The basic specific gravities of samples taken from the logs are listed in Table 2. The sample blocks, approximately $7 \times 5 \times 3$ cm, were obtained from the central areas some 30 cm from the end zones of one representative log in each group. The basic specific gravities of wood samples obtained from logs inoculated with *P. adustus* alone and from the controls at the end of storage were reduced by averages of 15 and 8%, respectively, when compared with values obtained for those logs inoculated initially with *T. viride.*

The successful control of storage decay by growing *T. viride* in recently felled white birch logs is contingent upon the ability of the mold to rapidly colonize the substrate before wood rotting fungi can become established. The use of antagonistic fungi to reduce discolorations and decay in land-stored logs would appear to be an alternate method of controlling deterioration where other means of protection are not possible.—J. K. Shields, Forest Products Laboratory, Ottawa, Ont.

Spore Discharge of *Scleroderris lagerbergii* Gremmen.—*Scleroderris lagerbergii* Gremmen, a Discomycete known to be associated with dying of branches and stems of various species of conifers, was first collected in the Province of Quebec by the author in 1964 on black spruce (*Picea mariana* (Mill.) BSP.) and white spruce (*P. glauca* (Moench) Voss). Subsequently, the fungus was also found on jack pine (*Pinus banksiana* Lamb.), lodgepole pine (*P. contorta* Dougl. var. *latifolia* Engelm.), red pine (*P. resinosa* Ait.), Scots pine (*P. silvestris* L.), and white pine (*P. strobus* L.). Examination of the specimens collected in Quebec revealed that the fruiting bodies of *S. lagerbergii* on pine matured earlier than those on spruce. To obtain additional evidence, the discharge of conidia and primary ascospores of *S. lagerbergii* was investigated on black spruce and jack pine. Two aspects, the duration of spore discharge and the effect of relative humidity, were studied.

The duration of spore discharge on black spruce was determined at Lake Jacques Cartier (alt 2,700 ft) in 1966 and on jack pine at Valcartier (alt 600 ft) in 1967. The beginning of the discharge period on black spruce at Lake Jacques Cartier and on jack pine at Lake Choquette (alt 1,200 ft) in the Laurentide Park was also established in 1967. Jacques Cartier and Choquette Lakes are situated 50 and 90 miles north of Valcartier, respectively. Sixteen spore traps, eight for each spore form, were set up at each locality. Each spore trap consisted of a microscope slide coated with vaseline and suspended 0.5 cm beneath a branch bearing fruiting bodies of *S. lagerbergii.* A 15×10-cm metal plate was placed over each slide. The slides were collected three times per week in the Laurentide Park and daily at Valcartier. The deposited spores were counted under a compound microscope by moving the $40\times$ objective across the slide four times at predetermined points.

The effect of relative humidity on spore discharge was investigated in the laboratory. One hundred per cent relative humidity was obtained with distilled water. Ninety-nine per cent humidity was maintained with saturated KH_2PO_4 and K_2SO_4 solutions at 15C and 98% humidity with KH_2PO_4 at 10C and K_2SO_4 at 20C. Glass preparation dishes (100×50 mm) sealed with rubber bands and wax were used as containers.

Discharge of both spore forms of *S. lagerbergii* on spruce began in 1966 in the second week of July and lasted until the second week of October. The maximum discharge occurred in the first week of August. In 1967, discharge of both types of spores began in the first week of July.

Discharge of conidia of *S. lagerbergii* on jack pine began at Valcartier in the third week of May and that of the ascospores in the first week of June. The maximum discharge of both types of spores occurred in the third week of June. No spores were caught after the first week of August. Discharge of conidia and ascospores of *S. lagerbergii* on jack pine in the Laurentide Park began in the first and second week of June, respectively.

Conidia and ascospores from fruiting bodies of *S. lagerbergii* collected on black spruce and jack pine were discharged only at 100% relative humidity.

Differences in climate between Valcartier and Lac Choquette and yearly changes in weather at Lac Jacques Cartier caused variations of up to 2 weeks in the beginning of spore discharge on either host. Spore discharge on black spruce at Lac Jacques Cartier, however, began 5 weeks later than on jack pine at Lac Choquette. Although a delay in spore maturation could be expected at Lac Jacques Cartier because of higher altitude, the 5-week lag in the beginning of spore discharge on black spruce cannot be attributed entirely to climatic factors. Spore maturation on jack pine at Valcartier and Lac Choquette coincides with the beginning of the growing season. This is not the case with *S. lagerbergii* on black spruce at Lac Jacques Cartier; the growing season at this locality begins only 1 to 2 weeks later than at Lac Choquette. Moreover, mature specimens of *S. lagerbergii* were collected on jack pine in the first week of June 1966 at an altitude of 1,800 ft, 30 miles west of Lac Jacques Cartier. The beginning of spore discharge at this locality in the spring of 1967 could not be determined. Although the investigation established the duration of spore discharge and the effect of relative humidity, additional research is required to clarify the observed differences in spore maturation of *S. lagerbergii.*—E. Smerlis, Forest Research Laboratory, Sillery, Que.

Infection of Scots, Monterey and Ponderosa Pines by Western Hemlock Dwarf Mistletoe.—Monterey pine (*Pinus radiata* D. Don.) and ponderosa pine (*P. ponderosa* Laws) are commonly infected with ponderosa pine dwarf mistletoe (*Arceuthobium campylopodum* Engelm. f. *campylopodum* (Engelm.) Gill) in the western United States. Scots pine (*P. sylvestris* L.) was successfully inoculated with ponderosa pine mistletoe (Weir. Bot. Gaz. 66: 1-31. 1918), and was recently found infected with larch dwarf mistletoe (*A. c.* f. *laricis* (Piper) Gill) in a plantation (Graham and Leaphart. J. Forest. 59:375-376. 1961). Our studies demonstrate that the three pine species are also susceptible to hemlock dwarf mistletoe (*A. c.* f. *tsugensis* (Rosend.) Gill) (Table 1).

TABLE 1

Appearance of swellings, shoots, and flowers for hemlock dwarf mistletoe infections on Scots, Monterey, and ponderosa pines

Host	Location of experiments[1]	Date of inoculation	Date swellings observed	Date shoots observed	Year and type of flower[2]
A. Seed from dwarf mistletoe infecting western hemlock (Caycuse, Vancouver Island)					
P. sylvestris	G	May 21/65	Mar. 4/66	June 16/66	1967–M
P. sylvestris	G	May 21/65	June 16/66	Aug. 18/66	—
P. radiata	G	Apr. 28/66	June 21/67	June 21/67	—
P. ponderosa	G	Apr. 23/65	June 16/66	June 19/67	—
P. ponderosa	P	Oct. 18/63	May 7/65	June 14/66	1967–M
B. Seed from dwarf mistletoe infecting lodgepole (shore) pine (Horne Lake, Vancouver Island)					
P. ponderosa	P	Oct. 27/64	June 15/66	Oct. 25/66	1967–M
P. ponderosa	P	Oct. 27/64	June 15/66	June 15/66	1966–F
P. ponderosa	P	Oct. 27/64	Oct. 25/66	Oct. 25/66	1967–M
P. ponderosa	P	Octl 27/64	June 15/66	June 15/66	1967–F

[1]G = Greenhouse; P = Plantation.
[2]M = Male; F = Female.

Inoculations were performed in a greenhouse with mistletoe seed collected in the spring after radicle emergence, and in a plantation using seed collected in the fall before radicle emergence. Those used in the spring were collected from coastal western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) branches and planted, using lanolin paste as an adhesive. Seeds used in the fall were from mature mistletoe fruit from coastal western hemlock and coastal lodgepole (shore) pine (*Pinus contorta* Dougl.). They were stored for 2-4 weeks at 5C and moistened before planting to effect their adherence to the branches. Dwarf mistletoe from coastal western hemlock and coastal lodgepole pine are considered indistinquishable by F. G. Hawksworth (personal communication. 1966).

Dwarf mistletoe aerial shoot growth and swelling enlargement indicated that all infections were thriving at the time of examination in June 1967. Swellings ranged in length from 22-114 mm, and on 6 of the 9 infections, male or female flowers have been produced. Brooms were initiated in 3 infections on ponderosa pine by the stimulation of dormant needle fascicle buds adjacent to the points of infection. In one case, this stimulation produced a new branch 73 mm in length. A similar reaction occurs in ponderosa pine infected by *A. vaginatum* (Willd.) Presl. f. *cryptopodum* (Engelm.) Gill (Hawksworth. U.S.D.A. Tech. Bull. 1246. 1961).

The range of hemlock dwarf mistletoe does not coincide with the natural range of the three pine species. However, plantations of them are occasionally established in coastal areas of British Columbia, and care should be taken not to locate them near hemlock or lodgepole pine infected with dwarf mistletoe.—R. B. Smith and H. M. Craig, Forest Research Laboratory, Victoria, B.C.

SOILS

Soil Moisture Retention May Be Adversely Affected By Breaking A Hard Pan.—There are approximately 2,600 acres of glacio-fluvial outwash plain of the Medway soil series in Yarmouth and Shelburne counties in southwestern Nova Scotia. Supporting a low-growing ericaceous cover dominated by *Corema conradii* Torr. (crowberry), *Arctostaphylos uva-ursi* (L.) Spreng. (bearberry) and *Gaultheria procumbens* L. (wintergreen), and being flat and boulder-free, they are superficially attractive planting sites. The soil, however, is extremely coarse-textured, has a very low moisture retention capability and is characterized by a massive 'ortstein' pan about 10 inches below the surface. Virtually impenetrable, the pan restricts root development to the uppermost strata.

Plantations on this site type have not been successful. Survival of red pine (*Pinus resinosa* Ait.) has been good but growth has been slow, white spruces (*Picea spp.*) have failed completely.

In May 1967, a provenance seeding trial was set out on the outwash plain at Indian Fields in Shelburne County by H. G. MacGillivray, Tree Biology Section, Department of Forestry and Rural Development, Fredericton. Weeds were controlled by hand cultivation of the seed spots and by cultivation along the rows of spots with a rotary cultivator. In one line of spots in each replicate of the trial, the pan was broken under the seed spots by a small explosive charge. As well as breaking the pan, the explosion destroyed all vegetation in and around the seed spots and no recovery was observed during the following summer. Using two adjacent replicates, advantage was taken of these treatments to study the effects of breaking the pan on soil moisture retention. Comparison with the control and tilling treatments was complicated by the effects of evapo-transpiration from the vegetation growing on them and so, in mid-July, 12 plots, each 3 feet square, were cleared of vegetation by clipping to afford a simple comparison with the explosion treatment.

Periodic sampling down to the upper surface of the pan, at 8 to 10 inches depth, was carried out and the moisture content determined gravimetrically. The results for one season suggested that retention of moisture in the rooting zone was reduced where the pan had been broken, presumably because of enhanced vertical drainage.

TABLE 1

Soil moisture content, percentage by weight

Date of sampling	Moisture Content % (means of 12 tests)				Rainfall since last reading
	Undisturbed	Cultivated not clipped	Clipped not cultivated	Pan broken after cultivation	
24/6	26.5	23.1	—	24.8	1.65 (6 days)
3/7	22.1	22.0	—	21.6	nil
10/7	23.7	24.3	—	23.4	1.31
24/7	31.3	25.6	32.4	22.4*	2.80
1/8	24.2	22.8	25.0	18.4*	0.82
8/8	19.0	18.0	19.2	18.2	1.55
15/8	21.9	22.7	23.4	20.4	2.42
22/8	18.2	20.5	20.1	18.2	2.27
28/8	19.2	20.3	21.0	19.3	0.12
9/9	22.8	20.5	20.2	21.8	1.74
18/9	24.0	24.7	19.8	17.4	1.03
25/9	27.5	24.4	25.5	23.4**	1.61
29/9	24.2	27.8	28.0	22.5**	nil
21/10	24.9	25.9	24.9	21.3**	9.49

Significant differences between clipped and pan broken treatments at the 0.05 and 0.01 probability levels indicated by * and ** respectively.

In 10 of the 11 cases where comparisons between "clipped" and "pan broken" treatments were possible, the clipped plots had a higher moisture content. Five of these differences were found to be statistically different by a chi-square test. In the remaining five and in the one case where the clipped plot had the lower moisture content, samples had been taken within a few hours of a rain storm and differences had not had time to develop (Table 1).

In a very wet summer, such as that of 1967, it may have been advantageous to improve soil drainage but in a drier, more normal year it would undoubtedly be harmful in soils where the strata below the pan are deep, coarse-textured and free-draining.—R. M. Strang, Forest Research Laboratory, Fredericton, N.B.

(*Continued from back cover*)

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