

# A chronological overview of the 1989 fire season in Manitoba

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## Abstract

In 1989 a new record was established for the number of fires (1147) and area burned (3.28 million ha) in Manitoba. These fires resulted in the unprecedented evacuation of 24,500 people from 32 different communities and cost over \$68 million (CDN) to suppress. The first major outbreak of fires occurred in central Manitoba in mid-May and was followed by a second peak of fire activity in northern Manitoba between July 16 and August 2. Both periods were characterized by multiple fire ignitions, severe fire weather and fire danger conditions, and extreme fire behavior. A general description of the events that took place during this historic fire season are presented in this paper.

## Résumé

Un nouveau record a été établi en 1989 pour le nombre de feux (1147) et pour les superficies brûlées (3.28 millions d'ha) au Manitoba. Ces feux ont provoqué l'évacuation sans précédent de 24 500 personnes de 32 communautés différentes et ont coûté plus de 68\$ millions (can) en frais de suppression. La première plus importante période de feux a eu lieu dans le centre du Manitoba à la mi-mai, et a été suivie par un second sommet d'activités incendiaires dans le nord du Manitoba entre le 16 juillet et le 2 août. Ces deux périodes ont été caractérisées par des foyers multiples d'incendie, par des conditions météorologiques et de risques de feux extrêmes, et par un comportement imprévisible des feux. Une description générale des événements qui ont eu lieu au cours de cette saison historique d'incendies de forêts est élaborée dans cet exposé.

## Introduction

The 1989 fire season was one of the most severe in the recorded history of Manitoba. It had a major impact not only on the natural resources of the province but also on its people, especially those living in northern and central Manitoba. During 1989, a record number of fires (1147) and area burned (3.28 million ha) occurred in Manitoba (Figure 1). These fires consumed over 9% of the forested area in the province, forced the evacuation of approximately 24,500 people from 32 different communities and cost over \$68 million (CDN) to suppress. The Manitoba fires also accounted for 43% of the 7.51 million ha burned in Canada in 1989 (Canadian Committee on Forest Fire Management 1990), which was a 71-year record high value (Van Wagner 1988).

The dramatic nature of the 1989 fire season brought worldwide attention to Manitoba. The events were reported upon daily by the local, national and international media and were compared to other large wildfire situations such as the Yellowstone National Park fires (Carrier 1989) and the great China fire (Yun-qian and Ji-zhong 1989). However, a composite overview of the fire season in Manitoba was never documented and therefore, the primary purpose of this paper is to provide such a general account. A description of the factors that influenced the fire occurrence and fire behavior as well as a review of the associated fire suppression and evacuation activities are presented. A more detailed analysis of meteorological and fire behavior characteristics during the 1989 fire season can be found in Hirsch and Flannigan (1990).

## Manitoba's Fire History

Fire history records dating back to 1918 indicate that within Manitoba, prior to 1989, an average of 394 fires per year have produced an annual area burned of 128,600 ha (Fig. 2). Also, there were only four years (1976, 1977, 1980 and 1988) in which more than 800 fires per year had occurred.

In only two previous years, 1929 and 1961, did the area burned exceed 1.0 million ha (Fig. 2).

The average fire season in Manitoba (based on 1968–87 data) usually begins with the occurrence of human-caused fires in the southern and central areas of the province in late April and early May (Fig. 3). This is followed by a decline in the number of fires in June, because June is generally a wet month (Longley 1972), and flushing of vegetation (green-up) has already occurred. In July, a second peak of fire activity occurs, primarily due to lightning-caused fires located in northern and eastern Manitoba. Finally, a human-caused fire season may occasionally occur in the fall in southern and eastern Manitoba (Einarsson and Fraser 1979).

The pattern of fires in 1989 (Fig. 3) was similar to a "normal" year, with a peak of human-caused fires in May and lightning-caused fires in July separated by a decline in fire activity in June. However, the number of fires occurring in May and July was over 2 and 4.5 times higher, respectively, than the 20-year average of 120 fires for each month. This resulted from above average fire activity in the Western and Interlake Regions in May and a record number of fires in the Northwest and Northeast Regions during July (Can. Committee on For. Fire Mgt. 1990).

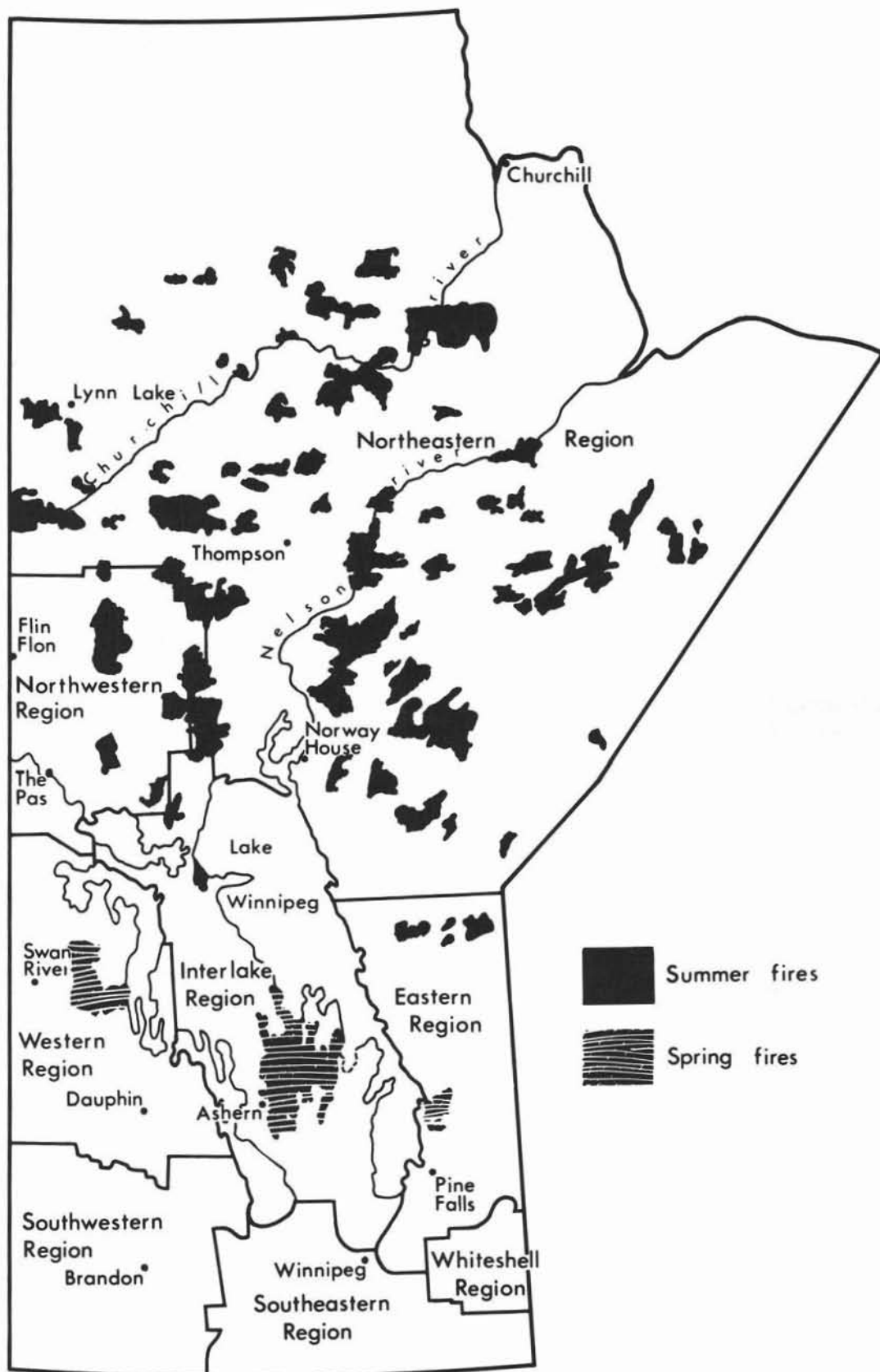
## April 19 – May 31, 1989

The fire season in Manitoba began on April 19, 1989. Approximately 9 fires per day were ignited over the first three weeks of the fire season. This was followed by a major outbreak of 95 human-caused fires between May 11 and May 13. Over the next six to seven days three fires, namely, the Cowan Fire in western Manitoba, the Ashern Fire in the Interlake Region, and the Sandy River Fire east of Lake Winnipeg, burned an estimated<sup>2</sup> area of 612,000 ha (Fig. 1).

Three major factors contributed to the unusually high number of fire ignitions and the extreme fire behavior (Fig. 4) in May. First, precipitation amounts in the central

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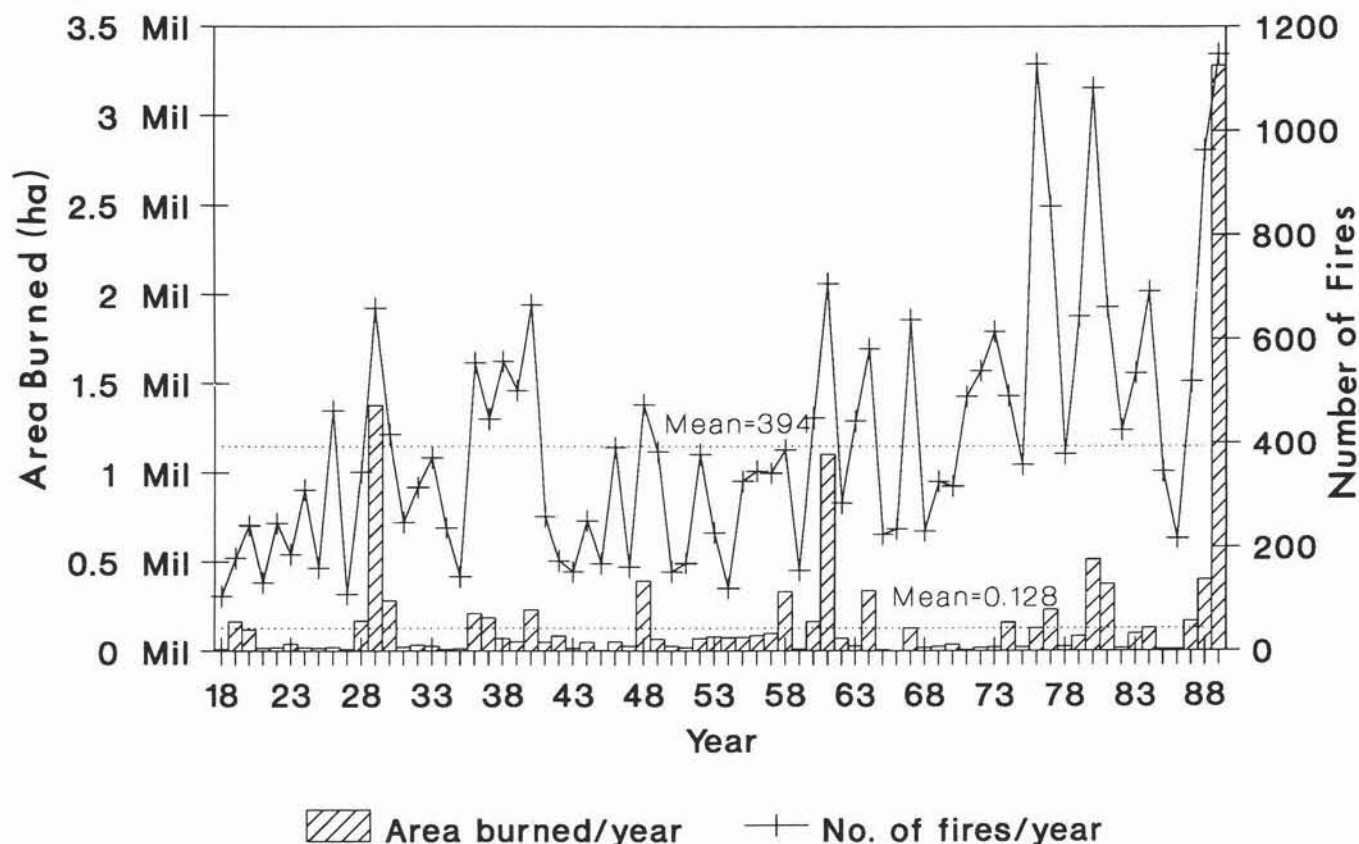
<sup>2</sup>Estimates were provided by the Manitoba Natural Resources Forestry Branch.



**Figure 1.** Fires > 5000 ha in size that burned during the 1989 fire season in Manitoba, Canada. Fires are shown by season (spring, summer) and region.

areas of Manitoba had been below normal for an extended period of time. For example, between April 1987 and April

1989 the monthly precipitation amounts recorded at Ashern and Dauphin exceeded their normal values (Atmospheric



**Figure 2.** Annual number of fires and area burned in Manit 1918–30 Petawawa National Forestry Institute; 1931–89 M:

18–1989. Dashed lines indicate the 71-year average values prior to 1989. Source: atural Resources.

**Table 1.** Fire weather observations and fire danger indices recorded at Dauphin, Manitoba, May 10 – 19, 1989 at 1300 CDT

Date	Temp. (°C)	RH (%)	Wind speed (km/h)	Rain (mm)	FWI System components					
					FFMC	DMC	DC	ISI	BUI	FWI
May 10	29.0	18	31	0.0	95.1 <sup>c</sup>	31.4 <sup>h</sup>	255	41.8 <sup>c</sup>	48	56.1 <sup>c</sup>
May 11	25.0	29	25	0.0	94.1 <sup>c</sup>	36.3 <sup>h</sup>	261	26.9 <sup>c</sup>	54 <sup>h</sup>	44.8 <sup>c</sup>
May 12	28.0	23	31	0.0	94.2 <sup>c</sup>	42.2 <sup>c</sup>	269	36.5 <sup>c</sup>	61 <sup>h</sup>	57.1 <sup>c</sup>
May 13	28.0	15	28	0.0	95.8 <sup>c</sup>	48.7 <sup>c</sup>	276	39.2 <sup>c</sup>	68 <sup>h</sup>	62.7 <sup>c</sup>
May 14	28.0	16	11	0.0	95.9 <sup>c</sup>	55.1 <sup>c</sup>	284	16.8 <sup>c</sup>	74 <sup>c</sup>	38.4 <sup>c</sup>
May 15	27.0	28	19	0.0	94.8 <sup>c</sup>	60.4 <sup>c</sup>	291	21.7 <sup>c</sup>	80 <sup>c</sup>	46.8 <sup>c</sup>
May 16	25.0	33	41	0.0	93.4 <sup>c</sup>	65.0 <sup>c</sup>	298	54.3 <sup>c</sup>	84 <sup>c</sup>	83.8 <sup>c</sup>
May 17	22.0	56	15	0.0	89.6 <sup>h</sup>	67.7 <sup>c</sup>	304 <sup>h</sup>	8.6	87 <sup>c</sup>	26.6 <sup>h</sup>
May 18	18.0	27	26	6.4	76.2	44.2 <sup>h</sup>	293	3.0	64	10.3
May 19	9.0	87	33	1.8	64.1	41.5 <sup>h</sup>	297	2.7	62	9.0

<sup>c</sup>Indicates an extreme index value based on the 1989 fire danger classes for Manitoba.

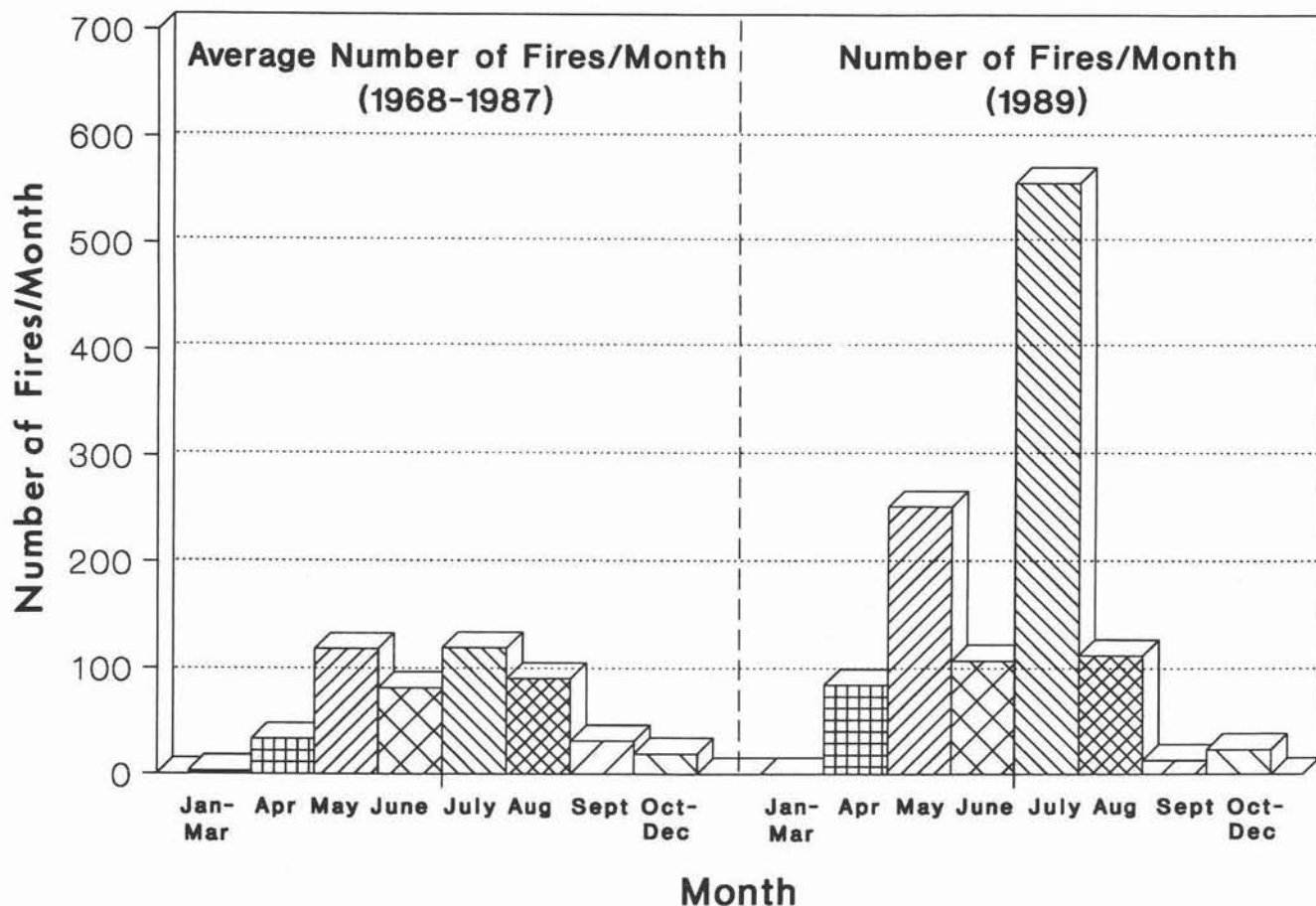
<sup>h</sup>Indicates a high index value based on the 1989 fire danger classes for Manitoba.

Abbreviations: FFMC, Fine Fuel Moisture Code; DMC, Duff Moisture Code; DC, Drought Code; ISI, Initial Spread Index; BUI, Buildup Index; FWI, Fire Weather Index.

Environment Service 1982) in only 4 and 6 months, respectively (Fig. 5). Second, even though southern areas of the province had experienced a relatively normal spring snowmelt, precipitation in April was only 25–50% of normal creating a very dry duff layer and a volatile fine fuel situation (Hirsch and Flannigan 1990). Third, the upper atmospheric and surface weather conditions between May 11 and May 16 were ideal for the development of wind driven crown fires (Forestry Canada Fire Danger Group 1992; Hirsch and Flannigan 1990). Maximum surface temperatures were above 30°C, minimum relative humidity (RH) values ranged from

15–25% and wind speeds averaged 20–35 km/h during major fire runs.

The severity of the fire danger conditions in mid-May are further illustrated by the components of the Canadian Forest Fire Weather Index (FWI) System (Van Wagner 1987). Table 1, the FWI System values for the Atmospheric Environment Service (AES) station at Dauphin, shows that many of the indices were at high or extreme levels for over a week. Conditions peaked on May 16 and then moderated on May 18 and May 19 when rain showers began over the fire areas. These rains and subsequent cooler weather resulted in no further suppression difficulties on these fires.



**Figure 3.** Total and average number of fires per month in Manitoba for 1989 and the period of 1968-87. Source: Manitoba Natural Resources wildfire reports.

The spring fire season was considered by many provincial fire suppression staff to be one of the worst in recent memory. As of May 31, 332 fires had burned approximately 772,500 ha and caused the evacuation of 2000 people from 7 different communities. Property damage caused by the fires was extensive with 15 summer cottages destroyed by the Sandy River Fire and 13 homes, many barns and out-buildings, cattle, fence lines, and crops lost in the Ashern Fire.

Two of the three campaign fires also had a significant impact on the forest industry in Manitoba. Abitibi-Price personnel estimated that the Ashern Fire consumed over 7 years of wood supply for their mill in eastern Manitoba and that the Sandy River Fire caused a 5% reduction in the annual allowable cut on their Forest Management License (FML).

### June 1 – July 15, 1989

During the month of June above average rainfall was recorded across most of Manitoba (Hirsch and Flannigan 1990). An exception to this was the north-central section of the province between The Pas and Thompson which received only a few scattered showers. In early July, precipitation from localized thunderstorms occurred across most of northern Manitoba. The number of new fires varied from 3 to 18 fires per day. Fires were actioned on a priority basis according to the values at risk (i.e., life, property and natural resources). Highly trained helitac crews, based in two northern locations,

actioned the highest priority fires while lower priority fires were attacked on a delayed basis by extra fire fighters. Some fires in more remote areas were regarded as observation fires and no suppression action was taken on them.

### July 16 – July 20, 1990

The fire suppression efforts during the first two weeks of July were proving to be quite effective. As of July 15, none of the fires actioned by helitac crews had escaped initial attack. However, on July 16 three escaped wildfires occurred in high priority areas. At this time the fire weather conditions were also becoming more extreme because of an "upper ridge" that covered most of western and northern Canada (Hirsch and Flannigan 1990). Temperatures in Manitoba reached 36°C with RH values as low as 25%. All-time record high temperatures of 34.9°C and 32.5°C were set in places as far north as Coppermine and Yellowknife, N.W.T., respectively.

The lack of precipitation in north-central Manitoba during July had once again reduced the moisture content of the forest fuels (e.g., duff layers and dead and downed woody surface fuels) and produced an extreme fire danger situation. This is reflected in the FWI System values for July 17 (Table 2) which indicate the potential for fire ignitions was extremely high, that almost all of the forest fuels were available for consumption and that high intensity fires could be expected under relatively low wind speeds.





Figure 4. The Sandy River Fire in eastern Manitoba, May 13, 1989.

Table 2. Fire danger indices for selected stations in northern Manitoba on July 17, 1989 at 1300 CDT

Station name	FWI system components					
	FFMC	DMC	DC	ISI	BUI	FWI
Lynn Lake	93.4 <sup>c</sup>	53.9 <sup>c</sup>	242	9.3	69 <sup>c</sup>	25.0 <sup>h</sup>
Snow Lake	92.3 <sup>c</sup>	54.8 <sup>c</sup>	537 <sup>c</sup>	7.5	87 <sup>c</sup>	24.3 <sup>h</sup>
Wabowden	92.1 <sup>c</sup>	91.1 <sup>c</sup>	439 <sup>h</sup>	8.2	120 <sup>c</sup>	29.8 <sup>c</sup>
Cross Lake	89.4 <sup>h</sup>	76.1 <sup>c</sup>	426 <sup>h</sup>	8.7	105 <sup>c</sup>	29.4 <sup>c</sup>
Norway House	93.4 <sup>c</sup>	71.2 <sup>c</sup>	470 <sup>h</sup>	11.9 <sup>h</sup>	103 <sup>c</sup>	35.9 <sup>c</sup>
Grand Rapids	90.6 <sup>c</sup>	53.6 <sup>c</sup>	322 <sup>h</sup>	7.4	76 <sup>c</sup>	22.1

<sup>c</sup>Indicates an extreme index value based on the 1989 fire danger classes for Manitoba.

<sup>h</sup>Indicates a high index value based on the 1989 fire danger classes for Manitoba.

On the afternoon of July 17 a total of 99 fires were burning in the province, of which 16 were considered out of control. However, that evening a surface weather system produced widespread lightning across the north. This lightning was accompanied by very little precipitation and was a major contributor to the 195 starts that occurred in Manitoba over the next three days. To combat these fires the Manitoba Natural Resources (MNR) department was utilizing 30 helicopters, their 5 CL-215 airtankers, and a large amount of heavy equipment and manpower. Attempts to obtain more aircraft were made, but were unsuccessful because of the extreme fire danger conditions in other parts of the country. Even with these fire suppression resources the escalating number of fires and their increased intensity soon overwhelmed suppression efforts resulting in more escaped wildfires. Then on July 19 the settlement of Cross

Table 3. Status of the wildfire situation in Manitoba on July 21, 1989

Fire status	Number	Fire status	Number
New ignitions	36	Observation	107
Under control	41	Declared out	31
Being held	25	Total burning	246
Out of Control	68		

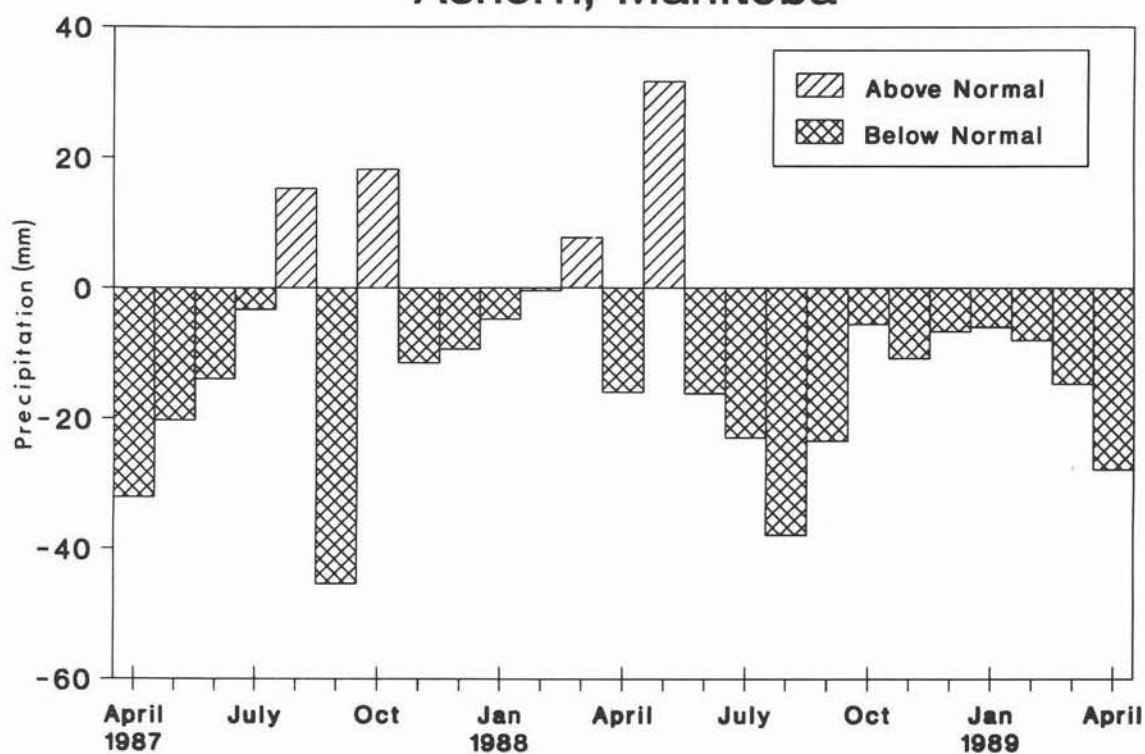
Lake (population 2500) became the first of many northern communities to be evacuated due to the threat of the fires (Fig. 6).

### July 21 – July 23, 1989

The status of the fire situation in Manitoba on July 21 (Table 3) had become extremely critical. A combined total of 175 observation and out of control fires were burning freely and would spread unrestricted once the forecasted winds began to blow. Unfortunately, by the afternoon of July 21 the upper ridge that had been anchored over Manitoba began to slowly break down causing the wind speeds to average 20 km/h to 33 km/h with gusts over 50 km/h being recorded at some stations. These winds created high intensity crown fires and pushed the fires northward at spread rates reaching 1.7 km/h (Hirsch and Flannigan 1990).

The extreme fire weather and fire danger conditions continued over the next two days and resulted in another 15000 people being evacuated from 16 more communities (Fig. 6). Both military and commercial aircraft were being used to airlift people to centres such as The Pas, Thompson, Brandon

## Ashern, Manitoba



## Dauphin, Manitoba

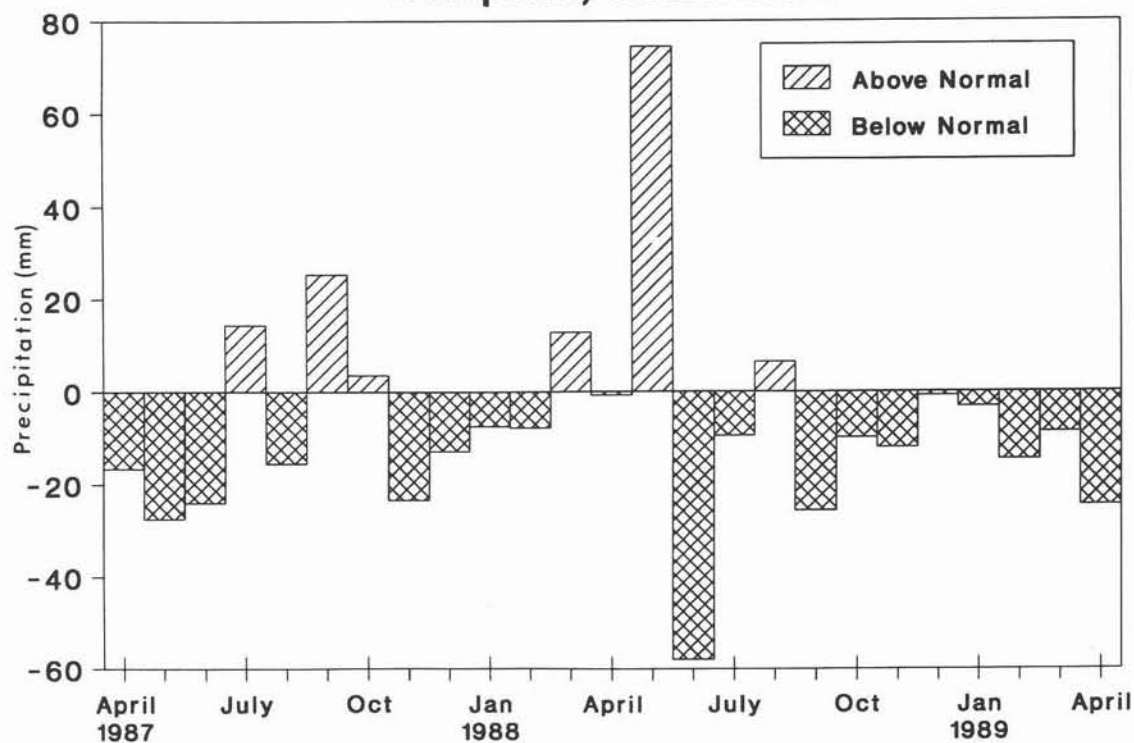


Figure 5. Departure from the 1951-80 normal precipitation amounts at Ashern and Dauphin, Manitoba from April 1987 to April 1989.

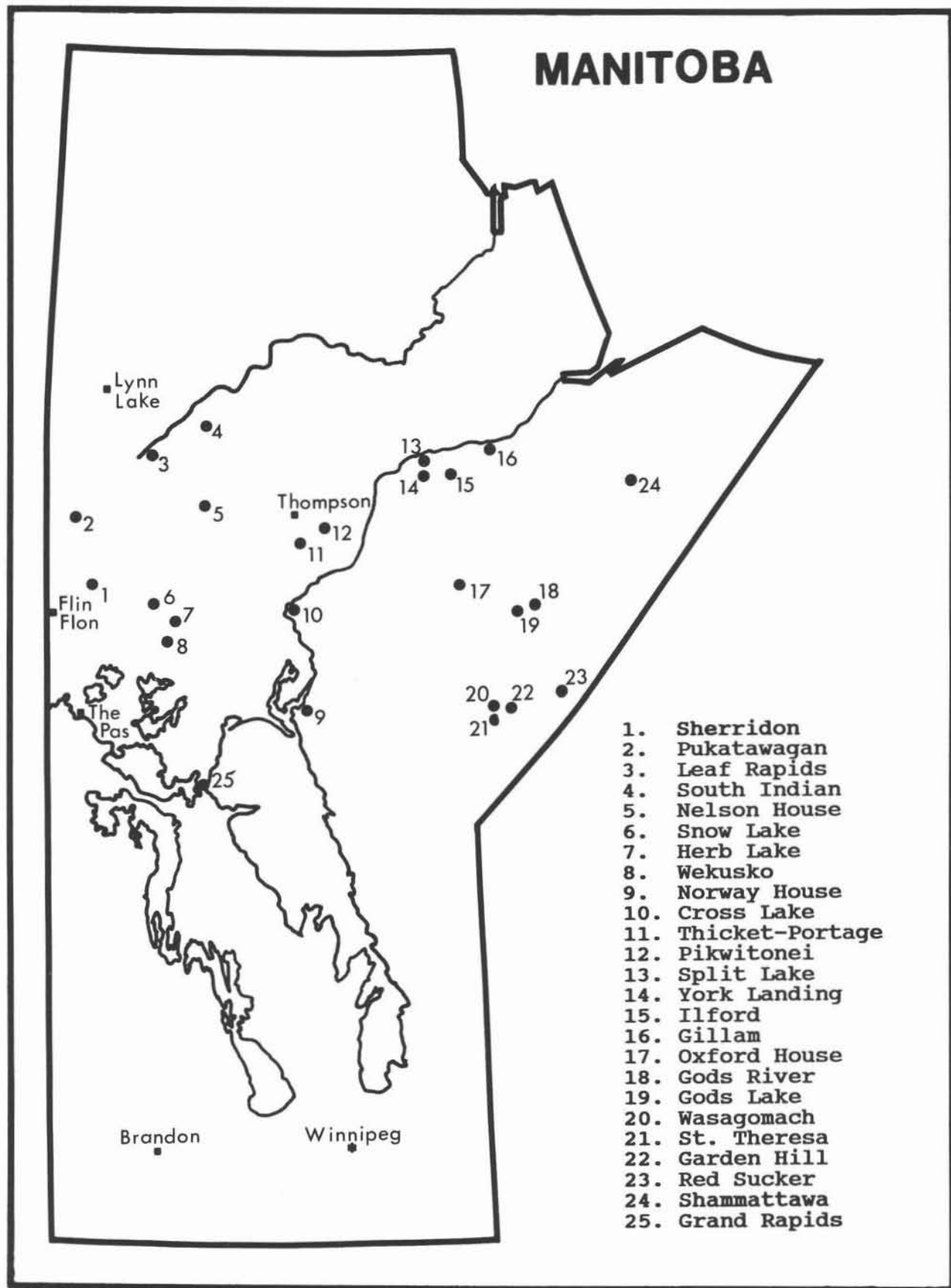


Figure 6. Communities in northern Manitoba that were evacuated between July 19 and July 26, 1989.

and Winnipeg. Given the massive evacuations and the extreme fire danger conditions, the Premier of Manitoba declared a state of emergency for the first time since the flooding of the Red River in 1950.

## July 24 – August 4, 1989

By July 24 the most severe burning conditions had passed, however evacuations were still occurring in some areas because of large amounts of smoke, which at times reduced visibility to a distance of less than 1 km. By July 26, a total of 22500 people from 25 communities (Fig. 6) had been evacuated from their homes for as many as 4 to 14 days.

With people's safety ensured, MNR staff began to focus their efforts on fire suppression, but the situation facing them was massive. On July 26, over 70 fires exceeded 5000 ha in size, many still threatening towns or primary wood supply areas. A decision was made to concentrate on fires or those sections of individual fires that had the highest potential to burn personal property or high value forest. This approach meant that other fires received only a limited suppression response or were allowed to burn freely.

The fire weather conditions varied from day to day and between areas causing certain fires to be more active than others. Suppression efforts were effective on most fires until August 1 when the last major fire runs occurred. On August 3 and August 4 rain began to occur across northern Manitoba. Amounts ranging from 12.5 mm at Wabowden to 84.6 mm at Norway House either completely extinguished or, at least, assisted in the suppression of fires.

## Implications of the 1989 Fire Season

The 1989 fire season was unique because of its immense proportions. This is illustrated by the fact that the amount of area burned in Manitoba during 1989 exceeded the cumulative total for the previous 25 years. Even if the 1989 fire season was a rare event, extreme fire danger conditions will undoubtedly occur again in Manitoba. For this reason, the preparedness and ability of the provincial fire management organization was called into question by both the public and the MNR department itself. As a result of this concern, three reviews (internal, external and public) were conducted to investigate the department's policy, organization and effectiveness. Many recommendations were made by the review committees and action has begun on their implementation.

A severe fire season such as 1989 always re-emphasizes the fact that large wildfires will periodically occur within

the boreal forest of Canada. It also reaffirms the challenge facing fire management organizations across Canada today. That is, to determine creative, cost-effective and environmentally acceptable approaches to fire management that will ensure the negative impacts of a fire season like 1989 are minimized in the future.

## Acknowledgements

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