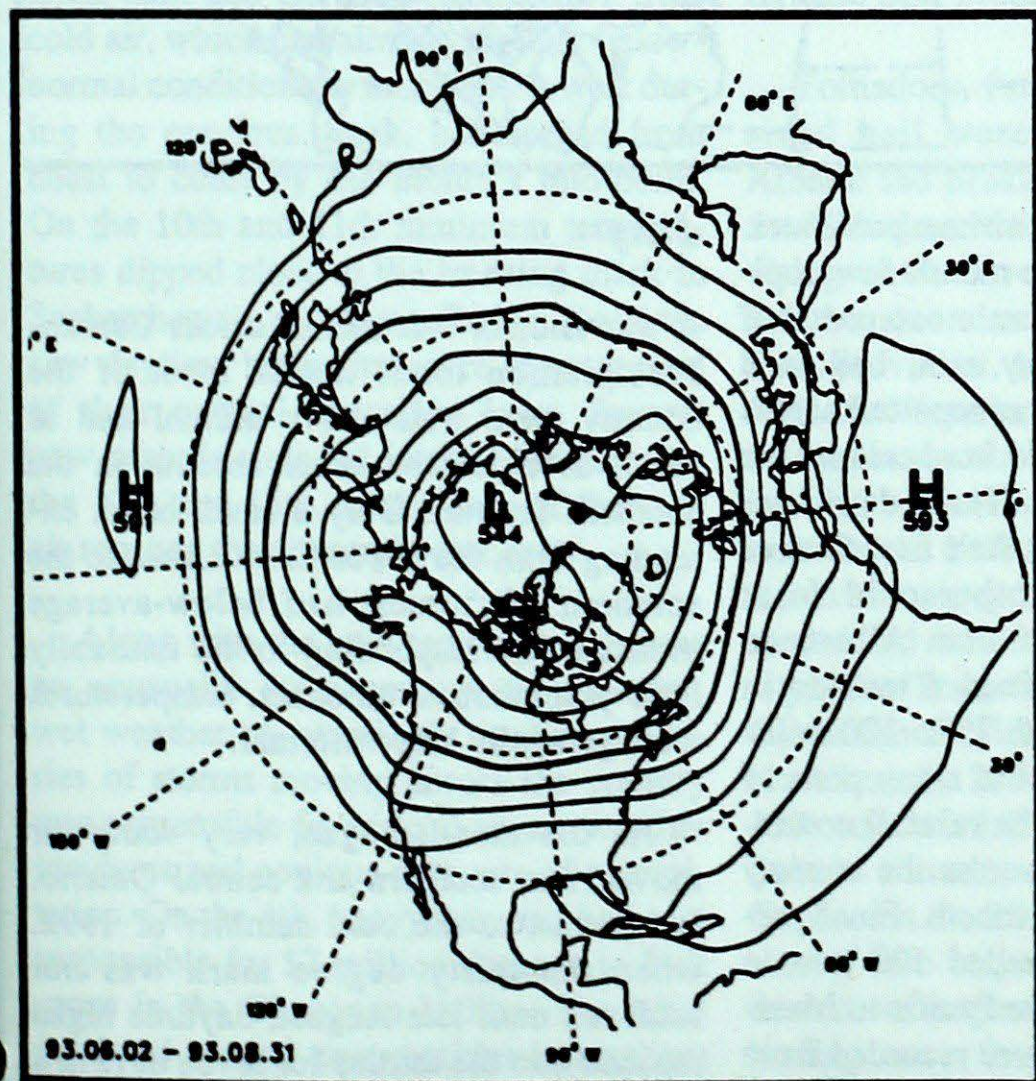
Beginning with a look at the 50 kPa analyses of height and anomalies through June, July and August, it appears that several of the anomalies corresponded well with the type of weather observed during this period.

Over North America, there were two anomalies that tended to dominate during this period - a negative height anomaly of 4 Decameters (dam) over the U.S. Northwest, and a positive anomaly of 6 dam centred over Quebec. These features tended to accentuate the ridging (+ 5 dam) over the western Pacific, extending towards the Yukon, and the trough (-5 dam) east of Newfoundland. As a result, the trough, normally off the west coast, was shifted inland from its long-term mean position. This resulted in cooler temperatures over the prairies, and above-normal temperatures over much of the Arctic and eastern Canada, except the Atlantic Provinces. This situation was opposite to that observed during the previous winter and spring - a pattern favoured by the El- Nino.

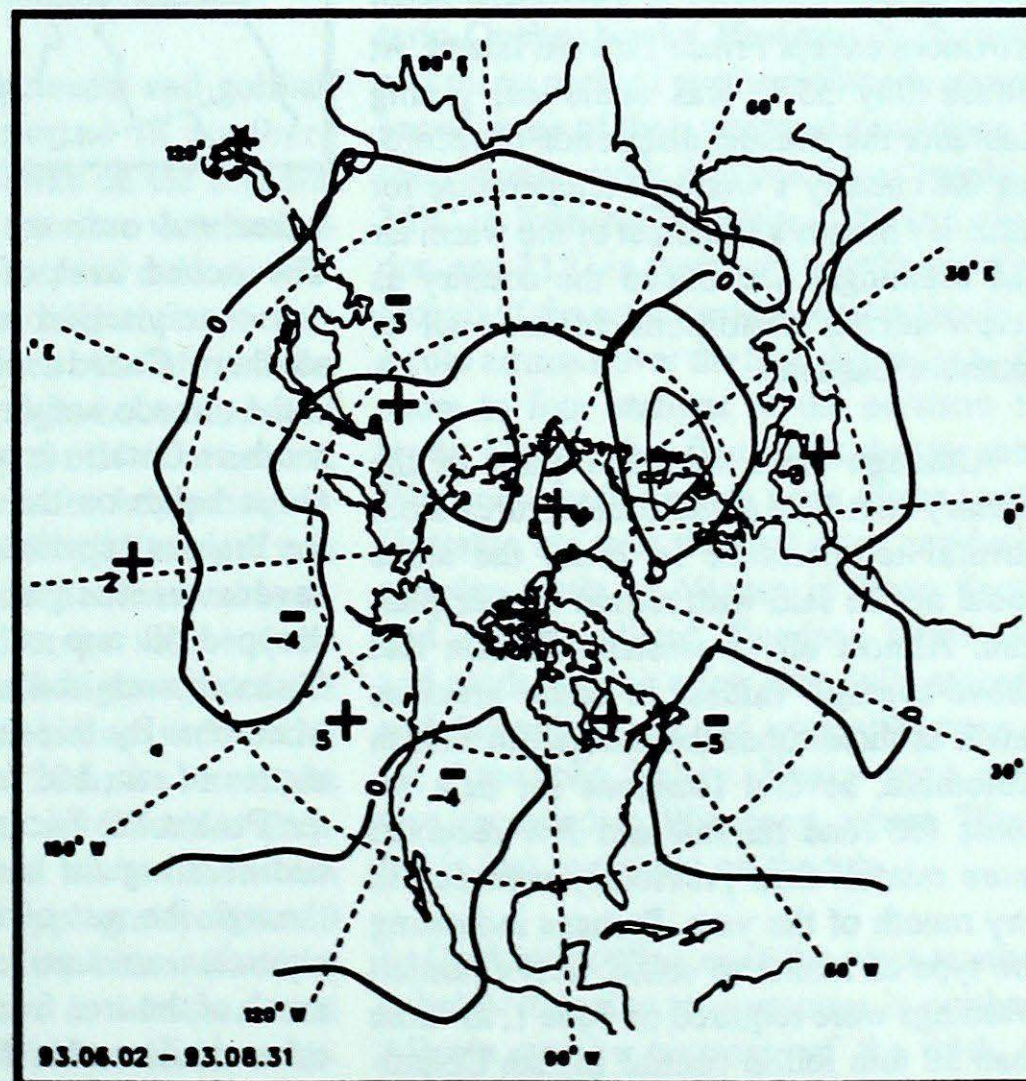
Over the central U.S. and Canadian Prairies, this summer's circulation pattern favoured increased precipitation. The areas included the Mississippi Valley, where the rains and flooding were disastrous. Some of this moisture probably had its origins in the Tropics. Over the summer, satellite imagery showed several tropical cloud systems displaced northward from the Gulf of Mexico and from the Pacific Ocean in the vicinity of lower California. These ultimately merged with disturbances in the circulation further to the north.

50-kPa ATMOSPHERIC CIRCULATION

Summer 1993



Mean geopotential heights
- 5 decametre interval -



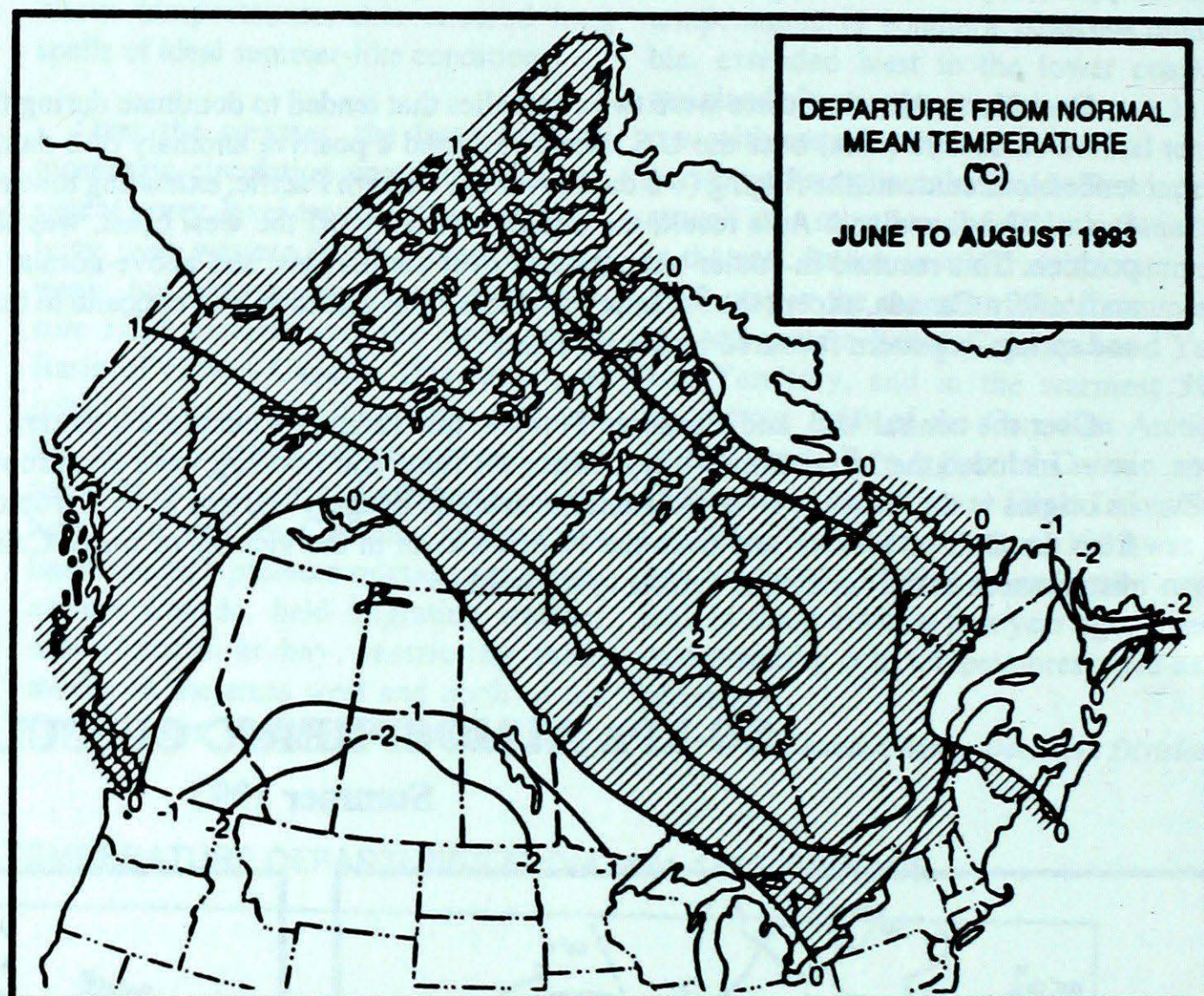
Mean geopotential height anomaly
- 5 decametre interval -

Summer 1993 - supplement

June

June will be remembered as a month with temperatures that did not show any significant departures from normal. Although a large part of the Arctic observed monthly means that were two degrees above average, most of the rest of the country recorded values that were about a degree or so below normal. For the first week of June temperature patterns were much as they had been at the end of May -- warm in the Arctic and in British Columbia, and unseasonably cool from Alberta to the Atlantic coast. However, as the month progressed the long wave ridge responsible for the Pacific coast's warmth gradually moved eastward. As a result, the west cooled off and much of eastern Canada saw temperatures that were increasingly warmer. By the third week of the month daytime highs had reached the thirty degree mark in all provinces except Prince Edward Island. At Goose Bay 35°C was achieved, giving Labrador the unusual distinction of recording the country's warmest temperature for June. By month's end most of the warm air had seemingly abandoned the country as below-normal conditions covered all of southern Canada.

Although there were few parts of the country that had notable departures from normal temperature in June, the same could not be said with regard to precipitation. Almost all of western Canada had above-average values, in some areas as much as three times the normal. In British Columbia, several locations set new records for June rainfall and few received more rainfall than previously recorded in any month of the year. Perhaps indicating the type of month to come, heavy rainfall warnings were required on June 1, as more than 50 mm fell in central British Columbia. Similar amounts fell across the Great

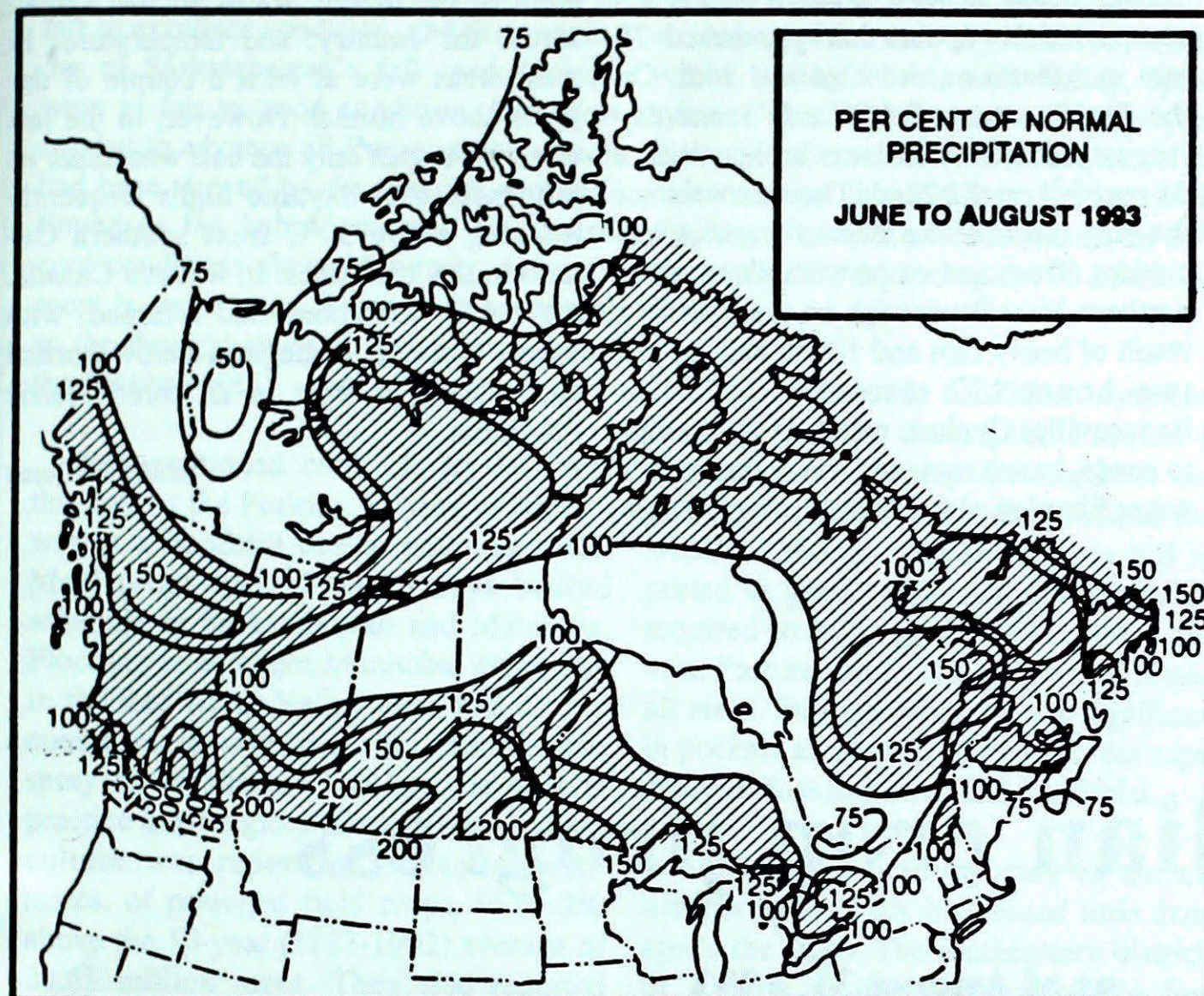


Lakes and over the Maritime provinces. The second week of the month saw copious precipitation across most parts of southern Canada. Heavy rain, hail, and some tornado activity was reported across southern Ontario as a cold front crossed the Great Lakes on the 9th. Three days later the Prairies experienced their first taste of severe weather as another cold front dropped 50 mm of rain from Alberta to Saskatchewan and spawned a tornado in Manitoba. By mid-month 75 to 100 millimetres of rain had fallen in many parts of the Prairie Provinces. The rainfall continued on a regular basis across the country through the rest of the month. Final precipitation amounts exceeded 100 mm in much of the area from the Pacific to Manitoba; similar amounts were recorded from the lower Great Lakes to the Atlantic coast.

July

It was another wet month across Canada. Precipitation totals across most of the country were well above normal and as much as twice the usual amount in the southern Prairies. Only a small band, extending from the lower Great Lakes to the southern Maritimes, had below-average moisture. Corresponding to the unusually high precipitation amounts, temperatures were generally below normal.

As the month began, very warm air moved into southern and central Ontario. In contrast to the cold summer of 1992, when the thirty degree mark was not achieved until late August, daytime highs reached into the thirties for seven days in a row. This was not to last, however, as a



cold front came barrelling through the area on the 9th, bringing with it severe thunderstorms that produced several small tornadoes, hail, and torrential downpours. This cold air, which had already brought below-normal conditions to much of the west during the previous week, had spread from coast to coast by the month's mid-point. On the 10th and 11th minimum temperatures dipped close to the freezing mark in Saskatchewan and some Prairie locations saw daytime highs that were more typical of their normal overnight lows. Several new records were set in the Maritimes on the 17th and 18th, as the core of the cold air reached the country's east coast.

Along with the cool temperatures came an unusually large amount of unsettled, wet weather. A seemingly continuous series of storms moving across the country was responsible for several severe weather incidents and copious amounts of precipitation. On the 4th, heavy rain and hail was responsible for \$7 million damage to fruit crops in the Okanagan Valley. The same weekend several communities in northern Manitoba had to be evacuated as 170 mm

rain caused streams to flood. The same cold front that had pushed through southern Ontario on the 9th produced another tornado near Fredericton the next day.

Tornadoes, funnel clouds, and golfball sized hail were reported in southern Alberta and Saskatchewan on the 21st and the 29th. In addition, weather watches advising of the development of cold-air funnels became almost a daily occurrence in both provinces, between the 7th and the 18th. At Victoria, an eight-hour rainfall of 50 mm broke not only the 24-hour record, but also set a new mark for July precipitation. On the 24th and 25th, 200 mm of rain fell in Winnipeg flooding streets and basements and inundated crops south of the city. The Trans-Canada highway and the Canadian Pacific mainline were both closed on the 27th and 28th; the result of a 150 mm rainfall east of Thunder Bay. Severe thunderstorms hit southeastern Quebec on the 29th dropping more than 50 mm of rain in just a few hours, flooding downtown expressways in Montreal and leaving more than 50,000 residents without power. Heavy rains also occurred in

the north as Yellowknife set a new 24-hour record of 17.6 mm on the 28th, and an unprecedented 41 mm fell at Iqualuit on the last day of the month. The only significantly dry areas in July were the southern portions of New Brunswick and Nova Scotia, where only 50-70% of normal precipitation was recorded, and southern Ontario, where some localities experienced their driest July since the early seventies.

August

Continuing the trend that had been established in June, cool and wet weather prevailed across most of western Canada in August. Mean temperatures were about a degree below their seasonal values and precipitation values, while not as high as in July, were above normal in most areas. In Eastern Canada it was the opposite story as monthly means were a degree or two above normal from the Manitoba border to the Maritimes. With the exception of Quebec's North Shore, precipitation in the east was generally below normal.

During the first week of August temperatures were two to four degrees below normal from southern Alberta to the Ontario-Quebec border. However, both coasts and many parts of northern Canada experienced some of their warmest conditions of the summer, with daytime highs reaching 36°C in British Columbia, 33°C in Labrador, and 31°C in the Northwest Territories. Not all of the north experienced warmth, as a cold air mass over the high Arctic brought snow to four stations in the northern islands. During that first week, heavy rainfalls continued in many parts of the south. Unstable air over the east coast produced one-day totals of 60 mm in Nova Scotia and Newfoundland, flooding basements and roads, setting a few new daily records, and damaging fruit and vegetable crops in the Annapolis Valley. Heavy rains were also recorded in Winnipeg, where 72mm fell in just two hours on the 8th.

Cold air settling over the west resulted in below-freezing temperatures in northern Alberta on the morning of the 11th. A storm system moving through southern

Saskatchewan on the 13th dropped 50 mm of rain and covered the ground with up to 5 cm depth of golfball sized hail. The next day, the same system gave Winnipeg another 59 mm rainfall, pushing the summer total well over 400 mm, setting a new record in the process. Early estimates place the cost of the summer's flood damage to the area at \$200 million. Heavy precipitation continued in all four western provinces through much of the rest of the month. On the 16th a 71 mm rainfall, set a new one-day record at Lethbridge, and hail the size of baseballs pounded Maple

Creek, Saskatchewan. Funnel clouds accompanied downpours that approached 75 mm in Alberta on the 23rd and 24th. On the Pacific coast, Port Hardy's one-day August rainfall record was broken with a 64 mm fall on the 22nd. The west was not the only place where the wet weather was evident. Trees and crops were damaged in northern New Brunswick on the 12th as a result of heavy rain and 10 cm hail. In just two hours 177 mm of rain fell at Beauceville, Quebec, resulting in damage to roads, basements, and the community's water filtration plant. Shortly after the mid-

point of the month, warm air had spread across the country, and temperatures in most areas were at least a couple of degrees above normal. However, in the last week of August only the east was under its influence, with daytime highs frequently reaching above 30°C from southern Ontario to the Maritimes. In western Canada, the colder conditions had returned, with means a couple of degrees below normal and reports of frost in all three Prairie Provinces.

Malcolm Geast

Canadian crop progress

as of August 31, 1993

The 1993 growing season will be remembered for some time yet but each province will remember it for a different reason.

British Columbia was generally cool and wet this summer, with limited amounts of sunshine. The summer rains were helpful to crops in areas northwest of Fort St. John, which were suffering from dry conditions up until June, but created a large problem for hay farmers across the province. The southern interior was unusually wet, delaying haying and harvesting of crops. Rains have washed out most nutrients from the cut hay, which could not be removed from the wet fields.

The unseasonably cool, cloudy weather in Kelowna has put the grape crop as much as three weeks behind schedule. The peach harvest has been completed, and pear harvesting began during the last week of August. Although most of the fruit crops were picked close to their normal harvesting times, a significant amount of crops in the Okanagan did not escape damage from severe storms. Thunderstorms, with heavy

rain and hail on June 26 and 27, damaged or destroyed between 25 and 35 percent of the fruit crops. On July 4, another cluster of intense thunderstorms, with heavy rain and hail, moved across the southern Okanagan, causing approximately \$7 million of further damage to the fruit crops.

The Prairies are expecting record cereal and oilseed production in 1993, as long as widespread damaging frosts do not intervene.

In May, temperatures in the Prairies started out generally warm, providing a normal start for perennial crops, but by mid-May, and through to June, the temperatures dropped, and frequent frosts occurred. In northeastern Saskatchewan, early May frosts set back emerging cereal crops. Some oilseed and specialty crops were so damaged by frost that they required reseeding. The Peace River region

of Alberta, northwestern and southeastern Saskatchewan, as well as southwestern Manitoba were very dry in May, causing uneven germination and crop stress. In contrast, southwestern Alberta was so wet in May that seeding was pushed back dangerously late. Pastures and haylands were suffering from the cool temperatures and frost during May and early June. Concern was growing over hay supplies, which were of poor quality - the result of frost and drought damage.

June became mostly cool and wet, with below-normal sunshine values. In Manitoba, long season crops, such as corn, were at risk from not fully maturing before the first fall frost. Cool, moist conditions were causing disease concerns for cereals, oilseeds and pulse crops. Crops in the Peace River region of Alberta, and low lying areas of Saskatchewan and Manitoba, were flooded and in poor condition. The rest of

Alberta's cereal and oilseed crops were in fair to excellent condition, and the remainder of Saskatchewan's fall seeded crops were in fair to good condition. Heat was needed to advance all Prairie crops, which had been slowed by the weather and continued to lag behind normal. Continued cool conditions slowed hay crop development in some areas. Rains were beneficial to the drought-stressed fields but delayed the first hay cut.

July continued cool, cloudy and wet throughout the Prairies. Haying in Alberta was at a standstill due to untimely rains. Most crops were 5 to 15 days behind schedule in Saskatchewan and Manitoba. Flooding in southern Manitoba, especially in the Red River Valley area, had caused considerable crop damage. Preventative spraying for disease had become general practice in all regions. Saskatchewan Agriculture was reporting production estimates, of principal field crops, to be 2% above the 10-year (1983-1992) average of 28.65 million acres. They also reported that they were expecting yields for all ma-

jor grains and oilseeds in 1993 to be above average, with *record* yields of winter wheat, spring wheat, oats, barley, spring rye and flax. If these above-average yield estimates are realized, Saskatchewan Agriculture states that 1993 production of the major grains and oilseeds would be 28% above the 10-year average of 20.22 million tonnes.

Cool, wet, cloudy conditions continued to be the norm across the Prairies in August, slowing crop development and pushing back maturation dates one to two weeks. Although crop potential is still reported as good, warm and dry weather is required to pull together a bountiful harvest. Pasture conditions are good in almost all areas. Disease problems are significant in pockets all across the Prairies, but especially in Saskatchewan and Manitoba.

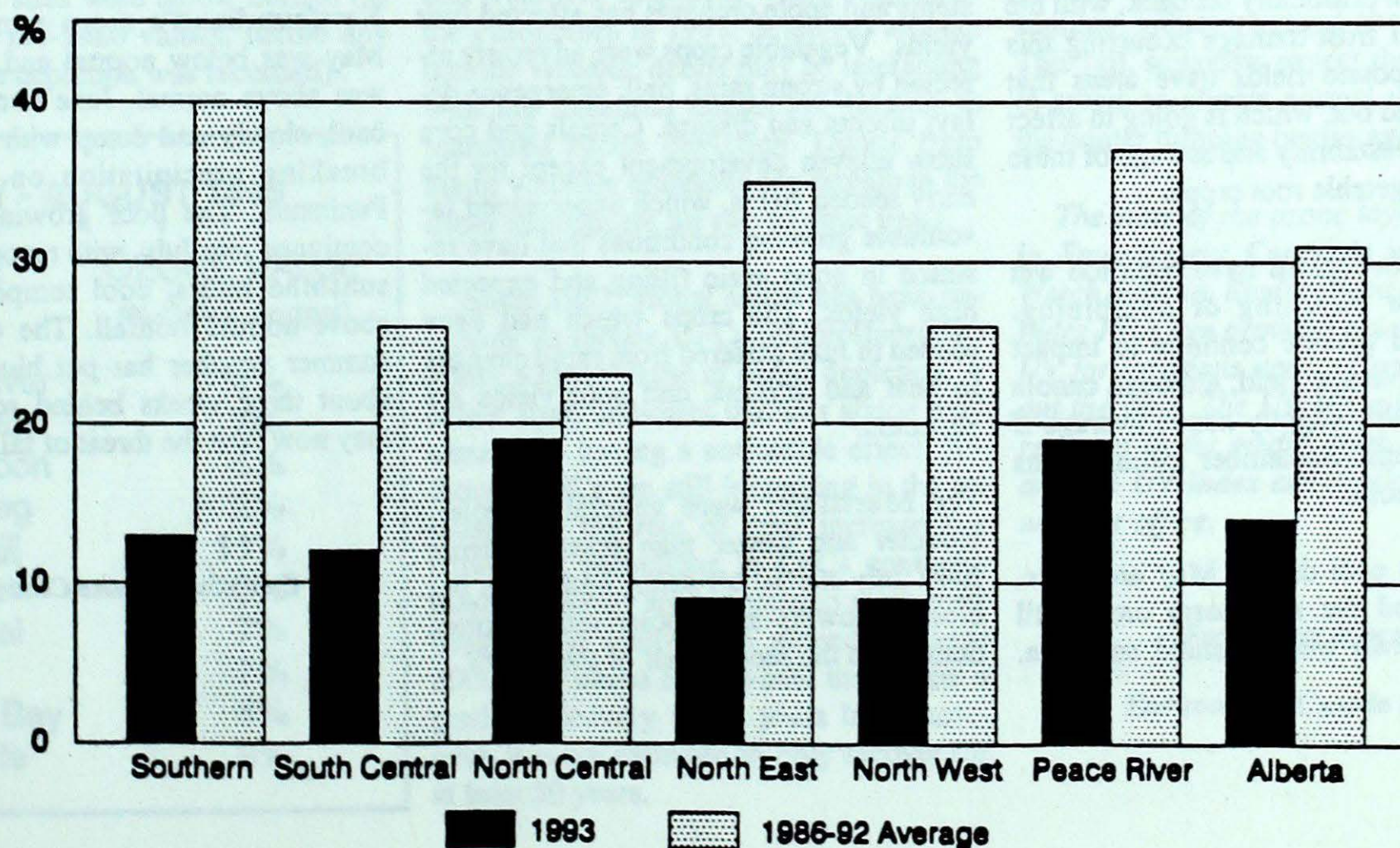
Frost was first reported in central Alberta on the 11th, but caused little damage to the crops. The southeastern districts of Alberta require another two to four weeks of frost-free weather to enable grain

crops to ripen after being slowed down by a very wet spring. In Alberta, some of the first cut hay still needs to be baled and the quality is being rated mostly poor to fair. Second cut hay yields and qualities are expected to be better. By the end of August, only 10 to 15 percent of the grain and oilseed crops were swathed, and no spring crops have been combined - all due to delayed maturation and the rain which has prevented harvesting activity.

Saskatchewan's cool, damp weather is slowing field operations considerably. As of August 31, only 5% of the spring wheat, 3% of the durum, 7% of the oats, 11% of the barley and 29% of the canola have been swathed, and 46% of the fall rye and 14% of the winter wheat has been combined. Across the south, 57% of the fall rye and 18% of the winter wheat is in the bin. Of the specialty crops, 14% of the mustard has been swathed and 4% of the lentils and field peas are down. Some crop deterioration has taken place, due to wet conditions and over maturation. Very slight damage was caused by light frost in various regions

ALBERTA

Percentage of All Crops Swathed by Region at August 30, 1993



of the province, and light hail damage was reported around Hanley.

Manitoba crops are suffering significantly from disease brought on by the very wet conditions. *Fusarium* head blight has infected wheat and barley crops in the Red River Valley and southcentral regions. Leaf diseases and root rot have affected all regions. Flooding in the south-central region has damaged specialty crops. Little progress was made in the swathing of cereals and canola, due to the rains and waterlogged conditions of the fields. A shortage of dairy quality and regular hay is expected, due to poor harvesting and drying weather.

In northwestern *Manitoba*, only a few wheat fields have been swathed and a few combined and dried because their ripening had been delayed. Yields are expected to be below average. Weed regrowth of this-tles has become a major problem in northwestern and central regions, where it has been generally drier than normal this summer.

Central regions have only swathed 10% of cereal acreage and less than half of that has been combined. Pulse crops have been severely affected by the continual wet weather. Sugar beets are waterlogged and corn has been drastically set back, with the possibility of frost damage occurring this fall. Many potato fields have areas that were drowned out, which is going to affect both the harvestability and storage of these and other vegetable root crops.

The eastern regions have been too wet to allow for swathing or combining. Flooding and disease continue to impact on a below-average yield, although canola may have yields slightly above average if disease and mid-September killing frosts do not get a hold.

Ontario was cool during May and June, which delayed the strawberry crop until early July - two weeks behind schedule.

High rainfall totals and cloudy conditions existed through June with most of the precipitation occurring during a few thunderstorm events. The heavy June rains encouraged plenty of crop growth. The warm and sunny July weather, throughout most of *Ontario*, allowed excellent haying conditions, provided a boost to the heat dependent corn and tomato crops and allowed fruits and other vegetables to catch up on the slow growing season to date. July rainfall was adequate for agriculture in most of *Ontario* but exceptionally heavy in northwestern *Ontario*, which received a spill over of the inclement cool and wet *Prairie* weather. Early August harvest of sweet corn saw good quality and sales. *Niagara Peninsula* grapes have an excellent sugar content due to the dry summer. Farmers across the province are expecting plentiful harvests.

Quebec's southwestern agricultural districts experienced warm, sunny conditions in June and July. The hay yields of the first cut were high but the quality was poor. Regrowth of hay was very good. Potato harvests are expected to be good, even though lack of rain, from the end of June to mid-July, had provoked moisture stress, and pest and disease stress was present through July. Strawberry yields were below normal. Winter damage to raspberry stems and apple orchards has affected fruit yields. Vegetable crops were adversely affected by strong rains, hail, emergence delay, insects and disease. Cereals and corn show uneven development except for the early seeded fields, which experienced favourable growing conditions that have resulted in good grain filling and expected high yields. The crops which had been seeded in June suffered from rapid changes in heat and dryness, and poor yields are expected.

The *Maritimes* were generally cooler, cloudier and wetter than normal during June. July started off sunny and warm but cloud, showers and cooler temperatures dominated the second half of the month.

In the *Annapolis Valley*, the wet weather had caused significant damage to vegetable crops. The moisture had encouraged mould and rot, resulting in problems with the quality of produce. This year's crops have suffered the worst moisture problem in several years, but some fields may still produce high yields. Potatoes were doing well but 30 to 80 percent of the broccoli fields suffered from head rot. Many *Valley* trees were damaged or killed by severe cold last winter, and most were subjected to frost and late snow in May. These factors, along with below-normal hours of bright sunshine, limited amounts of heat since the start of the growing season, and the damp summer weather, have slowed the development of fruit trees. The apple crop is expected to be 25% below the 3.5 million bushels of last year's above-average yields, but the apples should be larger this year. The pear, peach and cherry crop yields are also expected to be lighter this year, due to winter damage.

August had below-normal precipitation, with very dry conditions in southern *New Brunswick* causing crop stress. Blueberry fields near Bathurst, N.B. suffered extensive hail damage in mid-August. Temperatures and hours of bright sunshine were mostly above normal.

Newfoundland's mean temperature for May was below normal and precipitation was above normal. June continued to be cool, cloudy and damp with near record-breaking precipitation on the *Avalon Peninsula*. The poor growing conditions continued into July, with record-low bright sunshine hours, cool temperatures and above-normal rainfall. The cool, cloudy summer weather has put blueberry crops about three weeks behind schedule, and they now face the threat of fall frost.

Annette Goessl
Canadian Climate Centre, Downsview

Largest summertime Ozone depletions ever noted

Ozone watch from May - August 1993

A summary of data from measurements taken by Environment Canada shows the thinning of the ozone layer over Canada persisted this summer with the largest summertime depletions ever recorded. The ozone layer was about 7% thinner from May to August, and department scientists expect this may have led to higher UV (ultraviolet) values across the country.

Throughout 1993, the ozone layer over Canada has been thinner than in previous years. This summer, ozone depletion was slightly greater than in previous years, although not as severe as that observed earlier this spring.

Environment Canada now reports regularly on ozone measurements taken from ten sites across the country. For the summer (May to August), the average ozone values for all sites were below normal (as compared to pre-1980 values, before any serious ozone depletion was recorded).

Ozone thinning during the summer is of particular concern, because this is when the sun's rays are most intense and UV values are naturally at their highest. Over exposure to UV rays can increase the risk of sunburn, skin cancer and eye cataracts.

Using Environment Canada's UV Index scale (which generally gives values from 0 to 10), the summer ozone loss increased UV values by about half a point. This means that typical summer values in southern Canada, which are usually high (between 7 and 9 on the UV Index), occasionally entered the extreme range (over 9).

The low ozone values observed throughout 1993 can be attributed to the build-up of industrial chemicals in the atmosphere, as well as lingering volcanic debris from Mt. Pinatubo, which erupted in the Philippines in 1991. Scientists suspect that the volcanic debris may be interacting with the industrial chemicals, leading to increased ozone depletion. Debris from major volcanic eruptions can remain in the upper atmosphere for two to three years.

Since 1987, global action has been underway to reduce CFCs (chlorofluorocarbons), a major cause of ozone depletion. A recent study indicates that this action may already be having a noticeable effect. Although CFCs are still increasing in the atmosphere, the rate of their increase has slowed. If reductions in CFCs continue, these chemicals are expected to reach their peak in the atmosphere around the year 2000. The ozone layer would then begin a gradual recovery a few years later, however, it is not expected to fully recover for at least 50 years.

The federal government is working in partnership with the provinces to reduce CFCs and other ozone depleting substances. Canada played an active role at an international meeting last year in Copenhagen, where the Montreal Protocol - a global agreement to protect the ozone layer - was strengthened. Canada is committed to a phase-out of CFC production and importation by January 1996.

The ozone layer over Canada, which has been gradually thinning over the last decade, has a seasonal cycle of depletion. The greatest thinning occurs in late winter and early spring, lesser depletion is seen in the summer and the least in the fall.

This year has followed the usual cycle, with the greatest thinning observed from January to April, when ozone values averaged about 14% below normal. During the summer, values averaged about 7% below. This fall, scientists expect the ozone layer to return to almost normal values, before the winter thinning begins again.

The state of the ozone layer is reported in Environment Canada's weekly Ozone Watch bulletin. Environment Canada's UV Index Program provides a daily forecast of UV for locations across Canada throughout the year. The UV Index is now widely reported in the media. Both Ozone Watch and the UV Index are available from any weather office.

*For further information contact:
Jim Kerr*

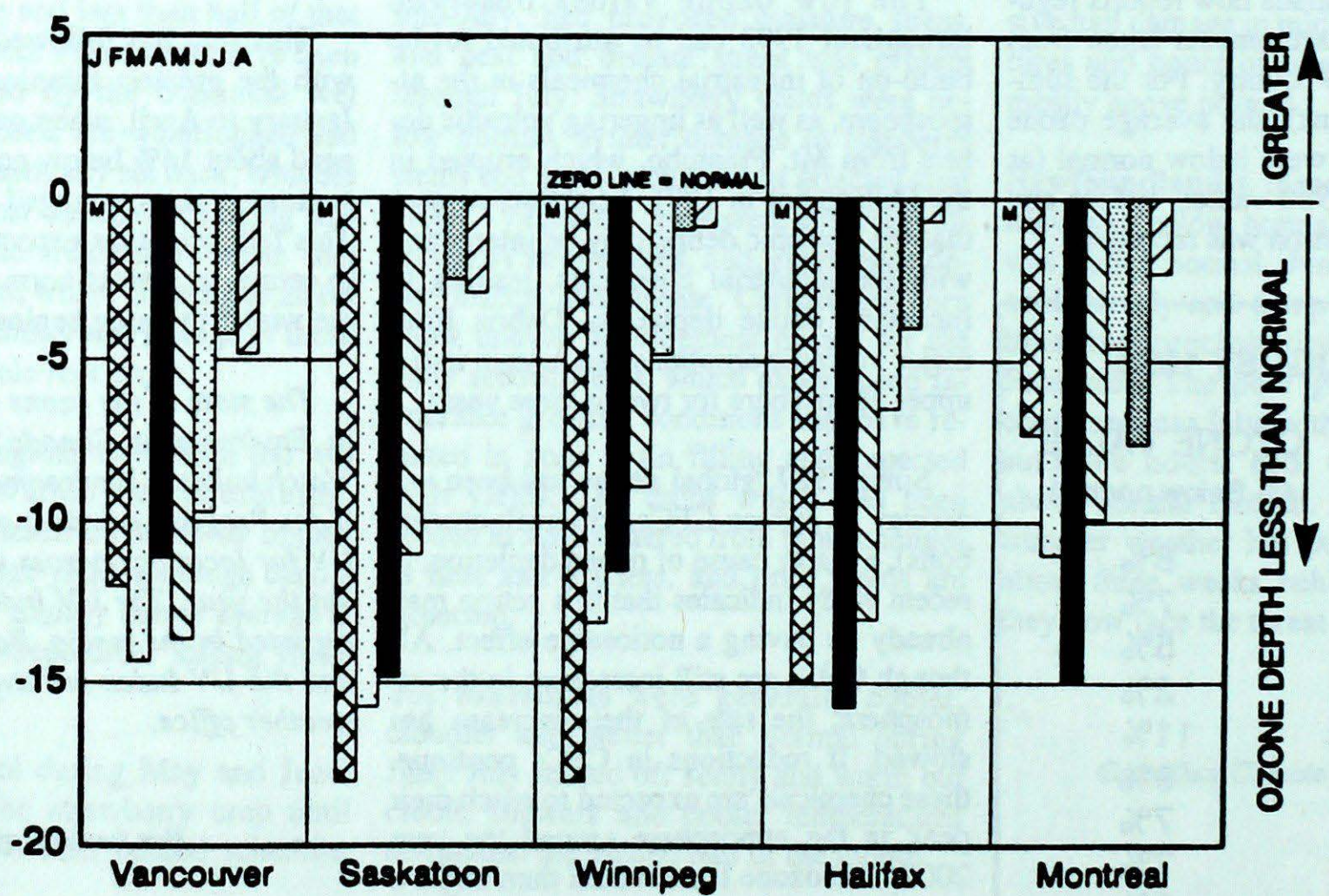
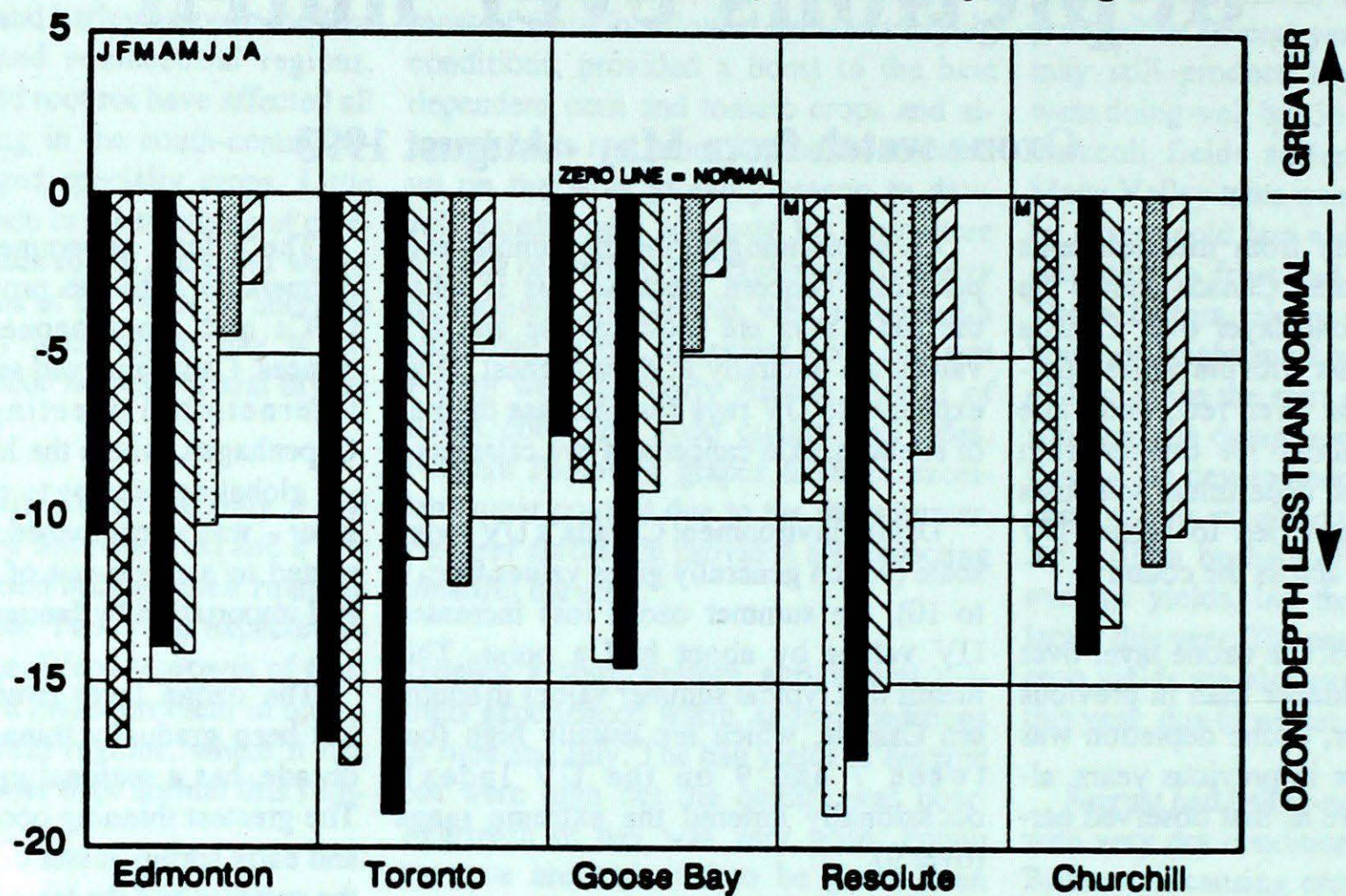
Environment Canada (416) 739-4626

MAY - AUGUST 1993

SITE	OZONE VALUE (% Below normal)
Vancouver	8%
Edmonton	7%
Saskatoon	5%
Winnipeg	2%
Churchill	11%
Toronto	9%
Montreal	7%
Halifax	7%
Goose Bay	5%
Resolute	9%

OZONE WATCH 1993

State of Canada's Ozone Layer - Monthly Averages



M = Insufficient data ZERO LINE = pre-1980 normal



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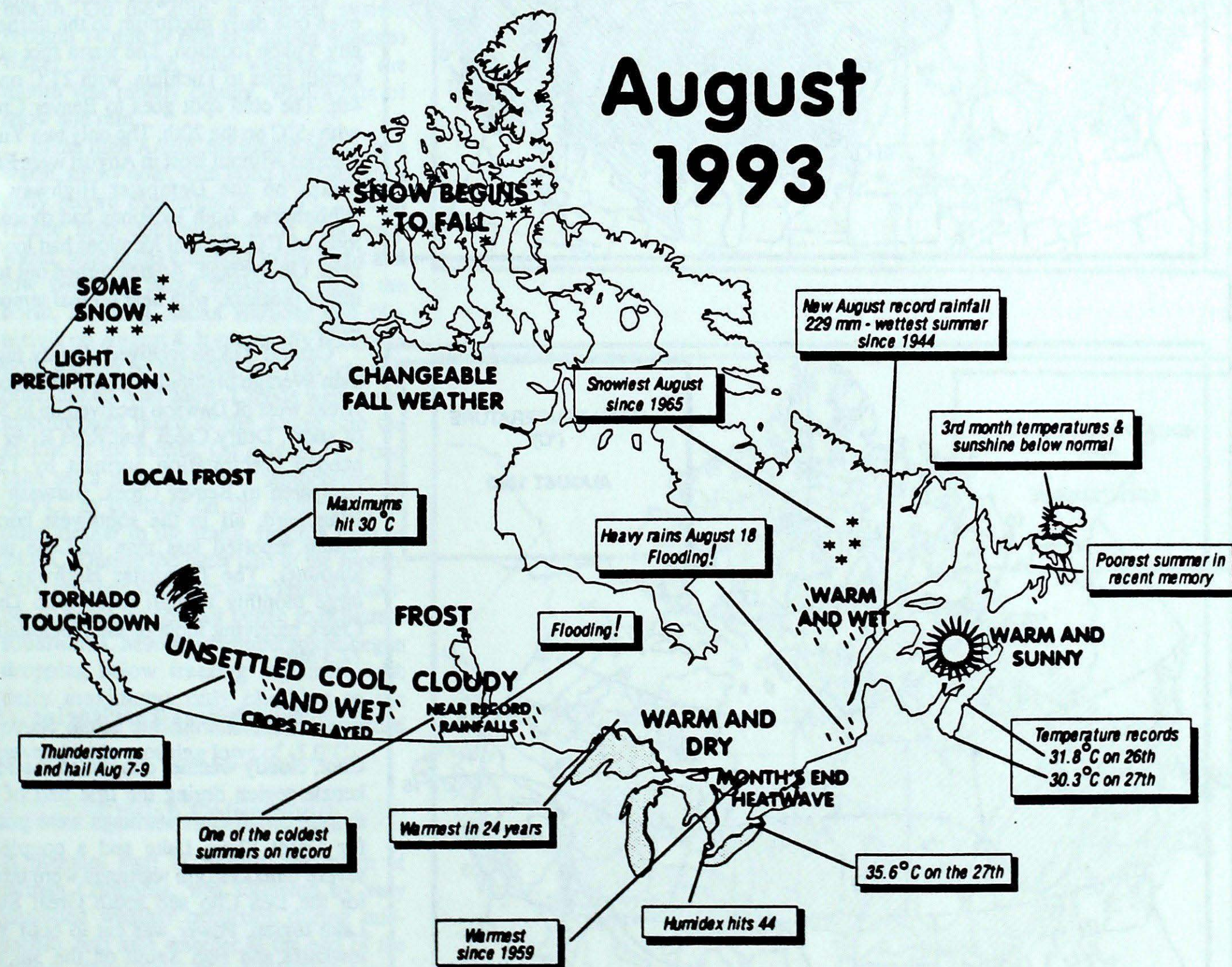
Monthly Review + Summer 1993 Review

August 1993

Vol. 15

CLIMATIC HIGHLIGHTS

August 1993



Across the country

Yukon

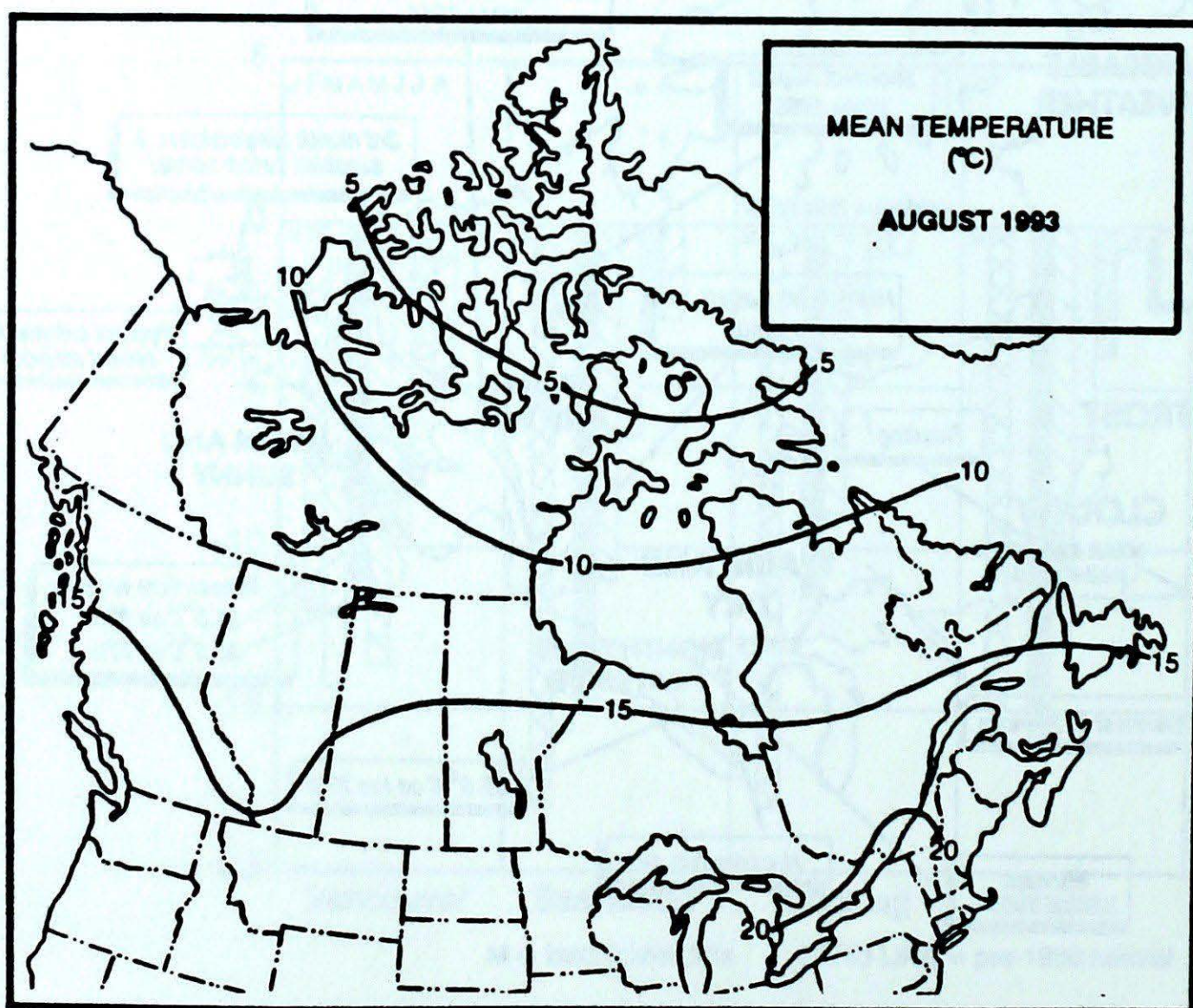
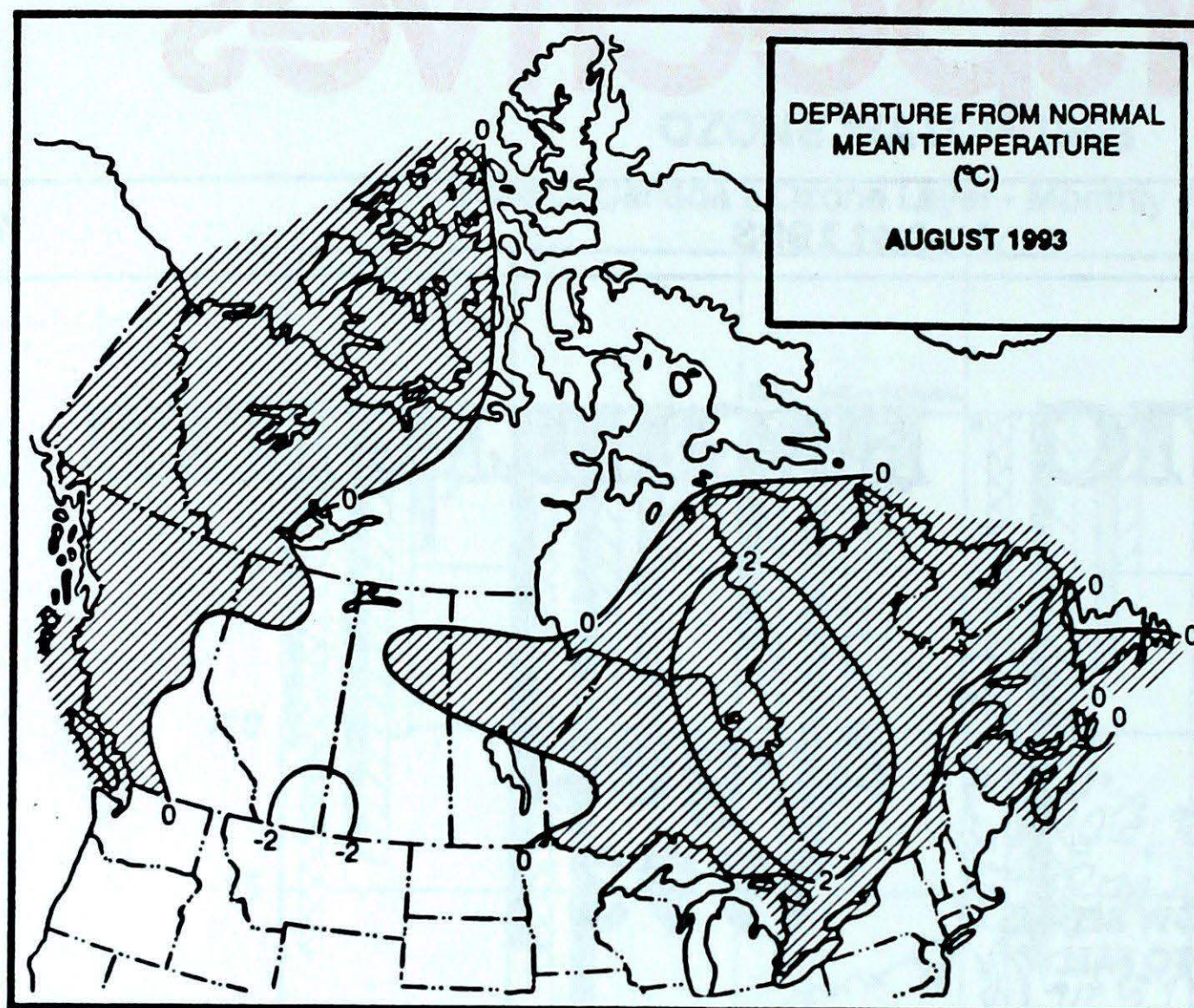
As the rest of Canada was enjoying summer scenery at lake front cabins, backyard pools or by taking walks and having picnics in the park, Yukon residents were treated to a burst of fall colours. In the short span of the month of August, fireweed bloomed to the top and turned a rust red, hill sides blazed with yellows and oranges, and twice the mountain tops were dusted with snow. A gentle reminder that fall is nearby.

The month of August failed to produce even one daily maximum in the thirties at any Yukon location. The warm spot of the month goes to Tutchitua, with 27°C on the 4th. The cold spot goes to Beaver Creek, with -5°C on the 20th. The only two Yukon stations without frost in August were Eagle Plains on the Dempster Highway and Whitehorse. Both locations had overnight lows of 1°C. Several locations had lows of zero. On average, August turned out to be rather pleasant, with near normal temperatures.

Central Yukon received slightly higher than average precipitation over the month. Areas west of Dawson received up to 5 cm of snow. Drury Creek and Ross River exceeded precipitation normals by 150% compared to Beaver Creek, Burwash and Blanchard, all in the southwest corner, which reported less than half the usual amounts. The Dempster Highway had large monthly rainfall totals with Drury Creek receiving most of the precipitation, 72.3 mm.

Northwest Territories

Cool, cloudy weather dominated the Mackenzie region during the first part of the month. Small craft warnings were posted for Great Slave Lake and a couple of severe thunderstorm warnings were issued for the Deh Cho and south Great Slave Lake region. Power was cut to both Yellowknife and Fort Smith on the 5th. On August 11, Hay River set a new record minimum of 1.1°C, while the next day Fort Smith set its own record at -1.1°C. By the



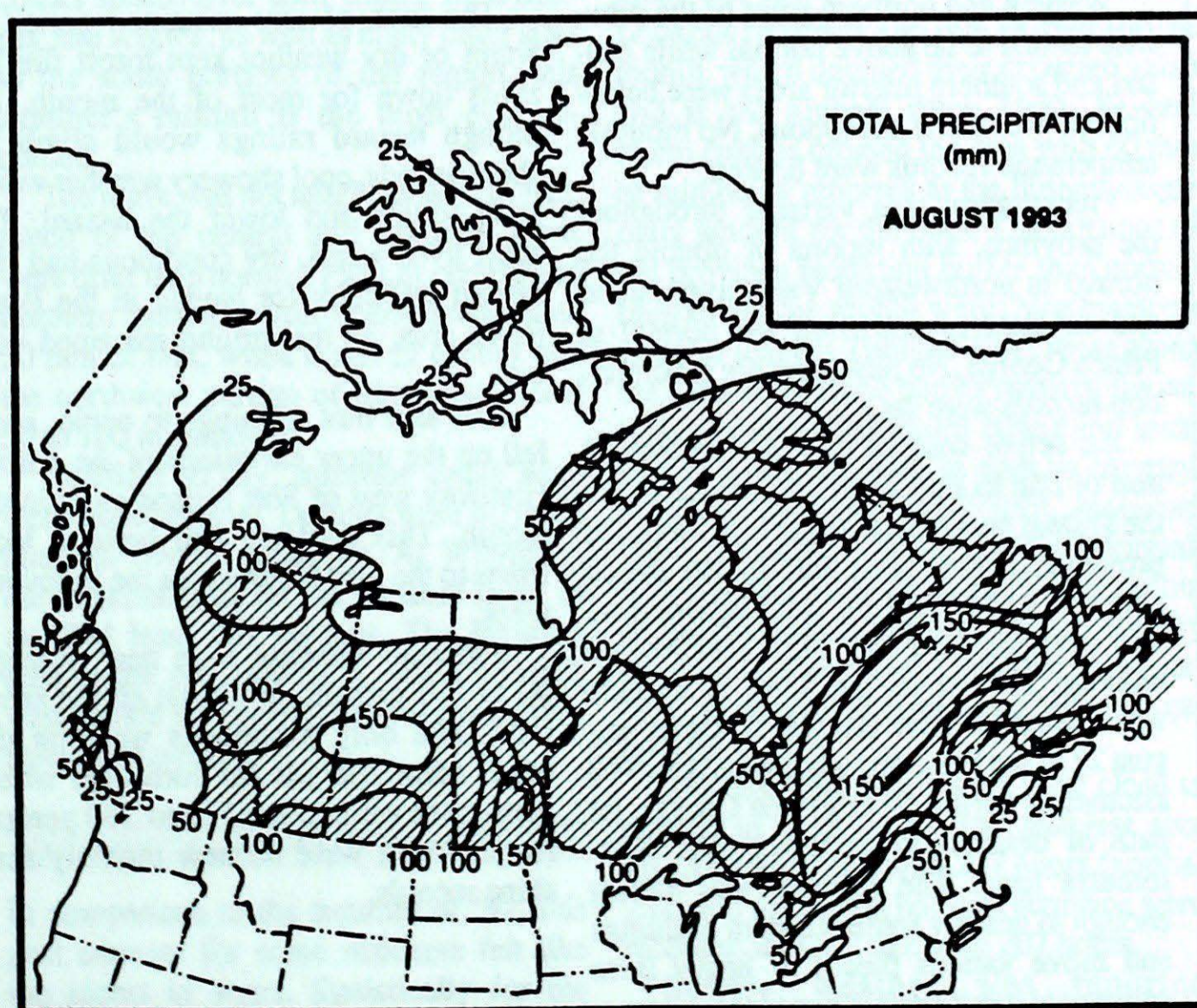
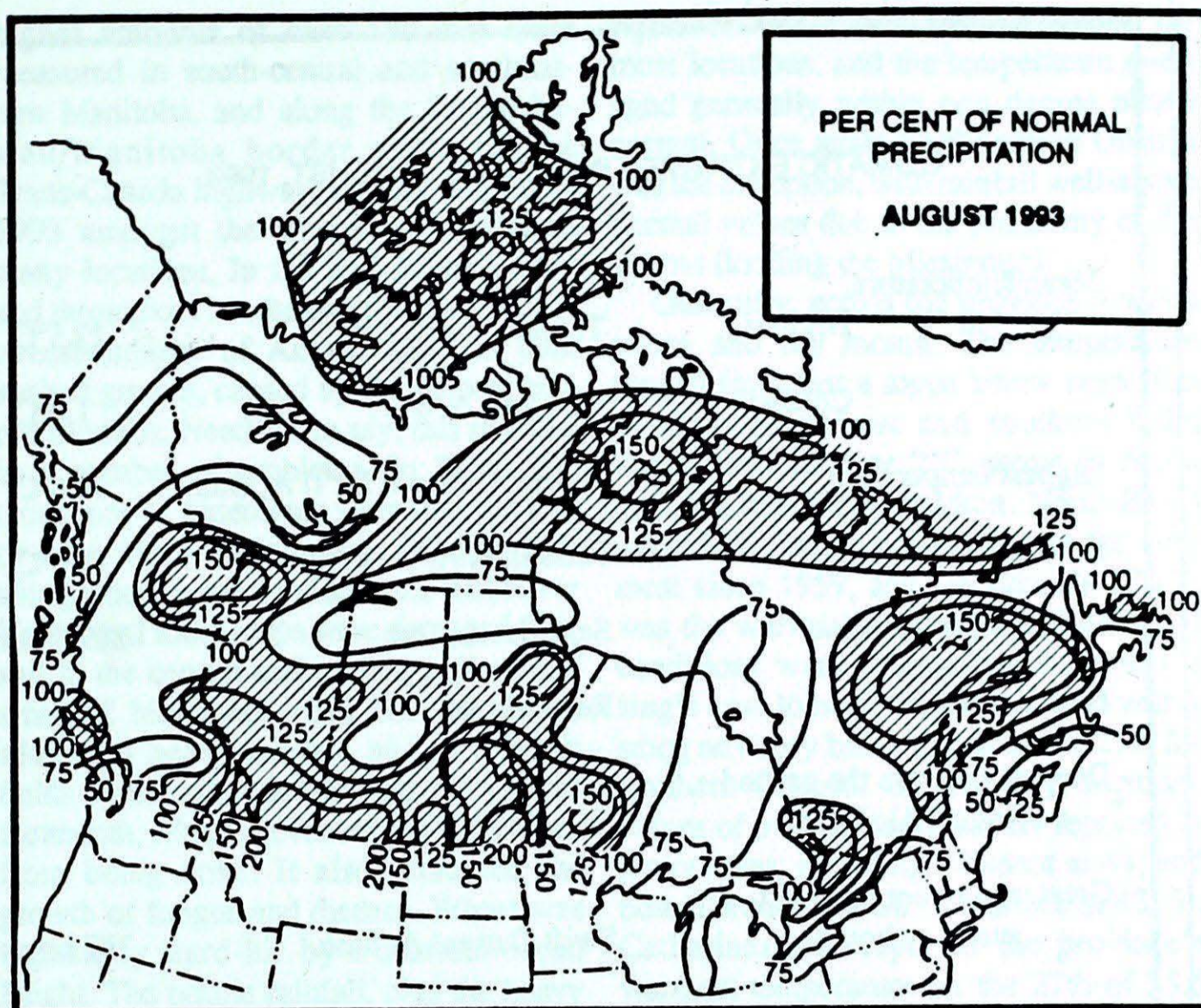
2nd week most of the cool weather had left the region and by the 15th, highs were reaching the mid to upper twenties. Fort Simpson reached 30°C on the 21st. Towards month's end cooler weather moved back into the area, with drizzle and fog reported in the Delta. The last few days of the month saw cloudy skies, scattered showers and highs in the mid-teens.

The Keewatin started out sunny, but a major storm tracked through the region during the first half of the month. Temperatures cooled off from the mid-twenties as cloud and rain became more common. Sunshine returned during the middle of the month. On the 20th, a weather system brought 14 mm of rain and strong winds to Baker Lake. The final weekend of the month was mostly cloudy, with a mix of snow and rain.

In the high Arctic, the month began on a warm, sunny note, with Pond Inlet setting a daily record maximum of 12.6°C. Baffin Island also continued to be relatively warm, with highs climbing to the teens and low twenties. Snow moved in from the north, reaching Sacks Harbour and Nanisivik on August 4. It eventually became a little warmer by the 10th, but rain was still often mixed with snow. Clouds were common through much of the Arctic into the middle of the month. On August 14, Pond Inlet set a new daily low temperature of -2.3°C. In contrast on the 15th, Coppermine further to the south, reach a high of 24.8°C. During the latter part of the month, wind and gale warnings were issued a number of times, as cold air began to penetrate southwards. Minimum temperatures began dropping below freezing regularly, with daily maximums only climbing to the single digits. By the 25th, Alert recorded several early morning lows of -5.0°C.

British Columbia

A pleasant start to August, for much of British Columbia, was followed by very unsettled weather occurring during mid-month, and nice weather at the end of the month. There were few significant departures from the long term averages of temperature, precipitation and sunshine.



CLIMATIC EXTREMES IN CANADA - AUGUST, 1993

Mean temperature:		
Highest	Toronto (City), Ont.	22.5°C
Coldest	Resolute, N.W.T.	1.0°C
Highest temperature:	Toronto(Pearson Int'l) A, Ont.	34.6°C
Lowest temperature:	Pond Inlet A, N.W.T.	-4.4°C
Heaviest precipitation:	Sept-Îles A, Ont.	229.4 mm
Heaviest snowfall:	Resolute A	25.5 cm
Deepest snow on the ground on August 31, 1993	Hall Beach A	1 cm
Greatest number of bright sunshine hours:	Swift Current A, Sask.	287 hours

Western and northern areas of the province tended to be above normal while central and southern interior areas were below normal with some exceptions. No monthly temperature records were broken.

Precipitation was variable throughout the province, with reports of double the normal in northwestern Vancouver Island and as little as one third the normal at Prince George. No new monthly precipitation records were set.

An active weather system brought 64 mm of rain to Port Hardy on the 22nd. As the system pushed across the interior of the province, heavy rains fell in the Peace country, where Fort St. John reported 41 mm over the 23rd and 24th. Fort Nelson reported 25 mm on the 23rd. A tornado was reported to have touched down on August 22 in the Hoodoo Lakes area, about 40 kilometres northwest of Prince George. Its path of destruction stretched over a kilometre long. The tornado was strong enough to destroy some old farm buildings and move various pieces of heavy farm equipment considerable distances.

The lack of any sustained period of warm or dry weather kept forest fire hazards down for most of the month. Although hazard ratings would climb for short periods, cool showery weather would soon follow and lower the hazard. The short lived warm, dry conditions had also caused difficulty for haying in the Peace River area, as the ground remained very wet.

Just as a hint of things to come, snow fell on the upper elevations of the Alaska Highway west of Fort Nelson early in the month. This cool air also brought local frosts to the Fort Nelson area the following week.

Sunshine amounts were near average, 90 to 110 percent, in almost all the province. The only exceptions were on the north coast and the far northwest where departures were in the 130 to 140 percent range. There were no new monthly sunshine records.

Alberta

At the beginning of the month, clouds and showers lingered across the south, while northern residents made the most of the long holiday weekend under mainly sunny skies. The circulation shifted more northwesterly by the 3rd of the month, bringing smoke from forest fires in the Mackenzie Valley to all areas. Visibilities were frequently reduced to near zero by smoke and fog, especially in the early morning hours. Seasonal temperatures rounded out the first week, as relatively warm air flooded across the province.

A cold front, sweeping southward over the province produced numerous thunderstorms from August 7 to 9. Cochrane received 25 mm hail, with numerous reports of golf ball size hail from the Swan Hills south to Calgary. A cold upper low crossed the continental divide on the 7th, spilling cool, moist air over the north, and giving rainfall amounts of 30 to 50 millimetres. As the system drifted southeastwards towards Saskatchewan, cooler air blanketed the remainder of Alberta. Golf ball size hail caused crop damage in the St. Paul area. Frost was reported at a few locations on the 11th, with numerous record-low temperatures set across the north, as a cool ridge of high pressure moved in from the northwest. Cool, unstable air remained over Alberta, triggering showers daily.

After mid-month, an intense disturbance moved northwards from Washington state, bringing rain. Reports of 20 to 75 millimetres were received from the southern locations, with Lethbridge recording a new 24-hour rainfall record of 71.1 mm on the 16th. An upper ridge built southward over the entire province by the 17th, bringing with it a glimmer of hope for better things to come, as temperatures reached 30°C at Fort McMurray and Lloydminster on the 21st.

On the final week of the month, yet another cold low pressure system moved eastwards into Alberta, bringing more clouds and showers. Numerous funnel clouds were sighted between Wabumun and Edmonton. Residents in southern Edmonton reported their lawns were white with hail on the morning of the 24th. As

the area of rain slid southeastwards, most locations reported 20 to 30 millimetres of rain; Cold Lake received 73 mm. Frost occurred through the north-central districts on August 25 and 26. The remainder of the month followed a familiar pattern, morning sunshine giving way to afternoon showers.

Saskatchewan and Manitoba

The month of August could best be described as cool, cloudy and wet, with temperatures below normal throughout most of the region. Only a portion of east-central and northern Manitoba reported temperatures that were above normal. Maximum temperatures were especially cool, as cloudy skies seemed to blanket the region. Patchy frost occurred during the last three days of the month, producing chilly readings of -2.0°C and -1.8°C at Roblin and Wasagaming, Man., respectively. The frost was not widespread, and there was little crop damage reported.

This summer was among the coldest on record in the southern Prairies, following the same cool pattern as the summer of '92. Days with maximum temperatures of 30°C or more were rare, and only occurred at a few locations. Extreme maximums for the month were mainly in the upper twenties. Ironically, the warmest area was across the north, where temperatures averaged near normal. Churchill had a mean temperature that was actually 0.4°C higher than normal, the only such location in the region. The cool weather put a damper on the agricultural sector. Most crops were 5 to 15 days behind schedule, and many farmers were concerned about an early killing frost, which would end the growing season. So far, the 1993 growing season is similar to the cool growing period of 1992, with the addition of near record rainfalls.

Much like July, most of the southern part of the region received measurable rainfall on two out of three days this month. Precipitation was heavy at times, and in the final tally, parts of southern Manitoba and Saskatchewan received between 2 and 3 times their normal monthly rainfall for August. Amounts were generally over 100 mm throughout the south, but

higher amounts of over 150 mm were measured in south-central and southeastern Manitoba, and along the Saskatchewan/Manitoba border north of the Trans-Canada highway, making August of 1993 amongst the wettest on record at many locations. In the Red River Valley and throughout southeastern Manitoba, the overabundance of August rain fell onto soaked ground, caused by July's near record rainfalls. Needless to say, this resulted in a number of problems. In Winnipeg, thousands of basements were flooded two or three times this summer. Many vegetable gardens were flooded in the Red River Valley and some crops were damaged. The soil in the central and eastern agricultural areas of Manitoba could not absorb the additional heavy rainfall, and as a result fields remained water-logged throughout the month, which prevented any field work from being done. It also promoted the growth of fungus and disease. Wheat was especially hard-hit by Fusarium Head Blight. The prairie rainfall, plus the heavy rains in the Dakotas, pushed the Red River to near the flood stage. Local streams and creeks spilled over their banks. In Winnipeg and Regina, as well as many other sites in the south portions of the region, this summer's rainfall is the most ever recorded.

The north was not nearly as wet. In fact, much of the central and northern areas were drier than normal. Parts of central and northern Saskatchewan received more than 50 mm of rain, while much of central and the northwest portion of Manitoba tallied 50 to 100 millimetres.

Needless to say, sunshine totals were well-below normal. Deficits were 40 to 60 hours at several locations. At Winnipeg, the sunshine total for the summer ranks as the 2nd least this century. The sunniest area in the two provinces was Churchill, where there was nearly 10 hours more sunshine than usual.

Ontario

In comparison to the summer of '92, this past summer for some residents felt like the nicest in years. Statistically for the months of June, July and August, total pre-

cipitation was within 10% of normal for most locations, and the temperature averaged generally within one degree above normal. Once again northwestern Ontario was the exception, with rainfall well-above normal values due to the proximity of the storms flooding the Mississippi.

Generally, across the province it was a warm and dry month. The temperature ranged from just a touch below normal in extreme Northwest and southern Lake Huron area to over 2°C above in North Bay, Earlton and Geraldton. North Bay's mean temperature of 19.4°C was the warmest since 1959, and Geraldton's 17.1°C was the warmest in 24 years. Hot, humid conditions were sparse, but there was a single case to note, which ended up with a smog advisory being issued on the 27th for southern Ontario. On that day, humidex values of over 40 degrees were reported in many areas, including Windsor at 44, and both Toronto and St. Catharines at 43. St. Catharines also reported the province's warmest temperature on the 27th of 35.6°C .

Rainfall was low over most of the province, but there were exceptions. Sioux Lookout recorded 186 mm of rain for the month, which doubled their expected value and is the highest since 1962. Several storm centres crossed the area with 40 mm of rain being reported as the highest single daily amount for the 25th. The portions of the province recording higher than normal rainfall for the month were: Northwestern Ontario (except Thunder Bay) areas along the Quebec-Ontario border north of the national capital, Manitoulin Island and areas east of Georgian Bay in cottage country. Kingston was the driest spot, receiving only 29 mm or 35 percent of their normal, which is the lowest since 1967. Reports out of the Niagara Peninsula indicate the dry summer will be vintage year for wine-makers, as the grapes have an excellent sugar content.

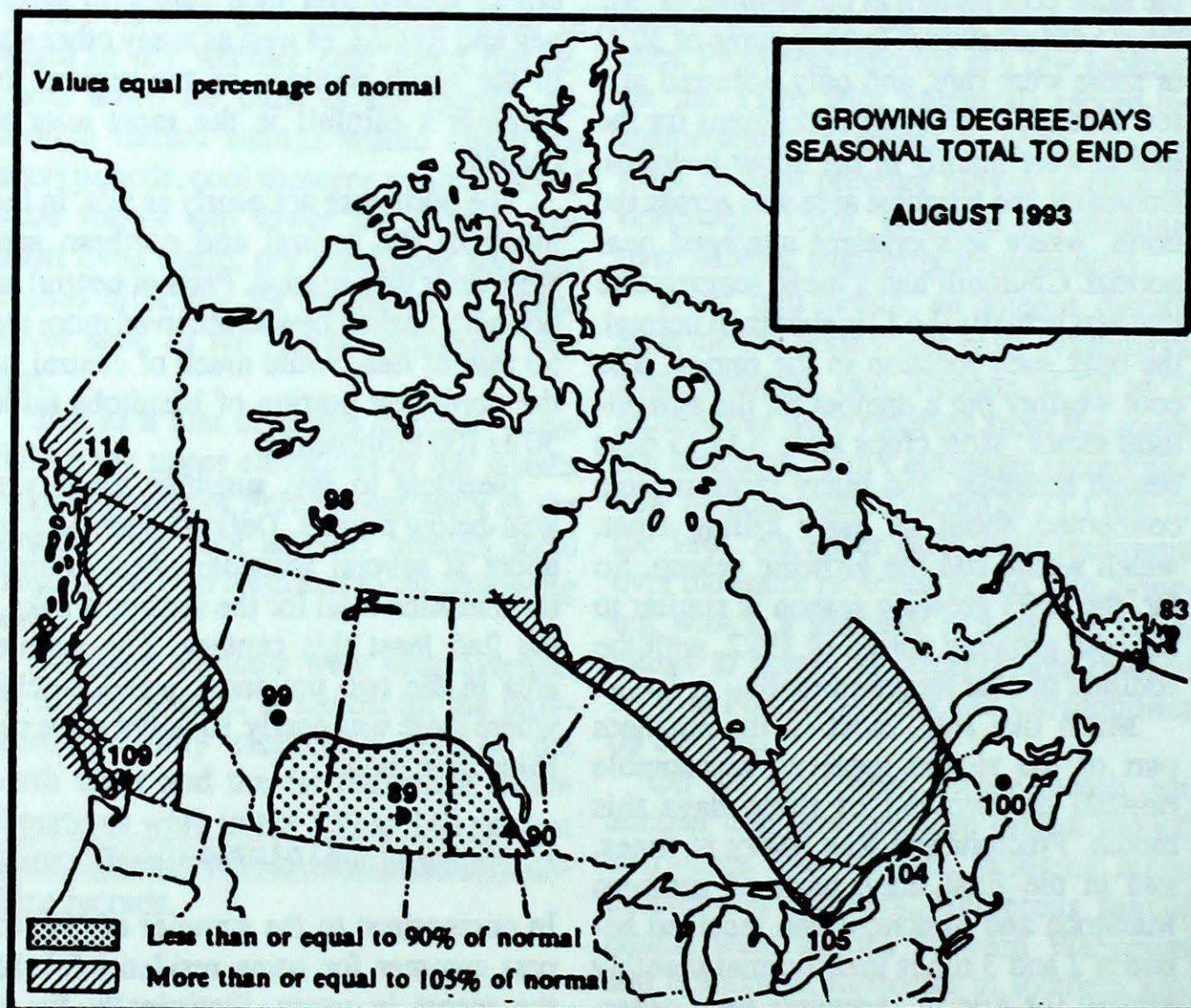
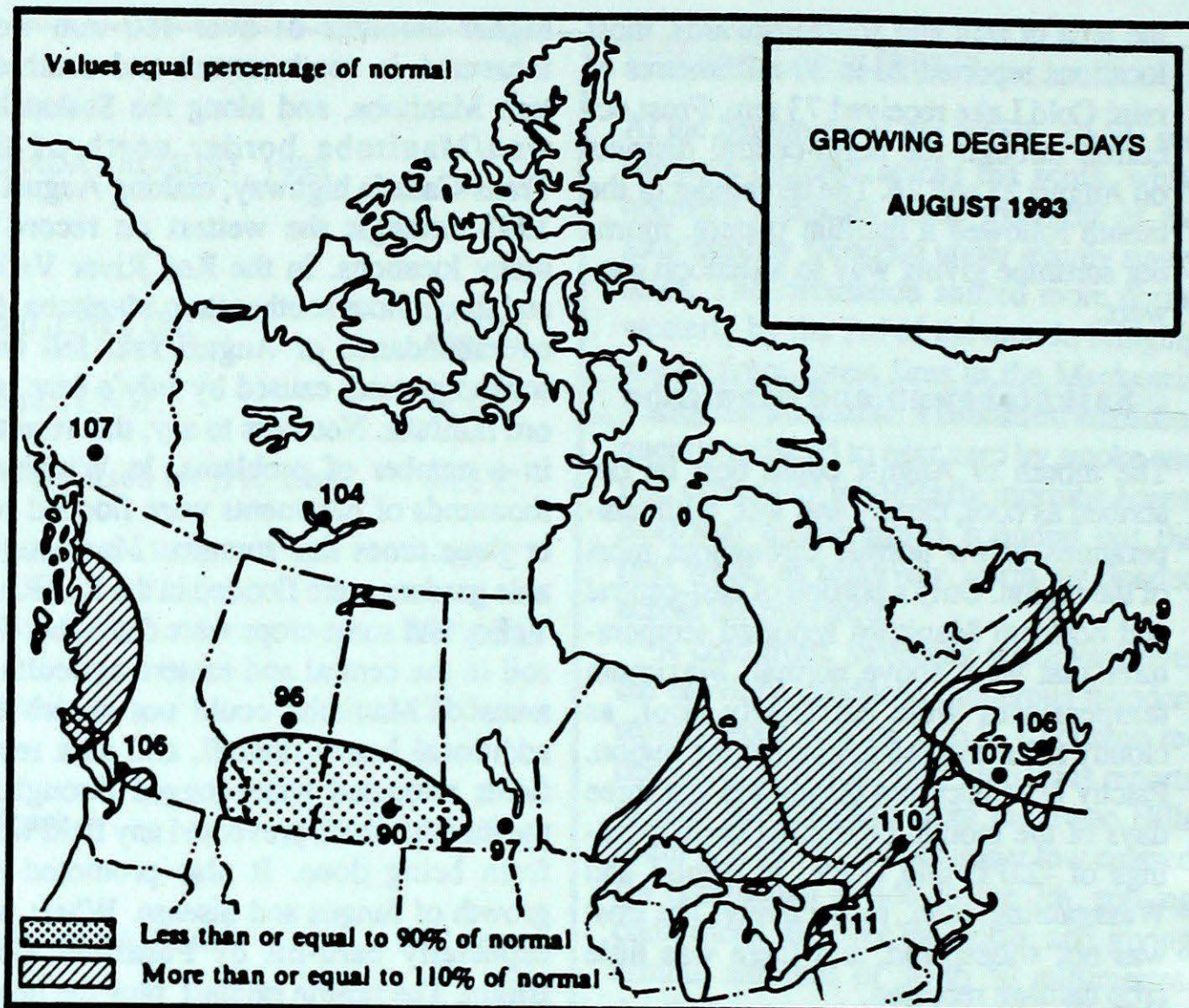
The sunshine hours were very close to normal in most areas. The sunniest spot was St. Catharines with 277 hours (normal 252) and the lowest hours of sunshine were recorded in Red Lake with 202 hours.

Severe weather was reported throughout the month with the most inci-

...continued on page 22

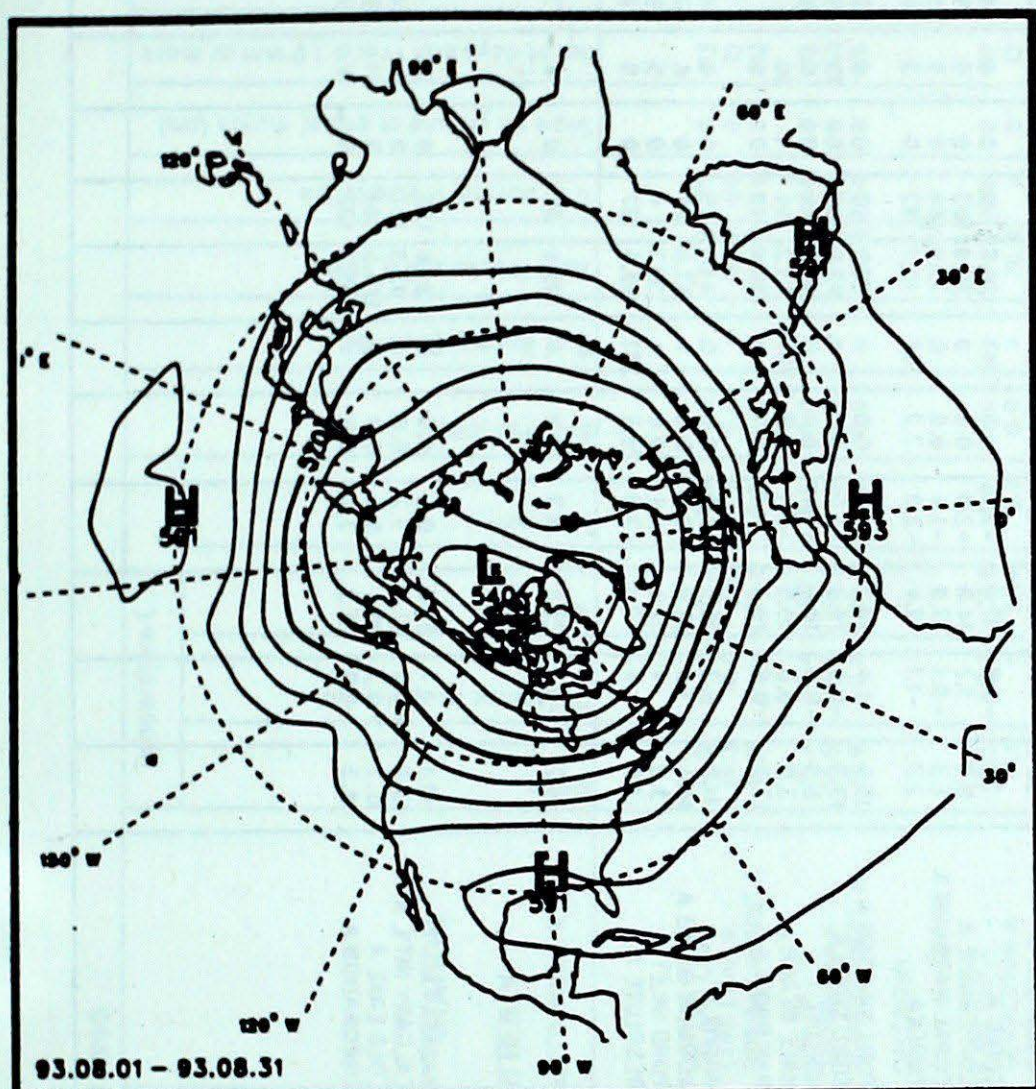
SEASONAL TOTAL OF GROWING DEGREE-DAYS TO END OF AUGUST

	1993	1992	NORMAL
BRITISH COLUMBIA			
Abbotsford	1457	1705	1276
Kamloops	1586	1964	1539
Penticton	1612	1872	1582
Prince George	1150	1073	969
Vancouver	1435	1662	1314
Victoria	1333	1443	1206
ALBERTA			
Calgary	978	*	1056
Edmonton Mun.	1225	*	1232
Grande Prairie	1100	*	1054
Lethbridge	1181	*	1315
Medicine Hat	1296	*	1465
Peace River	1095	*	1020
SASKATCHEWAN			
Estevan	1159	1004	1406
Prince Albert	1097	836	1161
Regina	1183	1038	1331
Saskatoon	1119	917	1296
MANITOBA			
Brandon	1118	946	1306
Churchill	343	89	303
Winnipeg	1156	1037	1287
ONTARIO			
London	1591	1244	1526
North Bay	1402	703	1269
Ottawa	1648	1462	1541
Thunder Bay	1040	841	1071
Toronto	1609	1407	1534
Trenton	1573	1366	1541
Windsor	1865	1637	1756
QUEBEC			
Baie Comeau	907	594	908
Maniwaki	1297	1182	1298
Montréal	1635	1515	1579
Québec	1453	1275	1337
Sept-Îles	764	685	769
Sherbrooke	1344	1015	1233
NEW BRUNSWICK			
Fredericton	1299	1213	1301
Moncton	1141	1059	1176
NOVA SCOTIA			
Sydney	1101	1009	1101
Yarmouth	1114	990	1079
PRINCE EDWARD ISLAND			
Charlottetown	1081	1056	1151
NEWFOUNDLAND			
Gander	559	538	695
St. John's	543	660	651
Stephenville	925	767	935

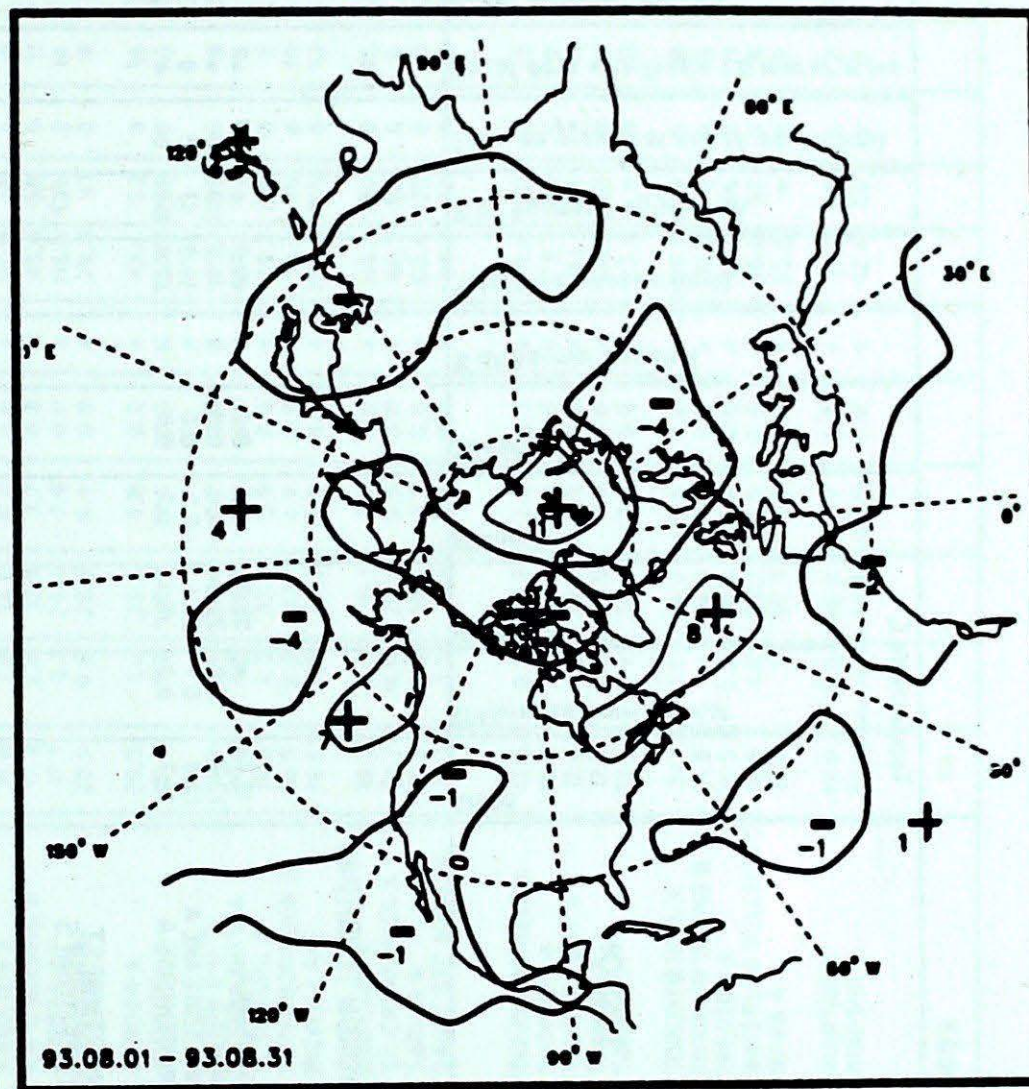


50-kPa ATMOSPHERIC CIRCULATION

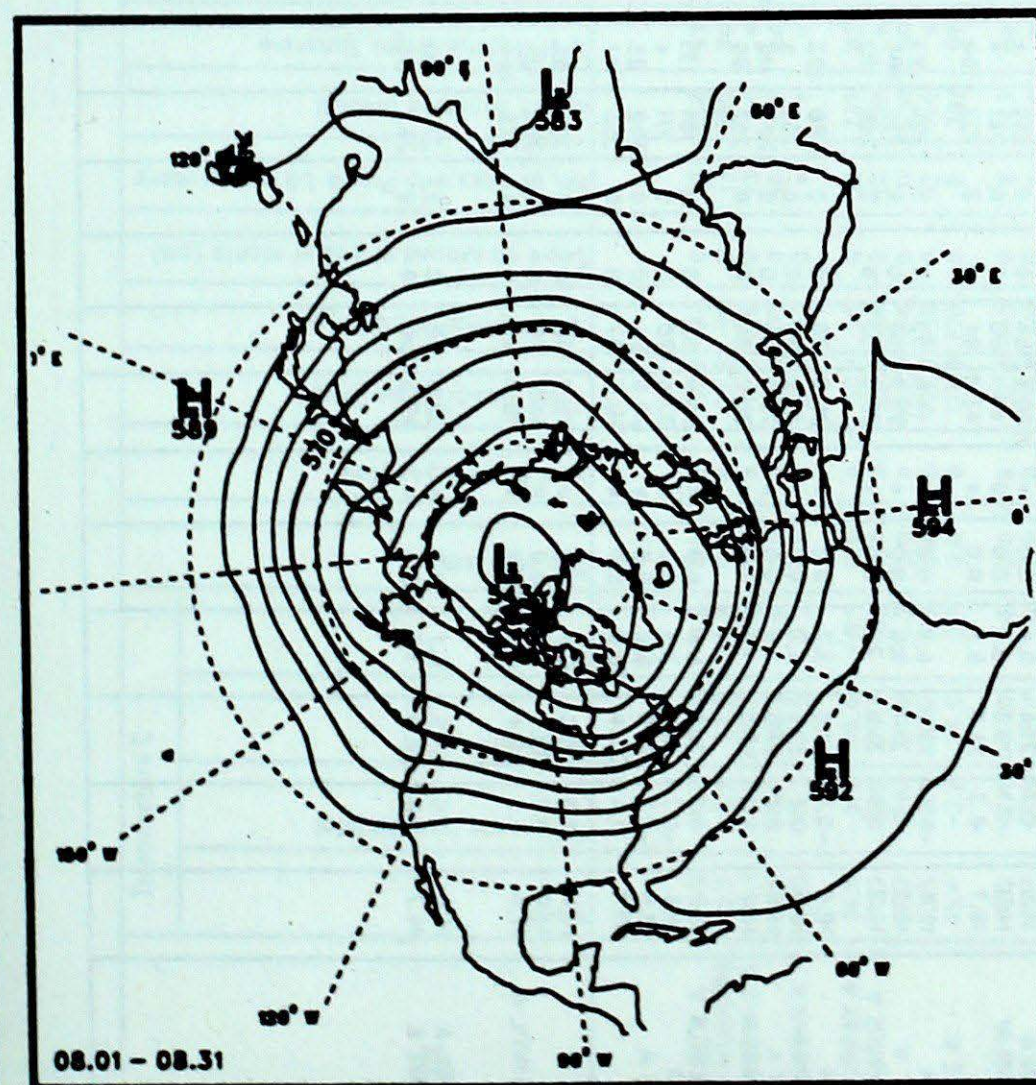
August 1993



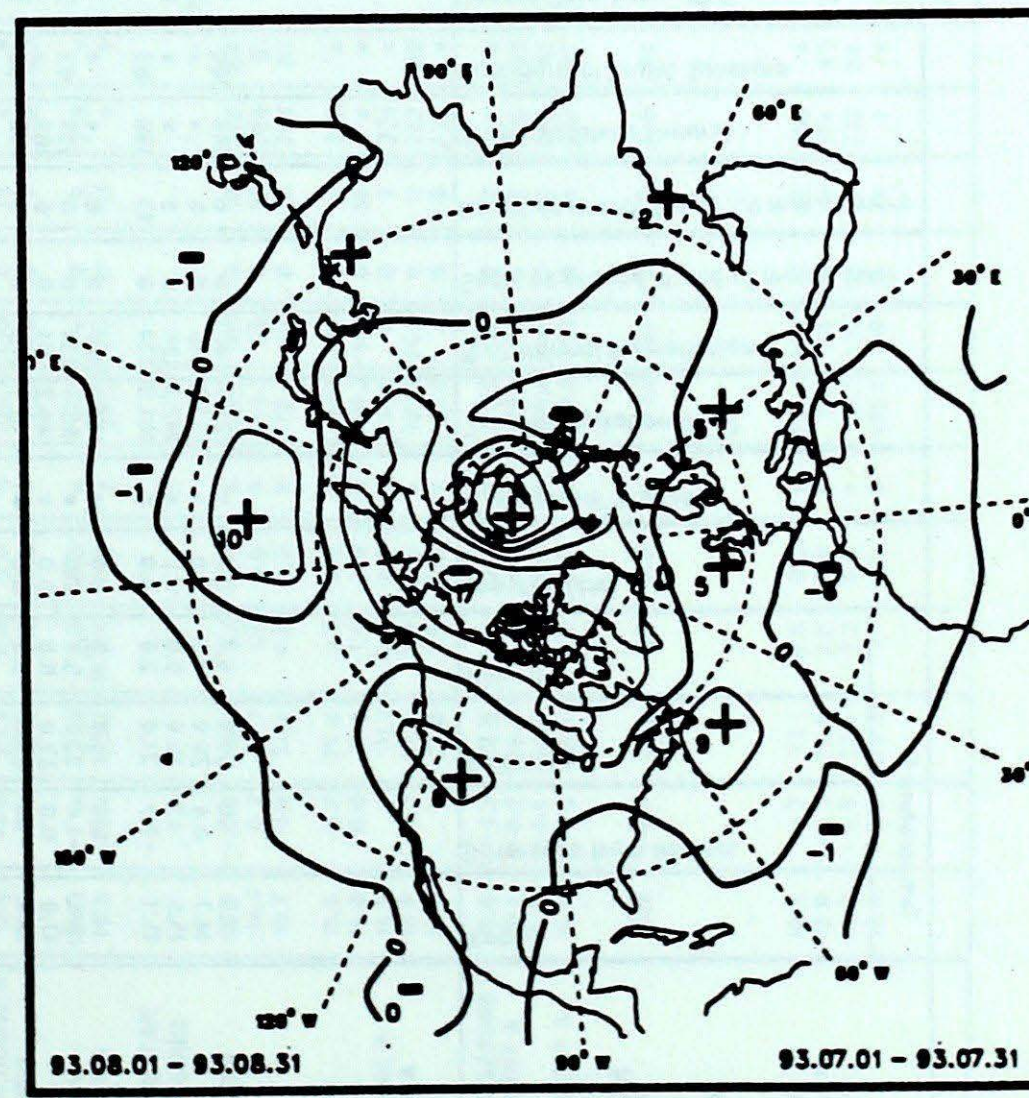
Mean geopotential heights
- 5 decametre interval -



Mean geopotential height anomaly
- 5 decametre interval -



Normal geopotential heights for the month
- 5 decametre interval -



Mean heights difference w/r to previous month
- 5 decametre interval -

AUGUST 1993

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									
BRITISH COLUMBIA													
ABBOTSFORD A	17.9	1.0	33.9	6.2	0.0	*	25.3	45	0	6	246	100	32.9
ALERT BAY	14.7	0.4	29.0	7.7	0.0	*	77.2	116	0	6	*	*	100.8
AMPHITRITE POINT	15.5	1.2	26.6	9.0	0.0	*	142.2	126	0	5	*	*	85.3
BLUE RIVER A	15.3	-0.7	31.0	2.6	0.0	*	101.3	131	0	13	199	88	*
CAPE SCOTT	14.1	0.6	19.0	10.8	0.0	*	95.1	84	0	8	*	*	*
CASTLEGAR A	18.4	-1.4	32.7	5.4	0.0	*	60.4	131	0	6	255	93	33.3
COMOX A	17.8	0.8	33.0	8.8	0.0	*	49.2	111	0	6	289	*	37.2
CRANBROOK A	15.6	-1.9	28.5	3.6	0.0	*	42.7	113	0	9	275	99	81.8
DEASE LAKE	11.9	0.3	26.8	-1.1	0.0	*	24.8	47	0	8	229	113	189.5
FORT NELSON A	15.5	0.7	31.4	0.4	0.0	*	100.6	164	0	9	259	*	98.1
FORT ST JOHN A	14.3	-0.1	28.8	3.2	0.0	0	60.1	100	0	8	247	*	120.6
HOPE A	18.7	0.3	35.8	8.8	0.0	*	47.3	94	0	8	222	100	26.6
KAMLOOPS A	19.4	-0.4	33.2	6.9	0.0	*	14.6	53	0	5	259	93	16.6
KELOWNA A	18.2	0.1	31.7	5.8	0.0	*	33.0	102	0	6	270	104	29.5
MACKENZIE A	14.3	0.5	31.5	2.1	0.0	*	80.8	152	0	8	246	102	119.3
PENTICTON A	19.0	-0.5	33.9	5.7	0.0	*	20.8	78	0	2	280	103	21.4
PORT ALBERNI A	18.0	0.4	35.3	4.5	0.0	*	45.2	104	0	6	252	*	30.5
PORT HARDY A	14.6	0.8	27.5	7.7	0.0	*	79.5	115	0	6	203	110	104.8
PRINCE GEORGE A	14.4	0.3	30.0	1.5	0.0	*	20.2	30	0	6	252	99	116.8
PRINCE RUPERT A	13.7	0.7	24.1	6.6	0.0	*	86.4	52	0	11	181	131	131.4
PRINCETON A	16.4	-0.7	31.6	2.5	0.0	*	32.6	128	0	5	271	*	*
REVELSTOKE A	17.6	-0.2	31.0	6.9	0.0	*	28.6	54	0	9	208	85	45.3
SANDSPIT A	16.1	1.4	23.4	10.9	0.0	*	28.4	57	0	6	256	147	50.7
SMITHERS A	14.4	0.3	30.9	1.9	0.0	*	39.3	90	0	5	224	96	118.0
TERRACE A	17.0	1.2	32.9	7.4	0.0	*	44.5	70	0	6	253	125	59.2
VANCOUVER INT'L A	17.6	0.5	29.4	9.3	0.0	*	19.0	46	0	4	265	104	33.8
VICTORIA INT'L A	16.6	0.5	31.6	6.7	0.0	*	12.8	48	0	2	277	101	59.5
WILLIAMS LAKE A	14.2	-0.8	28.6	1.7	0.0	*	45.3	106	0	9	263	94	118.8
YUKON TERRITORY													
DAWSON A	12.7	*	25.7	-1.2	0.0	*	49.5	*	*	*	*	*	*
MAYO A	13.2	0.6	25.9	-0.6	0.0	0	45.2	109	0	*	*	*	*
WATSON LAKE A	13.8	0.7	27.4	-0.5	0.0	*	19.8	47	0	9	237	104	144.9
WHITEHORSE A	12.7	0.2	26.1	0.7	0.0	0	32.0	84	0	4	228	99	165.3
NORTHWEST TERRITORIES													
BAKER LAKE A	9.4	-0.3	23.6	-1.4	0.0	0	39.0	105	0	8	190	90	268.0
CAMBRIDGE BAY A	6.6	0.1	16.7	-1.4	2.6	433	25.6	91	0	9	154	88	352.4
CLYDE A	3.1	-0.9	17.0	-2.7	11.6	147	20.8	80	0	6	162	85	461.4
COPPERMINE A	9.9	1.2	24.8	-2.0	0.0	0	39.8	103	0	9	196	102	253.2
CORAL HARBOUR A	7.3	-0.1	17.8	-1.4	0.0	0	75.0	169	0	9	159	71	331.3
EUREKA	2.2	-1.1	7.4	-3.0	7.2	267	10.7	92	0	3	244	102	*
FORT SIMPSON A	15.5	1.4	30.2	1.7	0.0	*	37.2	80	0	6	263	107	106.9
FORT SMITH A	13.3	-0.9	29.3	-1.0	0.0	*	83.0	195	0	10	194	74	145.7
IGALUIT	6.3	-0.6	18.8	-1.4	0.0	0	58.6	99	0	0	184	114	364.4
HALL BEACH A	3.8	-0.8	15.5	-2.1	13.8	767	38.2	94	1	10	*	*	440.1
HAY RIVER A	13.6	-0.8	29.3	1.1	0.0	*	18.4	49	0	6	*	*	143.4
INUVIK A	11.0	0.3	25.5	-0.9	0.0	0	41.6	95	0	6	147	68	218.4
NORMAN WELLS A	14.4	1.0	28.8	0.2	0.0	*	13.8	24	0	6	174	73	129.7
POND INLET A	3.3	*	12.6	-4.4	0.6	*	21.2	*	0	5	195	*	456.2
RESOLUTE A	1.0	-1.4	8.1	-2.9	25.5	381	39.4	127	0	9	92	58	528.7
YELLOWKNIFE A	14.2	0.1	25.5	4.3	0.0	*	15.4	35	0	4	270	94	125.7
ALBERTA													
BANFF	12.1	-1.7	27.0	0.5	0.0	0	81.4	166	0	17	*	*	182.1
CALGARY INT'L A	13.9	-1.3	27.4	3.2	0.0	*	92.3	167	0	11	241	86	131.4
COLD LAKE A	15.3	-0.2	29.4	0.4	0.0	*	123.0	161	0	11	239	94	96.9
CORONATION A	14.3	-1.8	28.2	2.6	0.0	*	55.2	107	0	6	258	90	118.9

AUGUST 1993

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									
EDMONTON INT'L A	14.3	-0.5	27.7	3.2	0.0	*	52.7	67	0	13	264	93	11.6
EDMONTON MUNICIPAL	15.5	-0.7	27.5	5.9	0.0	*	76.8	99	0	13	265	96	86.4
EDMONTON NAMAO A	15.1	-0.5	27.7	4.6	0.0	*	77.6	106	0	13	*	*	95.6
EDSON A	12.9	-0.5	26.5	0.0	0.0	0	96.8	112	0	10	207	84	158.5
FORT CHIPEWYAN A	14.0	-0.3	29.5	0.5	0.0	*	36.4	73	0	*	*	*	*
FORT MCMURRAY A	14.5	-0.3	30.4	-0.1	0.0	*	50.1	65	0	12	229	92	121.3
GRANDE PRAIRIE A	14.3	-0.5	29.7	-1.0	0.0	0	48.2	80	0	10	250	*	118.8
HIGH LEVEL A	14.2	0.4	28.5	-0.3	0.0	*	106.9	174	0	11	231	90	124.5
JASPER	13.5	-0.7	28.6	2.9	0.0	0	115.8	239	0	12	199	*	139.2
LETHBRIDGE A	15.4	-2.2	29.6	2.7	0.0	0	127.3	270	0	8	291	97	86.4
MEDICINE HAT A	16.5	-2.4	31.0	3.6	0.0	*	52.0	143	0	8	293	99	66.5
PEACE RIVER A	13.7	-0.5	27.1	1.4	0.0	0	55.1	110	0	*	*	*	124.1
RED DEER A	13.5	-1.4	27.1	1.1	0.0	0	46.1	70	0	12	*	*	139.8
ROCKY MTN HOUSE A	12.9	-1.4	25.9	0.0	0.0	0	100.0	130	0	13	*	*	158.8
SLAVE LAKE A	14.6	0.6	27.2	2.2	0.0	*	61.0	84	0	7	252	103	103.6
SUFFIELD A	16.3	*	31.2	2.8	0.0	*	49.7	*	0	9	279	*	68.6
WHITECOURT A	13.5	-0.4	25.7	0.5	0.0	*	103.1	117	0	11	*	*	135.9
SASKATCHEWAN													
BROADVIEW	15.7	-0.6	30.9	3.2	0.0	*	65.2	111	0	10	248	84	84.2
CREE LAKE	14.1	0.3	26.7	1.6	0.0	*	44.6	66	0	10	200	81	131.3
ESTEVAN A	16.7	-1.9	32.5	4.8	0.0	*	38.4	73	0	10	269	87	60.3
KINDERSLEY	15.6	-1.8	29.4	3.3	0.0	*	81.6	219	0	11	277	*	88.3
LA RONGE A	14.8	0.0	27.9	1.0	0.0	*	78.2	118	0	14	*	*	114.9
MEADOW LAKE A	14.5	*	31.1	-0.6	0.0	*	32.8	*	0	7	231	*	121.0
MOOSE JAW A	16.9	-1.7	32.0	5.0	0.0	*	105.9	263	0	11	262	88	60.1
NIPAWIN A	15.2	*	27.8	3.5	0.0	*	37.0	*	0	8	233	*	93.6
NORTH BATTLEFORD A	15.6	-1.2	28.8	3.0	0.0	*	33.8	74	0	7	*	*	85.6
PRINCE ALBERT A	15.7	-0.2	29.3	2.4	0.0	*	38.5	74	0	8	276	103	80.9
REGINA A	16.4	-1.4	30.4	3.4	0.0	*	109.4	244	0	9	256	87	70.8
SWIFT CURRENT A	15.6	-1.9	30.4	4.5	0.0	*	152.0	353	0	15	287	97	93.2
YORKTON A	15.5	-1.4	31.4	3.0	0.0	*	83.2	137	0	12	238	84	87.2
MANITOBA													
BRANDON A	16.3	-1.2	33.1	0.8	0.0	*	134.9	209	0	12	258	*	72.7
CHURCHILL A	10.8	-0.5	28.6	2.0	0.0	*	32.7	56	0	9	194	83	226.9
DAUPHIN A	16.3	-0.8	32.4	2.2	0.0	*	85.5	137	0	12	232	84	73.7
GILLAM A	13.6	0.5	26.8	1.1	0.0	0	130.0	159	0	15	*	*	139.5

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									
ISLAND LAKE	16.8	1.3	27.7	6.5	0.0	*	58.2	75	0	13	*	*	64.9
LYNN LAKE A	14.3	0.8	27.1	1.9	0.0	*	65.4	84	0	15	187	80	128.7
NORWAY HOUSE A	16.2	*	25.8	3.5	0.0	*	76.8	*	0	12	*	*	71.4
THE PAS A	15.7	-0.4	27.1	3.5	0.0	*	112.8	196	0	15	223	86	85.5
THOMPSON A	14.0	0.8	28.3	-1.2	0.0	0	74.5	85	0	13	211	92	131.6
WINNIPEG INT'L A	17.9	-0.4	30.7	5.6	0.0	*	190.8	254	0	16	234	83	41.1
ONTARIO													
EARLTON A	18.5	2.3	31.9	4.9	0.0	*	121.8	146	0	12	*	*	37.2
GERALDTON A	17.1	*	32.4	5.1	0.0	*	78.0	*	0	12	*	*	63.0
GORE BAY A	20.0	1.8	30.2	8.6	0.0	*	103.6	138	0	8	*	*	11.2
HAMILTON A	21.0	1.0	34.5	8.6	0.0	*	55.3	76	0	9	*	*	8.6
KAPUSKASING A	17.3	2.0	32.5	3.7	0.0	*	45.9	50	0	11	*	*	58.2
KENORA A	17.7	0.1	29.4	7.9	0.0	*	116.5	136	0	14	*	*	41.8
KINGSTON A	20.5	0.9	28.9	8.4	0.0	*	29.8	41	0	9	257	101	7.9
LONDON A	20.5	1.0	33.6	7.8	0.0	*	42.4	53	0	10	220	90	13.1
MUSKOKA A	18.4	1.0	29.9	5.4	0.0	*	120.3	135	0	12	*	*	35.6
NORTH BAY A	19.4	2.4	30.4	4.7	0.0	*	93.2	94	0	9	234	100	23.1
OTTAWA INT'L A	21.0	1.8	32.8	9.4	0.0	*	50.4	57	0	8	*	*	6.4
PETAWAWA A	19.0	1.3	32.6	5.5	0.0	*	99.7	126	0	9	*	*	29.8
PETERBOROUGH A	18.9	0.2	33.1	4.4	0.0	*	56.2	76	0	10	*	*	28.4
PICKLE LAKE	16.6	1.5	32.2	6.6	0.0	*	109.2	105	0	13	*	*	69.0
RED LAKE A	16.2	-0.1	28.1	5.7	0.0	*	115.2	130	0	15	202	*	73.2
ST CATHARINES A	21.7	0.8	35.6	8.5	0.0	*	60.2	80	0	6	277	*	6.8
SARNIA A	20.2	-0.3	34.0	6.7	0.0	*	63.4	125	0	11	248	99	12.4
SAULT STE MARIE A	18.1	1.2	31.2	5.4	0.0	*	64.2	78	0	11	239	96	38.8
SIOUX LOOKOUT A	17.5	0.9	31.7	7.3	0.0	*	186.4	211	0	15	*	*	55.8
SUDBURY A	19.4	2.1	32.7	7.9	0.0	*	73.2	88	0	9	236	94	24.9
THUNDER BAY A	17.8	1.4	30.7	5.9	0.0	*	61.1	74	0	11	252	99	40.4
TIMMINS A	17.5	2.0	32.8	1.6	0.0	*	46.5	52	0	11	*	*	53.0
TORONTO	22.5	*	34.4	12.6	0.0	*	43.6	*	0	8	*	*	1.8
TORONTO INT'L A	21.1	1.4	34.6	8.6	0.0	*	39.9	52	0	8	*	*	9.7
TORONTO ISLAND A	21.6	*	34.5	11.8	0.0	*	31.0	*	0	8	*	*	4.7
TRENTON A	20.5	0.8	31.4	6.8	0.0	*	47.8	66	0	11	*	*	11.5
WATERLOO WELLINGTON	19.9	1.0	32.7	6.0	0.0	*	45.6	57	0	9	*	*	18.7
WAWA A	17.0	*	27.5	3.7	0.0	*	95.8	*	0	9	*	*	80.9
WIARTON A	19.0	0.9	30.6	4.7	0.0	*	51.8	60	0	7	244	96	35.9
WINDSOR A	22.4	1.1	34.5	10.9	0.0	*	42.4	50	0	7	*	*	2.1

AUGUST 1993

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									
QUEBEC													
BAGOTVILLE A	17.9	1.5	29.2	3.2	0.0	*	105.8	106	0	13	*	*	39.5
BAIE COMEAU A	15.4	0.8	27.6	6.1	0.0	*	120.4	127	0	13	211	105	86.8
BLANC SABLON A	12.0	0.2	21.7	5.1	0.0	*	52.0	47	0	8	108	*	185.6
GASPE A	16.1	*	29.3	1.5	0.0	*	105.0	*	0	12	222	*	73.5
INUKJUAQ A	11.0	2.1	21.1	4.1	0.0	*	52.2	80	0	6	195	134	218.1
KUUJJUAQ A	10.6	0.2	28.1	-0.1	0.8	200	90.6	142	0	12	161	96	231.2
KUUJJUARAPIK A	12.7	2.3	27.8	2.4	0.0	*	62.9	67	0	14	173	104	172.9
LA GRANDE IV A	13.0	*	27.7	-1.2	0.0	*	67.6	*	0	16	164	*	162.1
LA GRANDE RIVIERE A	14.0	*	28.4	3.7	0.0	*	57.0	*	0	8	185	*	137.0
MANIWAKI	*	*	*	*	*	*	*	*	*	*	*	*	*
MONT JOLI A	17.1	1.1	26.7	8.6	0.0	*	85.2	108	0	13	229	93	43.5
MONTREAL INT'L A	20.9	1.3	32.3	6.2	0.0	*	43.6	47	0	11	260	108	8.5
MONTREAL MIRABEL I/	19.5	*	30.8	5.2	0.0	*	107.8	*	0	13	249	*	17.4
NATASHQUAN A	14.4	1.1	26.6	1.5	0.0	*	154.6	148	0	12	229	99	115.4
QUEBEC A	19.3	1.8	30.8	6.3	0.0	*	107.4	92	0	8	224	102	19.1
ROBERVAL A	18.0	1.6	29.6	4.2	0.0	*	119.0	121	0	13	220	*	43.2
SCHEFFERVILLE A	11.5	0.7	26.3	-0.1	21.6	939	84.2	86	0	10	194	127	201.8
SEPT-ILES A	14.6	0.5	26.0	4.8	0.0	*	229.4	220	0	15	194	87	108.1
SHERBROOKE A	18.4	1.9	30.2	2.6	0.0	*	132.9	101	0	12	262	*	33.3
ST HUBERT A	20.6	1.4	32.4	6.0	0.0	*	42.3	44	0	6	250	*	9.7
VAL D'OR A	17.6	2.1	30.4	5.5	0.0	*	83.4	82	0	12	229	97	51.0
NEW BRUNSWICK													
CHARLO A	17.6	1.2	29.4	6.9	0.0	*	88.0	84	0	11	254	104	40.3
FREDERICTON A	19.1	0.9	34.4	5.5	0.0	*	34.2	39	*	8	*	*	20.9
MONCTON A	18.3	0.7	31.3	6.3	0.0	*	15.6	20	0	4	303	132	22.6
SAINT JOHN A	17.5	0.9	33.0	6.2	0.0	*	6.6	6	0	2	263	123	35.0

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									
NOVA SCOTIA													
GREENWOOD A	19.0	0.7	33.6	4.0	0.0	*	68.0	76	0	4	*	*	18.4
HALIFAX INT'L A	18.5	0.4	30.6	9.4	0.0	*	44.9	40	0	3	*	*	18.5
SABLE ISLAND	17.1	-0.5	19.7	14.5	0.0	*	104.4	90	0	***	199	111	35.4
SHEARWATER A	18.4	0.6	31.8	9.9	0.0	*	72.6	74	0	6	227	101	17.2
SYDNEY A	17.0	-0.6	27.1	7.5	0.0	*	47.5	47	0	11	241	107	49.6
YARMOUTH A													
YARMOUTH A	17.6	1.2	30.3	8.3	0.0	*	28.4	29	0	4	271	130	27.3
PRINCE EDWARD ISLAND													
PRINCE EDWARD ISLAND	18.3	0.5	27.5	7.5	0.0	*	28.4	32	0	5	*	*	25.2
NEWFOUNDLAND													
BONAVISTA	14.5	-0.5	25.9	6.6	0.0	*	94.0	113	0	14	*	*	123.7
BURCEO	15.3	0.6	18.8	11.8	0.0	*	110.6	75	0	11	*	*	82.8
CARTWRIGHT	13.8	1.8	29.7	1.7	0.0	*	114.6	140	0	13	208	119	146.2
COMFORT COVE	15.4	0.1	28.0	4.5	0.0	*	124.2	118	0	11	*	*	100.2
DANIELS HARBOUR	13.4	-1.1	22.0	5.0	0.0	*	103.0	90	0	15	155	86	147.8
DEER LAKE A	15.3	0.0	29.9	1.2	0.0	*	45.8	45	0	7	*	*	100.2
GANDER INT'L A	15.4	-0.2	26.7	4.1	0.0	*	129.2	133	0	12	191	103	100.6
GOOSE A	15.7	1.4	32.4	1.0	0.0	*	63.2	61	0	9	229	130	104.3
MARY'S HARBOUR	14.5	3.6	31.3	2.0	0.0	*	71.4	88	0	8	*	*	131.9
PORT AUX BASQUES	15.6	0.9	25.8	7.7	0.0	*	148.4	129	0	8	186	*	75.3
ST ANTHONY	12.9	0.8	22.5	8.5	0.0	*	131.4	96	0	10	*	*	158.8
ST JOHN'S A	14.1	-1.2	28.2	3.7	0.0	*	111.0	91	0	11	174	*	139.5
ST LAWRENCE	14.7	0.8	23.1	7.4	0.0	*	88.6	62	0	10	*	*	101.3
STEPHENVILLE A													
STEPHENVILLE A	16.2	0.1	28.0	12.9	0.0	*	108.8	105	0	11	190	*	76.3
WABUSH LAKE A	12.2	0.4	27.3	-0.3	0.0	*	152.6	162	0	17	232	*	178.9

AGROCLIMATOLOGICAL STATIONS

AUGUST 1993

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	18.7	1.0	35.0	7.5	0.0	60.5	98	0	9	221	425.8	1772.0
SUMMERLAND	18.7	-1.3	32.5	8.0	0.0	28.2	103	0	6	259	425.1	1629.6
ALBERTA												
BEAVERLODGE	14.0	-0.2	29.5	0.5	0.0	81.0	127	0	10	247	279.5	1075.5
LACOMBE	13.6	-1.3	27.0	1.0	0.0	47.5	70	0	7	249	265.4	983.5
SASKATCHEWAN												
INDIAN HEAD	16.6	-0.8	32.0	4.0	0.0	56.8	102	0	8	**	353.0	1199.0
MELFORT	15.4	-0.7	27.5	3.5	0.0	45.9	84	0	10	229	324.0	1087.5
REGINA	16.2	-1.2	29.0	1.5	0.0	88.2	200	0	10	**	337.0	1155.8
SCOTT	14.8	-1.2	28.0	2.5	0.0	38.6	83	0	7	269	306.4	1044.1
SWIFT CURRENT	15.8	-1.9	30.5	4.0	0.0	153.4	402	0	13	262	336.7	1187.7
MANITOBA												
BRANDON	16.8	-1.1	33.6	1.3	0.0	134.0	193	0	10	**	364.7	1233.9
MORDEN	18.2	-0.1	33.0	6.0	0.0	85.6	141	0	16	254	432.0	1389.0
GLENLEA	18.5	-0.5	31.0	4.0	0.0	160.0	225	0	16	228	**	1292.3
ONTARIO												
DELHI	21.2	1.4	33.5	7.0	0.0	34.4	37	0	9	**	501.6	1759.3
ELORA	19.4	1.3	33.0	1.3	0.0	67.9	94	0	9	**	447.6	1526.2
GUELPH	19.6	0.8	32.9	4.2	0.0	49.2	60	0	8	**	452.6	1525.1
HARROW	22.3	1.1	33.5	10.0	0.0	43.2	55	0	8	225	536.7	1928.1
KAPUSKASING	17.6	2.1	31.5	2.5	0.0	32.3	36	0	11	230	**	1174.4
OTTAWA	20.8	1.4	32.9	6.3	0.0	44.4	52	0	10	257	508.7	1722.4
SMITHFIELD	21.9	2.6	33.6	8.4	0.0	34.2	45	0	9	**	513.9	1817.2

Courtesy of Agriculture Canada

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
QUEBEC												
LA POCATIERE	18.5	1.2	31.0	4.5	0.0	67.2	68	0	10	255	421.2	1350.2
L'ASSOMPTION	20.3	1.5	32.0	4.5	0.0	95.6	100	0	10	233	474.7	1623.0
NORMANDIN	16.3	0.9	28.5	0.3	0.0	120.0	128	0	12	217	340.4	1130.1
NEW BRUNSWICK												
FREDERICTON	19.4	1.3	34.0	5.5	0.0	34.6	40	0	7	273	447.8	1468.3
NOVA SCOTIA												
KENTVILLE	19.1	0.7	33.0	6.0	0.0	53.8	55	0	7	255	435.7	1415.0
NAPPAN	18.6	1.2	32.5	5.0	0.0	14.5	16	0	4	255	419.0	1279.3
PRINCE EDWARD ISLAND												
CHARLOTTETWN	**	**	**	**	**	**	**	***	***	**	**	**
NEWFOUNDLAND												
ST. JOHN'S WEST	14.3	-1.2	28.0	4.0	0.0	100.9	88	0	11	174	289.4	784.7

Courtesy of Agriculture Canada

...continued from page 15

dents generally associated with the passage of the cold front on August 27 and 28, across Southern Ontario. High winds and hail were the cause of most of the damage.

Quebec

For the most part, August was above normal in both temperature and precipitation. As well, there was a bit more sunshine than average. The pleasant temperatures were accompanied by heavy precipitation, especially in the Sept-Iles area.

While rainfall at Sept-Iles in July was just 2 mm short of the monthly record, the August rainfall total of 229.4 mm (230% of normal) was much above the previous August monthly record of 207.8 mm set in 1968. In the past two months, Sept-Iles has recorded nine rainfall events that produced between 23 and 47 millimetres of rain in less than 24 hours. The summer as a whole, (June to August) has brought more rain to Sept-Iles than any other summer since weather observations began in 1944, with 507.3 mm of rain being recorded this year, smashing the 1970 record of 427.0 mm. Although it was wet, there was no lack of sunshine, because the August figures are generally 10 to 20 percent above normal, with only a few exceptions.

On August 18, heavy rain inundated the Beauceville region of Quebec, approximately 50 km south of Quebec City, where 75 to 100 millimetres of rain was recorded in one day, causing flooding throughout the district. There were also unofficial reports of 177 mm of rain falling in a two-hour period in some places.

On August 28, 19.6 cm of snow fell at Schefferville - the second largest August snowfall at that location since records began. A record 23.9 cm fell on August 29, 1965.

A line of thunderstorms extending from Trois-Rivières to eastern Ontario on the 31st, swept across southern and eastern Quebec during the afternoon and evening hours. Heavy downpours of 25 to 30 millimetres in thirty minutes resulted in flash flooding. In addition, wind gust to 115 km/h were observed. On the same day, a tornado may have touched down near Wottonville, 50 km north of Sherbrooke. There

was also wind damage reported near Rimouski, while Baie-Comeau received more than 51 mm of rain.

Maritimes

August was generally sunny, dry and on the warm side. Precipitation was below normal in all areas. It was extremely dry in southern New Brunswick, with Saint John reporting only 6.6 mm, the lowest monthly precipitation ever since records began in the area back in 1871. The previous record was 6.9 mm set in October, 1947. Moncton reported only 15.6 mm, just 1.8 mm from tying their August record.

Hours of bright sunshine were generally well-above normal, except for areas in eastern Nova Scotia and northern New Brunswick, where they were just a few hours above average. Moncton, N.B. and Yarmouth, N.S. came within a few hours of having their sunniest August on record, with totals of 302.5 and 270.7 hours, respectively.

Mean temperatures for the month were generally on the warm side, except for parts of eastern Nova Scotia. A hot spell during the latter part of the month, set new record-high maximum temperatures on August 26, 27 and 28. Shearwater (Halifax-Dartmouth), reported a maximum temperature of 31.8°C on the 26th, setting a new record-high maximum for August. The previous record was 31.1°C, set in 1949. Records at Shearwater date back to 1944. Yarmouth, N.S. also broke their record for August, with a reading of 30.3°C on the 27th. Records at Yarmouth date back to 1879.

A band of thunderstorms, some severe, crossed the region on the 28th, causing some heavy downpours and strong winds. Power outages were reported in the Fredericton area and at Sydney, N.S. During a yacht race, near Shediac, N.B., a few boats were overturned by the winds. There were no casualties except for some wet yachtsmen.

Newfoundland and Labrador

Near normal temperatures and hours of bright sunshine prevailed across much of

Newfoundland during August. Precipitation varied across the region from near normal in the St. John's area, to above normal at Gander, to well-below normal at Deer Lake. Early in the month, above-normal temperatures were reported, with maximum readings near 30°C in central Newfoundland. However, during the second week, temperatures returned to more seasonable values, with record-breaking daily minimums of 3.7°C at St. John's. Overall, the mean temperature was near 15°C, except St. John's, mean of 14.1°C, which was more than one degree below normal.

Total monthly rainfall was approximately 110 mm, which is close to normal. However, Deer Lake in the west recorded 45.8 mm, which is less than half of normal. Several thunderstorms were reported across the region, resulting in power outages on the Burin Peninsula on the 14th. The prevailing wind across the Island was from the southwest at 18 km/h; however, frequent periods of onshore easterlies resulted in cool temperatures and frequent cloud cover in the St. John's area.

For the third month in a row St. John's recorded below-normal temperatures and sunshine, resulting in what residents consider to be the poorest summer in recent memory. The cool, cloudy summer has had its impact, as blueberry growers report the crops are three weeks behind schedule, with a real threat of frost, as we move into the fall season.

In Labrador, above-normal temperatures and sunshine prevailed across much of the district. Precipitation varied from below-normal in the Goose Bay area, to above-normal at Wabush Lake. Early in the month, above-normal temperatures were common, with Goose Bay recording a maximum of 32°C on the 2nd. During the latter part of the month, temperatures returned to more seasonable values, with minimums dropping below freezing late in the month. Overall, the mean temperature was 1 to 2 degrees above normal (Goose Bay mean 15.7°C, normal 14.2°C). Hours of bright sunshine were above normal across the region, with Wabush Lake reporting 232.4 hours, or about 40 hours above normal.