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Biology



*Strangers in Our Midst*

BY ROBERTA FRIEDMAN

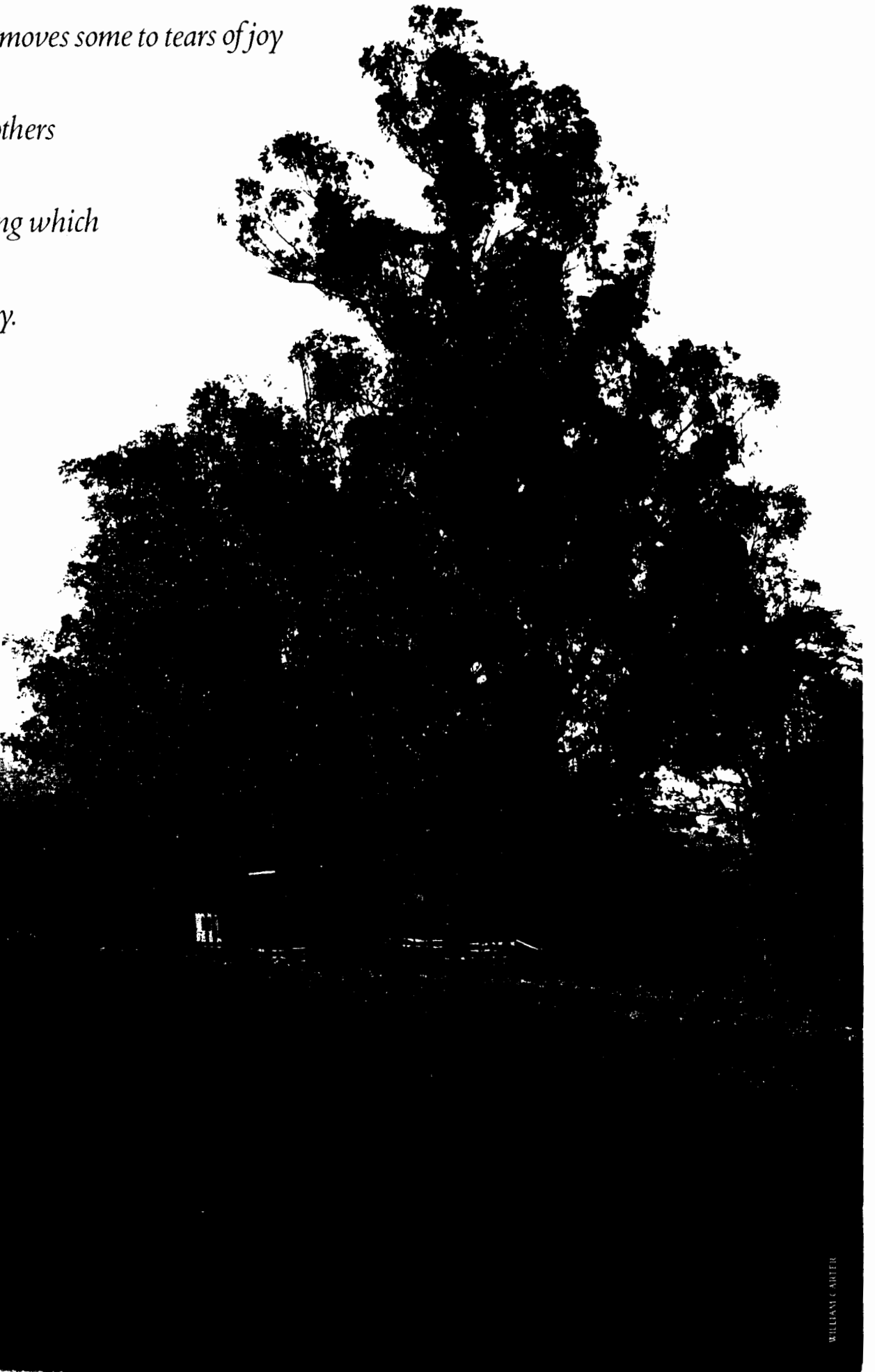
*The tree which moves some to tears of joy*

*is in the eyes of others*

*only a green thing which*

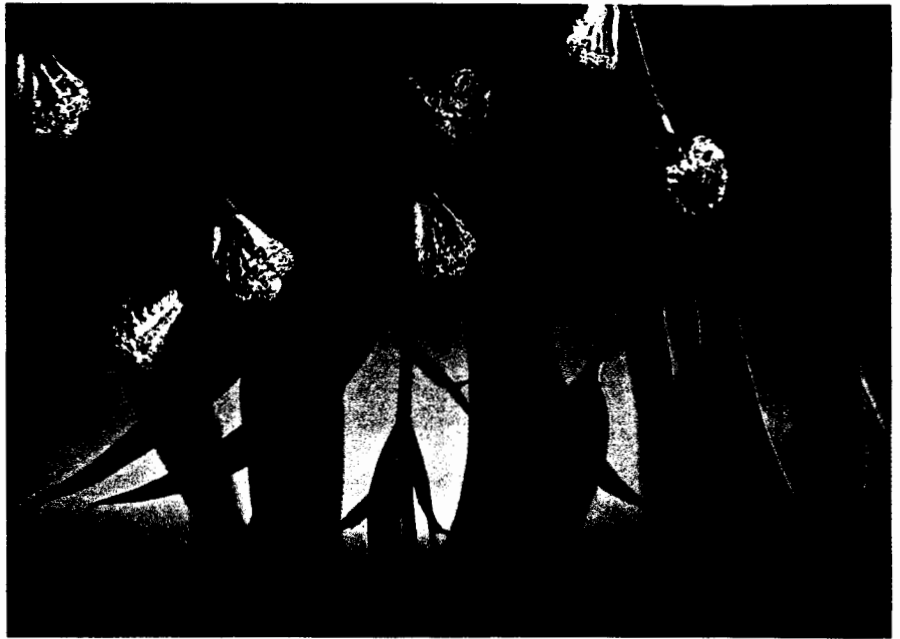
*stands in the way.*

WILLIAM BLAKE



Buds of the Tasmanian blue gum (*E. globulus*), right, and a flowering branch of the same species (below). Until recent years, blue gums accounted for about 80 percent of all eucalypt plantings in California.

Overleaf: an established eucalyptus planting east of Bolinas, California



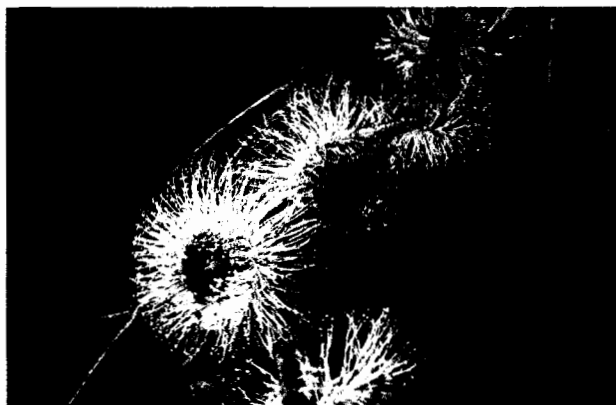
KEVIN SCHAEFER

**T**O ENVIRONMENTALISTS, TREES ARE NOT supposed to be green things that stand in the way. But in the battle to save native California, eucalyptus trees are falling, victims of their own invasive success.

Among flowering plants, genus *Eucalyptus* is the most commonly cultivated exotic in the world. A member of the family Myrtaceae, the genus boasts more than 500 species and hybrids in its native Australia, from *E. regnans* (mountain ash),

one of the world's tallest forest species, to the dwarf, shrubby mallees of bare sandstone plateaus. Eucalyptus trees have long been valued for their timber and as ornamentals, from Africa to China to America. Their hardiness has inspired schemes of reclaiming deserts, even the vast Sahara. But as fast-spreading immigrants into habitats threatened by other human activities, eucalypts have earned their share of detractors.

Eucalyptus means "I conceal well," as the trees' promoter Ellwood Cooper wrote in 1875. The cap, or operculum, of the bud sheds to reveal stamens, which wither after pollination as seed capsules form. Each dry capsule disperses its seeds like a saltshaker. Seedlings of some species grow at a clip of 10 to 20 feet (3 to 6 meters) a year, slowing as they mature. In several species, individual trees produce different types of leaves at different stages of maturity. Juvenile leaves are often covered by a waxy "bloom" to protect against frost, while oils produced by glands in the leaves of all species probably guard against water loss.



DAN SUZIO

*Contemplate the beauty, the grandeur,  
the productiveness of the great valleys of the  
Sacramento, the San Joaquin, the Salinas plain,  
and of every strip of arable land in the State,  
with belts of Eucalyptus trees planted as I have  
recommended. With such shelter California  
would become the paradise of the world.*

ELLWOOD COOPER, 1875

FUELED BY THE ECONOMIC INCENTIVE of the great timber rush at the turn of the century, Cooper's advice was followed to the letter. But today, farmlands that once played appreciative host to eucalyptus trees are rapidly disappearing. Houses have usurped orchards, and trees that ranchers planted for windbreaks or fuelwood turn out to be nasty neighbors. Great limbs can drop without warning. Sticky sap destroys car paint. Blue gums (*E. globulus*) especially shed a messy litter of bark and woody fruits.

Meanwhile, Californians are finding a new, almost guilty appreciation for the spare landscape that their predecessors tried to soften. Concern grows that the last remnants of the state's native grasses and herbs, of coast and valley oak, will choke in a sea of exotics, non-native plants imported on purpose or by accident.

Those who seek to restore at least part of public lands to their original state cultivate a distaste for eucalyptus, born from frustration. As Easterners might say, the trees spread like crabgrass. Chop them down, and in a season they'll sprout back.

People who would normally shun herbicides have been driven to plotting chemical warfare against these huge, aggravating weeds.

But eucalypts are more than just another pesky exotic such as broom or pampas grass. The trees tug at the human psyche. There is love for the shaggy giants that loom out of coastal or tule fogs, for shadowy arcades of silence broken by footfalls or the voices of hummingbirds. The pattern of eucalyptus has become woven into the fabric of California. For those who grew up here, childhood memories can be conjured by a pungent waft of blue gum. Of course, there are those who think the trees plain stink.

In one sense, eucalyptus is the embattled symbol of all transplants to this land, where bumper stickers read: "Welcome to California. Now go home." Eucalypt advocates have a favorite retort. If you want to take a purist attitude, says Emil Schmidt, a Native Son of the Golden West who nurtures unusual eucalyptus species on his retirement land near

Salinas, "give it all back to the Indians."

Eucalypt foes are quick to point out that terpine toxins in the leaf oils, carried to the ground by "fog drip," poison the soil. Leached phenols from accumulated fallen slash are also blamed for killing native California understory. A tangle of greenery growing underneath the trees in certain locales seems to argue against this allelopathic effect, but, says U. C. Santa Barbara plant ecologist Cornelius Muller, "I can assure you it's a real phenomenon."

When fog drip from the crowns is blown by ocean winds, dead zones under eucalyptus can extend to twice the reach of their branches. In part, allelopathy depends on where the trees grow. Heavy loam will harbor the toxins, whereas sandy soils allow them to wash out. In addition, perennials are less subject to eucalypt allelopathy than the annual herbs and grasses which must begin each year anew as seedlings.

The leaf oils and piles of dry debris invite wildfire. At an early meeting of the California Academy of Sciences, eucalypts were proposed as street trees because they are fireproof. Certainly the trees are remarkable fire survivors, but between their accumulated slash and their volatile oils, they act as living torches.

Lignotubers, the swollen, irregular woody masses at the base of many eucalypts, are reservoirs of dormant buds that can resprout, or coppice, quickly following an assault by fire or axing. Emergence of new trees is actually stimulated after fire as surviving crowns drop their seed onto ground burned bare of any competitors. Even without fire, seedlings can rapidly invade new territory. A double row of 1,000 eucalypts, planted in Mendocino County in 1895 as windbreak, now covers 94 acres (38 hectares).

Outfitted for survival in their harsh native climate with insect-foiling bark and tough, fibrous leaves that are readily replaced following depredation, it's no wonder the trees grow rampant in California. When Aussies want to kill a eucalyptus tree, says Australian-born Stanford professor Ron Bracewell, they do so by ringing the bark, and then keep a fire smoldering on the stump for a year.

hall, he points out a matriarch of a manna gum (*E. viminalis*), striking in new white bark following its yearly molt.

Each spring, stripping manna gums suddenly reveal themselves along California highways. Dark trunks of red ironbarks (*E. sideroxylon*) also stand out while the trees are wearing their pink-red blooms. But of the dozen or so species commonly planted, it is the towering, aromatic Tasmanian blue gum, *E. globulus*, that most Californians think of as eucalyptus.

Some eucalypts peel their bark; others, like the ironbarks, harden it with the dark resin they exude called kino. (This tannin-rich substance, quite different from true tree gums, earned eucalypts their misnomer). Both mechanisms are likely a defense against insects. But because eucalypts were imported to California as seed, none of their numerous pests came with them. At 200 feet (61 meters) high, the blue gums in the west grove at the University of California, Berkeley, planted in 1871, are the tallest outside Australia. Yet professor John Helms says the view opposite his office in the university's forestry school does not remind him of his native land — seldom are eucalypts found in Australia with leaves unchewed.

A new twist to the California history of eucalyptus is the appearance of the Australian longhorn borer beetle. Arriving perhaps as a stowaway in imported eucalyptus-wood pallets, *Phoracantha semipunctata* began boring its way four years ago through welcome reminders of home in Southern California. At the height of the beetle scare two years ago, the perhaps only half-sarcastic rumor circulating was that eucalypt foes would spread the insect on purpose. However, the borer has not yet made headway beyond Ventura County, and is not doing the damage that was initially feared. It thrives only on weak or dying trees, says entomologist Glenn Scriven. Healthy trees secrete enough resin to flood the galleries bored by the insects' larvae. Scriven and colleagues at University of California, Riverside, are now importing Ichneumonid wasps as a biological control for the borer.

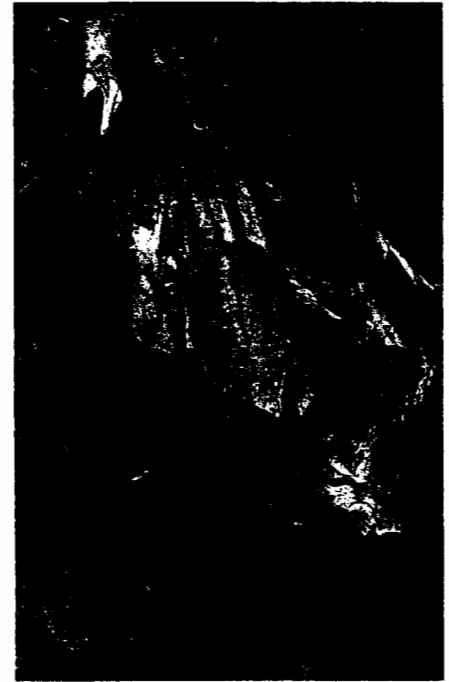
**M**ANY OF CALIFORNIA'S EUCALYPTS had been promoted as nostalgic substitutes for stately Eastern ash and hickory. Not picky about soils or water, the Australian imports soon rose throughout the state, blunting valley winds and relieving, for Yankee eyes, the aching emptiness of foothills and flat spaces. Railroad companies planted blue gums along their rights-of-way as ready timber for ties. For their passengers, the trees were to serve as a hedge against malarial effluvia en route.

In 1853, Robert Waterman, a clipper ship captain who settled in the Suisun Valley, introduced eucalyptus to California. By the 1870s, visitors were remarking on the trees as part of the state's landscape. And in 1889, blue gums were planted as windbreaks to protect citrus groves in southern California from Santa Ana winds.

John McLaren, developer of much of Golden Gate Park, had set elms along El Camino Real from Belmont to Millbrae. To protect the elms in their tender years, blue gums and manna gums were planted as nurse trees. Unfortunately, the elms never made it. Eucalypts were also among the shelter trees in Leland Stanford's botanic garden on the university campus. With the Senator's estate tied up in probate, inadequate watering killed the more delicate stock. Guess what lived.

By far the biggest eucalypt misapprehension, which resulted in the trees' becoming a permanent fixture in the state's landscape, was the turn-of-the-century timber boom, which fizzled. Eleven years after the gold rush, Oakland's native oaks and other Bay Area timber had already been decimated. Nearly everything in that era was made from wood: wagons, fences, rail ties, sidewalks, and even street paving blocks, as well as the gold rush sluices and mine shaft supports. As late as 1919, half the population in the state lived in wood houses and two-thirds burned wood for fuel. Fear of a timber shortage was gathering, not just in California but across the nation. Three million acres (over 1.2 million hectares) of forest were being cut each year in the U.S., according to a 1909 estimate. Tree planting was now

*A wall of eucalyptus (opposite), originally planted as a windbreak north of Jenner, California, has coppiced following cutting. Below, the peeling bark and immature foliage of E. globulus*





a patriotic duty, with San Francisco school children marshalled to the task, on Arbor Days, of planting the Presidio, Sutro Forest, and Mount Davidson, mainly with eucalyptus.

In 1871, the California Academy of Sciences published "On the Economic Value of Certain Australian Forest Trees," urging introduction of eucalyptus and acacia as an answer to the demand for wood. Eucalypts sprout new shoots from stumps. This coupled with their vigorous growth made them seem ideal for timber harvesting.

Marginal land planted in seedlings was soon advertised as a choice investment with promise of impressive return. State and national forest services backed claims of eucalyptus growth exceeding 90 feet (27.5 meters) within ten years. *Sunset* magazine touted the beauty and service of red gum, sugar gum (*E. cladocalyx*), and blue gum. Drawing an analogy to the Chicago packing house pig, "all used save the squeal," a 1909 article intoned that with eucalyptus, "all is utilized excepting the breeze that sighs through the branches." Ads for seedlings and planted land padded the same issue.

Novelist Jack London began planting 150,000 eucalyptus trees at his Beauty Ranch in Sonoma in 1910. By then, at least 100 companies in the Southwest were dealing in some sort of eucalypt commodity, selling seed, timber, land, or the trumpeting magazine ads. Cautionary notes were sounded but ignored. One man, Frank Havens, was responsible for the majority of eucalypts now capping the East Bay hills from El Cerrito to San Leandro.

Havens was also the person who brought the timber rush to its dead end by 1912. Hiring a forester from back East to test mill the local stock, Havens drew the sorry conclusion that his gum trees were just no good as lumber. As Abbott Kinney, former chairman of the state Board of Forestry, had written — only to be ignored — fifteen years before, "railroad ties (cut from plantation-grown trees) split and checked so badly that they could not hold rails down." UC Berkeley's Helms explains that the imported

Australian eucalypt wood which was so prized was cut from mature trees and had been kiln dried. "The young, brash material twists and warps if it is dried out of doors," he says.

*But on the banks of the Jordan, as if nothing happened,  
The same silence, and the same setting,  
The grove of eucalyptus, the bridge, the boat,  
And the salt-tinged breeze upon the water.*

#### POPULAR ISRAELI SONG

**D**ESPITE THE TIMELESS IMAGERY, eucalypts are newcomers to this Middle East scene. Australian botanist and famed eucalypt pusher Ferdinand von Mueller dreamed of a desolate Holy Land made fertile. Jewish settlers in Palestine at the turn of the century eagerly planted eucalyptus trees to drain the swamps of Galilee. The Sahara is still shifting sands, but von Mueller's plan to make the Holy Land bloom is realized.

The rapid transpiration of groundwater that gave eucalypts a reputation for drying marshes at the turn of the century may do a good turn for central California today. Large leaf area coupled with salt tolerance make eucalyptus a choice candidate for keeping brackish water, trapped above the clay layer beneath the fertile soils of the Central Valley, at bay. As irrigation runoff accumulates above the impermeable clay like water in a plugged bathtub, salinity reaches the level of crop roots. A quarter of valley croplands are already suffering.

To ameliorate the situation, the state's Department of Food and Agriculture has deployed *E. globulus* and *E. camaldulensis*, now growing in test plantations in a total of 179 acres (72.5 hectares) in Kings, Kern, and Fresno counties. The rationale

*Opposite: A giant manna gum (E. viminalis) in Sunol, California*

is that eucalyptus would remove the trapped water, although not the salts. Unlike the evaporation ponds of the Tulare basin, already laden with dangerous levels of selenium, eucalyptus would produce a cash crop — and unlike ponds, they would not poison shorebirds.

The allure of sheer biomass provided by the fast-growing trees is evident throughout the world. As an ingredient in fine printing paper, eucalyptus is prized for its pulping qualities. Last year Simpson Timber Company planted 250 acres (101 hectares) south of Redding, California, in red and manna gum. The company plans to put in another 800 acres (324 hectares) by this summer, in hopes of feeding its paper plants by the 1990s. The once-threatened wood famine echoes hauntingly in schemes to get cheap energy from the trees, ideas which surfaced during the oil crises of the 1970s and are still pursued. Fifty or so wood-burning power plants operating in California are looking for fuel. Pacific Oroville, in Anderson, alone consumes 120 truckloads of lumber mill waste a day. Eucalypts would be a logical supply source, except that shipping costs from established stands remain prohibitive, according to Tad Mason, a buyer for Pacific Oroville and the Signal Shasta power plant.

Mason encourages landowners considering eucalypts as a cash crop. Forestry researchers are comparing the energy potential of various eucalyptus species under test cultivation in the Yuba County foothills near Marysville. Energy shortages will return. Helms of UC Berkeley predicts, "and everyone will think eucalyptus is the savior of the world again."

The persistent utilitarian appeal of the trees contrasts with continuing debate over their foreign presence. As fast as industry is planting, conservationists elsewhere want to tear them out. Just what is native, for people or for plants? Where in the course of evolution does one stop time and say, this is the character of a place?

Quintessential vistas of California include lonely silhouettes stark against a ridge at sunset. Perhaps eucalyptus trees are strangers that cannot be plucked from our midst. 🌿

## ONE TOUGH CUSTOMER

A FOREST GROWS above San Leandro. It's just like the Santa Cruz mountains here, the occasional bay or oak amid dense stands of straight trunks — except these are not redwoods, but red gums. We're talking 700 acres (283 hectares) or more of *E. camaldulensis* in Chabot Regional Park. In 1906 Frank Havens planted this land, owned by his People's Water Company, in eucalypts. In the early 1920s and again in 1972, unusual freezing weather killed them. Or at least they looked dead, hundreds of acres of trees wearing brown leaves well into summer. Fearing uncontrollable fire, Regional Park personnel cut fuelbreaks throughout the East Bay hills. A strong autumn wind, says resource ecologist John Nicoles, could have blown fire all the way to the Bay.

Unfortunately, all eucalypt adaptations to the ecology of their native land come nicely into play whenever an axe is wielded. At Annadel State Park near Santa Rosa, California, where 100 acres (40.5 hectares) of eucalypts were cleared three years ago to promote native oaks, the coppice suckers are only now beginning to succumb to repeated applications of herbicide. The Nature Conservancy has burned, sawed, and chipped at eucalypts at its Jepson Prairie preserve, but the trees just keep sprouting. A Conservancy report on coppice control methods speaks of zinc nails driven into stumps (rumored to work) and flame guns (will work). But a staffer admits that some people want to keep the eucalyptus, as they provide the preserve's only shade.

At Elkhorn Slough near Moss Landing, volunteer docents have objected to plans to cut a stand of blue

gums. At Ardenwood Historic Farm in Fremont, by the Dumbarton Bridge, Nicoles intended to replace dying sugar gums, which are not regenerating, with a hardier species better adapted to the flooding problems that are killing *E. cladocalyx*. The outcry that greeted his preparatory clearing of less than an acre of sugar gum sounded again after he planted test plots of eucalypt seedlings. Now that the young trees are established — and beginning to crowd — people don't want him to thin them. This is a crop, Nicoles points out, like corn. After all, he says, the trees on this preserved farm were originally intended as a timber plantation.

In Marin, the local chapter of the Sierra Club is entering the debate over eucalyptus in the Golden Gate National Recreation Area. Only a few percent of historic wetland and riparian lands are left, and too few preserves in the Bay Area represent rare plants and animals, according to



Three years ago a hundred acres of eucalyptus were cleared in a native plant restoration project at Annadel State Park near Santa Rosa, California. The photo above shows the same area today after several applications of herbicide to control coppice suckers.