PACIFIC REGION TECHNICAL NOTES

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LIGHTNING, LIGHTNING FIRES AND FIRE WEATHER INDICES

B.A. Jensen
Fire Weather Presentation Technician
Kamloops Forest Region

INTRODUCTION

This report is an attempt to relate lightning caused forest fires and forest fire weather indices. For data, I used a lightning outbreak on July 22, 1980, the fires caused by the lightning by the 25th and the forest fire weather indices for the 22nd. The B.C. Forest Service Lightning Locator System provided the cloud to ground lightning events of the 22nd, I realized while preparing this report that the assumptions contained are quite rough, but I also realized that I have insufficient time while carrying out presentation duties to perform the proper research. The availability of lightning reports from the B.C.F.S. system on a daily basis would give a much more detailed result.

For this study, I used 3 areas, the Penticton Forest District within the Kamloops Forest Region due to its lack of rainfall, an area of the southern portion of the Kamloops Forest Region and the large area comprised by the Kamloops, Nelson and Cariboo Forest Region. See figure 1.

A study of the map produced by the Lightning Locator System indicates why many approximations were necessary for this quick report. The following will show in tabular form, the data studied. See figure 2. and 3.

THE LIGHTNING (Total 9400 strikes plotted by the Lightning Locator)

Penticton Forest District ...	Counted within approximate boundaries due scale ...	50
Southern Portion of Kamloops Forest Region ...	The Lightning Locator gave a precise count ...	473
The 3 Forest Regions ...	Not less than 60% and not more than 90% seemed to fall within these regions ...	5640-8460

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THE FIRES (discovered by the 25th)

KAMLOOPS FOREST REGION, BY FOREST DISTRICT

Clearwater	19	
Kamloops	6	
Salmon Arm	7	
Vernon	10	
Penticton	8	Total ... 51
Merritt	0	
Lillooet	1	
	51	

NELSON FOREST REGION ..... 39 Total ... 51

CARIBOO FOREST REGION 12

Southern Portion Kamloops Forest Region where approx. 40% of lightning for area fell, therefore 40% of fires discovered, including Kamloops, Salmon Arm, Vernon districts and all of Penticton district. 17 (Estimate)

FOREST FIRE DANGER RATING, DROUGHT CODE AND PRECIPITATION FOR KAMLOOPS REGION

District	Danger	Average Drought Code	Average Precip. Am't	% Coverage	Averaged from # Station
Clearwater	low	187	7.1 mm	100%	6
Kamloops	low-mod	340	1.3 mm	50%	6
Salmon Arm	low-mod-high	267	5.8 mm	100%	5
Vernon	low-mod-high	243	0.3 mm	20%	5
Penticton	low-mod	353	1.0 mm	20%	5
Southern Portion Kamloops Region	low-mod	300	2.1 mm		
Kamloops Region	low-mod	278	3.1 mm		

Approximate Forest Cover
Penticton .... Open
Srn Kamloops ... Open to closed but highest density of lightning in closed stands
Kamloops ... Cariboo ... Nelson ... mixed.

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IGNITION RATE, # FIRES, # LIGHTNING STRIKES IN PERCENTAGE

The 3 Forest Regions	102 fires for a range of 5640-8460 strikes % range 1.2-1.8% (1.5%) Mean
Southern Kamloops Rgn	17 fires for 473 strikes 4% ignition
Penticton District	8 fires for 50 strikes 16%

SUMMARY OF TABLES
(Since 50% of Fires in Kamloops Region
Same Percentage are Applied Here)

Area	Ignition Rate	Forest Cover	Danger Rating	Drought Code	Precip.
Kamloops Region	1.5%	mixed	low-mod	278	3.1 mm
Srn Kamloops Rgn	4%	mixed	low-mod-high	300	2.1 mm
Penticton Dist.	16%	open	low-mod	353	1.0 mm

Although this gathering of numbers contains a number of rather arbitrary parameters, there are a few points to be made.

1. It appears that there is a great increase in ignition rate, perhaps 8X if all parameters exist, if:
   a. Precipitation with the lightning occurs over less than 50% of the area experiencing lightning (Dry lightning).
   b. Drought Code is over 300. (This may be significant for it is also noted in B.C.F.S. literature as being the approximate lower limit needed for successful prescribed burns).
   c. Average precipitation of 1.0 mm or less at fewer than 50% of the area causes a great increase in ignition rate over those areas with 2.0 mm or more falling over less than 50% of the area (Penticton v.s. Srn Kamloops Region).
   d. Open forested stands are present under the lightning.
2. No correlation could be found between Fire Danger Hazard and ignition rate.
3. The average 1.5% ignition rate compares favorably with an approximation made by Plumber in 1912 where he estimated that 2% of trees struck by lightning would ignite (ref: Lightning Behaviour and Lightning Fires in Canadian Forests by P. Kourtz. Forestry Branch Departmental Publications No. 1179-1967). The ignition rates under open forest stands and with low precipitation, however, far exceed this estimate.

   This report was based on one event only but gave some interesting suggestions re lightning, forest fires and fire weather indices. Time and facilities prevent me from going further in this direction but his one event may have been sufficient to allow some general rules of thumb to be formulated.

FIGURE 1.

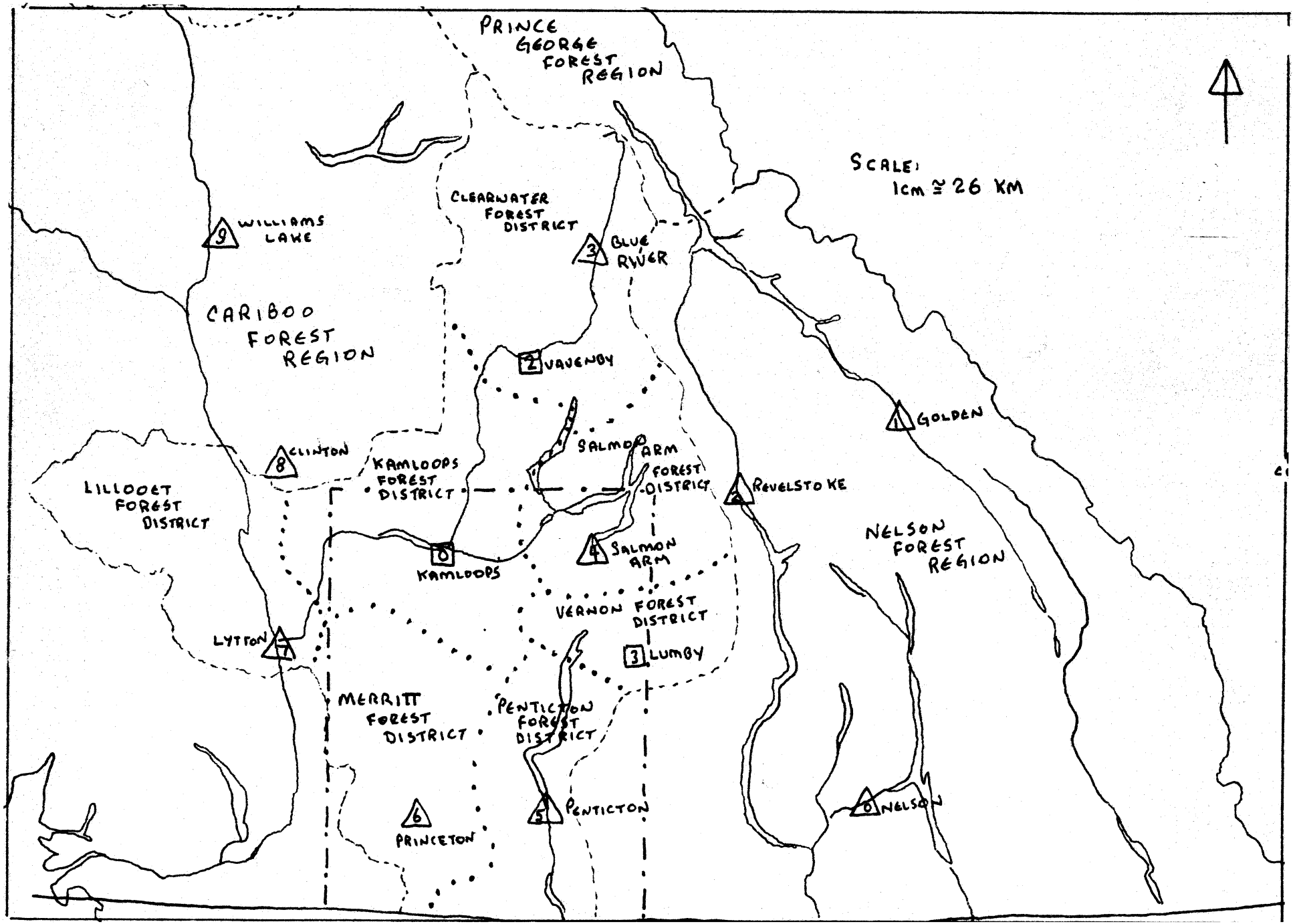
PRINCE GEORGE FOREST REGION
SCALE: 1cm ≅ 26 KM
CLEARWATER FOREST DISTRICT
9 WILLIAMS LAKE
3 BLUE RIVER
CARIBOO FOREST REGION
2 VAVENBY
1 GOLDEN
8 CLINTON
KAMLOOPS FOREST DISTRICT
SALMON ARM FOREST DISTRICT
7 REVELSTOKE
LILLOOET FOREST DISTRICT
NELSON FOREST REGION
4 SALMON ARM
0 KAMLOOPS
VERNON FOREST DISTRICT
LYTTON 7
3 LUMBY
MERRITT FOREST DISTRICT
PENTICTON FOREST DISTRICT
6 PRINCETON
5 PENTICTON
0 NELSON

FIGURE 2.

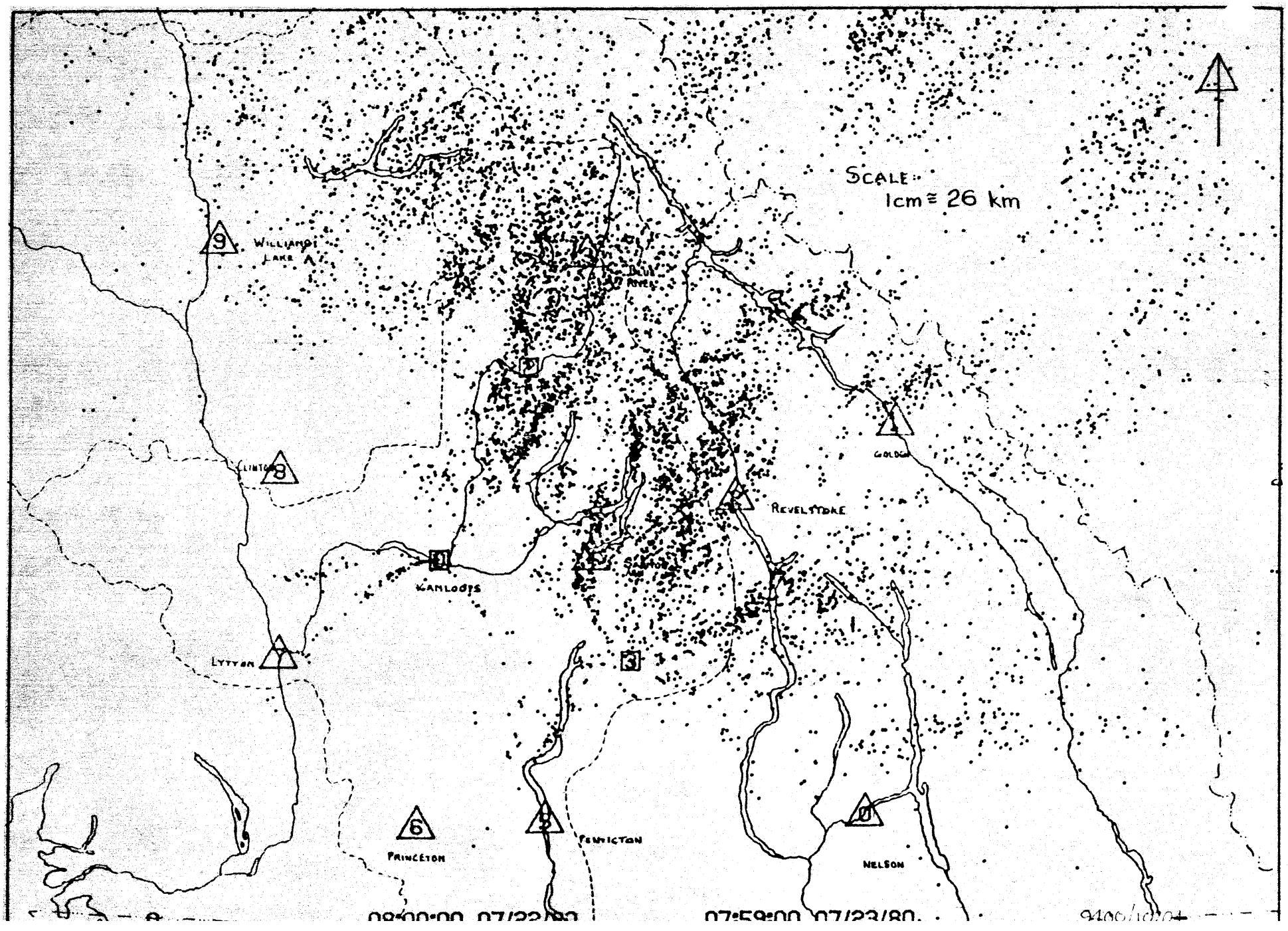
SCALE:
1cm ≡ 26 km
WILLIAMS LAKE
CLINTON
KAMLOOPS
LYTTON
REVELSTOKE
GOLDEN
PRINCETON
PENTICTON
NELSON
9
8
1
3
6
5
4
2

FIGURE 3.