Silviculture of Karri (Eucalyptus diversicolor F. v. M.) in Western Australia

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(Editors Note: the following article is a summary of a longer article submitted by the author to the Editors of "Australian Forestry". The opinions expressed and the conclusions reached are those of the writer).

SUMMARY

The composition and structure of the virgin stands, management methods for sawlog production and felling and regeneration methods are described. The growing stock is large, the rate percent is small: this is the most valuable increment in these stands. The basal area increment reaches a maximum in vigorous standards of about four feet diameter.

Treemarking and felling in the primary cut is carried out under the group selection system in healthy stands; and under the uniform system of clear felling with seed trees in the unhealthy stands. Two categories of fellings are required in both methods: the primary trade cut, or seeding felling for regeneration and protection; and the secondary felling, when the regeneration is well established at about 18 months after burning.

The probability of un-marketable trees today becoming marketable tomorrow is recognised in the application of the sele ction system. Only those which would hinder karri regeneration may be removed as a general rule from the gap centres to within one chain of groups of karri standards or seed trees. The minimum gap for satisfactory development of the karri seedlings is about 0. 4 acres or two chains diameter, and the maximum width up to six chains for seeding may be accepted. Three dominant or co-dominant trees each of nearly one chain crown spread can be expected to produce 160, 000 seeds in a moderate year. This seed supply is adequate for seeding two acres of freshly prepared seedbeds under all systems of silviculture for natural regeneration. The tree percentages for establishment of the seedlings ranges from 0. 6 to 2. 8 percent of the seed shed.

The length of the floral cycle is either three or four years, and seed production also varies. In a good year, the average seed tree produces 250, 000 seed (0. 75 lbs); and about one quarter of this in a moderate year; and no seed on an average of two years in three. Careful sampling of the stages of development, and seed testing are carried out to provide reliable estimates of the seed supply. An

estimate is made from measurements of the factors involved and multiplication of these factors: (i) the numbers of components per twig in the actual samples, (ii) the expected reduction in numbers reaching maturity and following seed shed, Fig. 1 (iii) the basic number of twigs produced annually in karri crowns, and following seed shed also, (iv) the actual crown area, Fig. 2.

In the dense regeneration of karri, the earliest tending now is producing the largest crop trees most rapidly. The response indicated is ten times as great as thinning later in pole stands and indicates the length of rotation may be reduced from 120 years for example to 80 years. Growth rates are most rapid and productive in ashbeds, and unproductive without the ashbed effect in the observed treatments. Response in volume production in $5\frac{1}{2}$ years is two times greater with reduction of competition in the first year of establishment of the karri seedlings; and three times greater with heavy fertiliser amendments at the time of thinning, than without these treatments. The initial advantage as demonstrated by growth on ashbeds is maintained during the life of the managed stand. A clean floor, in gridded strips lasting for many years is created by mist blowing with chemicals for uncrowding in regeneration when the seedlings and competing scrub are at a height of from 6 to 12 inches. This is a very important treatment because access is provided for subsequent thinning and fire protection requirements: without this treatment, access is impossible during the most productive period of growth of the stand.

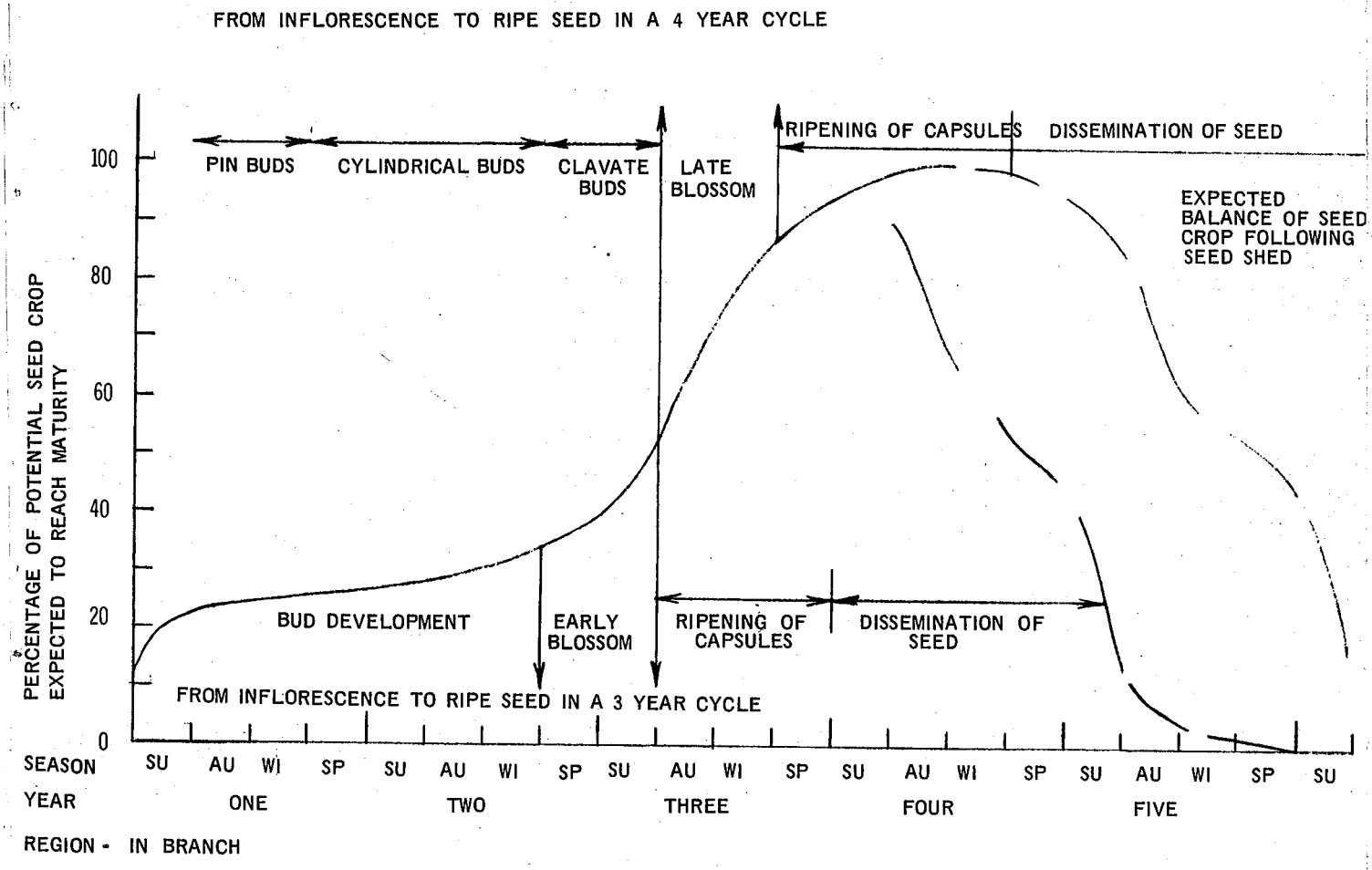
How thinning treatments straddle a balance between with loss, and without loss in volume production for a gain in size is demonstrated by a crown thinning trial in a pole stand. A response of 22 percent greater increment in merchantable volume also is demonstrated 40 years later in a second growth stand thinned at the age of 53 years, than in the un-thinned.

Crown spread measurements of well formed healthy crowns of the largest crop trees indicate a crown ratio of 18 in crown/stem diameters for karri (and of 15 for jarrah). Consequently healthy stands fully occupying the site are gauged to maintain high volume production in the range of 80 to 130 square feet per acre for karri (and of 80 to 110 for jarrah). By transforming basal area into its main components (stem numbers and average girth) prescriptions are shown for intermediate thinnings. Half of the stem numbers in a critically well-stocked stand can be removed without reducing the value of volume production. Other principles applied when thinning any stand are that

the spacing per tree varies inversely as the number of trees; and the spacing per group varies from the spacing per tree, as the square root of the number of trees per group. Thinning of high quality jarrah and karri stands to ideal densities is recommended through the application of these principles: where d = stem diameter in inches,
and D = crown diameter in feet:
the spacing in feet for 1 stem is either 1.75d" or 1.4D';
the spacing in feet for 2 stems is either 2.5d" or 2.0D';
the spacing in feet for 3 stems in either 3.0d" or 2.4D'.

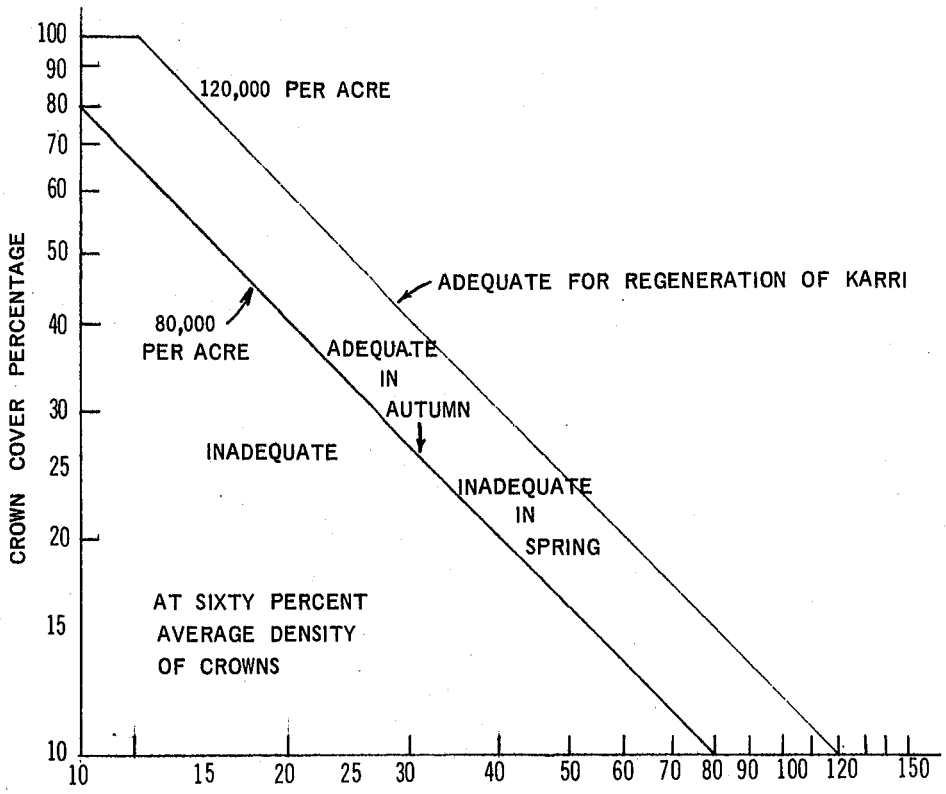
Scientific practice and principles are being followed up and demonstrate how the rotation may be shortened in matters connected with the seed and growth of the seedlings. The control of a desirable system of silviculture, the increased production of saleable wood and protection are made possible through the silvicultural use of fire with the assistance of chemicals. The basic methodology in part is intended to follow Troup, "Silvicultural Systems" (1928).

FIGURE 1



Graph at each stage of floral development through P. Christensen (W.A.F.D. 1968) showing the percentage of the potential seed crop which may be expected to mature.

FIGURE 2



Graph of seed supplies required in regeneration of karri, showing 80,000 seeds per acre in autumn and 120,000 seeds per acre in spring for the percentage of crown cover and seed production measured from samples of the branches of the crowns.