ERRATA

1. The scales on all figures except the cover map were added before the figures were photoreduced and are therefore incorrect.

2. Page 32, lines 17-18 should read: 2 miles per hour or 175 feet per minute.

CLIMATIC CONDITIONS BEFORE AND DURING FOUR SIGNIFICANT FOREST FIRE SITUATIONS IN ONTARIO

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ABSTRACT

Four major and historically significant Ontario forest fire situations are investigated from a fire weather standpoint. Long-term climatic conditions preceding each fire, in addition to actual weather during the fire, are reported and discussed in relation to fire behavior.

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INTRODUCTION

During the 50-year period between 1921 and 1970, forest fires in Ontario burned over a total of 13,256,061 acres[1] - an annual average of 265,121 acres (Anon. 1972). In the four large fire situations discussed in this report the total acreage burned in the Province was as follows: 1930 (711,809); 1938 (138,245); 1948 (1,017,389); 1961 (1,184,728). With the exception of 1938 each of these years must be considered an extremely bad fire year when figures for acreage burned are compared with the 50-year average.

In each of these 4 years, the fires investigated in this study contributed substantially to the total provincial acreage destroyed. The Garden Lake and Dog Lake fires in June of 1930 burned over 335,666 acres (47.2% of provincial total) north and northwest of Thunder Bay, and the Dance Township fire near Fort Frances in October of 1938 consumed 74,049 acres (53.6% of provincial total) and killed 20 people. In May and June of 1948 the Chapleau-Mississagi fire destroyed 687,452 acres (67.6% of provincial total) between Thessalon and Chapleau, while the 1961 wildfires north of Sioux Lookout burned over 1,087,350 acres (91.8% of provincial total) during June and July of that year.

Fire behavior and fuel type information presented in this report was gathered from provincial fire reports through the cooperation of the Ontario Ministry of Natural Resources (OMNR).

Weather information presented was gathered from a variety of sources including OMNR, the Environmental Data Service of the United States Department of Commerce, and the Atmospheric Environment Service (AES) of Environment Canada. A strong attempt has been made to gather and present weather information from observation sites located close to each fire but some data are presented from more distant stations where this information is more detailed or complete.

Figure 1 shows the location of the fires investigated in this study.

GARDEN LAKE AND DOG LAKE FIRES (1930)

(a) *General Description*

The Garden Lake fire (see Fig. 2a), which is thought to have started from an untended campfire at about 0900 hours on June 1, 1930, was 150 acres in size and burning on the shore of a small lake 4.5

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[1] 1 acre = approximately 0.4 hectares.

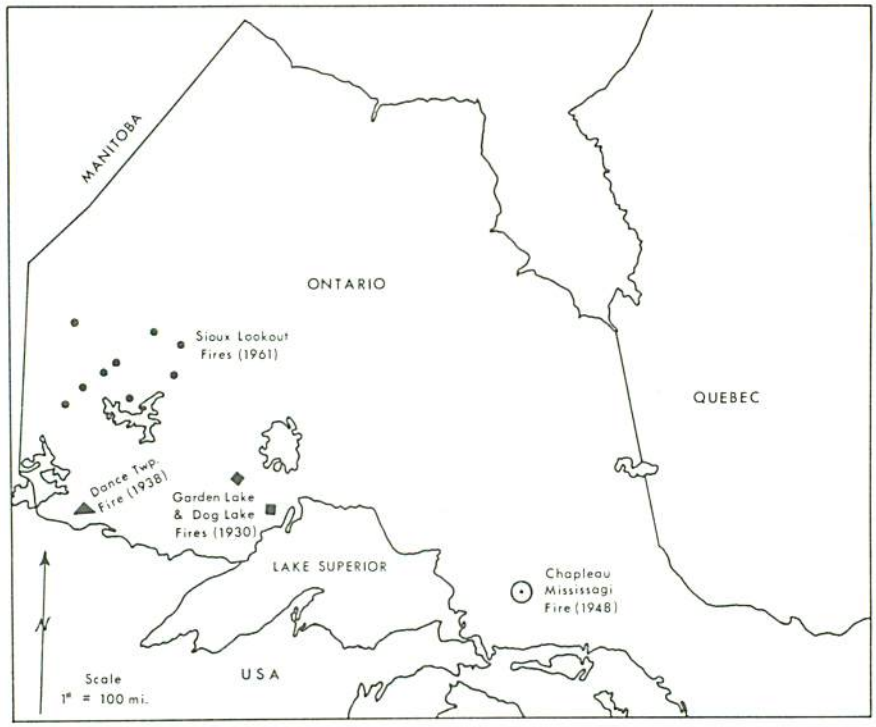

Fig. 1. Location within Ontario of fires investigated in this study.

miles[2] northeast of Mack Station when discovered by air patrol at 1700 hours on that same day. Eyewitness reports indicate that, within 30 hours, the fire had spread 55 miles to the north and northeast before its progress was checked during the night of June 2. Extremely strong winds during the day of June 2 caused crowning and contributed greatly to the very fast spread of the fire. Owing to these high winds on June 2 and low clouds and fog on June 3 and 4 it was impossible to sketch the fire from the air until June 5 when the fire perimeter was mapped at 165,600 acres. The fire had run north for 15 miles, then northeast for another 40 miles, stopping near Kabitotikwia Lake on the Armstrong-Thunder Bay highway (Fig. 2a). The average fire width was 6 miles and the maximum 12 miles. Although the first fire crew left for the fire by rail on June 3, organized fire fighting did not begin until June 5. Headquarters were set up at Garden Lake to supply fire fighters along the approximately 150 miles of fire line. Up to 19 crews and 187 men had worked on the fire before it was listed as under control on June 29, 1930.

Two small fires merged in mid-June and eventually joined the Garden Lake fire, bringing the total burned area to 173,350 acres of crown land, of which 129,110 acres were licensed to timber and pulp companies and the remainder were unlicensed. Black spruce (*Picea mariana* [Mill.]

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[2] 1 mile = approximately 1.6 kilometers.

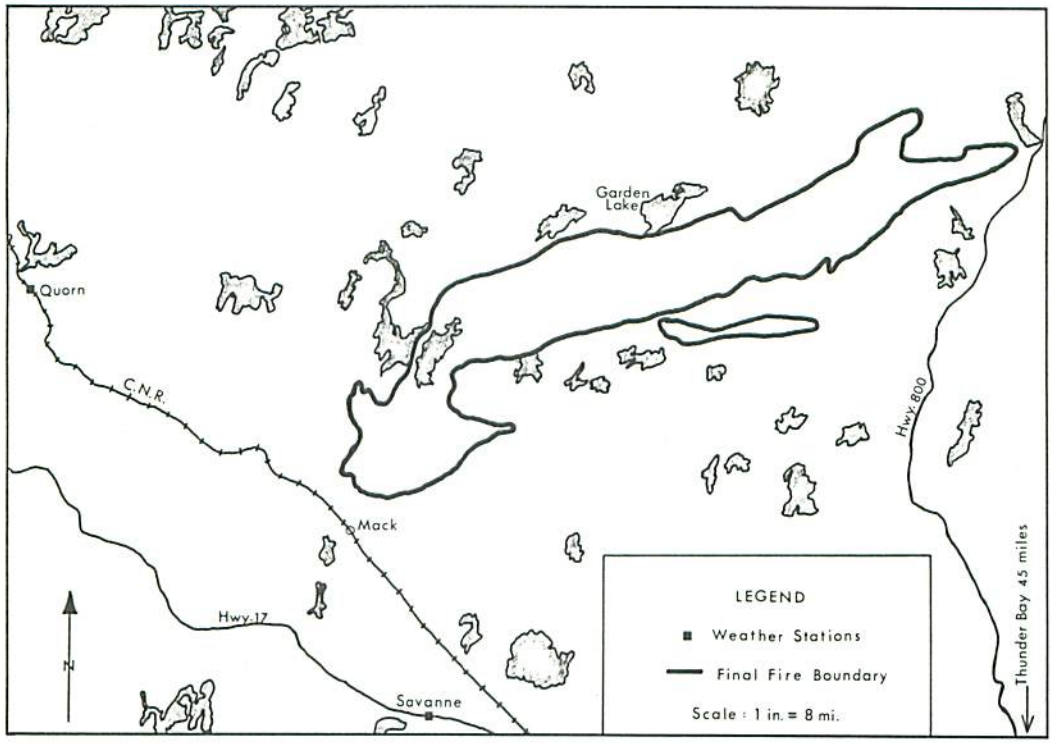

Fig. 2a. Location and final perimeter of Garden Lake fire.

B.S.P.), jack pine (*Pinus banksiana* Lamb.) and balsam fir (*Abies balsamea* [L.] Mill.) were the predominant species in the area; of these, 635,620 cords[3] of spruce, 190,949 cords of pine and 143,813 cords of balsam were destroyed.

The total fire fighting cost for the Garden Lake fire amounted to $71,788.

The Dog Lake fire was actually a combination of four fires (Fig. 2b) that started from untended campfires in late May and early June of 1930. All fires were manned but grew together to burn over 162,316 acres, most of this acreage being destroyed on June 2, 1930. Of the total fire acreage 105,260 acres were on licensed crown land, 13,230 acres on private land and 43,826 acres on unlicensed crown land. An estimated 390,000 cords of black spruce pulpwood, 30,000 cords of poplar (*Populus* L. spp.) and 1,350,000 FBM[4] of jack pine were lost. Damage to houses and barns in Jacques Township amounted to $15,000 and total fire fighting cost was $11,240.

(b) *Weather in Months Preceding Fires*

Precipitation records for two stations located near the origin of the Garden Lake fire show a consistent precipitation deficit in the

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[3] 1 cord = approximately 3.6 cubic meters

[4] 1 board foot = approximately 2,359.74 cubic centimeters

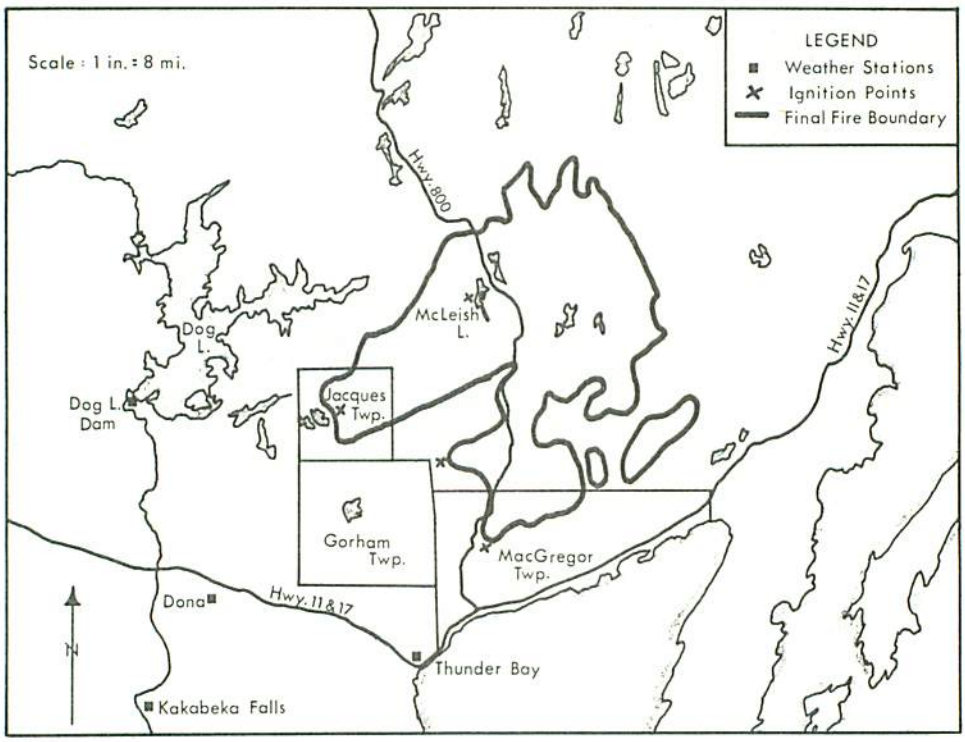

Fig. 2b. Location and final perimeter of Dog Lake fire.

months preceding the fire (Fig. 3a). Precipitation at Quorn (30 miles northwest) and Savanne (17 miles south) was 2.62 inches[5] and 2.73 inches, respectively, below normal for the first 5 months of 1930.

Average daily temperatures at these two stations were not significantly higher or lower than normal in the months preceding the fire, although February, 1930 was much warmer and January significantly colder than normal (Fig. 3b).

Precipitation records for stations nearest the Dog Lake fire vary considerably (Fig. 3a), with Thunder Bay (8 miles south of the fire) recording average precipitation from January through April, 1930 and a surplus of 1.21 inches during May. At Dona (15 miles southwest of the fire), however, precipitation was 3.68 inches below normal for the January-April period and a rainfall deficit of 0.69 inches was recorded in May, 1930. The weather station closest to the fire was at Dog Lake Dam but no 10-year normals are available for this station. However, during the first 5 months of 1930 this station recorded precipitation only 0.05 inches higher than that of Dona and 2.55 inches lower than that of Thunder Bay. Thus it would appear that, owing perhaps to the

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[5] 1 inch = 2.54 centimeters (exactly)

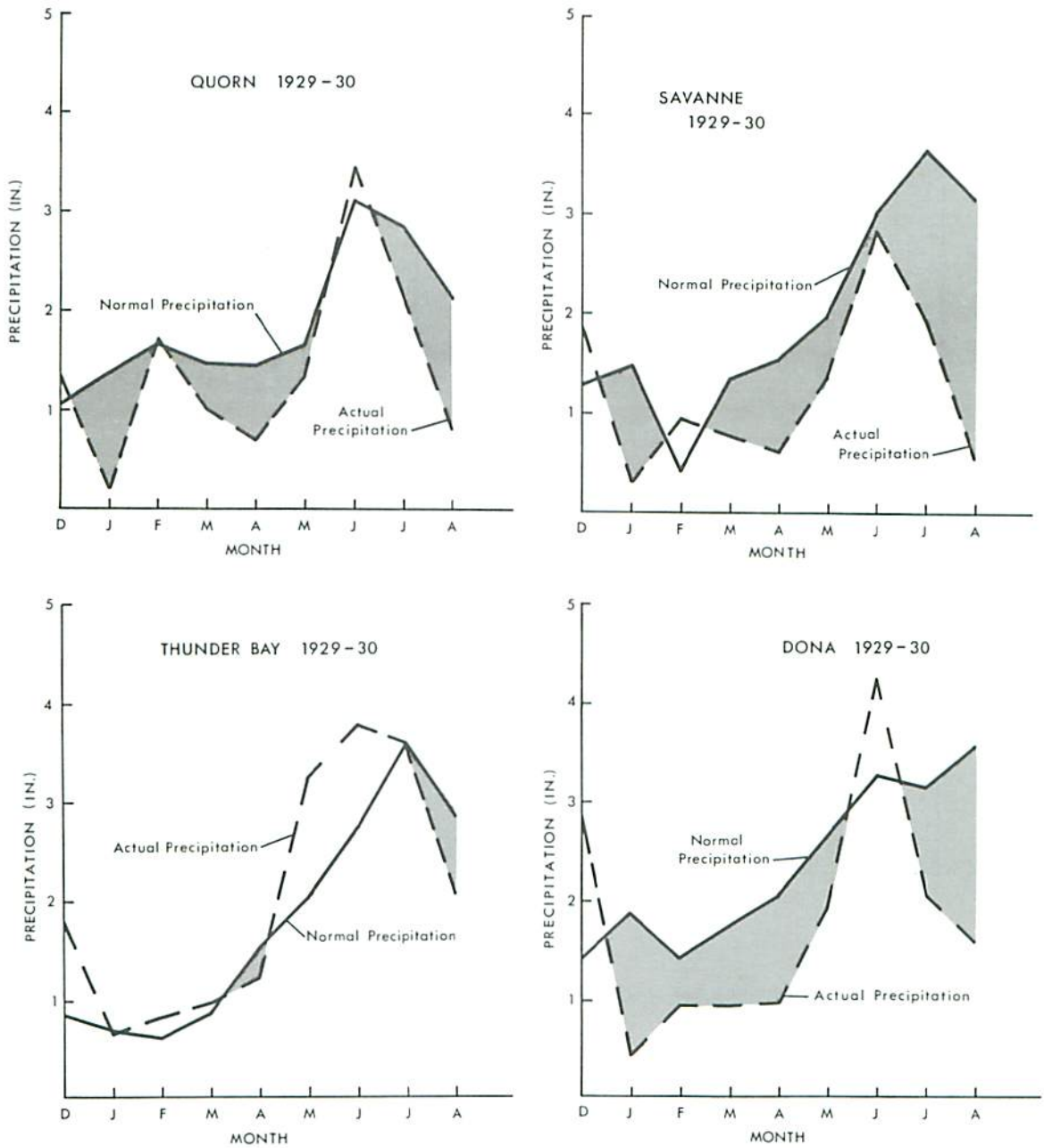

Fig. 3a. Departure from normal monthly precipitation amount for four northwestern Ontario stations for the period preceding and during the Garden Lake and Dog Lake fires.

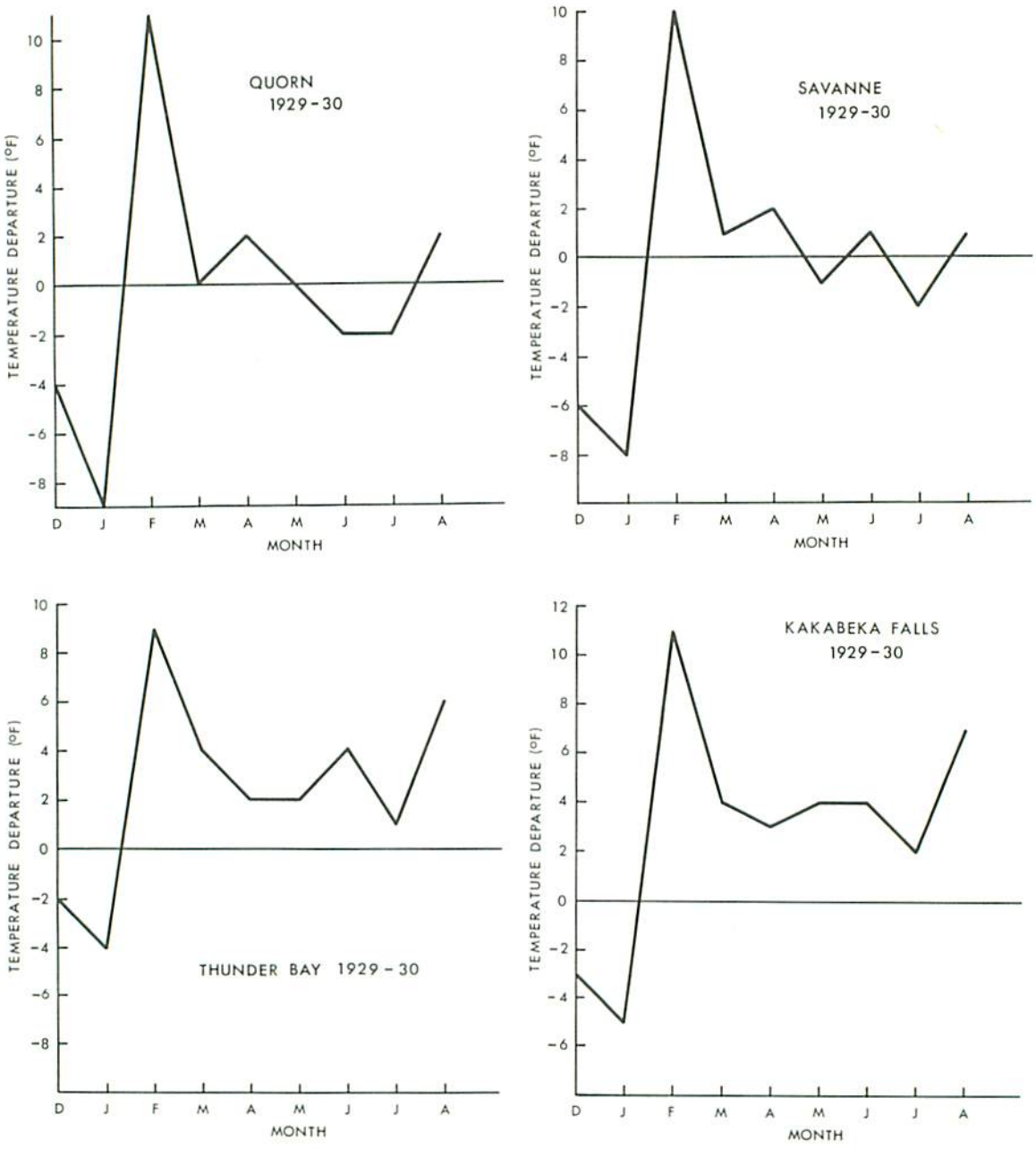

Fig. 3b. Departures of monthly temperature from average for four northwestern Ontario stations for the period preceding and during the Garden Lake and Dog Lake fires.

influence of Lake Superior, precipitation records for Thunder Bay are not very representative of conditions further inland.

Average daily temperatures for stations at Thunder Bay and Kakabeka Falls (no temperature records for Dona are available) were below normal in January, 1930 and above normal for the 4 months preceding the fire outbreak, February, 1930 being a particularly warm month (Fig. 3b).

Thunder Bay was the only station in northwestern Ontario that was recording wind speed and relative humidity in addition to temperature and rainfall in 1930. Using these values to calculate the Fire Weather Index (FWI) from the system in use today (Anon. 1970), we obtained the figures shown in Table 1. Although weather conditions at Thunder Bay may be considered not very representative of the situation further inland where the fires started, they are the only complete records available. Although precipitation for the first 5 months of 1930 was lower at inland stations, during the critical last 2 weeks in May no rainfall was recorded at any stations, including Thunder Bay. It is probable, therefore, that the FWI in late May and early June for Thunder Bay is fairly representative of much of the Thunder Bay District, despite its location on Lake Superior.

(c) *Weather Immediately Preceding and During the Fires*

During the week preceding the start of the Garden Lake fire on June 1 and the major run of both the Garden and Dog Lake fires on June 2, northwestern Ontario had been under the influence of cool, dry Arctic air from a high pressure cell which tracked from northern Manitoba on May 28 (Fig. 4a) to lie over the northeastern United States on June 1. As a result, lower temperatures and dry weather prevailed in the Thunder Bay region in late May. Table 1 shows the FWI and its component indices calculated (using Thunder Bay noon weather) for the 3-week period before and during the Garden and Dog Lake fires. In spite of the 2-week interval without rain before the fires, FWI moisture code values - Fine Fuel Moisture Code (FFMC), Duff Moisture Code (DMC), Drought Code (DC) and Adjusted Duff Moisture Code (ADMC) - were all in the moderate range as a result of fairly low temperatures.

A deep low pressure area moved from western Canada to lie approximately 100 miles north of The Pas, Manitoba by June 1. Also on June 1 a secondary low pressure system appeared over central North Dakota (Fig. 4b). By early June 2 this secondary low had amalgamated with the Manitoba low to form a large and intense low over extreme northwestern Ontario (Fig. 4c, 4d). A strong west-south westerly geostrophic gradient existed over northwestern Ontario at this time, estimated at 40-60 miles per hour[6]. The presence of the short wave trough originally associated

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[6] 1 mile per hour = approximately 1.6 kilometers per hour

Table 1 Noon fire weather before and during the Garden and Dog Lake fires (measured at Thunder Bay AES synoptic station)

Date	Wind (mph)[a]	Temp (°F)[b]	R.H. (%)	Rain (in.)[c]	FFMC[d]	DMC[e]	DC[f]	ISI[g]	ADMC[h]	FWI[i]	FWI Class[j]
May											
15	2	52	94	0.12	13.9	0.5	34.8	0.0	0.9	0.0	vl
16	20	43	63	0.49	47.2	0.7	18.9	0.8	1.3	0.2	vl
17	12	48	74	0.12	49.4	0.7	19.9	0.5	1.3	0.1	vl
18	6	50	17	-	76.6	3.1	23.7	1.4	4.7	0.6	l
19	4	52	76	-	76.2	3.9	27.7	1.2	5.7	0.5	l
20	10	54	77	0.05	68.6	4.7	31.9	1.1	6.9	0.6	l
21	8	64	80	0.15	52.4	3.4	33.1	0.4	5.4	0.2	vl
22	18	70	52	-	79.3	6.2	38.9	4.9	8.9	5.0	m
23	8	56	61	-	81.0	7.7	43.3	2.6	10.7	2.7	l
24	8	48	61	-	80.6	8.7	46.9	2.5	11.9	2.8	l
25	10	52	69	-	79.9	9.7	50.9	2.7	13.2	3.3	l
26	12	53	69	-	79.8	10.8	55.0	3.2	14.5	4.2	m
27	10	45	93	-	73.8	10.9	58.3	1.6	14.9	1.7	l
28	16	61	50	-	82.5	13.2	63.2	5.9	17.3	8.5	m
29	6	55	54	-	83.2	14.9	67.5	2.8	19.2	4.5	m
30	4	57	71	-	81.4	16.0	72.0	2.0	20.6	3.1	l
31	12	77	46	-	87.4	19.7	78.5	7.9	24.2	12.8	h
June											
1	6	62	74	-	84.8	20.9	84.6	3.5	25.9	6.6	m
2	30	82	46	-	89.0	25.1	92.8	41.6	29.9	45.5	e
3	6	56	87	0.07	61.5	23.7	97.8	0.6	29.5	0.7	l
4	4	55	99	0.06	39.5	23.0	103.2	0.1	29.5	0.2	vl
5	12	54	87	0.31	34.6	12.7	95.4	0.2	19.1	0.2	vl
6	6	55	70	0.00	57.1	13.8	100.8	0.5	20.6	0.4	vl

[a] 1 mile per hour = approximately 1.6 kilometers per hour

[b] $t°F = 5(t-32)/9°C$

[c] 1 inch = 2.54 centimeters (exactly)

[d] Fine Fuel Moisture Code

[e] Duff Moisture Code

[f] Drought Code

[g] Initial Spread Index

[h] Adjusted Duff Moisture Code

[i] Fire Weather Index

[j] vl = very low, l = low, m = moderate, h = high, e = extreme.

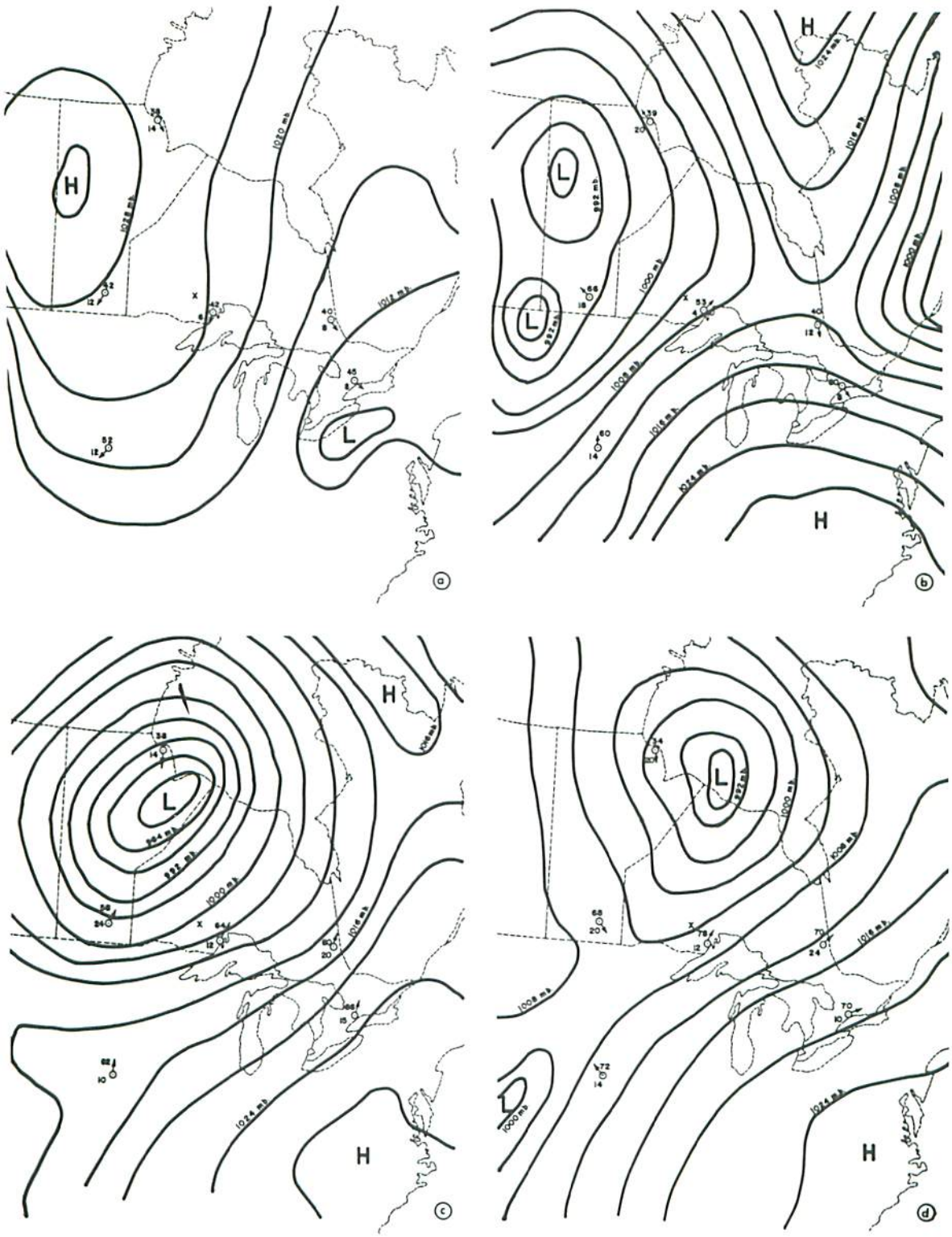

Fig. 4. Surface weather maps during the Garden and Dog Lake fires:
4a. May 28, 1930 - 0800 hours EST
4b. June 1, 1930 - 0800 hours EST
4c. June 2, 1930 - 0800 hours EST
4d. June 2, 1930 - 2000 hours EST

with the North Dakota low and moving across northwestern Ontario on June 2 led to instability at upper levels in the atmosphere and this, in turn, coupled with a strong pressure gradient, created a severe fire weather situation in that part of the Province. Weather maps were compiled only twice daily (at 0800 and 2000 hr EST), and as a result no noon weather maps are available for this period. Specific weather information is shown for selected stations across the east-central United States and Canada. Dry-bulb temperature is given above and to the left of each station while wind speed is plotted at the lower left. Wind direction is indicated by an arrow.

The strong southwesterly surface winds measured at Thunder Bay at noon on June 2 (30 mph) were the direct result of this phenomenon and caused Initial Spread Index (ISI) and FWI values for this day to be extremely high, in spite of the relatively moderate moisture code values. The sustained high winds (12 mph at both 0800 and 2000 hr as well as 30 mph at noon) contributed most significantly to the tremendous northeasterly rate of spread of the Garden Lake fire which moved 55 miles between the evenings of June 1 and June 2, a period of approximately 26 hours. This constitutes an average rate of spread of approximately 2.1 miles per hour, or 186 feet per minute[7]. Phenomenal as this rate-of-spread figure is, it is most likely a conservative one as the 26-hour period includes the night of June 1 when the fire no doubt spread at a much slower rate than it did during the day of June 2, owing to lower temperature and wind speed and increased humidity. Therefore, it is likely that the fire spread greatly exceeded this average spread rate during daylight hours on June 2.

No rate-of-spread figures are available for the Dog Lake fire other than that its greatest spread occurred on June 2, 1930.

The extreme ISI and FWI conditions were short-lived, however, as greatly reduced winds and temperatures occurred in northwestern Ontario on June 3. The cold front associated with the intense low discussed earlier passed through the fire region at this time. Subsequent days were cooler and rainfall was recorded at Thunder Bay on June 3, 4 and 5. As a result of this abrupt weather change behind the low pressure cell the Garden Lake fire did not spread appreciably after the evening of June 2.

In summary, there can be little doubt that an overall lack of rain in the months preceding the Garden Lake fire had a significant effect on the behavior of this fire; however, the tremendous influence of the consistently strong winds and upper air instability on June 2,

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[7] 1 foot per minute = approximately 0.3 meters per minute

1930 on the fire's rate of spread on this date is evident in the unique shape of the fire.

DANCE TOWNSHIP FIRE (1938)

(a) *General Description*

The Dance Township fire of 1938 is believed to have resulted from the merging of a number of clearing fires in and around Dance Township. These settlers' fires, numbering perhaps in the hundreds, came together under high winds on October 10, 1938 and ran north and northeast for nearly 25 miles. The fire was finally held at Sphene and Pipestone lakes on October 15 after burning over 74,049 acres (Fig. 5) and killing 20 people. The area is fairly hilly and contains a large number of lakes; much of it had been recently clearcut or partially cut over, creating large sections of slash and young growth. Jack pine, poplar, red pine (*Pinus resinosa* Ait.) and eastern white pine (*Pinus strobus* L.) were the predominant species.

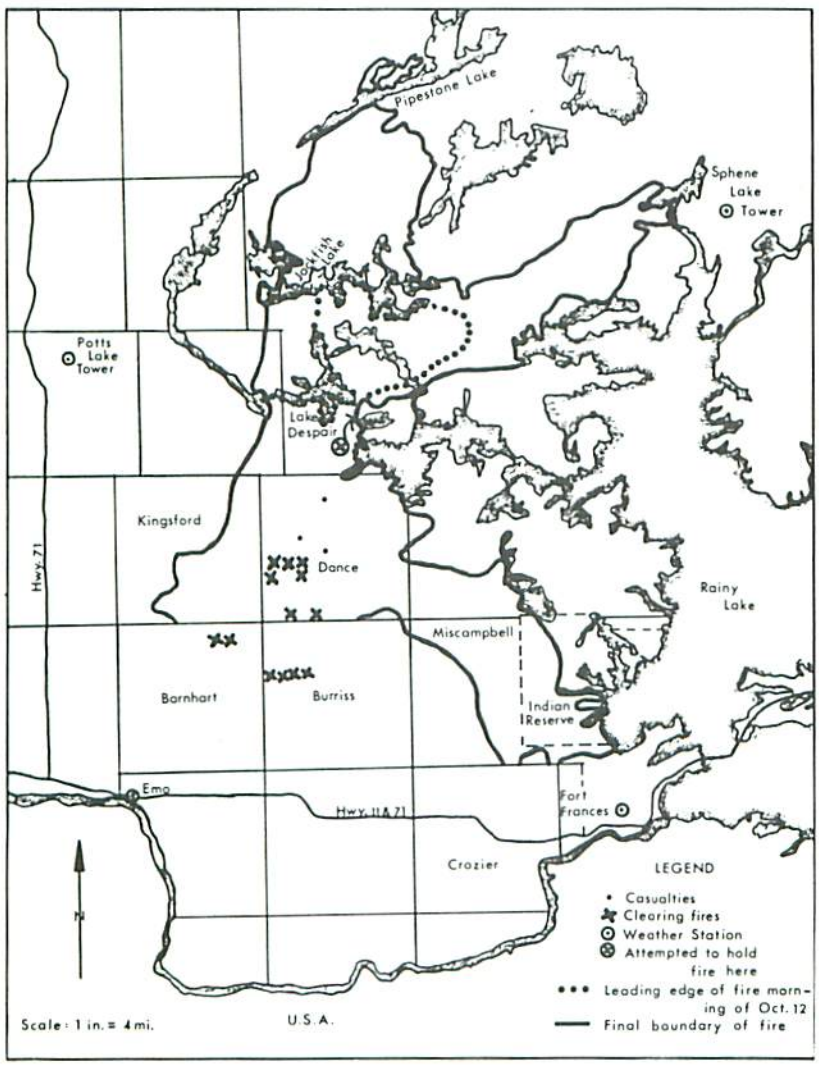

Fig. 5. Location, intermediate and final perimeter of Dance Township fire.

Of the 54,478 acres of crown land and 19,571 acres of private land burned,over 34,045 acres were classified as young growth, 20,322 acres as second growth, 11,864 acres as slash, and the balance as miscellaneous fuels. Of the total acreage 49,109 acres were listed as partly killed and 24,940 acres as completely killed. Because of the uncertainty in determining the exact location and status of many of the clearing fires burning in early October, the map in Figure 5 does not show the complete southern border of the fire. However, the locations of 13 clearing fires known to be burning south of Lost Creek in Dance, Bassiss and Carpenter townships on the morning of October 10, 1938 are shown, along with the areas in which settler families died. The fire that burned into Miscampbell Township and the Rainy Lake Indian Reserve originated in Crozier Township, entered the southern boundary of Miscampbell at two locations (Fig. 5) and grew to join the Dance fire.

(b) *Weather in Months Preceding Fire*

Although precipitation during the year preceding the Dance fire was 4.19 inches above normal at Emo and only 1.95 inches below normal at Fort Frances (Fig. 6a), the times at which most precipitation occurred are quite important. Both stations (AES) recorded well-above-normal rainfall in April and May of 1938 while rainfall was well below average for the succeeding 4 months at both stations, with the exception of July, 1938 at Emo when two large thunderstorms increased precipitation to 1.85 inches

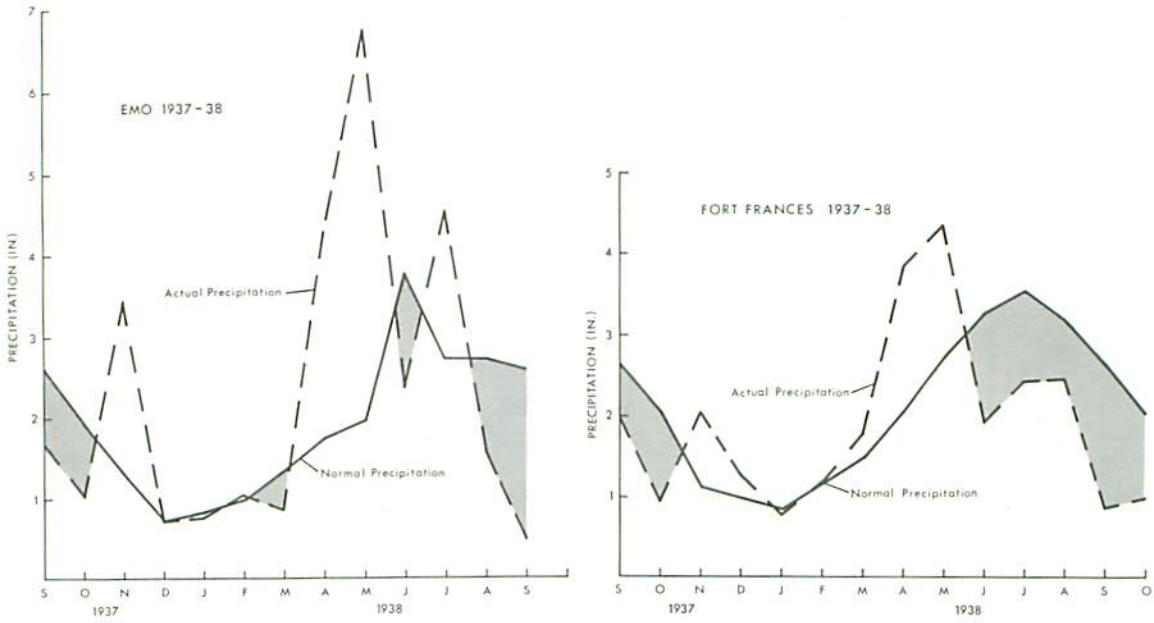

Fig. 6a. Departure from normal monthly precipitation amount for two stations near the Dance Township fire for the period preceding and during the fire.

above normal. For the August-September period rainfall at Emo was 3.23 inches below normal while Fort Frances reported precipitation 2.52 inches below normal for the same period, and 5.05 inches below normal for the 4-month interval between June and September of 1938.

During September rainfall throughout the region averaged only 0.58 inches at four weather stations, Fort Frances, Emo, Potts Lake Tower and Sphene Lake Tower reporting 0.86 inches, 0.50 inches, 0.46 inches, and 0.51 inches, respectively. Only light and intermittent rainfall was recorded at all stations except when a thunderstorm on September 9 resulted in 0.70 inches of rain at Fort Frances. During October no rain fell at any station in the region until after the Dance fire had made its run between October 10 and 14.

Average daily temperatures were above normal for every month from January through September at both Emo and Fort Frances (Fig. 6b), with substantially above-normal values recorded at both stations in February and March and again in August and September of 1938.

High temperatures, in combination with the substantial lack of rain in the Fort Frances region during the late summer and early fall of 1938, created an extremely dangerous and potentially explosive situation.

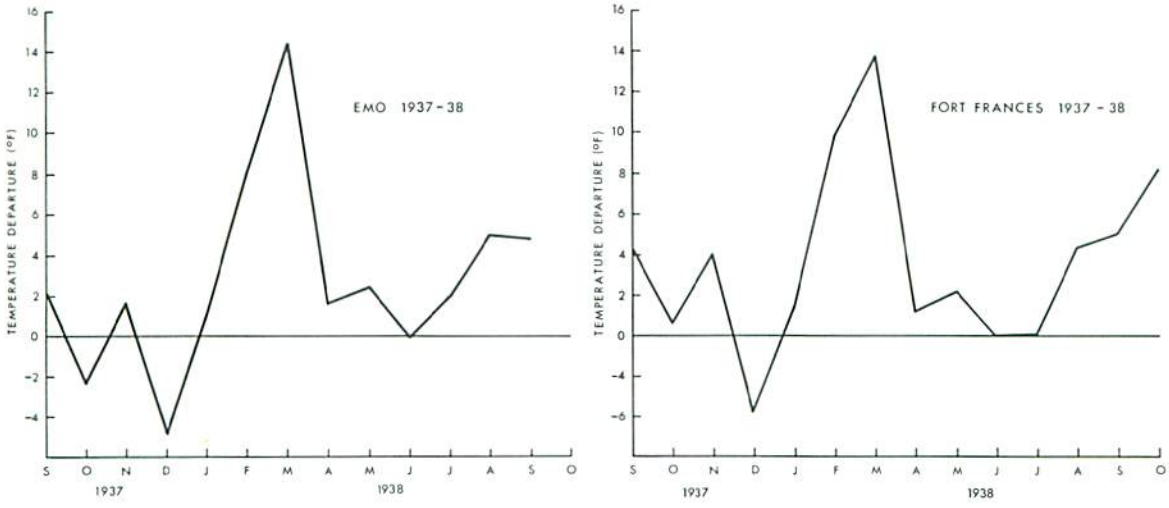

Fig. 6b. Departures of monthly temperature from average for two stations near the Dance Township fire for the period preceding and during the fire.

The large quantities of highly inflammable logging slash present, the extremely dry and warm weather conditions, and the large number of clearing fires burning contributed greatly to the severity of the Dance fire.

(c) *Weather Immediately Preceding and During the Fire*

Table 2 shows the FWI and its component indexes for the month previous to the Dance Township fire, calculated from noon weather observations taken at Bemidji, Minnesota which, although it was 80 miles southwest of the fire, was the nearest station taking the complete noon weather readings necessary for calculating the FWI. From a glance at Table 2 it is obvious that, unlike the Garden Lake situation in 1930, the weather in northwestern Ontario was extremely dry for the month preceding the fire, with low humidities common. As a result all FWI moisture codes, notably the DMC, DC and ADMC, were extremely high on October 10 and these high values contributed as much to the extreme FWI situation throughout the run of the Dance Township fire as did the ISI. This was completely unlike the 1930 situation, in which an extreme ISI was the major influence on fire behavior.

Following a high pressure cell which had moved across Ontario during the previous 3 days, a maritime arctic cold front moved into northwestern Ontario on October 7, but produced only a few widely scattered showers, none in the vicinity of Fort Frances. After this cold front passage a high pressure center moved across Ontario on October 8 and 9 (Fig. 7a), settling in the southeast over Pennsylvania on October 10. An inactive maritime warm front passed over extreme northwestern Ontario on October 9 (Fig. 7b) so that the fire region lay in a warm sector on October 10 with a moderately strong flow of south-southwesterly warm air (Fig. 7c). The pressure gradient on this day, when the Dance Township fire started its run, was approximately 30 mph, resulting in surface winds in the vicinity of 15 mph. A maritime cold front lay over the Dakotas on October 10 and passed through the fire region late on October 11 (Fig. 7d) producing isolated showers. Meanwhile a deepening low pressure system moved steadily eastward from Saskatchewan, producing, in the fire area, a relatively strong southwesterly gradient of approximately 40 mph on October 11 when this low was centered over northern Manitoba. Surface wind speeds on this day averaged between 15 and 20 mph in northwestern Ontario. This system and gradient persisted, resulting in strong winds and dry conditions (and extreme FWI values) until October 15 when the pressure gradient weakened considerably, the winds tapered off, and rain fell in the Fort Frances area.

For this fire and for subsequent fires discussed in this report, specific station information is given in a format slightly different from that used for the 1930 fires. Dry-bulb temperature is shown at the upper left, while relative humidity is plotted at the lower left of each

Table 2 Noon fire weather before and during the Dance Township fire (measured at Bemidji, Minnesota)

Date	Wind (mph)	Temp (°F)	R.H. (%)	Rain (in.)	FFMC	DMC	DC	ISI	ADMC	FWI	FWI Class
Sept 9	8	59	95	0.70	23.2	11.6	344.2	0.1	21.4	0.1	vl
" 10	8	74	63	-	66.2	13.2	349.9	0.8	24.1	0.9	vl
" 11	8	69	60	-	79.1	14.7	355.1	2.1	26.7	4.2	m
" 12	6	75	53	-	85.0	16.8	360.9	3.6	30.1	7.4	m
" 13	6	79	48	-	87.7	19.4	367.1	5.0	34.2	10.8	h
" 14	14	65	54	-	87.4	20.9	371.9	9.3	36.7	18.0	h
" 15	10	62	65	-	86.3	22.1	376.4	5.8	38.5	12.8	h
" 16	14	67	47	-	87.5	24.0	381.4	9.3	41.5	19.2	h
" 17	12	57	48	-	87.0	25.4	385.4	7.4	43.6	16.7	h
" 18	10	47	49	-	86.0	26.2	388.4	5.6	44.9	13.6	h
" 19	8	57	62	-	85.1	27.3	392.4	4.2	46.4	11.1	h
" 20	4	67	40	-	87.9	29.4	397.4	4.4	49.7	11.9	h
" 21	8	75	33	-	90.4	32.4	403.2	8.5	54.0	20.6	h
" 22	3	79	39	-	90.8	35.4	409.4	6.0	58.2	16.5	h
" 23	14	73	44	-	90.6	37.8	415.0	14.1	61.5	31.2	e
" 24	9	70	38	-	90.6	40.2	420.3	9.4	64.9	24.3	e
" 25	16	79	42	-	90.9	43.0	426.5	17.3	68.7	37.8	e
" 26	14	69	38	-	90.8	45.4	431.7	14.6	71.9	34.6	e
" 27	7	72	40	-	90.9	47.9	437.2	8.4	75.2	24.2	e
" 28	5	65	38	-	90.7	50.1	442.0	6.9	78.0	21.6	h
" 29	8	67	44	0.04	85.3	52.1	447.0	4.3	80.7	15.5	h
" 30	4	65	50	-	86.4	53.8	451.8	3.6	83.0	13.7	h
Oct 1	16	68	52	-	86.8	55.4	455.9	10.1	84.9	29.2	e
" 2	8	75	42	-	88.8	57.6	460.7	6.8	87.7	22.7	e
" 3	8	73	51	-	88.9	59.3	465.3	7.0	90.0	23.3	e
" 4	6	60	79	-	85.4	59.9	468.6	3.7	90.8	14.8	h
" 5	10	49	81	-	82.3	60.2	470.8	3.5	91.2	14.2	h
" 6	22	56	56	-	84.2	61.1	473.7	11.7	92.4	33.8	e
" 7	14	61	60	-	84.5	62.2	477.1	6.4	93.8	22.4	h
" 8	4	59	54	-	85.1	63.3	480.3	3.0	95.2	13.0	h
" 9	14	79	45	-	88.4	65.6	485.5	10.5	98.0	32.4	e
" 10	14	79	36	-	90.0	68.2	490.7	10.6	101.2	33.0	e
" 11	14	74	45	-	88.7	70.2	495.4	10.9	103.7	34.2	e
" 12	14	63	48	-	88.3	71.7	499.0	10.4	105.5	33.3	e
" 13	12	71	29	-	91.1	74.1	503.4	12.8	108.4	38.7	e
" 14	16	58	32	-	90.6	75.7	506.5	16.7	110.3	46.3	e
" 15	6	56	47	0.20	64.2	50.1	489.4	0.7	79.8	2.5	l

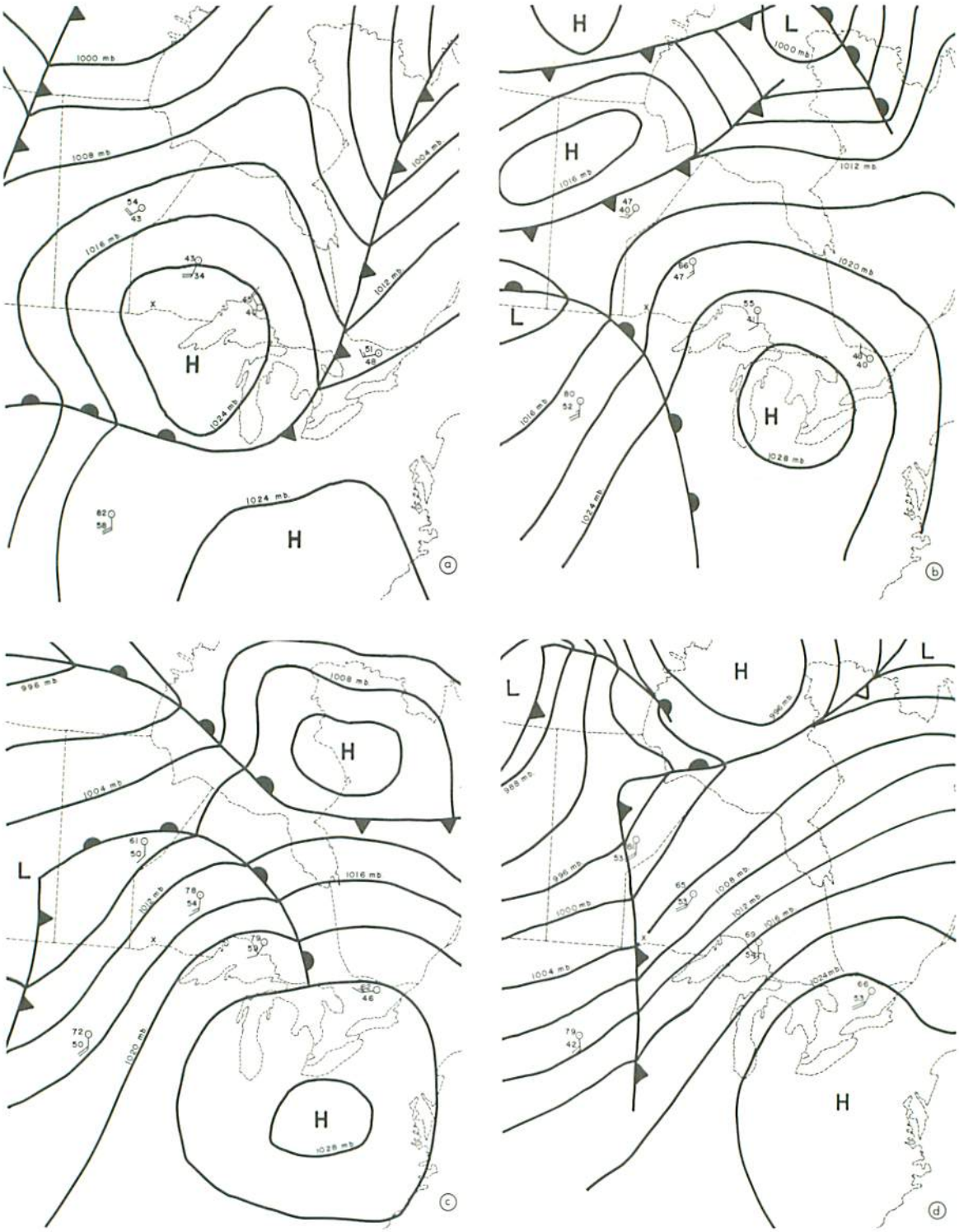

Fig. 7. Surface weather maps during the Dance Township fire.
7a. October 8, 1938 - 1200 hours EST
7b. October 9, 1938 - 1200 hours EST
7c. October 10, 1938 - 1200 hours EST
7d. October 11, 1938 - 1200 hours EST

station. Wind direction is indicated by an arrow and wind speed by a series of bars on the tail of each arrow (a long bar for each 10 mph increment in wind speed and a short bar for each 5 mph increment).

Owing to heavy smoke, aerial reconnaissance on the Dance Township fire was delayed until the morning of October 12 when the approximate location of the leading edge of the fire was ascertained (Fig. 5). The strong winds of October 10 and 11 pushed the fire north 14 miles to Jackfish Lake by late in the evening of October 11, a back-fire attempt at Hope Lake (location marked in Fig. 5) having failed to hold the fire. Using a 30-hour interval between the beginning of the fire's run in the early afternoon of October 10 and its arrival at Jackfish Lake by the evening of October 11, an average rate of spread of 0.47 mph or 41 feet per minute can be calculated, although it is most likely that the fire greatly exceeded this spread rate during the day on October 10 and 11, slowing down considerably on the night of October 10.

In summary, the Dance Township fire spread at a much slower rate than the Garden Lake fire, owing in part, perhaps, to the large number of lakes in the fire area, but mostly because of lower wind and ISI values during the fire's run. Moisture code values (FFMC, DMC, DC, and ADMC) were extreme in the Fort Frances area in October, 1938 and this, in combination with the large amount of slash fuel in the fire area, undoubtedly resulted in an intense fire in which a great deal of fuel was consumed. The Garden Lake situation was almost the opposite - low moisture code values, no available slash fuel, but an extremely high wind which resulted in a tremendous rate of spread.

CHAPLEAU-MISSISSAGI FIRE (1948)

(a) *General Description*

In the spring of 1948 two large fires, one referred to as Chapleau Fire No. 69-3 and the other as Blind River Division Fire No. 1 (Mississagi), merged somewhere in the vicinity of Peshu Lake, slightly northwest of the Mississagi River system (Anon. 1964). The area burned totalled 645,340 acres of valuable timber lands and although a prompt salvage operation no doubt recovered some of the timber losses, a full damage appraisal could never be made on what has come to be known as one of the most disastrous forest fires in Ontario's modern history. The final boundary of the fire included some 53 townships located almost centrally between the towns of Chapleau and Blind River and lying mainly east of what is now Highway 129 (Figs. 8a and 8b).

The Chapleau portion of the fire started on the afternoon of May 25, 1948, as a result of right-of-way burning in the southwest corner of Township 8D and spread quickly, fanned by high winds from the northwest.

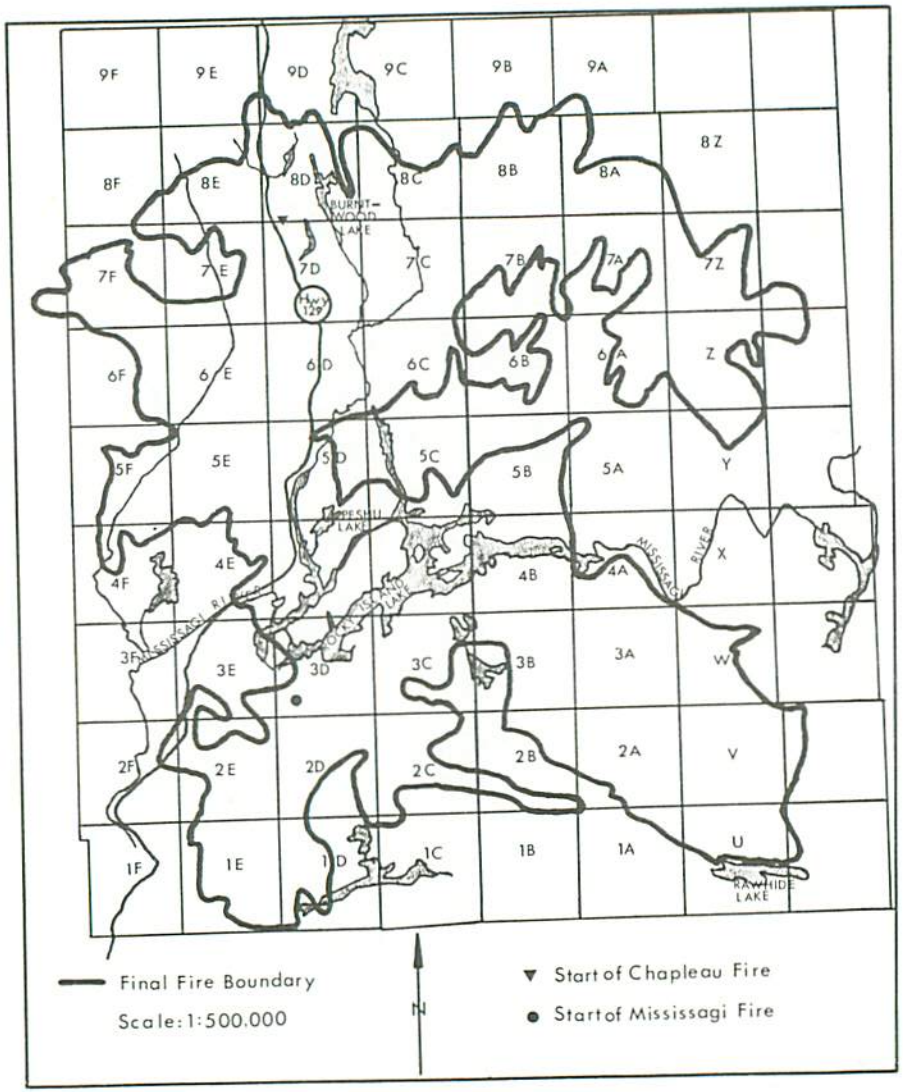

Fig. 8a. Map of Chapleau-Mississagi fire showing local features, townships and the origin of both sectors of the fire.

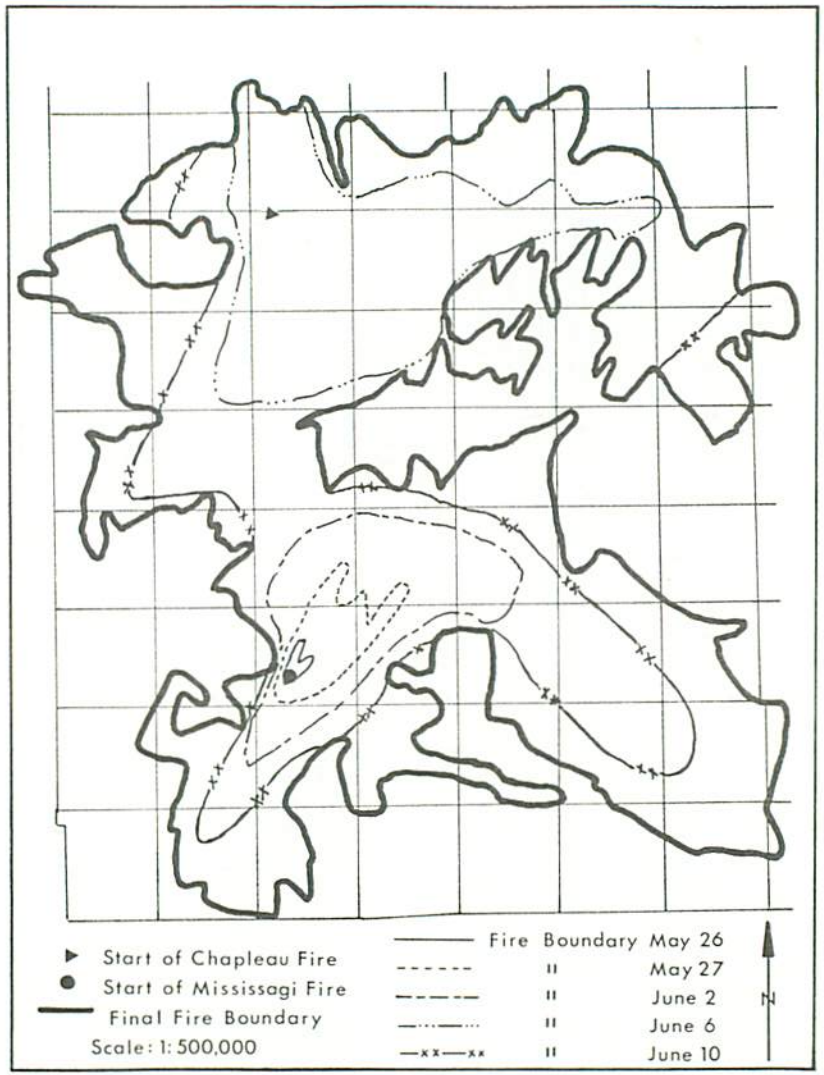

Fig. 8b. Composite rate-of-spread map for the Chapleau-Mississagi fire showing the fire boundary on certain days and the final perimeter of the fire.

Meanwhile, in the Mississagi area, a fire was discovered in Township 3D shortly after noon on the same day; it was later believed to have been caused by poachers on the Mississagi game preserve.

In both locations, lack of green vegetation on the forest floor, areas of severe budworm infestation in balsam fir and spruce dating back 10-15 years, and some areas of logging slash coupled with extreme fire weather conditions precluded any immediate control of these fires. Generally rough and hilly topography in the area also increased control difficulty.

As mentioned earlier, reliable estimates of damage caused by these fires will never be obtained. The report on the Mississagi fire lists over 200 million FBM of white, red and jack pine as being destroyed along with various amounts of tie, pulpwood and post material to a total estimated value of $921,669.

The Chapleau fire report estimates losses of more than 250 million FBM of softwood lumber plus assorted pulp, post, and tie material for a value loss of $1,155,740 and private property losses of over $16,000. The damage to soil, watersheds, wildlife and potential recreation areas cannot, of course, be measured.

(b) *Weather in Months Preceding Fire*

Reports on both parts of the Chapleau-Mississagi fire indicate low water and precipitation levels in the fire area during the preceding fall and winter. An information circular compiled by the Ontario Division of Forest Protection showed water levels in lakes and streams in the fire area to be approximately 2 feet[8] below normal as of March 1, 1948 (Hess 1948). Provincial fire weather stations at Ranger Lake and Chapleau (10 miles west and 30 miles north of final fire perimeter, respectively) were closest to the fire area, but some of the 1948 weather records for Ranger Lake have been lost and fire weather records at Chapleau were not begun until early May. AES records for Chapleau are complete only from March, 1948 and as a result this information was supplemented with more complete data from AES stations at Biscotasing (20 miles east) and Blind River (30 miles south), somewhat more removed from the fire perimeter.

Precipitation data from these two stations for the 8-month period (September-May) preceding the fire outbreaks indicates that Blind River had a relatively high deficit of 3.75 inches while Biscotasing precipitation was marginally (0.18 inches) above normal for the same period (Fig. 9a). Winter droughts at both stations were offset by above-normal

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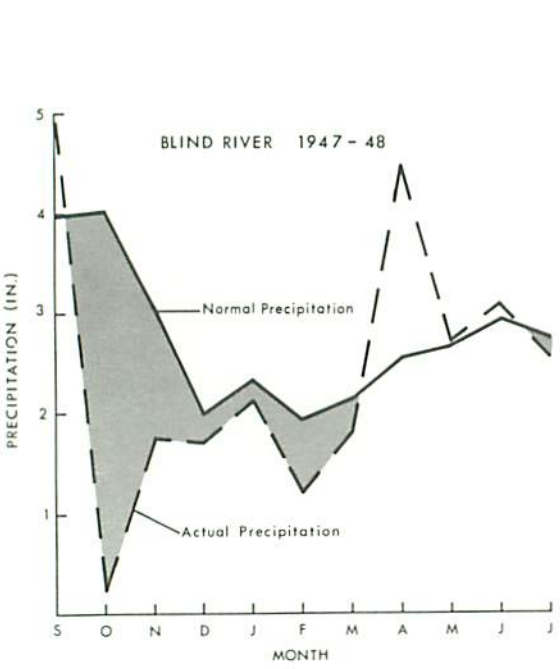
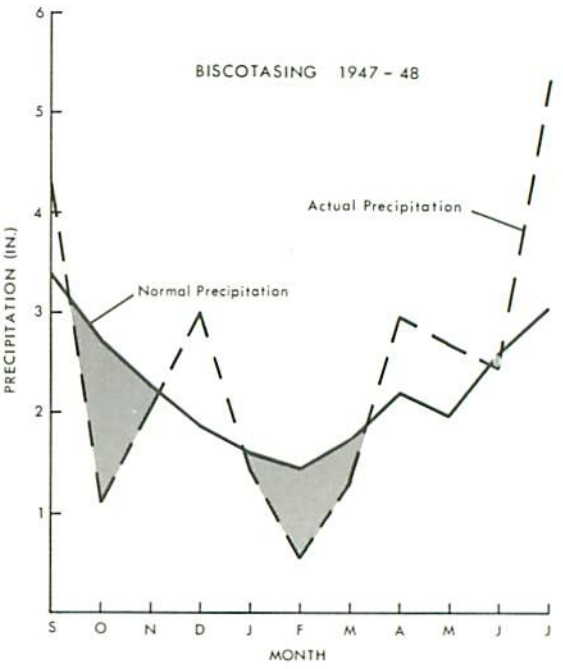
[8] 1 foot = 30.48 centimeters (exactly)





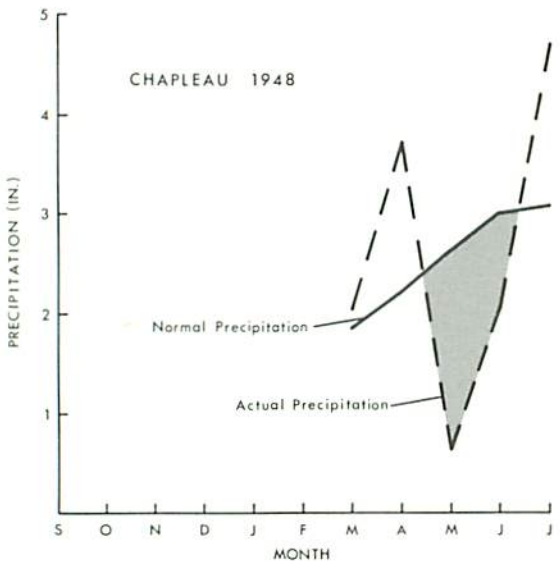


Fig. 9a. Departure from normal monthly precipitation amount for three central Ontario stations for the period preceding and during the Chapleau-Mississagi fire.

rainfall at both stations for the April-May period. Chapleau recorded a large rainfall surplus in April but during May and June precipitation recorded at this station was well below normal. Rainfall during May, 1948 before the fire's outbreak totalled 1.01 inches at Chapleau and 2.47 inches at Biscotasing. Ranger Lake station reported frequent showers in April and general rains on May 5, 6 and 7, but no rain of any account after that until June 22.

An examination of temperature records for Blind River and Biscotasing shows that the fall and winter preceding the fires were no warmer than usual, although October, 1947 and April, 1948 were much warmer than usual at both stations (Fig. 9b). No temperature data were available from Chapleau station during this period.

Fire report information indicates prolonged drought in the fire area but only moderate drought at the provincial fire weather stations, in part, perhaps, because these stations are somewhat removed from the fire area.

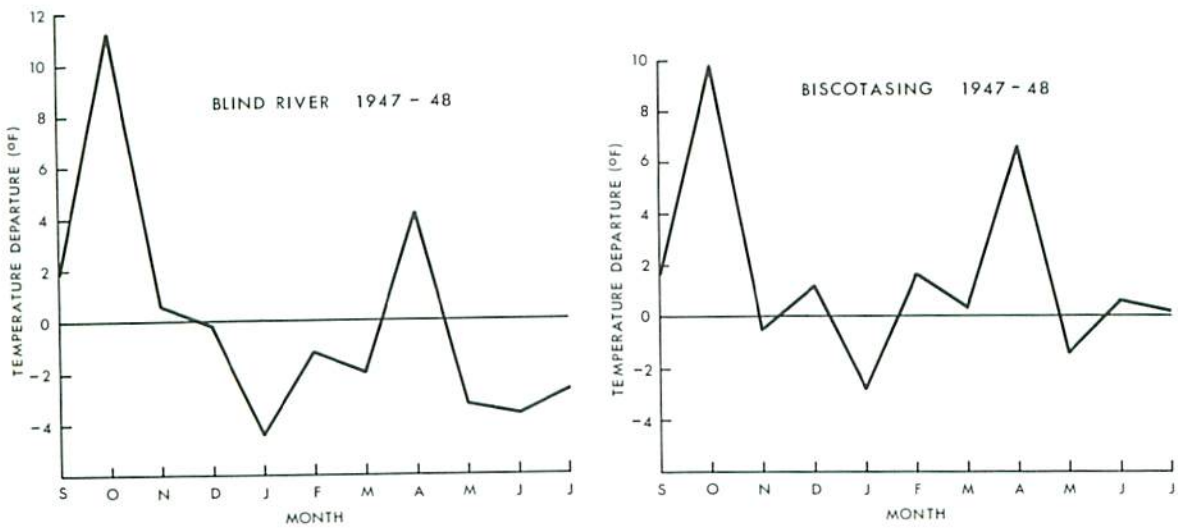


Fig. 9b. Departures of monthly temperature from average for Biscotasing and Blind River weather stations for the period preceding and during the Chapleau-Mississagi fire.

(c) *Weather Immediately Preceding and During the Fire*

Only intermittent light rains were recorded at Chapleau and Ranger Lake during the 2 weeks preceding the fire and temperatures were generally cool (Table 3). On May 25, when both parts of the fire were started, Ontario was under the influence of an Arctic high pressure system (Fig. 10a) which had moved south from northern Manitoba 2 days earlier. A cold front, associated with a fresh outbreak of Arctic air, lay across the central prairies and extreme northwestern Ontario on May 25 and this front moved southeast over the next few days, displacing warmer air, causing strong southwesterly winds in the fire area, and passing through central Ontario on the afternoon of May 27 (Fig. 10b). As a result of strong winds associated with this frontal passage both sections of the fire spread rapidly and by nightfall on May 27 the Mississagi and Chapleau sections had burned over 29,000 and 6,000 acres, respectively. An Arctic high pressure cell following this front settled over Ontario and the north-central United States for the next 7 days, bringing initially cool temperatures and low winds. There was little change in fire perimeters on May 28 and 29. By May 30, however, temperatures and wind speeds had increased (Fig. 10c) and at the end of this day, 45,000 and 9,000 acres, respectively, were destroyed in the Mississagi and Chapleau sections. On June 1 the Chapleau portion of the fire had grown to 40,000 acres.

Warmer temperatures and lower humidities prevailed on many days during the first 2 weeks of June, 1948. Wind velocities and directions varied considerably from day to day.

A polar cold front and an Arctic cold front passed through the fire area on June 4 (Fig. 10d). Strong winds associated with these fronts caused rapid fire spread with the Chapleau and Mississagi sections of the fire covering approximately 130,000 acres on June 4. Lightning fires caused by the passage of this frontal system required a diversion of men and equipment to protect the town of Chapleau and little control was taken on the northern (Chapleau) section of the large fire for the next week.

Sometime between June 5 and 7 the Mississagi and Chapleau portions of the fire joined near Peshu Lake. Strong winds, warm temperatures and low humidities continued and another cold front moved through the fire area on June 8 (Fig. 10e). By June 10 the fire was still out of control and had burned over a combined total of approximately 475,000 acres. Certain fire sectors were being held, but in many areas the fire ran unchecked.

Strong winds continued for most of the next week as two additional cold fronts moved southeastward through central Ontario before light showers between June 14 and 17 (Fig. 10f) temporarily eased the

Table 3 Noon fire weather before and during the 1948 Chapleau-Mississagi fire (measured at Chapleau)

Date		Wind (mph)	Temp (°F)	R.H. (%)	Rain (in.)	FFMC	DMC	DC	ISI	ADMC	FWI	FWI Class
May	21	7	36	82	0.07	51.5	18.8	72.8	0.4	22.9	0.4	vl
"	22	3	45	85	-	54.9	19.2	76.1	0.3	23.5	0.3	vl
"	23	7	46	74	0.07	53.5	18.2	79.0	0.4	23.1	0.4	vl
"	24	2	54	55	-	68.7	19.8	83.2	0.6	24.8	0.6	l
"	25	12	64	22	-	87.3	23.6	88.4	7.7	28.3	13.7	h
"	26	25	76	34	-	90.5	28.1	94.8	34.1	32.3	41.4	e
"	27	25	79	27	-	92.3	33.3	101.5	43.5	36.6	51.1	e
"	28	7	44	85	-	85.8	33.6	104.7	4.2	37.3	9.8	m
"	29	7	57	38	-	87.8	36.1	109.2	5.5	39.5	12.6	h
"	30	18	68	26	-	91.5	40.2	114.8	22.0	42.8	35.4	e
"	31	15	71	32	-	91.5	44.2	120.7	17.4	46.2	31.3	e
June	1	15	85	31	-	92.0	49.8	129.1	18.7	50.7	34.3	e
"	2	7	85	38	-	92.1	54.8	137.6	9.9	54.9	23.1	e
"	3	12	88	62	-	90.0	58.0	146.3	11.1	58.3	25.8	e
"	4	12	57	74	-	86.5	59.0	152.0	7.0	59.9	18.9	h
"	5	20	64	30	-	90.2	62.5	158.3	21.9	62.9	42.2	e
"	6	30	74	35	-	90.6	66.7	165.7	51.8	66.7	73.7	e
"	7	15	72	41	-	90.7	70.3	172.8	15.5	70.3	35.6	e
"	8	15	75	29	-	91.7	75.0	180.3	17.9	75.0	40.2	e
"	9	7	72	30	-	91.8	79.3	187.4	9.5	79.2	27.0	e
"	10	20	74	56	-	89.9	82.1	194.8	21.1	82.1	46.6	e
"	11	15	67	39	-	89.8	85.4	201.4	13.8	85.4	36.1	e
"	12	25	64	35	-	90.1	88.7	207.8	32.2	88.6	62.8	e
"	13	25	64	37	-	89.8	91.8	214.1	31.0	91.7	62.4	e
"	14	15	47	86	0.05	71.3	92.1	218.8	2.0	92.1	9.0	m
"	15	15	60	49	0.26	67.4	56.0	210.6	1.6	67.3	5.9	m
"	16	15	64	41	0.20	72.0	39.5	207.3	2.1	53.5	6.5	m
"	17	15	64	45	0.11	74.3	34.7	210.2	2.5	49.1	7.2	m
"	18	10	65	38	-	85.4	37.8	216.6	5.2	52.7	14.0	h
"	19	10	78	33	-	90.2	42.5	224.4	9.7	57.7	23.4	e
"	20	25	73	34	-	90.7	46.7	231.6	35.1	62.1	56.4	e
"	21	5	70	48	-	90.0	49.7	238.6	6.3	65.4	18.3	h
"	22	1	66	59	-	88.5	51.9	245.1	3.7	67.9	12.4	h
"	23	15	76	86	0.40	55.3	27.5	227.5	0.9	42.2	1.9	l
"	24	10	63	69	0.30	56.6	16.3	216.5	0.6	27.5	0.7	l

situation. The fire continued to spread in many directions throughout the next week because of dry, fairly windy conditions.

General rains beginning on June 22 and continuing for 4 or 5 days, in conjunction with cloudy and humid conditions, dampened the fire considerably and allowed fire fighters to gain control of the situation. Smudge and spot fires occurred regularly for the next month but the most serious problem had ended.

In summarizing the Chapleau-Mississagi fire it is important to consider fuel as well as weather conditions. The presence of large areas of budworm-killed spruce and balsam, and jack pine blowdown near the fire's origins, when coupled with an initial lack of manpower and audio communication, precluded early control, so that the fire quickly reached a size where control without favorable weather was impossible. Unlike other fires discussed in this report, this fire spread over a long period (almost 4 weeks) during which regularly strong winds, combined with intervals of high temperatures and low humidities, continually frustrated control attempts. After each frontal passage the weather stabilized and headway was made in controlling the fire, but the arrival of the next cold front negated this effort and the fire raged out of control again. The FWI was high or extreme on most days and the

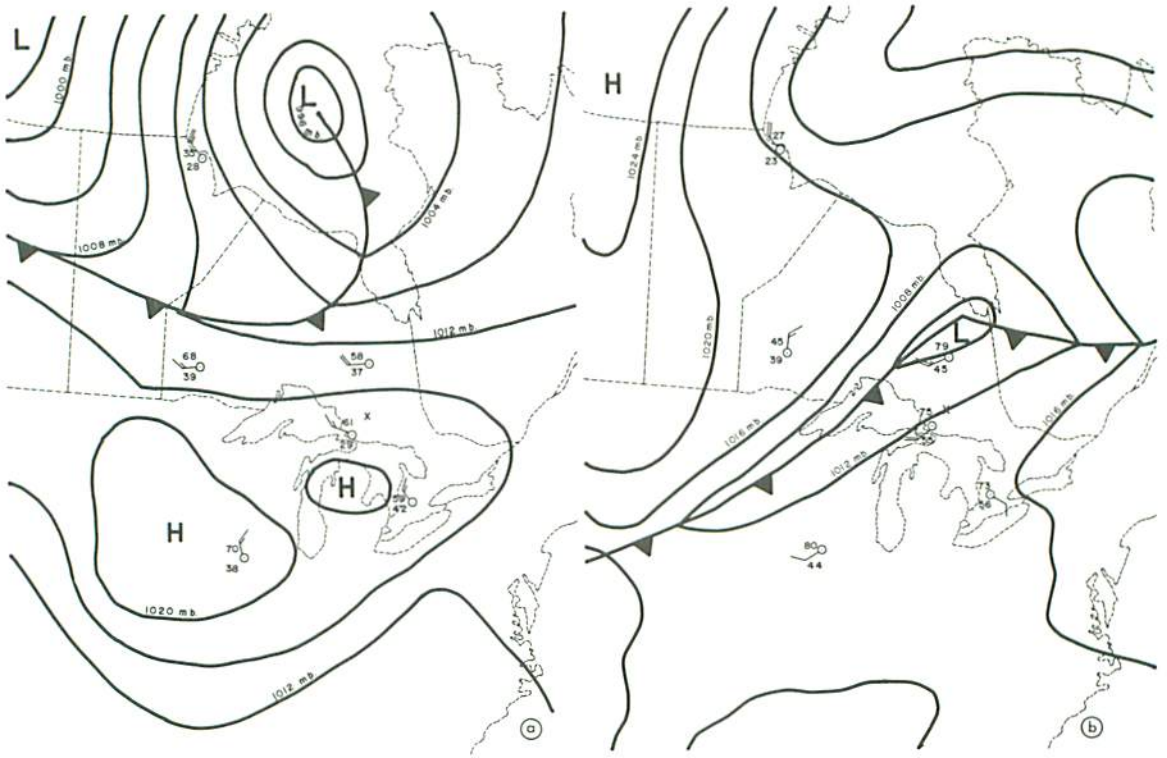


Fig. 10. Surface weather maps during the Chapleau-Mississagi fire
10a. May 25, 1948 - 1300 hours EST
10b. May 27, 1948 - 1300 hours EST

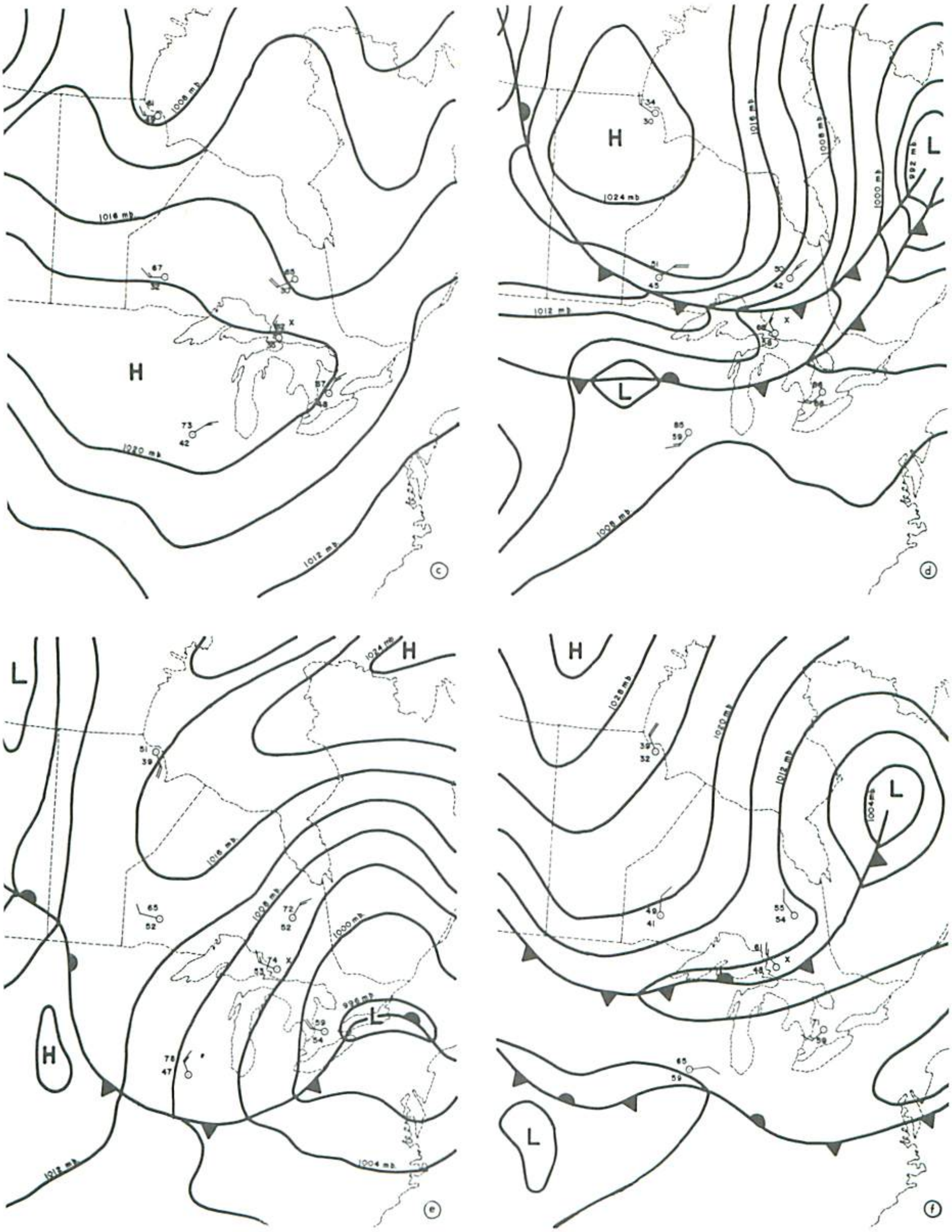


Fig. 10. Surface weather maps during the Chapleau-Mississagi fire
10c. May 30, 1948 - 1300 hours EST
10d. June 4, 1948 - 1300 hours EST
10e. June 8, 1948 - 1300 hours EST
10f. June 14, 1948 - 1300 hours EST

moisture codes increased steadily (Table 3) until mid-June. A fresh outbreak of fires early in June threatened the town of Chapleau, drained available manpower, and greatly restricted control efforts on the Chapleau-Mississagi fire - an important fact to consider when assessing control efforts.

SIOUX LOOKOUT FIRES (1961)

(a) *General Description*

Unlike the three major fire situations investigated and discussed earlier, which resulted from human carelessness, the Sioux Lookout fires were caused by lightning. In the Red Lake and Pickle Lake divisions of the Sioux Lookout Forest District, 1,110,137 acres were burned over in the summer of 1961. Of the 111 fires that burned during that summer, this report will deal only with the nine largest fires, all lightning-caused, which burned over 1,087,350 acres (97.9% of the area burned in Red Lake and Pickle Lake divisions and 91.7% of the total acreage [1,184,728 acres] consumed in the Province in 1961).

The location and final area of each fire are shown in Figure 11. The fires are numbered in order of detection within each division and where a fire is assigned more than one number, two or more separate fires have burned together. All nine fires originated from lightning storms passing through the Sioux Lookout District in the latter half of June, 1961 and raged out of control for approximately one month with by far the greatest area being burned over on July 1, 1961. Many fires were unmanned throughout their existence in some of the more northerly locations. Fires in these areas do not receive suppression action unless they threaten populated areas or high property or forest values. Most fires were manned right after their discovery but were not yet under control when high winds caused them to overrun existing fireguards and burn uncontrolled over large areas in late June and particularly on July 1. All nine fires were listed as surface, ground and crown fires during their uncontrolled period.

Jack pine and black spruce were the predominant species on the burned areas with both mature and second-growth stands present. For the eight fires for which damage appraisal estimates are available (the records are incomplete for Fire No. 35 at Red Lake) 654,165 acres of mature and 344,340 acres of second-growth coniferous forest were destroyed. Mixed or hardwood forests were affected far less with only 43,345 acres of mature and 30,499 acres of second-growth timber burned over. Trembling aspen (*Populus tremuloides* Michx.) and white birch (*Betula papyrifera* Marsh.) are the predominant hardwood species in the area. The terrain is gently rolling with swampy areas surrounded by rock ridges.

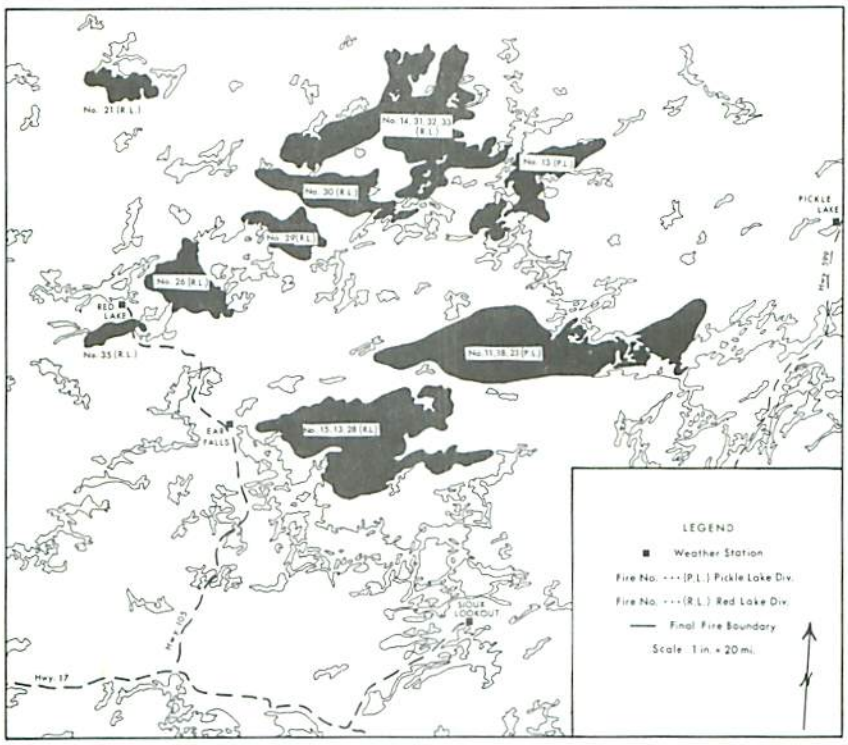


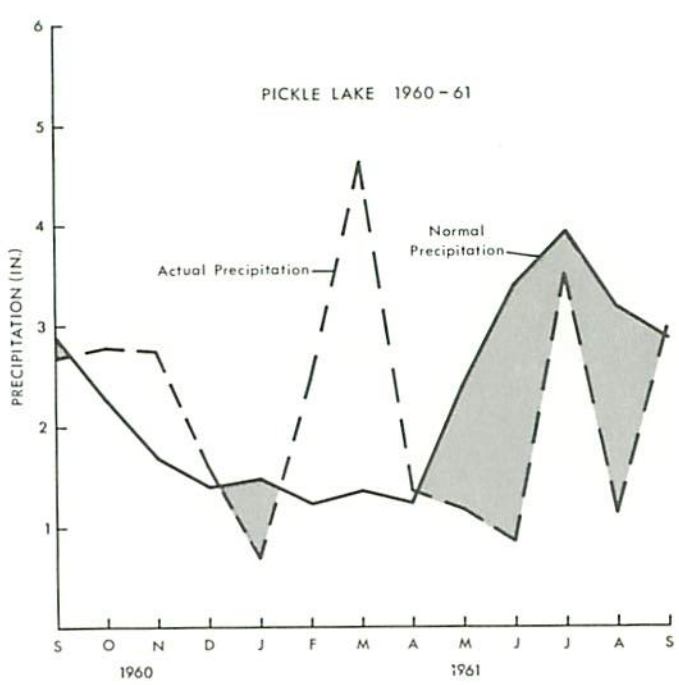
Fig. 11. Final perimeters of nine major Sioux Lookout fires of 1961.

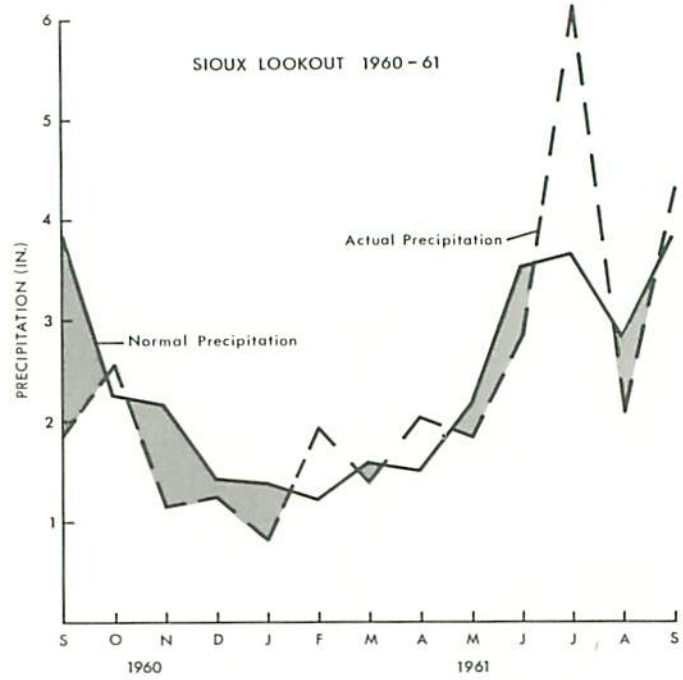
(b) *Weather in Months Preceding Fires*

In examining precipitation during the 10-month period between the beginning of September, 1960 and the end of June, 1961 (Fig. 12a), one can readily see that precipitation varied a great deal across the Sioux Lookout District in this period. Ear Falls, by far the driest station, showed a deficit of 6.88 inches for this period while Sioux Lookout and Pickle Lake recorded a deficit of 3.22 inches and a surplus of 1.63 inches, respectively. During the critical months of May and June, 1961 all three stations showed rainfall deficits: Pickle Lake, Ear Falls and Sioux Lookout recorded deficits of 3.76 inches, 2.45 inches and 0.96 inches respectively, for this 2-month period.

With the exception of Sioux Lookout, which received 2.49 inches of rain on May 31 and June 1, all stations in the district reported sparse rainfall throughout May and June, with total rainfalls not exceeding 0.75 inches. Rainfall during the last half of June was intermittent, well scattered, and associated with lightning and thunderstorms.

Average daily temperatures (Fig. 12b) are available for only Ear Falls and Sioux Lookout during 1961 but both stations recorded above-average temperatures from January through June, with temperatures substantially above normal in February and March of 1961 at both stations.





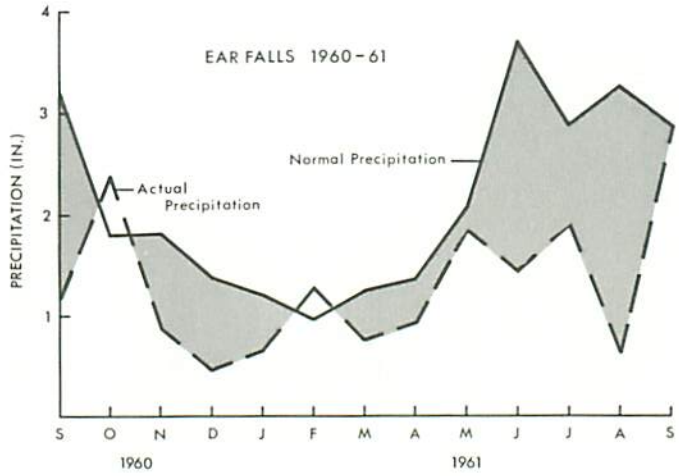


Fig. 12a. Departure from normal monthly precipitation amount for three Sioux Lookout area stations for the period preceding and during the 1961 fires.

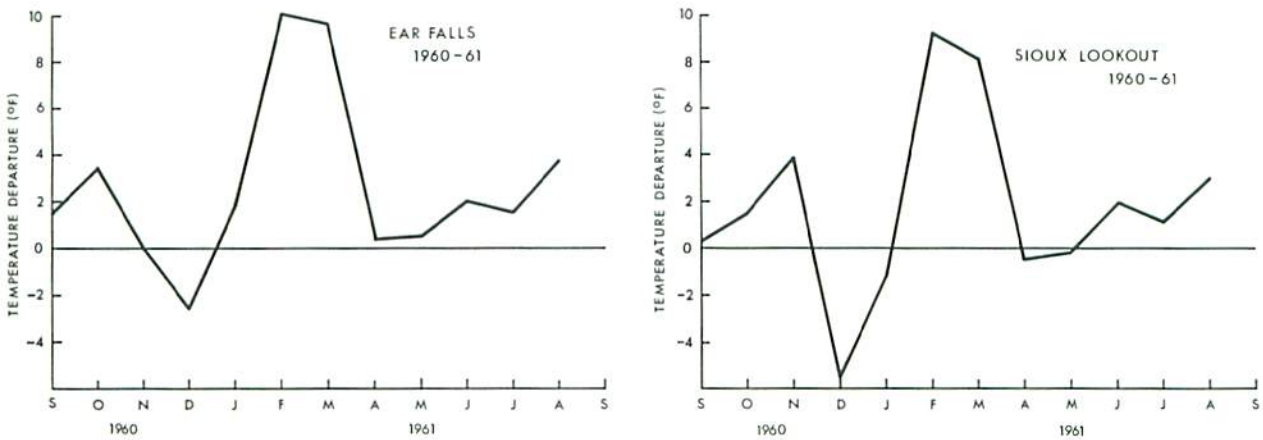


Fig. 12b. Departures of monthly temperature from average for Ear Falls and Sioux Lookout stations for the period preceding and during the 1961 fires.

(c) *Weather Immediately Preceding and During the Fires*

During the 3-week period before the major run of the Sioux Lookout fires on July 1, 1961, only scattered shower activity occurred in the district. Red Lake station reported no rain at all (Table 4a), while Sioux Lookout recorded 0.44 inches (Table 4b) and Pickle Lake recorded 0.80 inches.

On June 17 and 18 (Fig. 13a) twin cold fronts associated with a low pressure cell over Hudson Bay moved through northwestern Ontario, bringing strong winds, scattered showers, and thunderstorms. Lightning associated with these storms caused a large number of fires in the Sioux Lookout area, including five of the fires discussed here. With the passage of these fronts a high pressure cell moved east from the prairies to influence northwestern Ontario for the next few days.

A low pressure cell which had tracked across the northern United States drifted northward on June 24, causing rain in eastern Ontario but not affecting the fire area (Fig. 13b). Between June 26 and 27, however, another low pressure system, associated with a maritime and a polar cold front moved into northwestern Ontario bringing scattered rain (Fig. 13c) and causing a new rash of lightning fires, including the final four discussed here. An arctic high

Table 4a Noon fire weather before and during the 1961 Sioux Lookout fires (measured at Red Lake)

Date	Wind (mph)	Temp (°F)	R.H. (%)	Rain (in.)	FFMC	DMC	DC	ISI	ADMC	FWI	FWI Class
June 11	0	71	61	0.26	47.6	7.3	119.5	0.2	12.6	0.1	vl
" 12	10	65	53	-	74.4	9.7	126.0	1.7	16.2	2.0	l
" 13	10	55	88	-	73.8	10.1	131.4	1.6	16.9	1.9	l
" 14	2	65	38	-	83.6	13.3	137.9	2.2	21.4	3.6	m
" 15	8	70	51	-	86.3	16.1	144.8	4.9	25.2	8.9	m
" 16	15	78	39	-	89.5	20.4	152.6	13.2	30.6	21.3	h
" 17	5	76	62	-	88.4	23.0	160.1	5.1	33.8	10.8	m
" 18	35	68	46	-	88.3	26.0	166.9	56.9	37.4	60.8	e
" 19	18	54	59	-	86.9	27.4	172.2	11.9	39.2	22.3	h
" 20	10	65	90	-	82.1	27.9	178.7	3.5	40.2	8.7	m
" 21	0	61	84	-	80.8	28.7	184.7	1.3	41.3	3.4	l
" 22	10	66	44	-	86.3	31.6	191.3	5.8	44.7	13.9	h
" 23	10	72	42	-	88.5	35.2	198.4	7.7	48.7	18.2	h
" 24	0	62	45	-	88.1	37.7	204.6	3.2	51.7	9.5	m
" 25	0	72	45	-	88.4	41.1	211.7	3.4	55.4	10.3	m
" 26	5	76	59	-	88.1	43.9	219.3	4.9	58.5	14.3	h
" 27	5	76	36	-	90.0	48.2	226.8	6.3	62.9	17.9	h
" 28	8	84	32	-	91.4	53.5	235.2	9.8	68.2	25.6	e
" 29	10	62	74	-	87.5	54.8	241.3	6.8	69.9	20.1	h
" 30	8	72	65	-	86.9	56.9	248.5	5.4	72.4	17.1	h
July 1	40	80	35	-	90.7	61.2	257.0	117.8	76.7	125.4	e
" 2	20	58	88	0.26	48.6	36.6	247.8	0.9	53.5	2.7	l
" 3	4	53	82	-	57.6	37.1	253.6	0.4	54.4	0.7	l
" 4	8	74	54	-	79.0	39.8	261.5	2.1	57.6	7.0	m
" 5	0	72	77	0.57	37.0	18.7	230.5	0.1	31.0	0.1	vl

Table 4b Noon fire weather before and during the 1961 Sioux Lookout fires (measured at Sioux Lookout)

Date	Wind (mph)	Temp (°F)	R.H. (%)	Rain (in.)	FFMC	DMC	DC	ISI	ADMC	FWI	FWI Class
June 11	5	65	75	-	68.5	10.0	95.3	0.8	15.9	0.6	l
" 12	11	65	51	-	81.1	12.5	101.7	3.4	19.2	5.3	m
" 13	12	58	41	-	85.4	15.0	107.5	6.1	22.2	10.0	m
" 14	9	60	38	-	87.4	17.7	113.4	6.2	25.4	10.8	h
" 15	13	70	30	-	90.5	21.8	120.4	12.8	30.0	20.6	h
" 16	17	75	33	0.40	91.0	26.2	127.8	19.1	34.6	29.2	e
" 17	15	77	50	-	75.8	16.2	116.5	2.8	24.0	5.1	m
" 18	15	71	42	-	86.2	19.6	123.6	8.6	28.1	14.8	h
" 19	20	56	46	-	86.1	21.7	129.1	12.7	30.6	20.7	h
" 20	11	59	39	-	87.4	24.3	135.0	7.2	33.5	14.2	h
" 21	6	64	39	-	88.2	27.3	141.3	5.4	36.8	11.8	h
" 22	12	64	39	0.04	85.2	30.3	147.7	5.9	40.1	13.3	h
" 23	7	66	50	-	86.1	33.0	154.2	4.5	43.0	11.1	h
" 24	14	67	34	-	89.2	36.6	160.9	11.7	46.6	24.0	e
" 25	3	75	33	-	90.6	41.0	168.3	5.8	50.9	15.1	h
" 26	13	76	39	-	90.9	45.1	175.9	13.7	54.9	29.0	e
" 27	13	74	49	-	90.2	48.3	183.2	12.3	58.3	27.8	e
" 28	6	83	29	-	92.3	53.8	191.5	9.3	63.2	23.8	e
" 29	12	72	49	-	90.6	57.0	198.6	12.1	66.4	29.3	e
" 30	15	74	52	-	89.7	60.1	206.0	13.7	69.5	32.5	e
July 1	24	84	34	-	91.6	64.7	214.9	36.3	73.8	62.3	e
" 2	19	63	58	0.04	82.9	66.5	221.7	7.9	76.0	23.3	e
" 3	7	51	69	-	80.8	67.4	227.3	2.3	77.4	9.2	m
" 4	15	72	40	0.18	77.1	48.6	226.3	3.1	63.2	10.4	m
" 5	5	77	44	-	86.1	52.0	234.5	3.8	66.9	12.6	h

followed these fronts into northwestern Ontario on June 29 but by June 30 an intense low pressure cell had formed over Alberta and Saskatchewan and was moving quickly eastward (Fig. 13d).

The maritime cold front associated with this low pressure system passed through the Sioux Lookout area between 0900 and 1000 hours on July 1 (Fig. 13e). The strong pressure gradient caused very high winds behind the cold front and all fires in the district raged out of control. The FWI and its component indexes were extreme on this day at both Sioux Lookout and Red Lake (Tables 4a and 4b) as well as Pickle Lake.

Owing to high winds and heavy smoke no aerial reconnaissance was undertaken on any of the large fires on this day and, as a result, spread rates for these fires are unavailable. However, Red Lake fire No. 35 (Fig. 14), which threatened the town of Red Lake on this day, was closely observed and documented, and the tremendous rate of spread of this fire can be considered representative of other fires spreading that day. Between 1000 and 1400 hours on July 1 this fire moved east-northeast 8 miles before crossing Highway 105, a spread rate of 2 miles per hour or 175 feet per second.

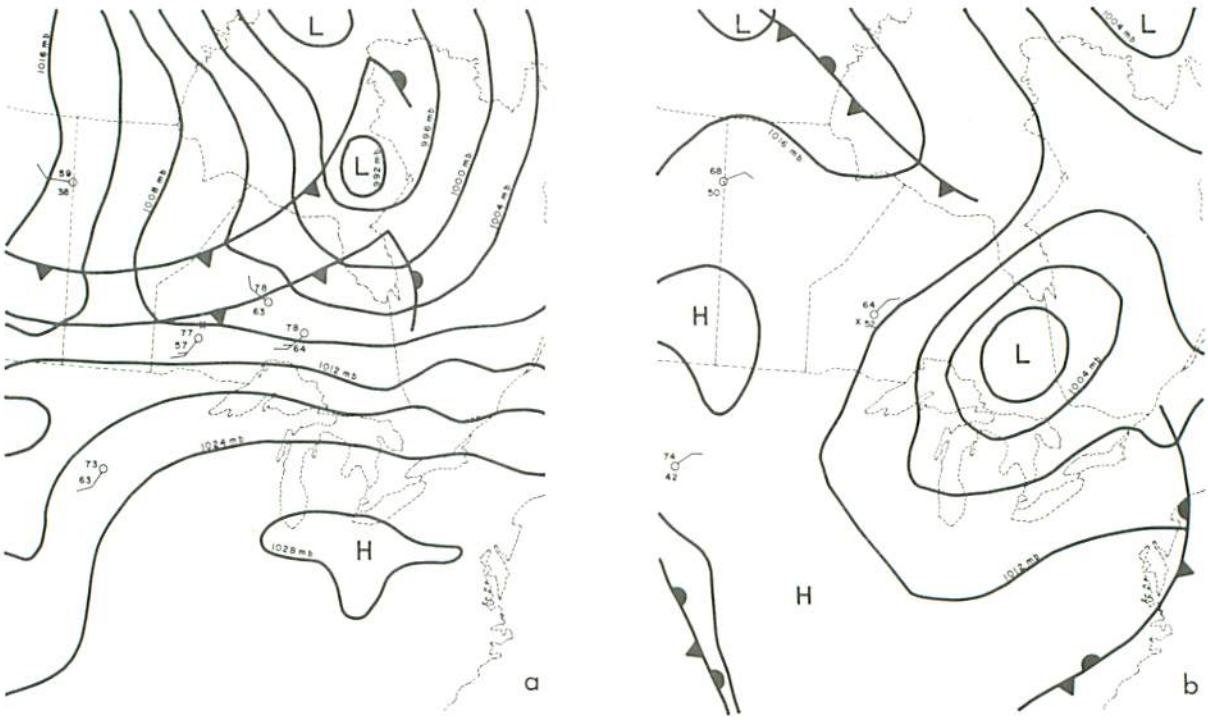


Fig. 13. Surface weather maps during the Sioux Lookout fires
13a. June 17, 1961 - 1300 hours EST
13b. June 24, 1961 - 1300 hours EST

Fig. 13. Surface weather maps during the Sioux Lookout fires
13c. June 28, 1961 - 1300 hours EST
13d. June 30, 1961 - 1300 hours EST
13e. July 1, 1961 - 1300 hours EST
13f. July 2, 1961 - 1900 hours EST

Hourly observations from the AES station at Sioux Lookout for July 1, 1961 are shown in Table 5; the wind shift and rapid drop in humidity following the frontal passage are quite striking. The strong west-southwesterly winds, high temperature and low humidity prevailed throughout the afternoon.

Strong winds continued on July 2 but lower temperatures and scattered showers (Fig. 13f) eased the fire situation somewhat. Decreased winds and continued scattered rainfall over the Sioux Lookout District throughout the next week greatly reduced the fire danger and the fires did not pose a serious problem thereafter, some being controlled by fire crews and others burning themselves out.

In summary, the Sioux Lookout fire situation of 1961 was by far the most severe in terms of acreage destroyed, but the fact that most of this acreage was in remote, unpopulated areas greatly reduced tangible losses.

The large number of lightning fires occurring in the district in late June, 1961, coupled with the inaccessibility of most of these fires, resulted in many fires still burning out of control when the

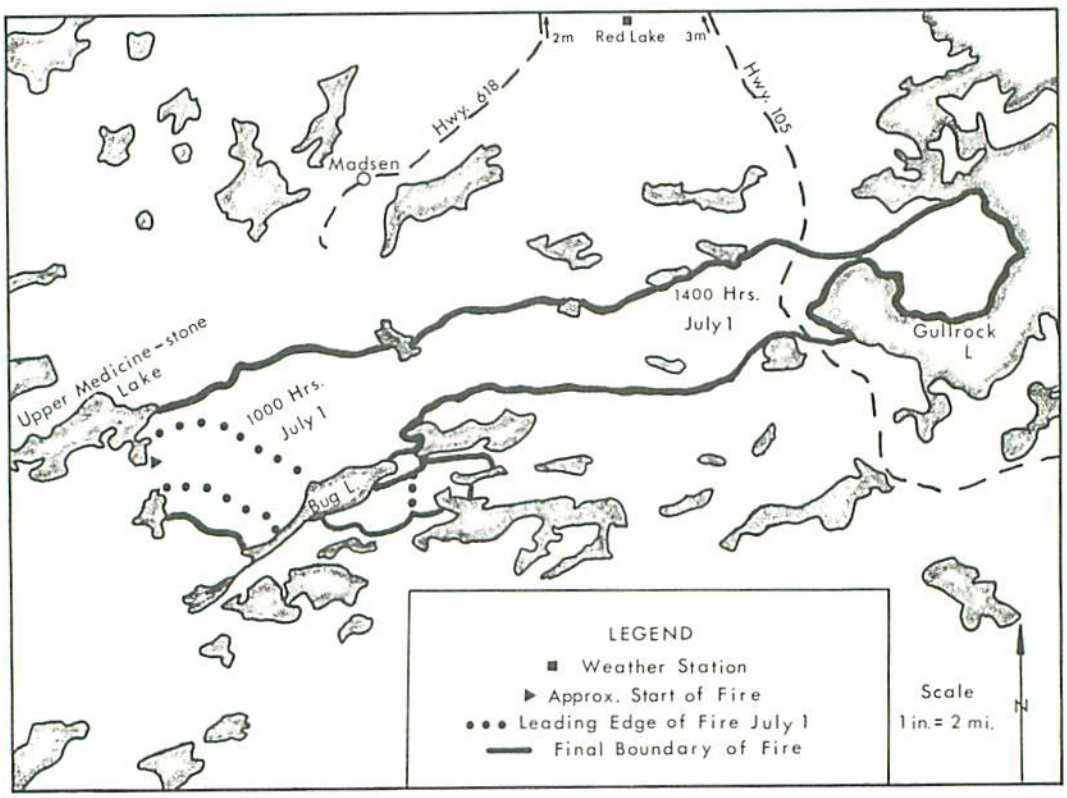


Fig. 14. Rate-of-spread map for Red Lake Division Fire No. 35 showing intermediate and final fire perimeter.

Table 5 Hourly weather observations at Sioux Lookout AES station (July 1, 1961)

Hour	Dry-bulb temp (°F)	Wet-bulb temp (°F)	R.H. (%)	Wind direction	Wind speed (mph)
0100	65.8	57.8	63	SSE	10
0200	65.4	57.6	62	S	7
0300	62.8	58.0	76	S	6
0400	62.0	58.0	80	S	7
0500	62.6	58.0	76	S	6
0600	63.0	59.0	80	SSW	5
0700	68.8	64.2	78	S	6
0800	72.2	65.2	69	S	7
0900	78.0	62.0	41	SW	10
1000	80.4	61.0	32	WSW	17
1100	82.4	61.2	29	W	20
1200	83.8	63.8	34	WSW	24
1300	83.2	63.6	34	WSW	28
1400	84.0	65.0	36	WSW	30
1500	83.2	65.0	38	WSW	24
1600	82.5	68.7	50	WSW	30
1700	79.6	68.1	57	WSW	30
1800	78.1	67.8	60	W	16
1900	71.0	63.3	67	WNW	14
2000	68.6	61.0	66	W	14
2100	66.5	59.6	69	WSW	12
2200	66.6	59.1	65	WSW	10
2300	65.0	58.5	69	W	8
2400	63.0	56.8	69	W	6

extreme fire weather conditions of July 1 occurred. On that day the fires grew very quickly and control action was impossible until the fires were sufficiently slowed by beneficial weather conditions.

SUMMARY

While all of the fire situations analyzed in this report are similar in that they caused widespread destruction, distinct differences in fire behavior and the reasons for these differences are evident on close examination.

Very high spread rates in the Garden Lake and Sioux Lookout fires were overwhelmingly due to tremendous wind velocities and upper air instability over a relatively short period. In both cases mature and second-growth coniferous stands were the main fuel types consumed. Fuel moisture conditions appear definitely more severe in the case of the Sioux Lookout fires, perhaps because they occurred later in the fire season.

Both the Dance Township and the Chapleau-Mississagi fires spread at slower rates and over longer periods than those just discussed. Extremely dry conditions prevailed before and during each fire. Fuel conditions presented a serious hindrance to control efforts; large areas of logging slash were consumed during the Dance Township fire, and extensive areas of budworm-killed balsam fir and spruce, in addition to slash and blowdown, were burned over in the Chapleau-Mississagi fire.

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