

# LUMBER GRADES AND VOLUMES FROM LODGEPOLE PINE INFECTED WITH DWARF MISTLETOE

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## ABSTRACT

A study of lumber grade yields and recovery factors from dwarf mistletoe-infected lodgepole pine trees in British Columbia indicated that there were no differences of practical importance compared with yields and quality recovered from a control group of noninfected trees.

Mistletoe infestation was confined largely to the crown portions of infected trees, with few instances of lower bole attack. Although there were no differences in visual grade yields from infected and noninfected samples, there was good evidence of growth retardation in the infected stand.

*Additional keywords:* *Pinus contorta*, Lumber grade yields, Lumber recovery factors.

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum* Nutt. ex Engelm.) extends throughout western North America and, in Canada, ranges into western Ontario (Hawksworth and Wiens 1972). Principal hosts for the parasite are lodgepole pine (*Pinus contorta* Dougl. var. *latifolia* Engelm.) and jack pine (*Pinus banksiana* Lamb.). Losses in lodgepole pine growth attributed to mistletoe attack are estimated at 90 million cubic feet per annum in British Columbia (Baranyay 1972). In five stands of lodgepole pine in Alberta, growth losses for the same reason were estimated to range from 18.1 to 31.5% of normal growth (Baranyay and Safranyik 1970).

A study of the effect of dwarf mistletoe on wood properties of lodgepole pine indicated that infected and noninfected wood from stem-infected trees was inferior to wood from noninfected trees in strength and longitudinal shrinkage characteristics (Pirto et al. 1974).

There are no reported studies on the effect of this particular dwarf mistletoe on lumber yields and quality from lodgepole pine, but a study of lumber yields from white fir [*Abies concolor* (Gord. and Glend.) Lindl.] from California, infected by a different dwarf mistletoe and a true

mistletoe, suggested that the infection "either does not adversely affect lumber grade, or that present quality control procedures are ineffective in detecting the changes" (Wilcox et al. 1973).

Because the lodgepole pine dwarf mistletoe is so widespread in interior British Columbia, and there was some question as to the applicability of normal lumber-grade yield and recovery factors to infected trees for appraisal purposes, the Western Forest Products Laboratory of the Canadian Forestry Service was requested to participate in a cooperative study with the British Columbia Forest Service and the forest industry. The study objective was to compare lumber yields and visual grades of mistletoe-infected lodgepole pine trees to those from a control group of noninfected trees. No strength tests were conducted on lumber.

The area chosen for the study was in the Westlake Pulp Harvesting Forest. The particular stands from which trees were selected were about 40 miles southwest of Prince George, B.C.

## PROCEDURE

As this was in the nature of a preliminary study to obtain data that would indicate

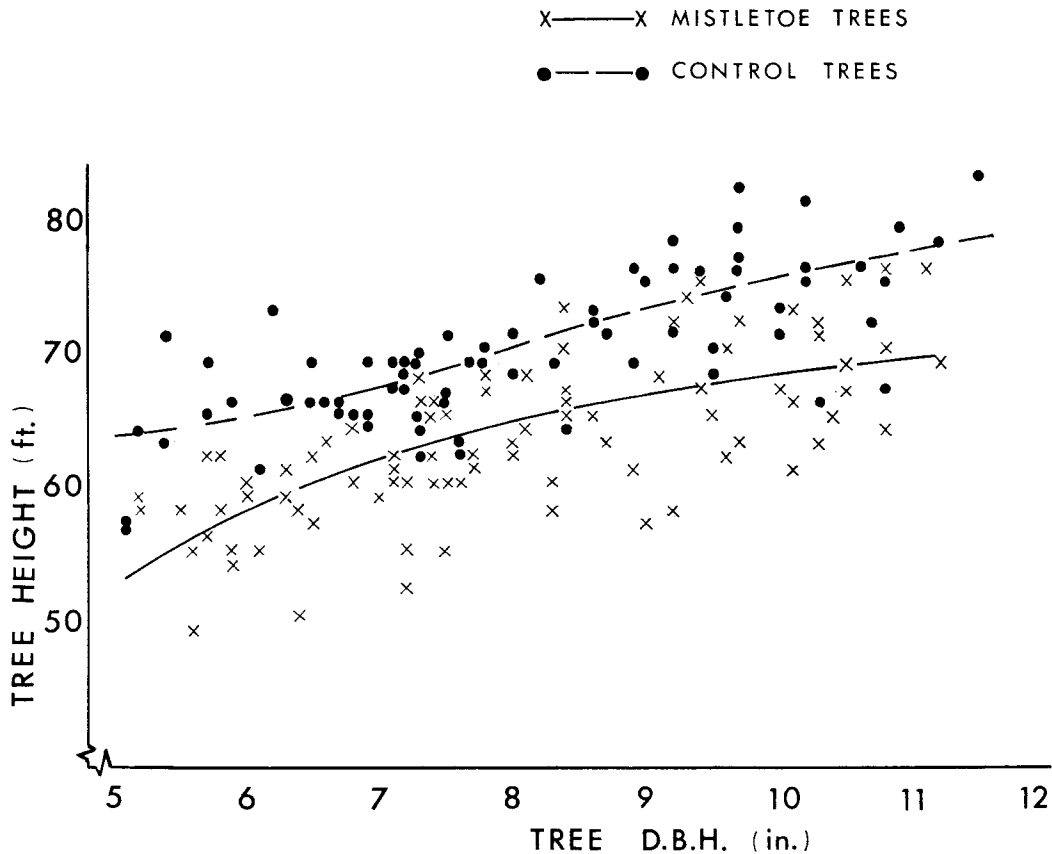


Fig. 1. Tree height related to tree dbh.

the extent of research necessary to answer adequately the question of possible yield and quality differences between infected and noninfected trees, the approach taken was to select severely infected trees and compare them with noninfected trees. The philosophy was that if there were no detectable differences, then sampling could terminate.

All of the characteristics of each sample tree were recorded on a field sheet. Degree of infection was assessed using the six-class mistletoe rating system (Hawksworth and Lusher 1956), which is applied to tree crowns only. This appears to have become a fairly standard method of rating mistletoe attack (Baranyay et al. 1971) and is used by the British Columbia Forest Service. Using this system, a tree crown is divided into top, middle, and bottom thirds, and each

third is given a numerical rating of 0, 1, or 2, depending on whether there is no visible infection (0); light infection (1), i.e. half or less of the branches infected; or heavy infection (2), i.e. more than half of the branches infected. The numerical ratings for each third of the crown are summed and a total of 5 or 6 classifies a tree as severely infected.

Because of a suspicion that any detrimental effects of mistletoe attack on lumber quality would be more marked in smaller trees, each group of trees was divided into two size classes. The upper limit of the small class was 8.5 inches dbh. Thus there were four groups of trees for which separate records were kept.

The samples were matched as closely as possible within dbh classes because this is one of the criteria used by the British Co-

TABLE 1. *Tree distribution by dbh class*

Tree dbh (in.)	Group	
	Mistletoe (no. of trees)	Control
5.1-6.0	13	13
6.1-7.0	12	11
7.1-8.0	22	26
8.1-8.5*	9	5
8.6-9.0	4	6
9.1-10.0	12	14
10.1-11.0	13	11
11.1-12.0	2	2
12.1-13.0	2	1
13.1-14.0	-	1
14.1-15.0	1	-
TOTAL	90	90

\* Arbitrarily selected upper limit for trees designated small.

lumbia Forest Service in establishing lumber recovery factors for trees and stands, on the premise that recovery factors increase as tree dbh and log size increase.

Heights, ages, and other characteristics were recorded for each tree, which, subsequent to being felled, was transported tree length to a sawmill site. Each tree was scaled in the long-log form to a top dib of 4 inches by a licensed scaler, using the rules of the British Columbia Firmwood Scale, which estimates net cubic volume by deducting only for rot and lack of wood. Each tree length was then bucked into 16- and 8-foot logs and a mill scale was also taken. Logs were then processed in four groups in a stud mill equipped with a 4-saw scrag, an edger, and a chipping remanufacturing unit.

Green lumber from each group was tallied by size, stacked, and subsequently dried to an average 15% moisture content over a

40-h period in a dry kiln. Dressed dried lumber was graded and tallied at the planer mill.

## RESULTS

### Trees

Distributions of trees by dbh classes are shown in Table 1. Tree ages within each group were fairly uniform, but the average ages differed by 23 years. Average age for the mistletoe group was 102 years, with a standard deviation of 8.8 years. For the control group, average age was 79 years, with a standard deviation of 5.6 years.

Tree heights related to tree dbh are shown for both groups in Fig. 1. Over the range of dbh, the control trees averaged from 6 to 8 feet more in total height than the mistletoe group. As there were no obvious major site differences, it is assumed that the growth of infected trees had been retarded by the dwarf mistletoe attack.

Fifty-two of the 90 infected sample trees had stem infections as evidenced by mistletoe shoots, but 83% of these indications occurred in the crown above the minimum utilized top of 4-inch dib.

There was some stem swelling associated with mistletoe attack in only four trees in total, and three of these were in utilized portions of the trees.

Thus, although each of the infected trees was rated to have severe crown infestation, the effect on utilized stems of minimum 4-inch dib was in general of minor degree.

### Logs

Log scale data are given in Table 2. Mill scale is the volume of logs from which lumber was recovered. The differences be-

TABLE 2. *Log scale data*

	Group					
	Mistletoe			Control		
	Small	Large	Total	Small	Large	Total
Long-log scale (cu ft)	422.6	582.6	1005.2	468.3	640.0	1108.3
Mill scale (cu ft)	395.7	528.6	924.3	387.4	595.8	983.2

TABLE 3. *Lumber volumes*

	Group					
	Mistletoe			Control		
	Small	Large	Total	Small	Large	Total
Green lumber (board feet)	2548.00	3892.00	6440.00	2619.00	4053.33	6672.33
Dried lumber (board feet)	2407.50	3736.84	6144.34	2501.84	3825.67	6327.51
Trims and rips (board feet)	124.50	107.16	231.66	99.83	155.66	255.49
Cull (board feet)	16.00	48.00	64.00	17.33	72.00	89.33

tween mill scale and long-log scale of 8.0 and 11.3%, respectively, for the mistletoe and control groups, are attributable mainly to the exclusion of lengths less than 8 feet from the mill scale.

A comparison of scale deductions from logs of the two groups of trees indicated that there were no significant differences in deductions for pathological reasons, and thus no increased decay associated with mistletoe attack.

#### *Lumber*

(a) *Volumes.* Lumber volumes recovered are shown in Table 3. The difference between green and dried lumber consists of trims, rips, and cull. Dried lumber volumes varied from 94 to 96% of green volumes, averaging 95.4% in the mistletoe group and 94.8 in the control; so there was no practical difference between them.

(b) *Grades.* The lumber grade yields shown in Table 4 also exhibit no important

differences between the two groups on average; nor can any practical differences be associated with tree size.

The No. 1 grade applies to one-inch lumber. Stud and Economy grades apply to two-inch lumber. These are visual grades which have recommended allowable unit stresses (NLGA 1970). Lodgepole pine is included in the northern species group, and the recommended allowable stresses for the Stud grade in this group lie between those for Standard and Construction grades of light-framing lumber (paras. 302 h-1 and 302 i, NLGA 1970). Had the mill in which the logs were processed been grading for light framing or other lumber category, there is nothing to suggest that there would have been any difference in lumber grade distributions between the two groups of trees.

Thus, although there may be reductions in strength properties in bole-infected wood, as indicated by Piirto et al. (1974),

TABLE 4. *Lumber grade yields*

Lumber Grade *	Group					
	Mistletoe			Control		
	Small	Large	Total	Small	Large	Total
	(percentage of dried lumber)					
No. 1	6.96	7.20	7.11	5.74	7.87	7.03
Stud	92.16	91.25	91.60	93.57	90.01	91.41
Economy	0.22	0.28	0.26	---	0.27	0.17
Cull	0.66	1.27	1.03	0.69	1.85	1.39

\* NLGA 1970. Standard Grading Rules for Canadian Lumber.

TABLE 5. *Dressed, dried lumber recovery factors (board feet of lumber per cubic foot of log)*

Type of log scale (cu ft)	Group					
	Mistletoe			Control		
	Small	Large	Total	Small	Large	Total
Long log	5.70	6.41	6.11	5.34	5.98	5.71
Mill scale	6.08	7.07	6.65	6.46	6.42	6.44

any differences due to mistletoe were not apparent in this study.

(c) *Recovery factors.* The lumber recovery factors of Table 5 show that yields from mistletoe-infected trees were actually greater on average than those from control trees. In small trees, the mill-scale recovery factor was lower for mistletoe than for control, but the reverse held in the larger trees.

We attach no particular significance to the small difference in recovery between group totals.

(d) *Dimensions.* Distributions of lumber thicknesses and widths are shown in Table 6, where once more the similarity in results between the two groups is striking.

#### CONCLUSION

The evidence from this study strongly suggests that there are no practical differences in lumber grade yields and recovery factors between lodgepole pine with severe crown infections of dwarf mistletoe and noninfected lodgepole pine in the Westlake area of British Columbia near Prince George.

Thus, there is no apparent reason why normal grade yields and recovery factors should not be applied to mistletoe-infected lodgepole pine for appraisal purposes.

However, there was corroborative evidence that mistletoe attack severely retards volume growth, as the infected trees were older and shorter than the noninfected trees, with no apparent site differences.

Thus there is good reason to effect control measures by placing priority on the removal of infected stands, when this option is available.

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TABLE 6. *Lumber thickness and width distribution*

	Group					
	Mistletoe			Control		
	Small	Large	Total	Small	Large	Total
	(percentages of dried lumber)					
<i>Thickness</i>						
1 inch	7.01	7.30	7.18	5.78	8.02	7.13
2 inch	92.99	92.70	92.82	94.22	91.98	92.87
<i>Width</i>						
3 inch	3.88	4.48	4.25	4.10	4.99	4.64
4 inch	96.12	95.52	95.75	95.90	95.01	95.36

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