

1971 SPRUCE BEETLE SURVEY OF THE CROWSNEST FOREST, ALBERTA

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ABSTRACT

In 1972, the incidence of successful spruce beetle attacks in the Crowsnest Forest, Alberta, is expected to be about the same as that in 1971. In 1971 the average incidence of attacks in the 11 sampled stands was 1.3 times as great as that in 1970. Increases in attack incidence in 1971 in the Bunny Creek, upper Dutch Creek, and North Racehorse Creek stands of 9.3%, 0.8%, and 2.2% by volume, respectively, over that of 1970 were responsible for the increase in the average attack incidence for all sampled stands. Aerial inspection of the stands and appraisals of population levels of hibernating beetles suggest that, given favourable weather conditions, a small to moderate increase in the incidence of attacks may occur in the Bunny Creek, upper Dutch Creek, and Lyall Creek stands in 1972. These three stands should be inspected in the midsummer of 1972 and the change in attack incidence evaluated. Current population levels still constitute a potential hazard to the overmature and mature spruce stands in southwestern Alberta and continuation of monitoring of beetle activity in these stands is recommended.

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INTRODUCTION

Aerial and ground surveys of mature Engelmann spruce (Picea engelmanni Parry) stands infested by the spruce beetle (Dendroctonus rufipennis Kirby) in the Crowsnest Forest, Alberta, were carried out in mid-September of 1971. Techniques of appraisal of damage and hazard were similar to those used by Robins (1969) and Safranyik and Petty (1970) in previous surveys of the same area. The objectives of the aerial survey were: (1) to locate new areas of infestation and (2) note changes in beetle activity and tree mortality in the known infested stands. The ground survey involved measurement of the volume of spruce, in various infestation classes, on a number of semi-permanent cruise lines; the objectives were: (1) to estimate tree mortality, (2) record the incidence of current beetle attacks relative to those of 1970, (3) note changes in stand structure as a result of beetle activity, and (4) forecast population and damage levels for 1972.

All known mature spruce stands in the Crowsnest Forest were covered by the aerial survey and trees with yellowish and thinning foliage, or recently bared tops were noted. Ground inspection along upper Dutch Creek prior to the air survey indicated that the majority of trees with yellowish and thinning foliage had been attacked and killed in 1970 and were completely girdled by larval activity. Trees attacked in 1971 still had healthy green foliage and, therefore, could not be detected from the air.

Ground surveys were conducted in 11 areas, all of which had

been surveyed previously: 8 in 1968-70, inclusive; 2 in 1968 and 1970; and, 1 in 1970. Data recorded on the semi-permanent cruise lines included those relevant to tree condition, and the D.B.H. of spruce trees greater than 8 inches. Volume/acre of spruce trees, by various infestation categories, were obtained by point sampling at 2-chain intervals along the cruise lines.

RESULTS

The results of the ground survey of the semi-permanent cruise lines are given in Table 1 and the location of the lines are shown in Figure 1. The important findings of the 1971 ground survey are as follows:

- (1) On the average, the incidence of attacks in 1971 was about 1.3 times that of 1970 (i.e. attacked trees comprised 2.0 and 1.7% of the volume in these two years, respectively.). Increases in volume attacked at Bunny Creek (Station 38), Dutch Creek (Station 37) and North Racehorse Creek (Station 16) of 9.3%, 0.8% and 2.2%, respectively, are responsible for the net increase in average attack incidence for all stations in 1971 over that of 1970. The increase in attack incidence at Bunny Creek has been expected on the basis of the results of the 1970 survey (Safranyik and Petty, 1970).
- (2) Current attacks in 1971 occurred at 7 stations but trees

with successful* attacks were recorded from only 4 of these stations (col. 3-5, Table 1). Of the 4 areas where successful attacks were recorded in 1971 (North Racehorse Creek, Dutch Creek, Bunny Creek and the Divide (Station 19)), successful attacks were also recorded in 1970 with the exception of the North Racehorse Creek area (Station 16).

- (3) Trees with successful current attacks comprised about 1.5% of the volume of the stands examined; seven-eighths of this volume consisted of trees which had been attacked previously (cols.3 and 4, Table 1). The largest successfully attacked volumes were recorded in the Bunny Creek and upper Dutch Creek stands with 11.8% and 5.2% of the stand volume, respectively.
- (4) About two-thirds of the volume of the stands examined have never been attacked (col.2, Table 1).
- (5) On the average, about 71% by volume of all trees attacked died by the fall of 1971.
- (6) Hibernating adult beetles were recorded from the following locations (the numbers in brackets indicate the percentage of the total number of spruce trees greater than 8 in. D.B.H. that contained hibernating adults):
Station 14 - Window Lake Road (3.6%), Station 16 -

* Successful attack is defined here as hatching of at least some of the eggs in an egg gallery on an attacked tree and the presence of live larvae under the bark at the time of sampling (i.e., mid-September 1971).

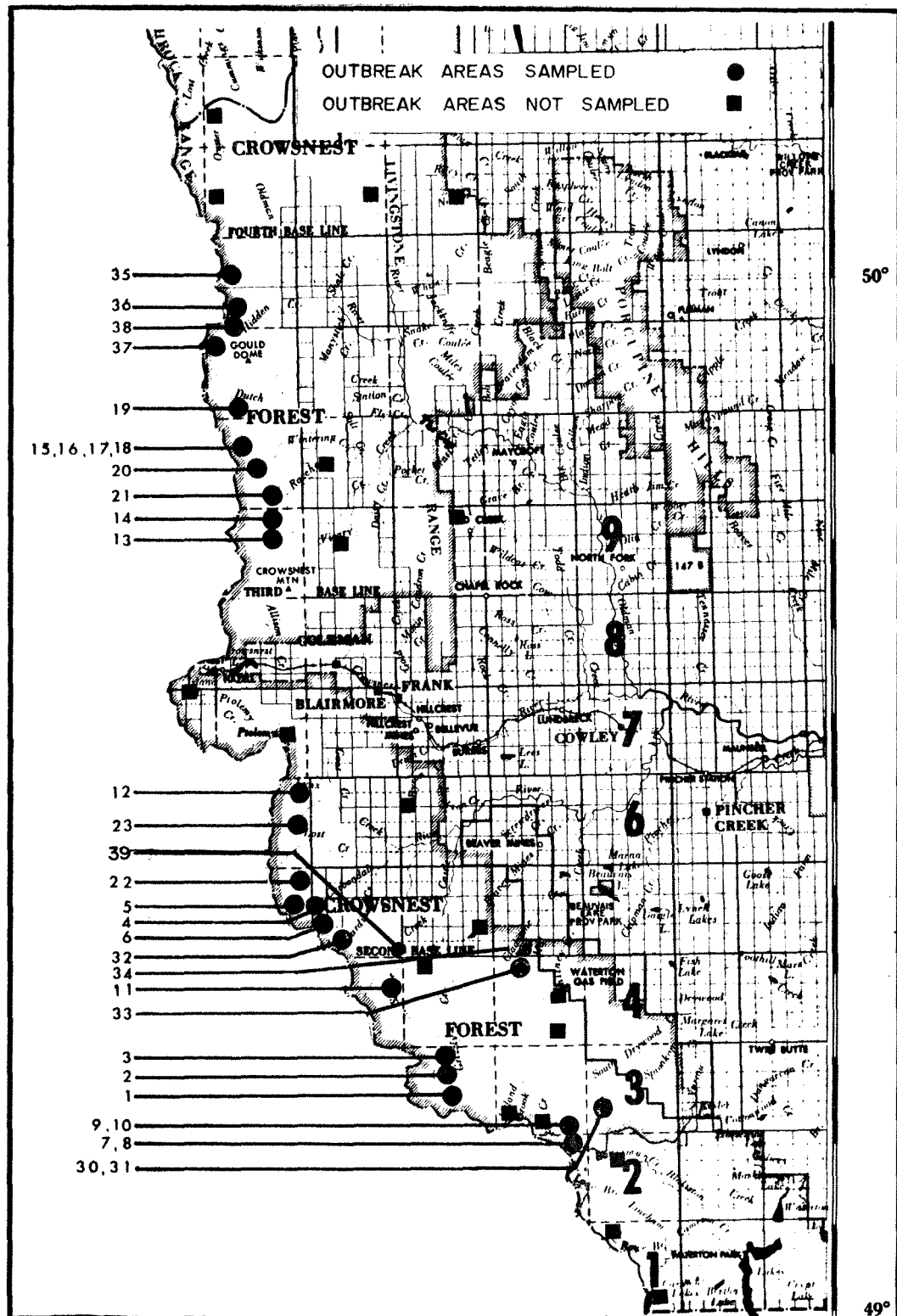


Fig. 1. Map of spruce beetle infested area of the Crowsnest Forest illustrating the locations of survey lines established from 1968 to 1971. (The numbers on left-hand side of map are identification codes for cruise lines).

Table 1. Results of appraisals of damage by the spruce beetle, Crowsnest Forest, 1971.

Station (1)	Unattacked (2)	1971			1970		Prior to 1970	
		Successful 1st attack (3)	Successful attack following unsuccessful prior attack (4)	Unsuccessful 1st attack (5)	Successful attack (6)	Unsuccessful attack (7)	Attacked but alive (8)	Attacked and dead (9)
Percentage F.B.M. per acre ¹								
*2E	44.97	-	-	-	1.42	1.87	13.35	38.39
**8	79.43	-	-	-	2.75	-	1.96	15.86
14	55.96	-	-	3.19	-	2.95	5.06	32.84
16	69.04	-	2.23	-	-	-	14.82	13.91
19	76.71	1.33	-	1.33	1.55	-	-	19.28
***32	37.99	-	-	1.85	-	-	13.87	46.29
***34	70.28	-	-	-	-	2.68	18.21	8.83
35	85.23	-	-	-	-	-	7.39	7.38
37	56.06	1.25	3.95	-	2.90	1.45	4.48	29.91
38	22.30	-	11.77	-	2.45	-	5.12	58.36
39	96.72	-	-	-	-	-	-	3.27
AVERAGES	64.66	0.18	1.34	0.52	0.88	0.64	8.01	23.76

¹ Only spruce trees 8 inches and greater in D.B.H. were measured.

* Cruise line relocated but in same general area as in 1970.

** Cruise line shortened from its 1970 length.

*** Some blow down occurred in these areas between the 1970 and the 1971 survey.

North Racehorse Creek (2.1%), Station 19 - The Divide (1.2%), Station 37 - upper Dutch Creek (5.8%), and Station 38 - Bunny Creek (9.8%). Upon successful overwintering, these adults will attack new host trees in late spring and early summer of 1972.

Observations on the cruise lines and along Dutch Creek indicated that the majority of trees with fading and thinning crowns were attacked initially in 1970 and usually contained low densities of various sizes of larvae, teneral, and mature adults. Most of the successful 1971 attacks were in old, low-vigor trees and in trees that had been attacked previously. These trees produced little or no resin flow and contained paired adults, small larvae and, occasionally, eggs. Most of the successful attacks on previously attacked trees were strip attacks.

During the aerial survey, trees with yellowish and thinning foliage (i.e. trees that had been attacked during the late spring and summer of 1970) were noted in overmature stands at the following locations (usually several trees at each location): along Bunny Creek, upper Dutch Creek, upper South Hidden and North Hidden creeks, Lyall Creek, Oyster Creek, upper Daisy Creek, Todd Creek, Screwdriver Creek, Gladstone Creek, Whitney Creek, Font Creek, and along the upper South and West Castle rivers. Ten of these areas are located at the heads of valleys along the Continental Divide on the Alberta - British Columbia border. The largest numbers of trees with yellowish and thinning foliage, were observed at upper Dutch, upper Bunny, and Lyall creeks.

On the basis of the results of the 1971 ground and aerial survey, it is predicted that, given a mild winter coupled with deep snow conditions, a small to moderate increase in population levels (and in the incidence of attacks) may occur in the overmature spruce stands along Bunny Creek, upper Dutch Creek, and upper Lyall Creek in 1972. On the average, however, the 1972 attack is expected to be of about the same severity as that in 1971. Attacks in 1972 are expected to be concentrated on trees that survived previous attacks. Current population levels of spruce beetles still constitute potential hazards to the residual and uninfested overmature spruce stands in the Crowsnest Forest. The stands at Bunny Creek, upper Dutch Creek, and upper Lyall Creek should be re-examined in the midsummer of 1972 in order to appraise the accuracy of this forecast. If increases in attack incidence were noted in these three stands, more of the overmature stands should be examined in order to assess the overall population trend.

The D.B.H. distribution of the total number of spruce trees/acre greater than 8 inches, and those of the unattacked trees and trees in three damage classes are given in Fig. 2. This figure is presented in order to gain a better insight into the effects of spruce beetle epidemics on stand structure. (Although average percentages of attacked volumes, by D.B.H. classes, and the ratio of the volume of all attacked trees to that of dead trees were presented in last year's survey highlights (Safranyik and Petty, 1971), such information applies to all sampled stands as a whole, and not to individual stands separately.)

Fig. 2 shows that trees 10 inches and smaller in D.B.H. escaped attacks in all of the sampled stands. The frequency, relative to the total number of trees in a D.B.H. class, of successful attacks increased; conversely, the frequency of unsuccessful attacks decreased with increasing D.B.H. class.

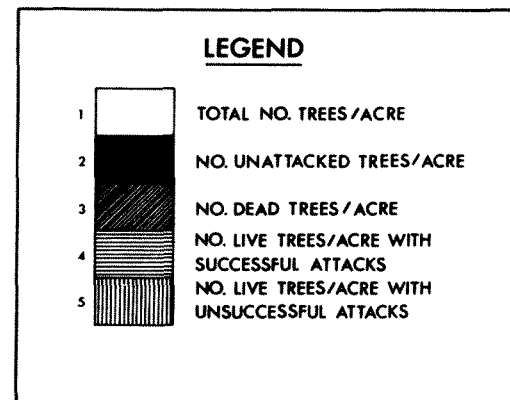
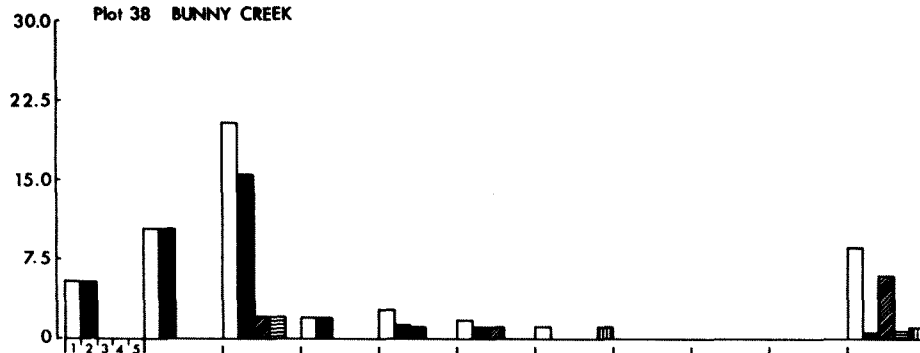
ACKNOWLEDGEMENTS

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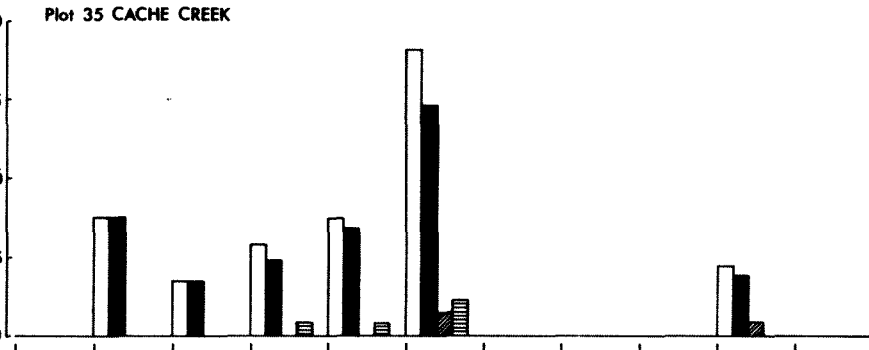
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Plot 38 BUNNY CREEK

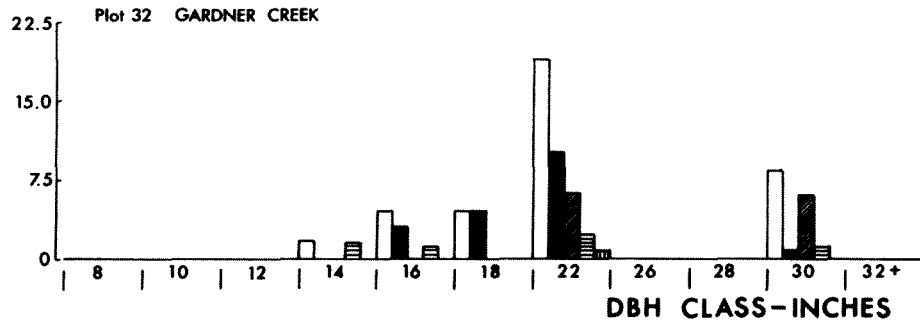


NUMBER OF TREES PER ACRE

Plot 35 CACHE CREEK



Plot 32 GARDNER CREEK



DBH CLASS-INCHES

Plot 39 RAINY RIDGE

