



FOREST RESEARCH REPORT

**NOVA SCOTIA DEPARTMENT
OF LANDS AND FORESTS
P.O. BOX 68, TRURO, N.S. B2N 5B8**

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A SURVEY OF SEEDLING DEBARKING WEEVIL DAMAGE IN FIRST AND SECOND YEAR PLANTATIONS IN NOVA SCOTIA

INTRODUCTION

Recently, debarking weevils (primarily *Hylobius congener* D.T.) have caused varying levels of damage to newly established plantations in the Maritimes Region (Magasi, 1986; Smith et al., 1987). Debarking weevils feed on the inner bark of stumps and slash as well as on newly planted seedlings. They are attracted to recent clearcuts by the odour of resins originating from freshly cut stumps and branches (Welty and Houseweart, 1985). Magasi (1986) states that over 85% of the planted seedlings were killed by this insect in some

plantations examined in 1984. This evidence of extreme damage has prompted the Canadian Forestry Service to undertake studies to determine the sites most susceptible to attack and how to avoid damage within the high risk areas (Pendrel, 1987). The following report summarizes the results of a survey conducted by the Nova Scotia Department of Lands and Forests to obtain estimates of the level of debarking weevil damage in selected Nova Scotia plantations.

METHODS

An assessment of 76 plantations (1668 hectares) established in 1986 and 1987 was carried out during the late summer and fall of 1987. These plantations were primarily located in Antigonish and Pictou Counties (67% of the plantations sampled) where populations of debarking weevils were known to be high. Plantations were also surveyed in other parts of Nova Scotia with the cooperation of Bowater Mersey Paper Co. Ltd., Stora Forest Industries and Scott Worldwide Inc. No plantations were assessed

in the Cape Breton South and South Shore Sub-divisions.

The assessed plantations were selected so as to include a variety of tree species, site conditions and stock types. Thirty-two percent (49% by area) of the assessed plantations were planted with red spruce multipot seedlings, 20% (33% by area) with black spruce multipot seedlings and 13% (5% by area) with black spruce 2/1 bareroot stock (Table 1).

One-half of one percent of the seedlings were

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sampled in each plantation with a minimum of 10 plots and a maximum of 75 plots being established. Each of the planted trees in the sample plots was examined for evidence of seedling debarking weevil feeding. For plantations with 1.8 x 1.8 metre spacing, 2.1 metre radius plots were used for sampling, whereas for the 2.1 x 2.1 metre spacing, 2.4 metre

radius plots were used. These sample plots were located at even intervals along parallel cruise lines equally spaced across each plantation.

This report uses three measures to assess seedling damage and mortality caused by the debarking weevil:

$$\text{Damage (\%)} = \frac{\# \text{ live seedlings} + \# \text{ seedlings attacked}}{\text{total \# seedlings}} \times 100$$

$$\text{Mortality (\%)} = \frac{\# \text{ seedlings dead}}{\text{total \# seedlings}} \times 100$$

$$\text{Mortality Ratio (\%)} = \frac{\# \text{ seedlings dead}}{\# \text{ live seedlings attacked} + \# \text{ seedlings dead}} \times 100$$

Seedlings were considered dead if their stems were completely girdled or were partially girdled and had

no live foliage. They were recorded as attacked if they were only partially girdled and had live foliage.

Table 1. Number of plantations and area (ha) surveyed for each species and stock type.

		Multipot	2/0 Bareroot	2/1 Bareroot	2/2 Bareroot	Total***
		# (%)	# (%)	# (%)	# (%)	# (%)
Red Pine	N*	3 (3.9)		2 (2.6)		5 (6.6)
	A**	61.0 (3.7)		17.0 (1.0)		78.0 (4.7)
Red Spruce	N	24 (31.6)		4 (5.3)		28 (36.8)
	A	815.3 (48.9)		42.5 (2.5)		857.8 (51.4)
Black Spruce	N	15 (19.7)	1 (1.3)	10 (13.2)		26 (34.2)
	A	542.5 (32.5)	2.1 (0.1)	74.7 (4.5)		619.3 (37.2)
White Spruce	N	2 (2.6)	2 (2.6)	2 (2.6)	7 (9.2)	13 (17.1)
	A	15.3 (0.9)	7.9 (0.5)	11.0 (0.7)	59.9 (3.6)	94.1 (5.6)
Norway Spruce	N	1 (1.3)		3 (3.9)		4 (5.3)
	A	5.0 (0.3)		13.8 (0.8)		18.8 (1.1)
Total***	N	45 (59.2)	3 (3.9)	21 (27.6)	7 (9.2)	76 (100)
	A	1439.1 (86.3)	10.0 (0.6)	159.0 (9.6)	59.9 (3.6)	1668 (100)

* Number of plantations

** Area (ha)

*** Percentage totals may not equal column and row sums due to rounding.

RESULTS

OVERVIEW

The average mortality (% dead) of all assessed plantations was 3% (range 0 - 24%), with a median of 0% and the average damage (% attacked + dead) was 17% (range 0 - 80%), with a median of 14% (Table 2).

The highest mortality and damage generally occurred in the Eastern region of Nova Scotia. For example, out of the nine plantations with greater than 10% mortality, three were found in Antigonish

Table 2. Mean mortality (% dead), mean damage (% attacked + dead) and sample size by plantation location.

Subdivision	County	% Dead	Range	% Attacked + Dead	Range	No. of Plantations	Area (ha)
Cape Breton/North		11	10-12	28	26-31	3	114
	Inverness	11	10-12	28	26-31	3	114
	Victoria	N/D*	-	-	-	-	-
Cape Breton/South		N/D	-	-	-	-	-
	Richmond	N/D	-	-	-	-	-
	Cape Breton	N/D	-	-	-	-	-
Eastern		3	0-24	17	0-80	53	957
	Antigonish	4	0-24	20	0-80	26	295
	Guysborough	3	1-4	3	1-4	2	34
	Pictou	3	0-19	15	0-50	25	628
North Central		7	0-13	12	2-22	2	37
	Cumberland	N/D	-	-	-	-	-
	Colchester	7	0-13	12	2-22	2	37
South Central		1	0-4	13	8-17	3	96
	Halifax	N/D	-	-	-	-	-
	Hants	1	0-4	13	8-17	3	96
Valley		2	0-8	18	10-37	9	318
	Kings	N/D	-	-	-	-	-
	Annapolis	2	0-8	18	10-37	9	318
South Shore		N/D	-	-	-	-	-
	Lunenburg	N/D	-	-	-	-	-
	Queens	N/D	-	-	-	-	-
Western		0	0-0	15	6-22	6	146
	Digby	0	0-0	21	20-22	2	19
	Yarmouth	0	0-0	11	6-15	2	43
	Shelburne	0	0-0	12	10-15	2	84
Nova Scotia (Total)		3	0-24	17	0-80	76	1668

* N/D - No data collected

County, three in Pictou County and two in Inverness County. Four of the five plantations with greater than 40% of their seedlings damaged were located in Antigonish County and the other was in Colchester County. On the other hand, no mortality was recorded in the Western Subdivision (Digby, Yarmouth and Shelburne Counties), although some damage did occur (15% on average).

Figures 1 and 2 show the distribution of plantations by mortality and damage levels respectively.

MORTALITY RATIO

The mortality ratio figures shown in Table 3 represent the mortality for a given damage level. This ratio was found to decrease with larger stock types. For the 76 plantations assessed, the ratio of mortality to damage was highest for the smaller 2/0 (32%) and multipot seedlings (20%) and lowest for the large 2/2 bareroot seedlings (5%). Similarly, those plantations with seedlings that averaged greater than 6 mm in root collar diameter (RCD) exhibited the lowest mortality ratio (6%). The mortality ratio for

From Figure 1 it can be seen that there was no debarking weevil induced mortality in 51% of the plantations surveyed and 83% had a mortality level of less than or equal to 5%. Figure 2 indicates that only 11% of the plantations were free from debarking weevil damage while 57% of the plantations had 15% or fewer of their seedlings damaged. On the other hand, approximately 12% of the plantations had greater than 10% mortality and 5% had greater than 45% damage.

the smallest seedlings (2-4 mm RCD) was considerably higher (35%).

It is interesting to note that the hardest hit plantation at North Grant, Antigonish County contained 2/2 stock. Eighty percent of the trees were attacked but only 5% died. This compares to a multipot plantation at Pinevale, Antigonish County which had the highest mortality (24%) but where only 37% of the trees were damaged.

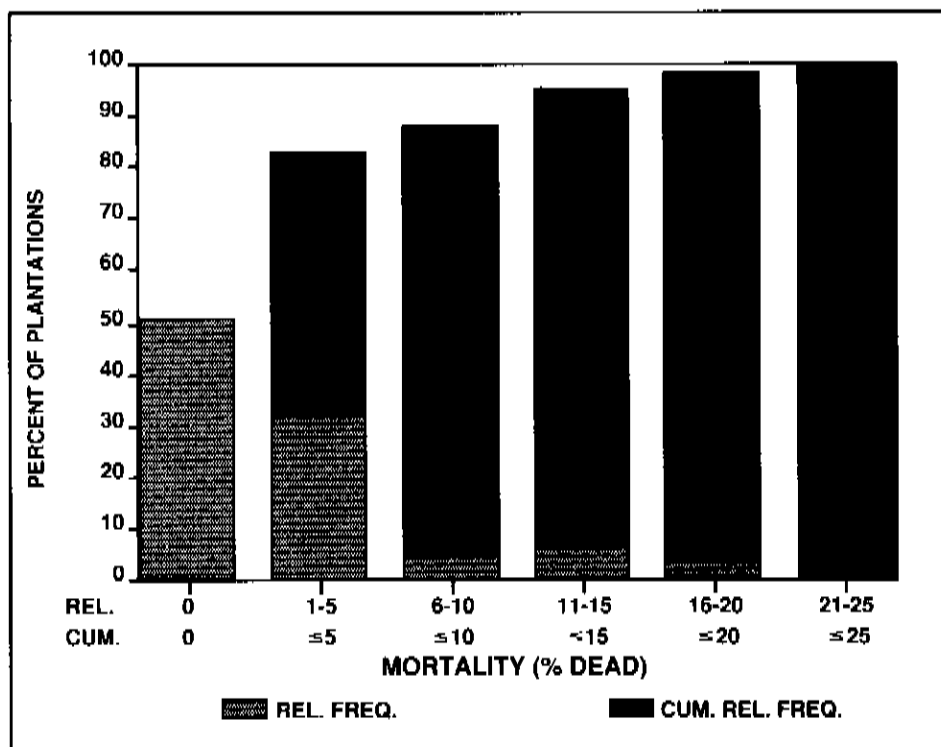


Figure 1. Relative frequency (Rel. Freq.) and cumulative relative frequency (Cum. Rel. Freq.) of plantation mortality (% dead) due to debarking weevils.

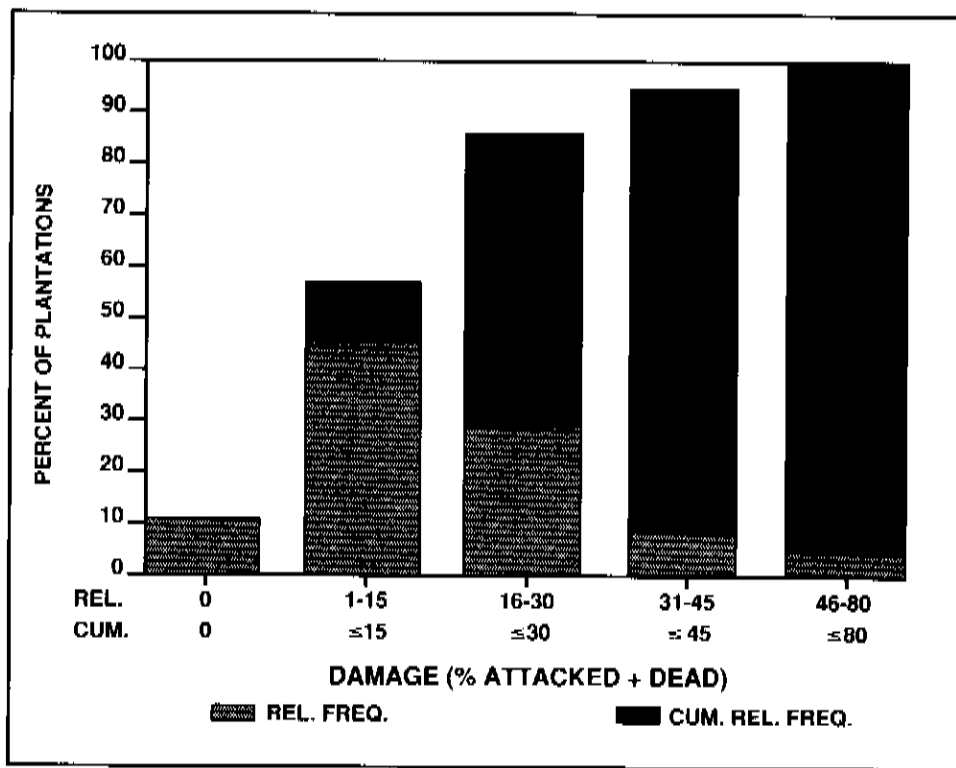


Figure 2. Relative frequency (Rel. Freq.) and cumulative relative frequency (Cum. Rel. Freq.) of plantation damage (% attacked + dead) due to debarking weevils.

Table 3. Mortality ratio and sample size by stock type and root collar diameter.

	Mortality Ratio (%)	Number of Plantations	Area (ha)
Stock Type			
Multipot	20	45	1439
2/0 Bareroot	32*	3	10
2/1 Bareroot	9	21	159
2/2 Bareroot	5	7	60
Root Collar Diameter			
2-4 mm	35	21	603
4-6 mm	12	35	722
6+ mm	6	20	343

* On average, 2/0 bareroot seedlings had a smaller root collar diameter than the multipot seedlings for those plantations sampled.

SUMMARY

- 1) The average percentage of planted trees killed by debarking weevils was 3% and ranged from 0 to 24%.
- 2) The average percent of planted trees killed and/or attacked by debarking weevils was 17% and ranged from 0 to 80%.
- 3) Nine out of 10 plantations had a mortality less than 10%. Eight out of 10 plantations had a mortality less than 5%.
- 4) Mortality was highest in Inverness County and in general decreased westward. For example, the average mortality caused by debarking weevils for the three plantations in Inverness County was 11%; for the two plantations in Colchester County - 7%; for the 53 plantations in the Eastern Subdivision - 3%; for the nine plantations in Annapolis County - 2%; and for the six plantations in the Western Subdivision - 5%.
- 5) The mortality ratio (ratio of dead to attacked plus dead) was greatest for the smallest stock and least for the largest. On average, the mortality ratio was 35% for plantations having a root collar diameter (RCD) of 2 - 4 mm at the time of survey and only 6% for plantations with root collar diameters exceeding 6 mm. These results are reflected in the average mortality for the different stock types. For multipot plantations, the average mortality was 6% and for plantations established with 2/1 and 2/2 stock, the average mortality was approximately 2%.

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