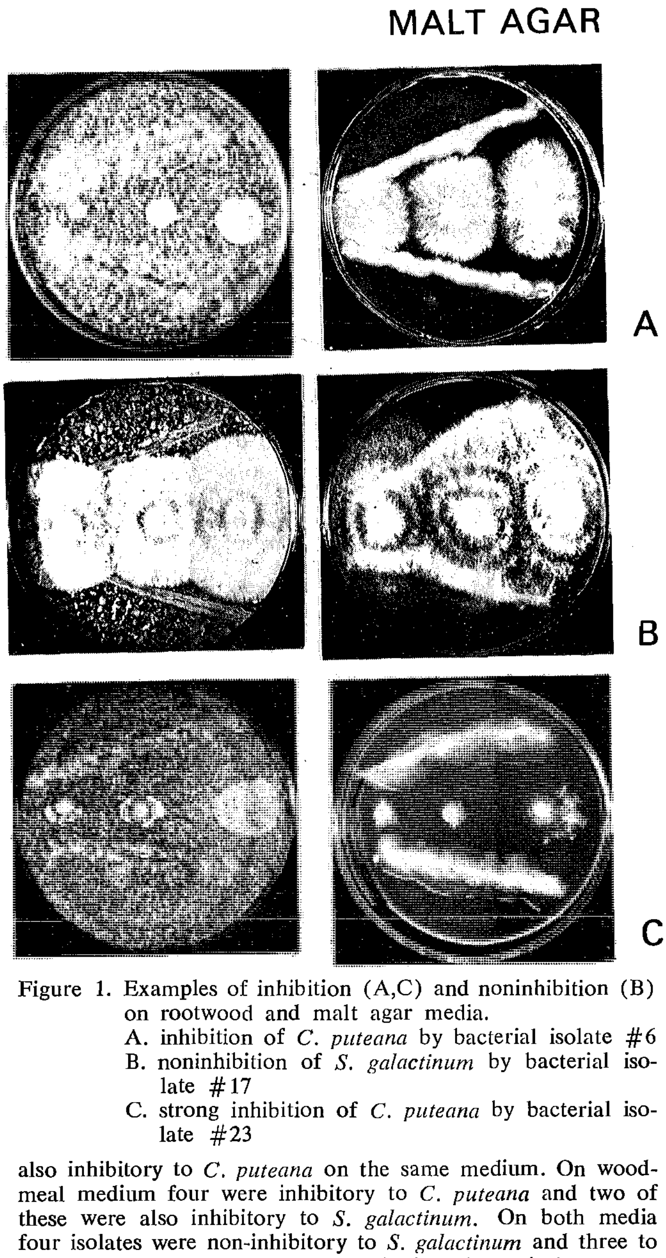

Figure 1. Examples of inhibition (A,C) and noninhibition (B) on rootwood and malt agar media.

A. inhibition of *C. puteana* by bacterial isolate #6

B. noninhibition of *S. galactinum* by bacterial isolate #17

C. strong inhibition of *C. puteana* by bacterial isolate #23

also inhibitory to *C. puteana* on the same medium. On woodmeal medium four were inhibitory to *C. puteana* and two of these were also inhibitory to *S. galactinum*. On both media four isolates were non-inhibitory to *S. galactinum* and three to *C. puteana*; two were common to both. Eleven isolates were exceptionally inhibitory (inhibition zone of 10-12 mm) to both fungi on both media (Fig. 1-c). There was no apparent relationship between the origin of the bacterial isolates, i.e. discolored, decayed, or clear wood, and the degree of inhibition.

It is evident from these results that bacteria do occur in roots of balsam fir and that many of them inhibit, *in vitro*, the growth of *S. galactinum* and *C. puteana*. Since one of the media used contained ground root wood, it is suggested that some of the bacteria may also influence the growth of these two fungi in nature.—T. E. Sterner, Maritimes Forest Research Centre, Fredericton, N.B.

SYLVICULTURE

Eucalypts for Southern Coastal British Columbia.—The spectacular growth of eucalypts and the success with which they have been introduced to other countries, prompted a search in 1968 for a species suitable for the southern coastal region of British Columbia.

The eucalypts are known to be generally sensitive to low temperatures, but in the Australian Alps, commercial forests occur above 1200 m (4000 ft) elevation in an area that has intermittent or continuous snow cover for about 4 months of the year. During that period, frost occurs on almost every clear night.

Three species were selected for the trial: *Eucalyptus nitens*, *E. rubida* and *E. delegatensis*. The selection was, of necessity, a compromise between fast growth of high quality timber and frost resistance. The seed came from the Australian Alps, about 1100 m (3500 ft) a.s.l. While exact meteorological data are not known, the following table summarizes the most important differences in the climate of the seed source and then southern tip of Vancouver Island where the trees were grown.

	Area of seed origin	Planting trials Vancouver Is.
Latitude	36-38° S	49-51° N
Altitude	approx. 1100 m	30 to 200 m
Rainfall	200 to 250 cm (80 to 100″)	80 to 150 cm (30 to 60″)
Rainfall during 4 summer months	40 to 50 cm (16 to 20″)	15 to 30 cm (6 to 12″)
Morning frost	frequent during 4 winter months	frequent during 5 winter months
Frost lasting several days	occasional	several periods every winter
Minimum temperature	−12 to −9° C (10 to 15° F)	−18 to −14° C (0 to 6°F)

Since the area of seed origin has a moister climate with higher winter temperatures than southern Vancouver Island, mortality due to frost was expected. It was hoped, however, that the genotypic variation would enable some individuals to withstand cooler winters.

In March 1969, the seed was sown in flats, and grown in a greenhouse until early June. By that time, the seedlings were 10 to 15 cm (4 to 6 in.) high. Approximately 200 seedlings, equally divided among the three species, were planted in each of three localities on southeastern Vancouver Island. The sites included a deforested, slash-burned eastern slope at 200 m (650 ft) elevation, a known frost pocket at 100 m (330 ft) and a recently bulldozed loamy subsoil at 30 m (100 ft). Survival averaged 91%. Apart from an occasional weeding on the low-elevation plot, the seedlings received no irrigation, fertilization or other treatment.

In the winters of 1969/70 and 1970/71, December frosts caused moderate damage to leaves, branch tips and naked buds. Because of this damage, flushing was delayed until mid-June, coinciding with the onset of summer drought on Vancouver Island. Consequently, the growth during the summer was slow, but increased with rains in late September. During October, the height increment of many trees averaged more than 2 cm (0.8 in.) per day. A gradual decrease of temperatures brought about cessation of growth and a degree of hardening on most trees by mid-December. By the end of the third growing season (December 1971), the average height on all three plots was 3 to 4 m (10 to 13 ft), with a few individuals reaching 5½ m (18 ft). During that time, Douglas-fir planted simultaneously as 1+0 and 2+0 bare-root stock on two "high-elevation" plots averaged 45 cm (18 in.).

At the end of the third growing season, 27 Dec. 1971, a frost of −12 to −7°C (10 to 19°F), depending on plot location combined with a 20 mph wind caused heavy damage; some trees were killed to ground level, while on others, branch tips and buds, including accessory buds, were destroyed. Trees killed to ground level were removed from the plots. On the remaining trees, 1972 growth had to initiate from epicormic bud strands. Consequently, flushing occurred very late — toward the end of June. On October 29, while trees were at the peak of their growth, a sudden, unseasonal frost of −7 to −4°C (20 to 25°F) occurred. Soon after this, the bark began to split at ground level (Fig. 1), indicating that the stems were dead. In the spring of 1973, only about half of the trees in the "low-elevation" plot sprouted from the lignotubers, enlarged, knob-like bases typical for eucalypts.

Figure 1. Heavy stem damage caused by unseasonal frost.

Although the original attempt to find a few individuals able to withstand the winter temperatures on southern Vancouver Island failed, there are several observations worth mentioning:

1. A combination of frost damage and summer drought imposed a phenological time table on the studied species similar to that of plants adapted to dry climates, i.e., they only flushed before the beginning of summer drought and during the dry hot summer they remained almost dormant. However, immediately following the first heavy rain in the fall, and regardless of lower temperature, their growth rate sharply increased. This made them particularly susceptible to early frost.

2. The three species studied did not differ in their frost resistance, but within each species, there was a large variation among individual trees in the time of flushing and hardening. Individuals that flushed early, hardened early and suffered the least damage.

3. Several eucalpyts planted as ornamentals in somewhat protected situations in parks and gardens survived the unseasonal frost with only moderate damage. While temperature data are not available, it is improbable that these situations are more than that 2°C (4°F) warmer than the "low-elevation" plot.

4. In any future trials, seed from higher elevations is desirable.

E. delegatensis grows at higher elevations in Tasmania and *E. rubida* at Mt. Kosciusko. Also, attention should be turned to other species, with greater frost resistance, even though their growth may be slower. *E. fraxinoides* and *E. oreades* as commercial species and *E. parvifolia* as an ornamental appear to be a good choice. Because higher elevations receive higher rainfall, the trees should be planted on protected southern slopes or on moist alluvial soils in the valleys on the southwest coast of Vancouver Island. This may help their phenological adaptation, by providing sufficient moisture for summer growth and hardening with lower temperatures in the fall.—S. Eis, Pacific Forest Research Centre, Victoria, B.C.

SOILS

DDT Residues May Be Lost From Soil by Direct Volatilization.—Large quantities of technical DDT were sprayed in New Brunswick forest areas between 1952 and 1968 for the control of spruce budworm [*Choristoneura fumiferana* (Clemens)] and much of it still persists in the forest soil [Yule, Bull. Env. Contam. and Toxicol. 9: 57-64, 1973]. Recent analysis of the top 6 inches (15.2 cm) of soil collected from Priceville Ecology Study area during the middle of 1972 showed an average "oven-dry" concentration of 0.097 (12%) *o,p*-DDT, 0.638 (78.6%) *p,p'*-DDT and 0.076 (9.4%) ppm of DDE respectively.

Volatilization and vapor phase transport, apart from microbial degradation and leaching, are the major sources of dissipation of "non-volatile" pesticides such as DDT from soil. The volatilization process depends basically on the vapor pressure of the individual compounds. Recent vapor pressure studies of DDT isomers and DDE by Spencer and Cliath [J. Agr. Food Chem. 20: 645, 1972] indicated that the *o,p*-isomer and DDE are more volatile from soils than the *p,p'*-DDT due to their higher vapor pressures. This report deals with the relative concentration of these components found in air samples collected at zero and 6 ft (1.8 m) above ground in forest environments in the Priceville area.

Air-sampling apparatus used was similar to that of Yule and Cole [Proc. 4th Int. Agric. Aviat. Congr. Kingston 346-353, 1969] consisting of a generator powered Gelman pump operating at the rate of 16 lpm (16 x 10^{-3} m^3/min) for 3 hours coupled with a florisil (20 g) sampler and dimethylformamide (DMF) (150 ml) bubbler. Three sampling stations, A, B, and C were established in the Priceville area close to where soil samples were collected for the analysis. Air samples were collected at ground level and 6 ft above the ground on the windless sunny forenoon (temp 18 ± 2 C) of 9 Aug. 1972. Duplicate samples were collected in the afternoon under nearly similar weather conditions. The DDT residues were extracted from the florisil with benzene (150 ml) and partitioned from the DMF with aqueous sodium sulphate (5%, 500 ml) and *n*-hexane (2 x 100 ml) prior to gass chromatographic analysis. The benzene and hexane fractions of each sample were pooled, flashed (0.5 or 1.0 ml) and analysed using a HP 5750 GC instrument fitted with electron capture (Ni 63) detector. The operating conditions were similar to those used by Yule [*loc. cit.*]

Table 1 shows that appreciable amounts of DDT residues in Priceville forest soil are dissipated by volatilization. Even though the technical material sprayed initially and the soil analysed recently contained *ca* 20 and 12% of *o,p*-DDT respectively, the results indicate that the *o,p*-isomer disappears more rapidly from the soil than *p,p'*-DDT. The average *o,p*/*p,p'*