

The History, Ecology and Future of Eucalyptus Plantations in the Bay Area

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[Link to talk on Youtube](#)



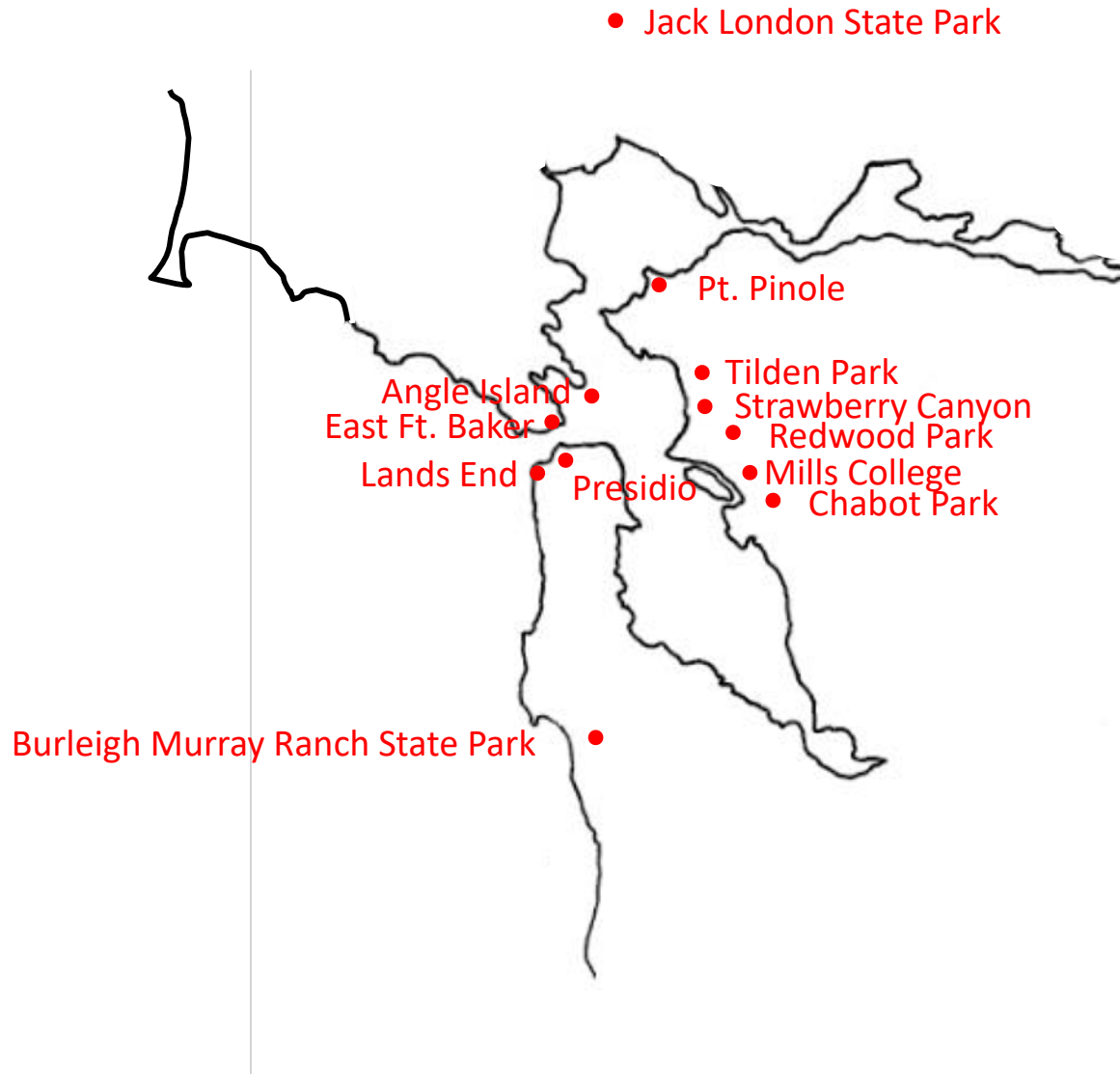


“The Eucalyptus seems an indispensable element of this State’s landscapes, as indigenously Californian as the redwoods, the poppy fields, the long white coastal beaches, the gleaming granite of the High Sierra.” H. Gilliam, 1965

Overview

1. History of eucalyptus in California
2. Characteristics of eucalyptus plantations
3. Modification of site conditions by eucalyptus
4. Eucalyptus forests as habitat for wildlife
5. Future of eucalyptus plantations in California

Location of Eucalyptus Study Sites



History

- Initial Introduction
- Planting during the 1870s
- Planting from 1906-1913
- Planting in the latter half of the 20th century

Initial Introduction of Eucalyptus to California



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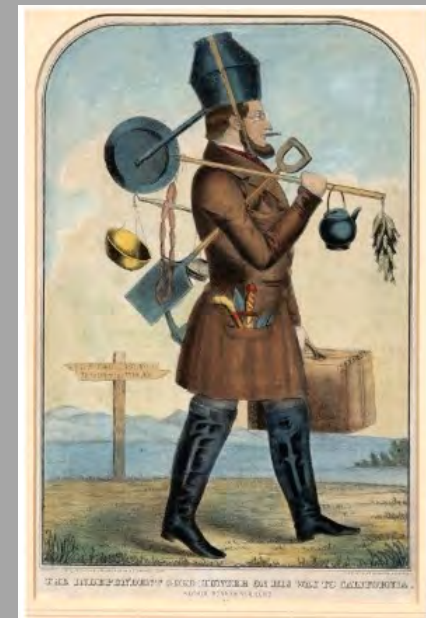
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Eucalyptus Planting in the 1870s



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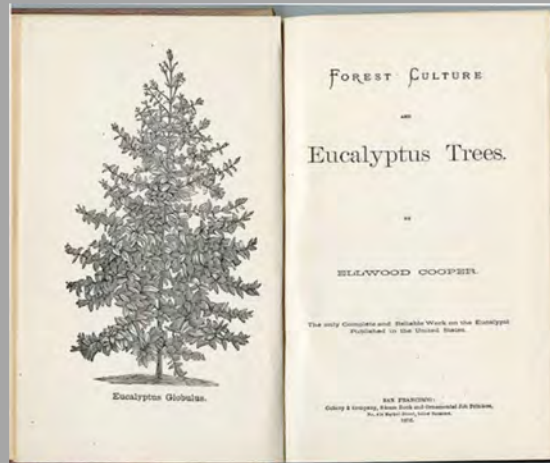
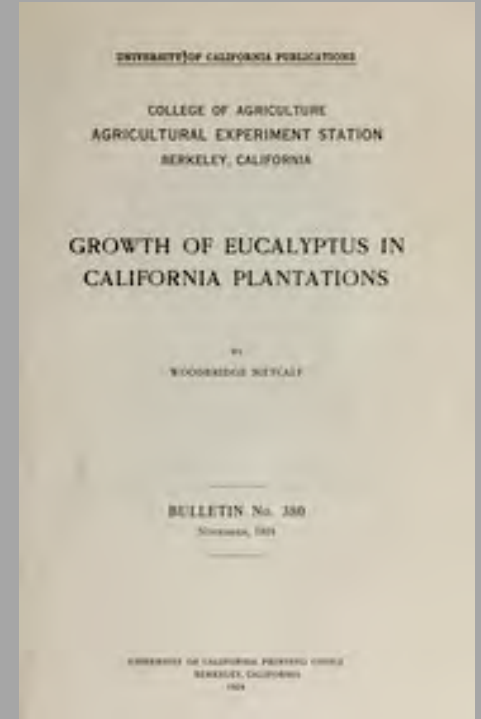
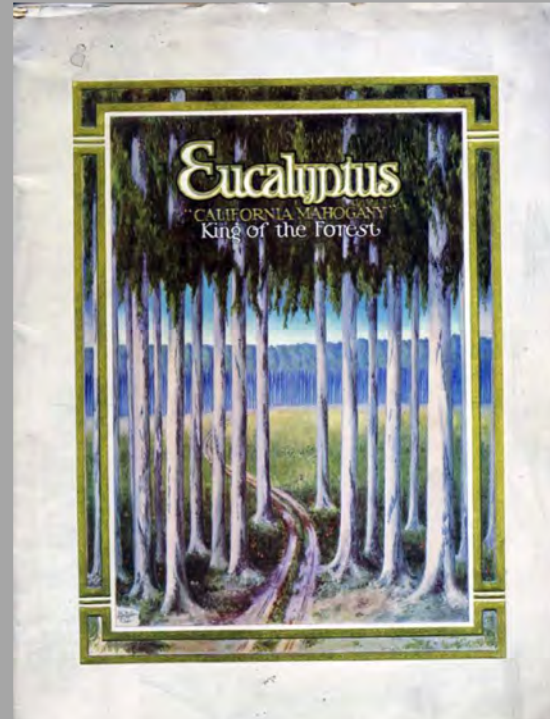
ON THE SHORE OF LAKE MERRITT

A natural salt water lake within ten minutes' walk of the business center. Oakland has the most equable climate of any city in California; a water front of over fifteen miles, suitable for manufactories, and is growing in population faster than any other city in the State. Why not locate in Oakland?

For more explicit information and illustrated literature address
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Eucalyptus Planting 1906 -1912



Latter Half of the 20th Century

Propagating fast-growing eucalypts for energy crops

Clifford B. Law □ Gary H. Malzer □ Roy M. Yoder

High rooting success has been achieved from seedling cuttings



Cuttings are treated in plastic growing tubes under insecticide treatment.



Worker C. H. Malzer is shown cutting. Optimum rooting requires about four weeks.

The wide availability and resulting high yields of many eucalypts in California's varied climatic zones is a prime reason for their choice as a fast-growing source of renewable fuel. To fill the demand for plants needed for the many small plantations being established throughout the state, nurseries and some entrepreneurs specializing in eucalypts are supplying seedlings in great

quantities. Although this response filled the market, the industry's genetic diversity in these seedlings is greater than desirable. Some derived from seedlings selected for southern limited high growth rates may differ from those suited to growth rates after transplanting to the field (table 1).

This difference in growth rate may be compounded during the overwintering period after a harvest: the stronger trees are stronger and the weaker trees weaker. With the survival loss of the weaker trees, gene banks in form in the plantation, which may reduce the yield potential with a substantial harvest deficit.

Clonal material has been suggested to replace seedlings and reduce genetic variability. Clones can be developed through cut or stem tissue divisions of parental propagation, but sources of these cuttings are limited to the same genotypes. Although adult eucalypts have been the recipients of being grafted to root systems has been reduced in many eucalypt species. Puschel of AFRC, Perth, Western Australia, has been able to root cuttings taken from seedlings of 16 species, but most became extremely difficult to root shortly after the seedling stage of growth. Of more practical value, using leafy stem (top) tissue (shoot) development from cuttings on below stem portion of adult trees or stems are readily rooted. Harvest rates 78 eucalypt species, including quality forestry species for biomass plantations, that have been tested from seedlings, sprouts, shoots, or both (V. J. Harwood, in American Forestry Research 3: 221-231, 1988).

Source plants

An advantage of the genetic diversity in parent plantings is the variety of trees to choose from for use in cloning. Our present studies have incorporated 66 new species (eucalyptus camaldulensis and 65 new ones). Fast growing species are planted in temperate temperatures down to 20°F (7°C). These will give rise to a fairly wide range of environmental conditions making them suitable to a large part of California.

A planting of various species at Los

An illustration of a eucalyptus tree in a field, showing its growth and structure.



These trees are eucalyptus seedlings promptly selected for uniformity may differ by two- or three-fold after transplanting because of genetic diversity.

by Dale Chapman, of Chatham Forestry Foundation, and Gary Malzer, Farm Advisor, San Joaquin County, has provided a good mix of trees for observation. Two of these trees were selected as source plants for testing propagation research. The first tree (C-1) was selected because of its apparently high productivity in the first 18 months after planting. The other selection is from a red gum tree (C-2) that has proved to be a fast grower with few side branches and a straight bole. This tree received first seed from two independent growers in Texas and Florida. Other trees from the same seed source have performed well on several sites, some of them relatively alkaline or dry or with shallow soils.

Another source of material comes from trees fast-growing, 18-month-old trees of a hybrid, *E. camaldulensis* x *radix* (CR-1) and (CR-2) on the Davis campus. Most seedlings from this source have proved successful in periodic flooding conditions shown from this hybrid may be particularly useful for municipal wastewater disposal sites. The work discussed here was performed with C-1, but observations for C-1, CR-1, and CR-2 indicate that similar procedures will apply to them.

Propagation

Eight-year-old eucalyptus cuttings, reduced to two- to four nodes with leaves remaining on the upper node of these nodes. We discarded the terminal

cuttings, because cutting usually very low, the in the more basal cuttings. Leaf surface area was a half of that cuttings in more closely in late to late.

Leaves are exposed to condensation cuttings, and of low of leaves do will be reflected in its performance. Cuttings were spaced in open sections of middle 60 percent initially. Cuttings in flats filled with water (30% w/v) or in plastic starting tubes (1 liter) planting in a supply

United States Department of Agriculture

Forest Service Pacific Southwest Forest and Range Experiment Station

Research Paper PSW-152

Tests of 36 Eucalyptus Species in Northern California

James P. King Stanley L. Krugman

TABLE 1. Variation in tree growth of three seedling eucalyptus plantings selected originally for uniform growth rate.

Species	Tree diameter at 18 months	
	Range	Mean
<i>Eucalyptus camaldulensis</i> (Bore)	2.24-3.50	4.28
<i>E. nitens</i>	3.00-4.50	3.87
<i>E. dalymploea</i>	2.14-4.40	3.48
<i>E. camaldulensis</i> x <i>radix</i> (Bore)	1.74-3.50	3.42
<i>E. nitens</i>	1.80-3.00	2.53
<i>Eucalyptus</i> (Cambridge)	4.00-6.00	5.00
<i>E. nitens</i>	1.80-3.50	3.02

CV = coefficient of variation; n = number of trees. These measurements were taken at 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114, 120, 126, 132, 138, 144, 150, 156, 162, 168, 174, 180, 186, 192, 198, 204, 210, 216, 222, 228, 234, 240, 246, 252, 258, 264, 270, 276, 282, 288, 294, 300, 306, 312, 318, 324, 330, 336, 342, 348, 354, 360, 366, 372, 378, 384, 390, 396, 402, 408, 414, 420, 426, 432, 438, 444, 450, 456, 462, 468, 474, 480, 486, 492, 498, 504, 510, 516, 522, 528, 534, 540, 546, 552, 558, 564, 570, 576, 582, 588, 594, 600, 606, 612, 618, 624, 630, 636, 642, 648, 654, 660, 666, 672, 678, 684, 690, 696, 702, 708, 714, 720, 726, 732, 738, 744, 750, 756, 762, 768, 774, 780, 786, 792, 798, 804, 810, 816, 822, 828, 834, 840, 846, 852, 858, 864, 870, 876, 882, 888, 894, 900, 906, 912, 918, 924, 930, 936, 942, 948, 954, 960, 966, 972, 978, 984, 990, 996, 1002, 1008, 1014, 1020, 1026, 1032, 1038, 1044, 1050, 1056, 1062, 1068, 1074, 1080, 1086, 1092, 1098, 1104, 1110, 1116, 1122, 1128, 1134, 1140, 1146, 1152, 1158, 1164, 1170, 1176, 1182, 1188, 1194, 1200, 1206, 1212, 1218, 1224, 1230, 1236, 1242, 1248, 1254, 1260, 1266, 1272, 1278, 1284, 1290, 1296, 1302, 1308, 1314, 1320, 1326, 1332, 1338, 1344, 1350, 1356, 1362, 1368, 1374, 1380, 1386, 1392, 1398, 1404, 1410, 1416, 1422, 1428, 1434, 1440, 1446, 1452, 1458, 1464, 1470, 1476, 1482, 1488, 1494, 1500, 1506, 1512, 1518, 1524, 1530, 1536, 1542, 1548, 1554, 1560, 1566, 1572, 1578, 1584, 1590, 1596, 1602, 1608, 1614, 1620, 1626, 1632, 1638, 1644, 1650, 1656, 1662, 1668, 1674, 1680, 1686, 1692, 1698, 1704, 1710, 1716, 1722, 1728, 1734, 1740, 1746, 1752, 1758, 1764, 1770, 1776, 1782, 1788, 1794, 1800, 1806, 1812, 1818, 1824, 1830, 1836, 1842, 1848, 1854, 1860, 1866, 1872, 1878, 1884, 1890, 1896, 1902, 1908, 1914, 1920, 1926, 1932, 1938, 1944, 1950, 1956, 1962, 1968, 1974, 1980, 1986, 1992, 1998, 2004, 2010, 2016, 2022, 2028, 2034, 2040, 2046, 2052, 2058, 2064, 2070, 2076, 2082, 2088, 2094, 2100, 2106, 2112, 2118, 2124, 2130, 2136, 2142, 2148, 2154, 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9132, 9138, 9144, 9150, 9156, 9162, 9168, 9174, 9180, 9186, 9192, 9198, 9204, 9210, 9216, 9222, 9228, 9234, 9240, 9246, 9252, 9258, 9264, 9270, 9276, 9282, 9288, 9294, 9300, 9306, 9312, 9318, 9324, 9330, 9336, 9342, 9348, 9354, 9360, 9366, 9372, 9378, 9384, 9390, 9396, 9402, 9408, 9414, 9420, 9426, 9432, 9438, 9444, 9450, 9456, 9462, 9468, 9474, 9480, 9486, 9492, 9498, 9504, 9510, 9516, 9522, 9528, 9534, 9540, 9546, 9552, 9558, 9564, 9570, 9576, 9582, 9588, 9594, 9600, 9606, 9612, 9618, 9624, 9630, 9636, 9642, 9648, 9654, 9660, 9666, 9672, 9678, 9684, 9690, 9696, 9702, 9708, 9714, 9720, 9726, 9732, 9738, 9744, 9750, 9756, 9762, 9768, 9774, 9780, 9786, 9792, 9798, 9804, 9810, 9816, 9822, 9828, 9834, 9840, 9846, 9852, 985

Major Species of Eucalyptus Planted in California



Blue Gum



Red Gum



Sugar Gum



Red Ironbark



Silver Dollar

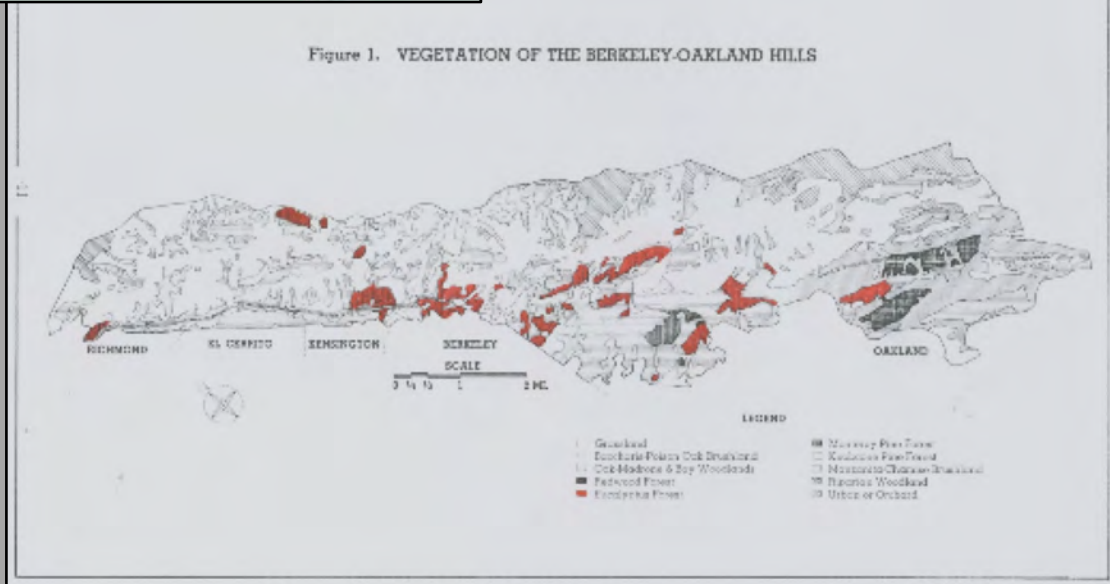


Lemon Scented

Distribution of Blue Gum Eucalyptus



Figure 1. VEGETATION OF THE BERKELEY-OAKLAND HILLS



Characteristics of Eucalyptus Plantations



Structural Characteristics

Location	Number of Stands	Ave. Stand Area (ac.)	Ave. Max. Height (ft.)	Ave. Max. Diameter (in.)	Ave. Number of trees/acre
Presidio	28	3.7	80	26	163
Land's End	4	2.3	75	26	364
Tilden Park	5	0.7	60	16	540
East Ft. Baker	1	8.1	50	36	1795



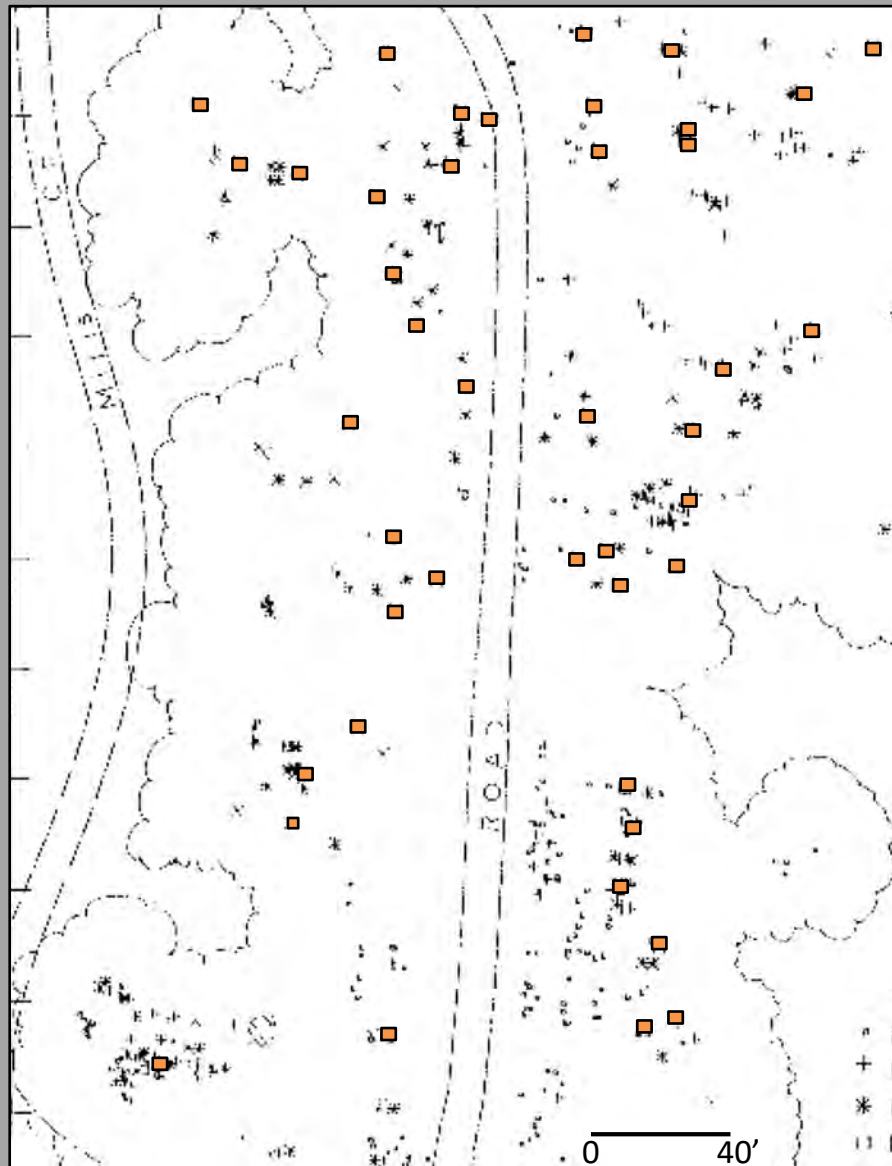
Initial Spacing of Trees in Plantations

(Angel Island State Park)

Plantation Number	Tree Spacing	Trees/Acre
6	8 x 8	680
9	8 x 8	680
10	8 x 8	680
11	8 x 8	680
15	8 x 8	680
1	12 x 12	302
16	12 x 12	302
3	15 x 15	193
12	15 x 15	193
13	25 x 25	70
2	30 x 30	48
5	30 x 30	48
7	30 x 30	48
Average	14 x 14	349
Modal	8 x 8	680

Diameter Distribution of Eucalyptus along Mill Creek

(Burleigh Murray Ranch State Park)



Size Class

- I. ht < 4'8" or dbh ≤ 02"
- + II. 02" < dbh ≤ 6"
- * III. 6" < dbh ≤ 18"
- IV. 18" < dbh ≤ 36"

<u>Size Class</u>	<u>Density per Acre</u>
I	57
II	27
III	25
IV	17

Species Composition of Eucalyptus Plantations



FAMILY	SCIENTIFIC NAME	COMMON NAME
Amaryllidaceae	<i>Brodiaea puchella</i>	Blue dicks
Anacardiaceae	<i>Toxicodendron diversiloba</i>	Poison oak
Apiaceae	<i>Heracleum lanatum</i>	Cow parsnip
	<i>Sanicula crassicaulis</i>	Snakeroot
Boraginaceae	<i>Cynoglossum occidentale</i>	Hound's tongue
Brassicaceae	<i>Brassica nigra</i>	Black mustard
Caprifoliaceae	<i>Lonicera hispidula</i>	California honeysuckle
	<i>Sambucus caerulea</i>	Blue elderberry
	<i>Symphoricarpus mollis</i>	Snowberry
Compositae	<i>Artemisia douglasiana</i>	California mugwort
	<i>Aster radulinus</i>	Broad-leaf aster
	<i>Cirsium vulgare</i>	Bull thistle
	<i>Solidago californica</i>	California goldenrod
Curcubitaceae	<i>Marah fabaceus</i>	Wild cucumber
Euphorbiaceae	<i>Euphorbia helioscopia</i>	Wartweed
Fagaceae	<i>Quercus agrifolia</i>	Coast live oak
Graminae	<i>Avena fatua</i>	Wild oat
	<i>Bromus diandrus</i>	Ripgut
	<i>Bromus mollis</i>	Soft chess
	<i>Cynosurus echinatus</i>	Dogtail
	<i>Elymus glaucus</i>	Blue wild-rye
	<i>Sisyrichium bellum</i>	Blue-eyed grass
Labiatae	<i>Mentha pulegium</i>	Pennyroyal
	<i>Mentha arvensis</i>	Field mint
	<i>Stachys bullata</i>	California hedge nettle
	<i>Stachys rigida</i>	Hedge nettle
Lauraceae	<i>Umbellularia californica</i>	Bay
Leguminosae	<i>Lathyrus vestitus</i>	Hillside pea
	<i>Lupinus albifrons</i>	Lupine
	<i>Vicia americana</i>	American vetch
	<i>Vicia sativa</i>	Spring vetch
Plantaginaceae	<i>Plantago lanceolata</i>	English plantain
Polygonaceae	<i>Rumex pulcher</i>	Fiddle dock
Rosaceae	<i>Fragaria californica</i>	Wood strawberry
	<i>Rubus ursinus</i>	California blackberry
Solanaceae	<i>Solanum nigrum</i>	Black nightshade
Umbelliferae	<i>Conium maculatum</i>	Poison hemlock
Crucifereae	<i>Dentaria californica</i>	Milkmaids

Eucalyptus Understory Plant Species Survey

(Tilden Park – 1990)

Summary

Number of Families = 21

Number of Genera = 34

Number of Species = 38

FAMILY	SCIENTIFIC NAME	COMMON NAME
Amaryllidaceae	<i>Brodiaea puchella</i>	Blue dicks
Anacardiaceae	<i>Toxicodendron diversiloba</i>	Poison oak
Apiaceae	<i>Heracleum lanatum</i>	Cow parsnip
	<i>Sanicula crassicaulis</i>	Snakeroot
Boraginaceae	<i>Cynoglossum occidentale</i>	Hound's tongue
Brassicaceae	<i>Brassica nigra</i> *	Black mustard
Caprifoliaceae	<i>Lonicera hispidula</i>	California honeysuckle
	<i>Sambucus caerulea</i>	Blue elderberry
	<i>Symphoricarpus mollis</i>	Snowberry
Compositae	<i>Artemisia douglasiana</i>	California mugwort
	<i>Aster radulinus</i>	Broad-leaf aster
	<i>Cirsium vulgare</i> *	Bull thistle
	<i>Solidago californica</i>	California goldenrod
Curcubitaceae	<i>Marah fabaceus</i>	Wild cucumber
Euphorbiaceae	<i>Euphorbia helioscopia</i> *	Wartweed
Fagaceae	<i>Quercus agrifolia</i>	Coast live oak
Graminae	<i>Avena fatua</i> *	Wild oat
	<i>Bromus diandrus</i> *	Ripgut
	<i>Bromus mollis</i> *	Soft chess
	<i>Cynosurus echinatus</i> *	Dogtail
	<i>Elymus glaucus</i>	Blue wild-rye
	<i>Sisyrichium bellum</i>	Blue-eyed grass
Labiatae	<i>Mentha pulegium</i> *	Pennyroyal
	<i>Mentha arvensis</i> *	Field mint
	<i>Stachys bullata</i>	California hedge nettle
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Lauraceae	<i>Umbellularia californica</i>	Bay
Leguminosae	<i>Lathyrus vestitus</i>	Hillside pea
	<i>Lupinus albus</i>	Lupine
	<i>Vicia americana</i>	American vetch
	<i>Vicia sativa</i> *	Spring vetch
Plantaginaceae	<i>Plantago lanceolata</i> *	English plantain
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	<i>Rubus ursinus</i>	California blackberry
Solanaceae	<i>Solanum nigrum</i> *	Black nightshade
Umbelliferae	<i>Conium maculatum</i> *	Poison hemlock
Crucifereae	<i>Dentaria californica</i>	Milkmaids

Introduced Species Eucalyptus Understory Plant Species Survey

(Tilden Park – 1990)

Summary

Number of Families = 21

Number of Genera = 34

Number of Species = 38

Native to California = 24

*Introduced to California = 14

Comparison of Species composition of Eucalyptus with Oak Woodland

(Tilden Park – 1990)

Eucalyptus Plantation

Number of Families = 21

Number of Genera = 34

Number of Species = 38

Native to California = 24

Introduced to California = 14

Oak Woodland

Number of Families = 16

Number of Genera = 19

Number of Species = 19

Native to California = 14

Introduced to California = 5

Plant Species Richness in Eucalyptus Plantations and Oak Woodlands

<u>Location</u>	<u>Habitat</u>	<u>Vegetation Type</u>	<u>Number of Species</u>
Tilden Park ¹	Upland	Eucalyptus	21
		Oak Woodland	12
Tilden Park ²	Upland	Eucalyptus	38
		Oak Woodland	21
Murray Park ³	Riparian	Eucalyptus	34
		Riparian Woodland	58

¹ = Jewell Lake (Contra Costa County); ² = Golf Course Road (Contra Costa County); ³ = San Mateo County, near Half Moon Bay

Understory Conditions and the Establishment of Plant Species



South Facing Slope
Edge Site: 15 species
Interior Site: 15 species



North Facing Slope
Edge Site: 8 species
Interior Site: 8 species

Variation in Understory Species in Eucalyptus Plantations

Understory Species beneath Eucalyptus Canopy

(Tilden Park - March 19, 2014)

Species	South Facing Slope		North Facing Slope	
	Edge	Interior	Edge	Interior
Bedstraw (<i>Galium aparine</i>)	•	•	•	•
California Bay (<i>Umbellularia californica</i>)	•	•	•	•
California blackberry (<i>Rubus ursinus</i>)	•	•	•	•
Chickweed (<i>Stellaria media</i>)	•	•	•	•
Coast Live Oak (<i>Quercus agrifolia</i>)	•	•	•	•
Pulsun oak (<i>Toxicodendron diversiloba</i>)	•	•	•	•
Wild cucumber (<i>Morah fabaceus</i>)		•		•
Annual grass (<i>Poaceae</i>)	•	•		
Cotoneaster (<i>Cotoneaster sp.</i>)	•	•		
Coyote brush (<i>Lyccharis pilularis</i>)	•	•		
Milmaids (<i>Dentaria californica</i>)	•	•		
Snakeroot (<i>Sanicula crassicaulis</i>)	•	•		
Snowberry (<i>Symphoricarpos mollis</i>)	•	•		
Checker bloom (<i>Sidalcea malvaeflora</i>)	•			
French Broom (<i>Genista monspessulana</i>)	•			
Wood Rose (<i>Rosa gymnocarpa</i>)	•			
Hedge Nettle (<i>Stachys rigida</i>)		•		
Tayon (<i>Heteromeles arbutifolia</i>)		•		
California Polypody fern (<i>Polypodium californicum</i>)			•	
Giant periwinkle (<i>Vinca major</i>)			•	
English ivy (<i>Hedera helix</i>)				•

Ubiquitous Understory Species



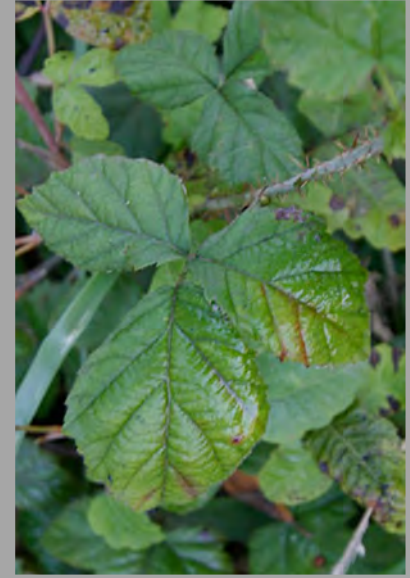
California Bay



Coast Live oak



Poison Oak



California Blackberry



Bedstraw



Chickweed

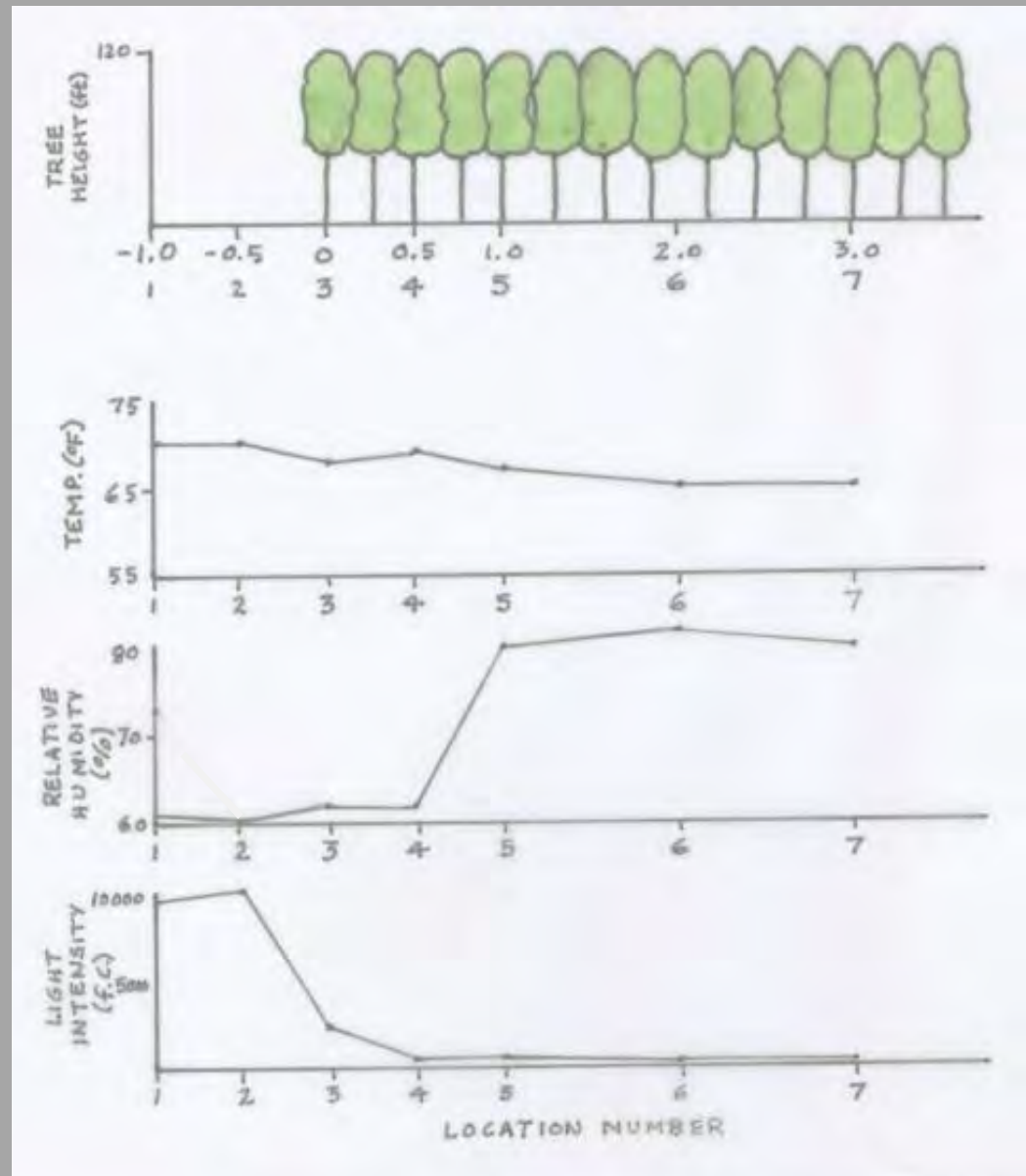
Modification of Site Conditions by Eucalyptus

- Microclimate
- Soil
- Streams



Effects of Eucalyptus Plantation on Microclimate

(Tilden Park, 2101)



Eucalyptus Modification of Grassland Microclimates

(Presidio)

<u>Factor</u>	<u>Modification under Eucalyptus</u>
Temperature (day)	- 10%
Temperature (night)	+ 5%
Relative Humidity	+ 5%
Light Intensity	- 90%
Wind Velocity	- 40%
Precipitation	- 12%
Fog Drip	+ 300%

Effects of Eucalyptus on Soil Characteristics

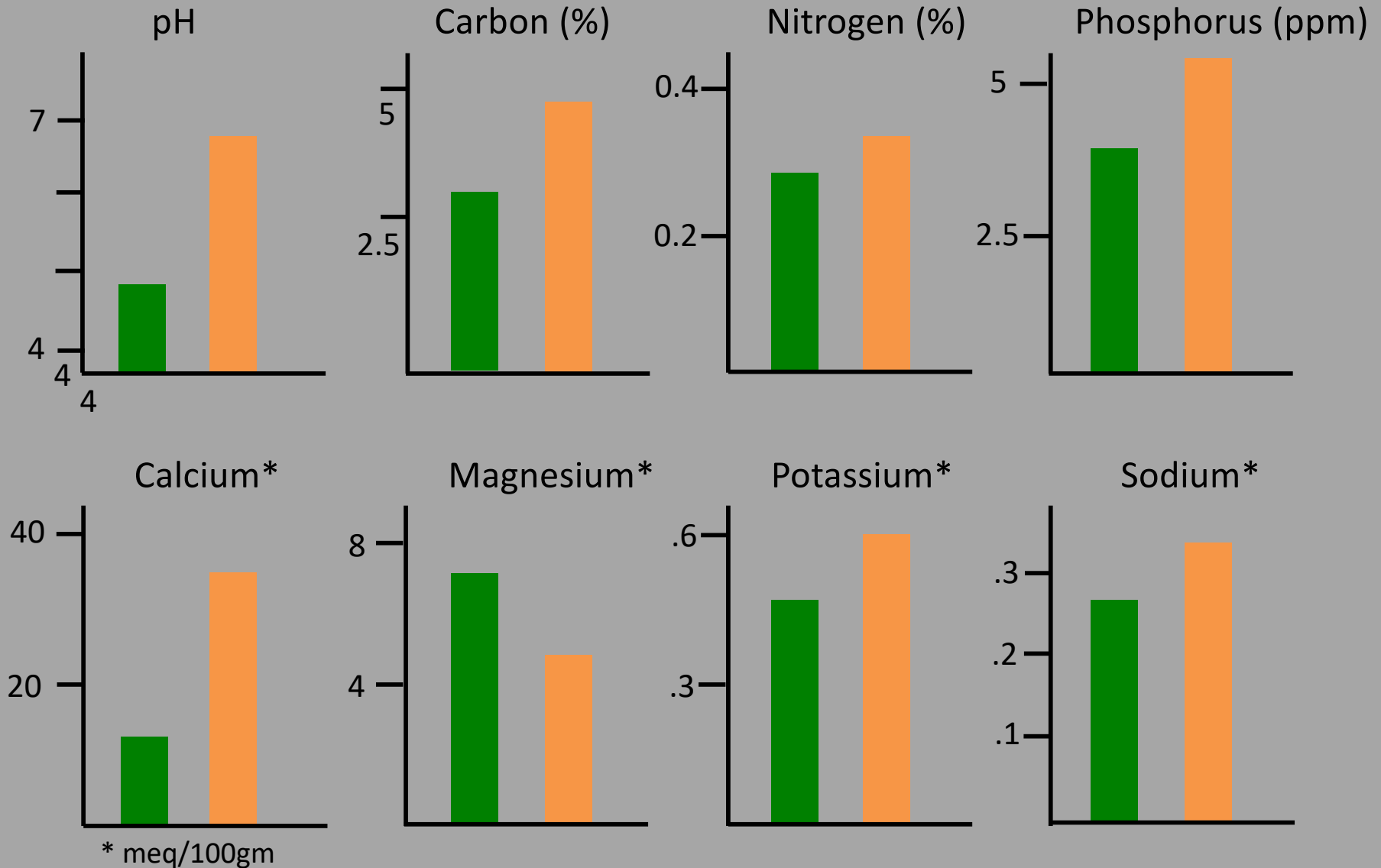


Effects of Eucalyptus on Soil Characteristics

(Zinke *et al*, 1988)

Grassland

Eucalyptus



Allelopathic Effects of Eucalyptus

Reprinted from *Mataoa*, Volume 18, Number 7, July 1965

VOLATILE GROWTH INHIBITORS PRODUCED BY EUCALYPTUS GLOBULUS

HARROLD G. BAKER

The possibility that plants of some species gain advantage in natural competition by the excretion of substances (excrines or ectocrines) inhibitory to the growth of their potential neighbors is under investigation in a number of laboratories. Among these investigations, the studies by Muller and his co-workers on volatile substances produced by aromatic shrubs have aroused considerable interest. Working particularly with *Salvia* and *Artemisia* they have shown that volatile terpenes from the leaves may inhibit root-growth of *Cucumis* seedlings placed in a closed container with them (Muller, Muller, and Haines, 1964). They have also demonstrated the presence of these terpenes in the air surrounding these shrubs in nature (Muller and Muller, 1964; Muller, 1965) and have postulated how they may enter the cells of victimized seedlings through solution in cuticular lipids (Muller, 1965).

The simplicity of the experimental set-up used by these workers in their demonstration of root-growth inhibition by volatile substances from shredded *Salvia* leaves suggested that this might form a suitable class exercise in an ecology course. Consequently, it was tried with the Evolutionary Plant Ecology course at the University of California, Berkeley, in the spring semester of 1964, with subsequent additional experiments which have been facilitated by National Science Foundation Research Grant No. G 21821. I am indebted to Charles Quibell who carried out the extra experiments, meantime making very valuable suggestions regarding technique.

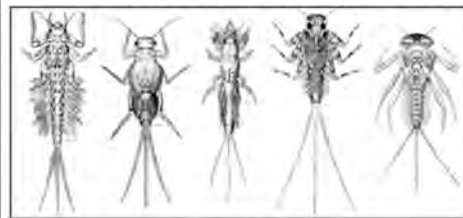
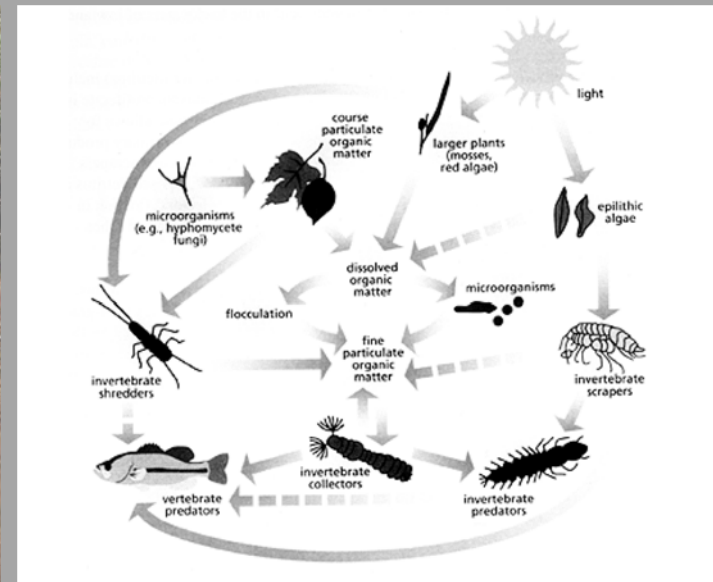
Results obtained by the class were variable until the experimental design was fully standardized. The chambers and contents (fig. 1) were modeled after the setup described in Muller, Muller and Haines (1964). The seeds of *Cucumis sativus* L. were soaked in distilled water for 2 hours and then placed in position on the moist filter paper in the chambers. The glass lid to each chamber was fixed in place with petrolatum. The chambers were then kept together in the dark at 26.7°C (80°F) usually for 48 hours before measurements of root-growth were made. Only main roots were measured, laterals being ignored. The very few ungerminated seeds were also left out of account.

The availability of a small introduced population of *Salvia spiana* Jeps. on Grizzly Peak, Berkeley, enabled the results in Table 1A to be obtained. The differences between controls and test growths are all significant at the 1% level, confirming the findings of Muller et al.

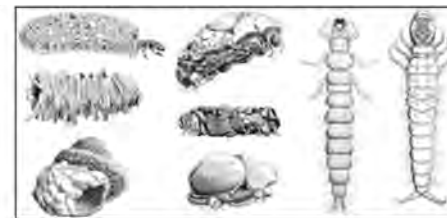
However, it seemed likely that some other, more abundant local source of excrines could be found. In the vicinity of Berkeley there are numerous plantations of *Eucalyptus globulus* Labill. under which very few



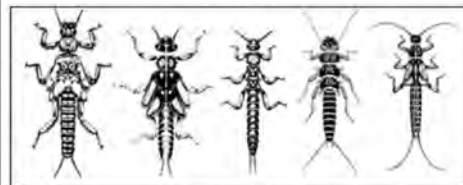
Eucalyptus Litter and Stream Insects



Mayflies



Caddisflies



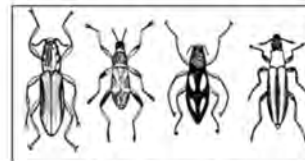
Stoneflies



Gilled Snails



Water Pennies



Riffle Beetles



Dobsonflies

Eucalyptus Litter and Stream Insects

(Lacan, Resh, and McBride, 2009)

<u>Litter Type</u>	<u>Annual Input</u>	<u>Decomposition</u>	<u>Macroinvertebrate</u>
Eucalyptus	950 gm/m ² /yr	0.0193 gm/day	species richness species diversity pollution tolerance
Native Riparian	669 gm/m ² /yr	0.0134 gm/day	

↑
no significant difference
↓

Wildlife Habitat Value of Eucalyptus Plantations



Use of Habitats in the East Bay Regional Parks

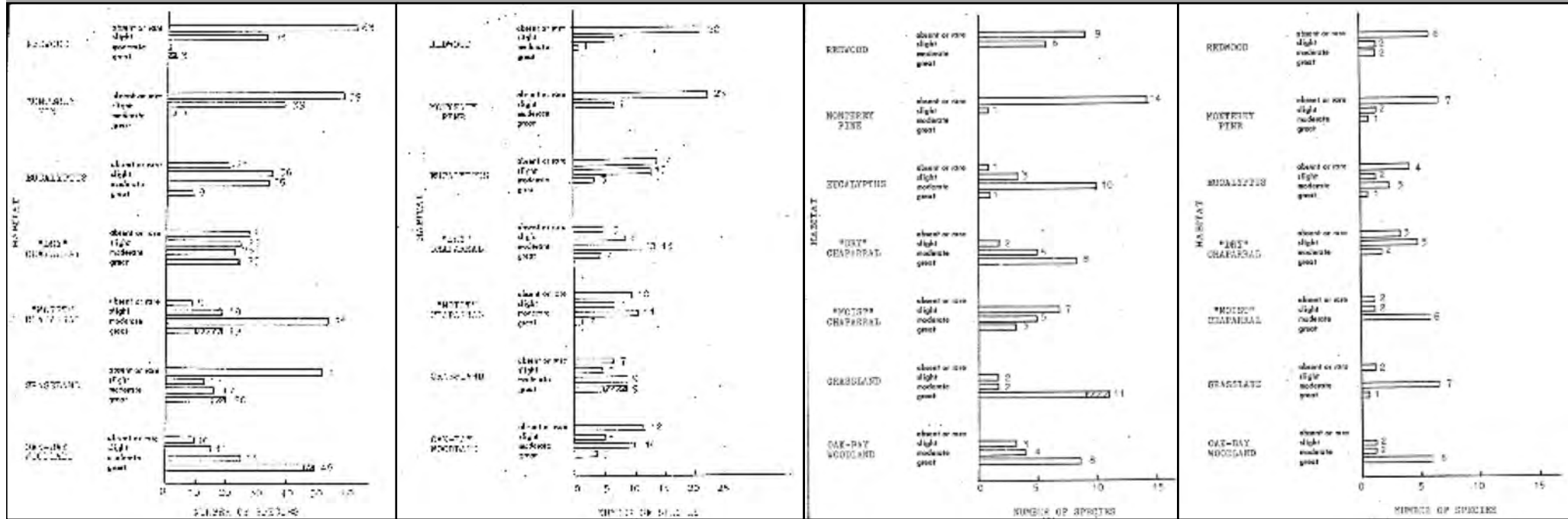
(Stebbins, 1978)

Birds

Mammals

Reptiles

Amphibians



Use of Habitats in the East Bay Regional Parks

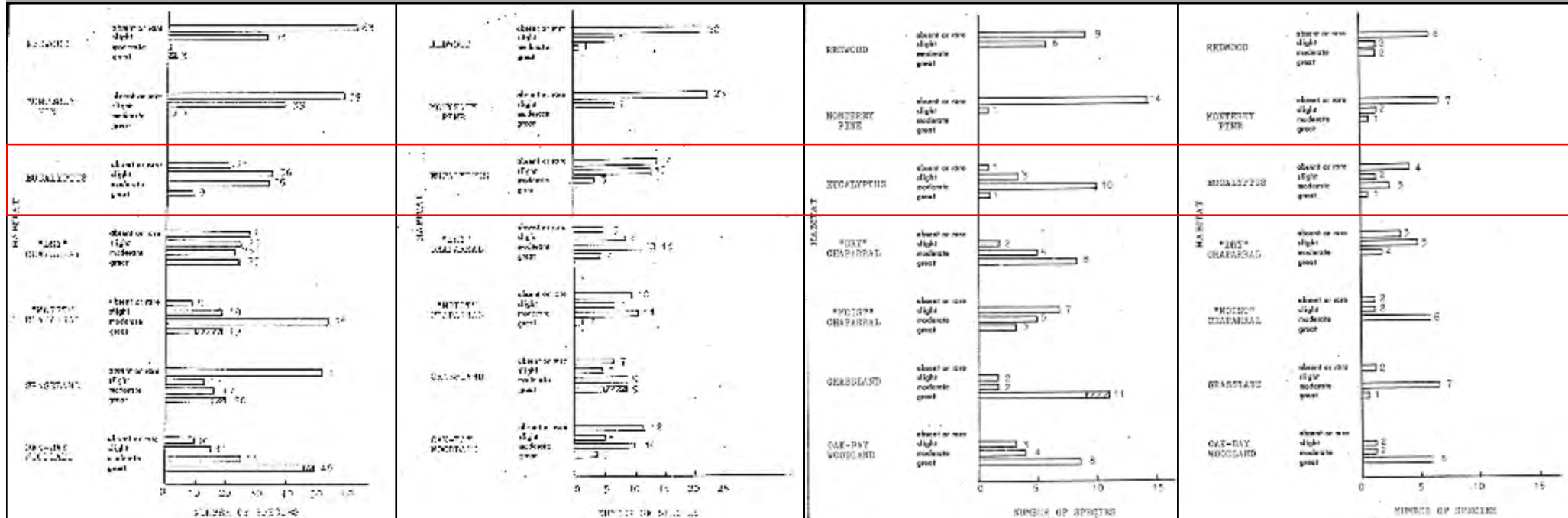
(Stebbins, 1978)

Birds

Mammals

Reptiles

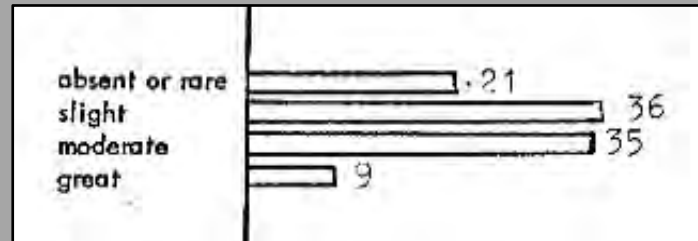
Amphibians



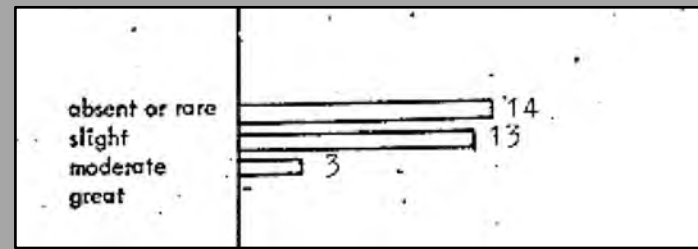
Use of Eucalyptus in the East Bay Regional Parks

(Stebbins, 1978)

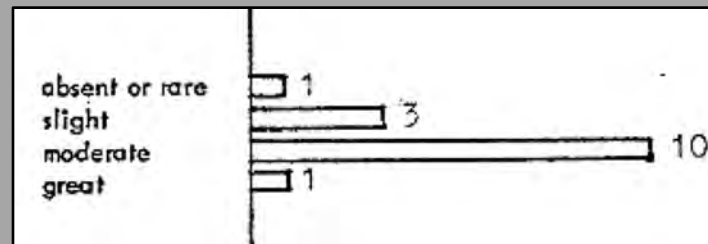
Birds



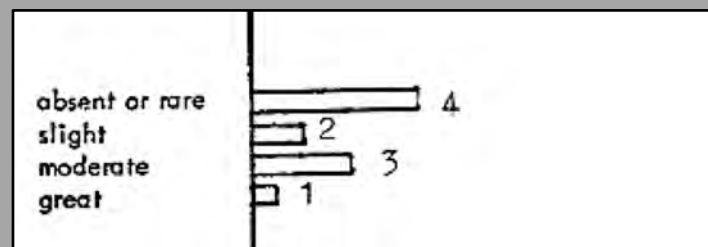
Mammals



Reptiles



Amphibians



Birds making “great” use of Eucalyptus habitat



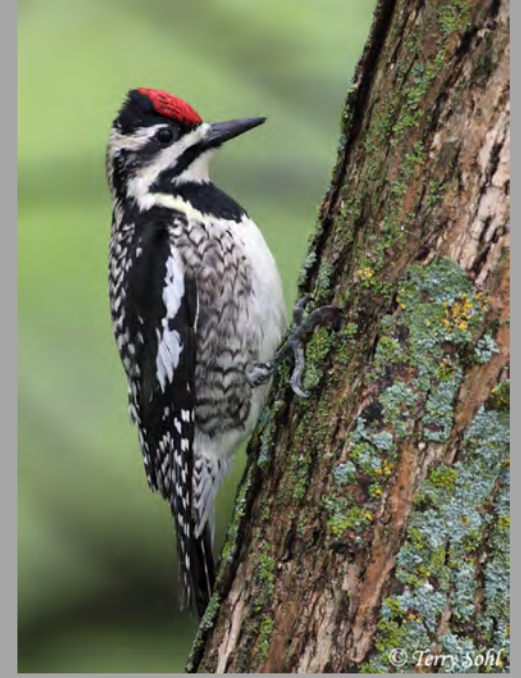
Mourning Dove



Great Horned Owl



Steller Jay



Yellow-bellied Sapsucker



Allen Hummingbird



Olive-sided Flycatcher



Brown Creeper



Dark-eyed Junco



Audubon Warbler

Reptiles and Amphibians making “great”
use of Eucalyptus habitat



Southern Alligator Lizard



Slender Salamander

Small Mammal Use of Eucalyptus Plantations

(Tilden Park, 1990)

Number of Animals Captured*

<u>Vegetation Type</u>	<u>Deer Mouse</u>	<u>California Meadow Mouse</u>
Eucalyptus	35	0
Grassland	3	1

(*200 trap nights)



Deer Mouse
(*Peromyscus maniculatus*)

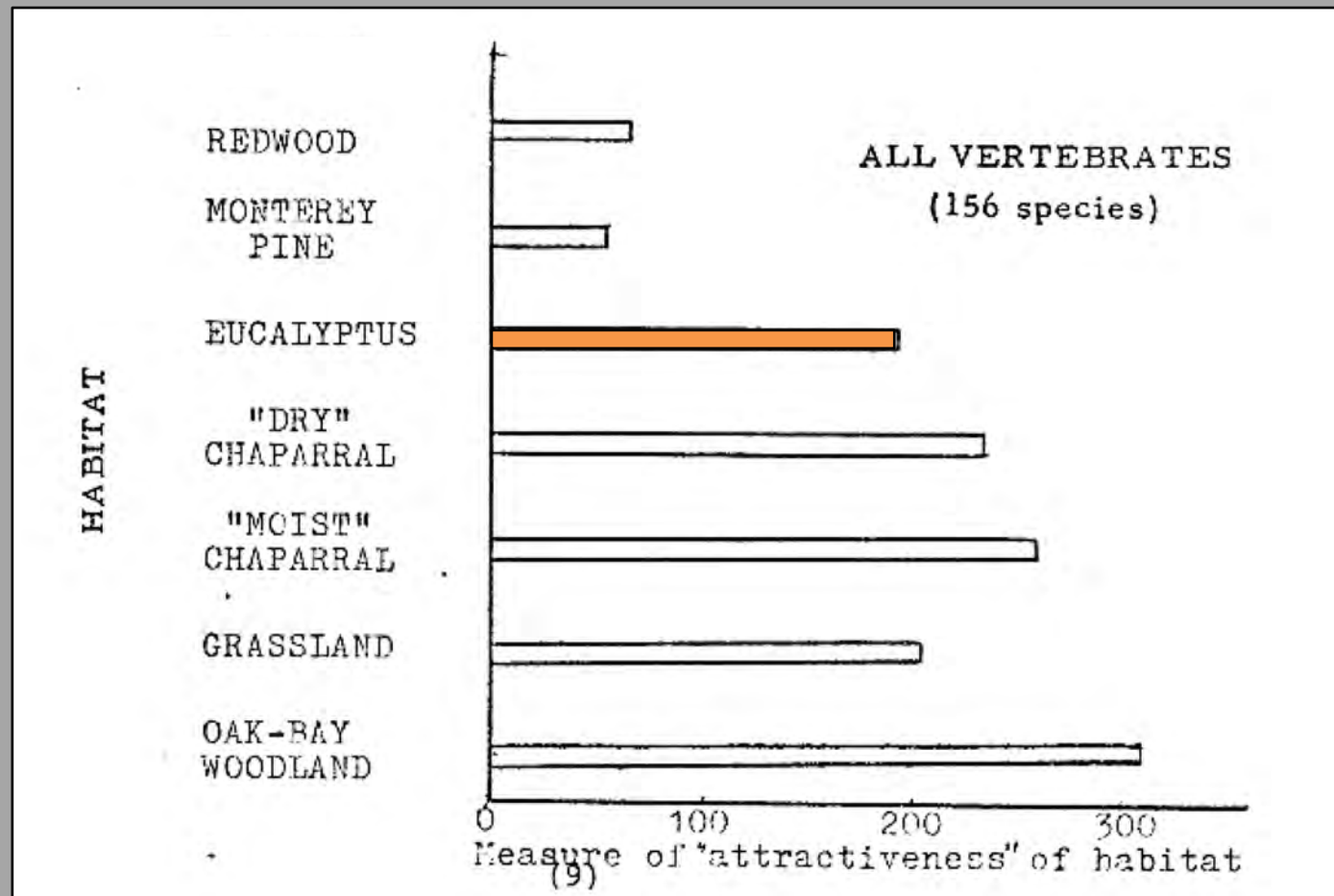


California Meadow Mouse
(*Microtus californicus*)

Attractiveness of Habitats in the East Bay Regional Parks

(Stebbins, 1978)

All Species Making Use of Habitat



Use of Eucalyptus Plantations by Insects



Eucalyptus and Monarch Butterflies



Site	County	Number	Tree
Presidio Park	San Diego	900	Eucalyptus
UCSD	" "	4,500	Eucalyptus
Hosp Grove	" "	900	Eucalyptus
Doheny Grove	Orange	1,000	Not specified
Huntington Central Park	" "	3,500	Eucalyptus
Norma Gibbs Park	" "	700	Not specified
Leo Carrillo State Beach	Los Angeles	800	Eucalyptus
Camino Real Park	Ventura	10,000	Eucalyptus
Harbor Boulevard	" "	23,000	Eucalyptus
Ellwood Main	Santa Barbara	85,000	Not specified
Tecolote Canyon	" " "	22,000	Eucalyptus
Refugio State Beach	" " "	2,500	Palm & Eucalyptus
Oceano Campground	San Luis Obispo	20,000	Monterey cypress
Pismo State Beach	" " "	110,000	Not specified
Los Osos, Sweet Springs	" " "	8,000	Not specified
Andrew Molera State Park	Monterey	10,000	Eucalyptus
Pacific Grove	" "	45,000	Monterey pine
Lighthouse Field State Beach	Santa Cruz	50,000	Monterey cypress & Eucalyptus
Natural Bridges State Beach	" "	95,000	Not specified
New Park Mall	Alameda	500	Eucalyptus
Ardenwood Regional Reserve	" "	20,000	Eucalyptus
San Leandro Golf Course	" "	25,000	Eucalyptus
Muir Beach	Marin	4,000	Monterey cypress
Bolinas Terrace	"	18,000	Not specified
Bodega Dunes Campground	Sonoma	400	Eucalyptus & Monterey cypress

Eucalyptus Longhorned Borer

(Phorocantha semipunctata)



Parasitic Wasp of Eucalyptus Longhorned Borer

(*Avetianella longoi*)



Red Gum Lerp Psyllid



Jack Kelly Clark

UC Berkeley entomologist Don Dahlsten counts the number of red gum lerp psyllids, a new eucalyptus pest, on river red gum foliage in Ardenwood Park, Alameda County.

Scientists have released *Psyllaephagus bliteus* (shown next to white lerp cover) and are monitoring to see if the parasitic wasp controls red gum lerp psyllid.



Jack Kelly Clark



Jack Kelly Clark

The life stages of red gum lerp psyllid. *Clockwise from bottom:* eggs, late instar, white cover and adult.

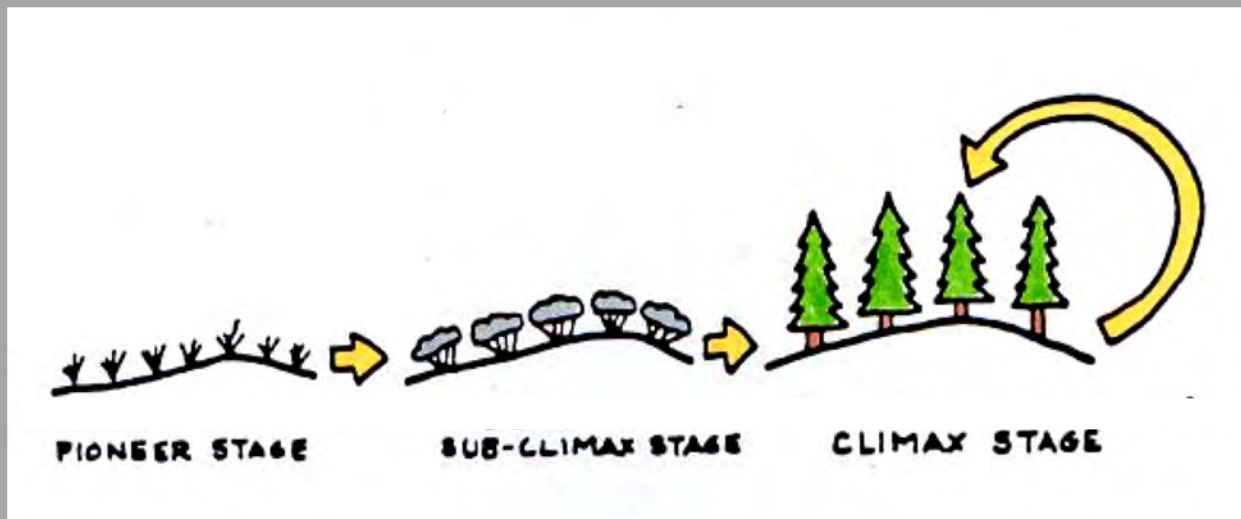
Future of eucalyptus plantations in the San Francisco Bay Area

- Successional change
- Invasion of adjacent vegetation types
- Potential impacts of naturalized pest species

Plant Succession in Eucalyptus Plantations

- Concept of succession
- Current trends in the understory of Eucalyptus plantations

Plant Succession



Plant Succession in Eucalyptus Plantations



Coast Live oak



California Bay



Comparative Shade Tolerance



<u>Species</u>	<u>Shade Tolerance</u>
Eucalyptus	intolerant
Coast Live Oak	tolerant
California Bay	very tolerant

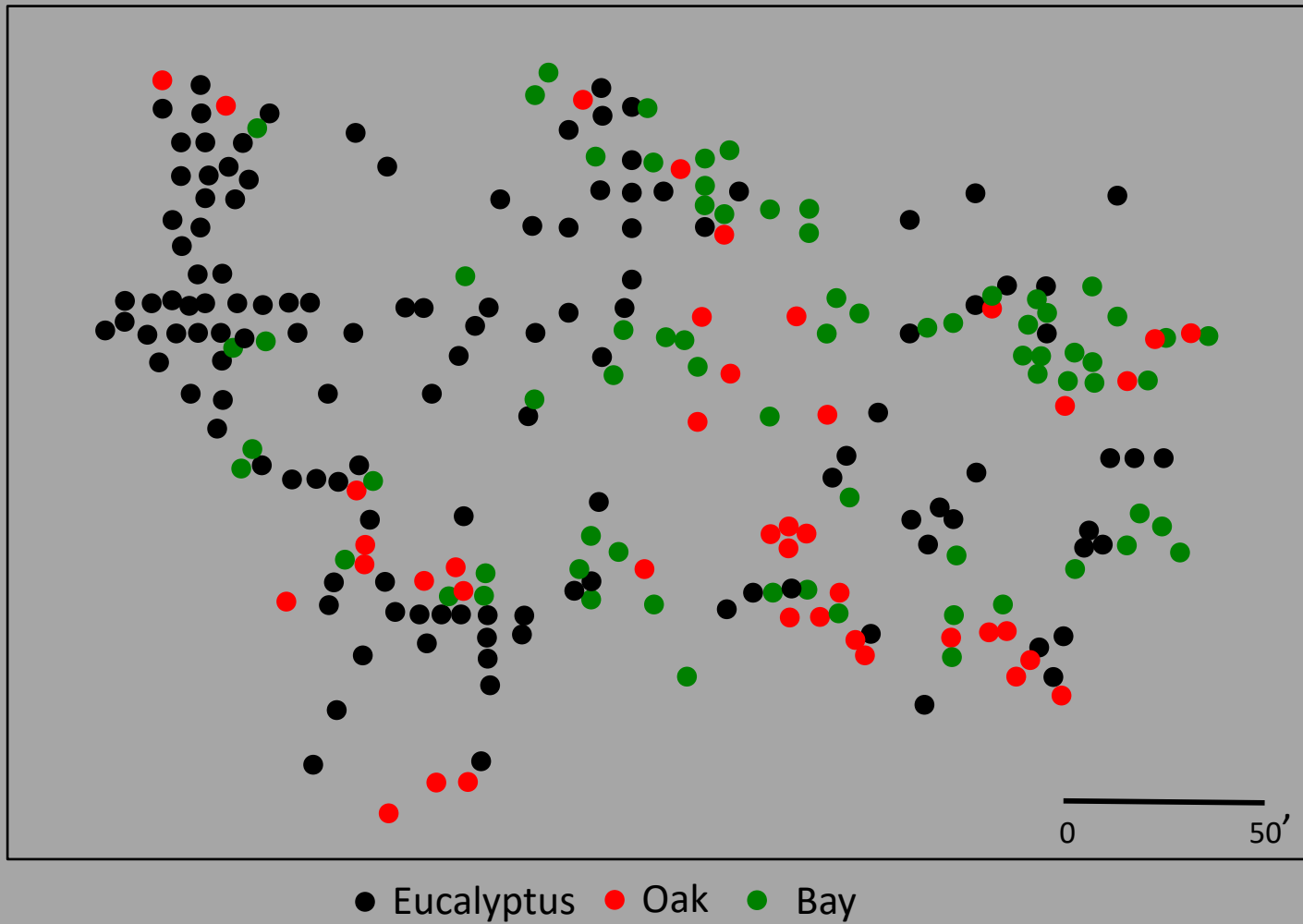
Oak and Bay in Understory of Eucalyptus

(Tilden Park)



Occurrence of Oak and Bay in Eucalyptus Understory

(Tilden Park, 1990)

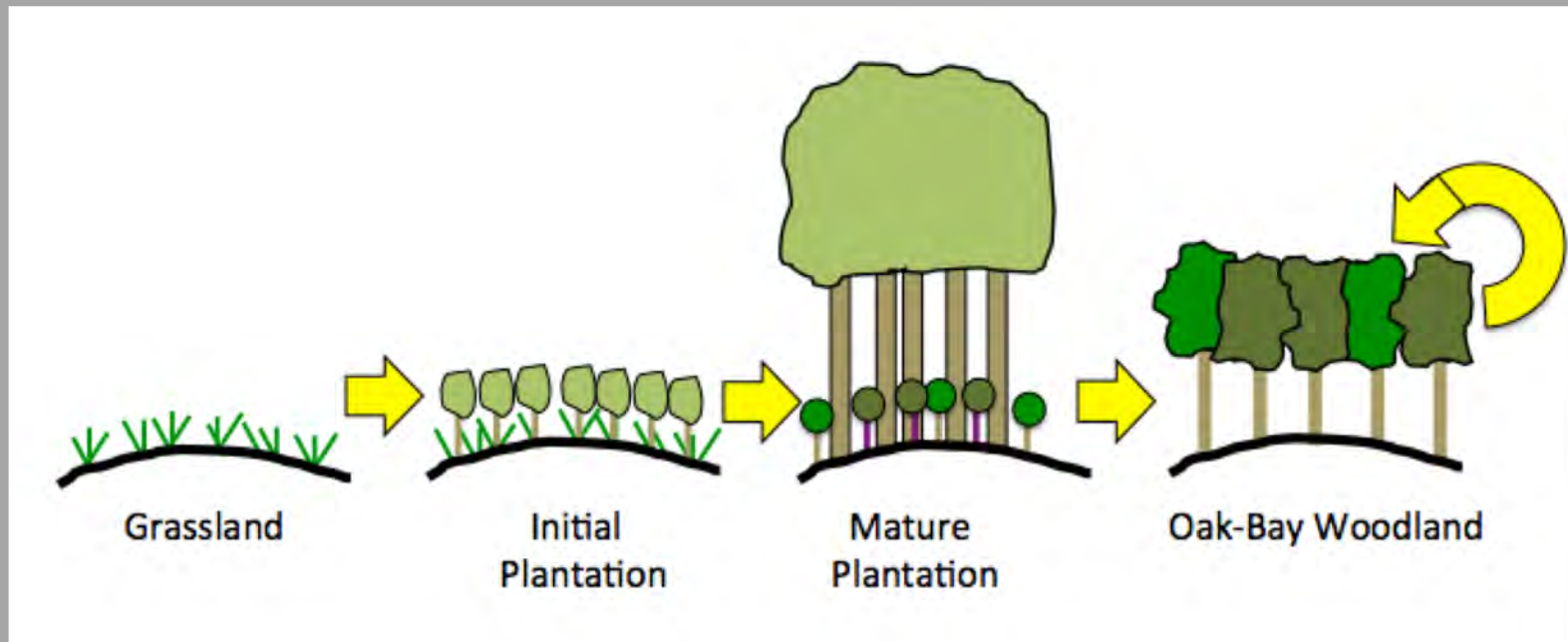


Oak and Bay Trees in Eucalyptus Plantations

(Tilden Park, 1990)

Stand Number	Number of Trees per Acre		
	Eucalyptus	Coast Live Oak	California Bay
1	477	74	97
2	520	42	33
3	530	41	32
4	697	22	129
5	416	10	0
Average	540	38	58

Succession in Eucalyptus Plantations



Fire and Eucalyptus



Fuel Loading in Eucalyptus Plantations



FUEL ELEMENT	Eucalyptus		California Bay		Coast Live Oak	
	Live Component	Dead Component	Live Component	Dead Component	Live Component	Dead Component
Herbs and grasses	0.03	0.02	0.42	0.18	0.31	0.17
Shrubs and saplings	0.49	0.0	0.27	0.01	0.25	0.03
Fine twigs (1-hour)		1.33		0.69		1.18
Small branches (10-hour)		2.94		1.93		4.60
Medium branches (100 hour)		1.41		2.67		2.40
Logs (1,000 hour)		19.63		11.06		0.69
Litter (leaves, bark, needles, etc.)		4.99		1.70		2.19
TOTAL FUELS	Eucalyptus - 30.84 tons per acre		California Bay - 18.93 tons per acre		Coast Live Oak - 11.82 tons per acre	

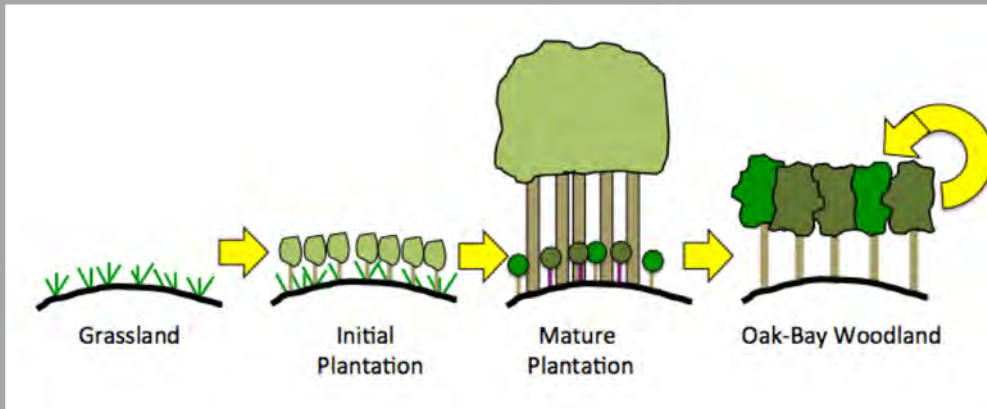
From: U. S. National Park Service

Response of Eucalyptus to Burning

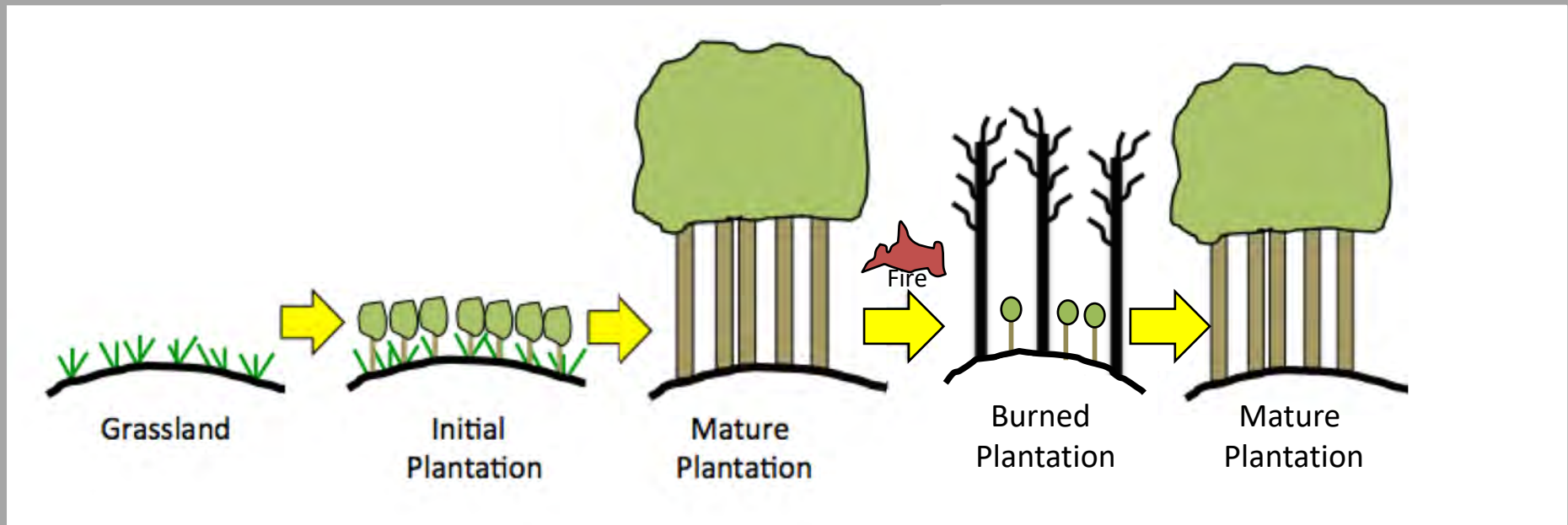


Succession in Eucalyptus Plantations

Without Fire:



With Fire:

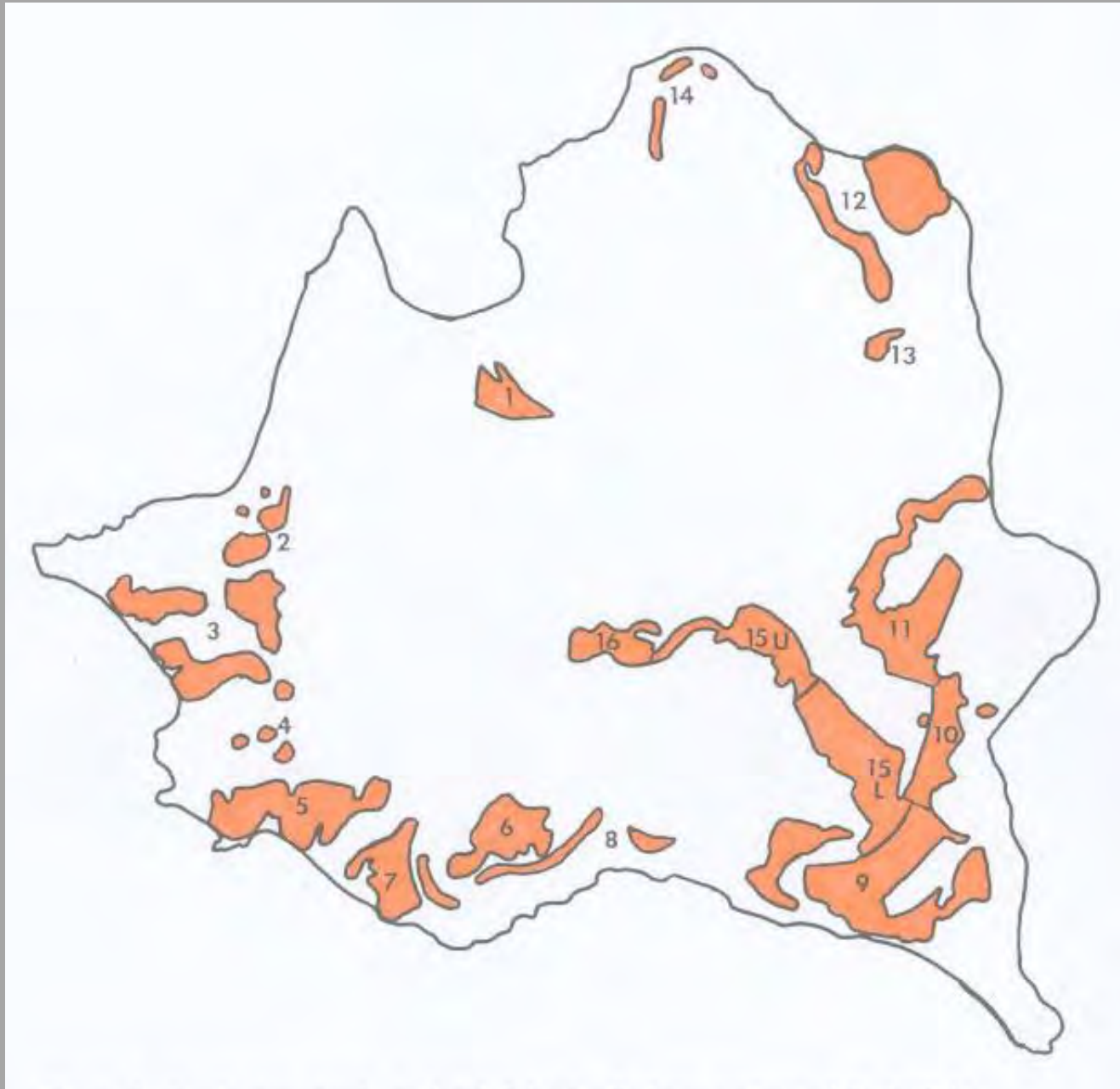


Future of Eucalyptus Plantations in the San Francisco Bay Area

- Successional change
- Invasion of adjacent vegetation types
- Management objectives

Eucalyptus Plantations on Angel Island

(1988)

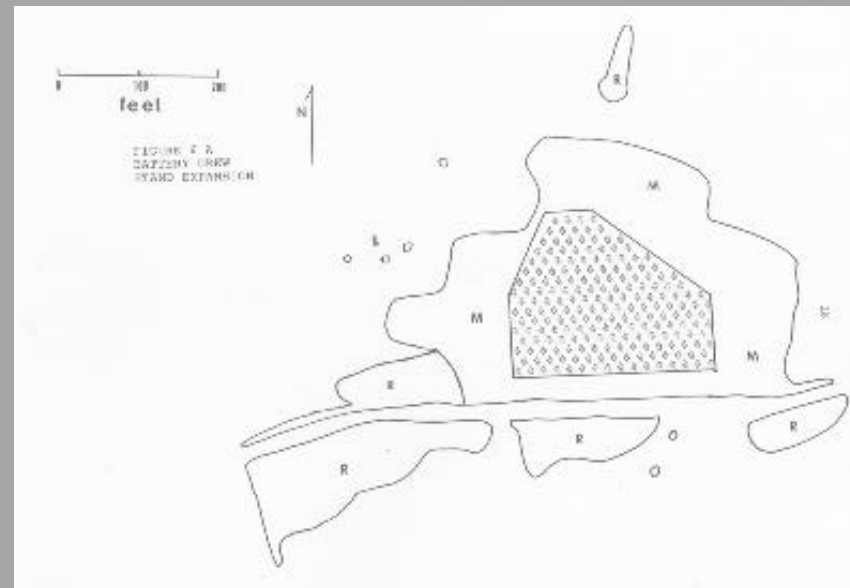
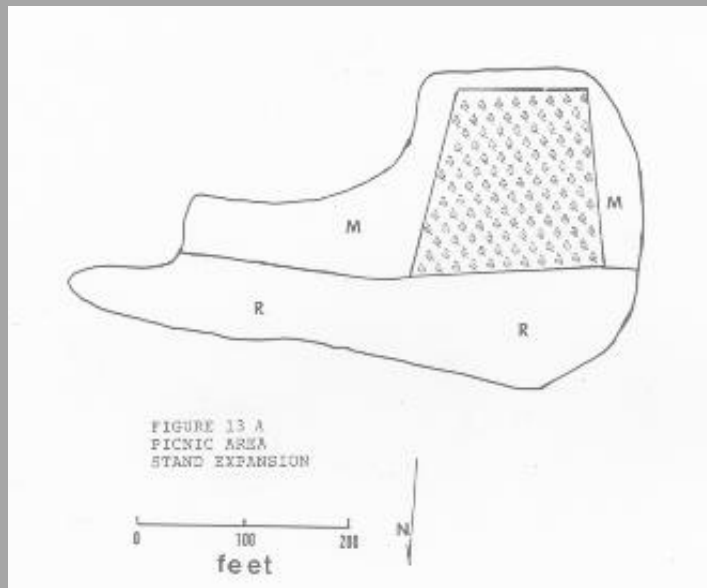
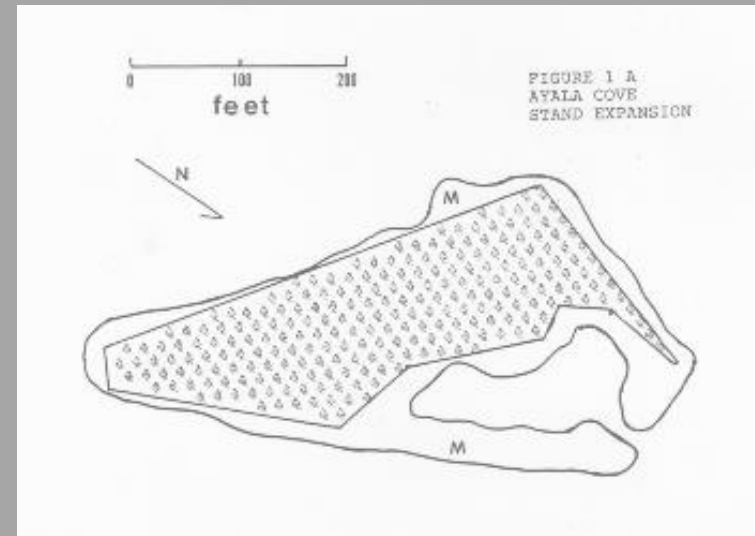
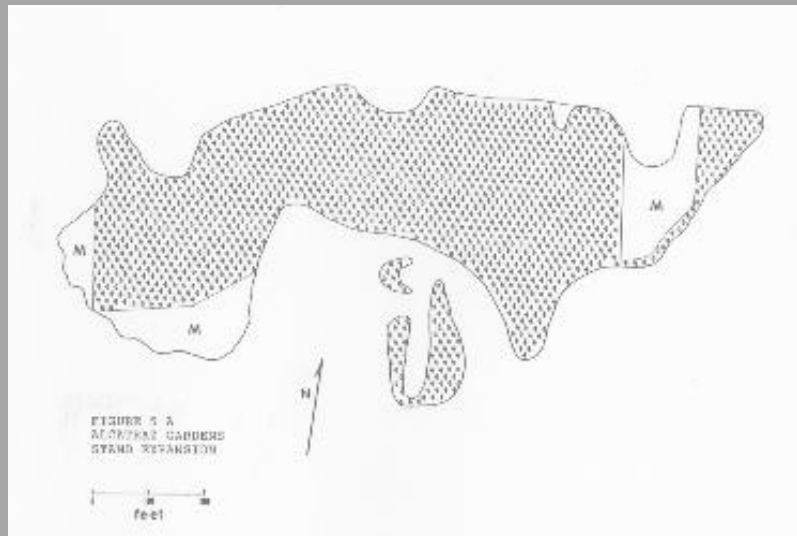


Expansion of Eucalyptus Plantations on Angel Island

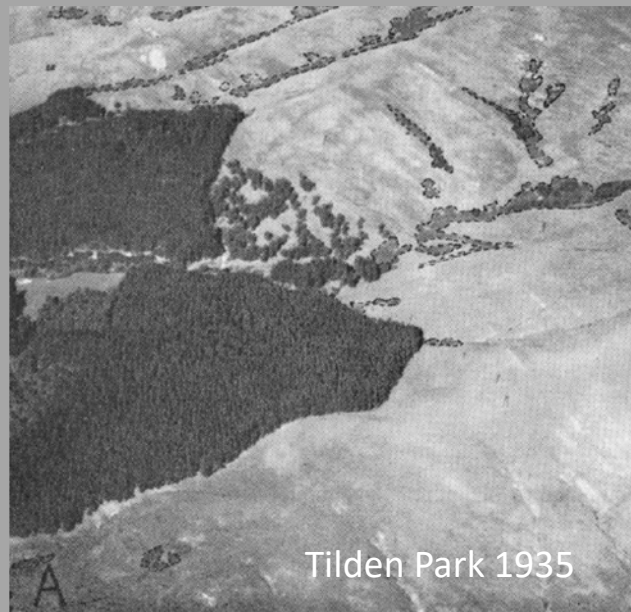
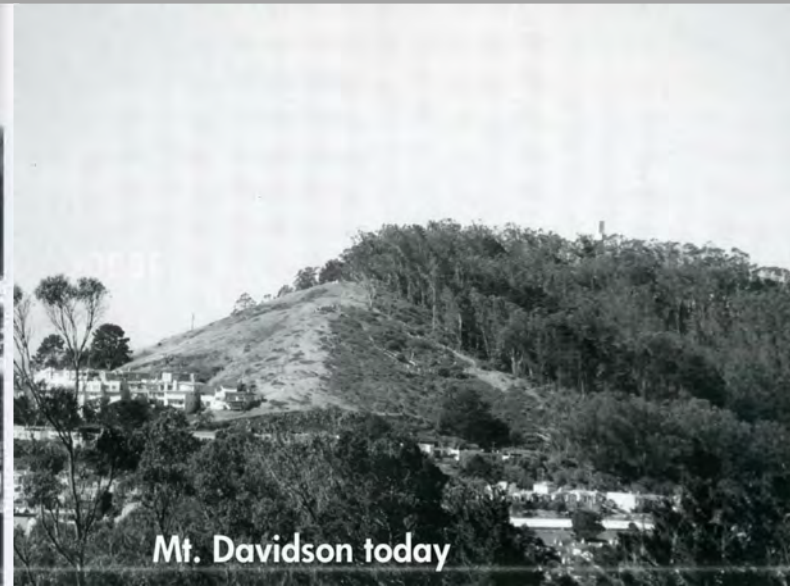
TABLE 1. AREA COVERED BY EUCALYPTUS STANDS

Map Unit	Acres Planted	Total Acres	Expansion Acres
1	1.2	1.9	0.7
2	1.6	2.5	0.9
3	0.1	9.3	9.2
4	0.1	1.5	1.4
5	1.2	8.2	7.0
6	1.0	3.9	2.9
7	2.2	4.4	2.2
8	0.1	1.5	1.4
9	4.3	14.9	10.6
10	1.0	4.9	3.9
11	3.1	10.6	7.5
12	0.7	4.4	3.7
13	0.6	2.2	1.6
14	0.1	0.8	0.7
15	6.0	12.6	6.6
16	0.3	2.5	2.2
Total	23.6	86.1	62.5

Expansion of Eucalyptus Plantations on Angel Island



Stable Boundaries of Eucalyptus Plantations



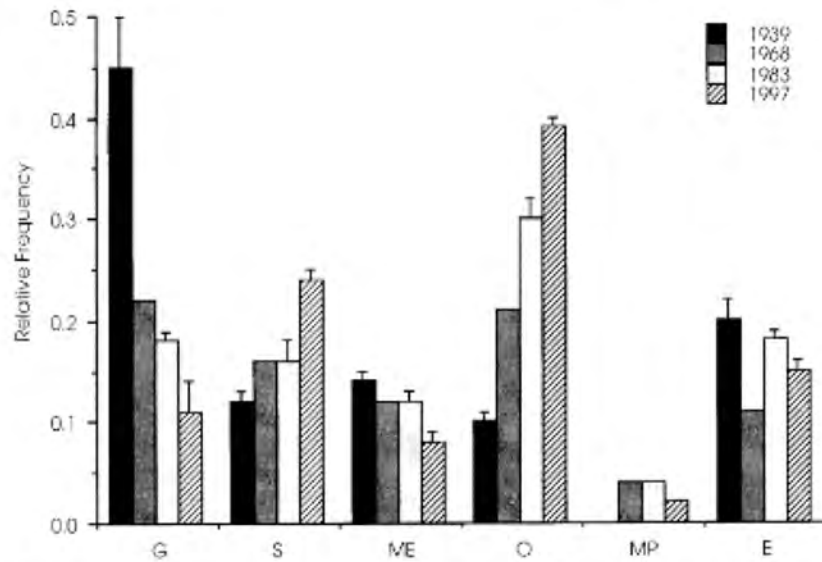


Fig. 2. Relative frequency of six vegetation types, (G: grass, S: shrub, ME: mixed evergreen, O: oak woodlands and savannas, MP: Monterey pine, E: eucalyptus), in Chabot Regional Park. Error bars indicate 1 S.E.

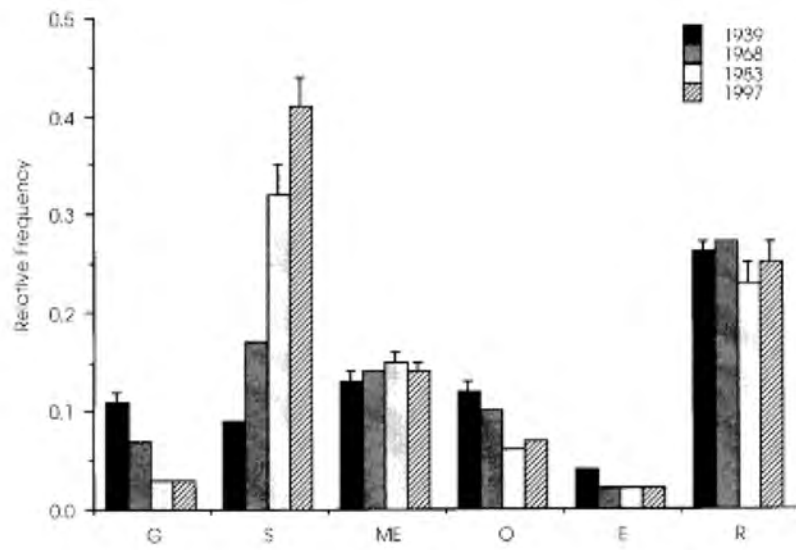


Fig. 3. Relative frequency of six vegetation types, (G: grass, S: shrub, ME: mixed evergreen, O: oak woodlands and savannas, E: eucalyptus, R: redwood), in Redwood Regional Park. Error bars indicate 1 S.E.

Decline in Area of Eucalyptus (1939-1997)

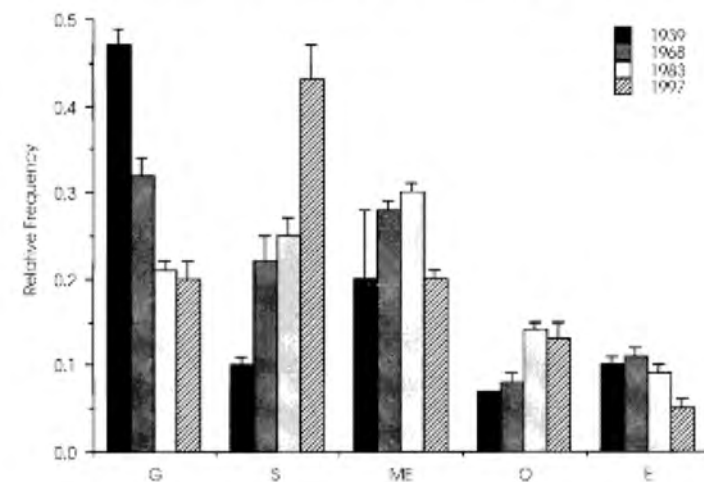
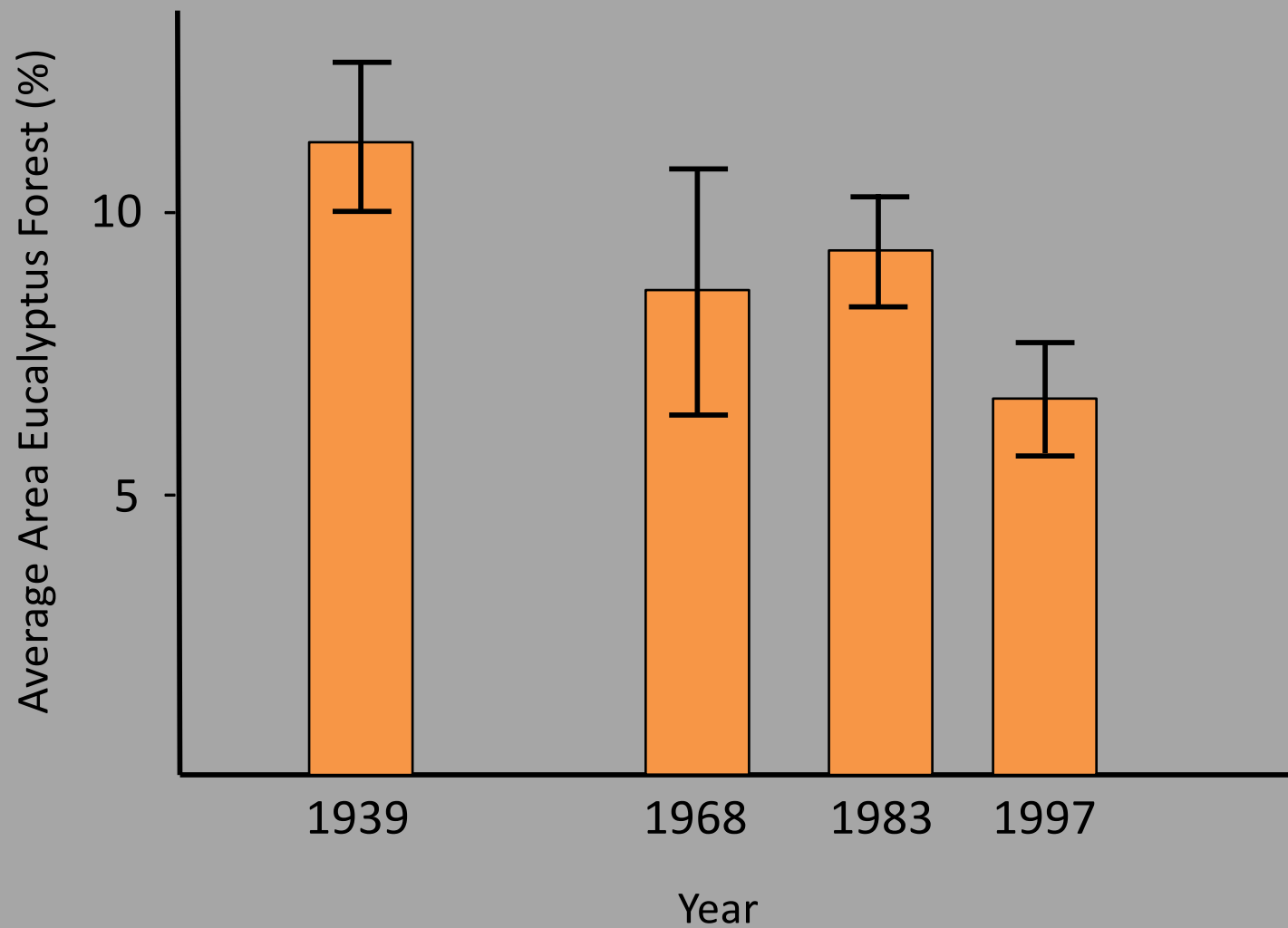


Fig. 4. Relative frequency of five vegetation types, (G: grass, S: shrub, ME: mixed evergreen, O: oak woodlands and savannas, E: eucalyptus), in Tilden Regional Park. Error bars indicate 1 S.E.

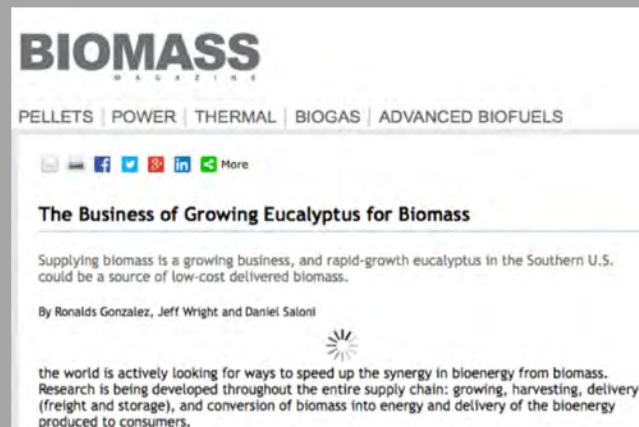
Decline in Eucalyptus in Three East Bay Parks



Alternative Management Objectives for Eucalyptus Plantations



Recreation



Wood Products



Removal

January 12, 2014

The Great Eucalyptus Debate: A Love/Hate Relationship SF Chronicle "Insight"



Photo by Michael Short, Special to the Chronicle
(Posted by John Maybury, Pacifica Riptide, Pacifica, California)

Gone Native

California's love-hate relationship
with eucalyptus trees

by Jared Farmer

APRIL 1970: The Beatles announce their breakup. U.S. forces the invasion of Cambodia. By most measures, the world had seen Using a slogan modified from John and Yoko — "Give Earth — students at some 1,500 American schools prepare for a n Environmental Teach-In, better known as the first Earth Day. In Ventura County, 50 tree-huggers from Moorpark College lie in front of Los Angeles Avenue near Simi Valley. Even here, far away from Berkeley, "ecolo students" (to use the words of the *Los Angeles Times*) could be found protesting th of a tree-lined road. The police arrest 10. On April 22, the defendants are arraign court. By the end of the week, the trees are gone.

What had been lost? Ancient redwoods? Historic oaks? Not quite. The trees i were Australian eucalyptus.

Since the 1850s, Californians had assisted a continuous introduction of eucalyptus by two frenzied periods — one in the 1870s, the other from 1907 to 1911. believed variously that eucalyptus would provide fuel, improve the weather, boost ductivity, defeat malaria, preserve watersheds, and thwart a looming timber famine. foremost, however, Californians planted the trees to domesticate and beautify the to make it more green.

By the mid-20th century, the distinctive blue-green foliage of eucalyptus trees seen all over the state. The Australian genus was far more prevalent than the red official state tree, and scarcely less iconic. The immigrant plant had been naturak

Eucalyptus: California Icon, Fire Hazard and Invasive Species

Liza Gross, KQED Science Contributor | June 12, 2013 | 42 Comments

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Specialized reproductive structures called "epicormic shoots" sprout from buds on the bushfire damaged trunk of a Eucalyptus tree, about two years after the 2003 Eastern Victorian alpine bushfires. Near Anglers Rest, Victoria, Australia. (Photo: jiron)



Acknowledgements

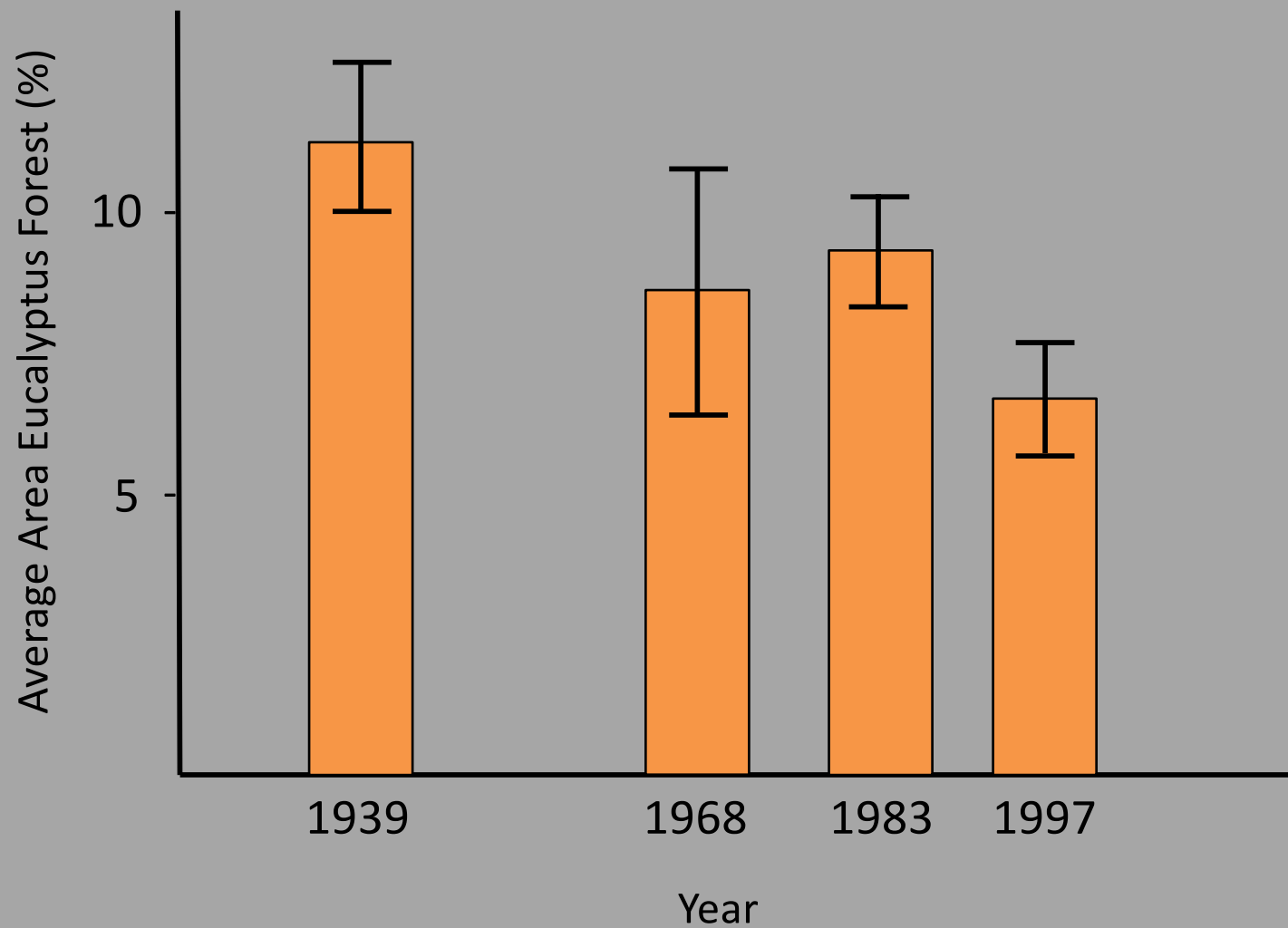
David Amme
Jim Bertenshaw
David Boyd
Sheauchi Cheng
Peter Ehrlich
Igor Lacan
John Leffingwell
Rowan Rowntree
Will Russell
Al Stangenberger
Neil Sugihare
Paul Zinke

End

California Bay in Understory of Eucalyptus (Tilden Park)



Decline in Eucalyptus in Three East Bay Parks



Attractiveness of Habitats in the East Bay Regional Parks

(Stebbins, 1978)

