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ENTOMOLOGY

Survival and Development of Mountain Pine Beetle Broods in Jack Pine Bolts from Ontario.—In the late 1970s, an outbreak of mountain pine beetle (*Dendroctonus ponderosae* Hopk.) developed in lodgepole pine (*Pinus contorta* var. *latifolia* Engelm.) in Cypress Hills Park on the southern Alberta–Saskatchewan border and isolated infestations were also detected on Scots pine (*Pinus sylvestris* L.) and lodgepole pine in several locations in southern Alberta. As there are no previous records of mountain pine beetle activity in these areas, the sudden appearance of the infestations implied long-range dispersal of 200 km or more from the nearest outbreaks in southwestern Alberta, southeastern British Columbia, and adjacent areas of Montana and Idaho (Can. For. Serv., A Review of Mountain Pine Beetle Problems in Canada, 1982). Concerns were raised regarding the possibility of further spread by the beetle to the north and east into jack pine (*P. banksiana* Lamb.) forests that extend to within 300 km of the Cypress Hills. Furniss and Schenk (J. Econ. Entomol. 62:518–519, 1969) reported that a natural infestation of the mountain pine beetle killed nine of ten 51-yr-old jack pine trees in the Shattuck Arboretum of the University of Idaho. Some beetle progeny matured and emerged from the nine trees. This paper describes egg gallery length, brood production, and the size and sex ratio of emerged mountain pine beetles reared in jack pine bolts from within the natural range of this host species. These data are compared to data from similar rearings on lodgepole pine.

In the week of 10 August, 1981, four bolts, with a mean height and circumference of 60 cm and 62.5 cm respectively, were cut from a jack pine tree near Sault Ste. Marie, Ont., and the ends were waxed to retard dessication. The bolts were packaged and shipped by air to Victoria, B.C. On 17 August, five female mountain pine beetles, reared on bolts cut from an infested lodgepole pine on 16 June near Princeton, B.C., were inserted into entrance holes punched through the bark of each of the four bolts and confined under gelatin capsules (Lanier and Wood, Ann. Entomol. Soc. Amer. 61:517–526, 1968). The entrance holes were spaced evenly around the circumference, 5 cm from the bottom of each bolt. One day after the introduction of the female beetles, the males were introduced into the entrance holes and the infested bolts were put into emergence cages and the insects were reared in the laboratory at 21±5°C. The emerged brood adults were collected from the cages thrice weekly until 5 November when the bark was removed from each bolt and the numbers of live brood were tallied separately by bolt and stage of development. Egg gallery length was measured to the nearest mm. Gallery establishment was considered successful if egg niches and associated larval mines were observed. The thickness of the phloem was measured to the nearest 0.05 mm on two samples from each bolt. Emerged brood adults were sexed and the width of the prothorax at its widest point was measured to the nearest 0.03 mm on a subsample of 25 beetles of each sex.

Thirteen of the 20 introductions (65%) on the four bolts established galleries with progeny. Three of the unsuccessful introductions resulted from the death of the female beetles either before mating or before oviposition. The other nonproductive galleries contained unhatched eggs and were in bolts that had at least two successful introductions. Therefore, the failure of these eggs to hatch was probably because of egg sterility rather than factors related to the bolts. The average length of the successful egg galleries, 27.69 cm (Table 1), was not significantly different ($p > 0.05$) from the 23.52 cm and 25.74 cm reported by McGhehey (North. Forest Res. Cent. Inf. Rep. NOR-X-9, 1971) for mountain pine beetle reared in lodgepole pine slabs.

TABLE 1
Average length of successful egg galleries, brood production, adult size, and sex ratio of mountain pine beetle broods from jack pine bolts

Gallery length (cm)			Avg no. brood/ gallery	Avg width of prothorax (mm)					Male propor-tion
n	$\bar{x}$	$s_{\bar{x}}$		n	Female	$s_{\bar{x}}$	Male	$s_{\bar{x}}$	
13	27.69	2.67	36.6	25	2.09	0.054	1.90	0.032	0.39

A total of 476 live broods were produced in the 4 bolts, or 36.6/successful gallery, of which 95% were adults, 1% pupae, and 4% mature larvae, at the termination of the experiment. There was no relation between gallery success – brood production and phloem thickness that had a range of 0.85–1.30 mm for the four bolts. Ten pairs of mountain pine beetles, introduced into lodgepole pine bolts in the same manner as described previously and reared at a constant 24° C, produced an average of 31.7 brood (91% adults)/gallery, not significantly different ($p > 0.05$) from brood production in jack pine bolts. Similarly, there were no significant differences in the average width of the pronotum or the male ratio ($p \geqslant 0.05$) of brood adults reared in jack pine bolts (Table 1) and the corresponding statistics for brood adults reared in lodgepole pine bolts ($\bar{x}$[males] = 1.89 mm; $\bar{x}$[females] = 2.12 mm; male ratio = 0.36).

These results show that mountain pine beetle can reproduce successfully in the laboratory in jack pine logs or cut trees from the natural range of this tree species and that the expected average gallery length, brood production, and the size and sex ratio of the emerged beetles are comparable to those reared from lodgepole pine logs under laboratory conditions. The natural infestation on jack pine in Idaho (Furniss and Schenk 1969) and our results suggest that mountain pine beetle can maintain populations in jack pine and that there is a danger of this beetle spreading eastward into jack pine forests. Therefore, efforts to suppress the current beetle activity in the Cypress Hills are well justified.—L. Safranyik and D.A. Linton, Pacific Forest Research Centre, Victoria, B.C.

Results of Aerial Treatments with Dimilin® and *Bacillus thuringiensis* for Gypsy Moth (*Lymantria dispar* [L.]) Control in Quebec. — In 1977 and 1978, in cooperation with the Laurentian Forest Research Centre, Agriculture Canada tested the use of the growth-regulating hormone Dimilin® as a means of controlling the gypsy moth (*Lymantria dispar* [L.]). This hormone inhibits the synthesis of chitin required for the formation of a new integument, thus preventing the larval moult. In 1979, *Bacillus thuringiensis* (B.t.) was used by the Quebec Department of Energy and Resources to control gypsy moth outbreaks in two Montreal area parks. This report describes the vegetation of the treated areas, the insect population assessment techniques used, and the effectiveness of the two insecticides.

The area treated at Saint-Antoine-Abbé is fully developed for recreation and camping purposes. The forest vegetation consists mainly of grey birch (*Betula populifolia* Marsh.), with some white pine (*Pinus strobus* L.) and red maple (*Acer rubrum* L.). The area of Oka park treated with insecticide is almost entirely developed for outdoor activities. The forest vegetation is mostly mixed, mature hardwoods, with a predominance of sugar maple (*Acer saccharum* Marsh.), red oak (*Quercus rubra* L.), trembling aspen (*Populus tremuloides* Michx.), and large-tooth aspen (*P. grandidentata* Michx.). White pine of intermediate age is the most abundant coniferous species. The Mont Saint-Bruno and Mont Saint-Hilaire forests are mature or overmature and are composed almost exclusively of hardwoods. Sugar maple, red oak, white oak (*Q. alba* L.), and American beech (*Fagus grandifolia* Ehrh.) are the dominant species, accompanied by trembling and large-tooth aspens, red maple, ironwood (*Ostrya virginia* [Mill.] K. Koch), white birch (*B. papyrifera* Marsh.), butternut (*Juglans cinerea* L.), eastern hemlock (*Tsuga canadensis* [L.] Carr.), white pine, and red pine (*Pinus resinosa* Ait.). Trails and roads were built for access and recreation, especially in Mont Saint-Bruno park.

Dimilin® was applied in 1977 to a 178-ha camping ground at Saint-Antoine-Abbé (Huntingdon) and in 1978 to a 498-ha area of Paul Sauvé park in Oka (Deux-Montagnes). These two aerial sprayings were carried out in late May using a Grumman AgCat equipped with a conventional system of booms and nozzles (No. 8003 flat fan tips). A single application of Dimilin® 25W (active ingredient 25%) mixed with water was applied at the rate of 4.68 L/ha.

Aerial spraying of B.t. comprised two applications of Thuricide 7 days apart. All areas (650 ha) of Mont Saint-Bruno park (Chambly) and all areas (587 ha) of Mont Saint-Hilaire park (Rouville) were treated in late May and early June 1979. The following formulas were used:

Insecticide (B.t.)	Dosage	Anti-evaporator	Medium
Thuricide 32B (25%)	19.6 BIU	Sorbitol (30%)	Water (45%)
Thuricide 32B (50%)	39.52 BIU	Sorbitol (20%)	Water (30%)

Added to both these mixtures were an adhesive (Chevron 1/1600) and chitinase (9884 nephelometric units/ha). The preparations used were recommended by W.A. Smirnoff of the Laurentian Forest Research Centre. The biological insecticide was applied at the rate of 9.36 L/ha using two Grumman AgCat aircraft equipped with a conventional system of booms and nozzles (16 No. 8006 and 28 No. 8004 nozzles, flat fan tips). The first application was in late May, when 60–70% of larvae were in the second instar and foliage development was at approximately 70%.

Egg-mass populations were calculated before and after spraying in sample plots of 1/20 ha (15 at Saint-Antoine-Abbé, 20 at Oka, 5 in Mont Saint-Bruno park, and 5 in Mont Saint-Hilaire park). Between 5 and 10 control plots, covering a total area of 0.08, 0.25, 0.5, and 0.5 ha, were set up near each of the treated areas in Saint-Antoine-Abbé, Mont Saint-Hilaire, Mont Saint-Bruno, and Oka respectively. A visual count of egg-mass populations was conducted in the spring and fall at ground level, on regeneration, and on trunks and crowns of all trees in the control plots. The viability of eggs was determined after hatching was completed by examining egg masses on tree trunks in the control and treated areas. Pre-spraying larval development was determined by identifying the life stages of 300 larvae collected twice before spraying. Larval populations were calculated before and after spraying, with the aid of binoculars, by counting larvae on tree trunks, branches, and foliage for a 10-min period. This technique was modified in 1979;

in each sample plot the observer counted, during a 1-min period, the larval population of each of 10 trees selected at random.

A qualitative assessment of the larval population was carried out by measuring feeding activity of larvae before and after spraying. This was done by counting the caterpillar feces collected on 20 plywood boards, each measuring 930 cm^2 and covered with a thin layer of vaseline. The boards were placed every 4 or 5 days under trees in each sample plot for 12 h, starting at 8 p.m.

Natural mortality during larval development was calculated in 1978 and 1979 in the control plots using the above-described binocular method and by rearing 100 larvae through the first three larval instars. For instars 4, 5, and 6, this natural mortality was calculated with the aid of burlap or tar paper traps 20-cm wide, installed at breast-height on 40 trees in the treated area and 10 trees each in the Mont Saint-Bruno, Mont Saint-Hilaire, and Oka control plots. The traps were installed 10 days after spraying and visited weekly until the end of larval development; the number of individuals parasitized or diseased was noted at each visit. The natural mortality of larval populations in the Dimilin®-treated sector in 1977 at Saint-Antoine-Abbé was estimated only from the rearing of 200 larvae collected 9 June and 21 June because field work could not be conducted on a continuing basis. The foliage protection obtained with Dimilin® or B.t. was estimated using binoculars to examine 10 trees per sample plot; the resulting value was compared and adjusted with that for the entire treated area.

The winter survival study of egg masses (e.m.) deposited in trees of the control plots revealed hatching percentages of 50.5% (716 e.m.) at Saint-Antoine-Abbé and 61% (2 595 e.m.) at Oka in 1978. The 1979 figures were 79.9% (2 885 e.m.) and 85.7% (1 990 e.m.) at Mont Saint-Bruno and Mont Saint-Hilaire respectively. High egg-mass population levels (Table 2) and high hatching percentages justified the application of control measures. Good synchronization was obtained in most cases (Table 1) between the date of the first insecticide application and the targeted development of larvae and foliage. Insecticide sprayings were delayed at Saint-Antoine-Abbé and Mont Saint-Hilaire because the aircraft was unavailable on the recommended spraying date in 1977 and because of unfavorable weather conditions for spraying in 1979.

TABLE 1

Larval and foliage development at the time of the Dimilin® spraying in 1977 and 1978, and of the aerial application of B.t. in 1979

Insecticide	Locality	Date of treatment: 1st spraying	Date of treatment: 2nd spraying	Larval stage (%): I	II	III	IV	Foliage development (%)
Dimilin®	Saint-Antoine-Abbé	30-05-77	—	0	6.8	68.9	24.3	60
	Oka	30-05-78	—	23.6	56.7	19.7	0	76
B.t.	Mont Saint-Bruno	22-05-79	1-06-79	31.0	66.0	3.0	0	76
	Mont Saint-Hilaire	1-06-79	4-06-79	10.0	86.0	4.0	0	93

The Dimilin® and B.t. applications resulted in significant reductions in gypsy moth larvae and egg-mass populations (Table 2). Both insecticides caused over 95% larval mortality 20 days after treatment. Moreover, larval feces indicated a marked slowdown in foliage consumption and significant larval mortality in the first days after application of insecticide. A reduction in larval activity and population level was also apparent in control plots because of natural mortality. The effectiveness of both insecticides was also shown by reductions of 99.8–100% in post-spray egg-mass populations in treated areas

TABLE 2

Assessment of pre- and post-spray larval and egg mass populations in localities treated with Dimilin® in 1977 and 1978, and with B.t. in 1979

	Larval populations														Egg masses/ha			
	Mean number of larvae						Mean number of excreta											
	Control			Treated			Control			Treated					Control		Treated	
Insecticide and locality	Pre-	10*	20*	Pre-	10	20	Pre-	10	20	Pre-	10	20			Pre-	Post-	Pre-	Post-
Dimilin®																		
Saint-Antoine-Abbé (1977)	10.3	13.2	37.1	23.6	2.5	0.16 (99.3)**	67	16	37	61	0	0			7 900	131 (98.4)	988	2 (99.8)
Oka (1978)	457	942	452	544	61	24 (95.6)	341	71	32	837	0.2	0			13 208	6 208 (53.0)	32 072	0 (100)
B.t.																		
Mont Saint-Bruno (1979)	513	333 (35.1)	123 (76.0)**	638	3 (99.5)	0 (100)	1550	16	—	1044	2	0			6 664	288 (95.7)	15 552	32 (99.8)
Mont Saint-Hilaire (1979)	309	193 (37.5)	93 (69.9)	424	3 (99.3)	0 (100)	150	33	—	241	1	0			2 412	932 (61.4)	9 772	24 (99.8)

*10 and 20 days after spraying

**Percentage of egg-mass and larval population reduction – applies to all figures in parentheses

(Table 2). Egg-mass population sampling in the control plots also showed significant reductions in insect populations, especially at Saint-Antoine-Abbé and Mont Saint-Bruno; however, these reductions were less than those in sprayed areas.

In 1979, biotic and abiotic factors also contributed to the significant reduction in the gypsy moth population. Temperature, precipitation, and wind conditions in late May 1977 and 1978 were definitely more favorable to gypsy moth development and to aerial spraying of insecticide than in the same period of 1979. During the last week of May 1979, the mean temperature was 12.4°C, the total precipitation was 50.5 mm, and wind velocities averaged 12.5 km/h, with a maximum of 32.8 km/h. Climatic conditions for the same period in 1977 and 1978 were much more favorable for aerial spraying, with respective temperatures of 17.0°C and 20.1°C, low precipitation (11.6 and 0 mm), and winds that did not exceed 17.0 km/h. Natural mortality in the first three larval instars resulting from climatic conditions or various biotic agents in the Mont Saint-Bruno and Mont Saint-Hilaire control plots in 1979 was estimated at 35.1 and 37.5% respectively. The importance of the biotic natural mortality factors of late-instar gypsy moth larvae is presented in Table 3. Parasitism played a more significant role at Saint-Antoine-Abbé and Oka in 1977 and 1978 whereas entomopathogens were mostly responsible for the natural decline of larval populations at Mont Saint-Bruno and Mont Saint-Hilaire in 1979. The total natural mortality in 1979 was estimated at 69.9 and 76.0% in the control plots at Mont Saint-Hilaire and Mont Saint-Bruno respectively.

TABLE 3
Natural mortality of fourth to sixth instar larvae in the control sample plots

Localities	Number of larvae	Natural mortality (%)		
		Entomo-pathogens	Parasites	Total
Sainte-Antoine-Abbé	400	1.0	21.0	22.0
Oka	490	11.4	20.0	31.4
Mont Saint-Bruno	242	36.0	4.9	40.9
Mont Saint-Hilaire	604	17.4	15.2	32.6

Excellent foliage protection was obtained with both insecticides. Defoliation of less than 10% was recorded on sprayed areas, as compared to 25, 60, 25, and 41% in the control plots at Saint-Antoine-Abbé, Oka, Mont Saint-Hilaire, and Mont Saint-Bruno respectively.

Both insecticides proved effective in controlling the gypsy moth and protecting foliage. Of the two insecticides, only B.t. is registered in Canada. Biotic and abiotic factors also contributed to reducing gypsy moth population levels, particularly in 1979.—L. Jobin, Laurentian Forest Research Centre, Ste. Foy, Que. and A. Caron, Agriculture Canada, Montreal, Que.

PATHOLOGY

***Sirococcus* Blight not Seed-borne on Seratinous Lodgepole Pine.**—The fungus *Sirococcus strobilinus* Preuss causes a blight of conifers, especially on regeneration and nursery seedlings, in northern North America and Europe (Funk, Plant Dis. Rep. 56:645–647, 1970; Magasi et al., Plant Dis. Rep. 59:664, 1975; Roll-Hansen, Medd. Nor. Skogforsoeksves. 21:175–246, 1967). In British Columbia forest nurseries, the disease affects young germinants of container-grown spruce (*Picea* spp.) and 1-0 bareroot lodgepole pine (*Pinus contorta* Dougl.) throughout the autumn (Sutherland and Van Eerden, B.C. Min. For.-Can. For. Serv. Jt. Rep. No. 12, 1980). Recently, we determined that *S. strobilinus* is seed-borne on spruces (Sutherland et al., Can. J. Bot. 59:559–562, 1981) and, with improved techniques for detecting seed-borne *S. strobilinus*, we decided to re-examine Illingworth's findings (Can. J. Forest Res. 3:585–589, 1973) that the fungus is not seed-borne on *P. contorta*. This question needs a definitive answer for developing *Sirococcus* blight controls for B.C. lodgepole pine nurseries and also for export-related guidelines for *P. contorta* seeds.

Three experiments were made to assay lodgepole pine seeds for *S. strobilinus*. In the first experiment, 500 seeds from each of Illingworth's (1973) 20 provenance seedlots (all of which were diseased in his nursery trials) and seeds from four seedlots with nursery histories of *Sirococcus* blight were cleaned of debris (Edwards, Pac. Forest Res. Cent. Inf. Rep. BC-X-188, 1979), stratified (48 h water soak, 3 wk storage at 3°C), and five replicates of 100 seeds from each seedlot were sown in 10-cm pots containing autoclaved 1:1 sand–peat mixture. Seeds were covered with autoclaved sand and the pots arranged in a completely random design in the growth chamber with alternating periods of light (900 lux, 20°C, 8 h) and no light (16°C, 16 h). Each pot was fitted with a 6-cm-high plastic enclosure sleeve to maintain a high humidity and prevent possible interpot spread of the pathogen. High humidity, low light intensity, short day length, and temperatures of 16–21°C favor *Sirococcus* blight development (Wall and Magasi, Can. J. Forest Res. 6:448–452, 1976). Twice weekly for 4 wk and then weekly for 3 wk, seedlings were examined for *Sirococcus* symptoms (Sutherland and Van Eerden, 1980) and suspected seedlings or portions were placed on sterile, moist filter paper in petri dishes and periodically checked for *S. strobilinus*. Sometimes suspected materials from these plates were transferred to malt agar to obtain fungus growth.

In the second experiment, 500 seeds from each of Illingworth's (1973) 20 provenance-seedlots were surface-sterilized with 30% H_2O_2 for 30 min (Sutherland et al., Can. For. Serv. Bi-mon. Res. Notes 34:20-21, 1978), washed with sterile, distilled water, and plated onto 1.5% water agar in petri dishes. Incubation was at 20°C with 8 h of light (900 lux)/day. Seeds were examined for *Sirococcus* 8 days after plating, then twice weekly for 2 wk, and then weekly for another 3 wk. Fungi suspected of being *S. strobilinus* were transferred to malt agar to obtain pure cultures.

The third experiment was made with the four lodgepole pine seedlots with nursery histories of *Sirococcus* blight. Because spruce seeds with abnormal (shrunken) contents yielded *S. strobilinus* up to seven times more often than normal seeds (Sutherland et al. 1981). 1 000 seeds from each of the four seedlots were X-rayed, and the seeds classified as normal, abnormal (shrunken contents), and seedcoat damaged; 96.9, 1.9, and 1.2% of the seeds were normal, abnormal, and seedcoat damaged respectively. No empty seeds occurred in the seedlots. The seeds were then surface-sterilized, plated, and processed as in the second experiment.

S. strobilinus was not obtained from any of the 24 lodgepole pine seedlots (20 provenance seedlots and four nursery seedlots) in any of the three experiments. Our results confirm Illingworth's (1973) findings that the fungus is not seed-borne on lodgepole pine and they also substantiate his report that lodgepole pine provenances vary in susceptibility to *Sirococcus* blight. Illingworth gives other examples of genetic-based variation in susceptibility to this disease, i.e., on lodgepole pine in Scotland and on Norway spruce (*Picea abies* [L.] Karst.) in Czechoslovakia. Inoculation experiments should be made to clarify the relation between seed source and susceptibility to *Sirococcus*. Most of the seedlots that we used were of the interior variety of lodgepole pine that usually bears serotinous cones (Dobbs et al., B.C. Min. For.-Can. For. Serv. Jt. Rep. No. 3, 1978), i.e., cones that remain on the tree without opening for a year or more following maturation. Apparently the fungus is unable to reach seeds in these serotinous cones, but it might occur on seeds of coastal lodgepole pine, the cones of which are mainly nonserotinous (Dobbs et al. 1978). We suspect that inoculum for *Sirococcus* blight of bareroot lodgepole pine originates from diseased trees adjacent to the nursery.—Jack R. Sutherland, W. Lock, T.A.D. Woods, and Terri Suttill, Pacific Forest Research Centre, Victoria, B.C.

FIRE

Physical Properties of Some Ontario Slash Fuels.— Increasing interest in fuel sampling in Ontario has triggered a demand for reliable quantitative data on the physical characteristics of fuel complexes. This has been especially true in the case of slash fuels because of heightened interest in prescribed burning for silvicultural treatments within the province.

The standard sampling method for inventorying slash fuel weight loadings is based on the line intersect method (Warren et al., Forest Sci. 10:267–276, 1964; Van Wagner, Forest Sci. 14:20–26, 1968). Brown (Forest Sci. 17:96–102, 1971) modified the sampling procedure for the line intersect method and called it the planar intersect method. Further details on the use of this modified method are given by Roussopoulos and Johnson (USDA Forest Serv., Res. Pap. NC-88, 1973), and by Brown (USDA Forest Serv. Tech. Rep. INT-16, 1974). It will be referred to herein as the line intersect sampling method because the theory used in its development does not vary from that used by Van Wagner (1968) in the development of the earlier method for forest fuel sampling.

The major disadvantage of the line intersect sampling method has been the time required for the measurement of all ground fuel particle diameters to calculate fuel weight loadings. This disadvantage has been overcome by establishing squared values for the quadratic mean diameters by species and size classes so that the number of intersects by size class need only be counted. Measurements of Ontario slash species diameters were taken for slash of various ages at 19 prescribed burn sites across Ontario. The sampling method was similar to that of McRae et al. (Can. For. Serv. Rep. O-X-287, 1979), and consisted of a number of random sample lines on each site where diameters were recorded by species for all intersecting fuel particles crossing the sample line. All fuel particle diameters were measured to the nearest 1.0 cm with calipers. Table 1 shows the quadratic mean diameter squared values calculated from these data.

TABLE 1

Quadratic mean diameters (squared) for slash fuel particles by species and size class for Ontario

Size class diameter	Species*	No. of plots	$(dq)^2$	$S\bar{x}$**
0.00–0.49	JP	67	0.0856	0.0036
	BS	160	0.0436	0.0012
	TA	43	0.0943	0.0056
	WB	23	0.0790	0.0090
	BF	99	0.0488	0.0028
0.50–0.99	JP	59	0.4284	0.0166
	BS	127	0.4163	0.0095
	TA	37	0.4143	0.0254
	WB	12	0.4026	0.0332
	BF	70	0.4469	0.0154
1.00–2.99	JP	64	2.6804	0.1390
	BS	127	2.4296	0.0888
	TA	39	3.3151	0.2127
	WB	15	3.3244	0.3799
	BF	74	2.6825	0.1875
3.00–4.99	JP	47	14.0218	0.5050
	BS	82	14.9260	0.3870
	TA	24	14.0279	0.7500
	WB	11	17.2936	1.1100
	BF	40	15.2097	0.6440
5.00–6.99	JP	30	37.1807	0.9720
	BS	61	35.8541	0.7490
	TA	15	32.3260	1.7000
	WB	7	35.2200	2.7440
	BF	35	34.3029	0.9190

*JP – Jack pine, BS – Black spruce, TA – Trembling aspen, WB – White birch, BF – Balsam fir

**$S\bar{x}$ = standard error of mean

To determine if there was any significant difference among the species by size classes, an analysis was performed according to Tukey's procedure (Steel and

Torrie, Principles and procedures of statistics. Toronto: McGraw-Hill Book Co. Inc., 1980). There was no significant difference (0.01 level) except in the 0–0.49 size class, in which black spruce (*Picea mariana* [Mill.] B.S.P.) and balsam fir (*Abies balsamea* [L.] Mill.), though not significantly different from each other, were significantly different from the jack pine (*Pinus banksiana* Lamb.), trembling aspen (*Populus tremuloides* Michx.), and white birch (*Betula papyrifera* Marsh.) group. This difference should be expected because black spruce and balsam fir have a much finer branching habit than the other species. None of the species in the latter group was significantly different from each other.

The squared quadratic mean diameter values were used in standardizing sampling procedures (McRae et al. 1979) for collecting prescribed burn data in Ontario.—D.J. McRae, Great Lakes Forest Research Centre, Sault Ste. Marie, Ont.

RECENT PUBLICATIONS JULY-SEPTEMBER 1982

7 **Alfaro, Rene I., and John H. Borden. 1982.** Host selection by the white pine weevil, *Pissodes strobi* (Peck): feeding bioassays using host and nonhost plants. Can. J. Forest Res. 12:64–70.

7 **Brix, H., and F.T. Portlock. 1982.** Flowering response of western hemlock seedlings to gibberellin and water-stress treatments. Can. J. Forest Res. 12:76–82.

4 **Corriveau, Armand G., and Gilles Vallée. 1981.** Forest genetics and tree improvement are on the way in Quebec. For. Chron. 57:165–168.

7 **Funk, A., and Job Kuijt. 1982.** *Mycocalicium viscinicola* sp. nov. (Caliciales) on mistletoe viscin in South America. Can. J. Bot. 60:191–193.

3 **Goldsmith, F.B., and J.C. Lees. 1982.** Regeneration and management of white ash in Nova Scotia and New Brunswick. For. Chron. 58:35–39.

7 **Hawkes, B.C., and B.D. Lawson. 1980.** Fire hazard appraisal in pre-commercially thinned stands of British Columbia coastal Douglas-fir and interior lodgepole pine. Pages 137–145 *in* Proc. Sixth Metereol. Conf. Seattle, WA. 22–24 April.

7 **Lawson, B.D. 1981.** Prediction of prescribed fire behavior and effects on forest fuels. Paper presented at Northwest Forest Fire Counc. Annu. Meet. Portland, OR. 23–24 Nov.

5 **Myren, D.T. 1981.** Use of borax and sodium nitrite in an operational thinning of red pine in Ontario to prevent stump infection by *Fomes annosus*. For. Chron. 57:284–285.

4 **Ouellette, G.B. 1981.** Ultrastructural cell wall modifications in secondary xylem of American elm surviving the acute stage of Dutch elm disease: vessel members. Can. J. Bot. 59:2411–2424.

7 **Pang, P.C., and K. McCullough. 1982.** Nutrient distribution in forest soil leachates after thinning and fertilizing Douglas-fir forest. Can. J. Soil Sci. 62:197–208.

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