

California Big Trees

young trees make rapid growth and are adaptable to transplanting

Woodbridge Metcalf

Young stands of California's big trees—the *Sequoia gigantea*—under study for 32 years have demonstrated the ability of the species to reproduce itself under favorable conditions, proving that the mammoth old trees need not be the last survivors of their kind.

Cone production apparently starts when trees are about 50 years old. Seed of excellent quality has been obtained from trees 60 to 70 years old, as well as from trees of two thousand years.

Seedling Establishment

Sequoia seeds respond promptly when propagated in seed flats or outdoor seedbeds and given usual nursery care. They grow rapidly and can be transferred to the field when one or two years old.

Under natural conditions seedlings are rarely found in mature forest stands. The seeds falling on the litter and humus of the forest floor evidently are not able to establish themselves.

Occasional seedlings will be found on exposed mineral soil along roads or trails particularly where moisture conditions are good and overhead canopy not too dense. Even under these conditions root competition from larger trees is generally so severe that seedlings are stunted or killed out entirely during the first year or two.

The young stands which became established in Whitaker's Forest, Mountain Home State Forest, the Big Stump section and similar restricted areas were the result of the following combination of favorable factors:

1. Selective logging to partially open up the stand and expose areas of mineral soil. Sufficient trees must be left to provide seed and save shade;
2. Adequate distribution of seed by squirrels or other natural means;
3. Late rains in spring and early rains in fall during one to two years;
4. Summer seasons free from extreme heat, low humidity and high winds;
5. Successful fire protection for 40 to 50 years.

Although fire protection is a most important requirement for the establishment of any young forest stand, removal of slash and other logging debris by burning is a valuable aid in exposing mineral soil

and providing suitable conditions for germination of redwood seeds.

Favorable Conditions

Sequoias become established most easily on moist flatlands or on cool, north and east slopes where usually they grow in association with the sugar pines and white fir.

A combination of favorable growing factors following the selective logging of the 1870's at Whitaker's Forest resulted in such good germination and establishment of sequoias and other species that over considerable areas the seedling trees were as closely spaced as in a seedbed. Under such conditions even during the first year or two, the young trees are forced to fight for space to grow and a struggle for the essential nutriment of life goes on continuously both below and above ground.

In the early months and years of growth outside influences such as rodents, grazing animals, frost, heat, drouth and floods take their toll with advantage to trees which are most vigorous or fortunately situated.

Study Plots

Five sample plots for study of growth and mortality were established in the young stands in Whitaker's forest in 1915. All trees were tagged and measured then and have been remeasured at about five-year intervals since that date.

Three of the plots at that time showed a stand density of more than 1,000 trees per acre and in the most crowded areas a large proportion of the trees were definitely weakened by the severe competition.

A few trees showed signs of dominance which many of them have maintained throughout the succeeding years.

Rapid Growth

It is evident from a study of the figures taken during the last 32 years that the sequoias have not only outstanding rapidity of growth where conditions are favorable, but also a remarkable tenacity of life under competition. In one plot of one quarter acre only 109 trees survive

in 1947 of the 362 measured in 1915. Though 253 trees of all species on the plot have given up the fight, a number of the suppressed sequoias still cling to life though they have grown less than a half-inch in diameter during the last quarter-century and have crowns which show only faint indications of green foliage.

Thinnings are now being carried on throughout all of the young stands in order to relieve the excessive competition which otherwise will continue in these dense young stands for many years.

Observations in the study plots show that sequoias grow more rapidly in height, diameter and volume than any of their associates. The height growth of well-located, dominant trees on good soil has averaged two feet per year for over 70 years.

Sequoias will dominate any stand in which they start on fairly even terms with any other tree species.

The thickness and relative fire resistance of sequoia bark after about 40 years gives them an added advantage over other trees in surviving fires of quite severe nature which may kill most of the associated species.

The young stands at Whitaker's Forest have demonstrated the remarkably rapid growth rate of *Sequoia gigantea* during its youthful years. It is not a difficult tree to plant and indications are that the natural range can be very greatly extended by planting operations.

Planted trees are making excellent growth at many points in California and as far north as Portland, Oregon. It is altogether likely that in the future this notable tree may yield large quantities of lumber and other forest products from forest areas where it is now unknown, as well as from natural stands under intensive forest management.

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Sequoia near plot No. 4 Whitaker's Forest, 11.6 ft. in diameter, 275 ft. tall.