

EUCALYPTS IN CALIFORNIA.

By A. N. PERHAM.

*Presidential address read at the 10th Annual Meeting
of the N.Z. Institute of Foresters, 1937.*

Eucalypts occupy much the same position in the landscape of California as *Pinus radiata* does in New Zealand and to most Californians they are typical of the country-side and not recognised as aliens.

So far as information is available from literature on the subject, seed of *E. globulus* was first introduced about the period 1850 to 1860, and the wonderful results obtained with it led to this species being widely used in the formation of plantations and wind-breaks, and for ornamental purposes.

The early plantings were made in single rows or narrow belts in optimum soil conditions and the remarkable growth-rate eventually formed the basis of wild statements as to the probable returns to be obtained, in the event of the species being used for afforestation on a large scale. These statements, assisted by rumours of rapid exhaustion of hardwood supplies in the East (i.e. Mississippi Valley, etc.) and consequent expectation of sharp rises in prices, about the year 1900 led to the formation of companies for planting eucalypts on a share or acre basis and a boom developed which finally resulted in some forty to fifty thousand acres being planted.

To a New Zealander with a knowledge of the *Pinus radiata* boom in New Zealand the similarity in events leading to the development of both booms is remarkable. In both cases there was the demonstration of remarkable growth-rate under optimum conditions; then the statement of wonderful returns to be obtained from wholesale plantings, backed by the spectre of exhaustion in the one case, of native hardwood supplies and in the other of native softwoods. Probably the most remarkable of all was the credence given by even hard-headed business men, to the rash conclusions based on figures collected from growth under optimum conditions but applied without discount to inferior and often entirely dissimilar conditions.

In California it is probable that much larger areas than the forty to fifty thousand acres mentioned would have been planted but for the fact that early in the boom the U.S. Forest Service, the State Forester and the Forestry Section of the University of California took the initiative, firstly in urging caution in the acceptance of maximum yield figures used for propaganda purposes as being applicable to the large sale proposals, and secondly in hastening to collect data from trees grown under conditions as similar as possible to those which would obtain in plantations; and at the earliest possible moment these organisations issued bulletins based on the more conservative figures so obtained. These bulletins effectively "pricked the bubble."

For some considerable time, the U.S. Forest Service and the Forestry section of the University of California had been carrying on experimental work, and realising the need of comprehensive data and recognising the opportunity in the large plantings which had taken place, the former organisation undertook to make growth studies, and accordingly a comprehensive series of sample plots were established in plantations growing under as diversified conditions as possible. Later, as the national forest areas in California were generally found to be unsuited to the growth of eucalypts and the information collected of little practical value to the Forest Service, the whole of the work was handed over to the Forestry Division of the University, which organisation subsequently carried it on and accumulated a wealth of information on the subject.

It was found that while some seventy or more species were present in the State either as single specimen trees or larger numbers, practically the whole of the plantings were confined to the following four species :—Blue gum (*E. globulus*), grey gum (*E. tereticornis*), red gum (*E. rostrata*) and sugar gum (*E. corynocalyx*). The proportional distribution was roughly, blue gum, 80 per cent. with plantings generally distributed but most intensive in the coast districts ; grey and red gum, 15 per cent., confined to the Sacramento and San Joaquin valleys and the interior valleys of the southern part of the State ; sugar gum, 4 per cent., practically confined to southern California on account of it being frost tender ; other species amounted to one per cent. only.

Blue gum. Among the plantations of this species a total of 78 sample plots were set out and, from the data obtained, the following yield table was developed.

Age Year.	Volume in solid cubic feet, including bark.		
	Site I.	Site II.	Site III.
2	300	100	0
4	1,050	600	250
6	2,150	1,350	750
8	4,400	2,400	1,400
10	6,100	3,400	2,050
12	7,450	4,350	2,550
14	8,550	5,150	2,900
16	9,600	5,900	3,250
18	10,500	6,500	3,500
20	11,450	7,100	3,800

Site I is comprised of good deep-bottom-land with a soil of good agricultural quality and with the water table close to the surface during a great part of the year. Land in this site is generally, except for the odd corners to be found on most farms, too fertile and too valuable for other purposes, to be retained for timber cropping.

Site II is comprised of soils often fertile and suitable for agriculture under irrigation but in natural state generally deficient in moisture or situated where other factors (exposure, etc.), cause the land to be less suitable for growth than in *Site I*. Where irrigation is developed, land in this class also becomes too valuable for timber cropping.

Site III is comprised of land generally too poor, steep, or dry, or too exposed to be valuable for other purposes. It is on this site-class or the non-irrigable lands of *Site II* that plantations of eucalypts will in the future be maintained or developed, except of course the odd corners available on farms. The average mean annual growth per acre, based on the figures collected from sixty-seven plantations averaging $10\frac{1}{2}$ years of age, is 271 cubic feet or 3.02 cords of firewood (90 cub. feet being allowed as the equivalent of one cord). Actually the figures vary between a maximum of 805 cubic feet and a minimum of 29 cubic feet; the latter figure, however, was from a four year old plantation growing on a clay loam slope, probably of poor quality.

Red gum. Next to the blue gum, this species has been most extensively planted. It has proved suitable for situations too cold for blue gum and is also better able to withstand severe drought and alkaline soils. In form, the tree under Californian conditions is almost invariably crooked and on that account alone is unsuited for anything except firewood. Among this species, 28 sample plots in 26 plantations were set out, the average mean annual growth being 105 cubic feet or 1.17 cords per acre. The average age was nine years. Figures vary between a maximum of 252 cubic feet to a minimum of 15 cubic feet, the latter being again young ($3\frac{1}{2}$ years old), and growing on very poor soil.

No yield table was compiled for this species but a study of the figures available generally show less than half the growth rate of blue gum, this holding true even where the species are growing alongside one another on similar soil and under similar conditions.

Grey gum. This species has proved successful in sites too arid and drought-stricken for the establishment of blue and red gums but except for this asset it appears to have nothing to commend it. Figures from 25 sample plots in 20 plantations of the species show a mean annual increment of 86 cubic feet or 0.95 cords per acre at an average age of 8.1 years.

Sugar gum. This species can only be grown in frost-free areas in which situation it has much the same growth rate as red gum, but is of much better form. Twenty-one sample plots were established, the figures from which show an average growth rate of 110 cubic feet or 1.22 cords per acre, the average age being 10 years.

Of the species comprising the other one per cent., only 21 were in sufficient quantity to warrant measuring, but as there is no range of soil site little can be gleaned from the figures. In all but the following, *E. viminalis*, *E. sideroxylon*, *E. leucoxylon*, *E. resinifera*, *E.*

saligna, *E. botryoides*, *E. diversicolor*, and *E. obliqua*, the mean annual growth compares so unfavourably with the four dominant species, that they are probably not worth further consideration.

Utilization. The principal use to which eucalypts have been put in California is in the production of firewood, and for this purpose they have proved superior to all native species, except live oak.

Plantations destined for firewood are usually cut at about 10 to 12 years, at which age as much of the produce as possible is placed on the market in the round. More mature trees entail a great deal more labour in sawing and splitting and are not so eagerly sought after. Coppice growth is frequently cut at 7 years. Stumpages for firewood (on the basis of one cent. being equal to one halfpenny) range from 6/3 to 16/8 per cord according to situation and market conditions. Delivered to consumers in the towns, and cities, the wood brings from £3/12/0 to £4/16/0 per cord.

These values indicate that some nice sustained yield firewood cutting propositions might be possible, especially as blue gum coppices so freely.

A certain amount of the wood has been converted to sawn timber, but the excessive warping, checking and falling-down which has occurred has been most disappointing. Most of the trees cut, however, have been between the age of 10 and 15 years and while the logs are large enough the timber is perhaps too young for conversion.

Blue gum trees of approximately 35 years of age, mostly open growth specimens, cut in the San José district gave much better results, but the timber was not by any means free from these defects. The improvement found here may have been due to age, but it is interesting to note that the history of the trees leads to the belief that the seed from which they were grown was probably collected on the mainland whereas others have definitely been grown from Tasmanian seed. H. D. Tiemann, during the course of kiln-drying experiments, conducted by him at Berkeley, stated that the wood of these trees was definitely superior to that of other Californian-grown wood of the same species. He also, later, during a visit to the Antipodes noted that the smaller capsules and more scaly bark of the San José trees conformed more to the mainland than to the Tasmanian type.

Some of the wood has been very successfully converted to charcoal, but its value for firewood practically precludes its use for this purpose. Oil has also been distilled from the leaves but it has seemingly been difficult to bring the product up to U.S.P. requirements.

And so one of the big "bubbles" in Commercial Forestry has, in the main, resolved itself into a firewood producing proposition, but while the grandiose schemes of promoter and investor alike have not eventuated, the solid comfort of many Californians has been attended to.

Literature Cited.

- (1) Ingram, N. D., (1908), Eucalyptus in California. *Californian Agricultural Station*. Bull. No. 196.
- (2) Margolin, L. (1910). Yield from Eucalyptus Plantations in California. *California State Board of Forestry*. Bull. No. 1.
- (3) McClatchie, A. J. (1902). Eucalypts cultivated in the United States. *U.S. Dept. Agric. Bureau of Forestry*. Bull. No. 35.
- (4) Metcalf, W. (1924). Growth of Eucalyptus in Californian plantations. *Agricultural Experiment Station, Berkeley, California*. Bull. No. 380.
- (5) Woodbury, T. D. (1912). Yield and Return of Blue Gum in California. *U.S. Dept. Agriculture. Forest Service Circular* No. 210.

Insects from India.

With both the importation of foreign timbers and of goods shipped in wooden cases or containers, it is inevitable that foreign timber-infesting insects will reach New Zealand from time to time. It is our extreme good fortune that not more of these have become established in this country.

A noteworthy incident occurred late in 1936 when a wholesale firm in Wellington received a consignment of rubber shoes from Calcutta. The shoes were packed in large crates and it was noticed soon after their arrival, that insects were emerging from the timber. The crates were made of a variety of timbers both hardwoods and softwoods and from two of the crates the following species of beetles were obtained : *Dinoderus minutus* F ; *Heterobostrychus aequalis* Waterh. ; *Sinoxylon ceratoniae* L. ; *Minthea rugicollis* Wlk ; and *Tillus notatus* Klug.

The first three species are Auger beetles common in India and with a wide host range ; the fourth is a small powder post beetle found of course in hardwoods ; and the last is a Clerid probably predacious upon one or more of the Auger beetles. All except *T. notatus* were alive and as the cases were being unpacked in the bright sunlight upon the flat roof of a high building, they were very active. *S. ceratoniae* was the commonest species, a large number of specimens being collected.

The incident is remarkable for the comparatively large number of species involved and for the large numbers in which they were found. The packing cases were destroyed as soon as possible after the removal of their contents.

A. F. CLARK.