ASSESSMENT OF WOOD BORER CONTROL TRIALS, MACKENZIE, BRITISH COLUMBIA, 1967

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FORESTRY BRANCH
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INTRODUCTION

Damage to felled trees and stored logs, caused by wood-boring insects such as ambrosia beetles and round-headed and flat-headed wood borers, is a serious problem experienced by foresters in many parts of British Columbia. Healthy trees are not attacked, but those damaged by fire or other means, and those recently felled, are subject to attack. A few borer holes can greatly lower the value of lumber or render a shipment unacceptable in some export markets and the mines provide entrance courts for decay fungi which increase losses.

Damage caused by wood borers can be minimized by prompt logging and utilization of windthrown, fire killed and felled trees. Trees felled during late fall and winter may be left unprocessed until spring; however, in the growing season prompt removal and milling is essential or developing borers will feed on and damage the wood. If this cannot be done, the bark should be removed or treated with an insecticide to discourage oviposition and kill young broods already established (Ross and Downton 1966; Richmond 1961 and 1967).

One wood borer group causing significant damage in the Interior of British Columbia is that comprising the round-headed wood borers or Cerambycidae. The economically important species are mostly rather large beetles with a life cycle lasting from one to several years. They lay eggs in bark crevices or niches cut into the inner bark; the larvae, white, soft-bodied grubs with red-brown heads, feed in the bark and wood, finally pupating and emerging to attack new trees (Roff 1967; Ross 1960).

Because of summer access difficulties, the year's supply of logs for many Interior mills is cut each winter. Decks of whole-tree logs, 25-35 feet high, at a mill-site near Mackenzie, 100 miles northeast of Prince George, were attacked by cerambycid wood borers in 1966, causing significant degrade of lumber. In an effort to prevent a repetition of losses in 1967, benzene hexachloride was applied that spring and summer to decks of logs cut the previous winter. About 45-60 million f.b.m. were involved. This report describes the operation and presents the outcome, based on examination of the logs in the fall of the same year.

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METHODS

Under the direction of H. Richmond, benzene hexachloride was applied to decked whole-tree white spruce, Picea glauca (Moench) Voss, in the Alexandra Forest Products Ltd. mill yard on May 20 to 22 and July 15. One pound gamma isomer BHC per Imperial gallon of oil solvent was applied at a minimum rate of 10 gallons per acre of decked logs. A truck-mounted high-pressure sprayer was used to treat the exposed ends of the logs and the tops of the decks were sprayed from a helicopter.

To test the effectiveness of the treatment, a third of one deck was sprayed during the first application period only; the remaining two-thirds was left unsprayed. All other decks were sprayed twice.

In late September 1967, a Forest Insect and Disease Survey appraisal crew sampled the treated and untreated decks to determine the effect of the spray. Logs were selected at intervals along the top of the decks and others were yarded out from about 1/2 to 3/4 of the way down the piles, using a large bulldozer equipped with a winch (Figure 1). Twenty logs were sampled from the surface of each of the 3 treatment decks; 10 logs were selected from within each deck.

One-square-foot bark samples (6 x 24 inches lengthwise along the logs) were removed and the number of holes in the wood where larvae had entered were counted. A single sample was taken from each side of each sample log about 1/3 log length from each end (4 samples/log) (Figure 2) and two additional samples were taken from the sides of the within-deck logs, close to the butt ends.

Comparisons were made between unsprayed, once-sprayed and twice-sprayed treatments, and between logs from the surface of the decks and from within.

RESULTS

The wood borer attacks were almost entirely those of Tetropium cinnamopterum Leconte (Coleoptera: Cerambycidae) (Linsley 1962). Members of this genus typically bore only an inch or two into the wood and are not, therefore, as destructive as another common wood borer genus, Monochamus, of which only a few attacks were noted.

Total borer holes found after removal of square-foot sections of bark from 100 logs were compared between logs on the surface of decks and those within the decks and between the spray treatments (Table 1). An analysis of variance performed on data from 10 logs selected at random from the surface, and 10 logs from within each of the 3 different treatment decks, showed a high variability between logs (Table 2). This made analysis for other factors more perplexing than if variability between logs had been negligible.

Figure 1. Pulling white spruce log from within deck.

Figure 2. One square foot bark sample removed from white spruce log, exposing Tetropium attack.

Table 1. Comparison of Attacks by Wood Borers on Decked Logs Treated With Insecticide, Mackenzie, 1967.

Sample Location in Decks	Treatment	No. of Logs Examined	No. of Sq. Ft. Samples Examined	Av. No. Holes / Sq. Ft. Sunny Side	Shaded Side	Total	No. Logs With 0-1 Holes	% of Samples With no Attack
Surface	Unsprayed	20	80	2.82	8.20	5.51	1	33.7
	Sprayed Once	20	80	2.25	9.00	5.67	1	30.0
	Sprayed Twice	20	80	1.17	6.12	3.66	6	52.5
Within	Unsprayed	10	40			3.57	3	25.0
	Sprayed Once	10	40			2.25	6	57.5
	Sprayed Twice	10	40			3.02	5	50.0
Butt ends 1/	Unsprayed	10	20	0.80	2.00	1.40	4	50.0
	Sprayed Once 2/	10	20	2.00	1.20	1.60	4	45.0
	Sprayed Twice 3/	10	20	3.00	4.30	3.65	5	50.0

1/ Same logs as "Within" above.

2/ Butt ends sprayed once in addition to one spraying of entire deck.

3/ Butt ends sprayed once in addition to two sprayings of entire deck.

Table 2. Analysis of Variance of Attacks/Sq. Ft. by Wood Borers on Decked Logs at Mackenzie, 1967, Comparing Spray Treatments and Logs On and Within the Decks.

Source	Degrees of Freedom	Sums Squares	Mean Squares	F
Spray Treatments	2	71.4583	35.7292	N.S.
Deck Levels	1	372.5042	372.5042	4.62*
Treatment x Levels	2	55.3583	27.6792	N.S.
Experimental Error (Logs x Treatments x Levels)	54	4587.2250	80.4776	3.47**
Sampling Error (Samples x Logs)	180	4168.7500	23.1597	
Total	239	9255.2980		
Correction for Mean	1	4272.7042		

* Significant at 5% level (differences between levels are significant).

** Significant at 1% level (variability between logs is high).

N.S. Differences not significant (between treatments at different levels and at all levels).

Although the difference between spray treatment on logs, either on the surface of decks or within the decks, was not statistically significant, the surface logs in the twice-sprayed decks did suffer a lower average number of attacks per square foot of log surface than the once-sprayed and unsprayed decks. The spray treatments seemed to have had little effect on borer attacks on logs within the decks. The added spray treatments on the exposed butt ends of the logs afforded no additional protection.

Fewer holes per square foot occurred on the surface log samples from the sunny side of the logs than on those from the shady side. The within-deck logs had, on the whole, significantly lower attack than surface logs.

The numbers of attacks found on the logs were high, although an appreciable number of samples were undamaged. The percentage of square-foot samples from the twice-sprayed decks with no attack was about 50%. About 30% only of the samples of both unsprayed and once-sprayed decks, on the other hand, had not been attacked.

CONCLUSIONS

The two applications of insecticide appeared to reduce the attack on logs on the surface of decks. The single application in May was not effective and such variables as the formulation, rate and method of application need further study. The mid-July spray was late and considerable attack had already occurred. The insecticide had little effect on attack within decks, presumably because of lack of penetration, but the attack was lighter than on surface logs, even in the unsprayed deck. Logs within the deck were not heavily attacked, presumably due to the effects of shading or their being inaccessible to the adult borers. However, it was clear that exposure to direct sun was also unfavourable to the insect, because attack was heavier on the shaded side of surface logs.

The effectiveness of the control operation was obscured by the high variability in attack between logs. It was hard to assess the attack within the decks; pulling the logs out of the deck was such a difficult operation that they could be taken only from mid-deck or lower. A more precise estimate of the effectiveness of the spray might have been obtained by sampling logs from different levels as the deck was being broken down. A mill study comparing lumber produced from logs from different levels and subjected to different treatments might more adequately assess future treatments.

Comparisons of this year's attack with that of former years would not be useful unless the beetle populations were known in each instance. Although an attempt was made to assess borer populations on the decks using one-square-foot glass pane flight traps, the results were not satisfactory; it appeared that larger traps were needed.

It would be difficult to make recommendations on the basis of these results. The applications appeared to have resulted in some reduction in borer attack, at least on surface logs, but further tests of spray formulations and methods at different times of application are obviously necessary. Experiments with protection of decks by shading or water storage might be useful. Since the decks are entirely utilized each summer, there should be no emergence of new beetles from them; attack results from an influx of beetles from the surrounding area each year and the population may be reduced by its continued destruction through milling. To avoid adding to the beetle population, dead infested trees should not be brought from the woods to the site during the winter along with fresh cut logs, or beetles emerging in the spring will add to the resident population.

ACKNOWLEDGEMENTS

Forest Insect and Disease Survey Ranger Supervisor L. Fiddick, Ranger D. Beddows, and Appraisal Technician E. Wegwitz assisted with data collection. The authors are indebted to personnel of Alexandra Forest Products Ltd., Mackenzie, for providing invaluable assistance in making logs available for study, and to M. Magar, Systems Analyst, for assistance with analysis of the data. A. Molnar, Survey Head, D. A. Ross, E. D. A. Dyer, and L. H. McMullen advised during the interpretation of data and edited the report.

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