

THE EUCALYPTUS OF CALIFORNIA

SEEDS OF GOOD OR SEEDS OF EVIL?

by Robert L. Santos
California State University, Stanislaus
Librarian/Archivist
bsantos@toto.csustan.edu

Alley-Cass Publications
Denair, California
Copyright 1997

TABLE OF CONTENTS

[Section One / The Early Years](#)

[From Down Under](#)
[Just Call It "eucalyptus"](#)
[Eucalyptus Discovered](#)
[Noted Writers and Authorities](#)
["California Here I Come!"](#)
[Who Was Really First?](#)
[Interest Continues](#)
[To the End of the Century](#)
[From Rags to Riches Maybe?](#)
[The Doldrums](#)
[Renewed Interest](#)

[Section Two / Physical Properties and Uses](#)

[Physical Properties](#)
[Identification](#)
[Climate](#)
[Drought](#)
[Frost](#)
[Soils](#)

[Seeds](#)
[Young Plants](#)
[Strength](#)
[Foliage](#)
[Flowers](#)
[Bark, Trunk, and Roots](#)
[Cropping Back](#)
[The Multiplicity of Uses](#)
[As Forest Cover](#)
[For Firewood and Biomass Fuel](#)
[As Windbreaks](#)
[As Timber](#)
[As Posts, Pilings, Poles, and Railroad Ties](#)
[Uses As Hardwood](#)
[It Should Be Well-Seasoned](#)
[For Pulp, Paper, and Fibreboard](#)
[As a Boiler Cleaner](#)
[A Source of Honey](#)
[A Source of Food](#)
[As Medicine](#)
[Fighting Malaria](#)
[For Landscaping and Roadways](#)

[Section Three / Problems, Care, Economics and Species](#)

[A Fire Hazard?](#)
[Beetle Problem](#)
[Love or Hate and the Ecological Question](#)
[Planting and Care](#)
[Individual Trees, Groves, and Plantations](#)
[Economics](#)
[So Many Eucalyptus Species](#)
[Finis](#)

[Notes](#)

[Bibliography](#)



[Back to Home Page](#)

The Eucalyptus of California

Section One: The Early Years

by **Robert L. Santos**
California State University, Stanislaus
Librarian/Archivist
bsantos@toto.csustan.edu

Alley-Cass Publications
Denair, California
Copyright 1997

FROM DOWN UNDER IT CAME

While traveling along the roads and highways of California, especially along its coast and inland valleys, one will see the usual oak, pine, and scrubbrush. Yet there is another member of the plant family whose presence is dominating and charismatic. Its size is lofty; its silhouette captivating; its smell clean and antiseptic like the scent unfurling from a medicine cabinet. Many think it is a California native, but it is not. It is really an immigrant from Australia that arrived as many immigrants have in this wonderful country, surreptitiously.

It is the remarkable eucalyptus of which we speak that came from the virgin forests of that vast land down under, Australia. It is as curious as that land with its pouched animals and mysterious aborigines. Its adaptability and its hardiness can be seen in its groves which cling to the California hillsides and fill the crevices of the landscape. It is difficult to imagine what California would look like without the seemingly omnipresent eucalyptus.

It has had a checkered history though in California. At first it was a tree of promise stirring the imagination, and then later becoming a tree of disappointment and ultimately disdain. In its homeland of Australia, it was a true friend to the settler supplying material for a pioneer's needs. Its almost mythical reputation came with the Australians to the California goldfields and with the American travelers who had seen the colossus in Australia.

In Australia, the eucalyptus has been the tree of folklore where children sing of the "kookaburra in the gum tree." Where also children and aborigines, enjoy the sweet flakes of the manna gum. Medicine is found in its oils which has been used to cure everything from an upset stomach to a nasty laceration. Doctors and primitive cultures have both used it as a healer. The eucalyptus provided the early Australian settler materials for buildings, implements, and desperately-needed fuel. Its powers, its versatility was virtually unchallenged by anything else on the Australian continent.

The purpose of this study is to tell the story of this amazing tree and its impact on California. There is an array of literature, both scientific and historical, that gives only segments of the story. This study is an attempt to fashion those segments into a tailored narrative that has clarity and imparts information to the reader. It is by no means comprehensive. The focus is on important facts, major personalities, and key issues. The documentation is provided for further research and study of this fascinating immigrant tree.

JUST CALL IT "EUCALYPTUS"

This writer has chosen, as others have, to use the word "eucalyptus" to refer to this genus. In scientific literature, the first letter is normally capitalized. It is sometimes referred to as "eucalypts" to break away from the scientific form and to give it a more common-appearing name. This really hasn't stuck, but it is still seen in the literature. Also in this study, the writer has chosen, as others have, not to refer to eucalyptus species by their full scientific name, such as, "E. globulus" or "Eucalyptus globulus." Instead, the "E" or "Eucalyptus" is dropped, and the name merely becomes "globulus."

EUCALYPTUS DISCOVERED

The first time that the eucalyptus tree appeared in recorded history was in Abel Janszoon Tasman's journal during his voyage of exploration. In his journal entry for December 2, 1642, at the island of Tasmania, which was named after him, a reconnaissance party reported back that they had ". . . seen two trees about 2 1/2 fathoms in thickness, and they measured from 60-65 ft. from the ground to the lower branches . . ." They were intrigued by the gum that was secreting from the trees and brought back samples to show others.¹

The eucalyptus tree next appeared in William Dampier's 1688 journal written at Brunswick Bay, New South Wales. He wrote, "Most of the trees we saw are dragon trees as we supposed; and these too are the largest trees any where. They are the bigness for our large apple trees and about the same height; the rind is blackish and somewhat rough. The leaves are of dark colour; the Gum distils out of the knots or cracks that are in the bodies of the trees." ²

Captain James Cook was the next writer to make reference to the eucalyptus. He wrote on May 6, 1770 at Botany Bay, "We found 2 sorts of Gum one sort of which is like the Gum Dragon and is the same as I suppose Tasman took for gum lac, it is extracted from the largest tree in the woods." Writing in August 1770, botanist Joseph Banks, who was with Cook at the time, too referred to a "dragon" tree,

The one tree tolerably large with narrow leaves not unlike a willow which was in every place in which we went . . . resembling Sanguis Draconis . . . this I should suppose to be the gum mentioned by Dampier . . . also that Tasman saw . . . ³

There was a tree, *Dracena draco* or dragon tree, found on both the Madeiras and the Canary Islands that secreted gum. It would appear that the explorers most certainly had this tree in mind when comparing it to the eucalyptus.

The gum the eucalyptus secretes provides natural protection against insects because it literally drowns the menacing pests. Both Tasman and Dampier did in fact accurately identify this ecological secretion as "gum." But it was Captain Arthur Phillip who first used gum in reference to a type of tree. In a letter dated May 15, 1788 from Sydney, he wrote, "What seeds could be collected are sent to Sir Joseph Banks, as likewise the red gum taken from the large gum-tree by tapping."⁴

In his travels, Banks collected plant specimens, marked them, brought them to England and stored them away to identify later. The eucalyptus specimens remained untouched until a French botanist visiting England had the opportunity to view them. Charles Louis L'Heritier de Brutelle poured over the specimens and chose the scientific name of "Eucalyptus" which is a concoction of two Greek words: "eu" which means "well" and "kalypto" which means "I cover." The cover refers to the lid or operculum which hides the flower until it is thrown off to allow the flower to bloom.⁵

The operculum shape is different for each eucalyptus species, and this shape determines the second half of its scientific name. For example, the blue gum's scientific name is *E. globulus*. "Globulus" describes the shape of the operculum area which resembles a coat button, round or globe-like. It was another French botanist, Jacques-Julien Houtou de la Billardiere, who in 1791 fully identified the blue gum and assigned it its complete scientific name which is has been used since. In fact, Billardiere, while visiting Tasmania, was one of the first to refer to the genus as "Eucalyptus" in the written word. He lamented, "I have not yet been able to produce flowers of a new species of Eucalyptus."⁶

Eucalyptus is a large family having over 600 species growing in its native habitat of Australia. It is like the pouched mammals found there having a species for every climatic variable. There are small ones, large ones, bushy ones, and erect ones. One for every possibility. The eucalyptus species are grouped by common names mostly because non-scientists tend not to be very distinctive. After all, a tree is a tree and a bush is a bush. Australians group the eucalyptus into these common name categories: gum, mahogany, box, and stringybarks. Immediately one can see how really generic and unsophisticated these names are, but they do make clear enough statements as to physical appearance, and reveal how the untrained person views the species. Species of eucalyptus live in a vast array of local natural environments. Some are found in arid climates. Others prefer swampy conditions with its abundance of moisture. Some can exist in low temperatures while others will be burned by the frost. Some make there natural home in New Guinea, Timor, the Moluccas, and the Philippines besides Australia.⁷

The eucalyptus is a world traveler. It has been successfully grown on most every continent. Its fast growth, size, and beauty are attractive features persuading the interested to plant seed. It grows best in environmental conditions similar to those in its native habitat which is generally semi-tropical to semi-arid. The eucalyptus has served humankind in many ways. It has been used as fuel and as windbreaks to protect crops, farm animals, and buildings. Its oils have been extracted and used in medicine and in scented products. At one point in recent history, it thought to alter the local atmosphere making life healthier for the residents. In 1868, the renowned eucalyptus enthusiast from Australia, Baron Ferdinand von Mueller summed up the possibilities of the genus which lay worldwide, "This marvelous quickness of growth, combined with a perfect fitness to resist drought, has rendered many of our tree fame abroad -- especially so in countries where the supply of fuel or of hard woods is not readily attainable, or where for raising shelter . . . we probably possess the means of obliterating the rainless zones of the globe, to spread . . . woods over our deserts, and thereby mitigate the distressing drought and to annihilate perhaps even that occasionally excessive dry heat evolved by the sun's rays from the naked ground throughout extensive regions of the interior . . . affording shade and shelter, and retaining humidity to the soil, serve other great purposes . . ." ⁸

Von Mueller is sometimes referred to as "the Prophet of the Eucalyptus" because of such exuberant predictions. Being a pragmatic scientist as well, he spoke on the eucalyptus' ability to stop soil erosion and soil shift. He described the method by which the roots decomposed rock creating better soil for crops. He also discussed the use of eucalyptus to halt malaria by disinfecting the air, and in the broader sense, to clean the air at large for healthier living.⁹ Eucalyptus was von Mueller's life which he avidly promoted worldwide in his writings and lectures.

NOTED WRITERS AND AUTHORITIES

After the British and French botanists of late 18th century had identified and recorded certain species, eucalyptus specialists emerged who were excited about the genus and saw great potential. One such person was von Mueller who was introduced above. He was the first of a line of "eucalyptologists" who wanted to spread the word about this (seemingly) miraculous tree. Baron von Mueller was German-born who moved to Australia in 1847. He became the botanist for Victoria in 1879 which was a position he held until 1884. He published *Eucalyptographia*, a ten volume work, which identifies 100 eucalyptus species. The encyclopedic work was the first to present the eucalyptus to the general reading public and to scientists as well. The massive tomes contained descriptions, illustrations, and enthusiastic commentary.¹⁰

Von Mueller studied and wrote about eucalyptus for over fifty years. He had twenty to thirty species to add to his published works, but he died before he could complete the effort.¹¹ In 1902, there were only five copies of *Eucalyptographia* to be found in the United States. Lectures and selected writings of von Mueller's were published by

Ellwood Cooper in 1876 to insure that Californians became knowledgeable of eucalyptus. "The Prophet" proclaimed, "The eucalypts are destined to play a prominent part for all time to come in the sylvan culture of cast tracts of the globe."¹²

In California, early on, there sprang up botanists and enthusiasts who introduced the general populace to eucalyptus and advanced subsequent efforts on its part.

One such person was Ellwood Cooper who came to California in 1870 and settled in the Santa Barbara area. He took early note of the eucalyptus species already growing there, and could see the potential of such a tree. He immediately bought land and planted eucalyptus groves covering some 200 acres. His groves became renowned for their beauty and lushness. This was said in 1904, "One can stroll through his groves as through primeval forests. In the canyons, Eucalypts twenty-five years old tower high above oaks . . ." ¹³

In 1876, Cooper published *Forest Culture and Eucalyptus Trees* which included a lecture by Cooper, two lectures by von Mueller, a paper by von Mueller, a description of eucalyptus species by von Mueller, and a seed catalog. The intent of the publication was to provide Californians with information concerning the eucalyptus and to promote its growth in the state. It accurately states on the title page, "The only Complete and Reliable Work on the Eucalypti Published in the United States" because it was that indeed.

Cooper was president of Santa Barbara College, a small private school. On the occasion of a library benefit, November 26, 1875, he delivered a stirring lecture on forests and spoke of his favorite tree, the eucalyptus. In his address, he argued that California, and alas, the world, needed the eucalyptus for the planet's well-being. He believed that a perfect climate could be generated by planting the right vegetation in the proper locales. To quote, he wanted to "moderate the winds, increase the rain, and we have perfection . . . How is this to be done? By planting forest trees."¹⁴

A successor to Cooper was Abbot Kinney of Los Angeles. He was chairman of the California Board of Forestry from 1886 to 1888 during which time he launched a program that resulted in the planting of thousands of eucalyptus. The forestry experimental station at Santa Monica was established by Kinney where he did many studies on 75 to 100 eucalyptus species. By 1910, he was by far the leading contemporary eucalyptologist who had published more than anyone else on the topic.¹⁵

Kinney had acquired wealth through tobacco interests and came to California in the late 1870's to invest this capital in land and agriculture. He knew Cooper and his work. He saw the extraordinary eucalyptus growing on Cooper's land. While chairman of the forestry board, he embarked on a program of distributing free eucalyptus seed and seedlings to interested growers.¹⁶ In 1895, he published his classic work, *Eucalyptus*, which became the bible for eucalyptus growers. It is a compendium of fact and information about all aspects of eucalyptus horticulture from discussing soils to which species to plant.

To gather information for his publication, Kinney linked up with a colleague, A.J. McClatchie. McClatchie had a very large microscope, and with it, along with two copies of von Mueller's *Eucalyptographia*, the two botanists traveled throughout California studying the eucalyptus.¹⁷ McClatchie later worked at the Arizona forestry experiment station in Phoenix, and published in 1902, *Eucalypts Cultivated in the United States* a scientific work rich in history and fact. At the turn of the century and shortly thereafter, there were eucalyptus specialists working at the various forestry stations and at the University of California experimental facilities, who published informative pamphlets through those governmental agencies. No research of eucalyptus horticulture would be complete without consulting those contributions. To name the more important authors: Charles Shinn, C.H. Sellers, George Lull, Louis Margolin, and Norman Ingham.

Next on the eucalyptus scene was Woodbridge Metcalf. For over fifty years, he would dominate the field. He began his professional career in 1914 at the University of California, Berkeley where he taught forest botany, tree management and tree identification. In 1926, he became the first California Extension Forester who strongly advocated the usage of eucalyptus as windbreaks for citrus groves. Metcalf wrote and published essays, articles, and books on the Australian tree and other trees found in California. In 1956, he represented the United States at the FAO World Eucalyptus Conference held in Rome, Italy.¹⁸

One final figure to recognize is Max Watson. He was an extraordinary man with varied interests. He was originally from San Diego where he witnessed the eucalyptus boom early this century. It was a tree he simply grew to love as a boy tramping through the groves. As a young man, Watson opened a nursery in San Diego and planted many thousands of seedlings with his own hands. His nursery business brought him to the San Joaquin Valley where he continued planting trees. He took a great interest in people especially those who needed help. In his lifetime, Watson was a social worker, probation officer, and vocational arts teacher. Through an agreement with California prison authorities, he was able to hire prisoners to work in his nurseries and plant trees. Watson retired to San Jose where he opened still another nursery and an arboretum.¹⁹

"CALIFORNIA, HERE I COME!"

The gold rush changed California in forever. The Mexican dons would begin to fade from the scene eventually being relieved of their ownership of vast land holdings. The California Indian, decimated by white man's disease, would continue to disappear and essentially melt into the surrounding society. Present was the onslaught of brash and arrogant Americans seeking fortune and bringing with them different ideas, a different philosophy, and a new way of life. Thousands of American gold seekers arrived in California with the sole idea of striking it rich and to return home with their newly found riches. However, many did stay and bought land or went into business. California was still their land of promise. Australians came too seeking wealth in the gold fields. These hardy and rough-hewed people were very similar to frontier Americans what with their maverick attitude and adventuring nature.

They packed up their belongings and boarded ships mostly constructed from blue gum timber. When they embarked from Sydney or Hobart Town, they brought with them a mental picture of their homeland's landscape. In California they saw barren hills and valleys. They could visualize how their lofty and majestic eucalyptus could change such a bleak picture.

California vegetation was indeed bleak with one exception being the pine forests which grew at the higher elevations. There too were a few oaks, willows, sycamores, and scrub brush growing on the hills and in the valleys at the lower elevations. But the desirable land was virtually treeless. The Franciscan missionaries brought with them trees to provide food, but these orchards were small, isolated, and located near the missions.

When California became a state in 1850, the citizens of Los Angeles needed to fly the stars and stripes, but they had no trees to construct for a flagpole. Indians were sent into the San Bernardino Mountains to chop down two pine trees and bring back so the American flag could fly over southern California.²⁰

The trees near settlements were used immediately for fuel and construction of dwellings. Oakland was founded in 1850 in the midst of a forest of live oaks. Shortly this forest would vanish. Oakland also had a forest of redwoods covering five square miles. Two very tall trees in the forest were used by ships' captains to guide them through the Golden Gate sixteen miles at sea.²¹ This redwood forest was used in the construction of Mission San Jose²² and in the urban development of Oakland and San Francisco during the gold rush. By 1860, all the redwoods had vanished. Gone were the 300 foot giants that had once stood there.²³

To the gold seekers and settlers, live trees did not have value in any permanent sense and were exploited at will. For example, miners cut down trees just to find straight ones to be used in their "toms" and sluices. Trees were used too as instant fuel for fires to cook over and to warm chilled bodies. The early California wheat farmers removed trees to clear fields for their crops.²⁴

In 1863, John S. Hittel published Resources in California in which he described California's bare terrain. "The valleys are mostly bare of timber, with here and there a grove of oaks, and lines of trees and bushes along the water courses." In regard to Napa Valley and its surrounding hills, he said, " These mountains, brown near the foreground and blue in the distance . . ." ²⁵ gives one a picture of bleakness.

Hittel writing again, "Most of the Sacramento and San Joaquin valleys, the Colorado Desert, the eastern slopes of the Coast Mountains, and the Coast Range south of latitude 35 degrees, are treeless."²⁶ In his work The Natural Wealth of

California, published in 1868, author Titus Fey Cronise gives this picture of Santa Barbara County: "There is but little timber in any part of the county, except oak, willows, and sycamore, which grow on the plains or in the valleys. The highest mountains being covered with grass or wild oats during the winter and spring . . ."27

Of Stanislaus County, Cronise said: "With the exception of a few scattered oaks along the larger streams, and a sparse growth of the same trees interspersed with an inferior species of pine found on the eastern foothills, the county is destitute of timber."28 These authors paint a clear picture of California's virtually treeless landscape.

It was during the gold rush, that the eucalyptus was introduced into California either by Australians, or by Americans who had been to Australia, or knew of the tree and had seed shipped in. Australian miners used eucalyptus oil in Australia in the recovery of gold as noted by this writer: "Diggers from our eastern goldfields (Australia), chasing the pot of gold at the American end of the rainbow, took and planted seed of those trees whose oil they had used in the flotation process for the recovery of gold particles . . . Eucalyptus oil."29

This seems plausible, but it does take time for the eucalyptus to reach a certain size to be able to produce a large enough volume of leaves from which a sizeable amount of oil can be distilled. Another problem would be the climate of the Sierra Nevada foothills where the gold was located. It is too cold normally at that altitude during the winter for the eucalyptus to survive.

A stronger possibility is the "strike it rich" concept. The eucalyptus is a fast-growing tree and provides firewood and materials for construction. This would interest most enterprising men. News of such a tree would have reached the ears of the miners or others in California from the Australians. Once the goldfields played out, these men of fortune turned to other prospects of gaining wealth. This colossus of a tree could be exploited for their financial gain, and it would seem possible to these redirected fortune hunters that the eucalyptus would enable them to "strike it rich."30

The Australians themselves seem to be a link. At this time, it was quicker to bring supplies from Australia than from eastern United States because American cargo ships had to go around the horn of South American, and The Panama Canal and the transcontinental railroad were not built yet. Shipyards in Sydney and Hobart Town, Tasmania constructed vessels made from blue gum which would ultimately sail into San Francisco Bay. These ships would be representatives of what the eucalyptus could do.31 A 90 ton schooner, it was said, was made from one eucalyptus tree! Imagine the attention and instant fame this claim would garner. Not only did the tree get a reputation, but the Australian woodcutters and shipbuilders who produce such a craft did as well.32

In *Blue Clippers and Whale Ships of Tasmania*, the author, Will Lawson, wrote: "These early Tasmanians were unusual men, their achievement and characters so amazing and the ships they built so sturdy that Time could not destroy them. When they wanted ships they built them, not always in properly appointed shipyards, but often in creeks or on beaches or river banks, wherever suitable tall trees grew. These big-hearted men felled the trees (eucalyptus), pit-sawed them by hand power into planks, beams, keels, and frames, to shape their vessels which were to brave the ocean storms and the dangers of uncharted coasts. And they carried the name and fame of Tasmanian ships and seamen over the seven seas."33

In 1849, over 2,600 Australians left Sydney for San Francisco.34 It took between three to four months to make the passage with the American clipper ships completing the trip quicker than the more bulky blue gum vessels. It was on one of these voyages that the first sack of eucalyptus seed was imported.35 Because eucalyptus seed is tiny, a small sack, which can hold several thousand seeds, was all that was needed.36

The demand for trees quickened with settlement because wood was needed for fuel and construction. Settlers from the well-forested eastern United States disliked the monotonous treeless landscape of California and immediately began planting trees near their buildings for beauty, shade and firewood. The eucalyptus could meet these needs quicker than other trees, and because of this and its enormous size, it attracted attention.

WHO WAS REALLY FIRST?

There is some speculation as to who was the first person to plant eucalyptus in California. Most accounts seem to point to W.C. Walker who was the owner of the Golden Gate Nursery in San Francisco located at Fourth and Folsom Streets. It is believed that he planted the first seeds in 1853 from 14 different species.³⁸ In the August 7, 1857 issue of the California Farmer, Walker ran an advertisement with eucalyptus for sale. At the San Francisco Mechanics Fair of October 1857, he exhibited three different varieties of eucalyptus.³⁹ One can conclude that without question, Walker was involved early in the propagation of eucalyptus in California.

Dr. H.H. Behr of San Francisco, who was a German native and a friend of Alexander Humboldt, had an interest in eucalyptus which he spoke of often. He had been to Australia twice, where as a botanist he worked with the renowned Australian eucalyptologist Baron von Mueller. With such an association, it has been generally concluded that he either brought eucalyptus seeds from Australia to California or had them sent to him. Dr. Behr may in turn have given them to fellow San Franciscan Walker for care and nurture at his nursery. Nevertheless, California had a resident expert living in San Francisco, in the person of Dr. Behr, who undoubtedly urged the experimentation of eucalyptus.⁴⁰

Looking for real hard evidence, H.M. Butterfield did find in 1935 an 1858-1859 Golden Gate Nursery Catalog at the Academy of Sciences in Golden Gate Park. It listed eucalyptus species as follows:

Eucalyptus Resinifera (Aus.)-- Splendid weeping forest tree. 60 feet. \$10.00

" Argentea " -- Argentea foliage 20 feet. \$10.00

" Augustifolia " -- dwarf 5 feet \$ 5.00

Also noted in the catalog is a list of seeds received from M. Guilfoyle of Sydney, September 15, 1859. These species were robusta, iron bark, blue gum, longifolia, nigra, and globosa (globulus?).⁴¹

Maybe it was Captain Robert H. Waterman who planted the first eucalyptus seeds in California? In a biography of this clipper ship captain, entitled That Fabulous Captain, one finds that Waterman bought land in Suisun Valley for his retirement and planted eucalyptus in 1853. He apparently commissioned an ex-first mate to bring eucalyptus seed to him from Australia. Waterman not only planted seed on his ranch, he gave some to his neighbors as well. The blue gums currently in the area are felt to be connected with these early plantings.⁴²

Professor Woodbridge Metcalf, one time Forester for the University of California, Berkeley, and an expert on California eucalyptus, felt from his research that the first eucalyptus in California appeared at Oakland's Shellmound Nurseries and Fruit Gardens in 1856.⁴³ Metcalf gives no evidence to support his claim, but H.M. Butterfield, writing in 1939, notes that the nursery did have eucalyptus seedlings listed in its stock in 1856 for \$5 each.⁴⁴ The owner of the nursery was R.W. Washburn, and from the evidence, one can conclude that he was one of the pioneers in the propagation of eucalyptus in California. Still another challenge comes from Abbot Kinney, who wrote in 1895, " The planting of trees of various species of Eucalyptus in California has been carried on since January 1856, when Mr. C.L. Reimer successfully introduced 14 species."⁴⁵ Kinney, an important figure in California eucalyptus history, does not continue the story of this account in his work. Without evidence from Kinney or other writers, it is difficult to support this claim though one would like to because of Kinney's importance to eucalyptology.

Taking into consideration all of these accounts and evidence, one seems to conclude that Behr and Walker were probably the first to propagate eucalyptus in California. One can state, however, without question, that there were indeed eucalyptus pioneers on both sides of San Francisco Bay in the 1850's.

INTEREST CONTINUES

Soon the East Bay became the leader in the eucalyptus movement because of the availability of good land and an agreeable climate for the genus. Stephen Nolan, owner of Oakland's Bellevue Nursery, was impressed by the rapid growth and adaptability of Walker's eucalyptus so much that he commissioned a sea captain to bring him eucalyptus seed from Australia which he planted in 1861. He sold the seedlings and continued to buy seed to expand his eucalyptus interests.⁴⁶ His 1871 catalog lists 34 species selling for 25 to 50 cents a plant with blue gum costing a mere 10 cents.⁴⁷ The eucalyptus tree was a curiosity to most and were bought for beauty or shade.⁴⁸

Involved in the early dissemination of eucalyptus were Bishop William Taylor, his wife Annie, and James T. Stratton,

who was California's Surveyor-General. Bishop Taylor, minister of Alameda's Methodist Episcopal Church, visited Australia in 1862 while on a worldwide evangelical crusade. He sent eucalyptus seed to Annie, who planted them, and gave away or sold thousands of seedlings.⁴⁹

General Stratton got seeds from Annie Taylor and was the first to plant blue gum on a large scale. In 1869, he planted forty-five acres on hill land behind Hayward in Alameda County. In 1880, he cut down 20 acres to make way for an orchard.⁵⁰ In 1870, Stratton won a \$50 prize from the State Board of Agriculture for his effort in planting such a large number of eucalyptus trees. He kept records of his work with eucalyptus to share with other interested growers.⁵¹ In Kern County Weekly Courier of August 1, 1874, this appeared:

The two Australian gum trees . . . on James T. Stratton's place in East Oakland, have probably the largest family in the world. From their seed has sprang over one hundred and fifty thousand trees, and the seed of these are already over fifty thousand more, that is two hundred thousand children and grandchildren all told.⁵²

Curiously enough in the column next to this article was an advertisement for eucalyptus medicine. It read: "Double Extract of Eucalyptus for Fever and Ague at G.B. Chester's."⁵³ Thus as early as 1872, just two decades after the introduction of eucalyptus into California, the tree was making itself known even to isolated regions of the state.

Stratton, owner of the Gum Tree Nurseries in Hayward, W.A.T. Stratton, a nurseryman in Petaluma, and Major Locke of Pasadena were the biggest producers and distributors of eucalyptus in the 1870's. In 1873, James Stratton marketed 50,000 seedlings, and in 1876, W.A.T. Stratton shipped 5,000 seedlings in just one day. Major Locke supplied 200,000 seedlings in 1877. There was a shortage of seedlings because of rising demand consequently eucalyptus seed was sold.⁵⁴

Interest in eucalyptus was beginning to surface too at the state government level. Its support in regard to experimentation and testing would be crucial. There was a section on "Australian Forest Trees" in the 1868 Transactions of the State Agriculture Society. Much of it was a reprint of a von Mueller's essay praising the eucalyptus for its rapid growth and size. The Transactions also noted that a recent botanical display by the society contained eucalyptus logs. It commented, "These woods generally are very hard and dense, and as they can all be naturalized in California, and many of them are already introduced, some facts about them have special interest."⁵⁵

In 1870, in its biennial report, the State Board of Agriculture spoke of the need of "artificial forests" in California to cover the barren terrain. It was the duty of the board to stop any further destruction of the state's forest and to encourage the planting of new vegetation. To quote, "It is a matter of no less importance to encourage and foster the growth and cultivation of artificial forests."⁵⁶

Further in its report, the board noted that California had no natural hardwoods which were needed in the manufacture of wagons, carriages, and agriculture implements. California's climate prevented any eastern hardwood to be successful in the state, but the board noted, "We have also imported and grown successfully some of the most valuable varieties of hard wood trees from Australia, and the timber produced from these is also to be equal to that grown in its native country." The board went on to recommend that a prize be given to the grower of "the largest quantity of useful forest trees planted during the year."⁵⁷ The prize was the \$50 awarded to James T. Stratton for his eucalyptus enterprise.

In 1862, a state law was passed to protect timber. It disallowed the cutting of trees on private land or public streets which seems extreme, but it was needed to stress the importance of trees to the state. This was followed by the another state law, the Tree Culture Act of 1868, which encouraged the planting of shade and fruit trees along California roads. In it the various county boards of supervisors were given the responsibility of coordinating the effort within their jurisdiction. Growers would get \$1 per planted tree after the tree had grown for four years.

The project was not much of a success mostly because of a lack of interest, and there were some budgetary difficulties. Still it was a positive effort because the public was officially notified of the need of trees in the state, and the government was willing to adopt programs to help. The federal government too promoted programs to encourage tree planting. In 1873 a federal law was enacted which gave 160 acres to anyone who planted 40 acres in trees and maintained them for a period of eight years.⁵⁸

Towards the end of the century, one could already see on the California horizon lofty eucalyptus trees whose silhouettes resembled ship's masts and its foliage, the billowing sails. These mature eucalyptus trees were evidence that serious planting of eucalyptus had occurred decades before and indeed the eucalyptus did grow fast and was sizeable.

Distinctive individual trees could be seen like the blue gum planted in 1856 along Milpitas Road in San Jose by retired ship captain Joseph Aram. He retired from sea duty and opened a nursery in San Jose.⁵⁹ It was speculated that eucalyptus had been planted as early as 1855 on the University of California, Berkeley campus,⁶⁰ but documents do show that six species were planted on the campus in 1877.⁶¹ Other early trees include the eucalyptus planted by Richard Davis at the corner of G and 15th Streets in Sacramento.⁶²

A similar debate occurs as to who planted the first eucalyptus just in southern California. Nothing conclusive has been established. One account attributes William Wolfskill, owner of Rancho Santa Anita, to have received seed from the Taylors in 1863 or 1865 and planted a dozen trees.⁶³ It may have been Albert Workman, a native of Australia, who imported seed from his homeland and planted it on his Canoga Park ranch in the early 1870's.⁶⁴ At this time many southern California ranches received seed from the government seedling and seed program which muddles the water some.⁶⁵ The first large acreage in southern California was planted by Ellwood Cooper and J.L. Barker, both of Santa Barbara County, in 1872. They planted 100 acres with 150,000 blue and red gums. Near Los Angeles, in 1874 and 1875, the Widney and Nadeau groves were planted.⁶⁶

The printed media played an important role in the propagation of eucalyptus by its articles, advertisements, and promotional seed giveaways. The California Farmer became one of the biggest distributors of eucalyptus seed. In 1872, with a \$4 subscription customers received packets of eucalyptus seed.⁶⁷ The magazine's owner was Colonel Warren who was an acquaintance of W.C. Walker of Golden Gate Nursery. In 1875, California Farmer ran advertisements for thousands of eucalyptus seedlings which clearly shows the massive scope of the rising industry.⁶⁸ Pacific Rural Press too was a strong proponent of eucalyptus and ran practical articles on planting, care and economics. These two periodicals had an enormous impact on the expansion of eucalyptus growing in the state.

TO THE END OF THE CENTURY

The first publication in California on the eucalyptus was compiled by Ellwood Cooper of Santa Barbara. It contained a lecture given by Cooper in 1870 and writings by the famed eucalyptologist Baron Ferdinand von Mueller of Australia all which was mentioned earlier in this study. This compilation contained philosophical discussions of forests, especially eucalyptus, and information concerning eucalyptus species, planting, and economics of harvesting. Cooper was one of the first to plant eucalyptus in an experimental sense. He examined growth, soils, and environmental factors keeping records which he shared with interested growers.⁶⁹ His ranch, "Ellwood," was near the ocean and typically rocky and hilly which gave his experiments a variety of soils, elevation, and localized climates.

Cooper began his work with eucalyptus by contacting Thomas Adamson who was the U.S. Consul-General in Melbourne, Australia. He wrote and asked Adamson for seeds and information about eucalyptus. Along with eucalyptus seed, Adamson sent some of von Mueller's written works giving Cooper permission to publish them. Cooper in return sent fifty copies of his publication back to von Mueller. This way the botanist Baron could be informed of the progress of eucalyptus in California and share that information with others.⁷⁰

Cooper's lecture in 1870 at Santa Barbara College was a milestone in the history of California eucalyptus. He spoke of the importance of forests in general to world climates, and that local climates could be changed by trees. He felt California could have a "perfect climate" by transforming the existing one with belts of trees. He recommended that California plant belts of eucalyptus from 100 to 150 feet wide and a quarter mile long at right angles to the prevailing wind. These belts would occupy 1/8 of California's landmass⁷¹ and serve not only as alterers of climate, but as protective windbreaks as well. He reasoned,

Contemplate the beauty, the grandeur, the productiveness of the great valleys of the Sacramento, the San Joaquin, the Salinas Plain, and every strip of arable land in the state, with belts of eucalyptus trees . . . with such shelter, California would become the paradise of the world.⁷² It is known and proved that three fourths of surface will produce more, if

protected by trees planted in the other fourth.⁷³

Cooper felt that property owners had a moral obligation to plant trees to provide a better environment. Economically, he argued, they would be compensated from returns on firewood and from crops protected by windbreaks.⁷⁴ His lecture was a stirring one in which he used logic, reason, and appeals to ethic and moral standards of the day. He strongly urged the planting of eucalyptus. He implored, "What shall we plant? The rapidity of growth of the blue gum, and the facility with which it can be propagated, is a feature of great importance . . ." ⁷⁵ He continued, "Who does not look with an honest pride on the beautiful creation which, with a generous spirit, he has raised up around him."⁷⁶

Cooper supplied eucalyptus seed to interested growers such as his good friend Judge Charles Fernald, who in turn provided seed to horticultural societies and organizations interested in forestry. Cooper was active statewide in forestry and served on the State Board of Forestry and the Commission of Horticulture. His contribution to the preservation and propagation of trees was enormous. He had a special love for the eucalyptus which he considered to be blessed with promise. His excitement for the genus can be seen in this glowing proclamation:

He (grower) increases certainty of his crops, decreases one-fourth of his labor, beautifies his home, improves the climate, doubles the value of his land, receives inspiration from this work of his own hands, elevates his own condition, and adds to the refinement of himself, his family, and all his surroundings.⁷⁷

Advocates such as Cooper and the printed media served as prime motivators in a movement that was picking up momentum. But there is nothing like visual proof for the skeptical. Now one could see the much-discussed eucalyptus growing in abundance particularly along the California coast and in the inland valleys. Also one could go to the many nurseries where eucalyptus seed, seedlings, and literature was available. For many, growing eucalyptus was a reasonably-priced experiment.

The Central Pacific Railroad took an avid interest in the eucalyptus. The railroad constantly needed materials for its lines primarily for ties, poles, posts, and firewood. The eucalyptus conceivably could produce these necessary supplies according to contemporary information. The railroad also wanted to attract settlers to buy railroad land adjacent to the tracks. The plan was to beautify the barren landscape with fast-growing eucalyptus as an enticement.

In 1877, Assistant Chief Engineer for the Central Pacific Railroad, J.D. Scupham, bought 40,000 eucalyptus seedlings, mostly blue gum, from nurseries in Oakland and Hayward. The railroad planted the seedlings in the San Joaquin Valley and in some instances near wells as an attraction to settlers. The next year, 250,000 seedlings were bought from Locke of Pasadena and 300,000 from George Baxter of Hayward. In the two year planting program, the railroad planted about one million trees. The program was a bust though. Soon it was discovered that eucalyptus ties would crack and check if not seasoned properly. These ties could not hold a spike in place securely which was obviously of great importance to track stability. The eucalyptus wood also rotted away easily.⁷⁸ Thus ended the first real experiment of eucalyptus for an industrial purpose. Decades later the Santa Fe Railroad would curiously repeat the exact same experience. Government agencies continued their support of eucalyptus through their informative literature and seed distribution programs. For example, the State Forestry Commission sold seeds at a very low price of the better eucalyptus species. The University of California had a program of offering free seed to interested growers.⁷⁹ Experiment stations were also established by the government.

In 1887, the State Board of Forestry received land donations on which to build experiment stations.⁸⁰ Experiment stations were instituted at Santa Monica, Chico, Merced, Hesperia, San Jacinto, and Lake Hemet. At the Santa Monica station one could buy eucalyptus seedlings for \$3 or \$4. This program was primarily designed to stimulate interest at the local nurseries. It was believed generally that eucalyptus could be grown for profit, and all that was needed was encouragement in the right places. It was reported that in 1890, the Santa Monica station distributed 76,000 eucalyptus seedlings to 421 interested growers. This station was experimenting with 55 eucalyptus species.⁸¹

In 1887, the State Board of Forestry was disbanded, and its authority and experimental stations were transferred to the College of Agriculture at the University of California, Berkeley. The college dean was E.W. Hilgard who distributed eucalyptus seed and seedlings of various species to the public. By 1900 the college was the authority on eucalyptus in California. Work at the experiment stations continued with Santa Monica and Chico stations being the most active.⁸²

Municipalities took an interest in eucalyptus. Trees were planted for shade and to beautify parks and streets. In the 1880's, San Francisco's Mayor Adolph Sutro, along with local school children, planted eucalyptus on Arbor Days at the Presidio, Sutro Forest, Mount Davidson, and Yerba Buena Island.⁸³ Over 300,000 trees were planted in Golden Gate Park by John McLaren, many which were eucalyptus.⁸⁴

Abbot Kinney of Santa Monica made major contributions to the propagation of the eucalyptus. He served as the chairman of the State Forestry Bureau from 1886 to 1888, and as State Forester, he distributed an untold quantity of free eucalyptus seeds and seedlings throughout the state. His only request was that growers keep records which would serve as information for prospective growers.

Kinney served as roadmaster in the Santa Monica area where he lined the roads with eucalyptus and planted a multitude of seedlings on his ranches in Santa Monica and San Gabriel Valley. He lectured and published a very important work in 1895 with the simple title of Eucalyptus.⁸⁵ It was the most comprehensive treatment at the time containing instructions on planting and care of eucalyptus with accounts on experiments and detailed descriptions of species. It was an encyclopedic document.

By the end of the nineteenth century, California had been fully invaded by the eucalyptus. It could be seen most anywhere in the state where climate permitted. It was being used for fuel, windbreaks, medicines, shade, and beautification. Writing in *Out West* in 1904, Alfred McClatchie observes, "Without the Eucalyptus, California would be a very different state. What she owes to them it is impossible to fully estimate. Nothing short of being entirely deprived of these trees would enable her citizens to realize how much their presence means. Without them, landscapes now varied and softened by their presence would be comparatively monotonous and unattractive. Winds would sweep unchecked over regions where their progress is now impeded by avenues and groves of Eucalypts. Orchards that in the shelter of Eucalypts are profitable would be unproductive. Had not these trees been introduced, the fuel problem would be a very different one. Were some agency to destroy all the Eucalypts now growing in California, the price of real estate would fall at once."⁸⁶

The whole eucalyptus tree could be used from its roots to its crown, from its bark to its foliage. It not only provided fuel, windbreaks, medicine, shade and beauty, it also was lumber for implements, nectar for bees, pulp for paper, and chemical for boiler cleaning. When cut down, the eucalyptus would resprout providing yet another crop of products within a few years. It appeared to be a miracle tree only limited by one's imagination. It created an excitement leading to a surge of interest that would become the boom of 1905 to 1912.

Waxing poetic, California writer Lawrence Clark Powell speaking at Mills College, with its eucalyptus groves, cooed, ". . . no tree is more beautiful in the wind or against the sky, and none provides better nesting for the soft-voiced mourning dove. As for firewood, the bittersweet smell of this wood is evidence of a non-sparking blaze almost as slow-burning oak."⁸⁷

But not everyone was enchanted by the genus, and the numbers would grow when soon its true economic value would be revealed. These disgruntled individuals would disdainfully refer to the eucalyptus as the "Australian weed." In this passage from *Old Calabria*, novelist Norman Douglas vents his disgust on the wonder tree:

A single eucalyptus can ruin the faire landscape. No plant on earth rustles such a horribly metallic fashion when the wind blows through these everlasting withered branches; the noise chills on the marrow; it is like the sibilant chant of ghosts. Its oil is called "medicine" only because it happens to smell rather nasty; it is worthless timber, objectionable in form and hue -- objectionable above all things, in its perverse, and inhuman habits. What other tree would have the effrontery to turn the sharp edge of its leaves -- as if these were not narrow enough already! of their minimum of shade and maximum discomfort to mankind?⁸⁸

FROM RAG TO RICHES, MAYBE?

Many of the eucalyptus trees seen today in California base their existence on the eucalyptus boom of 1905-1912, during which time, large eucalyptus plantations were created with the hope of reaping sizeable profits. The tree promised much. Its rapid growth and size were well-known. Californians had developed valuable uses for it. It was

promoted by the print media, government, the University, and enthusiasts who gave lectures and published essays on it. It was a rising star that received yet another boost in 1907. The U.S. Forest Service issued a report entitled "The Waning Hardwood Supply and the Appalachian Forests." The eucalyptus is a hardwood which could fill this void.

In the 1870 Biennial Report of the State Board of Agriculture, there was a discussion concerning the need of hardwood in California. Californians already had to import hardwood from eastern United States and Australia because none grew in the state. The report encouraged the planting of "artificial forests" to meet this need.⁸⁹ At this time, Ellwood Cooper was clamoring for the same activity, and he was trying to show the economic viability of eucalyptus with the hope that it would meet the hardwood needs of the state in the future.

Building on this idea in 1888, George McGillivrey published an article in *Overland Monthly* entitled "The Economic Value of the Eucalyptus" in which he presented the many possible products the eucalyptus could produce. He based his pitch on the manufacturing done in Australia; however, this was manufacturing that utilized centuries-old eucalyptus instead of young trees which is a crucial distinction. McGillivrey went on to praise the adaptability of the eucalyptus to California and the possibilities of its many species. It was quite simple to him. Just plant eucalyptus and "while quietly the forest advances almost without expenditure and care, its wood treasures increase from year to year without taxing the patience of generations."⁹⁰ He summarizes, "The propagation of Eucalyptus is easy, rapid, and inexpensive."⁹¹ Who could argue differently after seeing the process and its living results.

With articulate men in the eucalyptus industry praising the value of the tree, and with government and the University supporting the effort, anyone with some interest and finances could easily be persuaded to invest in the industry that was still in its infancy. It looked like an investment too good to pass up to any intelligent person.

Abbot Kinney added more wood to the eucalyptus fire with his advocacy in lecture, publication, and experimentation. He was considered an eucalyptus authority and a sensible businessman. In many ways, he was model of what others could do if they too became active in the industry. He had records of positive results from his eucalyptus farming and spoke eagerly on the subject.

On the eve of the eucalyptus boom, Alfred James McClatchie, horticulturalist at the Arizona Experimental Station in Phoenix, published a U.S. Bureau of Forestry bulletin entitled "Eucalypts Cultivated in the United States." This 1902 document was chock-filled with history, discussion of horticultural techniques and uses of eucalyptus. It was an impressive publication of information and encouragement where every part of the eucalyptus seemed to have a use and solid economic value. McClatchie reduced and summarized much of the bulletin in two articles he published in 1904 in *Out West*, a widely circulated magazine. In *Out West* he wrote, "The Eucalypts serve a greater value of useful purposes than the trees of any other genus existing on the globe today."⁹² This was the attitude of most heading into the boom. The eucalyptus boom got immediate support from the 1907 U.S. Forest Service circular with the title "The Waning Hardwood Supply and the Appalachian Forests," written by William L. Hall which was mentioned before. It was a frank discussion of the shrinking supply of hardwood so needed by many industries in the United States. It was a scary report that received wide publicity. In it, Hall presented the facts concerning the remaining hardwood supply in each Appalachian state. It was bleak. Harvested amounts were falling off, but there was also a decline in demand. Nevertheless, something had to be done to fill the gap. Hall wrote at the end of the circular:

The inevitable conclusion is that there are lean years close ahead in the use of hardwood timber. There is sure to be gap between the supply which exists and the supply which will have to be provided. How large that gap will be depends upon how soon and how effectively we begin to make provision for the future supply. The present indications are that in spite of the best we can do there will be a shortage of hardwoods running through at least fifteen years.⁹³

Hall felt though that softwood, metal, and concrete would replace hardwood eventually in many instances.⁹⁴ To demonstrate the alarm produced by the report, one author grimly records, "History shows that following in the wake of timber exhaustion, invariably will be found decaying civilization, race, disintegration, national corruption and dissolution."⁹⁵ Hoping to circumvent any such demise, there were investors digging deeply into their pockets to finance an answer. The miraculous eucalyptus seemed to be the solution to many though Hall made no mention of it in his report.

The rush was on. There were a flurry of articles expressing the importance of eucalyptus in the hardwood question. George Peavy, beginning in 1909, wrote a series of articles for the California Weekly entitled "Eucalyptus in California," which were designed to enrich and encourage those involved in the eucalyptus industry. He reported that there were "fully one hundred companies engaged either in planting eucalyptus seedlings, contracting to plant acreage, selling acreage in prospective plantations, or selling stock in companies whose avowed object is to plant, care for, and harvest the product of eucalyptus plantations."⁹⁶ There now was a full-blown eucalyptus industry in California.

Peavy believed there to be a market for eucalyptus hardwood because the amount of hardwood harvested from 1899 to 1906 had decreased by 15.3%. But was this because of decrease in demand or decrease in availability? It was the former, but Peavy still expected that the eucalyptus would be a major supplier of hardwood soon because of its rapid growth. To be successful in the market place, he highly recommended that the eucalyptus grower be scientific by selecting the proper species and land.⁹⁷

State Forester, George Lull, published two articles in 1909 and a circular for the State Board of Forestry. His articles appeared in Grizzly Bear and the California Weekly. His approach to the eucalyptus boom was cautionary but still supportive. This could be by virtue of his position in which a more conservative stance was expected. He did feel that the eucalyptus could play a key role in the hardwood shortage. Lull did warn though, just like Peavy, that to be successful it was necessary to plan, develop, and care for land and trees scientifically.⁹⁸

In any industrial boom, there is always the problem of the unscrupulous schemer those who will distort fact to gain profit. Promotional literature from eucalyptus companies came under scrutiny. Lull urged interested investors to compare the information in the companies' prospectuses to the studies found in government publications especially on eucalyptus growth and harvest yield. There were a few eucalyptus companies that were investigated by authorities concerning their ethics. A committee of real estate agents and foresters was created in Los Angeles just to review promotional literature.⁹⁹

It was this statement made by Lull which got him into some difficulty: It would appear to require no wizard's mind to foresee that this State will become, within the next twenty years, the base of hardwood supplies and the home of the hardwood manufacturers. If such should be the case the long-despised eucalypts will be greater wealth-producers than the orange or any other of California's famous crops.¹⁰⁰

He also commented that eucalyptus was similar to oak and hickory as a hardwood. It was felt by his critics that he had overstepped his bounds because such commentary would invite wildcat investments throwing the industry into a whirlwind of gluttonous activity. It was felt that control was needed not chaos in the fragile infant industry.

Lull continued to take what he thought was a reasonable stance on the issue. He even criticized Peavy in a letter he wrote to California Weekly concerning Peavy's statistics. He indicated that Peavy had used 1903 figures in his article which did not apply in 1909. Lull was trying to make it known, even though he had been overzealous in his prediction, that the government wanted growers and investors to move cautiously and verify information before plunging forward.¹⁰¹

The federal government got involved in the issue. In 1910, H.S. Betts and C. Stowell Smith authored an U.S. Forest Service circular with the title "Utilization of California Eucalypts." The circular warned the public of the possibility of being misled by published statistics which over-projected yields and profits. It wanted it to be clearly known that the Forest Service was still uncertain that the eucalyptus would bring in the returns the industry was expecting.¹⁰²

The reason for this caution and guarded skepticism can be seen in this comment from the authors Betts and Smith: "The problem utilizing eucalyptus wood readily without undue waste is a difficult one because of its tendency to warp, shrink, and check during drying."¹⁰³

They went on to note that the promise of eucalyptus in California was based on the old virgin forests of Australia. This was a mistake as the young trees being harvested in California could not be compared in quality to the centuries-old eucalyptus timber of Australia. It reacted differently to harvest. The older trees didn't split or warp as the infant California crop did. There was a vast difference between the two, and this would doom the California eucalyptus

industry.104

Having looked at the publications by authorities whose views had a great impact on the eucalyptus boom and also its demise, let's dip into the boom itself and see first-hand its frenzied activity. Knowledge of the eucalyptus had already spread across the United States. Those in forestry circles knew it was a fast-growing tree that could provide strong and durable wood if given the proper treatment. In California some had grown eucalyptus on prime agriculture land with excellent results. The government had done tests on certain species to determine its strength and durability. Those results were admirable. Eucalyptus simply showed great promise.

Eastern furniture companies, aware of the shrinking hardwood supply, and having heard about the eucalyptus industry in California, wanted to relocate in the West. Charles Glum, representing a large Philadelphia furniture company, commented: "We have been on the coast for several weeks, with the view of acquiring lands for the growing of the red Eucalyptus tree . . . I am of the opinion that the gum is a harder wood and is more suitable for furniture purposes . . . It will be necessary to move our factories to this coast . . . In fact, all the large eastern manufacturers are working along the same lines."105

In 1907, the first nursery that was exclusively eucalyptus, produced 600,000 seedlings in its first year. By 1911, all eucalyptus nurseries together in California would have a total production of 7 1/2 million seedlings.106 It took 144 men and 100 horses to plant fields of 1,600 acres in eucalyptus. One manufacturing and milling company bought acreage to supply its saws with eucalyptus lumber. This same company had plans to build a factory to process eucalyptus for implements, vehicle stock, and flooring. The company enthusiastically stated, "Demands for the product are so great that the factory will not be able to supply all the orders offered."107

Hughes Manufacturing and Lumber Company of Los Angeles was using eucalyptus extensively and the demand was so great that orders were hard to fill.108 In reaction to demand for information about eucalyptus, the State Board of Forestry published a circular entitled, "A Handbook for Eucalyptus Planters." It dealt with planting, species, soils, moisture, and climate. It also contained studies on size, age, and yield done by measuring specimens at plantations throughout the state. The purpose was to head off wild production claims.109

It seems that eucalyptus companies were using statistics from the Forestry Society of California, a non-governmental entity. An investigation was launched into society's practices especially the information in its literature. It found that an advertising agency had gathered the statistics and produced the brochures. The society had to be reorganized and its literature cleaned up to the satisfaction of the investigating authorities.110 Still company prospectuses were as one would expect, slick brochures with glowing statements and carefully selected pictures. The advertising prospectus of the Mahogany Eucalyptus and Land Company of Oakland was largely a pictorial presentation containing photographs of trees, nurseries and plantations. Its text made claims in the usual superlative fashion, such as, "This tree at this particular moment is in many instances the most valuable one on the face of the globe. Maturity is in a decade or two. No Teak, Mahogany, Ebony, Hickory or Oak was ever tougher, denser, stronger or of more glorious hardness . . ."111

The prospectus went on to proclaim that the eucalyptus could grow to over 500 feet and that the company's plantations were fully active. It spoke of the many uses of the eucalyptus and about its healing nature as a medicine. The company claimed nine nurseries and had photographs of them. Throughout, the prospectus was nicely done, used typical selling techniques, and didn't appear to be dishonest except maybe the usual exaggerations which one would expect. It ended by saying, "The purpose of the prospectus is to show that the Company's money investiture in Eucalyptus is as the Rock of Gibraltar for impregnable strength and strategic position."112

The president of the Mahogany Eucalyptus and Land Company was Frank C. Havens who did indeed plant eucalyptus throughout the Oakland hills. He got seed from Australia and planted millions of seedlings on 3,000 acres. He built a sawmill, and the company's arboretum contained sixty varieties of eucalyptus. The company was incorporated in December 1910 and was dissolved in February 1913. Its impact can still be seen today in the forests that grace the landscape.113

The eucalyptus companies advertised for investors to be partners in the enterprise. An investor could buy land fully planted and make monthly payments. The company did all of the work, and shared what profits there were with their business partners. It took normally ten years before a profit could be realized. An acre planted in eucalyptus cost \$250

with the promise of making \$2,500 an acre at harvest time ten years later.¹¹⁴ This offer was tempting, and "widows, teachers, and small businessmen invested their life savings in the eucalyptus boom. Farmers ripped out staple crops to plant eucalyptus."¹¹⁵

The railroads took an interest. Santa Fe Railroad planted eucalyptus on thousands of acres at Rancho Santa Fe for ties, poles, and interior woods for railroad cars. By 1908, the railroad discovered, just as the Central Pacific Railroad did several decades before, that unseasoned eucalyptus wood twisted and cracked thus putting an end to their project.¹¹⁶ Even the novelist Jack London got into the act. He planted 100,000 trees on his ranch with the intention of using the wood for furniture. This would not eventuate.¹¹⁷

From Fall 1909 to Spring 1910, 23,000 acres in California were planted in eucalyptus, mostly red and blue gums. These investments were obviously at an infancy stage as it would take years before harvesting could take place. Eucalyptus still at this point was being used primarily for firewood.¹¹⁸

The boom fizzled. It was found that eucalyptus wood could not be seasoned properly to do the things that had been anticipated. Tests of seasoning were performed and processes were structured for proper curing, but there was a great dissatisfaction with these. Eucalyptus wood warped, cracked, twisted, and became too tough once cured. The yields that were projected it was found would take too many years to be realized. The hardwood shortage that spurred the boom was resolved by the use of steel, cement, and other substitutes. Wagons and carriages were being replaced by metal automobiles thus ending that hardwood market. Using eucalyptus for fuel was diminished by the discovery and rising use of oil, gas, and electricity.

The boom ended. Lumber mills using exclusively eucalyptus timber closed. Furniture manufacturers moved back East. Plantation trees were sold for firewood. Pharmacologists dropped their support which meant that eucalyptus would not be used in most medicines. Prime agriculture land was returned to traditional crops. Nurseries unloaded their eucalyptus stock. Through the rest of the twentieth century eucalyptus would be used mostly for fuel, windbreaks, and in certain medicines.

Not everyone was enchanted with the eucalyptus anyway, and now even more felt a dislike as represented in this sarcastic piece from *The Argonaut*:

There is a craze all over the state about the eucalyptus or Australian blue gum tree . . . Eucalyptus will frighten away fevers and murder malaria. Its leaves cure asthma. Its roots knocks out ague as cold as jelly. Its bark improves that of a dog. A dead body buried in a coffin made from the wood of the blue gum will enjoy immunity from the exploring mole and the penetrating worm . . . this absurd vegetable is now growing all over the State. One cannot get out of its sight . . . crops up everywhere in independent ugliness. It defaces every landscape with botches of blue and embitters every breeze with suggestions of an old woman's medicine chest. Let us have no more of it.¹¹⁹

THE DOLDRUMS

For the next 40 years, the country would see wars and a great depression. Interest in eucalyptus declined dramatically and farmers turned to irrigated crops especially in the inland valleys. However, the eucalyptus was well and flourishing. Beautiful forests dotted the coastal hillsides and crevices. They had become a permanent fixture so much so that most residents of the state believed them to be native. Left untouched, their size even awed visiting Australians. Magazines recognized these mammoths by carrying travel articles which pointed out special groves or unique individual trees.

RENEWED INTEREST

There was a spawning of interest in the 1950's. The Masonite Corporation tested various eucalyptus species in regard to fibreboard. In the 1960's, the University of California Cooperative Extension launched a program to identify eucalyptus species determining which ones grew the fastest. Quick growth tied with economics is always of interest. New species were being tested such as *nitens*, *glauca*, and *ovata*.¹²⁰

The energy crisis of the 1970's and a renewed interest in small-acreage farming brought attention to the miracle eucalyptus. Alternative sources of energy was high on the agenda. Instead of turning generators with petroleum fuel, biomass fuel, such as wood and other similar substances, was being considered. This form of energy was examined by the University of California and the State Forestry Department, and in the 1980's, nine biomass study sites were created.¹²¹

Environmental tolerances of the various eucalyptus species are now being tested provoked by recent California droughts and freezes. New smaller species are being genetically produced primarily for highway and urban planting. There are between 70 to 100 species growing in California today.¹²²

The 1980's did usher in renewed large scale growing of eucalyptus for biomass fuel, fibreboard, and pulp for paper. Some growers have planted 30 acres or more with 80,000 to 100,000 seedlings. There are small growers too who may have of an acre of land planted in eucalyptus for firewood. Cords of cut wood are bringing \$125 to \$180. Windbreaks are still being planted for protection of crops and residences. In the recent droughts, certain species of eucalyptus are proving to be survivors and thus are used for shade and ornamentation requiring little care.¹²³

Eucalyptus workshops have been held in Sacramento for the exchange of ideas and new findings. One such workshop was held June 14-16, 1983 and covered such topics as history, species selection, products, uses, economics, growth and yield, cultural requirements, propagation, and breeding programs. Another workshop was held May 9, 1991.

Eucalyptus is found worldwide and is in major industrial production in Brazil and China. There are environmental and cultural concerns to address. It is for certain though, like it or not, the eucalyptus will always be a tree of the future because it has so much to offer humanity.

[Back to Table of Contents](#)

The Eucalyptus of California

Section Two: Physical Properties and Uses

by **Robert L. Santos**
California State University, Stanislaus
Librarian/Archivist
bsantos@toto.csustan.edu

Alley-Cass Publications
Denair, California
Copyright 1997

PHYSICAL PROPERTIES

The eucalyptus can be found in a variety of sizes with some species being among the largest trees in the world; whereas, other members of the genus, may be mere shrubs. It grows on the desert, swampland, valleys, and alpine regions. It finds nourishment in a complexity of soils and can survive in differing types of climate.

The eucalyptus is an evergreen and many species grow very rapidly especially globulus. Mostly erect in form, the tree is strong and usually slender. It is an aggressive plant whose leaves demand every vestige of sunlight, and its roots suck up all the moisture within their domain. The color of the wood varies from white to dark brown depending upon the species with the heartwood and sapwood being indistinguishable among species. The grain of this hardwood is similar to hickory or ash and is just as beautiful if handled correctly by the workworker.¹²⁴

It propagates best from seed, and because of this, there is no transfer of disease as would be the case with cuttings or seedlings.¹²⁵ This has been an important factor in the success of eucalyptus in California which has been virtually disease-free; thus, from the beginning of its introduction into California, eucalyptus seed and not seedlings have been imported from Australia.

IDENTIFICATION

Of all the Australian plants, the eucalyptus species are the most difficult to distinguish from one another because of their physical similarity.¹²⁶ The eucalyptus belongs to the Myrtaceae family in which there are ninety separate genera. In the eucalyptus genus there are over 600 species, and even this figure is an estimate, because there are numerous separate varieties that have a similar nomenclature. This is because trees within an eucalyptus grove grow closely to each other, producing many hybrids.¹²⁷

Classification of the various species of the eucalyptus was first attempted in 1789 by M. Willdenow who used the shape of the operculum or lid as his basis. In 1828 Augustin Pyramus de Candolle created another classification which

was based on the leaf's relative position to the stem. Von Mueller designed still another classification which was contained six bark types. In 1886, George Bentham, followed still with another based on the anthers, which is where the pollen is found, and modified by fruit types and types of oil found on the leaves.¹²⁸

The idea behind formulating a classification is to simplify the identification of the species. But as one can see, classification is in the eye of the beholder -- basically how the inquiring scientist sees the plant. Because of advances in science and technology, identification has been made easier, and because of this, new species have been found. Other eucalyptus classification systems have been designed besides the ones noted above, but the method of using the operculum as a basis seems to be the standard.

CLIMATE

For most eucalyptus species mild climate is the best where there are warm summers, temperate winters, moderate rainfall, dry atmosphere, and plenty of sunlight. Temperature tolerance ranges generally between 15 to 100 degrees F. Quick changes in temperatures, however, are stressful for the eucalyptus especially in the weaker trees. Occasional storms with heavy rainfall are better than frequent rain because sunlight is important for growth as well as moisture.¹²⁹

The eucalyptus grows best along the coast of central and southern California which is substantiated by observing the lush healthy groves and forests found in those areas. An outline of the eucalyptus growing region can be seen by locating the frostline on a California map. Frost-tolerance varies from species to species. For example, blue and sugar gums are damaged when temperatures dip below 26 degrees F. while manna and gray gum can withstand colder temperatures to 22 degrees F. Seedlings many times are killed by extremes in temperatures because of their small size and fragile nature.¹³⁰ Humidity is important to some species especially the blue gum which does quite well in coastal fogs.¹³¹ As a rule of thumb, most eucalyptus species will be successful wherever citrus and olive trees are successful as they essentially require the same climatic mix of moisture and warmth.¹³²

DROUGHT

Drought in recent years has made Californians more conscience of water conservation especially in regard to plant life. Some eucalyptus species have proven to be drought resistant. In the 1917, there was a drought in California where temperatures hovered between 110 and 120 degrees F. It was found that the foliage on most eucalyptus trees burned with the amount of tree damage being dependent upon type of soil and wind. Trees in loamy soil did better than those on sandy soil because it contained more moisture. A survey was done concerning the number of trees killed by the 1917 drought. It was found that of 2,885 blue gum trees examined only 9 died. The red gum did even better in that only 10 trees died out of 4,461.¹³³

FROST

The amount of frost an eucalyptus tree can take is determined by the atmosphere's humidity, the tree's condition, the tree's sap flow, and the age of the tree. Older trees can take temperatures up to 15 degrees F.; whereas, younger trees can take only a minimum of 24 degrees F.¹³⁴ The covering of young trees with straw or gunnysacks is important to protect them from the cold. Exposure to sunlight at any point, young or old, is important to a tree's survival especially in colder weather. Of all the eucalyptus species amygdalina (peppermint) has proven to be the most resistant to frost.¹³⁵ This is followed in frost-tolerance order by red, gray, manna, blue, sugar, and lemon gum trees.¹³⁶ To develop a grove of frost-tolerant eucalyptus, collect and plant seed only from those trees that give evidence of resistance to frost.¹³⁷

A freeze hit southern California in 1913 where temperatures dropped to 14 degrees F. It was found that not a blue gum was lost, and trees in dense groves suffered the least because colder temperatures were kept away from the inner trees.

Blue gum resprouted the quickest to replace the foliage that had been damaged. Plantations having one or two year old trees lost 85% of them. Manna gum proved to be the most resistant to the cold with only 20% of its foliage being damaged.¹³⁸ E.N. Munns, Forest Examiner of the U.S. Forest Service, studied the damage and published his results in *Journal of Forestry*. It is an in-depth study of the species and their damage with the most popular species having good survival rates.¹³⁹

In December 1932, temperatures in the Central Valley dropped to 5 degrees F. Many eucalyptus trees looked destroyed, but because the roots were still alive, foliage resprouted as warmer weather came forth in the spring. Cold winter weather is not uncommon in California because the Alaska storm system sweeps the region. The 1972 freeze did burn back many species of eucalyptus. Once the litter was cleaned from that freeze, another cold-snap hit in 1990.¹⁴⁰ The species less affected by frost are the ones which grow the slowest. They contain less water and hence less moisture to freeze. But it is the common thought, that since eucalyptus resprout anyway after environmental damage, it is still profitable to plant the faster growing species.¹⁴¹

Recent studies and reports have been published in regard to environmental tolerance of eucalyptus. New hybrids and clones are being tried with the hope of finding species that will resist satisfactorily radical temperature fluctuations.¹⁴² A report on frost damage from the 1990 freeze identified certain factors that determine eucalyptus damage among which are soil moisture content, duration of the low temperatures, tree size and condition, local climate, and the time in the season the freeze strikes. In the 1990 freeze, temperatures went as low as 10 degrees F. in the Bay Area. The eucalyptus trees suffered enormous amount of damage from curled stems and twigs to split bark.¹⁴³ It is a fact of life, that freezing weather is unkind to this genus, but it is also true that it will fight back by producing new sprouts in the warmer months. It is simply a hard tree to kill.

SOILS

The perfect soil for most eucalyptus species is deep, well-drained loamy soil. The problem is this soil is used by other more valuable agricultural crops. The eucalyptus is generally planted on unused or worthless sections of acreage which contain poorer soil. The chemical composition of the soil is important though in that large amounts of harsh chemicals will stunt and damage the tree.¹⁴⁴ The soils moisture content too is important because most eucalyptus species are dependent upon massive amounts of water for their quick growth.¹⁴⁵

Water availability depends upon the water table depth. Ideal depth for most eucalyptus is a water table that is eight to ten feet below the surface. Some species do well with a water table depth at thirty feet. Hardpan near the soil surface is not good though because the roots are prevented from seeking the water table. The roots will in this case grow laterally not giving the tree a strong and sturdy taproot. Eucalyptus responds well to moist soil through natural rainfall or irrigation. However, most species won't grow in standing water such as is found in swampy land. Two species which do excel in such dampness are the red gum and swampy mahogany.¹⁴⁶

Soils for eucalyptus need to contain plant food elements such as potash, lime, magnesia, iron, phosphoric acid, and humus with high nitrogen content.¹⁴⁷ Eucalyptus roots can spread out to 100 feet laterally and sink 60 feet into the soil.¹⁴⁸ There has been much experimentation with eucalyptus growing in alkali soils. Alkali deposits can stunt a tree's growth until the roots break through it.¹⁴⁹ But there are species that can absorb alkali removing it from the soil so other crops can be planted successfully. In 1985, over 650,000 eucalyptus and casurina trees were planted in western San Joaquin Valley to determine the ability of these genera to remove alkali found in the soil of undrained land.¹⁵⁰

SEEDS

Eucalyptus seeds are generally small in size with only a few within a capsule being fertile. The hardiness of the tree determines the number of seeds it produces. Trees between twenty to forty years of age produce the most seeds. Sunlight is needed to germinate seeds that is why in dense forests or groves no seedlings grow. The canopy of the foliage and the litter on the ground keep the sunlight out.¹⁵¹ But when a fire sweeps through a forest, seeds are

exposed to sunlight allowing replacement of damaged trees. The eucalyptus produces massive amounts of seed to allow survival after such environmental damage.¹⁵²

Many non-native plants do not reproduce from seed naturally, but eucalyptus do in California.¹⁵³ This demonstrates its adaptability to foreign climate and soils. The fruit of the eucalyptus remains unopened until it falls to the ground. Seed dissemination is uncommon by the wind or birds; consequently, seedlings appear right beneath the parent tree where the fruit dropped.¹⁵⁴

In the early planting years in California, results from eucalyptus seed held some surprises. Quite often the species desired was not the species produced from the acquired seed. This caused much discouragement and frustration. Even seed from known experts were mistakenly identified. For example, Baron von Mueller sent seed to L. Stengel, a Los Angeles nurseryman, which produce other species than thought. The problem was not really in the mishandling and misidentifying seed, but lay in environmental differences. Because California varies somewhat in climate and soil from Australia, the Australian seed planted produced a California eucalyptus which is somewhat different in character.¹⁵⁵ Also, many eucalyptus look alike such as the manna and red gums.¹⁵⁶

Abbot Kinney remarked in 1895 on seed confusion: " One of my most reliable correspondents in years gone by has sent me seed marked *Eucalyptus polyanthema*, which turned out to be *Eucalyptus gunnii*, and packages of *rostrata* that in one case contained six different species of *Eucalyptus*."¹⁵⁷

Blue gum seeds are small, mostly fertile, and can be kept for up to four years before planting. One ounce of seed contains 10,000 fertile seeds.¹⁵⁸ Still eucalyptus trees can be difficult to propagate due to the smallness of the seed, general infertility, and required climates.¹⁵⁹ The best time to collect seed is in late summer or early fall. Spread the seed capsules out in the sun and the seeds will be expelled from the capsules in a few days. Good seeds will germinate within a week.¹⁶⁰ Start the young seedlings with seeds in flat nursery boxes. Plant the seedlings in prepared soil after the frosty season. It is best to plant on cloudy days with the likelihood of slight rain.¹⁶¹

In recent years, seed sources have become extremely important because of the economics of the massive eucalyptus plantations found in Brazil and China. In 1985, the first seed source studies began to appear where seeds gathered from various locations in Australia and California were tested for hardiness and growth.¹⁶² Of recent, there has been such a demand for seeds from the Lake Alcatraz area, an Australian national park, to the point where the authorities are concerned that there is not enough seed left to maintain the natural forests there. This puts pressure on the non-Australian countries to grow their own seed for planting.¹⁶³ In 1987, tests began to enlarge the pool of California-produced seed. Such studies are important because reliable seed sources are critical to the future of eucalyptus as a commercial entity.¹⁶⁴

In place of seed reproduction cloning of eucalyptus is being tried. This is done by taking a "rooting" from a stem or stump, and planting it; thus, the new tree is in reality the same tree or a clone.¹⁶⁵ Hybridization can occur though when several species are in a grove sharing the same soil. Selection of a rooting then must be done carefully to assure that the desired clone is produced.¹⁶⁶

YOUNG PLANTS

Young eucalyptus require frequent watering. Coastal trees usually find enough moisture from fog where the trees in the inland valleys get water from irrigation. Weeds need to be eliminated near young trees because they rob the soil of the life-sustaining nutrients. Also rodents need to be kept away from seedlings because they will ravish them.¹⁶⁷

As the eucalyptus grows its lower branches drop off leaving a trunk that is like a straight pole. In crowded groves, young trees compete for sunlight making them straight and thin.¹⁶⁸

STRENGTH

Hardness, strength, durability, and flexibility varies with each species. Eucalyptus is generally very tough, and resists denting, tension, and torsion.¹⁶⁹ Strength tests done early this century found that eucalyptus compares with white oak and hickory. Australian and California grown eucalyptus were tested for strength and found that there wasn't any difference.¹⁷⁰

Because eucalyptus uses extreme amounts of water to feed its fast growth, the woodgrains are few, and the texture is very dense. Freshly cut eucalyptus wood will sink in water because of its weight.¹⁷¹ After being dried, shrinkage of eucalyptus timber is between 34.6% and 13.5% depending upon the species and environmental conditions.¹⁷²

FOLIAGE

The color found in eucalyptus foliage varies according to the species, and usually it is blue, light or grayish green, or dark green. The foliage varies in density from sparse to very dense. Young leaves are broad and short becoming long and narrow as the tree ages. The edges of the leaves point to the sun for the collecting of sunlight. Leaves are also thick and leathery containing oil glands which emit a highly-scented odor.¹⁷³

FLOWERS

In most eucalyptus species, the flowers are noticeable with some being profuse and showy. Their color varies from white, cream, pink, yellow, and red depending upon the species.¹⁷⁴ There are two types of flowering eucalyptus: one which flowers once a year and one which flowers most of the year. Only sideroxylon and polyanthema species are of the former, and amygdalina, regnans, angostriifolia, and linearis are examples of the latter. The constant availability of pollen for honey bees year round is an economic advantage, but eucalyptus honey has a strong peppermint taste and odor which makes it disagreeable to some consumers. Manufacturers mix it with orange blossom honey for a better taste and scent.¹⁷⁵

BARK, TRUNK, and ROOTS

Eucalyptus is known for its shedding bark and its smooth white, almost porcelain-appearing, surface underneath. Commonly today, along California freeways, one can see another type of eucalyptus which has a black furrowed surface that doesn't shed. It doesn't have the artistic appearance of the other but serves a purpose in the drought exposed areas of the interior.

Baron von Mueller developed a classification of eucalyptus by bark type. For example, gums have smooth bark which is gray-creme and sheds in ribbons or in flakes. Bloodwood species can be both smooth-barked or rough-barked. Boxes and peppermint species have fibrous and closely interlaced bark. Stringybarks are fibrous, thick, coarse, and don't shed. And ironbarks have black furrowed bark containing kino or resin which hardens in the air.¹⁷⁶

The trunks of many eucalyptus species are erect and straight-grained. The circumference of these trunks is larger at the bottom gradually getting smaller going up the trunk. This is a proper shape necessary for poles, masts, and piles. There are some species that have crooked trunks and are used for other purposes.¹⁷⁷ Some trunks look like mottled marble being silver or white in color.¹⁷⁸ Eucalyptus trunk wood is as hard as hickory and just as tough to penetrate.¹⁷⁹

The root system is important to the eucalyptus primarily because its rapid growth and size demands large quantities of water. It needs a strong taproot to secure it and lateral roots to support its size. The taproot needs to sink down into the soil at least six feet for good anchorage. Lateral roots will spread out to one hundred feet which can be a problem when planted near buildings and other types of facilities. The roots and rootlets can disrupt ditches, crack cisterns, clog water pipes and damage septic tanks.¹⁸⁰ Eucalyptus roots are aggressive.

CROPPING BACK

For survival the eucalyptus has a natural tendency to resprout after it has been cut back or environmentally damaged. Usually within three to six weeks new sprouts will appear. It is suggested to keep two to four of the largest and more erect sprouts while removing the others. This will give those remaining sprouts the opportunity of being satisfactorily nourished. These new sprouts in reality are new trees growing from a mature root system.¹⁸¹

The proper time for cutting eucalyptus for lumber and firewood is during the rainy season. This way there is enough soil moisture for the stumps to sprout vigorously. After groves have been recut several times, they decrease in rate of growth and yield. One should consider replanting when depreciation is readily noticeable.¹⁸²

THE MULTIPLICITY OF USES

Eucalyptus serves man well. It has more useful purposes than any other tree on earth. For example, it provides forest cover for any terrain from mountains to swamps. It gives shade and acts as a windbreak. It furnishes gum, resin, oil, and nectar. When cut it is used for fuel, construction, poles, posts, and hardwood products. The eucalyptus even has the reputation of improving the climate in which it grows.¹⁸³ It has been proclaimed to be "The Tree of California."¹⁸⁴

In its native land of Australia, the eucalyptus was found in virgin forests and provided the settler with a multitude of products from firewood to strong timbers. It was used in the manufacture of ships, bridges, railroad ties, railroad vehicles, wagons, furniture, agricultural implements, paving blocks, barrels, poles, piles, and posts.¹⁸⁵ It was used just like hickory, oak, and ash in the United States.

It was found in Australia that blue gum wood used inside railroad cars lasted at least twenty years. Such use requires elasticity, strength, and durability. A house was built in Toowoomba from eucalyptus and was still in excellent condition after thirty years. A bridge crossing the Dawson River containing eucalyptus girders and piles, forty years later was as strong as when first built.¹⁸⁶ Eucalyptus wood can be as hard as iron and as durable if it receives proper treatment.

Eucalyptus has been used in place of mothballs, to scour out boilers, in various medicines, pulp for paper, and in landscaping. Today it is used also as biomass fuel, ply- wood, charcoal, and as an alcohol substitute in gasoline engines.¹⁸⁷ It also is being used to drain waste water to eliminate soil salinity.¹⁸⁸ (Even the Israelis have used eucalyptus trees surreptitiously to mark Syrian targets.¹⁸⁹ In Mexico, marijuana and poppy growers have used eucalyptus to hide their illegal crops.)¹⁹⁰ There are so many uses for eucalyptus that it is like the proverbial pig where everything is used except the oink. In the case of the eucalyptus, everything is used except the noise from its rattling leaves and someone might find a use for that with new technology.

AS FOREST COVER

Eucalyptus provides valuable forest cover which can become especially thick if not maintained properly. Ellwood Cooper was the first to recognize its potential as a forest cover and discussed it at some length in his lecture at Santa Barbara College in 1870. He planted eucalyptus on a massive scale at his Santa Barbara ranch, beginning with 50,000 trees in 1872. He planted seedlings on hillsides, in canyons, on ocean bluffs, and flatlands. Cooper planted them not just for forest cover but for wind-breaks, shade for roads, for timber and firewood. In 1900, he had 200 acres of eucalyptus forest of various species which was a showcase to interested public. McClatchie wrote in Out West in 1904:

One can stroll through his groves as through primeval forests. In the canons, Eucalypts twenty-five years old tower high above oaks that have been growing there for over two centuries. On hillsides that were formerly bare are dense forests in which ferns and other shade-loving plants find a home. Wind-swept plains that formerly gave small returns in the crops to which they were planted yield abundantly since they have been sheltered by groves of Eucalypts. For

*over a score of years Mr. Cooper has been reaping the reward of his foresight. Besides enjoying the beauty, the shade, and the shelter of his grove, he has received from them directly a good financial return for his expenditure.*191

FOR FIREWOOD AND BIOMASS FUEL

Using wood as fuel for heating and cooking is as old as man. Because of its rapid growth, eucalyptus became an attractive fuel and was planted for that reason and for that purpose. Today, besides the traditional fireplace or cookstove uses, eucalyptus wood is chipped and used as biomass fuel in the generation of electricity.192

It was suggested in a 1903 Scientific American article that because of its rapid growth and size, eucalyptus would replace other fuels such as coal in California. Fuels from petroleum were entering the mass market at this time and soon would replace most wood sources. Still most homes used wood for fuel and industry used wood in its steam engines.193

Wood from most eucalyptus species makes good fuel. Groves of five years will produce 50 to 60 cords while groves of ten years will supply 80 to 150 cords. The quality of the soil, irrigation practice, and maintenance will vary the size of the yield. The cost of cutting the grove is determined by the age of the tree and the type of species. In 1908, it took one-half of the market price to cut and stack wood for sale.194

For so many years in southern California, firewood came solely from blue gum trees. This area was virtually treeless and eucalyptus groves were planted to service the need. In 1908, this was said about the firewood industry.

*The returns of investments in Eucalyptus plantations have been generous, in many cases exceeding those received from equal areas under cultivation in orchards or agricultural crops. Groves set out in fertile Los Angeles Valley have yielded from 50 to 80 cords per acre at every cutting. Yields of 75 cords per acre every seven or eight years have been frequent.*195

In northern California, planting of eucalyptus for firewood before 1900 was not on a large scale because oak was still available. In 1910, it was predicted that oak would vanish as agriculture encroached, and consequently forests of eucalyptus would be needed.196

Eucalyptus burns brightly and has a refreshing fragrance. It is equal to oak as firewood and is better than other natural California wood. The best fuel comes from ten year old trees.

It does cost more to saw and split wood from mature trees because of their size and hardness. In 1924, eucalyptus firewood garnered profits of \$1.50 to \$4 a cord varying according to the condition of the wood, location of the grove, and other contributing factors. On contract, grove owners had wood cut and stacked for \$8 to \$12 a cord. When sold to the customer in the field, a cord brought \$10 to \$16, but if delivered, a cord would bring \$18 to \$24. However, when competing with other wood, eucalyptus might bring as little as \$1 a cord depending upon the distance from the market and the nature of the terrain.197

It was reported in 1908 that eucalyptus wood was sold in 96 cubic feet cords, known as the "California cord," rather than the usual standard cord of 128 cubic feet.

Logs were in ten inch lengths rather than the normal eighteen inch lengths and was bought by consumers without much protest.198

Because of its high water content, eucalyptus wood would shrink by 15% as is the case with blue gum when seasoned. Eucalyptus wood had to be split quickly after cutting because as it dried it became very tough. Straight-grained species, such as sugar and red gums, usually split without difficulty, but blue gum with its interlocking fibres had to be split immediately. Blue gum too could not be put directly on the ground as it rotted quickly.199

During the eucalyptus boom, an eucalyptus cutting industry developed in southern California. Groups of cutters would

harvest blue gum on a contract basis. These traveling gangs of woodcutters would saw and split wood at \$2 to \$3 a cord. The growers would in turn sell the wood for \$3 to \$8 a cord price varying according to the amount of transportation needed to move the cut wood.²⁰⁰

Over the years the University of California, the U.S. Forest Service, and other governmental agencies have done numerous tests on eucalyptus comparing species and comparing eucalyptus to other trees such as oak and hickory. These tests were done to determine eucalyptus' value as a fuel and as timber resource. These tests continue today because of the interest in biomass fuel worldwide.

From 1977 to 1984, a growth rate study was done in northern California which found that the eucalyptus species *viminialis* and *camaldulensis* grew faster than Monterey pine, walnut, and redwood.²⁰¹ Another study was taking place at the same time, analyzing the survival and growth characteristics of eucalyptus species. It was found that *globulus*, *camaldensis*, *dalyrympleana*, and clones of *camaldulensis* were the better species in a foothill environment when under an intensive maintenance program.²⁰²

The Simpson Timber Company, Tejon Ranch, the U.S. Bureau of Land Management, and U.S. Forest Service's Institute of Forest Genetics collectively ran tests at twelve eucalyptus groves in California concerning the eucalyptus' viability as a fuel for industrial plants. Another part of the study was on quality seed sources. The results were positive as indicated by this remark at Tejon Ranch: "We started growing eucalypts three years ago and so far it looks promising. If the trees are profitable, we'll grow them alongside our other cash crops."²⁰³ It was found that blue gums can produce ten tons of dried wood per acre per year. Such a yield comes from fifty foot eucalyptus trees that are about six to ten years old. This same yield would take other hardwoods nearly fifty or more years to produce."²⁰⁴

There are many misconceptions as to the quality of eucalyptus firewood. It is felt by some that it doesn't generate as much heat as oak and orchard trees. It is the moisture in the wood that determines heat value. The drier the wood the more heat value it has. Freshly cut wood generally has about 50% moisture content. When dried, moisture content is drops to 10% to 25%. Wood from most eucalyptus species generate heat equal to oak, but orchard wood being denser, generates more heat. But ultimately, it is the heating appliance (stove) that really decides the degree of heat produced anyway.²⁰⁵

The oil shortage of 1973 caused the government to look for alternative sources of energy. It has been suggested that hardwood could be grown on unused federal lands, and this would supply 5.6% of U.S. energy.²⁰⁶ In 1989, there were at least seventeen furnaces in the United States that burned wood or biomass wastes to generate electricity. Some generating stations have explored the possibility of growing their own trees near the stations for less costly harvesting process.²⁰⁷

In 1988, Cal-Bio, a biomass firm, had projected the construction of five biomass plants in California and felt that chipped eucalyptus wood could be used. It would take 150 to 200 tons of material each year to fulfill the need. But it was found in a recent study that the cost of harvesting, chipping, and transporting the woodchips would be too costly to justify the investment. One solution was to plant trees nearer the biomass plant and plant more acres.²⁰⁸

The estimation of the volume of fuel an eucalyptus tree produces has proven to be difficult to calculate with a great deal of accuracy. In 1974, the California Department of Forestry designed a table to project the yield from blue gum trees, but the table was for trees used as windbreaks and not grown specifically for fuel. In 1989, another table was developed to remedy the problem.²⁰⁹ It is not easy to predict yield because there are so many variables that can alter production, such as the age of the tree, spacing between trees, weather, soil, pests, and other environmental factors.²¹⁰

The research now is centered on scientifically producing eucalyptus species either through genetics, cloning or seed selection. There is a growing body of scientific literature on the eucalyptus. Recently an eucalyptus organization was formed which is based in Davis, California. Its name is the Eucalyptus Improvement Association, and it publishes numerous studies, reports, a quarterly newsletter, and news of the industry. It is a nonprofit organization consisting of private landowners, farmers, state and federal agencies, university extension, and forest industry personnel.

In 1978, the U.S. Department of Energy published a study entitled, "The Eucalyptus Energy Farm." It is a marvelous document providing a wealth of information on running one's own energy farm successfully.

An eucalyptus workshop was held in Sacramento, June 14-16, 1983, under the sponsorship of the Pacific Southwest Forest and Range Experiment Station and the Cooperative Extension at the University of California, Berkeley. Speakers shared their knowledge of species selection, products, uses, economics, growth, yield, cultural requirements, breeding programs, and propagation.²¹¹

There is a continuing interest in finding new uses for the eucalyptus. At the MIE University of central Japan, for example, eucalyptus-produced fuel was used in a small farm engine. The fuel produced about the same power as gasoline but emitting 50% less carbon monoxide. Cost is a factor because it takes \$10 to produce a litre (1/5 of gallon) while it costs 60 cents to produce petro.²¹²

Eucalyptus is also used to make potash and charcoal. Potash is made by burning wood in pits, leaching the ashes, and evaporating. But in the late 19th century, potassium compounds were found and replaced potash in the making of ceramics, glass, soap, fertilizers, and munitions.²¹³ Eucalyptus produces an excellent grade of charcoal better than most native California wood. One cord of eucalyptus makes 1,000 lbs. of charcoal. To produce charcoal, wood is burned in a kiln for about three weeks. It must be watched constantly which makes it expensive to manufacture.²¹⁴

AS WINDBREAKS

Windbreaks are used to reduce the wind's force or velocity to make life more livable for humans, plants, and animals. It reduces soil erosion and limits dust. A home can save 30% of its heating and cooling costs by having a windbreak because it reduces the effect of hot and cold winds. It also provides shade. In regard to crop production, it reduces wind damage to crops thus yields are greater. Windbreaks protect stock improving their condition. Milk cows give more milk, and sheared sheep suffer less. Currently a windbreak could cost \$1,500 to \$2,000 but the results pay for it.²¹⁵

Blue gum trees make the best windbreak. Some of the other species are too short or they don't have enough foliage to disrupt the wind. When planning a windbreak, it is important to know the wind patterns in the area and to select the proper species. In 1950, it was reported that there were two thousand miles of windbreaks in southern California primarily to protect citrus groves.²¹⁶

Crop protection is vital in California as some agricultural crops would fail without the benefit of eucalyptus windbreaks. This commentary reveals that importance:

In citrus sections, such as the Santa Paula, San Fernando, San Bernardino, San Gabriel, and Santa Ana valley, windbreaks alone render the production of citrus fruits profitable. In unprotected orchards, nearly the entire crop is frequently blown from the trees, or so scarred and bruised that the grade and market value are much reduced. Orchard trees are even broken or partially defoliated during severe storms."²¹⁷

Windbreak trees must be "wind-firm." The eucalyptus has an extensive lateral root system which makes it "wind-firm." Blue gum is a perfect windbreak tree because it has strong root anchorage, a flexible stem (trunk), and foliage that redirects wind. Its foliage does not stop the wind but directs it upward which is ideal for crop protection.²¹⁸

In northern California, eucalyptus windbreaks are used to protect vineyards, nut and fruit trees, vegetables, and grain. As one has observed, "Eucalyptus windbreaks in some sections have changed the aspect of the country, and by moderating the winds have greatly improved climate. Waste and sandy stretches have been turned to productive agricultural use."²¹⁹ In Oxnard, windbreaks hold in place loose sand which is usually buffeted by strong gusty winds. The sugar beet industry in Oxnard would be non-existent if it weren't for the windbreaks.²²⁰ In the Salinas Valley, windbreaks divert winds that could ruin truck farming crops.²²¹

Eucalyptus windbreaks protect towns and seaports from damage. In the latter, docked vessels are left secure and unharmed by fierce winds that can hammer the sea

coast. Sand stays in place and does not drift. It is recommended that eucalyptus windbreaks run at right angles every quarter of mile on level ground. Near the foothills, the spacing should be closer together however. To protect orchards, the windbreak rows should have a space every 100 to 200 feet. Heavy winds will sway the upper foliage of a windbreak tree, but the bottom foliage shelters the crops. Windbreaks also help to protect against freezes by cutting back on windchill.²²²

The best spacing for individual trees within a windbreak is four feet in double rows. Double-row configuration is especially good where there are strong winds because it prevents wind leakage. Trees are planted in double rows in an alternating fashion sealing off the holes in the windbreak. It has been found that windbreaks on the north or east sides of an orchard or field is less affective. Usually the south side is left open for wind drainage. It is not uncommon to find where there are strong ocean breezes multiple rows of windbreak trees. Many windbreaks use a combination of Monterey pine and eucalyptus. One has density while the other has height.²²³

Eucalyptus windbreaks should be properly managed. Older trees should be removed because they lack lower foliage which will allow wind to get through. Litter dropped by the windbreak trees should be picked up to protect against fires which can destroy a windbreak.²²⁴ Irrigation or watering is needed for a healthy windbreak. Because the eucalyptus needs large amounts of water for growth, adequate watering is essential or the lateral roots from the windbreak trees will rob and stunt the trees that it is protecting. Some growers have dug trenches three to four feet deep between the windbreak trees and the orchard trees to stop lateral root extension.²²⁵

AS TIMBER

Eucalyptus timber has been put to similar uses similar as other hardwood. It has had some success, but it has failed as well. Its failure is really a misconception in the minds of growers and investors. They were expecting too much from the young eucalyptus trees. They were anticipating products like those produced in Australia. The problem was those products came from eucalyptus trees in virgin forests which were several hundred years of age. The quality of the wood from these older trees differs greatly from the young eucalyptus trees found in California. This misunderstanding meant economic ruin for some in California. It also gave the eucalyptus a bad reputation which still exists today.

Settlers in Australia used the eucalyptus trees just as pioneers in California used the oak and redwoods. They needed shelter, vehicles for transportation, household amenities, and fuel for survival. Eucalyptus timber was used in the construction of ships, buildings, bridges, wharves, and railroad cars. It was used in the manufacturing of barrels, paving blocks, agriculture implements, and furniture. It was also cut for poles, posts, and pilings. The eucalyptus was instrumental in the successful settlement of the vast Australian continent.²²⁶

Shipbuilding was an important industry in eastern Australia and in Tasmania. The towering blue gum supplied timbers for the construction of a multitude of ships. There was a certain pride in this effort as seen in this excerpt:

*These early Tasmanians were unusual men, their achievements and characters were amazing and the ships they built so sturdy that Time could not destroy them. When they wanted ships they built them, not always in properly appointed shipyards, but often in creeks or on beaches or river banks, wherever suitable tall trees grew. These big-hearted men felled the trees, pit-sawed them by hand power into planks, beams, keels, and frames, to shape their vessels which were to brave the ocean storms and the dangers of uncharted coasts. And they carried the name and fame of Tasmanian ships and seaman over the seven seas.*²²⁷

These blue gum ships sailed into San Francisco Bay loaded with men and supplies for the California gold fields. These ships served as vivid examples of what the eucalyptus could do. They showed the utility and toughness of the wood. Australian eucalyptus timber was imported for a number of years until the eucalyptus in California reached some maturity.²²⁸

AS POSTS, PILINGS, POLES, and RAILROAD TIES

One of the early uses of California eucalyptus was for fence posts. The blue gum grows quickly, is straight in form,

and was grown on ranches. Its wood is hard and strong but less durable in the ground than other species, such as sugar and red gums, but nonetheless it was a popular fence post tree.

Experiments were done early this century testing the durability of the various eucalyptus species in soil. It was found that treatment with creosote extended the groundlife of any post dramatically.²²⁹ When treated with creosote, eucalyptus posts would last between eight to ten years. They still would split and check though once dry. Also it was hard to drive a nail into the dried wood.²³⁰ These problems stifled their usage.

Eucalyptus timber was used as pilings for wharves along the coast and also to support roadways. Pine was the acceptable timber, but eucalyptus was used in a number of wharves. The enemies of pilings along the Pacific Coast are the teredo and limnoria worms. They can do immeasurable damage literally destroying wharves within a short period of time. These worms are transported from wharf to wharf by ships.²³¹

The teredo lives under water while the limnoria lives at the waterline and does the most damage.²³² The teredo is about four inches in length and eats up and down a piling. The limnoria on the other hand is the size of a pin and eats across the grain sawing the piling in half. These worms can destroy a wharf in seven years.²³³

Eucalyptus pilings proved to last longer in salt water than pine or even redwood. Most eucalyptus wharves had a last eight to fourteen years depending upon the species and the treatment of the wood.²³⁴ Wharves at Crescent City, Oakland, Port Harford, Gaviota, Serena, Summerland, Avalon, and San Diego used eucalyptus pilings.²³⁵ Oceanside and Santa Barbara piers used eucalyptus as well as reported by A. J. McClatchie in 1902. He also wrote that Abbott Kinney of Santa Barbara in a ten-year period had sold \$10,000 worth of eucalyptus timber for pilings.²³⁶

Eucalyptus pilings were usually 30 to 35 feet in length and had a diameter of 12 to 24 inches. In 1908 they brought \$5 to \$15 on the stump.²³⁷ It always has been difficult for eucalyptus to be fully accepted as a piling wood. Some wharf managers went so far as to hide the eucalyptus pilings from the public by placing a pine piling in front of them. Once the eucalyptus piling outlasted the pine one, the public was told of this.²³⁸

The eucalyptus species jarrah resists the worms the best. In 1894, it was said that had jarrah been used in the San Francisco wharf that it would have saved the city \$25 million over a period of forty years!²³⁹

Manna and blue gum timber was used in construction along the Santa Ana River in Orange County early this century. A causeway between Ventura and Santa Barbara used blue gum pilings as well. Though sugar, gray, and red gums are more resistant to decay, blue gum was the choice because of its availability to these projects.²⁴⁰

Normally Oregon pine and cedar were used for telegraph and telephone poles. Eucalyptus was tried as noted in this 1908 excerpt, "Eucalyptus poles have been tried to a limited extent, and may be expected under treatment to outlast the pole timbers in present use."²⁴¹ In Tasmania, just prior to 1876, a construction supervisor reported, "We used for poles young trees of the Blue Gum, White Gum, Red Gum, and Stringy-bark, taking only the bark off. We charred the butts as far as they went into the ground."²⁴² Once again, the timber used in Tasmania was from virgin forest prime for durability and strength. The younger and weaker California eucalyptus never reached this grandeur and subsequent respect; and consequently, it saw little use as telegraph and telephone poles.

In the late 19th century, Southern Pacific Railroad experimented with blue gum railroad ties in Nevada. A few hundred green and untreated ties were laid in sandy soil in central Nevada. Their strength and wear were within tolerance, but because they didn't receive proper seasoning and treatment, they cracked or checked badly so much so that the ties could not hold spikes. After four years, some of the ties had deteriorated from decay, but others lasted for eleven years. It was speculated that had these ties received the proper seasoning and treatment, they could have lasted much longer. Also other species, such as sugar, gray or red gums, would have lasted longer than blue gum. The blue gum ties however were considered equal to ties from second grade southern pine.²⁴³

With the eucalyptus boom of the first decade of the 20th century, came a resurgence of interest in using eucalyptus timber as railroad ties and in other railroad related construction. The Santa Fe Railroad bought the 10,000 acre Rancho San Dieguito in northern San Diego County which was about five miles from the ocean. Company representatives chose to use eucalyptus timber in their enterprise because of the tree's rapid growth, quality of wood, and its adaptability to railroad purposes. The hills and hillsides were planted in trees while the valleys were in planted with

alfalfa and flowers. It was aesthetics with economics.²⁴⁴

The railroad company planned to use the eucalyptus wood for ties, posts, and finish work inside the railroad cars.²⁴⁵ It needed three million ties a year which could be easily satisfied by a production prediction of seven million ties a year once the eucalyptus forest had reached maturity of eighteen years. They expected to cut alternate rows of timber for posts after five years. Proper amounts of groundwater seemed to be available and rain would supply water too. The trees were expected to do well in this environment.²⁴⁶ Three thousand eucalyptus seedlings were shipped from Australia and planted at Rancho San Dieguito.²⁴⁷

Shortly, Santa Fe Railroad had the same problems with the eucalyptus timber as the Southern Pacific Railroad had decades earlier. It wouldn't hold spikes because it split and checked. The eucalyptus ties simply didn't weather well. Soon the project was dropped, and the railroad sought other types of wood.

Over the years the untouched eucalyptus forests at Rancho San Dieguito grew lush and verdant. After World War II, Santa Fe Railroad turned the land into a residential development giving it the name of Rancho Santa Fe. A Spanish theme was applied to the development, and the land was bought up by celebrities, such as Douglas Fairbanks, Jr., Robert Young, Victor Mature, and Bing Crosby, who built elegant homes on their properties. There is a local ordinance which reads, "Removal of eucalyptus is prohibited."²⁴⁸

USES AS A HARDWOOD

Many species of eucalyptus produce hardwood of quality and beauty which is comparable to most U.S. hardwood. In 1908 this was written: "The timber eucalypts furnish hardwood possessing qualities similar to those of Eastern hickory or ash. The wood differs in strength and durability, but in general the timber is very strong, heavy and hard, with a close-grain and homogeneous structure."²⁴⁹ At the time of this writing, the United States was in the midst of a hardwood scare which provoked great interest in the fast-growing eucalyptus as a solution to the deteriorating hardwood supply.

California has no natural hardwood; consequently, it had to be imported at considerable cost. Planing mills in California, just before and after the turn of the century, used both California and Australian eucalyptus in their wood products. These mills and woodworking shops could be found in San Francisco, Los Angeles, and San Jose. Because most considered eucalyptus to be just firewood, there was a reluctance to use it for finished products. But the mills and shops persevered with a certain craftiness as seen in this statement made by a planing mill owner: "Seasoned blue gum timber has been substituted in San Francisco for orders for maple, hickory, and 'ironwood' without the knowledge but to the entire satisfaction of the purchaser."²⁵⁰

In 1910, T. J. Gillespie, manager of the Hardwood Planing Company of San Jose commented that his shop was ". . . operating almost exclusively in eucalyptus wood because it is the best hardwood in California today for high grade work. This wood is used in lieu of a second hickory, ash and oak, and is considered equal to any of them."²⁵¹

In a letter from the Hughes Manufacturing & Lumber Company of Los Angeles, dated December 20, 1909, the company proudly remarked that it had been using eucalyptus wood for three years in interior finish work for cabinets and paneling. It was responsible for the interior work in the Grosse building in Los Angeles which received high acclaim for its beautiful mahogany-like panels. The Hughes letter continued in its praise of eucalyptus wood:

*The wood is fully as strong as oak or hickory. When properly cured, it is as free from warping or checking as any hardwood we have. In fact, in view of the scarcity of oak, the many uses to which eucalyptus is adaptable, it will doubtless become the hardwood of the future.*²⁵²

Hughes Manufacturing had a steady supply of orders and wished that there was more eucalyptus wood available. Besides paneling, Hughes sold flooring board which ran \$65 to \$75 a thousand feet for 3/8 inch cut and \$110 for 7/8 inch.²⁵³ The species red gum and gray gum show a beautiful mahogany finish. The blue gum was used in interior trim, furniture, and flooring and would take any color of stain.²⁵⁴ Hughes Manufacturing was completely satisfied with the results received from eucalyptus wood.

One veneering plant in California reported it used eucalyptus. Several shops used eucalyptus in furniture but not in any sizeable production.²⁵⁵ One source noted that John Breuner Furniture Company of Sacramento and San Francisco had manufactured eucalyptus furniture. The company commented, "It (eucalyptus) works up very nicely, does not check, is very close-grain and takes a very beautiful finish, dainty, rich and attractive, equal to natural finished mahogany."²⁵⁶ Breuner's has no record of this activity per correspondence by this writer. Also the libraries of the American Society of Furniture Designers and the American Furniture Manufacturers Association have no information on furniture made from eucalyptus. Yet the evidence points to the fact that some eucalyptus furniture was made.

G.B. Lull, State Forester, wrote in 1908, "Seasoned blue and red gum wood has been used to a limited extent for cabinet work and for the manufacture of furniture. Handsome chairs and tables have been made, which are very strong and do not warp, check or loosen at the joints. The wood takes a splendid finish and has been stained to imitate mahogany very closely."²⁵⁷

In the 1920's eucalyptus was used in interior doors. The book entitled *Homes & Interiors of the 1920's* contains pictures of doors made from eucalyptus. C.H. Rogers of Watsonville grew eucalyptus and had it sawed at a local mill. He then used it in the interior of his house. T.A. Rogers of Oxnard had eucalyptus flooring put in his house which was to be believed to be the first.²⁵⁸

Blue gum was used in the manufacture of insulator pins for power poles. The power companies found the pins satisfactory for their purposes and the cost was very reasonable. At one point a manufacturing company in Sonoma produced 125,000 pins a year using twenty-five year old trees. The cut eucalyptus timber was seasoned for six weeks, and the pins didn't crack, warp or check. They proved to be just as strong and durable as high grade black locust.²⁵⁹ Insulator pins were sent to markets in Canada and the eastern United States.²⁶⁰

IT SHOULD BE WELL-SEASONED

Eucalyptus wood needs to be seasoned, and if properly seasoned, it contains similar qualities of other hardwoods. If not seasoned it will crack, check, and warp. Eucalyptus is a tree that absorbs tremendous amounts of water for growth; consequently, its composition is dense and virtually grainless. When it dries it shrivels because of the large water loss.

California eucalyptus trees were generally young sapwood having none of the utilitarian characteristics of the mature trees found in the virgin forests of Australia. To fully use the lumber from the young California trees seasoning was needed. Tests and experiments were done to determine correct seasoning methods. The public was made aware of these seasoning methods, but still there was skepticism and criticism. Many thought this attitude was baseless. Eucalyptus was stigmatized by its image of being a fast growing plant, much like a weed, and was best used for firewood and not much else.

Eucalyptus proved to be more costly to cut and mill than the other available hardwood. Eucalyptus timber would chip at the ends when being processed at a mill causing the workers to allow a foot on each end. To alleviate this problem and the many others, proper seasoning was desperately needed.²⁶¹

The seasoning process begins first by cutting the eucalyptus during the winter months, followed immediately by sawing the timber at the mill while it is still green. The sawed lumber is then stacked high allowing the weight of the pile to suppress the twisting and buckling tendency of the lumber. The lumber found inside the stack would be sheltered from the elements allowing the ends to cure gradually.²⁶²

"S" irons would be tacked into the ends holding the wood together. Also the ends would be painted slowing the splitting process as well. Furthermore, weights would be affixed on the ends to stop the lumber from warping. Air needs to circulate freely through the lumber pile to expedite the curing process. This is done by stacking the pile loosely. Air-seasoning is better than the quicker kiln-seasoning process. Seasoned lumber would be used in a year's time, but two year wait is better.²⁶³

A letter from Hughes Manufacturing, dated April 26, 1910, explained its seasoning method used for eucalyptus

lumber. The end-product would be finely finished wooden cabinets. The process was the same for oak. Three to four-inch thick planks were placed in gradually-heated water for four to five days, and then slowly cooled and air-dried for several months.

The results must have been acceptable as seen in this excerpt from the Hughes letter: "We have used this wood for the manufacture of bank and office fixtures, furniture, interior home finishing, decoration work, flooring, and for various other uses where a high polish is needed . . ." The letter continues by noting that the wood when seasoned as described above does not crack or warp.²⁶⁴ It is evident from the body of literature on eucalyptus lumber that some sort of seasoning needed to take place before it would be suitable for working.

FOR PULP, PAPER, AND FIBERBOARD

Internationally, eucalyptus pulp has been used as a source for paper and fibreboard for years. In Australia, the first eucalyptus paper was made in 1914.²⁶⁵ Today, 85% of eucalyptus wood is used either for pulp or fuel. When the paper industry switched from long to short fibre, eucalyptus pulp became very popular.²⁶⁶ Usually eucalyptus trees that are from five to seven years old are best for pulp which is a shorter growth period than for many other trees.²⁶⁷

The most popular eucalyptus species used for papermaking are globulus, grandis, and camaldulensis. These species have mid to low fibre density which is best for pulp production. There is a constant effort though to create new and better species for the paper industry.²⁶⁸ Nitens and dalrympleana species are proving to be important sources for pulp because they have little bark and are dense.²⁶⁹

Recently, several companies in California have indicated an interest in using eucalyptus pulp for paper and wafer board.²⁷⁰ Worldwide, Brazil and Chile are major producers of eucalyptus pulp. Brazilian plantations can be found in the interior rain forests with acreage expanding daily.²⁷¹ Chile has been involved in the eucalyptus industry for decades as well as China and Japan.²⁷²

AS A BOILER CLEANER

Boiler explosions were common on steamboats plying the Sacramento and San Joaquin Rivers. Scale produced from the muddy water used in boilers would collect on the inside separating the iron of the boiler from the water. When heating took place, the iron would be heated separately from the water. This would generally overheat the iron, weakening it, and hence an explosion.²⁷³

A boiler cleaning agent was developed by George Downie of San Lorenzo about 1888. He bought eucalyptus leaves from General Stratton and boiled them in water producing a dark brown liquid. This liquid was the cleaning agent which was poured into boilers eliminating the scale.²⁷⁴ This was done once a month.²⁷⁵ Not only was the boiler cleaner used in ship boilers, it was also used in boilers found in factories in the Bay Area and in the eastern United States.²⁷⁶

A SOURCE OF HONEY

The eucalyptus flowers provide nectar for bees especially when other flowers aren't available. Some species bloom continuously and hence a constant supply of nectar is available. Besides being a food, some claimed that eucalyptus honey could settle nerves and relieve irritation in the mucous membranes.²⁷⁷ Eucalyptus honey has a strong pepperminty taste and odor which makes it less desirable than other honeys.²⁷⁸

Honey provides a farmer with additional income. The best species as recommended by the Santa Monica Forestry Station were sugar gum, red gum, and red iron bark.²⁷⁹ Types of soil and climatic changes varies the availability of the nectar.²⁸⁰

A SOURCE OF FOOD

Outside of honey, Californians have never used eucalyptus for food, but the Australians have. The Aborigines use eucalyptus roots as a source of water. They also cook and eat the roots. The flakes from manna gum are eaten as dessert by children. Dried eucalyptus leaves are fed to horses, cattle, and sheep.²⁸¹

Koalas get moisture and food from eucalyptus leaves. It knows which species it likes, and by smelling, it can tell which ones might be harmful. Contrary to myth, koalas aren't drugged by eucalyptus leaves, but rather they have a very slow metabolism which keeps them relaxed. Koalas have a pleasant odor which comes from the eucalyptus food it eats.²⁸²

American zoos have fresh eucalyptus leaves flown in to feed their koalas. The Philadelphia Zoo has 40 lbs. shipped from California three or four times a week. The Milwaukee Zoo spends \$12,000 yearly on eucalyptus leaves.²⁸³ The Los Angeles Zoo found that Koalas eat leaves from seventeen different eucalyptus species but will prefer some over the others.²⁸⁴

AS MEDICINE

By its very essence, eucalyptus has the scent of freshness and purification. It smells healthy, and consequently, its oils have been used in both folk and modern medicine. This writer's own father told of the practice of putting a eucalyptus leaf between the lips of sick people having respiratory problems. The hanging of eucalyptus leaves in houses was common as well as boiling eucalyptus leaves on stoves allowing the pepperminty odor to permeate the air.

The essential oil used for medicinal purposes is produced by boiling eucalyptus leaves in water, condensing the vapor, and collecting it.²⁸⁵ The species *amygdalina* produces 265.5 ounces of oil from 1,000 lbs. of leaves while *globulus* produces 134.8 ounces from the same amount of leaves.²⁸⁶ *Globulus* oil contains about 60% eucalyptol (cineol); whereas, *amygdalina* oil contains no eucalyptol but produces phellandrene. Both eucalyptol and phellandrene are used in medicines.²⁸⁷

Pharmacopoeias of Britain and United States require 70% cineol in eucalyptus oil. Some species do have that consistency and more.²⁸⁸ But the 70% requirement has been difficult to acquire in California because of the cost of production; consequently, eucalyptus oil is imported from Australia where species can produce the proper amount of cineol more cheaply.²⁸⁹

The Pharmacology of *Materia Medica* lists the medical uses of eucalyptus extractions. It can be used as a stimulant, aphrodisiac, antispasmodic, and antiseptic. It is used in the treatment of septic fevers, diphtheria, asthma, foetid breath, ulcers (syphilitic and otherwise), infections of the bladder, urethra, vagina, and spongy and bleeding gums. It is used as a disinfectant in gangrenous or foetid suppuration, foul ulcers, and offensive skin discharges.²⁹⁰ It is used too for coughs, lung diseases, and sorethroats. Eucalyptus tea is good for digestion.²⁹¹ Eucalyptus oil in hot baths serves as a nerve sedative. A popular cure for singers and speakers with sore throats has been "Mission Eucalyptus" used along with Listerine which too contains eucalyptus oil.²⁹²

Eucalyptus oil manufactured for medical purposes can be found in several different forms. It comes as a capsule, fluid extract, powered extract, solid extract, elixir compound, inhalant, lozenges, tinctures, and pills.²⁹³ All of these preparations have a strong pepperminty odor. On the tongue and in the stomach, eucalyptus oil produces warmth. If taken internally, large doses can produce headaches, and fatigue. It can cause death in animals from paralysis.²⁹⁴

In 1895, Abbott Kinney reported examples of medical success. A doctor in Kansas used eucalyptus extract to heal an amputation which healed well with little pain.²⁹⁵ A Dr. Wooster of San Francisco used eucalyptus medicine in 136 cases of various infirmities in which 106 were cured. A Dr. Keeler in Australia treated 432 cases with eucalyptus extract, and 310 were cured. These are just two of the many examples found in Kinney's report.²⁹⁶

Eucalyptus tincture has been used in the treatment of wounds and sores. Tincture is produced by putting macerated leaves in alcohol for three months. Ten lbs. of leaves gives 25 quarts of tincture.²⁹⁷ Aborigines of Australia used eucalyptus leaves as poultices on wounds. There was one case where an Aborigine had a wound where there was a protrusion of his intestines. They were pushed back into place and dressed in a poultice of eucalyptus leaves. He healed.²⁹⁸ It was reported in 1871, that hospitals were using eucalyptus as bandages.²⁹⁹ It was becoming more evident that the eucalyptus had healing powers and should be used medicinally.

At the 1888 World's Fair in Melbourne, Australia, there were 26 cases of diphtheria. Patients breathed steam produced by boiled eucalyptus oil in water. They were able to cough up the balls of tough white mucus. All but two patients fully recovered.³⁰⁰ It was used too to cure dysentery which settlers and miners contracted.

Eucalyptus was sprayed once or twice a day in sick rooms to disinfect unhealthy air.³⁰¹ Eucalyptus seedpods, called portieres, were draped inside houses to emit a healthy scent. It was felt asthmatic patients found relief breathing the eucalyptus-treated air. Eucalyptus oil was used by the rich and poor alike. The Stanford family of Palo Alto used eucalyptus oil as medicine as reported by Leland G. Stanford in a 1970 article.³⁰²

The English settling in Australia used eucalyptus as a medicine. Its smell reminded them of their English peppermint. It was used for colic, dysentery, and diarrhoea. In the gum secreted by the eucalyptus is found the ingredient kino. Taken internally kino is good for intestinal disorders. A factory was established in Australia to produce peppermint gum oil a cure for many ailments.³⁰³

Eucalyptus species that have a small amount of foliage will have a high level of kino. *Rostrata*, *resinifera*, *marginata*, *diversicolor*, and *siderphloia* are of this type. *Rostrata* posts and poles lasts the longest in the ground because of its kino content.³⁰⁴ Kino is similar to the resin found in pine trees.³⁰⁵

At the turn of the century, a Los Angeles physician was able to produce and sell nine tons of oil which was used in a salve, soap, and cough drops.³⁰⁶ H.B. Silkwood of Garden Grove produced one ton of oil from one hundred tons of material to use in medical products.³⁰⁷ Eucalyptus oil came primarily from blue gum in California because it could be manufactured and sold profitably. J.C. Mitchell of Garden Grove could extract three to four gallons of oil from two tons of leaves and twigs. The cost of processing was \$3 a gallon. In 1908, it was reported that California distilleries were having trouble finding a market for eucalyptus oil³⁰⁸ because eucalyptus oil from Australia was sold for a cheaper price.

Today, the world market uses 2,000 to 3,000 tons of eucalyptus oil a year. It is mostly a disinfectant,³⁰⁹ but it is also used in perfumes and flavoring. The major producers of this oil are China, Portugal, Spain, Chile, South Africa, and Swaziland.³¹⁰ The oil's odor is very noticeable but non-toxic. A bottle of eucalyptus oil was accidentally broken at Dulles International Airport in 1992. Twenty people were hospitalized, a terminal was closed, and thirteen flights cancelled. This was resultant of its pungent smell not because it hurt people.³¹¹

Recently in California, because of the malathion spraying to eradicate the med fly, eucalyptus leaves have been boiled and inhaled to clear one's respiratory system affected by the spray.³¹² Products being manufactured today using eucalyptus oils are ointments, such as, Vaporub. Health stores sell rubbing agents containing eucalyptus which are used for sore muscles and joints. Eucalyptus oil is used in saunas and spas for its healing vapors and sedative powers as a muscle relaxant.³¹³

FIGHTING MALARIA

One of the most enthralling chapters in the history of eucalyptus is its relationship to the eradication of malaria. Throughout the nineteenth century, it was believed that the eucalyptus fought malaria simply by disinfecting the ground and air. By the end of the century, the cause of malaria was found, and the eucalyptus' true relationship to the disease became known.

The female anopheles mosquito carries the malaria parasite and implants it in a human's blood system. The mosquito's home and breeding ground is generally in a area of standing water such as swampland. Because the eucalyptus absorbs

large amounts of water, it can drain swampland thereby destroying the habitat of the mosquito, and consequently stopping the spread of malaria. But the story of malaria and the eucalyptus before this was known is fascinating.

As in any mystery there are theories. Early on there were many theories of how the eucalyptus miraculously stopped malaria. Also there were glowing accounts of real life experiences of the successes made in the fight against malaria by the eucalyptus.

Very few people know that California had malarial problems. Malaria could be found in the Sacramento Valley and Kern County last century. In the Third Biennial Report (1874-75) of the California State Board of Health, the secretary of the board, Dr. Thomas M. Logan, was the author of a section entitled "Malarial Fevers and Consumption in California." Much of the report was about the eucalyptus and its ability to suppress the spread of malaria. He reprinted a contemporary article taken from the Kern County Courier reporting on one farmer's experience with malaria and eucalyptus:

In regard to the anti-malaria influence of the eucalyptus, we have this conclusive evidence. We have given it what we regard as a reasonably fair test on our own farm. This is cultivated by two families, or companies, of Chinese. One company lives near the north and the other the south end of the premises, about three-fourths of a mile apart.

The localities both parties inhabit are favorable to the development of malaria. The soil is rich, moist, and teeming with vegetable life, and the free sweep of the prevailing wind is obstructed by the intervention of dense thickets. As might be expected, they

have, every year, during the heated term, suffered with malarial fever. Last winter we determined to test the much vaunted virtues of the eucalyptus.

In February we gave to the party at the north end two ounces of the seed with the directions that it should be planted near the house. It germinated finely, and produced several thousands of young plants, but the frost killed most of them. About twelve

hundred, however, survived. These, when the heated term commenced, had attained an average height of two feet, and emitted a strong aromatic or camphorous odor, perceptible at a distance of a hundred yards.

In due time the party at the south end were visited by their usual mildly distressing fever, but up to the present time we have looked in vain for the first symptoms to develop in the other. They are all, to their own astonishment, in the most robust health. These trees now average more than three feet in height, and the atmosphere of the house is strongly impregnated with their odor . . . and propose, the coming season, to plant it on all the waste places and corners on our farm we can spare from the other purposes. If everybody would do likewise, the great valley of Kern County

might soon take rank among the sanitariums of the State . . . " 314

Concluding, Dr. Logan wrote, "These evidences go far to establish the fact that the eucalyptus globulus has a good effect in preventing the spread of malarial diseases . . ."315

In the California State Board Health's Tenth Biennial Report (1886-88) appeared an article with the title "Irrigation and Forestry Considered in Connection with Malarial Diseases." Use of eucalyptus and other plants were being used to stem the spread of malaria as seen in this excerpt:

It is a well established fact that in malarial districts the planting of shrubs and trees has had the effect to greatly modify, if not entirely remove, the malarious influence . . . But wonderful far efficacious than all, owing to the rapidity of its growth, its wonderful powers as an absorbent, and the balsamic exhalation of its essential oil, it is Australian blue gum tree (Eucalyptus globulus).316

Dr. W.P. Gibbons of the Medical Society of the State of California wrote, "It has not been proved, though asserted until belief is established, that the aroma of the eucalyptus is effective in preventing the incubation of intermittents."317 The scientific and medical fields knew that the eucalyptus arrested malaria but didn't really know why. The assumption by some was it was disinfected the air.

There were numerous reports worldwide of the success the eucalyptus was having in treating malaria. In 1874, the periodical California Horticulturalist contained such reports. For example in Cape Colony in southern Africa came this testimony: "In the spring of 1867, I planted upon this farm 13,000 plants of the Eucalyptus globulus. In July of that year, the season in which the fevers appear, the farmers were completely free from them . . ."318

Another example is this report from Constantine (Turkey) where eucalyptus had been planted: "The atmosphere is constantly charged with aromatic vapors, the farmers are no longer troubled with disease, and their children are bright with health and vigor."³¹⁹

M. Gimbert in 1874 made these comments before the French Academy of Sciences concerning the eucalyptus:

A tree springing up with incredible rapidity, capable of absorbing from the soil ten times its weight of water in twenty-four hours, and giving to the atmosphere antiseptic camphorated emanations, should play a very important part in improving the health of the malarious districts . . . it has the property of absorbing directly from marshes, thus preventing fermentations which are produced, and paralyzing the animal miasma proceeding from them which might arise from them."³²⁰

During this period of time, throughout the world, the eucalyptus was labeled "fever tree" because it generally stopped the spread of deadly fevers. In Valencia, Spain, eucalyptus trees had to be protected by guards to prevent leaves from being stripped off by its citizens.³²¹ And what did the Australians think about their treasured native tree and malaria?

In 1876, J. Bosisto read a paper before the Royal Society of Victoria (Australia) entitled, "Is the Eucalyptus a Fever-Destroying Tree?" He opened with this statement:

*Its (eucalyptus) power to absorb considerable moisture, and to permeate the air with its peculiar odour, led to the belief that this tree . . . exerts a beneficial influence upon malarious districts . . . is the eucalyptus a fever-destroying tree? Or, in other words does it tend to lessen malaria or to destroy miasmatic poison?*³²²

Bosisto then tells of his investigations in Australia, commenting: "Australia on the whole may be said to be pretty free from virulent endemic or miasmatic fevers, and the latter may be said to exist only as the eucalyptus recedes."³²³

After analyzing eucalyptus oils and resins, Bosisto was not able to find anything in them that had the power to oxygenate and purify the air more so than other plants.³²⁴ He noted that eucalyptus oils permeating the air, did refresh one's breathing.³²⁵ Bosisto concludes his paper with some support of the eucalyptus' value in fighting malaria, but the question is still virtually unanswered. He wrote, "In conclusion, may we not say with some authority that the evidence set forth in this paper on our own vegetation is in favour of the eucalyptus being a fever-destroying tree?"³²⁶

The most famous case concerning eucalyptus treatment of malaria comes from the Tre Fontaine Monastery near Rome, Italy. Each year during the "fever season," the monks would come down with malaria. Swamps were near, and the monks worked the fields returning to the monastery at night. It was thought that the night air carried malaria. Eucalyptus trees were planted in the swamps reclaiming the land with their ability to drain the water through their root systems. With the water gone the mosquitoes had no habitat in which to breed and carry on activity. Malaria fever greatly lessened, but a Dr. Montechiare, who was a physician for years in that area, was not convinced that eucalyptus affected the disposition of malaria.³²⁷

Scientists and physicians knew that the eucalyptus did something to interfere with the process of malaria, but what it did and how it did it wasn't clear. Many simply disclaimed it until the cause of malaria was found.

In California, malaria reached its peak in the 1880's. Blue gums were planted with fervor because it was generally felt they purified the air and had some effect on malaria. This comes from the Pacific Rural Press:

*A paper read before the California Academy of Natural Sciences in 1879 reported that the Southern Pacific Railroad had planted 1,000 eucalyptus trees between the train stations and the marshes to ward off malaria in the interior valley. The number of malaria cases had dropped from twenty-five to eight.*³²⁹

It was thought that malaria came from moist, rich soil escaping into the night air during the summer months. Night air is usually damp and chilly, and thought to carry a multitude of maladies of which one was malaria. The word "malaria" in Latin means "bad air." By virtue of its aroma, it would be only natural to suppose that the eucalyptus somehow purified the "mal aria" or bad air.

It was also thought that the oils dropping from the eucalyptus leaves and the gums secreted from the bark, disinfected

the ground around the tree. These secretions had a purifying effect just like its aroma did to the surrounding air.

In his 1895 work, *Eucalyptus*, Abbott Kinney gave many examples of the success eucalyptus was having in arresting malarial fever. Some of have been noted above. Kinney thought that malaria entered the body through the ingestion of water, milk, or food. The malarial germ, he felt, was released into the air by turning over soil in warm, marshy land, and some way it got into what humans ate or drank. He cited Bakersfield cases where unboiled water from shallow wells (he felt) caused malaria. He called it the "Bakersfield Fever." After the water was boiled from these wells the malaria disappeared he reported.³³⁰ Kinney did experiments with meat, water, and eucalyptus leaves. He wanted to see if eucalyptus stopped the growth of bacteria. In results were inconclusive.³³¹

The connection was beginning to be seen between disease and insects especially mosquitoes. Kinney used an eucalyptus smudge to kill mosquitoes, but it didn't work.³³² The Pacific Rural Press reported in 1876, ". . . being very much in his sleep by mosquitoes, took it into his head to place a young plant of eucalyptus in his bedroom over night. From that moment the insects disappeared and he slept in comfort."³³³ There was a doctor who rubbed eucalyptus leaves on his horse to drive the insects away. Pillows were sprinkled with an eucalyptus powder to keep insects off them.³³⁴

The Tulare Register ran this testimony: "Our house was surrounded with blue gum trees. We always slept with our doors and windows open and were never seriously bothered while just a few rods away the stock would be covered and almost perish with the great numbers (mosquitoes) tormenting them."³³⁵

Finally the cause of malaria was known. In a 1900 issue of *The Forester*, published by the American Forestry Association, there was an article entitled, "The Eucalyptus in the Tropics: Its Rapid Growth and Value as a Sanitary Agent, Acting as a Preventative of Malaria." It told of the cause of malaria, and urged the planting of eucalyptus to dry up swampland thereby removing the mosquito's breeding habitat. The article went on to discuss the positive effect eucalyptus had on the air.³³⁶ This theme could be seen too in the 1897 yearbook of the U.S. Department of Agriculture:

With regard to the sanitary value of the tree, it has been strongly stated that its value was owing to its rapid growth and the great absorbent power of its roots in drying up wet and marsh lands, but it is no longer doubted that *Eucalyptus globulus*, along with other species of *Eucalyptus*, evaporate with water a volatile oil and a volatile acid, which permeate the atmosphere and contribute to its invigorating and healthy nature and character.³³⁷

The eucalyptus had found its place as a partner in the prevention of malaria, and it still held its usual stature as an agent in cleansing the air. The latter would last until modern medicine got more sophisticated and became disinterested in old-fashion ideas of treatment or "sanitation."

FOR LANDSCAPING AND ROADWAYS

One area in California where the eucalyptus has had a high profile certainly is in its presence along the roads and highways of the state. With its willowy silhouette cast against the hills and flatlands, it pleases the mind with its picturesque form. It is a reminder that there is something more to our world than asphalt, steel guardrails, and automobiles. It gives us a glimmer of a peaceful past when humankind turned to the natural world for answers instead of to science and its automaton creations.

One has only to drive along the coastal foothills of this state to become immediately aware of the dark forests of eucalyptus hugging the hills and gullies. As the eye sweeps across those images, there is a stirring inside finding expression in aesthetic pleasure and a recognition that those forests belong there. The eucalyptus did indeed change California horizons as expressed by Kinney in 1895:

The introduction of this tree has done more to change radically the appearance of wide ranges of country in California than any other one thing. In the reclamation of many arid plains of the central and southern parts of California the blue gum has worked almost like magic. It modifies the winds, breaks the lines of view all so quickly that one can

scarcely realize that a valley of clustered woods and lines of trees was but a year or two before a brown parched expanse of shadeless summer dust. I do not think that the power of the blue gum in modifying the appearance of a country can be appreciated by any one who has not seen some stretch of country before and after its introduction.³³⁸

Tree shade is something that humankind has always appreciated. On hot summer days, tree shade is not only refreshing, but it is part of survival. One of the earliest uses of the eucalyptus was for ornamentation and shade. Eucalyptus were planted along country and some city roads for beauty and for the practicality of shade.

Of the eucalyptus species blue gums were first used, but their size and aggressive root system made them more of a liability than an asset. Their roots tore up sidewalks and streets. They were too big to prune, and dripping water from them made the graveled roads muddy. Many were removed. It was simply a problem of finding the proper species.³³⁹ Today smaller and less aggressive eucalyptus are used.

Route 160 near Rio Vista has the oldest remaining roadside eucalyptus. They were planted over one hundred years ago along the levee road. In the 1890's in southern California, eucalyptus were planted along roadways to halt gusting winds.³⁴⁰ This was done too in the 1930's on the highway west of San Bernardino.³⁴¹ In 1913 a law was passed to give power to the county boards to oversee the planting of trees along the roadside. The purpose of the legislation was to encourage communities to plant trees for beauty, shade, and windbreaks.³⁴²

In the 1930's more legislation was passed. Route 91, from Fresno to Bakersfield, has eucalyptus along it primarily because of that legislation. In the 1950's, along Highway 99, from Marysville to Modesto, the species sideroxylon was planted.³⁴³ These are just a few examples of highway planting. If one gets off the beaten path and travels on an old highway, there will be evidence of early eucalyptus roadside planting.

The use of eucalyptus along roadways continues today. The species have changed. In 1961, CalTrans planted camaldensis, citriodora, caldocalyx, polyanthemus, rudis, and sideroxylon. In the 1980's, 11,000 caldocalyx, 10,000 camaldensis, 6,000 sideroxylon, and 3,000 rudis were planted along highways.³⁴⁴

CalTrans' present plan is to plant eucalyptus as (1) part of the urban landscape (2) part of the rural aesthetic especially in the dry areas of the Central Valley and southern California (3) to define the highway's borders (4) windbreaks for safety and to prevent soil erosion (5) sources of chips for mulching to be used planted areas.³⁴⁵

CalTrans did a study in Sacramento recently on drought and the eucalyptus. It found that these three species are drought tolerant: dalrympleana, parvifolia, and annulata. However, for most eucalyptus species there was modest survival rate.³⁴⁶ Trees that are used in roadside landscaping are selected for their adaptation to the local climate and for their overall usefulness to the roadway.



[Back to Table of Contents](#)

The Eucalyptus of California

Section Three: Problems, Cares, Economics, and Species

by **Robert L. Santos**
California State University, Stanislaus
Librarian/Archivist
bsantos@toto.csustan.edu

Alley-Cass Publications
Denair, California
Copyright 1997

A Fire Hazard?

Who can forget the recent October 1991 fire in the Berkeley-Oakland hills where 3,000 homes were lost and 24 people died. Temperatures got up to 2,000 degrees F. as the firestorm swept the hills. There are those who blame the eucalyptus for the fire. There are others who disagree saying that eucalyptus was at fault just as much as any other tree. Who is right? To answer this question, one must look first at the historical facts in regard to eucalyptus and fires.

The eucalyptus is regarded generally as a "dirty tree" because if its litter is left untouched it can pile up to several feet on a grove's floor. This litter consists of falling bark, leaves, branches, and seed pods. They all contain oil which increases the litter's flammability.³⁴⁷ The oil also slows the decomposition process so the litter remains nearly whole and a fire hazard longer.³⁴⁸

When trees grow closely together, they form a canopy which doesn't allow light to penetrate; consequently, ground vegetation doesn't grow. This is the case in eucalyptus groves. No vegetation means no dry grass, and hence, not a source of fire.³⁴⁹ Therefore, one can rule out dry grass as a facilitator in the 1991 fire.

No question eucalyptus litter is a fire hazard. In 1907, the U.S. Forest Service warned about eucalyptus litter: "The large quantity of litter -- which accumulates beneath a stand is extremely inflammable . . .³⁵⁰ When fire gains access to a plantation the oily litter burns so fiercely that it can scarcely be extinguished before the whole grove is burned."³⁵¹

Historically, the East Bay has had numerous grass and forest fires. In October 1887, before large groves of eucalyptus were planted 8,300 acres of primarily grass were burned in the Chabot area. In 1897, near Berkeley, 7,000 acres burned. Eucalyptus groves were planted in the first decade of the twentieth century. In September 1923 a fire destroyed 640 homes in Berkeley. Thirty-six homes and 250 acres were burned in September 1973. One would have to conclude that there seems to be a natural tendency for this area to generate fire from some sort of dried vegetation.³⁵²

Eucalyptus planting in the East Bay hills began in the 1880's when the Judson Dynamite and Powder Company

planted trees to muffle the sound of dynamite and to hide an ugly landscape created by the blasts. Large scale planting of eucalyptus occurred during the first decade this century. It was for timber and real estate investment, and to control fires that hampered the area.

The Oakland Tribune writing at that time noted the problem of fires and the value of the new eucalyptus: ". . . (eucalyptus is) primarily a measure against recurring fires that almost every year swept over the hills . . ."353

The State Board of Forestry in its Ninth Biennial Report (1923) commented: " Not more than fifteen years ago the hills lying along the easterly portions of the cities of Oakland and Berkeley were not as now covered with groves of forest trees, but were practically bare on the western slope . . . During that time to planting of trees, grass fires were of common occurrence during the summer months . . ."354

Winter freezes compound the fire problem by killing back trees that then drop the dead wood and foliage to the grove floor. Blue gum is by far the most common California eucalyptus and is intolerant of below freezing weather. The fires in the East Bay hills of 1923, 1973, and 1991 were preceded by a freeze. Very few eucalyptus actually die from frost because their root systems are unaffected. They merely shed the frost-burned foliage and wood, and resprout. But the amount of litter dropped to the ground is enormous.355

Just after the 1972 freeze, the people of the area were frantic, fearing the possibility of a fire if the litter from the freeze was not removed. Legislation for relief refunds was introduced in Congress and hearings were held. At the hearing before the Subcommittee on Forests of the Committee of Agriculture this was said: "Forest Service's leading expert on this eucalyptus disaster (the freeze) has stated that the fire threat posed by these dead trees 'is unique in that a sudden and widespread kill of such highly flammable species in a urban area of normally severe fire hazard has never been experienced before in the United States.'"356

It was estimated that two million trees had been killed in the 1972 freeze which amounted to about 50 tons of debris per acre and covered 3,000 acres. The debris lying on the ground was one to two feet deep. Again the prophetic voice of the Subcommittee on Forests: "A small fire could easily become a major holocaust before the necessary equipment could get into the area, as there is no real access road into the Berkeley-Oakland Hills."357

H.H. Biswell, Professor of Forestry and Conservation at the University of California, Berkeley made a prophetic statement too on March 1973:

*When eucalyptus waste catches fire, an updraft is created and strong winds may blow flaming bark for a great distance. I think the eucalyptus is the worst tree anywhere as far as fire hazard is concerned. If some of that flaming bark should be flown on to shake roofs in the hills we might have a fire storm that would literally suck the roofs off the houses. People might be trapped.*358

Federal disaster funding for the removal of the litter from the 1972 freeze was only \$1 million instead of the \$11 million requested. Without federal support, property owners had to pay for litter and tree removal themselves costing \$100 or more a tree.359 Only part of the damaged trees were removed, and a 12 mile, 200 foot firebreak was carved in the hills.360 This was inadequate as seen by the quick-moving 1991 firestorm.

Conclusively the 1990 freeze led to the 1991 firestorm. The eucalyptus got the blame for spreading the fire as seen in this San Francisco Chronicle article with the headline "Eucalyptus trees getting blamed for East Bay fire."

Eucalyptus globulus, the tall, aromatic trees dropped yet another notch in public esteem in the great East Bay hills fire of 1991. Like giant matchsticks and loaded with freeze-dried fuel, the East Bay's eucalyptus trees acted like a torch that spread the conflagration by exploding into flames almost instantly -- Experts who otherwise couldn't agree on whether the fire began by arson, official foul-up or act of God declared that the Australian imports bore heavy blame. And while her press aide derided the trees as "weeds," Berkeley Mayor Lori Hancock proposed chain-sawing thousands of them in hopes of forever preventing a repeat of the deadly events of Oct. 20, 1991.361

Blaming the eucalyptus was labeled by some as "hysterical." Alexander Kerr, a El Centro writer who spent seven years in Australia in wildfire control, called the assertions exaggerations. He and others passionately explained that the

spread of the fire was not caused by trees but by dry grass, unkempt lots, and exploding wooden houses. He explained that litter and dead grass must be removed continuously to avoid such a thing from happening again. To log off all of the trees, as has been suggested, would invite terrible soil erosion and the destruction of wildlife.³⁶²

Blaming the eucalyptus continued though. The eucalyptus trees were called "weeds" and "trash trees," "immigrants," and "mongrelizations of the species."³⁶³ One year after the fire, the garden editor of *Sunset Magazine* and an eucalyptus supporter, wrote: "With this tree, it seems you either love it or fear and hate it. And I've noticed that those who fear the tree seem almost irrational about it . . . A few messy types of eucalyptus need to have their debris cleaned every year or two, but scores of other kinds are as orderly and as safe as any other broadleafed evergreen."³⁶⁴

The native home of the eucalyptus, Australia, has eucalyptus forest fires generally every year. In January 1994 a large fire broke out near Sydney and was in the international news. This was said about the eucalyptus:

The explosive nature of the eucalyptus and the abundance of fuel produces a very intense fire that 'crowns' -- leaps from tree top to tree top . . . The fierce blazes have been stoked by the highly volatile oils of the eucalyptus tree, which vaporize under intense radiative heat as the fire approaches and explode, with flames sometimes towering as high as 230 feet.³⁶⁵

Another report:

*One reason Australia is so fire prone is the eucalyptus have aromatic oils in their leaves that adds to flammability . . . Eucalyptus trees are one of the world's most inflammable trees. It bursts into flames when fire reaches a certain temperature because there is rapid vaporization of the oils and that causes rapid ignition.*³⁶⁶

In 1962, the Australian Forestry and Timber Bureau published "Control Burning in Eucalyptus Forests." It said that controlled burning does not kill eucalyptus trees, but it burns off the litter that collects on the forest floor which is 10 tons per acre. It recommends controlled burning every five years.³⁶⁷

In his book, *Burning Bush: A Fire History of Australia*, published in 1991, Stephen Pyne told the story of an Australian firefighting expert who attended a conference in Berkeley. The expert visited the hills in and around Berkeley and saw how the eucalyptus forests in the area were allowed to grow. He was struck with terror by their volatile nature and fled back to Australia.³⁶⁸ This occurred just prior to the 1991 firestorm.

Kevin Starr, USC historian and current California State Librarian, said it best about our artificial and fragile environment:

*Newcomers built their California dream, landscaping barren neighborhoods with eucalyptus and Monterey pines, trees never intended to grow in such an arid place, and planted shrubs near their homes -- all fine fuel for fires. They built a natural environment that was not all natural. It was as beautiful as it was artificial, fragile and dangerous. We are constantly reminded what an artificially engineered construct . . . and consequently how fragile.*³⁶⁹

BEETLE PROBLEM

Eucalyptus trees grown in California had no natural enemy as is found in Australia. This was because the genus was transplanted by seed and not by seedling. Seedlings carry parasites while the seeds do not.

In 1984, the introduction of a natural enemy occurred. *Phoracanta semipunctata*, or longhorned beetle, either came from Chile buried in an eucalyptus pallet, or was transported to the Lake Forest lumberyard in timbers from Australia.³⁷⁰ Regardless of how or where the beetle was introduced, the first infestation was discovered near El Toro, California in October 1984 much to the consternation of eucalyptus growers and lovers of the tree.³⁷¹

Upon discovery, a representative of the California Department of Forestry sadly announced, "The insect is loose and it's just a matter of time before it infests every eucalyptus stand we have in California . . . the bug may be deliberately spread by ecological zealots who would like to rid the California landscape of the ubiquitous eucalyptus."³⁷² By 1986, the beetle could be found in southern California from Long Beach to San Diego, and from Van Nuys to Hemet.³⁷³ In

1987, it was destroying eucalyptus trees at the Scripps Ranch,³⁷⁴ and later in 1989 at Rancho Santa Fe.³⁷⁵

The longhorned beetle is one inch in length and is black in color with a small yellow around its body. It is a strong flier covering several miles in one flight. It lays its eggs deep into the eucalyptus bark.³⁷⁶ When it bores into the inner bark, it cuts off the supply of nutrients the tree needs and thereby killing it.³⁷⁷

The beetle makes an immense amount of noise as it eats its way through the bark as testified in this account: "All over Rancho Santa Fe you can hear the sound -- the clatter of insatiable little insect mandibles devouring another tasty meal of bark and wood. Some say the racket resembles falling rain. Or the crackle of Rice Krispies once the milk's been poured on." In 1991, it was estimated that 20,000 of the 100,000 trees at Rancho Santa Fe had been destroyed by the crunching beetle.³⁷⁸

The longhorned beetle quickly kills blue and manna gums and the other gums less quickly.³⁷⁹ It attacks old and weak trees especially those weakened by the recent droughts.³⁸⁰ The beetle is attracted to trees that suffer from lack of water. Pesticides don't kill it because its eggs are laid under layers of bark. Secreting gum is the eucalyptus' natural protection against the beetle. The gum engulfs the beetle smothering it, but because of the droughts, there has not been enough moisture within the trees to manufacture sufficient gum to stop the beetle.³⁸¹

The beetle problem is an expensive one. It has cost some homeowners as much as \$10,000 to have their beetle-infested trees removed.³⁸² The California Department of Forestry doesn't have the authority to help beleaguered homeowners because the eucalyptus trees are outside state forests, nor are they grown that much commercially.³⁸³

To some the eucalyptus is part of the family as one Scripps Ranch resident lamented: "People here are proud of their community and proud of our trees. That's how they think of the eucalyptus . . . It's like cutting off your arm to cut down one of our trees.³⁸⁴ But to protect surrounding trees the infested ones had to be removed.

Northern California awaited the beetle invasion. In 1989, it was estimated that one-third of the eucalyptus trees in the Bay Area would succumb to the beetle.³⁸⁵ The San Francisco Recreation and Park Department felt that 100,000 eucalyptus trees would be killed, but it depended upon how the beetle did in the colder weather of northern California.³⁸⁶ In 1991, the beetle had reached the Bay Area. Four hundred trees had been infested on the Stanford University campus.³⁸⁷

Methods to stop the beetle were tried. Infested trees were cut to the ground, and its wood buried or covered with a tarp. Some made chips from the wood thereby grinding up the larvae. The transportation of firewood from infested trees was stopped.³⁸⁸

It was noticed that well-watered trees weren't attacked by the beetle. The bark became a sponge of water which drowned the larvae.³⁸⁹ The Orange County Agricultural Commission gave this advice: "To prevent beetle infestation, irrigate eucalyptus trees with a trickling hose over a 24-hour period every few weeks during the summer."³⁹⁰

California scientists looked to Australia for answers to the beetle problem. In Australia the beetle's natural enemy is the *Syngaster lepidus* wasp which locates the boring beetle by sound and stings it. University of California, Riverside researchers unleashed the wasp in southern California in 1989³⁹¹ and elsewhere in 1992.³⁹² Success has been gradual. The beetle won't quickly go away in California, but measures are being actively applied to stop its spread.

LOVE OR HATE AND THE ECOLOGICAL QUESTION

In recent years, a battleline has been drawn concerning the future of the eucalyptus in California. There are those who dislike the tree because it isn't native to California. There are others who love the tree and are very active and vocal. This disagreement is not just occurring in California but is taking place in other regions of the world. The eucalyptus' value to the local environment is being questioned. The controversy concerning Angel Island eucalyptus is a case in point.

During the Civil War, Angel Island became an U.S. Army base. Eucalyptus trees were planted sporadically from 1863 through the 1930's for windbreaks and to beautify the island.³⁹³ There are currently 80 acres of eucalyptus on the island³⁹⁴ with most trees being forty to fifty years old.³⁹⁵

A plan was devised in 1979 by the California Park System to remove the eucalyptus trees from Angel Island to allow the island's natural vegetation to return. The Park System wanted the island to be an exhibit of natural California vegetation.³⁹⁶ It was estimated that it would take twenty years for the natural vegetation to fully return.³⁹⁷

One problem the plan ran into was the monarch butterfly. It uses the Angel Island eucalyptus for its winter home. The trees provide shelter and nectar during the long, cold winter months.³⁹⁸ However, there are 111 other locations along the central California coast that the monarch also uses, 75% being eucalyptus.³⁹⁹

Siding with the Park System have been environmental organizations, such as, the Sierra Club, Nature Conservancy, National Audubon Society, and the California Native Plant Society. They too want natural vegetation to return to Angel Island.⁴⁰⁰ This stance is represented in this statement made by Charlie Danielson of the California Native Plant Society: ". . . the eucalyptus is a weed. It grows extremely fast and has fewer limiting biological factors in its new environment than native species . . . the large amounts of litter shed by the trees are full of resin and break down very slowly, making it difficult for native plants to gain a foothold . . . no animal species feed on eucalyptus . . ." ⁴⁰¹

State ecologists want the parklands to have only natural vegetation, and the non-native plants to be grown only in parks and private gardens.⁴⁰² There are 6,021 species of vascular plants growing in California of which 975 are non-native. On Angel Island there are 53 non-native plants and 416 native plants.⁴⁰³

POET (Preserve Our Eucalyptus Trees) is a group that opposes the removal of eucalyptus trees. When their opposition refers to the eucalyptus as a "giant weed" or an "immigrant," they call this attitude "plant racism" or "specism" and want it stopped before it spreads and gets entrenched in the minds of Californians. Also POET fears that the giant environmental groups will influence the public because they are vocal and highly visible. POET co-founder, Chris Womack, feels that the eucalyptus is native enough to California: "Eucalyptus have been in California for 100 or more years and many of us regard them as part of the natural landscape." ⁴⁰⁴

Hikers and bikers oppose the removal of the eucalyptus from Angel Island because it adds beauty and provides shade and shelter. Ray Moritz, a private forestry consultant believes the removal of the trees will do great ecological damage to the island. It will cause soil erosion on the slopes, and the herbicides used to kill the eucalyptus roots will delay the return of the natural vegetation.⁴⁰⁵

Mortiz feels a reasonable course of action would be to thin out the groves. This would allow some of the natural vegetation to return and some of the trees to remain. David Boyd, senior resource ecologist for the State Park's northern region, argues that selective removal is not economically feasible. He wants all the trees to be removed at once.⁴⁰⁶

Boyd made arrangements with Louisiana Pacific Corporation of Antioch to transport the eucalyptus timber to its mill and be made into fibreboard. The entire process would pay for itself not costing the state any money. But the environmentalists are against this plan as it sets a precedent for logging off other forests for commercial purposes.⁴⁰⁷ The Angel Island issue is on hold for now.

A similar struggle goes on across the bay in Marin County. The National Park Service wants to remove all of the eucalyptus from the Golden Gate Recreation Area. There are thousands of trees with many over 100 years old.⁴⁰⁸ The groves cover 600 acres and is seen as a fire risk. Just like the State Park Service, the National Park Service wants only natural vegetation to grow on its parklands.⁴⁰⁹ After much public debate, the issue has been tabled while a study is being done concerning the historical value of the groves.⁴¹⁰

There have been other clashes statewide on the removal issue. For example, eucalyptus trees were cut down along Highway 17 in the Bay Area by the Federal Highway Administration (FHA) because they blocked billboards.⁴¹¹ Thirteen years later, the FHA reversed its policy and now gives trees priority over billboards.⁴¹²

In Antioch, William LeRoy sat in a eucalyptus tree protesting its removal. The tree was on property that was scheduled for senior citizen housing.⁴¹³ LeRoy got 900 community residents to sign a petition asking that the one-hundred year old tree be spared because of its historical value to Antioch.⁴¹⁴

Two eucalyptus on Nob Hill in San Francisco caused a stir in the community when they were to be removed by the Department of Public Works. The neighborhood argued that the trees were of value for their beauty and of tourist interest. A streetside public hearing was held by the city which resulted in the canceling of the removal plan.⁴¹⁵

Confrontations on the eucalyptus removal issue still abound. The older trees are large and messy, and mostly unsuitable for urban and suburban environments. Here are some further examples to demonstrate how widespread the problem has been. Five trees planted by San Francisco abolitionist and former slave, Mary (Mammy) Pleasant were scheduled for removal which was cancelled due to historical reasons.⁴¹⁶ Fifty-three acres of eucalyptus were saved in Carlsbad by a referendum.⁴¹⁷

Some trees lost the battle though and were removed. In Ramona, eucalyptus trees along Highway 67 were cut down for highway construction.⁴¹⁸ On the campus of the University of the Pacific, a row of 70-foot eucalyptus were removed because of the danger of falling branches to people and cars.⁴¹⁹ Falling branches is such a problem in Australia that the eucalyptus is sometimes referred to as the "widow maker" because of the deaths caused by falling branches.

Debate goes on at the international level concerning the value of the eucalyptus to the community and to the environment. In China, eucalyptus was planted on a massive scale for biomass fuel and pulp for paper. The local population complained that the trees took away the nutrients from the soil and also encroached on the natural vegetation. The Japanese too have been very active in establishing eucalyptus plantations in the orient. The Japanese own the plantations, but keep a low profile because the eucalyptus issue is very sensitive at the local level.⁴²⁰

In Spain, three hundred inhabitants of Tarzones, a village on the Bay of Biscay, revolted against the eucalyptus. At night they uprooted thousands of eucalyptus seedlings planted that day. Near the village of Valpacos, Portugal, 2,000 farmers battled police because the intruding eucalyptus was damaging their olive groves. In another Portuguese village, farmers chained themselves to tractors so the lands could not be prepared for eucalyptus planting.⁴²¹

In many parts of the world, the production of pulp for paper is an important industry. Eucalyptus wood is being used more and more for pulp, and the presence of large industrial eucalyptus plantations is angering local populations. The problem has become political in that the farmers, local citizens, and environmentalists see the eucalyptus as a capitalist venture, exploiting the land to gain profit for others who live outside the region. The eucalyptus is called "the capitalist tree" or the "fascist tree."⁴²²

There are two to three million acres of eucalyptus in Iberia. It is said the eucalyptus ". . . dries up the water resources, causes soil erosion, ruins the beauty of the landscape, destroys wildlife, and drives peasants from the land." Shepherds lose their pastureland to large plantations. Towns don't receive sunlight because the large trees shade them. Oil in the leaves discourages bugs, and consequently, there are fewer birds. The large eucalyptus groves get constant maintenance which leaves the ground barren and not attractive to wildlife. The eucalyptus replaces vineyards and olive groves.⁴²³

In some parts of the world, the eucalyptus has been considered a boon to the local economy, but when it fails for any reason the eucalyptus receives strong criticism. Quite often failure is attributed to either selecting the wrong species or selecting the wrong land. The problem is not really the tree but bad forestry practice. The FAO (Food and Agriculture Organization) reviewed the eucalyptus issue worldwide, and in 1985, published their findings in a document entitled "The Ecological Effects of Eucalyptus." It concluded after discussing its field research:

Having reviewed the evidence very thoroughly, we must stress that there can be no universal answer, either favorable or unfavorable, to the planting of eucalypts. Nor should there be any universal answer: each case should be examined on its individual merits. We cannot see how further general research, however detailed, can alter this conclusion. We stress that eucalypts should not be planted, especially on a large scale, without a careful and intelligent assessment of the social and economic consequences, and an attempt to balance the advantage against the disadvantages. 424

The discussion in this section on international issues is presented to alert the reader to ensuing problems both ecologically and politically which might find expression in California at some point. Also it is to make the reader aware of worldwide interest in eucalyptus.

PLANTING AND CARE

There are a number of good publications that have basic information on the proper planting methods and care of eucalyptus. Such authors as Abbott Kinney, Ellwood Cooper, Alfred McClatchie, Norman Ingham, George Lull, C.H. Sellers, and Woodbridge Metcalf give planting and care advice in their publications. Many of these works have already been cited in this study. Much of the information is similar and does not vary much even though some are older than others.

If one were to encapsulate the information in a phrase, it could be simply stated, "treat the eucalyptus like any other plant." This means: select the proper species, germinate the seeds indoors, keep seedlings in flat boxes, plant seedlings in proper soil during proper weather, water as needed, cultivate soil, and prune back when desired. This ideal recipe is basic to any plant with some variation in regard to plant type and environmental conditions. In this section, eucalyptus horticultural practices will be discussed briefly to give the reader some basic background. The deliberation will be in the context of history however.

One major question one must ask immediately before purchasing or gathering seed is where will these eucalyptus trees be planted? Early in the history of eucalyptus in California, planting was done on prime agricultural land with some trees being planted on hillsides. Once it was determined that the eucalyptus would not be a prime agricultural crop, farmers began planting them in waste land leaving the good soil for more important crops. Eucalyptus then has a history of being planted on poor soil void of nutrients, having little moisture, and little cultivation. There are exceptions to this of course where corporations planted large tracts of eucalyptus on good land. Some have planted eucalyptus in private gardens and public parks.

Once location and the objective have been decided, then the species can be chosen. Each eucalyptus species is different in regard to need and purpose. For example, a blue gum is not suitable to residential planting because it grows too big, is messy, tears up sidewalks, and invades sewer systems. It is more suitable as a windbreak or for biomass fuel. To select a species it is always advisable to use a written resource, or to ask an expert on the topic such as a farm advisor or nurseryman. Abbott Kinney was one such advisor.

In 1895, Kinney suggested interested growers should contact people who had eucalyptus experience, such as W.S. Lyons who was a botanist and former State Forester; J.L. Stengle at Park Nursery in Los Angeles; and Dr. Francischi of Santa Barbara.⁴²⁵ In his 1908 publication, George B. Lull listed several nurseries that sold eucalyptus seed or seedlings and could give advice on planting and care of the tree. Those were: Cox Seed Co., Pacific Nursery, and Seaman Nursery all located in the Bay Area. In southern California he listed Germain Seed and Plant Co., Stengel Exotic Nursery Co., and Theo. Payne.⁴²⁶

In some instances it was cheaper to grow seedlings than to buy them especially when large quantities were needed. Also there would be more consistency in seed stock if the grower collected and grew his own. Seed costs varied throughout the state from \$8 to \$30 a thousand. It would cost from \$2.50 to \$3.50 a thousand to grow seedlings. To buy or to grow seedlings was a matter of local economics and a separate decision for each grower.⁴²⁷

If species besides the common ones were desired, seed needed to be collected because they normally weren't available for sale. The best time to collect eucalyptus seeds is before the fruit opens. Once collected store in sacks or boxes. In warm water, seeds will open in 24 hours.⁴²⁸ There are 50,000 blue gum seeds in one pound and of these 40,000 will germinate and grow.⁴²⁹ Eucalyptus seeds will not germinate well in open soil but will in protected boxes.⁴³⁰ Growers have though broadcasted seed on sides of hills and have planted one seed at a time. The best time to do this is late June or early July.⁴³¹

For the best results, put seeds under 2 1/2 inches of soil covered with a layer of sand or redwood sawdust to hold the moisture. Be sure to keep the seeds damp through the heat of the day. Once the seedling breaks through the soil, water less or fungus will occur.⁴³² A lath house is the best facility for the germination of seed. It provides shade but allows some sun to filter in as well. The rule of thumb is forty seedlings per one square foot of space. Be sure to keep ants, rodents, and birds out.⁴³³

To be successful, McClatchie urges to plant species in the same conditions found in their native Australia. Some like arid climate while others like damp climate. Red and sugar gums do best in dry climates while the blue gum adapts easily to coastal moisture.⁴³⁴ It is important to know a species' frost toleration to be able to determine what climate in which to plant it.⁴³⁵

Having the right soil is crucial. Nearly all eucalyptus do well if the soil is properly prepared and maintained. The soil needs to be plowed and harrowed to allow the roots to reach moisture.⁴³⁶ It was found in a study by the University of California early this century that eucalyptus do poorly on sandy mesa soil and gravelly adobe slopes. Rich loamy soil is the general preference of the eucalyptus.⁴³⁷

Make sure that brush and trees are removed so the eucalyptus doesn't have to compete with them for soil nutrients.⁴³⁸ Soil should be free of clods,⁴³⁹ and then plant seedlings when six inches tall.⁴⁴⁰ Plant the seedlings in May or June. Be watchful of rodents eating the seedlings. Seedlings should be ten to twenty inches tall in the San Joaquin Valley because of the harshness of the summer heat.⁴⁴¹ It is good to plant seedlings before a rain. Cooper made this comment in regard to planting: "I have, with ten men, transplanted as many as seven thousand in an afternoon, and have ninety-five percent live."⁴⁴² Organize workers in teams. One group digs the holes, one to plant, and one to cover up.⁴⁴³

Avoid shock to the seedlings by keeping soil around the roots. Plant 1 1/2 inches lower in the soil than in the flat boxes. Press soil firmly and give small amount of water. Do not cultivate to kill the weeds which would take the nutrients away from the eucalyptus seedlings.⁴⁴⁴

Plant 1,000 trees to an acre with a spacing of 6 x 7 feet. In five years remove 3/4 of them leaving the straight and better specimens.⁴⁴⁵ McClatchie suggests planting them with 8 x 8 or 6 x 10 spacing. He advises not to plant too close as it affects proper growth.⁴⁴⁶ Ingham notes that spacing is important, and that close spacing will produce straight trees. Close spacing will also create a canopy which will shade the soil preventing evaporation and discourage ground vegetation.⁴⁴⁷

Lull suggests not to space smaller than 6 x 6 feet and not to space beyond 10 x 10. Take into consideration the purpose of the eucalyptus. If firewood is desired, spread the spacing out for more bushiness. If poles or posts are wanted, space closer for straight trees with little branches.⁴⁴⁸

Give the seedlings plenty of water especially in the inland areas which are much drier. Keep rabbits and other rodents away from the seedlings as they will eat them.⁴⁴⁹ Cultivation is important as it stimulates growth in young trees. In hot and dry climates, cultivation allows the young tree's roots time to locate the water table.⁴⁵⁰ It also stops weed growth which can sap the young tree's growth.⁴⁵¹ Cultivating costs should not exceed \$5 for the first year and \$2.50 the second year per 1895 estimates.⁴⁵²

Weak trees will soon die out allowing the stronger ones to use all the nutrients for greater growth.⁴⁵³ Thinning out of trees should be based on a production plan. Yield tables have been developed which factor in diameter of the tree, height of the tree, and the number of trees per acre. Such tables determine the number of trees needed to produce a certain yield.⁴⁵⁴

Any cutting, thinning or pruning should be done when the tree is least active which is normally during the late fall or winter. This is done so as not to bleed the tree's vitality. Cut the tree at an angle so the moisture will drain off thereby avoiding fungus growth. Cut the tree low because each new sprouting grows higher on the trunk.⁴⁵⁵

"The value of a plantation when ten years old will depend most largely on the care that it received during the first four or five years of its growth," advised Norman Ingham in 1908. It is important to remove limbs that deform trees to allow

for straighter and healthier growth.⁴⁵⁶ It cost from \$15 to \$50 per acre to prepare, plant, and maintain a plantation in 1908.⁴⁵⁷

INDIVIDUAL TREES, GROVES AND, PLANTATIONS

Planting of eucalyptus in California began gradually and then exploded on a massive scale. In the beginning eucalyptus was planted in gardens, near barns, next to houses, and along country lanes primarily for ornamental purposes. Once its value as firewood was seen, wider planting occurred. Next came the recognition of eucalyptus as a hardwood which could be used in numerous ways for profit, but this played out quickly when it failed to meet expectations. Left in the wake of this history are single trees, groves, and plantations. They provoke interest and their stories provide rich history which is covered in this section.

In 1876, Ellwood Cooper planted 50,000 eucalyptus on his "Ellwood" ranch. He recorded the progress of his enterprise advertising it when he could. Within three years his trees reached over forty feet. He planted on a variety of terrain for experimentation to see how the trees compared.⁴⁵⁸ It was reported that he cut 1,000 cords of wood per year which sold for \$2.50 a cord or \$2,500. His listeners were reminded that this money came from land little used for other purposes.⁴⁵⁹ Cooper wrote of other successes. General Naglee planted eucalyptus in San Jose in 1866 which grew within ten years to a height of ninety feet and a diameter of eighteen inches.⁴⁶⁰

In 1895, Abbott Kinney wrote of blue gum which he planted along Santa Monica streets in 1876. Kinney was the road master for the area, and he planted the trees in straight rows for aesthetics. Many didn't receive proper care and were cut down for firewood. This left holes in his orderly rows. He complained about this and about realtors who planted eucalyptus unevenly on property.⁴⁶¹ Kinney also told of Dr. Charles P. Murray, who was the road master for the Sierra Madre district, and his sugar gum plantings along the Lamanda and Sierra Madre roads.⁴⁶²

Kinney spent a day in the early 1890's at the University of California, Berkeley campus inspecting the eucalyptus trees planted decades before. He found fourteen species and most were in bad condition. He wasn't pleased about what he saw and wrote: ". . . the Eucalyptus plantations at the University of California grounds are uninteresting."⁴⁶³ In 1943, the California Division of Forestry recorded that the tallest eucalyptus tree in the state was on the Berkeley campus which measured 209 feet. In this grove there were 113 trees averaging 146.9 feet in height and 25 inches in diameter. It was projected that the grove could produce 294 cords of wood. This particular grove was planted in 1884, and the size of the trees even awed Australian visitors.⁴⁶⁴

Eucalyptus seed and seedling giveaway program of the University of California Experiment Station was popular throughout the state. In its 1903 report, it listed the species and the growers receiving them. The growers were expected to keep records and give feedback to the University. The species in the program were the familiar ones, such as, *rostrata*, *leucoxydon*, *robusta*, *gunnii*, *polyanthema*, *citriodora*, and *globulus*. Growers participating in the program were Albert Etter of Ettersberg, Humboldt County; H. Overacker Jr. of St. Helena, Napa County; L.L. Guss of Oakley, Contra Costa County; C.C. Wulff of Watsonville, Santa Cruz County; S.H. Haskell of Porterville, Tulare County; Alfred Day of Chatsworth Park, Los Angeles County; and Mrs. C.E. Foss of Alpine, San Diego County.⁴⁶⁵

During the eucalyptus boom period, many plantations were established. Dwight Whiting of El Toro, Orange County, reportedly planted 1,000 acres of gray, red, and sugar gums. The Bixby Company of Long Beach planted 3,000 acres of blue, gray, lemon, and sugar gums.⁴⁶⁶ Harry W. Dunn reported in his 1906 article that the Santa Fe Railroad had planted eucalyptus on its southern California ranch of 10,000 acres. In the desert, near the towns of Calexico, Coachella, and Imperial, several hundred acres were planted in eucalyptus. He commented⁴⁶⁷ that "Eucalyptus trees are being planted all over the bare foothills of southern California."⁴⁶⁸

Union Lumber Company at Fort Bragg, Mendocino County logged off 10,000 to 15,000 acres to plant eucalyptus, George B. Lull, State Forester, reported in 1908. The plan was really for the reforestation of redwoods. An eucalyptus tree would be planted next to a redwood to block out the hot sun so the redwood could grow without being burned.

Central Counties Land Company planted blue and sugar gums in the Clear Lake area. Pacific Electric Company and the Ontario Power Company bought land in Riverside and San Bernardino Counties to plant with eucalyptus.⁴⁶⁹

Lull lists some of the owners who planted groves for firewood:

Owner	Location	Acreage	
Cooper	Ellwood	200	
Bennett	Del Mar	200	
Nadeau	Florence	115	
Meecham	Petaluma	100	
Varrick	Orange	90	
Hazard	Los Angeles	90	
Thaxter	Florence	80	
Nichol	Santa Fe Sprgs	80	
Smith	Berkeley	80	
Bixby	Long Beach	80	
Rosencrans	Gardena	80	
Gunn	Santa Fe Sprgs	50	
Hough	Huntington Park	40	
Sexton	Compton	40	
Kellam	Compton	40	470

Norman D. Ingham in his 1908 publication for the College of Agriculture Experiment Station, Berkeley, has a section listing the places in California where eucalyptus has been planted and the species planted. For example at Tulare amygdalina, gunnii, rostrata, viminalis, globulus, and resinifera were planted. At San Jose globulus, rostrata, viminalis, stuartiana, corynocalyx, rudis, polyanthema, and tereticornis were planted.⁴⁷¹

C.H. Sellers, a former Assistant State Forester, in his 1910 publication there were yield tables of major California eucalyptus plantations. He compiled this information at the height of the eucalyptus boom to give tangible numbers to legitimize the eucalyptus industry. This was done to encourage growers and to give information to prospective investors. The tables contained the owner of the grove, grove's location, spacing between trees, age of trees, number of trees per acre, volume of timber, cords, volume of board feet, and if the trees began from seedlings or sprouted.⁴⁷²

Without question Sellers' study contained very valuable information. Tree spacing varied with each plantation from 4 x 4 feet to 12 x 12 feet with the most common being 8 x 8 and 10 x 10. The Baldwin plantation had the oldest trees which were 24 years old followed by the trees at the Mecham plantation in Petaluma which were 20 years old. Most plantations in southern California had eucalyptus of 6 to 9 years. Baldwin had the largest volume followed by Mecham. In Compton, Micheaux, Diamond Coal Company, Lassing, Montique, Sexton, and Stewart had eucalyptus plantations. Bailey and Newman had plantations in Santa Ana. Most of Sellers' research centered in southern California.⁴⁷³

Harrison Mecham's (Meechan or Meccham, spelling varies) ranch located 6 miles north of Petaluma had 200 acres in eucalyptus which had been planted in 1888. The ranch contained 5,000 to 6,000 acreage of rolling hills where cattle and sheep grazed. The eucalyptus occupied the gullies and hilltops to provide shelter for the livestock from the frequent rains.⁴⁷⁴

L. Micheaux of Compton kept records of his eucalyptus which were shared with others. His plantation was used in promotional literature, and in one such brochure of the Eucalyptus Timber Corporation (1910) this was written:

*Mr. Micheaux's work is a striking example of successful Eucalyptus culture, and the public is indebted to him for some very valuable data as to the actual results which he has accomplished. He has kept a careful record of the date of each cutting and the results obtained, and is, therefore, in position to speak accurately and intelligently.*⁴⁷⁵

In 1910, Ellwood Cooper had eucalyptus that were now 35 years old and 175 feet in height which when cut could produce 2,000 feet of lumber each.⁴⁷⁶ In Linda Vista near San Jose, a grove of blue gum planted in 1870 were from

40 to 150 feet tall as noted in the 1910 publication of Louis Margolin on eucalyptus yields. He studied the important plantations and groves of the state. In northern California, he visited the Mecham ranch and studied the trees. In Alameda County, he examined a number of groves that were 30 to 40 years old. These trees had grown in loamy soil which is the best for eucalyptus. There were 300 to 800 trees per acre.⁴⁷⁷

Margolin's study contained individual tables for each grove he visited and gave the location, number of trees per acre, height, and volume per acre. The majority of the groves are under ten years of age and trees height averages 40 feet. He also has tables of older groves of 20 years with trees 100 feet tall. Only blue gum appears in the study.⁴⁷⁸

The 1916 report of the State Forester presents a table listing the California commercial plantations in existence. The table gives the plantation's location, eucalyptus species, acreage planted, age of the trees, and condition. It shows an immediate decline in the eucalyptus industry just after the boom. Companies whose plantations were studied: American Eucalyptus Company, California Eucalyptus Timber Company, Eucalyptus Estates Company, Golden State Eucalyptus Company, Sacramento Valley Eucalyptus Company, and Yolo Eucalyptus Company. Acreages ran from 240 of the American Eucalyptus Company to 1,330 of the Sacramento Valley Eucalyptus Company. The most popular species were tereticornia, rostrata, and globulus. Trees on the whole were four to seven years old and mostly in poor to fair condition. Just the Pratt Eucalyptus Company of Escondido had an excellent rating.⁴⁷⁹

In the August 1956 issue of Sunset Magazine there was an article describing the various California eucalyptus groves along with a map of their location. It begins with the Mecham ranch groves planted in the 1880's. One grove is 1 1/2 miles long and 7 rows wide. Near Lakeville and Petaluma Creek there are trees planted in the 1860's. Near Glen Ellen is Jack London's ranch where 10,000 eucalyptus were planted in 1910. William T. Coleman, who was the leader of the 1856 San Francisco vigilantes planted blue gum on his ranch north of San Rafael.⁴⁸⁰

Tamalpais Valley grove of red and blue gums were planted in 1910 with 75,000 seedlings to ultimately be used as pilings for San Francisco wharves. In the East Bay, Frank Havens and his People's Water Company planted \$250,000 worth of red and blue gums in the Berkeley-Oakland hills. Eucalyptus trees were planted at Mills College in 1871. Across the bay, the Presidio, Sutro Forest, Mount Davidson, and Yerba Buena Island. Some of these come from San Francisco Mayor Adolf Sutro's Arbor Day plantings in the 1880's. In 1886, 3,000 people traveled by boat to Yerba Buena Island to plant eucalyptus and to hear speeches given by Sutro, Joaquin Miller, and General Mariano Vallejo.⁴⁸¹

In the 1870's, John McLaren, developer of Golden Gate Park, planted elms along El Camino Real. Eucalyptus trees were planted next to the elms to shelter them. These blue and manna gums outgrew the elms and were removed eventually for highway widening.⁴⁸² McLaren also planted 30,000 trees in Golden Gate Park among which were eucalyptus.⁴⁸³ In 1888, eucalyptus and other trees were planted on the Stanford University campus. Soon the eucalyptus outgrew the other trees and became the focal point of the arboretum and botanic garden. In 1956, the oldest existing eucalyptus tree in California was the San Jose eucalyptus planted in 1858 by Captain Joseph Aram.⁴⁸⁴

In the central valley of California, practically every ranch had an eucalyptus tree planted near ranch buildings. Frederick Roeding, a Fresno nurseryman, planted a number of eucalyptus species at Roeding Park, Fresno. Also in Fresno, are 3,000 eucalyptus planted by Theodore Kearney at Kearney Park. The J.C. McCubbin ranch near Dinuba has manna gum trees planted in 1889. In Visalia, there is an eucalyptus tree planted by David Douglass in 1860.⁴⁸⁵

John Smedley of the South Pacific Coast Railroad planted eucalyptus along the streets of Newark, located in southern Alameda County in the 1870's.⁴⁸⁶ At the Los Angeles State and County Arboretum is found the "Wolfskill Eucalyptus" next to Queen Anne Cottage. Some feel that William Wolfskill planted eucalyptus on the Rancho Santa Anita in the 1860's or 1870's. Harris Newmark bought the rancho in 1872 and commented that there were five blue gums near the house. The Queen Anne Cottage was built in 1881 by another owner, E.J. Baldwin, and he planted eucalyptus. Many feel that the "Wolfskill Eucalyptus" was actually planted by Baldwin in 1881.⁴⁸⁷

Found in the National Register of Historic Places is the Etiwanda Windbreaks of San Bernardino. These eucalyptus were planted to protect fruit trees, fences, and houses from the constant winds blow in from the Cajon Pass.⁴⁸⁸ In South Pasadena, there is a citriodora eucalyptus that was planted by John Muir in 1889.⁴⁸⁹ Phineas Banning built a

home in Los Angeles in 1864 and planted a forest of red gums from Australian seeds given to him by missionary.⁴⁹⁰

The grandparents of all the blue gums planted in southern California are the blue gums found at Shadow Park in Canoga Park. They were planted by Alfred Workman in the 1870's from seed brought to him from his native Australia.⁴⁹¹ Selected as the "Champion Tree" by the American Forestry Association was the red gum found at the Tracy Ranch in Kern County. In 1990 it was 171 feet tall and 15 feet in circumference. It was planted by Fanny Tracy in 1904 where at one time there were three acres of eucalyptus.⁴⁹²

In recent years, because of pulp and biomass fuel interest, a 250 acre plantation was developed by Louisiana-Pacific Corporation near Willows, California. On it are 50,000 eucalyptus to be used for waferboard and pulp. In 1985, the largest grower of eucalyptus in California was Rod Kazanjian of Delano. He has 1,240 acres in eucalyptus.⁴⁹³ In 1988, 1.8% of the hardwoods in California was eucalyptus compared to 20.2% for California black oak.⁴⁹⁴

ECONOMICS

Much of the interest in eucalyptus has been in some fashion related to economics. Its fast growth, size, and utility commands a look at its possibilities. The profit road for the eucalyptus has not always been smooth. Some growers have had success, and indeed internationally, the eucalyptus industry is faring well. California eucalyptus history would be incomplete without some discussion of its economics.

Ellwood Cooper writing in 1876 addressed eucalyptus economics in plain terms. After five years of growth, 250 eucalyptus trees can produce 700 fence posts for a total of \$100, and the scrap wood would bring in another \$100. This would be a total of \$200. It cost \$20 a year to plant, maintain, and harvest the 250 trees which makes a total expense of \$100 for five years. One then would make \$100 profit for the five years. At the end of 50 years, it would be \$10,000 profit.⁴⁹⁵ A nice sum, but a long wait.

Eucalyptus normally was planted on unused or waste land, and when profits were made, it was additional money for the farmer. General Stratton of Alameda County planted 45 acres of blue gums in 1869 on hilly land east of Hayward. In 1880, he cut down 20 acres of the trees and sold them for \$3,866 or about \$17.50 an acre.⁴⁹⁶

Near Los Angeles during this same time, a grove of blue gum made a profit of \$6,450 at the end of seven years or \$9.50 per acre. It cost \$7.50 for an acre worth of seedlings; labor to plant per acre was \$5; yearly cultivation was \$5 per acre; and rental of the land was \$3 per acre each year. Total expense for seven years per acre was \$38.50. The grove produced 35 cords per acre at \$3 a cord, or \$105 per acre total. Total expense was \$3,734.50 and total takein was \$10,185 which produced a profit of \$6,450 at the end of seven years.⁴⁹⁷

In 1894, one writer summed it up this way:

*The average market price of this wood is \$3 per cord, and when a man gets a yield of \$45 per acre, which includes the expense of chopping and loading upon the cars, he is doing better, and placing more cash to his credit in the bank, than any farmer in the Willamette or Sacramento Valleys with a yield of fifty bushels of wheat to the acre.*⁴⁹⁸

Later in 1908, the tune had changed some. Now the thought was hardwood production instead of firewood as exemplified by this writer:

*Wood as a fuel is rapidly becoming a luxury, and there is in the mind of this writer no reason for expecting any increase in use as fuel by the general public . . . (it is) unprofitable and unwise to enter upon Eucalyptus planting with the sole idea of raising wood for fuel . . . the future will be found in hardwood for wagon work, farm and other implements, railroad coach, and house furnishings . . .*⁴⁹⁹

At the time of this prognosis, the boom was on and prospects were high.

Another writer in the same year talked of growing eucalyptus in rich agricultural soil: "Groves set out in fertile Los Angeles Valley have yielded from 50 to 80 cords at every cutting. Yields of 75 cords per acre every seven or eight years have been frequent." Large trees⁵⁰⁰ produced four to six cords or 1,500 to 3,000 feet of wood. Trees brought between \$12 to \$25 each.⁵⁰¹ At this time, eucalyptus promoters were making some fabulous claims such as \$2,500

planted today in eucalyptus would bring \$25,000 every ten years with proper care.⁵⁰²

L. Micheaux of Compton was featured in promotional literature describing his fortune made in eucalyptus. His 30 acre plantation had been cut a third time and sold for cord wood. He cut six acres of 5-7 year old trees and sold the wood for \$3,726 after expenses. He sold 500 trees for telegraph poles to a railroad for \$2,800. He also thinned out his plantation and sold cord wood for \$7 per cord. His profits from this and other eucalyptus wood was \$8,626 for six acres of 6 1/2 years of growth. He sold 120 acres containing eucalyptus for \$700 per acre near Santa Ana.⁵⁰³

For hardwood in 1910, eucalyptus would bring \$25 per 1,000 feet of board on the stump. This was the price for 23 year old trees south of Hollywood. The trees were 125 to 150 feet tall and 36 inches in diameter. These would produce 1,500 to 2,000 feet of lumber each.⁵⁰⁴

W.E. Graves, representing the Eucalyptus Timber Company, visited Ellwood Cooper at his ranch near Santa Barbara in 1910. The intent was to promote the eucalyptus industry of which Cooper was California's very first strong proponent.

The two men were looking at a grove of 30 year old trees which were about 160 feet tall. Graves asked Cooper how much money would they get?

Well, there are sixteen trees in that clump. The third one on the right is 2 1/2 feet in diameter and measures over 2000 feet of lumber. It is safe to say the trees will average fully 1000 feet each. This would make 16,000 feet of lumber. I can sell the lumber any day F.O.B. cars here, cut and cured, at \$100 per thousand feet, which would make the trees bring \$1600.

(Graves asks) *That is, of course, taking both the grower's and millman's profit, Mr. Cooper, would you not sell those trees just as they stand on the stump for say \$1000 cash?*

(Cooper replies) *No, I would not, for I have quite a large acreage of Eucalyptus on my ranch, and I intend putting in a sawmill next year, and it will not cost me anything but \$500 to cut and cure 16,000 feet of lumber.*⁵⁰⁵

At this time, Hughes Manufacturing Company, the largest cabinet factory in southern California would pay \$90 to \$100 per 1,000 feet of eucalyptus lumber if properly cured.⁵⁰⁶ Hardwood profits were there if the eucalyptus wood could produce the desired products. Also at this time (boom period), a veneering plant and six sawing and manufacturing plants were established just to handle eucalyptus.⁵⁰⁷

Promotional companies during the boom period were planting land with eucalyptus and selling it for \$250 an acre. The Forest Service did measurements on yield and felt that growers would get a fair return on their investment when paying not more than \$60 per acre. Soon it was realized that ten-year old eucalyptus was suitable only for firewood.⁵⁰⁸

Eucalyptus firewood in 1924 was selling for \$18 to \$24 a cord delivered or \$10 to \$16 not delivered. A grower could hire out cutting and stacking for \$8 to \$12 a cord. But some eucalyptus firewood sold for just \$1 a cord when competing with other woods such as oak or orchard wood. Transporting costs can be expensive especially when most eucalyptus groves are planted in isolated areas and on rough terrain.⁵⁰⁹

Cost of planting in 1912 was \$25 to \$40 an acre. By 1924 it had increased to \$45 to \$60 an acre. Owners of well-maintained groves estimated it cost \$100 an acre to buy land, plant and cultivate for ten years. Even regarding transporting costs from difficult terrain, the grower is still better off using steep and unused land for eucalyptus than rich agricultural land.⁵¹⁰

Eucalyptus four to six years old can be sawn for firewood. For maximum value, it is better though to wait until they are eight to ten years. Firewood can be sawn earlier from sprouted eucalyptus. For hardwood timber purposes, it takes twenty to thirty years to produce satisfactory quality, and much longer for superior grades.⁵¹¹

In 1988, to break even selling eucalyptus as biomass fuel, a grower would need to get \$65 cord at least. On the stump it would run \$26 to \$40 a ton.⁵¹² Again, as has been the case throughout eucalyptus history, it is cheaper to use waste land or non-agriculture acreage for eucalyptus fuel production.⁵¹³

SO MANY EUCALYPTUS SPECIES!

Nearly all the classic works on the eucalyptus have a section in them describing and identifying the various eucalyptus species. Baron Ferdinand von Mueller was the first to do so in his 1876 Australian work *Eucalyptographia*. In the same year Californian Ellwood Cooper published a work entitled *Forest Culture and Eucalyptus Trees* which included descriptions of the various eucalyptus species.

The next important California eucalyptus work appeared nearly two decades later in 1895 written by Abbott Kinney with the title *Eucalyptus*. This was the definitive publication of the time containing information on the various species and their relationship to the California environment. In 1902, Alfred McClatchie authored an important work entitled *Eucalypts Cultivated in the United States*. This study was published by the U.S. Bureau of Forestry and discussed the numerous species, their usage, and value.

Two important publications appeared in 1908. One came from the State Board of Forestry with the title *A Handbook for Eucalyptus Planters*, and the other from the University of California Experiment Station entitled *Eucalyptus of California*. The latter is of special interest in that it contains photographs and identification of eucalyptus foliage. The State Forester published in 1910 the work *Eucalyptus: Its History, Growth and Utilization* which was written by C.H. Sellers. It too had a section identifying California eucalyptus species. Finally, there are Woodbridge Metcalf's published works which contains identification of species.

Two recent Australian publications provide illustrations and descriptions of species. The most beautiful is the two volume work written and drawn by Stan Kelly and published in the United States in 1983 with the title *Eucalypts*. It is highly pictorial and contains descriptive text. The other publication is *Forest Trees in Australia* which was published in 1957 and contains photographs and descriptions.

There are over 600 eucalyptus species worldwide. The exact number is difficult to pinpoint because there are many hybrids that look similar.⁵¹⁴ In 1900, the number found in the literature was generally 150 species.⁵¹⁵ Australian botanist W.F. Blakely reported in 1955 that there were 522 species and 150 varieties.⁵¹⁶ Once a set of identification criteria was established and scientists used new technology available to them, the figure easily looms over 600 species.

Two hundred eucalyptus species have been transported to other continents from Australia.⁵¹⁷ There are at least 100 species growing in California.⁵¹⁸ At one time the Santa Monica Forestry Station had 70 species alone.⁵¹⁹ In 1924, Metcalf felt that he could identify between 60 to 75 species in California.⁵²⁰ Again, the reason for such ambiguity is that many species look alike.

Recently, Grace Heintz of Santa Monica, identified 500 eucalyptus species in California! She is a novice botanist who published a book entitled *Trees of Santa Monica*. How reliable is her information? Jim Bauml, senior botanist for the Los Angeles State and County Arboretum, consults with Heintz on identification. He prides Heintz and her abilities, and notes that there is no one "who has a broader or deeper knowledge of eucalyptus." She is referred to as the "Johnny Appleseed of eucalyptus."⁵²¹ Heintz is undoubtedly using a finer line of identification to locate that many. Because eucalyptus grow in tight knit groves, hybrids are numerous.

Identifying eucalyptus has always been a problem and so has the names applied to the various species. A common name can be applied to several species. For example, some call all eucalyptus "blue gum" or "gum." Australian settlers grouped the eucalyptus into four types: gum, iron bark, stringy bark, and box or wooly butt.⁵²² These general names are enough evidence to see the necessity of assigning scientific names to the species.

In this section information is given for only the most popular California species. This way the reader does not have to go to the major eucalyptus works for quick information.

These are the most popular California species:

E. amygdalina or black peppermint is the tallest of the eucalyptus with measurements over 400 feet in its native environment of Tasmania. The tallest recorded was 475 feet with a circumference of 130 feet. The tree was over 200 years old.⁵²³ The species was used in ships especially planks because of its length.⁵²⁴ It grows well in most of California even in the frosty inland valleys, but its height isn't as grand as in the Tasmanian virgin forests. It has dense foliage and branches droop. Its bark is rough and persistent, and has a distinctive peppermint scent. It seems to do well in poor soil.

E. camaldulensis, or red gum or Murray red gum or river gum, is the most widely distributed eucalyptus in Australia and hence an adaptable species. It can be found in the San Joaquin Valley.⁵²⁵ In California it has denser foliage and has been confused with *rostrata*.⁵²⁶

E. citriodora, or lemon-scented gum, and also referred to as spotted gum, carries a strong lemon scent. Its scented oil produces citronella which is a fragrant perfume. It is a native of Queensland in northeast Australia. It doesn't take the frost well which makes it a coastal tree. There are some fine specimens on the University of California, Berkeley campus. Its bark is a smooth silvery-white.⁵²⁷

E. cornuta, or yate eucalyptus, is native of southwestern Australia. It has rough and furrowed bark, and grows best along the California coast. *Cornuta* does well in alkaline soils and is used to reclaim land by draining the alkali from the soil.⁵²⁸

E. corynocalyx, or sugar gum has leaves that are somewhat sweet and will leave a taste of almonds. It is fed to cattle and sheep, and does well in dry areas because it has a long taproot. It is from southern Australia and when used as posts or poles will resist ground rot the best. Sugar gum is more frost-tolerant than most species and is used as hardwood in construction. It has red foliage and round leaves. Sugar gum can be found along roadways and being used as windbreaks. A very adaptable species that grows up to 150 feet in height.⁵²⁹

E. dalyrpleana, or white gum, comes from southeastern Australia and Tasmania. It is very similar to *viminalis* and resists frost well. It has rough bark at the base and smooth yellowish white bark elsewhere.⁵³⁰

E. globulus, or blue gum, is the most popular of the eucalyptus species planted in California. The words "eucalyptus" and "blue gum" are synonymous in the minds of many in that "blue gum" stands for all eucalyptus species. It is a native of Tasmania and Victoria, Australia and was first identified in 1792 by the French botanist Laubillardiere. Some trees in the virgin forest were over 300 feet tall. Its popularity stems from its very rapid growth and its use as windbreaks and firewood. If not seasoned properly, blue gum wood will warp and twist making it useless as a hardwood. In Australia, it was used in most construction especially in shipmaking, but the trees were from virgin forest and very old. Its widespread use in its native land misled Californians who were expecting their young trees to have the same qualities as the much older Australian trees. It grows best along the California coast because it likes damp climate. Frost will cripple it, but it resprouts quickly. It has been referred to as the "fever tree" because of its ability to dry up moisture in swampy lands thereby eliminating the breeding ground of the malaria-carrying mosquito. Eucalyptol is distilled from its leaves and used in medicines.⁵³¹

E. marginata, or jarrah, was considered to be the most valuable lumber for wharves and pilings because of its ability to resist the teredo worm.⁵³² It is a slow grower and can be found primarily in southern California with some groves in the San Francisco Bay Area. It comes from the southwestern corner of Australia.

E. obliqua, or messmate stringybark or messmate, grows in the southeastern corner of Australia and Tasmania. It has served the Australians well because of its many uses and its vigorous growth. It resembles European ash trees and was called "ash" by the early settlers in Australia. It has reached 225 feet in height in its native land. It grows well along the California coast because of its need for moisture.⁵³³

E. resinifera, or mahogany gum or red mahogany, has been used extensively in Australia and somewhat in the United States for mahogany inside railroad cars. It can be found along the east coast of Australia and does its best along the California coast.⁵³⁴

E. robusta, or swamp mahogany or swamp messmate, has rough red bark. It can be found primarily in southern California and grows well in low wet ground especially in alkali soil in the San Joaquin Valley. In Australia, it is found in New South Wales and has been used in shipbuilding and for various hardwood implements.⁵³⁵

E. rostrata, or red gum, grows extensively in California. It can tolerate frost, drought, and heat. It is durable and is used for a multitude of products. It is used for posts, piles, shipbuilding, and construction especially in southeast Australia in the early pioneer years. Red gum is the most versatile eucalyptus and can grow in all types of soils and environments. It is as hard as iron when dried.⁵³⁶

E. rudis, or desert gum, is a medium size tree of 75 to 100 feet in height. It is found in the southwest corner of Australia and is known there as swamp gum. It grows well along rivers but also likes dry climate.⁵³⁷

E. sideroxylon, or red ironbark, comes from southeast Australia, and its wood is dense and durable. It resists frost

and heat. It is used extensively throughout California especially along highways.

E. tereticornis, or gray gum (or forest red gum in Australia), is both frost and drought resistant. Because of its environmental adaptability, it grows well in the central valley of California. In Australia, it has had wide use, from shipbuilding to posts, because of its durability in water and ground. It was used reliably by early Australian settlers.⁵³⁸

E. viminalis, or manna gum, has grown over 300 feet tall in Australia. The name "manna" was given to it because it secretes a gum that becomes white thin flakes eaten by children of Australian settlers and Aborigines. It is not very durable, but it can tolerate frost. It is found in southeastern Australia and in Tasmania. In California it is seen mostly in the San Joaquin Valley. It is a favorite food of koalas.⁵³⁹

FINIS

This concludes the study of eucalyptus in California. The poem "Eucalyptus, II" by William J. Margolis is a fitting summation of the character of this marvelous unique tree.

Eucalyptus, II

Yes, Eucalyptus, you just stand
and sway in the wind, suck
the breast of earth,
breathe the sun,
yes, Eucalyptus, you just grow.

In rain you soak it up,
in calm you do not move,
& when the wind is fierce
you flex & gyre & snap a twig
& shed leaves all over the neighbors.

No, Eucalyptus, I'm not so flexible
as you -- I drown in these rains
and these gales lacerate my flesh
and my soul splits and shatters
all over the neighbors.

Yes, Eucalyptus, teach me
your stolidity -- I'll get
the hang of it yet. 540

[Back to Table of Contents](#)

The Eucalyptus of California

Notes

by **Robert L. Santos**
California State University, Stanislaus
Librarian/Archivist
bsantos@toto.csustan.edu

Alley-Cass Publications
Denair, California
Copyright 1997

- 1 Robert Fyfe Zachrin, *Emigrants Eucalyptus* (Melbourne: Melbourne University Press, 1978), 39.
- 2 *Ibid.*, 42-43.
- 3 *Ibid.*, 44.
- 4 *Ibid.*, 51.
- 5 *Ibid.*, 51
- 6 *Ibid.*
- 7 U.S. Department of Agriculture, Bureau of Forestry, *Eucalypts Cultivation in the United States*, by Alfred James McClatchie, Bulletin, no. 35 (Washington, DC: GPO, 1902), 15.
- 8 California Agricultural Society, "Australian Forest Trees," in *Transactions During the Years 1866 and 1867* (Sacramento, D.W. Gelwicks, State Printer, 1868), 271-272.
- 9 Ellwood Cooper, *Forest Culture and Eucalyptus Trees* (San Francisco:

- Cubery, 1876), 46-50.
- 10
U.S. Department of Agriculture, *Eucalypts Cultivation in the United States*, 20.
- 11
Ibid.
- 12
Alfred James McClatchie, "Eucalyptus of the Southwest," *Out West* 20(April 1904): 338.
- 13
Ibid., 340.
- 14
Cooper, 15.
- 15
California State Forester, *Eucalyptus: Its History, Growth, and Utilization*, by C.H. Sellers. (Sacramento: A.J. Johnston Co., Printer, 1910), 11.
- 16
Kenneth Johnson, "Eucalyptus," *Out West* 6(October 1971): 46-47.
- 17
George Eugene Fairhead, "Eucalyptus, the Hardwood of the Present" *Out West* 31(December 1909): 953.
- 18
University of California, Berkeley, *Extension of Agricultural Services, Trees of the Berkeley Campus*, Rev. ed. (Berkeley: The Extension, 1976), v.
- 19
Albert Wilson, "The Story of Two Careers: One of Tree, and the Other of a Man," *Journal of the California Horticultural Society* (October 1961): 144-148.
- 20
Viola Lockhart Warren, "Eucalyptus Crusade," *Southern California Quarterly* 44(March 1962): 31.
- 21
Carrie Casey, "Oakland's Redwood Retreat," *American Forests* 97 (November 1991): 55.
- 22
David John Nowak, "Urban Forest Development and Structure: Analysis of Oakland, California" (Ph.D., diss., University of California, Berkeley, 1991), 109.
- 23
Casey, 55.
- 24
California State Agricultural Society, "Australasian Arborculture," by T.B. Merry, in *Transactions During the Year 1893* (Sacramento: A.J. Johnston, State Printer, 1894), 125.

25

John S. Hittel, *The Resources of California* (San Francisco: A. Roman, 1863), 72.

26

Ibid., 92.

27

Titus Fey Cronise, *The Natural Wealth of California* (San Francisco: H.H. Bancroft, 1868), 111.

28

Ibid., 320.

29

Myra Hamilton, "Eucalyptus," *American Horticulturist* 57(October 1978): 27.

30

Frank William Purdy, "Eucalyptus Cultivation in California, 1853-1900" (MA thesis, Sacramento State College, 1968), iii.

31

Will Lawson, *Blue Gum Clippers and Whale Ships of Tasmania* (Melbourne: Georgian House, 1949), 15; Harry O'May, comp., *Wooden Hookers of Hobart Town* (Tasmania: L.G. Shea, Government Printer, 1900?), 60.

32

Jay Monaghan, *Australians and the Gold Rush* (Berkeley: University of California Press, 1966), 3.

33

Lawson, 15.

34

Charles Bateson, *Gold Fleet for California* (Sydney: Ure Smith, 1963), 156.

35

Johnson, 41; Woodbridge Metcalf, "Eucalyptus Trees Around the World," *Journal of the California Horticultural Society* (April-June 1958): 31.

36

Johnson, 41.

37

Purdy, 3.

38

Warren, 32.

39

Purdy, 1.

40

Johnson, 40.

41

H.M. Butterfield, "Introduction of Eucalyptus Into California," *Madrano* 3(October 1935): 149-150.

42

John A. Helms, "Introduction of the Eucalyptus to California, Their Current Status and Future Prospects," in *The International Forestry Conference for the Australian Bicentenary Proceedings of Papers Contributed and/or Presented Held in Albany-Wodonga 25 April - 1 May 1988*, vol. 3 (Melbourne?: Australian Forest Development Institute, 1988), 1.

43

"Whence the Eucalyptus," *California Conservationist*, November 1939, 18.

44

H.M. Butterfield, "Looking Back on California Horticulture," *Golden Gardens*, August 1939, 6.

45

Abbott Kinney, *Eucalyptus* (n.p.: B.R. Baumgardt, 1895), 6.

46

U.S. Agriculture, *Eucalypts Cultivated in the United States*, 18.

47

Helms, 2.

48

California State Forester, *Eucalyptus*, 9.

49

Butterfield, "Introduction," 153.

50

George McGillivrey, "Economic Value of the Eucalyptus," *Overland Monthly*, November 1888, 451.

51

California State Board of Agriculture, "Forest Culture," in *Biennial Report for the Years 1870-1871* (Sacramento: The Board, 1871), 51.

52

Kern County Weekly Courier, 1 August 1874, p.1.

53

Ibid.

54

Purdy, 11.

55

California State Agricultural Society, "Australian," 270.

56

California State Board of Agriculture, "Hard Timber," in Biennial Report for the Years 1870-1871 (Sacramento: The Board, 1871), 21.

57

Ibid., 22.

58

Purdy, 13-15.

59

Butterfield, "Introduction," 153.

60

University of California, Berkeley, Extension of Agricultural Sciences, 21.

61

U.S. Department of Energy, Division of Solar Technology, The Eucalyptus Energy Farm (Washington, DC: The Division, 1978), 4-5.

62

Butterfield, "Introduction," 152.

63

Edward Pugh, "Historic Eucalyptus," *Lasca Leaves* 16(Autumn 1966): 86.

64

Richard Simon, "Valley Eclectic," *Los Angeles Times*, 15 February 1988, *Metro* 8.

65

Pugh, 86.

66

California State Board of Forestry, *A Handbook for Eucalyptus Planters*, by G.B. Lull, Circular no. 2 (Sacramento: The Board, 1907), 5.

67

Purdy, 35.

68

Purdy, 9.

69

Cooper, 20.

70

Warren, 33.

71

Cooper, 15-16.

72

Ibid., 29.

73

Ibid., 16.

74

Ibid., 30-31.

75

Ibid., 5.

76

Ibid., 13.

77

Ibid., 16.

78

Purdy, 23.

79

McGillivrey, 457.

80

Purdy, 52.

81

Ibid., 55-56.

82

Ibid., 57-63.

83

Warren, 37.

84

John Bernard McGloin, San Francisco: The Story of A City (San Rafael, CA: Presidio Press, 1978), 159.

85

Warren, 37.

86

McClatchie, 336.

87

Clark Powell, "Eucalyptus Trees and Lost Manuscripts," California Librarian 17(January 1956): 32.

88

Ibid.

89

California State Board of Agriculture, "Hard," 21.

90

McGillivrey, 457.

91

Ibid.

92

McClatchie, 346.

93

U.S. Department of Agriculture, Forest Service, *The Waning Hardwood Supply and the Appalachian Forests*, by William L. Hall (Washington, DC: GPO, 1907), 14.

94

Ibid.

95

F.D. Cornell, "As It Was -- The Eucalyptus Industry --As It Is," *Grizzly Bear* 4(April 1909): 95.

96

George Peavy, "The Eucalypts in California," *California Weekly*, 30 April 11-June 1909, 363.

97

Ibid., 364.

98

George B. Lull, "The Eucalyptus Situation in California," *Grizzly Bear* 4(March 1909): 1.

99

Ibid.

100

Ibid.

101

George B. Lull, "Better Promise for the Eucalypt," *California Weekly* 16 June 1909, 479.

102

U.S. Department of Agriculture, Forest Service, *Utilization of California Eucalypts*, by H.S. Betts and C. Stowell Smith, Circular no. 179 (Washington, DC: GPO, 1910), 5.

103

Ibid.

104

Ibid.

105

California State Forester, 29.

106

Cornell, "As," 11.

- 107
Ibid.
- 108
Fairhead, 963.
- 109
California State Forester, Third Biennial Report (Sacramento: W.W. Shannon, Superintendent State Printing, 1910), 132.
- 110
Ibid., 136.
- 111
Mahogany Eucalyptus and Land Company. Eucalyptus: Prospectus of the Mahogany Eucalyptus and Land Company (Oakland, CA: Kelley-Davis, 1911?), 1.
- 112
Ibid., 25.
- 113
The Knave, "Eucalyptus, a Disappointment," Oakland Tribune, 10 January 1971, 9.
- 114
Don C. Miller, "Eucalyptus Patriarch," Westways 52(March 1960): 18.
- 115
Leonid Enari, "The Blue Gum," Lasca Leaves 26(March 1976): 12.
- 116
Ibid.
- 117
Miller, 18.
- 118
California State Forester, Third, 137.
- 119
Kenneth Thompson, "The Australian Fever Tree in California: Eucalypts and Malaria Prophylaxis," Annals of the Association of American Geographers 40(June 1970), 243.
- 120
Helms, 11-12.
- 121
Ibid., 13.
- 122
Ibid., 14.
- 123

Eric Gibson, "What's the Market for Eucalyptus," *California Farmer*,
16 April 1988, 45.

124

California State Board of Forestry, *Handbook*, 47.

125

U.S. Department of Agriculture, Bureau of Forestry, 26.

126

Ferdinand von Mueller, *Eucalyptographia* (Melbourne: John Ferres,
Government Printer, 1879), 3.

127

Zachrin, 10.

128

Ibid.

129

U.S. Department of Agriculture, Bureau of Forestry, 29.

130

California State Forester, *Eucalyptus*, 15.

131

California State Board of Forestry, *Yield from Eucalyptus Plantations
in California*, by L. Margolin, *Bulletin no. 1* (Sacramento: The Board, 1910), 6.

132

U.S. Department of Agriculture, Forest Service, *Eucalypts in Florida*,
by R. Zon and J.M. Briscoe, *Bulletin no. 87* (Washington, DC: The Service, 1911), 8.

133

E.N. Munns, "High Temperature and Eucalypts," *Journal of Forestry* 19
(1921): 30-31.

134

Kinney, 18.

135

Ibid., 33

136

California State Board of Forestry, *Handbook*, 10.

137

Kinney, 20

138

E.N. Munns, "Relative Frost Resistance of Eucalyptus in Southern Cali-
fornia," *Journal of Forestry* 16(1918): 418-419.

139

Ibid., 412-428.

- 140
Nowak, 120.
- 141
Thomas F. Ledig, "Improvement of Eucalypts for Fuel and Fiber in California," in *Biomass Production by Fast-Growing Trees*, eds. J.S. Pereira and J.J. Landsberg (New York: Kluwer Academic Publishers, 1989), 232.
- 142
J.K. Hasey and J.M. Connor, "Eucalyptus Shows Unexpected Cold Tolerance," *California Agriculture* 44(March-April 1990): 25-27; Barrie D. Coate, *Eucalypts for Amenity Use in California* (Davis, CA: Eucalyptus Improvement Association, 1990), 1; Michel Boulay, "Micropropagation of Frost-Resistant Eucalyptus," in *Proceedings of a Workshop on Eucalyptus in California*, June 14-13, 1983, Sacramento, California (Berkeley: Pacific Southwest Forest and Range Experiment Station, 1983), 102.
- 143
Sherburn R. Sanborn, "Frost Damage in Eucalyptus and Other Trees," *Tree Notes* 12(February 1991), 1.
- 144
California State Board of Forestry, *Handbook*, 9-10.
- 145
California State Board of Forestry, *Yield*, 6.
- 146
Ibid.
- 147
California Agricultural Experimentation Station, *Tolerance of Eucalyptus for Alkali*, by R.H. Loughridge, *Bulletin no. 225* (n.p.: The Station, 1911), 247.
- 148
Ibid., 252.
- 149
Ibid., 286-287.
- 150
Clarence Finch, "Agroforestry Plantings for 1990 in the Western San Joaquin Valley," *California Eucalyptus Grower* 5(July 1990), 8.
- 151
Zachrin, 15.
- 152
Ibid., 7.
- 153
University of California, Berkeley, College of Agriculture, Agricultural Extension Service, *Eucalyptus in California*, by Norman D. Ingham, *Bulletin no. 196* (Sacramento: State Printer, 1908), 46.

- 154
California State Board of Forestry, Handbook, 9.
- 155
Kinney, 23-24.
- 156
Ibid., 31.
- 157
Ibid.
- 158
Ibid., 30.
- 159
U.S. Department of Agriculture, Bureau of Forestry, 44.
- 160
Woodbridge Metcalf, Eucalyptus Trees Serve Many Purposes (Berkeley: Agricultural Extension Service of California), 8.
- 161
Ibid., 9.
- 162
Ledig, "Improvement," 234-235.
- 163
Ibid., 237.
- 164
Ibid., 238-240.
- 165
R.M. Sachs and C.B. Low, "Yields in High Density, Short Rotation Intensive Culture (SRIC), in Proceedings of a Workshop on Eucalyptus in California, June 14-16, 1983, Sacramento, California (Berkeley: Pacific Southwest Forest and Range Experiment Station, 1983), 71.
- 166
Zachrin, 15.
- 167
Ibid., 7.
- 168
Ibid.
- 169
California State Forester, Eucalyptus, 23.
- 170
U.S. Department of Agriculture, Forest Service, Utilization, 18.

171

Ibid., 8.

172

Ibid., 19-20.

173

Zachrin, 12; U.S. Department of Agriculture, Bureau of Forestry, 27.

174

McClatchie, 344.

175

Kinney, 124.

176

Zachrin, 11-12; Kinney, 124-130.

177

McClatchie, 345.

178

Hamilton, 26-28.

179

McClatchie, 344.

180

California State Board of Forestry, Handbook, 180.

181

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 46.

182

California State Board of Forestry, Handbook, 10-11.

183

U.S. Department of Agriculture, Bureau of Forestry, 31.

184

McGillivrey, 456.

185

California State Forester, Eucalyptus, 17.

186

Ibid., 19.

187

Warren, 38; John R. Shelly, "Utilization of California's Eucalypts," in *Future of Eucalyptus in California* (Davis: Eucalyptus Improvement Association, 1991), 61.

188

"Inmates Help Solve Agricultural Waste Water Problem," *Business Wire*, 26, November 1991.

189

Judith Colp Rubin, "Golan's New Battle Heights' Return to Syria,"
Washington Times, 14 May 1993, A1.

190

Gregory Katz, "Town Fears Another Shootout," Dallas Morning News,
22 February 1993, A1.

191

McClatchie, 340-342.

192

B.R. Hartsough and Gary Nakamura, "Harvesting Eucalyptus for Fuel Chips," California Agriculture 44(January-February 1990): 7-8.

193

Leland G. Stanford, "San Diego's Eucalyptus Bubble," Journal of San
Diego History 16(Fall 1970): 12.

194

University of California, Berkeley, College of Agriculture, Agricultural
Extension Service, Eucalyptus in California, 32-33.

195

California State Board of Forestry, Handbook, 37.

196

California State Forester, Third, 107.

197

University of California, Berkeley, Agricultural Experimentation
Station, Growth of Eucalyptus in California Plantations, by W. Metcalf, Bul-
letin no. 380 (Berkeley, The Station, 1924), 40.

198

California State Board of Forestry, Handbook, 41.

199

Ibid., 42.

200

Ibid.

201

Dean R. Donaldson and Richard B. Standiford, "Eucalyptus Fuelwood Rate Improves With Age," California
Agriculture 38(March-April 1984): 201.

202

J.K. Hasey "Low Elevation Foothill Fuelwood Plantation," California
Agriculture 42(November-December 1988): 21-22.

203

Ken R. Wells, "Eucalyptus for Energy," American Forests 94(May-
June 1988): 59.

204

Ibid.

205

Maureen Plas, Eucalyptus Firewood: Myths and Facts (Davis, CA: Eucalyptus Improvement Association, 1990?), 1-4.

206

Richard B. Pearce, "Eucalypts: Energy Tree of the Future," American Forests 89(January 1983): 33.

207

Ledig, 232.

208

Hartsough, 7.

209

N.H. Pillsbury, "Wood Equations for Central Coast Blue Gum," California Agriculture 43(November-December 1989): 14.

210

Gibson, 46.

211

United States Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station, Proceedings of a Workshop on Eucalyptus in California, June 14-16, 1983, Sacramento, California (Berkeley: The Station, 1983), 1.

212

Toshio Kojima, "Oil Distilled From Eucalyptus Trees," Reuters, 14 August 1980, 1.

213

Stanford, 11.

214

University of California, Berkeley, Agricultural Experimentation Station, Growth, 41.

215

John Moyer and Miles Merwin, "Design and Management of Eucalyptus Windbreaks," California Eucalyptus Grower 7(April 1992): 4.

216

Metcalf, Eucalyptus Trees Serve, 10.

217

California State Board of Forestry, Handbook, 34.

218

Ibid., 8.

219

Ibid., 34.

220

Ibid., 35

221

Moyer, 4.

222

California State Board of Forestry, Handbook, 36.

223

Ibid.

224

Moyer, 4.

225

California State Board of Forestry, Handbook, 32.

226

U.S. Department of Agriculture, Bureau of Forestry, 35.

227

Lawson, 15.

228

Fairhead, 960.

229

California State Board of Forestry, Handbook, 42-43.

230

Metcalf, Eucalyptus Trees Serve, 6.

231

California State Board of Forestry, Handbook, 44.

232

Ibid.

233

California State Agricultural Society, Australasian, 126.

234

U.S. Department of Agriculture, Bureau of Forestry, 36.

235

California State Board of Forestry, Handbook, 46.

236

U.S. Department of Agriculture, Bureau of Forestry, 36.

237

California State Board of Forestry, Handbook, 45.

238

University of California, Berkeley, Agricultural Experimentation Station, Growth, 43.

239

California State Agricultural Society, Australasian, 127.

240

University of California, Berkeley, Agricultural Experimentation Station, Growth, 43.

241

California State Board of Forestry, Handbook, 43.

242

Cooper, 25.

243

California State Board of Forestry, Handbook, 43-44.

244

"Railroad Eucalyptus Plantation in Southern California for a Future Timber Supply," American Lumberman, 15 February 1908, 33.

245

Harry W. Dunn, "One Tree to Save a State's Lumber Supply," Technical World Magazine 9(August 1908): 702.

246

"Railroad Eucalyptus Plantation," 33.

247

Ruth M. Harmer, "The Richest Community in the World," Fortnight, February 1956, 55.

248

Ibid., 55-56.

249

California State Board of Forestry, Handbook, 46.

250

Ibid.

251

California State Forester, Eucalyptus, 31.

252

W.E. Graves, Studies in Eucalyptus (St. Louis: Eucalyptus Timber Corporation, 1910), 89.

253

Fairhead, 961.

254

Ibid., 963

255

Ibid.

256

California State Forester, Eucalyptus, 27.

257

California State Board of Forestry, Handbook, 48.

258

Fairhead, 961.

259

University of California, Berkeley, Agricultural Experimentation Station, Growth, 41-42.

260

California State Board of Forestry, Handbook, 48.

261

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 31.

262

Ibid., 32.

263

California State Board of Forestry, Handbook, 47.

264

California State Forester, Eucalyptus, 41.

265

A.R. Penfold and J.L. Willis, The Eucalypts (New York: Interscience Publishers, 1961), 300.

266

John W. Turnbull, "Future Uses of Eucalyptus, California Eucalyptus Grower 7(April 1992): 6.

267

Ibid.

268

Ibid.

269

Ledig, 232-233.

270

Ibid.

271

James A. Rydelius, "Brazilian Eucalyptus Plantations Among the World's Most Productivek," California Eucalyptus Grower 5(July 1990):

7.

272
William D. Montalbano, "Dangers of Narrowing the Field," Los Angeles Times, 23 December 1993, A1.

273
California State Agricultural Society, "Australasian," 128.

274
McGillivrey, 454.

275
California State Agricultural Society, "Australasian," 128.

276
McGillivrey, 454.

277
U.S. Department of Agriculture, Bureau of Forestry, 41.

278
Kinney, 124.

279
U.S. Department of Agriculture, Bureau of Forestry, 41.

280
Kinney, 124.

281
Penfold, 325-326.

282
Ibid.

283
Steve Dale, "1st, Lincoln Park Zoo Finds Chow," Chicago Tribune, 9 September 1988, 6.

284
Cassy Cohen, "Los Angeles Zoo," Los Angeles Times, 12 June 1994, B10.

285
Jeff Callegari and Keith Durand, *Wild Edible Medicinal Plants of California* (El Cerrito, CA: The Authors, 1977), 90.

286
Kinney, 285.

287
Penfold, 246.

288
Ibid.

289

Moyer, Design, 5.

290

Kinney, 149.

291

Callegari, 90.

292

Kinney, 149.

293

Ibid.

294

Ibid., 152.

295

Ibid., 158.

296

Ibid.

297

Ibid.

298

Ibid., 135.

299

Purdy, 26.

300

California State Agricultural Society, "Australasian," 128.

301

Kinney, 149.

302

Stanford, 17-18.

303

J. Pearn, "The Enchanted Herb," *Medical Journal of Australia* 147
(7-21 December 1987): 569-570.

304

Kinney, 61.

305

F.G. Plummer, "The Growing of Eucalypts With Detailed Bibliography,"
in *Proceedings of the Society of American Foresters*, vol. 5 (Washington, DC: Society of American Foresters, 1907),
117.

306

Cooper, 22.

307

U.S. Department of Agriculture, Bureau of Forestry, 40.

308

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 34.

309

Turnbull, 7.

310

Moyer, Design, 4.

311

Weil Martin, "Oil Leak Disrupts Dulles," Washington Post, 29 February 1992, B4.

312

Kathleen Doheny, "Not in My Back Yard," Los Angeles Times, 29 January 1990, E1.

313

Judith Schoolman, "Products -- Everything Old Is New Again," Reuters Business Report, 25 January 1994.

314

Harold Farnsworth Gray and Russel E. Fontaine, "A History of Malaria in California," in Proceedings and Papers of the Twenty-fifth Annual Conference of the Mosquito Control Association, January 21-23 1957, San Jose, California (Turlock, CA: The Association, 1957), 28.

315

Ibid.

316

Ibid., 31.

317

Ibid.

318

"Eucalyptus Globulus: Its Use in Improving the Salubrity of Marshy and Malarial Districts," California Horticulturalist and Floral Magazine, January 1874, 16.

319

Ibid.

320

Ibid.

321

Cooper, 22.

322

J. Bosisto, "Is the Eucalyptus a Fever-Destroying Tree?" in the Transactions and Proceedings of the Royal Society of Victoria (Melbourne: The Society, 1876), 10.

323

Ibid., 11.

324

Ibid., 12.

325

Ibid., 21.

326

Ibid., 23.

327

U.S. Department of Agriculture, Bureau of Forestry, 43.

328

Thompson, Australian, 237.

329

Ibid., 238-239.

330

Kinney, 131.

331

Ibid., 132.

332

Ibid., 143.

333

Thompson, Australian, 242.

334

Ibid.

335

Ibid.

336

J. Gifford, "The Eucalyptus in the Tropics," *The Forester* 6(January 1900): 11.

337

Thompson, Australian, 239.

338

Kinney, 24.

339

Metcalf, Eucalyptus Trees Serve, 6.

340

Ralph L. Carhart, "Planting and Maintenance of Eucalyptus Along California Highways," paper presented at The Future of Eucalyptus in California, 9 May 1991, Sacramento, California, 3.

341

Ibid.

342

California State Forester, Fifth Biennial Report (Sacramento: State Printing Office, 1914), 342.

343

Carhart, 4.

344

Ibid.

345

Ibid., 8.

346

California Department of Transportation, Evaluation of New Species of Drought Tolerant Plants for Highways (Sacramento: The Department, 1981), 4-5.

347

U.S. Congress, House, Committee on Agriculture, Emergency Eucalyptus Assistance, report, 93rd Cong., 1st sess., 1973, 1.

348

Australia, Forestry and Timber Bureau, Control Burning in Eucalypt Forests, by A.G. McArthur, Leaflet no. 80 (Canberra: The Bureau, 1962), 1.

349

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 46.

350

U.S. Department of Agriculture, Forest Service, Forest Planting Leaflet -- Eucalyptus, Circular no. 59 (Washington, DC: The Service, 1907), 4.

351

Ibid., 10.

352

U.S. Congress, House, Committee on Agriculture, Predisaster Assistance for Eucalyptus Tree Fire Hazard: Hearing before the Committee on Agriculture, 93rd Cong., 1st sess., 29 May 1973, 10.

353

Nowak, 112.

354

California State Board of Forestry, Ninth Biennial Report (Sacramento: The Board, 1923), 45.

- 355
U.S. Congress, House, Committee on Agriculture, Predisaster, 10.
- 356
Ibid., 3.
- 357
Ibid., 7.
- 358
"E. Bay Eucalyptus Crisis," Sacramento Bee, 3 March 1973, A6.
- 359
Nancy Dooley, "Astounding Cost of the Dead Eucalyptus," San Francisco Chronicle, 22 July 1973, 5.
- 360
James Brachman, "How Many Trees Are Dead? San Francisco Chronicle, 29 April 1973, World 18.
- 361
Lance Williams, "Eucalyptus Trees Getting Blamed for East Bay Fire," San Francisco Chronicle, 22 December 1991, B1.
- 362
Ibid.
- 363
Ibid., B4.
- 364
Joseph F. Williamson, "Oakland Fire, One Year Later: 'Don't Blame the Eucalyptus.'" California Eucalyptus Grower 7(October 1992): 1.
- 365
Michael Perry, "Sydney Bushfires Fuelled By Exploding Eucalyptus," Reuters World Service, 10 January 1994.
- 366
Ibid.
- 367
Australia, Forest and Timber Bureau, 1.
- 368
Jonathan Kirsch, "Explosive Prose Propels Tome About Fire," Los Angeles Times, 30 January 1991, E1.
- 369
"East Bay Fire," Los Angeles Times, 18 October 1991, A1.
- 370

Brad Bonhall, "Pests Pack a Punch fo Dry Plants," Los Angeles Times, 4 August 1992, E1.

371

G.T. Scriven, "Beetle From Australia Threatens Eucalyptus," California Agriculture 40(July-August 1986): 4.

372

Elliot Diringer, "Beetle Threatens State's Eucalyptus," San Francisco Chronicle, 9 June 1986, 1.

373

Scriven, 6.

374

Nancy Ray, "Scientists Muster Army to Combat Beetles Threatening Southland's Eucalyptus Trees," Los Angeles Times, 11 October 1987, Metro 17.

375

John M. Glionna, "Wasps Get Job of Saving Eucalyptus From Beetles," Los Angeles Times, 17 July 1991, B1.

376

Scriven, 6.

377

Glionna, B1.

378

Ibid.

379

Bonhall, E1.

380

Robert Chow, "Longhorn Borer Beetle Found in the Bay Area," Los Angeles Times, 25 March 1989, 19.

381

Scriven, 4.

382

Chow, 19.

383

Dave Leshner, "State-County Tree Pest Battle Gets a Mite Confusing," Los Angeles Times, 29 December 1987, Metro 3.

384

Ray, Metro 17.

385

Chow, 19.

386

Diringer, I.

387

Glionna, B1.

388

"DWP Announces Plans to Fell Trees Infested By Eucalyptus Beetle,"
PR Newswire, 26 April 1989.

389

Bonhall, E1.

390

Ray, Metro 17.

391

"Researchers Pit Alien Wasp Against a Beetle," New York Times,
27 September 1988, C4.

392

Bonhall, E1.

393

Dana Nichols, "Eucalyptus Lovers Take On State Over Cutting Plan,"
Los Angeles Times, 10 October 1987, 3.

394

Maura Thurman, "Angel Island Trees Being Cut to Restore Park Eco-
logy, Gannett News Service, 18 September 1990.

395

Dale Champion, "Angel Island Eucalyptus Facing the Logger's Ax,"
San Francisco Chronicle, 9 September 1987, A2.

396

Charles Petit, "Some in Berkeley Want to Rid Hills of Eucalyptus,
Monterey Pine," San Francisco Chronicle, 23 October 1991, A19.

397

Dale Champion, "Angel Island Eucalyptus to Be Spared," San Fran-
cisco Chronicle, 12 September 1987, 2.

398

Kathleen Williams, "Outdoors / Monarch Butterflies," Los Angeles
Times, 21 January 1993, J14.

399

Walter E. Westman, "Managing for Biodiversity," BioScience 40
(January 1990): 26.

400

Thurman.

401

Paul Larmer, "Under the Spreading Eucalyptus," Christian Science

- Monitor, 14 April 1987, 25.
- 402
Champion, "Angel Island Eucalyptus to Be Spared," 2.
- 403
Ibid.
- 404
Champion, "Angel Island Eucalyptus Facing the Loggers' Ax," A2.
- 405
Nichols, 3.
- 406
Ibid.
- 407
Ibid.
- 408
Dale Champion, "A Plan to Chop Marin Eucalyptuses," San Francisco Chronicle, 8 March 1986, 3.
- 409
Dale Champion, "Public Hearing on Eucalyptus Removal," San Francisco Chronicle, 14 October 1986, 41.
- 410
"Park Service Details Plan for Cutting Eucalyptus," San Francisco Chronicle, 21 May 1986, 3.
- 411
"Eucalyptus Trees Cut in California," United Press International, 9 October 1982.
- 412
"Federal Highway Administration Reverses Policy on Legal Tree Cutting in Front of Billboards," U.S. Newswire, 8 June 1990.
- 413
"Still Up a Tree," Modesto Bee, 24 February 1993, B4.
- 414
Jennifer Warren, "California Album; Out on a Limb," Los Angeles Times, 24 February 1993, A3.
- 415
L.A. Chung, "2 Trees Attend Hearing," San Francisco Chronicle, 19 March 1985, 3.
- 416
"Historical Trees May Be Spared," San Francisco Chronicle, 23 May 1969, 27.

417

"A Job Well Done," Los Angeles Times, 8 March 1987, Metro 2.

418

Nancy Ray, "Battle of Ramona Can Save Only a Few Oaks," Los Angeles Times, 26 August 1990, D10.

419

"U. of the Pacific Cuts Big Trees," Chronicle of Higher Education, 28 September 1994, A7.

420

Majorie Sun, "When Trees Can Be Pest," Far Eastern Economic Review, 14 March 1991, 66.

421

William D. Montalbano, "Environment; On Iberian Peninsula," Los Angeles Times, 4 December 1990, H2.

422

Ibid.

423

Ibid.

424

U.N. Food and Agriculture Organization, The Ecological Effects of Eucalyptus, by M.E.D. Poore and C. Fries. (Rome: FAO, 1985), 55.

425

Kinney, 168.

426

California State Board of Forestry, Handbook, 14.

427

Ibid., 14-15.

428

Kinney, 168.

429

Cooper, 28.

430

U.S. Department of Agriculture, Bureau of Forestry, 46.

431

University of California, Berkeley, College of Agriculture, Agricultural Extension, Eucalyptus in California, 37.

432

Ibid., 38.

433

California State Board of Forestry, Handbook, 16-17.

434

U.S. Department of Agriculture, Bureau of Forestry, 32.

435

California State Board of Forestry, Handbook, 12.

436

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 39.

437

University of California, Berkeley, Agricultural Experimentation Station, Growth, 13.

438

Kinney, 168.

439

Cooper, 27.

440

Kinney, 172-173.

441

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 19.

442

Cooper, 27.

443

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 17.

444

Ibid., 41.

445

Cooper, 29.

446

U.S. Department of Agriculture, Bureau of Forestry, 37.

447

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 41.

448

California Board of Forestry, Handbook, 18.

449

U.S. Department of Agriculture, Bureau of Forestry, 48.

450

California State Board of Forestry, Yield, 7.

- 451
California State Board of Forestry, Handbook, 20.
- 452
Kinney, 172.
- 453
University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 41.
- 454
California State Board of Forestry, Yield, 8.
- 455
California State Board of Forestry, Handbook, 20.
- 456
University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 43-44.
- 457
California State Board of Forestry, Handbook, 20.
- 458
Cooper, 20.
- 459
Dunn, 702.
- 460
Cooper, 20.
- 461
Kinney, 50-51.
- 462
Ibid., 51.
- 463
Ibid., 119.
- 464
"Trees That Captured California," *Sunset*, August 1956, 48.
- 465
University of California, Berkeley, Agricultural Experimentation Station, Report of Work of the Agricultural Experimentation Station of the University of California from June 30, 1901, to June 30, 1903 (Sacramento: W.W. Shannon, Superintendent of State Printing, 1903), 143.
- 466
California State Board of Forestry, Handbook, 40.
- 467
Dunn, 697.

468

Ibid., 700.

469

California State Board of Forestry, Handbook, 40.

470

Ibid., 37.

471

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 55.

472

California State Forester, Eucalyptus, 50.

473

Ibid.

474

Ibid., 92.

475

Graves, 34.

476

Ibid., 64.

477

California State Board of Forestry, Yield, 12-14.

478

Ibid.

479

California State Forester, Sixth Biennial Report (Sacramento: California State Printing Office, 1916), 45.

480

"Trees That Captured California," 48.

481

Ibid.

482

Ibid.

483

McGloin, 159.

484

"Trees That Captured California," 48-49.

485

Ibid., 49.

486

The Knave, "Eucalyptus Has Served California Faithfully," Oakland Tribune, 28 August 1966, 30-31.

487

Enari, 14.

488

California Department of Transportation, Buildings and Bridges (Sacramento: The Department, 1993), 10.

489

Donald R. Hodel, *Exceptional Trees of Los Angeles*, Los Angeles: California Arboretum Foundation, 1988, 30.

490

Ibid., 33.

491

Ibid., 34.

492

Clarence Finch, "Agroforestry Plantings for 1990 in the Western San Joaquin Valley, California Eucalyptus Grower 5(July 1990): 8.

493

"Eucalyptus Tree Grower Buys Delano Property," Los Angeles Times, 17 March 1985, Real Estate 8.

494

U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, *Hardwoods of California's Timberlands, Woodlands, and Savannas*, by Charles L. Bolsinger (Portland, OR: The Station, 1988), 13.

495

Cooper, 29.

496

McGillivrey, 496.

497

Ibid., 496-497.

498

California State Agricultural Society, *Australasian*, 120.

499

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, *Eucalyptus in California*, 31.

500

California State Board of Forestry, *Handbook*, 37.

501

Ibid., 46.

502

Graves, 36.

503

Ibid., 91.

504

Ibid., 61.

505

Ibid., 62.

506

Ibid., 64.

507

Fairhead, 963.

508

U.S. Department of Agriculture, Forest Service, Yield and Returns of Blue Gum in California, by T.D. Woodbury, Circular no. 210 (Washington, DC: The Service, 1912), 7.

509

University of California, Berkeley, Agricultural Experimentation Station, Growth, 40.

510

Ibid., 57.

511

U.S. Department of Agriculture, Forest Service, Forest Planting, 11.

512

Karen Klonsky, "Economic Feasibility of Eucalyptus Production," California Agriculture 42(November-December 1988), 27.

513

Stan Kelly, Eucalypts, Rev. ed. (New York: Van Nostrand Reinhold, 1983): 31.

514

Zachrin, 10.

515

California State Board of Forestry, Handbook, 6.

516

Metcalf, Eucalyptus Trees Around the World, 32.

517

Zachrin, 17.

518

California State Board of Forestry, Handbook, 6.

519

University of California, Berkeley, College of Agriculture, Agricultural Extension Service, Eucalyptus in California, 30.

520

University of California, Berkeley, Agricultural Experimentation Station, Growth, 25.

521

Linda Fieldman, "For Seniors; Octogenarian Toils to Plant Seeds of Tree Awareness," Los Angeles Times, 12 June 1994, J24.

522

California State Agricultural Society, "The Eucalyptus," in Transactions During the Year 1874 (Sacramento: G.H. Springer, State Printer, 1875), 347.

523

McGillivrey, 452.

524

Cooper, 31.

525

Elizabeth McClintock, "Trees of Golden Gate Park -- 21 (Gums and Other Eucalypts)," Pacific Horticulture 43(Fall 1982), 25.

526

Ibid., 25.

527

University of California, Berkeley, Extension of Agricultural Services, Trees, 22.

528

Dunn, 699.

529

Kinney, 250.

530

Ledig, 237.

531

University of California, Berkeley, Agricultural Experimentation Station, Growth, 43.

532

Kinney, 44.

533

University of California, Berkeley, Extension of Agricultural Services, Trees, 24.

534

Dunn, 699.

535

McClintock, 27.

536

University of California, Berkeley, Agricultural Experimentation Station, Growth, 18.

537

California State Board of Agriculture, Shade and Ornamental Trees of California, by Merritt B. Pratt (Sacramento: The Board, 1922?), 71.

538

University of California, Berkeley, Agricultural Experimentation Station, Growth, 21.

539

McClintock, 24.

540

William J. Margolis, Eucalyptus Poems (Golden, CO: The Coupier Press, 1974), 2.

[Back to Table of Contents](#)

The Eucalyptus of California

Bibliography

by **Robert L. Santos**
California State University, Stanislaus
Librarian/Archivist
bsantos@toto.csustan.edu

Alley-Cass Publications
Denair, California
Copyright 1997

ARBENZ, J.H. The Eucalyptus in Texas. Austin: Austin Publishing Co., 1911.

"AS YOU TRAVEL THROUGH NORTHERN CALIFORNIA, HERE IS A GUIDE TO THE FAMOUS EUCALYPTUS STANDS." *Sunset*, August 1956, 46-49.

"AUSTRALIAN GUM TREES." *California Fauna and Journal of Useful Sciences* (1879).

BANDINI, JOSE. A Descriptive of California in 1828. Berkeley: Friends of the Bancroft Library, 1951.

"BEETLES PERIL EUCALYPTUS TREES IN L.A." *San Francisco Chronicle*, 25 May 1986, p. B5.

BOLAND, D. J., ed. *Forest Trees of Australia*. 4th ed. Melbourne: Thomas Nelson Australia, 1984.

BOSISTO, J. "Is the Eucalyptus a Fever-Destroying Tree?" In *Transactions and Proceedings of the Royal Society of Victoria*, pp. 10-23. Melbourne: The Society, 1876.

BRACHMAN, JAMES. "The Eucalyptus Crisis: How Many Trees Dead?" *San Francisco Chronicle*, 29 April 1973, *This World*, p. 18.

BURKE, C.E. and C.C. SCALIONE. "Investigations on the Oil in Eucalyptus Globulus of California." *Journal of Industrial and Engineering Chemistry* 7(1915): 206.

BUTTERFIELD, H.M. "The Introduction of Eucalypts Into California." *Madrano* 3(October 1935): 149-154.

BUTTERFIELD, H.M. "Looking Back on California Horticulture." Golden Gardens, August 1939, 6-7.

CALIFORNIA AGRICULTURAL EXPERIMENTATION STATION. Tolerance of Eucalyptus for Alkali, by R.H. Loughridge. Bulletin No. 225. Sacramento: The Station, 1911.

CALIFORNIA FURNITURE COMPANY. The California Furniture Company (N.P. Cole & Co.) [Catalog] San Francisco: The Company, ca. 1900.

CALIFORNIA STATE AGRICULTURAL SOCIETY. "Australasian Arborculture," by T.B. Merry. In Transactions During the Year 1893, pp. 125-174. Sacramento: A.J. Johnston, State Printer, 1894.

CALIFORNIA STATE AGRICULTURAL SOCIETY. "Australian Forest Trees." In Transactions During the Years 1866 and 1867, pp. 270-272. Sacramento: D.W. Gelwicks, State Printer, 1869.

CALIFORNIA STATE AGRICULTURAL SOCIETY. "The Eucalyptus." In Transactions During the Year 1874, pp. 347-349. Sacramento: G.H. Springer, State Printer, 1875.

CALIFORNIA STATE AGRICULTURAL SOCIETY. "Pacific Coast Woodlands." In Transactions During the Year 1877, pp. 141-149. Sacramento: F.P. Thompson, Superintendent of State Printing, 1878.

CALIFORNIA STATE BOARD OF AGRICULTURE. "Artificial Forest Culture." In Biennial Report for the Years 1870 and 1871, pp. 132-133. Sacramento: The Board, 1871.

CALIFORNIA STATE BOARD OF AGRICULTURE. "Forest Culture." In Biennial Report for the Years 1870 and 1871, pp. 54-55. Sacramento: The Board, 1871.

CALIFORNIA STATE BOARD OF AGRICULTURE. "Hard Timber." In Biennial Report for the Years 1870 and 1871, pp. 21-22. Sacramento: The Board, 1871.

CALIFORNIA STATE BOARD OF AGRICULTURE. Statistical Report of the California State Board of Agriculture for the Year 1916. Sacramento: California State Printing Office, 1917.

CALIFORNIA STATE BOARD OF FORESTRY. A Handbook for Eucalyptus Planters, by G.B. Lull. Circular No. 2. Sacramento: The Board, 1907.

CALIFORNIA STATE BOARD OF FORESTRY. Ninth Biennial Report. Sacramento: California State Printing Office, 1923.

CALIFORNIA STATE BOARD OF FORESTRY. Shade and Ornamental Trees of California, by Merritt B. Pratt. Sacramento: The Board, 1922.

CALIFORNIA STATE BOARD OF FORESTRY. Street and Highway Plantings, by Ben Y. Morrison. Bulletin NO. 4. Sacramento: State Printer, 1913.

CALIFORNIA STATE BOARD OF FORESTRY. Yield From Eucalyptus Plantations in California, by L. Margolin. Bulletin No. 1. Sacramento: The Board, 1910.

CALIFORNIA STATE DEPARTMENT OF AGRICULTURE. LANDSCAPE ARCHITECTURE OFFICE. Evaluation of New Species of Drought Tolerant Plants for Highways: Final Report, by Robert L. Thayer. Sacramento:

The Department, 1981.

CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION. ENVIRONMENTAL DIVISION. Buildings and Bridges. Sacramento: The Division, 1993.

CALIFORNIA STATE FORESTER. Eucalyptus: Its History, Growth, and Utilization, by C.H. Sellers. Sacramento: A.J. Johnston Co., Printer, 1910.

CALIFORNIA STATE FORESTER. Report of the State Forester for the Period July 12, 1905 to November 30, 1906. Sacramento: W.W. Shannon, Superintendent of State Printing, 1906.

CALIFORNIA STATE FORESTER. Sixth Biennial Report. Sacramento: California State Printing Office, 1916.

CALIFORNIA STATE FORESTER. Third Biennial Report. Sacramento: W.W. Shannon, Superintendent of State Printing, 1910.

"CALIFORNIA TREE TRAGEDY." Sacramento Bee, 7 April 1973, California Life, pp. 13-14.

"CALIFORNIA'S IMMIGRANT FORESTS." San Francisco Chronicle, 20 November 1961, p. 28.

CALLEGARI, JEFF and KEITH DURAND. Wild Edible Medicinal Plants of California. El Cerrito, CA: The Authors, 1977.

CHAMPION, DALE. "Angel Island Eucalyptus Being Spared." San Francisco Chronicle, 12 September 1987, p. 2.

CHAMPION, DALE. "Angel Island Eucalyptus Facing the Loggers' Ax." San Francisco Chronicle, 9 September 1987, p. 2.

CHAMPION, DALE. "A Plan to Chop Marin Eucalyptus." San Francisco Chronicle, 8 March 1986, p. 3.

CHAMPION, DALE. "Public Hearing on Eucalyptus Removal." San Francisco Chronicle, 14 October 1986, p. 41.

CHUNG, L.A. "Nob Hill Fights Off Chain Saws." San Francisco Chronicle, 8 February 1985, p. 3.

CHUNG, L.A. "Reprieve on Nob Hill: 2 Trees Attend Hearing." San Francisco Chronicle, 19 March 1985, p. 3.

COATE, BARRIE D. Eucalypts for Amenity Use in California: Time for a Change? Davis, CA: Eucalyptus Improvement Association, 1990.

COOPER, ELLWOOD. Forest Culture and Eucalyptus Trees. San Francisco: Cubery, 1876.

CORNELL, F.D. "As It Was -- The Eucalyptus Industry -- As It Is." Grizzly Bear 4(April 1909): 10-11.

CORNELL, F.D. "A Great Industry Promised for California." Grizzly Bear 3(September 1908): 4-5.

- CREASEY, DALE. "Composting and Eucalyptus Trees: An Alternative to Landfilling." California Eucalyptus Grower 5(April 1990): 5.
- CRONISE, TITUS FEY. The Natural Wealth of California. San Francisco: H.H. Bancroft, 1868.
- DIRINGER, ELLIOT. "Beetle Threatens State's Eucalyptus." San Francisco Chronicle 9 June 1986, P. 1, 6.
- DONALDSON, DEAN R. and RICHARD B. STANDIFORD. "Eucalyptus Fuelwood Rate Improves With Age." California Agriculture 38(March-April): 18-19.
- DONALDSON, DEAN R. "Planning and Preparing to Grow Your Own Firewood." California Eucalyptus Grower 5(April 1990): 1,6-7.
- DONALDSON, DEAN R. "Seven Year Performance of Eucalyptus Species in Napa County." California Agriculture 42(November-December 1988): 19-20.
- DOOLEY, NANCY. "Astounding Cost of the Dead Eucalyptus." San Francisco Chronicle, 22 July 1973, p. 5.
- DOYLE, J.H. "22 Golden Gate Park Trees Need to Be Cut, S.F. Says." San Francisco Chronicle, 10 September 1987, p. 27.
- DUFFIELD, J.W. California Experience With Eucalypts. Berkeley: The Author, 1952.
- DUNN, HARRY W. "One Tree to Save a State's Lumber Supply." Technical World Magazine 9(August 1908): 697-702.
- "E. BAY EUCALYPTUS CRISIS: FORESTS OF ONCE-FAVORED IMPORT ARE NOW A FIRE HAZARD." Sacramento Bee, 3 March 1973, p. A6.
- ELLIOT, W.R. "Gems in the Genus Eucalyptus." Pacific Horticulture 49(Spring 1988): 20-26.
- ENARI, LEONID. "The Blue Gum." Lasca Leaves 26(March 1976): 11-14.
- "EUCALYPTUS GLOBULUS: ITS USE IN IMPROVING THE SALUBRITY OF MARSHY AND MALARIAL DISTRICTS." California Horticulturist and Floral Magazine, January 1874, 16-17.
- EUCALYPTUS IMPROVEMENT ASSOCIATION. The Future of Eucalyptus in California: Proceedings of the 1991 Annual Meeting, May 19-20. Sacramento: The Association, 1991.
- "EUCALYPTUS OUTPERFORMS OTHER SPECIES IN SALTY FLOODED SOILS." California Agriculture 37(September-October 1983): 20-22.
- "EUCALYPTUS PLANTING." California Weekly, 14 May 1909, 387.
- EUCALYPTUS TIMBER CORPORATION. [Booklet Advertising the Eucalyptus Timber Corporation]. Los Angeles: The Corporation, 1909.
- "EUCALYPTUS TEST-CUTTING IN OAKLAND." San Francisco Chronicle, 28 February 1973, p. 49.

FAIRHEAD, GEORGE EUGENE. "Eucalyptus, the Hardwood of the Present." *Out West* 31 (December 1909): 953-965.

"FEDERAL AID COMING IN EUCALYPTUS DISASTER." *San Francisco Chronicle*, 26 May 1973, P. 1,6.

FINCH, CLARENCE. "Agroforestry Plantings for 1990 in the Western San Joaquin Valley." *California Eucalyptus Grower* 5(July 1990): 8.

"FIRE PERIL: CLEARING OAKLAND TREES -- \$1.5 MILLION." *San Francisco Chronicle*, 28 March, p. 2.

FUNKHOWSER, RAY G. "The Boom That Burst Into Beauty." *Westways* 41(July 1949): 10-11.

GIBSON, ERIC. "What's the Market for Eucalyptus." *California Farmer* 268(16 April 1988): 45-46.

GIFFORD, J. "The Eucalyptus in the Tropics." *The Forester* 6(January 1900): 11-13.

GILLIAM, HAROLD. "A Tree Changed California's Face." *San Francisco Chronicle* 18 July 1965, p. 28.

GRAVES, W.E. *Studies in Eucalyptus*. St. Louis: Eucalyptus Timber Corporation, 1910.

GRAY, HAROLD FARNSWORTH and RUSSEL E. FONTAINE. "A History of Malaria in California." In *Proceedings and Papers of the Twenty-fifth Annual Conference of the Mosquito Control Association, January 21-23 1957, San Jose, California*. Turlock, CA: The Association, 1957.

HARMER, RUTH M. "The Richest Community in the World." *Fortnight*, February 1956, 55-56.

HARTSOUGH, B.R. and GARY NAKAMURA. "Harvesting Eucalyptus for Fuel Chips." *California Agriculture* 44(January-February 1990): 7-8.

HASEY, J.K. and J.M. CONNOR. "Eucalyptus Shows Unexpected Cold Tolerance." *California Agriculture* 44(March-April 1990): 25-27.

HASEY, J.K. "Low Elevation Foothill Fuelwood Plantation." *California Agriculture* 42 (November-December 1988): 21-22.

HEINTY, GRACE. "Eucalyptus Deglupta." *Pacific Horticulture* 41(Winter 1980-81): 41-43.

HEINZ, GRACE L. *Trees of the Pacific Palisades*. Pacific Palisades, CA: The Author, 1986.

HELMS, JOHN A. "Introduction of the Eucalypts to California, Their Current Status and Future Prospects." In *The International Forestry Conference for the Australian Bicentenary Proceedings of Papers Contributed and/or Presented, Held in Albany-Wodonga 25 April-1 May 1988, vol. 3, 1-10*. Canberra: The Conference, 1988.

HODEL, DONALD R. *Exceptional Trees of Los Angeles*. Los Angeles: Arboretum Foundation, 1988.

HUNT, LEE O. "Eucalyptus: A World Perspective." *California Eucalyptus Grower* 5(July

1990): 1, 10-11.

JOHNSON, KENNETH. "Eucalyptus." *Out West* 6(October 1971): 451-49.

JONES, JAMES. "Eucalyptus Indoors." *Horticulture* 58(December 1980): 52-57.

KELLY, RICHARD. "New Cash Crop in California" *American Forests* 91(July 1984): 30-31.

KELLY, STAN. *Eucalypts*. 2 vols. Text by G.M. Chippendale and R.D. Johnston. Rev. ed. New York: Van Nostrand Reinhold, 1983.

KILDUFF, MARSHALL. "Now the Hills Are Barren." *San Francisco Chronicle*, 19 May 1973, p. 2.

KINGZETT, CHARLES. *Nature's Hygiene: A Systematic Manual of Natural Hygiene, Containing a Detailed Account of the Chemistry and Hygiene of Eucalyptus, Pine, Camphor Forests, and Industries Connected Therewith*. 3rd. ed. London: Bailliere, Tindall, and Cox, 1888.

KINNEY, ABBOTT. *Eucalyptus*. N.p.: Baumgradt, 1895.

KLOSKY, KAREN. "Economic Feasibility of Eucalyptus Production." *California Agriculture* 42(November-December 1988): 25-27.

LEDIG, F. THOMAS. "Improvement of Eucalyptus for Fuel and Fiber in California." In *Biomass Production by Fast-Growing Trees*, eds. J.S. Pereira and L.L. Landsberg, pp. 231-245. New York: Kluwer Academic Publishers, 1989.

LEE, ANTHONY and ROGER MARTIN. "Life in the Slow Lane." *Natural History* 99(August 1990): 34-42.

LULL, GEORGE B. "Better Promise for the Eucalypt." *California Weekly*, 18 June 1909, 479.

LULL, GEORGE B. "The Eucalyptus Situation in California." *Grizzly Bear* 4(March 1909): 1.

LYNCH, APRIL. "Unwelcome Green in Blackened Hills: Quick-Burning Eucalyptus' Stubborn Refusal to Die Is Bad News." *San Francisco Chronicle*, 10 February 1992, P. A13.

MAHOGANY EUCALYPTUS AND LAND COMPANY. *Eucalyptus: Prospectus of the Maghogany Eucalyptus and Land Company*. Oakland: Keeley-Davis, 1911.

MARGOLIS, WILLIAM J. *Eucalyptus Poems*. Golden, CO: The Coupier Press, 1974.

MCCLATCHIE, ALFRED JAMES. "Eucalyptus of the Southwest." *Out West* 20(April 1904): 336-346; reprinted in *Out West* 31(November 1909): 841-858.

MCCLINTOCK, ELIZABETH. "Trees of the Golden Gate Park -- 21(Gums and Other Eucalyptus)." *Pacific Horticulture* 43(Fall 1982): 22-27.

MCGILLIVERY, GEORGE. "Economic Value of the Eucalyptus." *Overland Monthly* 12 (November 1888): 449-458.

MCMINN, HOWARD E. and EVELYN MAINO. An Illustrated Manual of Pacific Coast Trees. Berkeley: University of California Press, 1959.

MERWIN, MILES. "Assessing and Preventing Drought Stress in Eucalyptus." California Eucalyptus Grower 5(July 1990): 9-11.

MERWIN, MILES. Eucalyptus and Fire: Inevitable or Preventable? Davis, CA: Eucalyptus Improvement Association, 1985.

MERWIN, MILES. "Evaluating Late Spring Recovery of Eucalyptus From Freeze Injury." California Eucalyptus Grower 6(July 1991): 4-5.

MERWIN, MILES. "Freeze Damage Observations in Northern California." California Eucalyptus Grower 4(July 1989): 6-7.

MERWIN, MILES. "The Future of Eucalyptus in California: Speakers' Summaries." California Eucalyptus Grower 6(July 1991): 8-9.

MERWIN, MILES. "Management of Eucalyptus in Rural Areas to Reduce Fire Risk." California Eucalyptus Grower 7(April 1988): 1, 8.

MERWIN, MILES and GARY NAKAMURA. "Palo Alto Workshop Examines Future for Biomass Fuel Production." California Eucalyptus Grower 7(October 1992): 5.

MERWIN, MILES. "Progress Report of Agroforestry Program in Central Valley." California Eucalyptus Grower 6(January 1991): 1, 6.

MERWIN, MILES. "Towards Sustainability of Intensively-Managed Tree Plantations." California Eucalyptus Grower 7(October 1992): 1,6-7.

MERWIN, MILES. "UC Biomass Group Reviews Eucalyptus Research Progress." California Eucalyptus Grower 6(January 1991): 4-5.

METCALF, WOODBRIDGE. "Eucalyptus Trees Around the World." Journal of the California Horticultural Society (April-June 1958): 31-36.

METCALF, WOODBRIDGE. Eucalyptus Trees Serve Many Purposes. Berkeley: Agricultural Extension Service, n.d.

METCALF, WOODBRIDGE. Introduced Trees of Central California. Berkeley: University of California Press, 1968.

MILLER, DON C. "Eucalyptus Patriarch." Westways 52(March 1960): 18-19.

MOORE, WILLIAM. "East Bay Hills: State Starts in on Eucalyptus." San Francisco Chronicle, 10 April 1973, p. 3.

MOORE, WILLIAM. "Eucalyptus Fire Threat -- Bad News From State." San Francisco Chronicle, 9 March 1973, p. 5.

MOYER, JOHN and MILES MERWIN. "Design and Management of Eucalyptus Windbreaks." California Eucalyptus Grower 7(April 1992): 4-5, 11.

MOYER, JOHN and MILES MERWIN. "Production of Essential Oils From Eucalyptus Species." California Eucalyptus Grower 7(October 1992): 4-5.

MUNNS, E.N. "High Temperature and Eucalypts." *Journal of Forestry* 19(1921): 25-31.

MUNNS, E.N. "Relative Frost Resistance of Eucalyptus in Southern California." *Journal of Forestry* 16(1918): 412-429.

NISHIMURA, HIROYUKI and MELVIN CALVIN. "Essential Oil of Eucalyptus Globulus in California." *Journal of Agricultural and Food Chemistry* 27(March 1979): 432-435.

NOWAK, DAVID JOHN. "Urban Forest Development and Structure: Analysis of Oakland, California." Ph.D. diss., University of California, Berkeley, 1991.

"OAKLAND PARK TREES." *San Francisco Chronicle*, 19 March 1973, p. 6.

"150,000 TREES GROW FROM TWO GUMS -- EAST OAKLAND." *Kern County Weekly Courier*, 1 August 1875, p. 1.

O'NEILL, GRAEME. "Ice-Age Relic Springs to Life." *New Scientist* 112(30 October 1984): 24.

OSBOURNE, JACQUELINE and BARRY J. MACAULEY. "Decomposition of Eucalyptus Leaf Litter: Influence of Seasonal Variation in Temperature and Moisture Conditions." *Soil Biology and Biochemistry* 20(1988): 369-375.

"PARK SERVICE DETAILS PLAN FOR CUTTING EUCALYPTUS." *San Francisco Chronicle*, 21 May 1986, p. 3.

PAYNE, THEODORE. "The Eucalyptus in California: The Eucalyptus Centennial, 1956." *Golden Gardens*, January 1957, 9-12.

PEARCE, RICHARD B. "Eucalypts: Energy Tree of the Future." *American Forests* 89 (January 1983): 30-34, 54.

PEAVY, GEORGE. "The Eucalypts in California: 1, The Vanishing Hardwoods." *California Weekly*, 30 April-11 June 1909, 363-364.

PENFOLD, A.R. and J.L. WILLIS. *The Eucalypts: Botany, Chemistry and Utilization*. New York: Interscience Publishers, 1961.

PETIT, CHARLES. "Some in Berkeley Want to Rid the Hills of Eucalyptus, Monterey Pine." *San Francisco Chronicle*, 23 October 1991, p. A19.

PILLSBURY, N.H. "Wood Equations for Central Coast Blue Gum." *California Agriculture* 43(November-December 1989): 13-14.

PLAS, MAUREEN. *Eucalyptus Firewood: Myths and Facts*. Davis, CA: Eucalyptus Improvement Association, 1989.

PLUMMER, F.G. "The Growing of Eucalypts With Detailed Bibliography." In *Proceedings of the Society of American Foresters*, vol. 5, pp. 109-130. Washington, DC: The Society, 1907.

POWELL, CLARK. "Eucalyptus Trees and Lost Manuscripts." *California Librarian* 17 (January 1956): 32-33, 57.

"PROPAGATING FAST GROWING EUCALYPTS FOR ENERGY CROPS." California Agriculture 37(May-June 1983): 20-22.

PRYOR, L.D. and L.A.S. JOHNSON. A Classification of the Eucalyptus. Canberra: The Australian National University, 1971.

PRYOR, L.D. "Eucalyptus Tree of the Future." American Forests 73(February 1967): 13-14, 47.

PUGH, EDWARD. "Historic Eucalyptus." Lasca Leaves 16(Autumn 1966): 86-87.

PURDY, FRANK WILLIAM. "Eucalyptus Cultivation in California, 1853-1900." Master's thesis, CSU, Sacramento, 1968.

"REAGAN URGED TO USE SURPLUS ON FIRE THREAT." San Francisco Chronicle, 14 September 1973, p. 47.

RINEHART, JAMES A. and RICHARD B. STANDIFORD. "Blue Gum Plantations Analyzed for Economic Return." California Agriculture 38(May-June 1984): 19-21.

ROGERS, MATILDA. Trees of the West: Identified at a Glance. Los Angeles: The Ward Ritchie Press, 1966.

SACHS, ROY. "Selection and Clonal Propagation of Eucalyptus." California Agriculture 42(November-December 1988): 27-31.

SCRIVEN, G.T. "Beetle From Australia Threatens Eucalyptus." California Agriculture 40(July-August 1986): 4-6.

SEDERQUIST, BETTY. "Landscaping California Trees." California Highway Patrolman 50(August 1986): 8-12.

STANFORD, LELAND G. "San Diego's Eucalyptus Bubble." Journal of San Diego History 16(Fall 1970): 11-19.

STEARNS, R.E.C. "On the Economic Value of Certain Australian Forest Trees, and Their Cultivation in California." In Proceedings of the California Academy of Sciences. San Francisco: The Academy, 1873.

THE KNAVE. "Eucalyptus, a Disappointment." Oakland Tribune, 10 January 1971, p. 9-10.

THE KNAVE. "Eucalyptus Has Served California Faithfully." Oakland Tribune, 28 August 1966, p. 30.

THOMPSON, KENNETH. "The Australian Fever Tree in California: Eucalypts and Malaria Prophylaxis." Annals of the Association of American Geographers 40 (June 1970): 230-244.

THOMPSON, KENNETH. "Insalubrious California: Perception and Reality." Annals of the Association of American Geographers 59(1969): 50-64.

THORPE, ROY. "Australia Gives Us the Eucalyptus." California History 62(Summer 1983): 139-141.

TIEMANN, H.D. "Eucalyptus Lumber -- Abstract of U.S. Forest Laboratory Report."

The Hardwood Record (Chicago), 25 September and 10 October 1913.

"TREES THAT CAPTURED CALIFORNIA." Sunset, August 1956, 44-45.

TURNBULL, JOHN W. "Future Uses of Eucalyptus: Opportunities & Problems." California Eucalyptus Grower 7(April 1992): 6-7.

"U.C. GROVE HAS TALLEST EUCALYPTUS." California Department of Natural Resources Newsletter, June 1943, 9-10.

U.N. FOOD AND AGRICULTURE ORGANIZATION. The Ecological Effects of Eucalyptus. FAO Forestry Paper, no. 59. Rome: FAO,1985.

U.S. CONGRESS. HOUSE. COMMITTEE ON AGRICULTURE. Emergency Eucalyptus Assistance: Report. H.Rpt. 400. 93rd Cong., 1st sess., 1973.

U.S. CONGRESS. HOUSE. COMMITTEE ON AGRICULTURE. Predisaster Assistance for Eucalyptus Tree Fire Hazard: Hearing Before the Subcommittee on Forests. 93rd Cong., 1st sess., 29 May 1973.

U.S. CONGRESS. SENATE. COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS. Predisaster Assistance for Eucalyptus Trees in California: Hearing Before the Subcommittee on Small Business. 93rd. Cong., 1st sess., 9 May 1973.

U.S. DEPARTMENT OF AGRICULTURE. Eucalyptus Globulus: Embracing Its Introduction: Culture, and Uses, by J.E. Planchon. Washington, DC: GPO, 1875.

U.S. DEPARTMENT OF AGRICULTURE. BUREAU OF FORESTRY. Eucalypts Cultivation in the United States, by Alfred James McClatchie. Bulletin, No. 35. Washington, DC: GPO, 1902.

U.S. DEPARTMENT OF AGRICULTURE. FOREST PRODUCTS LABORATORY. An Investigation of the Oil of Eucalyptus Globulus From California, by S.A. Mahood and D.E. Cable. Washington, DC: The Department, 1920.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. Eucalypts in Florida, by R. Zon and J.M. Briscoe. Bulletin, No. 87. Washington, DC: The Department, 1911.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. Forest Planting Leaflet -- Eucalyptus. Circular, No. 59. Washington, DC: The Department, 1907.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. History of Timber Management in the California National Forests, 1850 to 1937, by R.W. Ayres. Washington, DC: The Department, 1958.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. Seeds of Woody Plants in the United States, by C.S. Schopmeyer. Agriculture Handbook, No. 450. Washington, DC: GPO, 1974.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. Utilization of California Eucalypts, by H.S. Betts and C. Stowell Smith. Circular, No. 179. Washington, DC: GPO, 1910.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. The Waning Hardwood Supply and the Appalachian Forests, by William L. Hall. Washington, DC: GPO, 1907.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. Yield and Returns of Blue Gum in California, by T.D. Woodbury. Circular, No. 210. Washington, DC: GPO, 1912.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION. Proceedings of a Workshop on Eucalyptus in California, June 14-16, 1983, Sacramento, California. Berkeley: The Station, 1983.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION. Response of Eucalyptus Species to Frost Damage at the Redwood Experimental Forest, by Danny G. Heavilin. Berkeley: The Station, 1978.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. PACIFIC SOUTHWEST FOREST AND RANGE AND EXPERIMENT STATION. Robusta Eucalyptus Wood: Its Properties and Uses, by Roger G. Skolmen. Berkeley: The Station, 1963.

U.S. DEPARTMENT OF AGRICULTURE. FOREST SERVICE. PACIFIC SOUTHWEST FOREST AND RANGE AND EXPERIMENT STATION. Tests of 36 Eucalyptus Species in Northern California, by James P. King and Stanley L. Krugman. Berkeley: The Station, 1980.

U.S. DEPARTMENT OF ENERGY. DIVISION OF SOLAR TECHNOLOGY. The Eucalyptus Energy Farm. Washington, DC: The Division, 1978.

UNIVERSITY OF CALIFORNIA, BERKELEY. AGRICULTURAL EXPERIMENTATION STATION. Growth of Eucalyptus in California Plantations, by W. Metcalf. Bulletin, No. 380. Berkeley: The Station, 1924.

UNIVERSITY OF CALIFORNIA, BERKELEY. AGRICULTURAL EXPERIMENTATION STATION. Report of Work of the Agricultural Experimentation Station to the University of California From June 30, 1901, to June 30, 1903. Sacramento: W.W. Shannon, Superintendent of State Printing, 1903.

UNIVERSITY OF CALIFORNIA, BERKELEY. COLLEGE OF AGRICULTURE. AGRICULTURAL EXTENSION SERVICE. Eucalyptus in California, by Norman D. Ingham. Bulletin, No. 196. Sacramento: The State Printer, 1908.

UNIVERSITY OF CALIFORNIA, BERKELEY. COLLEGE OF AGRICULTURE. AGRICULTURAL EXTENSION SERVICE. Eucalyptus Serves Many Purposes. Berkeley: The Service, 1949.

UNIVERSITY OF CALIFORNIA, BERKELEY. COLLEGE OF AGRICULTURE. AGRICULTURAL EXTENSION SERVICE. Eucalyptus Species for California, by Woodbridge Metcalf. Berkeley: The Service, 1927.

UNIVERSITY OF CALIFORNIA, BERKELEY. DIVISION OF AGRICULTURAL SCIENCES. Planting California Forest Land. Leaflet, No. 2925. Berkeley: The Division, 1978.

UNIVERSITY OF CALIFORNIA, BERKELEY. EXTENSION OF AGRICULTURAL SERVICES. Trees of the Berkeley Campus. Rev. ed. Berkeley: The Extension, 1976.

VON MUELLER, FERDINAND. Eucalyptographia: A Descriptive Atlas of the Eucalypts of Australia and the Adjoining Islands. Melbourne: John Ferres, Government Printer, 1879.

WARREN, VIOLA LOCKHART. "Eucalyptus Crusade." Southern California Quarterly 44 (March 1962): 31-41.

WEISSER, PETER. "Eucalyptus -- Official Disaster." San Francisco Chronicle, 5 April 1973, p. 1, 28.

WELLS, KEN R. "Eucalyptus for Energy." American Forests 94(May-June 1988): 59.

"WHENCE THE EUCALYPTUS?" California Conservationist (November 1939): 18.

"WHY KOALAS LIKE EUCALYPTUS LEAVES." New Scientist 110(19 January 1984): 20.

WILLIAMS, LANCE. "Eucalyptus Trees Getting Blamed for East Bay Fire." San Francisco Chronicle, 22 December 1991, p. B1, B4.

WILLIAMSON, JOSEPH F. "Oakland Fire, One Year Later: 'Don't Blame the Eucalyptus.'" California Eucalyptus Grower 7(October 1992): 1, 12.

WILSON, ALBERT. "The Story of Two Careers: One of a Tree, and the Other of a Man." Journal of the California Horticultural Society (October 1961): 143-149.

ZACHARIN, ROBERT FYFE. Emigrant Eucalypts. Melbourne: Melbourne University Press, 1978.

[Back to Table of Contents](#)