

Industrial Planting of *E. viminalis* in Mendocino County¹

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The Masonite Corporation started up its forestry operations in Mendocino County in 1948 with the acquisition of approximately 21,044 hectares (52,000 acres) of mixed Douglas-fir (*Pseudotsuga menziessii* [sic] (Mirb.) Franco) and redwood (*Sequoia sempervirens* (D. Don) Endl.) timber including oak-grass woodland. Their only manufacturing facility was a hardboard plant at Ukiah although beginning in 1969 they did acquire several lumber mills in northern California.

In 1956, Masonite forester Jack Sweeley became interested in testing and evaluating several species of Eucalyptus as potential sources of fiber for the hardboard plant. A total of 32 plots involving a variety of species were planted throughout the County in an attempt to observe growth performance over a range of environmental conditions.

Sweeley established some basic selection criteria to help narrow down the vast array of species. These characteristics were as follows: (1) fast-growing (2) ability to coppice (3) frost-resistant (4) easy to plant as bare root seedlings and (5) compatibility with the hardboard plant's processing requirements.

The latter criterion was provided by Masonite's wood technologists in Australia who rejected certain species such as Karri (*E. diversicolor* F. Muell.) because of the undesirable red color of the wood and Messmate stringybark (*E. obliqua* L'Herit.) because of fiber instability.

In the next four years (1957-61) Masonite expanded its small plot testing program to a few larger plantings. Seedlings were raised under contract to the Parlin Fork Nursery operated by the Department, of Forestry. It

Abstract: The authors trace the development of a Eucalyptus reforestation program on private industrial forest land from early testing to production planting. Data is presented on a 14.2 hectare manna gum plantation which has produced an estimated yield of 481 cubic meters/hectare after 20 years. Because manna gum has about 60 percent greater density than Douglas-fir or redwood, total dry weight yield from such stands may be about 3 times the equivalent of the two native species.

should be pointed out that Masonite was also interested in spot seeding as a regeneration method. They borrowed an idea from Australia using pelletized seed where fertilizer and peat was added to the seed and then cubed. However, their preliminary trials indicated the procedure was not effective.

Early problems with deer browsing the first growing season were resolved with deer-proof exclosures. The foresters also found that site preparation procedures such as brush raking and burning helped to improve survival and growth performance.

It was during this period that Masonite's interest in Eucalyptus attracted scientists from all parts of the world who came to see how the various species were doing in north coastal California. Each scientist contributed views as to which species might do best under Mendocino's growing conditions.

By 1962, Sweeley had come to the conclusion that two species, manna gum (*E. viminalis* Labill.) and mountain gum (*E. dalrympleana* Maid.) had passed all the preliminary screening and therefore deserved special recognition for production planting. In February 1963, a 14.2 hectare (35 acre) planting was established in the Albion River drainage at a location romantically called Slaughter House Gulch. It was on an east-facing site with slopes ranging from 30 to 70 percent. Elevation averaged 122 meters (400 feet) with an average minimum January temperature of 4.4° C (40° F) with extremes to -6.7° C (20° F). It had been clearcut of redwood, Douglas-fir and grand fir (*Abies grandis* (Dougl. ex D. Don) Lindl.) and then prepared for burning. The burning was not completed successfully because of changing climatic conditions. Mean annual rainfall is 114 cm (45 inches). About half the area was fenced to reduce deer browsing pressure. A total of 14,000 *E. viminalis* and 5000 Monterey pine (*Pinus radiata* D. Don) were planted on an approximate 2.4 x 2.4 meter (8 x 8 foot) spacing.

A total of 10 plots were established to check survival and growth. After 3 years the plots averaged 78 percent survival and the average

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height of the seedlings was 95 cm (38 inches). There were no significant differences between the 5 plots in the enclosure and the 5 outside the fenced area.

In 1968, the senior author and Masonite forester Ralph Duddles returned to the Albion site and measured several trees as part of a preliminary yield study of manna gum existing on the Company's various plantations.

At Slaughter House Gulch, the trees averaged 7 meters (23 feet) in total height, and 3 meters (10 feet) to a 5 cm. (2 inch) top. Average diameter at a .46 meter (1.5 foot) stump was 6.8 cm (2.7 inches). These last two measurements were incorporated into a volume equation known as Smalian's formula where $V = A_1 + A_2/2 \times (L)$. The geometric figure is a truncated paraboloid and most nearly represents a log that has one end larger than the other and uniform taper.

Assumptions were made that annual radial growth would continue over the next 15 years as it had over the previous 5 years. However the same could not be said for height growth. The literature indicated that a flattening of the height/diameter curve occurs before age 20. By adjusting height growth, we estimated that heights would range from 22 to 31.7 meters (72 to 104 feet) at age 20 with an average of 27.1 meters (89 feet).

The last ingredient in this yield study was to project the number of trees/hectare. Our estimate called for 520 trees/hectare (210 trees/acre) and thus our yield prediction to age 20 was estimated to be 378 cubic meters/hectare (5408 cubic feet/acre) for the plantation.³

Fifteen years elapsed with only an occasional visit to the site. About two months ago, a mixed contingent of "Eucalyptus enthusiasts" decided to spend some time remeasuring the trees to get an accurate estimate of current volumes/acre. Trees were measured at d.b.h. (diameter-at-breast-height) and total height. A newer volume equation (King and Krugman 1980) was applied to the stand data and with the aid of a computer program, we found that the average stand volume equalled [sic] 481 cubic meters/hectare (6870 cubic feet/acre).

Instead of the 520 trees/hectare stocking, our data indicated we had a range from 667 to 865 trees/hectare (270 to 350 trees/acre). If we were permitted to adjust the original estimate

upward to 660 trees/hectare our projected volume yield using the crude Smalian formula would produce a perfect match!

However it should be noted that only a small number of trees were selected and measured in 1968 and although we used a much greater number in 1983, great statistical variability in the data were found.

Nevertheless, a current volume of 481 cubic meters/hectare for 20 years is quite respectable growth for an area that has had no supplemental irrigation and considerable competition from brushy species such as blueblossom (Ceanothus thyrsiflorus Eschsch.). The site is listed as a Site III, Hugo soil series with an average depth of 1.5 meters (5 feet).

It is important to note that E. viminalis is approximately 60 percent heavier than the average of redwood and Douglas-fir; this is of great importance to the perspective of a hardboard plant that buys its raw material on a bone dry weight per unit volume basis. This means that the equivalent dry weight yield of manna gum, measured in tonnes/hectare, is about 3 times that of our native fast-growing redwood in a short rotation of 20 years.

By 1969, Masonite's wood technologists discovered that Eucalyptus' unique fiber properties could be emulated by the native conifers and thus the technical demand for Eucalyptus came to a rapid close.

At the conclusion of the Corporation's Eucalyptus reforestation program in the winter of 1968-69, a total of 104 hectares (256 acres) of manna gum and mountain gum had been planted, thus ending a period of 13 years of intense forestry interest in a most promising species.

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³Data on file, Timber Realization Co., Calpella, California.