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## ARTIFICIAL SHADE IMPROVES SURVIVAL OF PLANTED DOUGLAS-FIR AND WHITE FIR SEEDLINGS

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### ABSTRACT

Artificial shading of Douglas-fir and white fir planted seedlings measurably increased survival as shown by five California Division of Forestry studies conducted in northern California. Tests were made on a variety of sites; from critical valley exposures to those of mild coastal climate. It was shown that survival of shaded seedlings was two to three times greater than unshaded ones. The greatest differences in survival, of course, were on the more critical sites.

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Douglas-fir (*Pseudotsuga menziesii* [Mirb] Franco) and white fir (*Abies concolor* [Gord. & Glend.] Lindl) are classed respectively in Baker's (1950) tolerance tables, as "intermediate" and "tolerant" in the amount of shade they enjoy for establishment and growth in the forest. Fowells (1965) indicates that white fir seedlings need a partially closed canopy under which to develop, and environmental conditions in large clearings inhibit regeneration. Douglas-fir develops best in its early stages when the environment is partially protected from full sunlight. Logically, then, it could be expected that shading should improve survival of planted Douglas-fir and white fir seedlings.

A number of observations and results of testing artificial shade for Douglas-fir and ponderosa pine have been published over the years, (Show, 1930; Person, 1937; Isaac, 1938; California State Board of Forestry, 1955; Maguire, 1955; Franklin, 1963), but there appears to have been little testing in replicated plots with measured shade, nor have there been tests using white fir. Duffield (1962) stated that the value of

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