erties of lodgepole pine veneer. Since an appreciation of the incidence and amount of red stain could prove useful to companies utilizing lodgepole pine for plywood manufacture, a survey was made for this purpose in March, 1958 in the Grande Prairie district, Alberta. The survey was conducted by the Calgary Forest Biology Laboratory in co-operation with the Alberta Department of Lands and Forests and Northern Plywoods Limited.

One hundred and forty trees on seven randomly-distributed plots were felled and sectioned at standard intervals (8 ft. 7 ins.), to permit the detection of red stain and advanced decay. The trees thus examined had an average age of 140 years (70-179 years), an average height of 87 ft. (63-110 ft.), and an average diameter at breast height of 12.9 in.

The volume of wood affected by red stain and decay amounted to 8.3 per cent and 8.0 per cent on the basis of the sample trees being utilized for plywood (minimum top diameter 10 ins.) and pulpwood (minimum top diameter 4 ins.) respectively. The amount of red stain that may be expected to occur in the recoverable veneer volume of trees of different sizes is presented in the following table.

RELATION OF TREE DIAMETER TO DEGREE OF RED STAINING IN THE VENEER VOLUME OF LODGEPOLE PINE

D.b.h. in	No. trees	Volume (cu. ft.)*			Percentage of veneer volume with red stain
		Gross	Cull	Veneer	
13	8	26.4	9.7	16.7	14.4
14	14	32.4	14.4	18.0	7.8
15	17	41.2	16.4	24.8	2.8
16	15	48.4	17.3	31.1	2.9
17	4	57.8	20.8	37.0	6.7
18	3	67.2	24.5	42.7	—
19	2	80.5	22.5	58.0	—
20	—	—	—	—	—
21	2	101.8	24.0	77.8	10.8
Total Average**	65	44.4	16.4	28.0	7.6

* Gross—Volume between S.H. (1.0 ft.) and 10-in. top.
Cull—Volume of 8-in. peeler core, advanced decay outside peeler cores, and volume of logs not suitable for peeling because of extensive rot at the centre.
** Average—Values are weighted by number of trees per diameter class.

The percentage of infected trees decreases in the larger diameter classes, but increases in the small, scattered group of large-diameter (17 ins.+), open-grown trees which make up approximately 7 per cent of the total number of trees in the stand. This condition is reflected in the table, which suggests that in terms of the percentage of veneer volume that is affected, red stain is generally more common in the small diameter trees of peeler quality.—A. A. Loman.

BRITISH COLUMBIA

Some Physiological and Anatomical Characteristics of Populus spp. as Related to Infection by Cytospora chrysosperma Fr.—Differential resistance to canker caused by *Cystospora chrysosperma* Fr. was observed in three species of poplar growing at a nursery on Lulu Island, B.C. The species concerned were *Populus trichocarpa* T. & G., a native; and two hybrids, *P. regenerata* and *P. robusta* var. *bachelieri*. The resistance to *Cystospora* increased in the order named.

Laboratory experiments with cuttings of the above species demonstrated a negative correlation of the bark moisture content and canker growth. Experiments using three fixed levels of moisture content of cuttings and three temperature levels showed significant differences in canker growth between levels of both factors and for all species. These differences confirmed the correlation.

Experiments with fixed levels of both atmospheric moisture and moisture content of cuttings showed significant differences of canker growth rate between levels for both factors and for all species. The differences were correlated with bark and wood moisture changes during the experiment.

Greenhouse experiments with 4-month-old plants of *Populus regenerata and P. robusta* showed infection could be obtained only when the plants were subjected to a drought regime and were exposed to low atmospheric humidity.

Anatomical differences observed in the wood and bark tissues of the three species suggest a basis for differences in water economy, and, hence, differences in physiological resistance to infection by *Cytospora*.

Differences occurred between species in pith size; vessel number and lumen diameter; sieve tube number and diameter; periderm thickness; number and arrangement of phloem sclerenchyma; compactness of cortex and other factors determining the efficiency of the stem in water storage, translocation, and retention. These differences coincided with the observed differences in resistance of the poplar species.—W. J. Bloomberg.

High Temperature Damage to Douglas Fir Seedlings.—Losses of Douglas fir seedlings due to heat injury were heavier than usual at the British Columbia Forest Service Nursery at Duncan in 1958 because of an unusually warm dry summer. On 2-0 stock, direct heat damage was slight but growth was retarded, presumably by drought. Most seedlings that had overwintered without frost damage reached plantable size. Seedlings that had been injured by frost, however, failed to reach plantable size, although they usually do so when a good growing season follows moderate frost injury.

Losses of 1-0 seedlings from heat injury were intensified by the fact that shade and water were reduced to control damping-off. The typical symptom of heat injury, a constriction or canker at the base of a seedling, was common. Incidence of the damage varied in different beds according to differences in cultural practices. One part of the nursery had been sowed about May 7 and another about May 14. Alternate beds throughout both parts were given the usual soil cover, or soil cover plus a mulch of dark sawdust. Heat damage was greater in the younger seedlings than in those a week older, and greater in beds mulched with dark sawdust than in those with only cover soil. Thus, the greatest losses, up to 50 per cent of some beds, resulted where the younger seedlings and the sawdust mulch occurred together.

By Munsell's colour charts, the dry sawdust cover was reddish brown (2.5Y, $\frac{4}{4}$) and the dry cover soil was pale olive (5Y, 5/3). In two selenium-cell light-meter readings, relative reflection from dry sawdust and dry cover soil was approximately 125:200 and 85:150. The following soil surface temperatures were indicated by dial thermometers with stainless steel shafts approximately 5mm. in diameter, which were laid on the cover surfaces after heat injury had been noticed; the air temperatures are as read from a maximum-minimum thermometer under approximately standard conditions at breast height about 100 yards from the seed beds.

June 17, 3:30 p.m.

Air temperature in shade	91°F.
Temperature at surface of cover soil in full sunlight	128°F.
Temperature at surface of sawdust cover in full sunlight	148°F.

June 18, 11:15 a.m.

Air temperature in shade	90°F.
Temperature at surface of cover soil in full sunlight	133°F.
Temperature at surface of sawdust cover in full sunlight	148°F.

These temperature records are in general agreement with a number of reported tests in which more precise instruments and methods have indicated surface temperatures of 140 to 150°F., or even higher, where heavy mortality to seedlings, especially very young seedlings, was taking place.—P. J. Salisbury and J. R. Long.

The Effect of Moisture and Temperature on the Emergence of the Larva of the Douglas-fir Cone Midge, Contarinia oregonensis Foote from Cone Scales.—Larvæ of the Douglas-fir cone midge, *Contarinia oregonensis* Foote, emerge from galls in the cone scales in the fall of the year when rains have commenced and temperatures dropped. The cones are still on the tree at this time and the larvæ vacate them to enter the duff where they spin puparia and overwinter.

An experiment was conducted to determine the effect of moisture and temperature on larval emergence from the cones.

Three hundred and twenty galled cone scales were divided into four equal groups and treated as follows: 1, air dry; 2, soaked in water for 5 minutes; 3, soaked in water for 1½ hours; 4, soaked in water for 6 hours. These treatments are referred to as: 1, dry; 2, moist; 3, wet; 4, saturated. Each treatment was divided equally between five plastic bags. One bag from each group was exposed to the following temperatures (Centigrade): 0°, 5°, 10°, 15°, and 20°.

Tables I and II show that moisture is necessary before larvæ will emerge. In the presence of moisture insects emerged at all five temperatures, and Table II shows that the highest percentage emergence (76.5) occurred under maximum moisture conditions, regardless of temperature.

Table III shows that higher temperatures are not conducive to emergence; only 21.0 per cent of the larvæ emerged at 20°, but 51.0 per cent emerged at 10°.

These data show that: 1. larvæ of the Douglas-fir cone midge will not emerge from galls under air-dry conditions; 2. moisture is required before emergence will take place and a saturated condition is preferred; 3. although larvæ emerged throughout the temperature range they showed preference for the lower temperatures.—A. F. Hedlin.