

THE LANDSCAPE EUCALYPTUS TREE: AN EVALUATION STUDY 1971-1978

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Since the early 1860's, hundreds of different species of *Eucalyptus* have been introduced into California. There are some 600 species of *Eucalyptus* which have a very wide range of climate, soil, and water requirements. Some of the species have been well studied in different areas of California, while others are found only as single trees. Evaluating the potential of any tree species for its suitability to various landscape environments requires several years. Too often observations are quite limited as to number of individual plants within the species and number of species within the genus. Fortunately, in the early 70's a large number of *Eucalyptus* were planted at the University Field Station in San Jose, making it possible to evaluate, over time, a large number of *Eucalyptus* species.

Ninety-two *Eucalyptus* species were planted for observation at the University of California Deciduous Fruit Station at San Jose, California. The principal plantings were made in April and October 1971 and July 1973. Planting stock for these plantings were propagated from seed at the Department of Environmental Horticulture under the leadership of Dr. Andrew Leiser. The seed source for these trees came from collections made in native forests in Australia.

The planting site at the field station has a typical Campbell silty clay soil type suitable for orchard crops. The surface soil is non-calcareous while the subsoil contains sufficient lime to cause chlorosis. Several species in this planting in our studies at the field station became chlorotic and died and it was our opinion that the lime-induced chlorosis was the primary factor. *Eucalyptus* trees found subject to this problem were *E. microcarpa*, *E. lindleyana*, *E. campanulata*, *E. obliqua*, *E. dives*, *E. sieberi*, *E. goniantha*, *E. gonglyocarpa*, *E. salubris*, *E. liquestrina*, *E. dicheomophlora*, *E.*

brockwayi, *E. euginioides*, *E. squamesa*, and *E. notabilis*.

Most *Eucalyptus* species are native to Australian soils with a pH below 7; some will tolerate soils as acid as 4.5. Few are found to grow well at pH's above 7.

All the seedling-grown trees were planted from 1- or 3-gallon containers. Prior to hand planting on beds, the site was ripped, disced, and furrowed. Irrigation was weekly through the first summer of establishment. Through 1975 a regular deep irrigation program was carried out from May through September. The planting was not irrigated during the years of 1976 and 1977 in which we experienced Northern California's severest



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drought in 100 years. As the parent soil of the site is considered a relatively deep and fertile soil, no fertilizer was applied. After planting, no staking or pruning was attempted.

Of the two plantings at the station made in 1971, the April planting quickly became established and plants grew rapidly. The October planting was checked by fall and winter weather, was tip-burned by frosts, and recovered slowly the following spring. Other observations of mid-summer *Eucalyptus* plantings have indicated quick establishment without excessive foliage growth the first year.

All *Eucalyptus* on the station site were measured annually for height and notes were taken on type of growth. Some species produced a multi-trunk, while others generally formed a central trunk. Once the trees reached about 3 years in the planting, litter drop became significant; evaluations followed (see Table 1). Observational notes were also taken on flowering and branch angle attachment. The latter is important since many species of *Eucalyptus* have weak or brittle limb structure and this can become a safety factor in the landscape.

During the winter of 1972, coastal central California experienced a hard freeze. Temperatures went as low as 23°F for one hour on two nights, and remained below 28°F for 12 hours at the Station. We also had a two-year

drought during the period these trees were closely evaluated; the effects could not be separated, however. In 1976 annual rainfall was 9 inches, in 1977 11 inches — compared to an annual average of 15 inches. These extremes in climate afforded an opportunity to observe the trees under a wider climate variation than would generally be experienced in a normal seven-year span.

Litter production on the ground was observed but not measured. It was composed of flower caps, flowers, fruit, twigs, and leaves. The average litter accumulations by months (1974-1977) is listed and rated; 0-no litter, 10-much litter.

To facilitate gathering this information, the entire site was raked clean two to three times a year. Differences between species in litter color, leaf size, leaf shape, bark and twig configurations, and fruiting differences made monthly observations meaningful. In the juvenile tree state, litter production was practically non-existent. Its impact was severe when all the luxuriant lower growth abscised, usually at the onset of flowering about the fourth year in the field. From then on, litter production appeared to be an annual occurrence.

Litter accumulation during the summer months was thought to be more objectionable than litter drop in the winter months; it was more visible, trashy, and a fire hazard. The large or long leaf

Botanical Name	Common Name	Litter Accumulation											
		Months											
		J	F	M	A	M	J	J	A	S	O	N	D
<i>E. accendens</i>	Powder-bark wandoo	3	-	4	4	2	4	4	5	2	1	3	-
<i>E. albens</i>	White box	-	-	-	3	2	2	2	2	1	1	1	-
<i>E. archeri</i>	Alpine cider gum	3	-	2	-	4	5	6	3	4	4	3	-
<i>E. blakelyi</i>	Blakely's red gum	3	-	3	3	4	4	4	4	3	4	5	-
<i>E. bosistoana</i>	Coast grey box	3	-	4	5	6	4	6	6	4	6	6	-
<i>E. burdettiana</i>		1	-	2	5	8	6	5	5	4	4	1	-
<i>E. grandis</i>	Rose gum	6	-	8	7	6	6	6	8	9	4	5	-
<i>E. gunnii</i>	Cider gum	1	-	1	5	3	3	2	2	3	1	2	-
<i>E. intertexta</i>	Gum-barked coolibah	3	-	4	6	5	6	4	3	3	4	1	-
<i>E. microtheca</i>	Coolibah	3	-	3	9	7	8	8	9	9	6	6	-
<i>E. perriniana</i>	Spinning gum	3	-	4	3	4	4	3	5	4	1	3	-
<i>E. populnea</i>	Bimble box	2	-	3	6	7	6	4	4	2	2	2	-
<i>E. scoparia</i>	Wallangarra white gum	3	-	3	4	7	5	5	5	5	4	4	-

shape may also be a factor since such leaves do not easily "melt" into the surrounding vegetation or blow away.

The thirteen *Eucalyptus* species discussed below are considered the most promising of those tested at the San Jose station by the author and by industry evaluators in the second and fourth years. Growth habits, adaptation to the site, and possible usefulness were considered.

Eucalyptus accendens Fitzg. (Powder Bark Wandoo) was outstanding for its uniformity and naturally-straight single trunk. The blue-green lance-shaped leaves grew on comparatively short horizontal lateral branches having low potential for limp drop. Inconspicuous flowers appeared from May to August starting in the fourth year. Some trees had chlorotic foliage the first three years. Almost no self-pruning and only light leaf drop occurred through the fourth year, but moderate leaf and fruit litter was observed May through August after the fifth year. Mature bark was smooth, white and powdery to the touch. Cold sensitivity and recovery from the December 1972 freeze was variable. None was top-killed in the San Jose planting. At Davis, 26-month-old plants were killed by minimum temperatures of 21°F in the same week-long freeze. Growth averaged seven feet high at the end of the second year; 27 feet in the fifth year at the station.

In Australia, *Eucalyptus accendens* grows in hilly ground on well-weathered, leached, well drained soils of low fertility. It can grow to 60 feet; 30-60 is more common. It is used as a shade tree where minimum rainfall is 15 inches or more.

This species appears to have good potential as a street tree and for high people-use areas. It should be quite safe from large limb fall, but twig dieback can be expected following long periods of water stress.

Eucalyptus albens Benth. (White Box) had a striking appearance during the first four years at the station; large, round, gray-green juvenile leaves in a fairly dense crown. Almost no self-pruning occurred during the first three years, but self-pruned heavily to 50 per cent its height in the fourth and fifth year. Mature (non-distinctive) foliage emerged in the fifth year. The species had smooth, tan bark and a clean appearance with a

silver crown. Young red-colored stems became white with age. Flowers, not showy, appeared during summer and fall. Lateral limbs tended to be nearly the same diameter as the trunk and were closely spaced, a potential for limb break-out problems. Moderate leaf, twig, and fruit litter was produced. It did not appear affected by the December 1972 freeze, but did become infected with *Armillaria mellea* (oak root fungus) from a nearby walnut planting. This species grew to ten feet in the fifth year on the station. It grew 17 feet in three years in an irrigated planting on deep soil in Walnut Creek.

In Australia it occurs on rich and well-drained soils of both igneous and sedimentary origin. It often grows to 80 feet with branching only in the upper half.

Eucalyptus albens should be a useful highway tree in many areas of California, especially in the agricultural districts of the central valley. The tree retains its reflective nature, a safety feature.

Eucalyptus archeri Maiden. & Blakely (Alpine Cider Gum), planted in 1973 at the San Jose station, was impressive from the beginning. Its blue-green sessile-leaved and upright spreading habit suggested a small *E. gunnii* (cider gum). Adult foliage emerged in the fourth year and at the same time it began producing moderate litter. The small leaves, however, "melt" easily into surrounding vegetation. Inconspicuous flowers appeared in the fourth year. The species grew to 18 feet in 3.5 years; 22 feet in 4.5 years. It had broad arching limbs by the end of the fifth season. It did not develop a heavy or hazardous limb structure. The mature bark is flaky.

In its native home, Tasmania, the alpine cider gum is a small, high mountain tree 15 to 30 feet high. The crooked trunk supports a crown nearly as wide as it is high. It grows where drainage is often poor with an annual rainfall of 60 to 90 inches with almost daily precipitation. Temperatures are among the lowest experienced by any eucalyptus. The mean minimum of the coldest month is 25-29°F and there are 150 frosts a year with no month frost-free. Heavy snowfalls occur.

It may have use in the florist trade if its juvenile growth can be maintained. Other locations of use may include areas of turf, high rainfall, and the

2500- to 4000-foot elevations of central California.

Eucalyptus blakelyi Maiden. (Blakely's Red Gum) was a uniform lot at the San Jose station; tall, straight, a single trunk with clean blue-green foliage. It had some narrow branch-angle attachments, which suggested a possible safety hazard in people-use areas. However, most lateral branches were of small diameter in relation to the trunk, a good feature for strength. This species flowered in the fourth year, at which time it heavily self-pruned. Flowering was conspicuous, but not showy, from April to August. The bark of this species was shed in irregular patches which varied in color from near white to dark gray and was not considered a fire, safety, or litter hazard. Litter production was moderate all year with slightly heavier amounts from June to August. No symptoms of cold injury were observed after the December 1972 freeze. Blakely's red gum grew to seven feet by the end of the second season after planting; to 42 feet in five years at the San Jose station. At Walnut Creek, on deep irrigated clay soil, it grew to 26 feet in three years as a uniform single-trunk tree. At the Max Watson planting in San Jose, the species grew to 28 feet in five years and was well regarded.

In Australia, Blakely's red gum grows in open woodlands of the warm interior in areas of 18- to 30-inch rainfall with the lowest recorded winter temperature of 14°F. It is noted for attractive bark colorings and a spreading crown of light green foliage. It is reported to be an excellent tree in the landscape of Canberra. It grows there to 80 feet.

Eucalyptus blakelyi should have wide use in California as a highway, golf course, or street tree; cismontane California.

Eucalyptus bosistoana F.J. Muell. (Coast Grey Box) exhibited much character as a container nursery plant and as a young tree in the landscape. The long, slender leaf petioles attached to the ovate leaves presented the appearance of quaking aspen. The species presented no training problems except for the removal of competing leaders. Adult leaves were a clear and attractive green. Flowering began in the fourth year, with inconspicuous flowers present from spring through early fall. The fruit persisted throughout the year.

It produced moderate to heavy leaf and twig litter in October-November, light litter the rest of the year. The bark is tight and not considered a fire hazard. The 1972 freeze produced severe leaf injury and major bark splitting to 14 month-old seedlings at San Jose, although no trees died. Recovery was excellent, however, and few dead twigs and leaves were visible seven months later; the single comment at that time was handsome. Rapid growth produced a forest-type tree 40 feet tall in five years.

In Australia, *Eucalyptus bosistoana* grows to about 120 feet along the coast, north and south of Sydney; a climate similar to coastal California. It is found on a wide range of soil types in humid regions from periodically-waterlogged clays to better-drained clay loams of higher ground; it is very dwarfed on the wetter sites. This species also occurs on limestone formations and on fertile loamy soils at elevations up to 1000 feet in Australia. Soils at the San Jose station also have a calcareous base, which may help explain its success there. The wood of coast grey box has commercial construction use. It is hard, strong, durable, and retains its yellow color longer than its close relative *E. molluccana*, coast box.

In California, *Eucalyptus bosistoana* should have merit along the coast skylines. To minimize the formation of possibly dangerous large and heavy lateral branches, plant it in groves.

Eucalyptus burdettiana Blakely & Steedm. excludes character. During the evaluation period it was a small (15 foot) single-stem, low-branching, bushy tree with an overall boxy shape. The round ovate leaves were an attractive blue-green color which turned orange-red at senescence. The light-scaled limbs and twigs were somewhat twisted and had an architectural quality. Its mature bark was flaky, not messy or hazardous. It appeared to be a surface rooter and leaned strongly in the direction of maximum sunlight. Large clusters of yellow, showy but scattered flowers and uniquely-shaped fruit developed in the fifth year. Leaf and twig litter production was comparatively low and occurred mostly in late spring and summer. Sensitive to cold weather, trees at a Fremont, California, planting died after the December 1972 freeze. Others at the San Jose

station recovered poorly from severe injury. However, it survived well at the Walnut Creek location with only minor tip burn. In five years this species had grown to a height of 21 feet with a 12 foot spread.

Eucalyptus burdettiana appears to be native to Ongerup, West Australia, but references to it are scarce. Its value appears to be only ornamental, which may account for a lack of interest. No common name was found.

This species should be suited to sunny mild climate locations where it can command a space equal to the drip line, about 12 feet diameter. It should be useful for purposes of screening, accent, or hedge. On close view it invites comment.

Eucalyptus grandis W. Hill ex Maiden. (Rose Gum) was outstanding for the attractive and rapid growth of its single trunk. There was little self pruning during the first three years of foliage extending to the ground. Extensive self pruning occurred the third fall after planting, with much twig and leaf litter and some large-limb breakout. Self pruning was heavy each summer thereafter. Coiled bark fragments extended many feet up the trunk, creating a possible fire hazard. Whorled branch arrangements and wide branch attachments appeared to allow easy selection of strong permanent branches. Quite inconspicuous flowering was noted in early spring beginning in the fourth season. December 1972 freeze injury to this species, 20 months after planting, was unexpectedly slight since it comes from a subtropical area. Adverse effects were hardly noticeable. At the San Jose station this species grew to 25 feet by the end of the second season, 50 feet (the tallest of tested species) by the end of the fifth year. It grew 27 feet in the first three years at the Watson planting in San Jose.

In Australia, *Eucalyptus grandis* grows in coastal climates along the sides of moist, fertile, east coast valleys. There, mature trees grow to 180 feet and six feet in diameter. Vertical growth of 10 feet per year has been recorded. Essentially it is a tree of temperate climates with only light frosts.

Eucalyptus grandis may have use where a fast-growing, tall, upright windbreak is desired. It may have value as a forest or woodland tree, or it may have commercial value. Its heavy litter production

and potential hazard from fire may limit its desirability.

Eucalyptus gunnii Hook. (Cider Gum) was outstanding at the San Jose station because of its upright, fairly narrow and clean appearance. Its foliage is similar to *E. archeri* and *E. pulverulenta*. The silvery juvenile foliage on cinnamon-red stems remained through the seventh year in the lower portions of the tree. Juvenile growth persisted in the top into the sixth year before initiating mature growth. Primary branches were strongly narrow-upright the first four years with few secondary scaffolds. Tertiary foliage was short and spreading. The eight trees planted were uniform in height, color, form, and performance. In the sixth and seventh years it tended to spread, thus becoming somewhat less narrow than expected. Flowers and fruit were quite inconspicuous, but a moderate fruit drop occurred in the spring. Leaf and twig litter production remained low throughout the trial. They had grown to 13 feet by the end of the second season at the San Jose station and to 45 feet in five years. In Walnut Creek it grew to 12 feet in three seasons and was surviving well in a saline soil on a cool and windy site next to San Francisco Bay in Mt. View; 10 feet in three years. At Pleasanton, on a clay soil in a winter-cold location, it grew to eight feet in three years with an excellent appearance. Trees at the Watson Arboretum in San Jose grew to 31 feet in five years and survival of the December 1972 freeze was satisfactory as no cold-injury symptoms were observed. It suffered only slight cold damage at the U.C. Davis planting.

Eucalyptus gunnii is native to Tasmania, Australia. It is usually not tall, but sometimes grows to 250 feet. Trees normally grow straight with uniform branching. The adult foliage is dense and dark. The mature bark is in small flakes, not hazardous, and lends character. In Australia the species grows well near the coast. It is very hardy, sometimes growing to 4000- to 5000-foot elevations in areas where winter temperatures fall to 20°F each night. It is known to survive in Iceland, Scotland, the Oregon coast, and in Seattle.

The wide adaptability, relatively clean habit, and generally upright form should serve to establish

the cider gum as a useful and widely-planted tree in many areas of the west.

Eucalyptus intertexta R.T. Baker (Gum-barked Coolibah) seedling growth was variable but had an interesting, narrowly upright multiple stem with weeping terminal growth that swept the ground. It was similar in texture, size, shape, and weeping habit of *Maytenus boaria* (Chilean mayten). Some trees lacked the weeping form in the beginning but developed it in the sixth and seventh year. Height growth was 3 feet by the end of the second year, 21 feet in the fifth, followed by a leveling off.

Eucalyptus intertexta is native to the arid interior of Australia between latitudes 20-30° south. It usually grows to 40-60 feet, occasionally to 80 feet. It grows on low-lying plains, sometimes where there is seasonal surface water. It is known to grow close to salt pans and is considered salt-tolerant. Also, it is notably drought- and frost-tolerant and is used for shade and street planting.

In California, *Eucalyptus intertexta* should be useful as a patio, accent, or silhouette tree against a wall. It should be well-adapted to difficult sites requiring little additional irrigation. Up until the eighth year, there were no indications it would grow to over 40 feet.

Eucalyptus microtheca F.J. Muell. (Coolibah) developed into a relatively low-spreading, thick, multi-stemmed tree with large lower limbs and strong branch angle attachments. Coolibah was inviting to tree climbers. In size and appearance, the eight plants in the group were uniform, clean, and attractive. The blue-green leaf color had a positive aesthetic quality contrasted with the smooth, persistent, light-colored bark. A heavy leaf fall of mature, cream-colored leaves occurred in August, completely covering the ground. Showy flowers began in February after the third season, but the main flowering period was April through August. Leaf and twig litter was moderate after the third year. The fruit was small and unimportant. In four years, coolibah grew to a spreading 14 feet in height and about as broad.

In Australia, *Eucalyptus microtheca* grows near seasonal waterways in the dry and hot areas of the country. It withstands periodic inundations. Eventually coolibah makes a moderate sized

character tree with an irregular gnarled shape.

It may be a good tree for school yards and individual home yards.

Eucalyptus perriniana F.J. Muell. ex. Ridw. (Round-leaved Snow Gum or Spinning Gum) was one of the most noticed species in the San Jose trial. The large circular, sessile, juvenile foliage on the wildly-spreading young trees was similar to that of a greatly-enlarged *E. pulverulenta*, the commonly-used florist type; the silvery blue-green leaf color of the juvenile foliage was striking. A high percentage of these stems were unbranched and two to three feet long suggesting possible use by the florist trade. The adult foliage of narrow, glaucous and generally non-distinctive leaves emerged in the fourth year. As for habit of growth, the eight plants were uniform. The multiple-trunk plants were six feet high by the end of the second season, growing to 43 feet in five years at San Jose. Inconspicuous flowers appeared in May and June in the fourth year. Fruit drop was unnoticeable and the accumulation of leaf and twig litter was by far the lowest of the species observed in the San Jose trial. The bark was smooth, but became blotched and scaly near the ground, certainly not a drawback to the appearance or safety of the tree. No symptoms of injury from the 1972 freeze were observed.

In Australia, *Eucalyptus perriniana* grows to less than 25 feet tall in an irregular form. In New South Wales (south eastern Australia) it grows in the mountains at 4000 and 6000 feet, while in Tasmania it is found in wet hollows on poor soils at altitudes of 1000 to 2000 feet.

Spinning gum needs a 20- to 30-foot space to grow, although adult growth is more upright than juvenile growth. It should have merit as a light reflector on highways, as a specimen tree, and for the cut foliage trade. Spinning gum should be useful at high elevations.

Eucalyptus populnea F.J. Muell. (Bimble Box) was stimulating as a small, rangy, colorful, multi-stem type (mallee) in the seven years of observation at the San Jose station. The widely-spaced leaves were bright green on both sides, quite large and oval, and possessing a long petiole, suggesting a quaking aspen crossed with green-leaf manzanita. The mahogany-colored twigs of the

new growth aged into smooth cream-colored stems with patches of maturing reddish bark; a very acceptable appearance. Branch attachments were noted to be strong. It flowered in February of the fourth year; however, buds, flowers, and fruit were observed nearly every month. Heaviest flowering occurs in August. Leaf, twig, and fruit litter, while not heavy, mainly fell in late spring. Leaf litter rated moderate, fruit litter rating slightly higher, twig litter rated low. Light injury to leaves and small twigs was recorded as a result of the December 1972 freeze, but recovery was rapid. In the fifth year the half-shaded six foot plants began to stretch. By the seventh year the plants were 11 feet tall, attractively rangy and light-scaled.

Eucalyptus populnea is native to inland areas west of Brisbane, Australia. It grows mainly on clay soils which tend to become water-logged in the wet season. Apparently slow to develop to its potential, it eventually grows to 80 feet with a very large crown. It retains its quaking aspen-like leaf character and is a good shade tree. It makes good fuel and the stumps sprout freely. A 1902 reference notes *E. populnea* (*E. populifolia*) to closely resemble *E. polyanthemus* (silver dollar eucalyptus).

Eucalyptus populnea may fit well where an attractive multi-stem tree is needed, especially in hot areas and on clay soils of questionable drainage.

Eucalyptus scoparia Maiden. (Wallangarra White Gum) was an impressive, large, open tree with clean yellowish tight bark (never messy) at the San Jose station. Its well-spaced scaffold branches were upright rather than spreading. Terminal foliage was gracefully pendulous, moving easily in air currents. The species was uniform in habit of growth. It bloomed in the fourth year and at the same time it heavily self-pruned its twig growth. Leaf litter was moderate and occurred mainly from February to October. Twig and fruit litter was minimal after the fourth season. Damage from the December 1972 freeze was barely detectable. The species appeared to be sensitive to soil salts; by the end of the season each leaf

was burned one third to one half of its length. After white gum became established, it averaged 10 feet of growth a year for three years. The average height at the end of the fifth season was 40 feet at the field station.

In Australia, this slender 30-40 foot tree inhabits granite hills between the cities of Sydney and Brisbane. It is similar to *Eucalyptus viminalis* (manna gum).

Eucalyptus scoparia appears to grow quickly to its potential height and should have merit on soils low in salts where a large open tree is desired. While similar to manna gum, this species has its own distinct character.

Summary

In all, 92 *Eucalyptus* species were observed, mostly at the San Jose station. The general purpose was to find "winners"; species that indicated some general usefulness to merit further trial under specific conditions.

A large number of species were discarded early because of chlorotic dieback and seedling death. Several species were discarded because they failed to survive the December 1972 freeze. Others simply did not exhibit characteristics different or superior to species already in the trade. Those herein reported at the San Jose station were designated most promising by University of California Cooperative Extension and industry evaluators. A future report on these and other species under test by University of California Cooperative Extension advisors throughout California will reveal *Eucalyptus* species that may be acceptable under usual and unusual conditions.

A five- to seven-year period of evaluation was determined to be sufficient time to assess most of the worth of a new *Eucalyptus* species. This has been accomplished and the San Jose station planting was destroyed.

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