ALAMEDA MANZANITA MANAGEMENT PLAN

Arctostaphylos pallida Eastw.

by

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Prepared for the

Endangered Plant Project

California Department of Fish and Game

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DEDICATION

This report is dedicated to the memory of James Roof, manzanita aficionado and preserver of California's native flora.

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TABLE OF CONTENTS

		PAGE
Part I	INTRODUCTION	1
	Taxonomy	1
	Range and Habitat	3
	Ecology	7
	Associated Vegetation	9
	Endangerment Factors	12
	Conservation Efforts	13
Part II	MANAGEMENT PLAN	16
	Mission	16
	Outline	16
	Narrative	18
Part III	IMPLEMENTATION SCHEDULE	26
LITERATURE CITED		29
APPENDIX A	Experimental Programs	32
APPENDIX B	Pamphlet Text	35

INTRODUCTION

The Alameda or pallid manzanita (Arctostaphylos pallida Eastw.) is officially designated by the State of California as a endangered shrub known to occur only in two isolated stands, with minor outliers, in Alameda and Contra Costa Counties, California (Smith and York, 1984). The East Bay Regional Park District (EBRPD) recently acquired one of these stands, on Sobrante Ridge, and for some years has been the landowner of the other, Huckleberry Preserve. Thus the District now manages most of the range of this species. Following the drought of the late 1970's and the heavy rains of the early 1980's, the Alameda manzanita exhibited dieback that was noted by Park workers, homeowners and members of the California Native Plant Society (Johnson 1983). This dieback has been attributed to a root fungus and has gone into remission in the last two years. Recently the Park District and the California Department of Fish and Game agreed to conduct a study of this species, to be known as the Alameda Manzanita Recovery Program. A detailed distribution and assessment study was completed in November 1985. This report constitutes the Recovery Plan. Future phases of the Recovery Program will plan and test management activities designed to improve the general condition of the species and ultimately help its recovery (Appendix A).

Taxonomy

For the purpose of this report, the Alameda manzanita will be referred to as Arctostaphylos pallida even though not all taxonomists agree with its hierarchial taxonomic status. A. pallida is an upright, non-burl-forming manzanita with closely imbricated, cordate and glabrous leaves. It attains heights of up to 4 meters. The epithet "pallida" refers to the pale glaucous bloom which occurs on the young leaves. The Alameda manzanita is a member of the A. andersonii Gray complex, and is considered by some to be A. andersonii var. pallida Adams ex McMinn (Munz 1968). The A. andersonii complex includes as many as fourteen taxa, including several species of probable hybrid origin, all of which occur in central coastal California (Jepson 1983, Davis 1972). The distinguishing features of this complex are the sessile or very short-petioled, heart-shaped leaves that clasp or nearly clasp the branches (See Fig. 1).

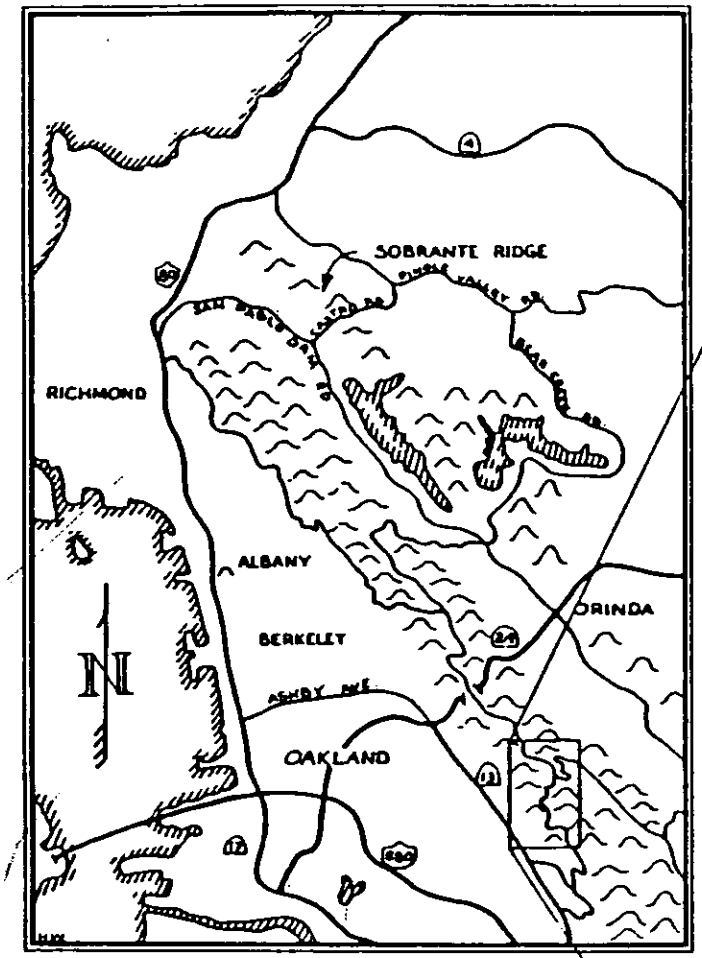
The species of the A. andersonii complex with the exception of A. auriculata and A. luciana, are coastal and experience coastal fog (stratus). These manzanitas inhabit sterile acid substrates (lithosols) including sandstone, shale, old sand dunes and granite (Wells 1962, Roof 1967, Griffin 1978, Stratford and Edwards 1984). Both large and low plants have been described for many of the species (Jepson 1939). Taller plants except for A. viridissima and A. pechoensis are usually woodland inhabitants and shorter plants occur on exposed barrens or in chaparral habitats.

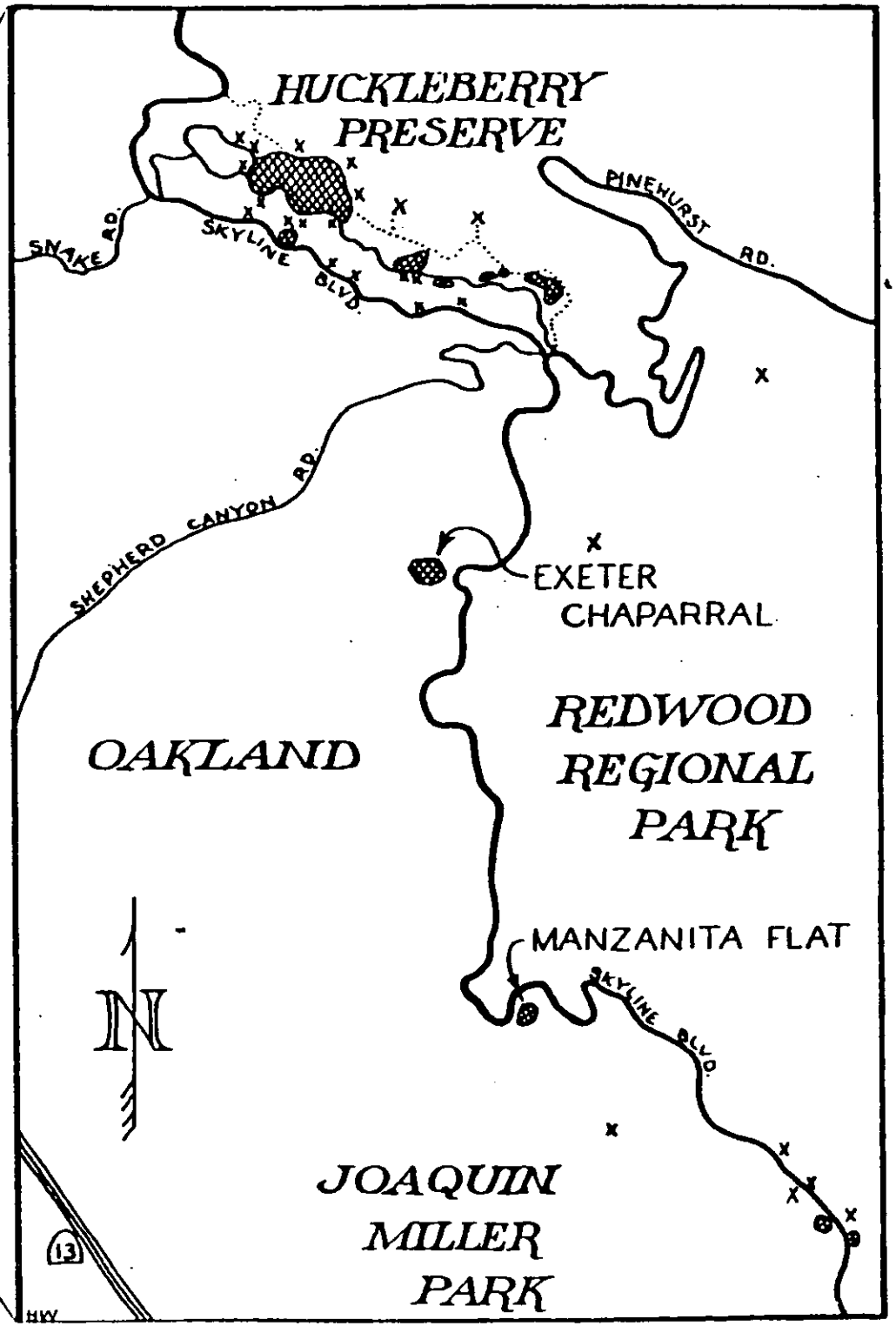
Figure 1. Arctostaphylos pallida Eastwood. ALAMEDA MANZANITA branchlet and flower cluster, X 1; flowers, X 3; fruit, X 3. Drawing by Emily Reid, 1987.

Range and Habitat

A. pallida was originally described as occurring in the "East Oakland Hills," "the hills back of Piedmont" (Eastwood 1934), and on "Moraga Ridge" (Adams 1940). Eastwood and Adams both described the Alameda manzanita as being small in stature from 1 to 1.5 m high. Presently in the East Bay Hills, the Alameda manzanita occurs in one main location on Huckleberry Ridge with several scattered satellite locations near Skyline Boulevard on private property, on East Bay Municipal Utility District property near Pinehurst Road, and in Joaquin Miller Park between 1300 and 1460 ft. elevation (see Map 1). The Moraga Ridge site has been thought by many investigators to be the Flicker Ridge chaparral that overlooks Moraga Valley but extensive searching on Flicker Ridge and reviewing of the literature and old maps indicates that the name "Moraga Ridge" must refer to what is now known as Huckleberry Ridge (see Photo 1). The second largest population of the Alameda manzanita and the northernmost location of the A. andersonii complex is in Contra Costa County on Sobrante Ridge between 600 and 700 ft. elevation (See Map 2).

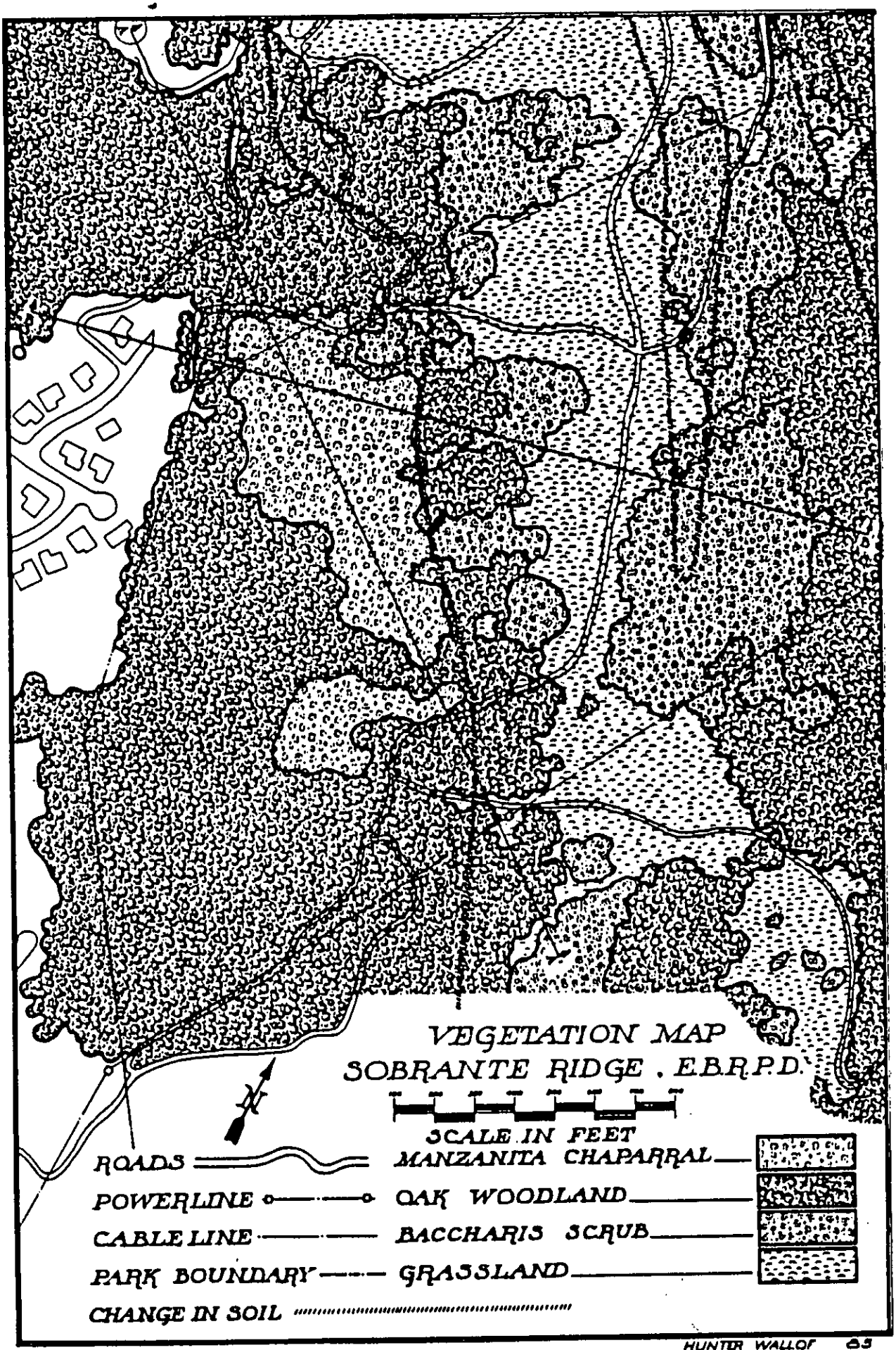
Photo 1. Huckleberry Ridge in the City of Oakland. Note Roundtop Mountain in the distance. The homes are built along Manzanita Drive. (All photos by the senior author.)





LOCATION MAPS of *Arctostaphylos pallida*

MAP 1


VEGETATION MAP
SOBRANTE RIDGE . E.B.R.P.D.
SCALE IN FEET
ROADS
POWERLINE
CABLE LINE
PARK BOUNDARY
CHANGE IN SOIL
MANZANITA CHAPARRAL
OAK WOODLAND
BACCHARIS SCRUB
GRASSLAND
HUNTER WALLOF 83

MAP 2

There are two naturalized stands of the Alameda manzanita in the East Bay Hills. One stand of several Alameda manzanitas exists along Skyline Boulevard adjacent to the Arbor Day Reforestation Project of Joaquin Miller Park. This population was transported there in the early 1970's via road-cut material from Huckleberry Ridge which contained seed of both A. pallida and A. crustacea and is now known as Manzanita Flat. The other naturalized stand consists of several dozen Alameda manzanita plants that were planted by the former Regional Parks Botanic Garden Director, James Roof. These plants line Shasta Road, Golf Course Drive, and Wildcat Canyon Road in Tilden Park near the Regional Parks Botanic Garden (see Photo 2).

Photo 2. Greg Whipple of the Regional Park Botanic Garden staff stands beneath a large specimen of the Alameda manzanita adjacent to the Botanic Garden. Note the rooted branches at the base.

A. pallida has narrow environmental tolerances. It is limited to bare, sterile, siliceous mineral soil in areas of summer fog. The mean annual precipitation for the Alameda manzanita sites is between 22 and 26 inches (Rantz 1971). The presence of summer fog (stratus or high fog) greatly influences the Alameda manzanita habitat. Stratus raises the relative humidity, lowers the temperature, reduces the solar exposure and may add up to 10" of accumulated precipitation via fog drip on Huckleberry Ridge (Patton 1956, Gilliam 1962). Only 20-40% of impinging solar energy penetrates through fog to warm the air and ground (Meyers 1968). Associated with moisture condensation on leaves of plants is a lowering of evapotranspiration rates that can result in less summer moisture stress for many plants (Stone et al 1950).

The two largest populations of the Alameda manzanita grow on Middle Miocene cherts and shales of the Monterey Group. The Rodeo Shale of Sobrante Ridge is light siliceous shale, while the Claremont Formation on Huckleberry Ridge consists of interbedded chert and shale (Lawson 1984, Radbruch 1969, Dibblee 1980). The satellite populations of the Alameda manzanita along Skyline Boulevard exist on Pinehurst Shale and Joaquin Miller Formation (Radbruch 1969). Both substrates are mixtures of shale, sandstone, and minor conglomerate. At both the Sobrante Ridge and Huckleberry Ridge sites the Alameda manzanita dominates in the central locations where there is little or no soil development. On these "barrens" sites A. pallida is the only vascular plant (see Photo 3).

Photo 3. "Barrens" of the Alameda manzanita at the Sobrante Ridge colony, Contra Costa County. Exposed lithosols contrast with grassland soils supporting open vegetation on the ridge in the background.

Ecology

The most outstanding feature of the ecology of the Alameda manzanita is that it is a chaparral fire-adapted shrub. Fire is a significant and effective regeneration factor in the management and recovery of decadent chaparral (Hanes 1977). Fire partially recycles limiting nutrients, consumes allelopathic litter, scarifies seed for germination, opens up the canopy providing light and space for seedling establishment, and reduces the number and types of pests and pathogens that attack weakened plants (Jepson 1939, Sampson 1944, Cooper 1922, Detling 1961, Gankin and Major 1964, Wells 1969, Mirov and Kraebel 1939). Seedling establishment for the

burl-forming manzanitas is not critical for stand regeneration; however, the obligate-seeding manzanitas like the Alameda manzanita need to regenerate from seed following fire or other disturbance (Keeley and Zedler 1978, Wells 1969).

The understory of the Alameda manzanita stands is generally free of herbs or other establishing shrubs and trees. This is due to the allelopathic effect of phytotoxins produced by roots, fallen fruit, leaf litter and exfoliating bark of the manzanitas (Chou and Muller 1972). It is generally believed that toxin removal by fire accounts for the subsequent flush of seedling germination of herbs and shrubs including the manzanitas. Manzanitas older than fifty years can begin to decline in vigor, accompanied by accumulating dead and downed wood and debris, contributing to a growing fuel load (Philpot 1977). Observations of the main Alameda manzanita populations indicate that the stands have not been burned in 80 to 100 years. The fuel load is high. The Alameda manzanitas exhibit signs of great age with many plants up to 75% dead. Seedling establishment has only been observed on recently cut slopes or disturbed sites associated with road grading and house building.

Within the two major "barrens" populations of Huckleberry Ridge and Sobrante Ridge, the main method of regeneration and recruitment is rooted branches (layering). The A. pallida populations within these barrens are stable; however, the Huckleberry Ridge manzanita population has the disadvantage of competing for branch rooting space with huckleberry (Vaccinium ovatum) and chinquapin (Chrysolepis chrysophylla var. minor), which by their fairly large spread and size can shade the manzanita branches. The Alameda manzanita does root beneath its own canopy, and invasion of this space by other species is limited by the allelopathic properties of the manzanita litter. Shading is a major factor only at the edge of, or outside of the barrens populations because tree species fail to become large enough to shade out the Alameda manzanita within these areas.

Another conspicuous characteristic of the Alameda manzanita is the development of dead or decorticated areas on the branches and trunks (Davis 1973). This condition is called bark striping and was first described by Adams (1934) in individuals of A. myrtifolia and A. viscida. Bark striping is most common with the older individual plants. Adams indicated that it has a pathological origin but Davis disagrees and suggests that striping is a "positive adaptation to the Mediterranean climate". His hypothesis is that in areas protected from fire, the shade-intolerant manzanitas attain sizes that strain the plant's ability to maintain live tissue. In a sense, the plant shuts down portions of its mass in order to continue meristem growth. The Alameda manzanita has the ability to maintain healthy growing branches even when it has lost major portions of the crown and live cambium. Plants that are over 75% dead since the fungus attack of 1983 show dramatic signs of recovery utilizing their ability to develop striped cambium (see Photo 4).

Photo 4. Striping: dead or decorticated areas on the branches and trunks of the Alameda manzanita.

Associated Vegetation

There are four vegetation types found at Sobrante Ridge: manzanita chaparral, oak woodland, baccharis scrub and grassland. The central manzanita chaparral covers the upper part of a south-flowing drainage with 30 to 40 degree slopes on a generally south and west facing aspect. This A. pallida/A. crustacea manzanita chaparral covers approximately 9 acres. The species diversity within this area is low. The Alameda manzanita comprises approximately 40% of the foliar cover, followed by A. crustacea (25%), Quercus wislizeni var. frutescens (20%) with the remaining 15% cover comprising bare ground and downed woody debris. Two groves of Quercus chrysolepis are present within the manzanita population (Havlik 1980). Bracken Fern (Pteridium aquilinum) and Bush Monkey Flower (Diplacus aurantiacus) are the only other vascular plants observed in the central Alameda manzanita populations. Surrounding three sides of the manzanita population is an open park-like oak woodland with Quercus agrifolia, Heteromeles arbutifolia, Eriodictyon californicum, and Pedicularis

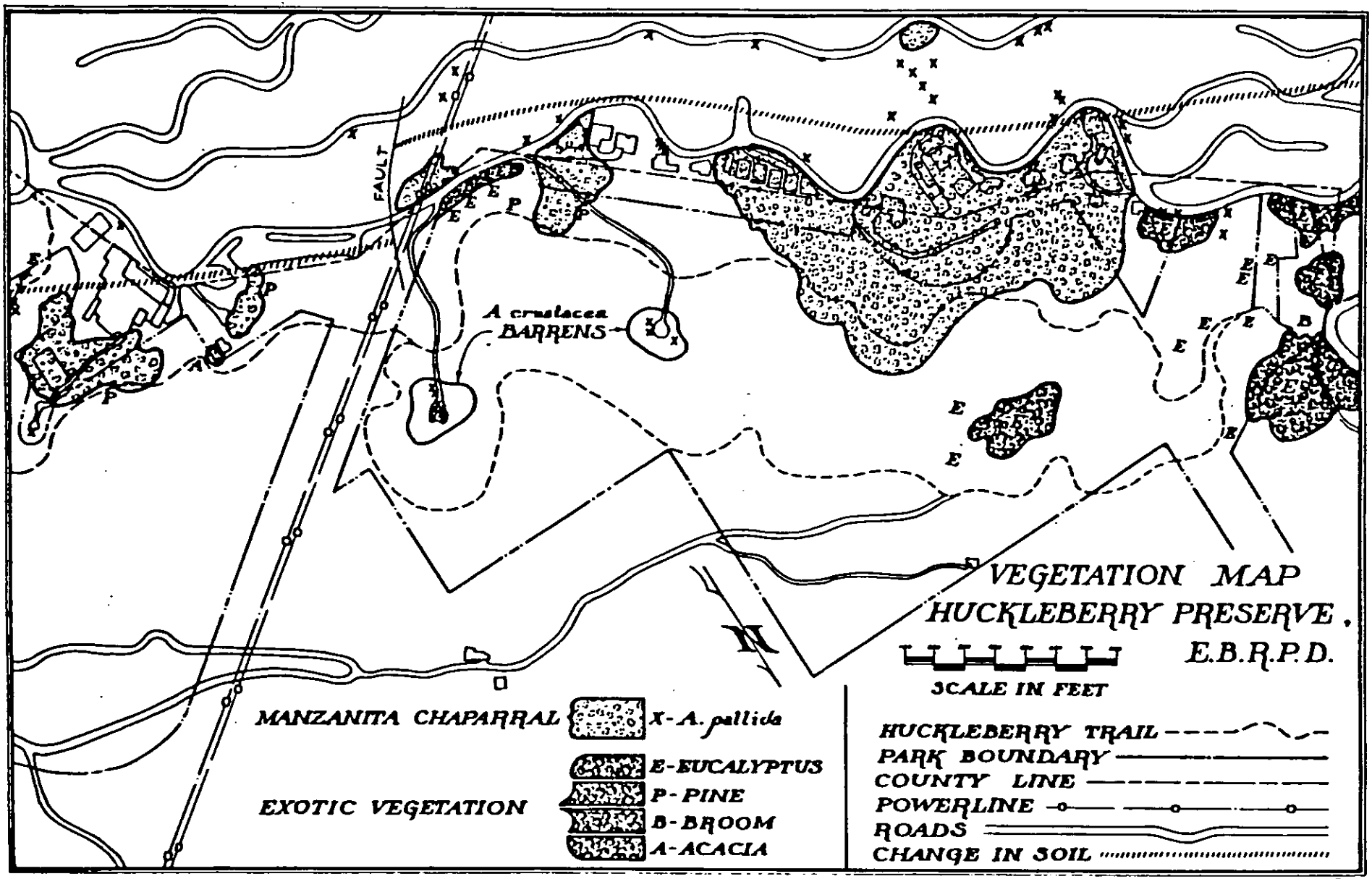
densiflora. Quercus wislizeni var. frutescens is the only plant observed regenerating or growing under the direct A. pallida canopy. Many dead and dying A. crustacea are found beneath the A. pallida canopy. The baccharis scrub and the grassland are found above the manzanita chaparral and oak woodland on a sandstone based ridge with well developed soil.

Of special note in this population is an evergreen oak which has lanceolate and entire leaves similar to Bay leaves. These plants are distinct from Quercus wislizeni var. frutescens in that they are arborescent. This oak was first described by Muller as Quercus shrevei (Muller 1938) and recognized recently as a variety of Quercus parvula (Nixon 1980). Also present were many Q. agrifolia type oaks with Q. wislizeni acorns and cups, curled leaves, and smooth shiny leaf undersides.

Huckleberry Ridge has a rich assortment of vascular plants including 190 species in 50 plant families (Stratford and Edwards 1984). There are two major vegetation types on Huckleberry Ridge: the manzanita/chinquapin chaparral and the oak/bay woodland which adjoins the chaparral on the north, east, and south side. The west side of the chaparral is a residential/eucalyptus area which probably was a grassland before the road building and eucalyptus planting took place. Map 3 outlines the extent of the Alameda manzanita which exists from the top of the ridge on Manzanita Drive down the northeast slope to the main Huckleberry Trail. A. pallida and A. crustacea dominate on the sunnier east facing slopes. The Alameda manzanita dominated areas outlined on Map 3 comprise approximately 20 acres on 30 to 40 degree slopes.

A vegetation-edaphic relationship similar to Sobrante Ridge exists on Huckleberry Ridge although richer in species composition. The poorest soils in the chaparral type near the summit of the Ridge are dominated by the Alameda manzanita with between 40 to 50% foliar cover. Huckleberry and chinquapin comprise up to 40% foliar cover in this area. The balance is made up of bare ground and fallen woody debris (up to 10%). On the edges of these areas, huckleberry and chinquapin dominated the cover (up to 70%). In these areas taller Alameda manzanita plants reach through the canopy and comprise approximately 30% of the plant cover. Quercus chrysolepis, A. crustacea, Heteromeles arbutifolia, Corylus cornuta var. californica, Garrya elliptica, and Ceanothus sorediatus are common in this area. Also shown on Map 3 are the pure A. crustacea populations that dominate two lower-elevation barren knobs with old fire roads leading down to them. A. pallida is represented on these sites by a few plants near the most disturbed portion of these knobs. The size and height of these plants indicate that they became established in the recent past, most likely when the area was disturbed in 1972. Several of these apparently healthy plants recently died on these locations. As with the Sobrante Ridge population, A. crustacea is intolerant of A. pallida canopy. The high occurrence of huckleberry plants under the Alameda manzanita canopy indicates that A. pallida allelopathy generally does not affect adult huckleberry plants. No huckleberry seedlings were noted and it is assumed that these plants are resprouts after a fire or were established soon after a fire's disturbance.

The small A. pallida stand below Skyline Boulevard on Exeter Drive is associated with a chaparral made up of A. crustacea, chamise (Adenostoma fasciculatum), huckleberry, toyon, and the lanceolate-leaf Quercus parvula


FAULT
A crustacea
BARRENS
N
VEGETATION MAP
HUCKLEBERRY PRESERVE,
E.B.R.P.D.
SCALE IN FEET
MANZANITA CHAPARRAL
X-A. pallida
EXOTIC VEGETATION
E-EUCALYPTUS
P-PINE
B-BROOM
A-ACACIA
HUCKLEBERRY TRAIL
PARK BOUNDARY
COUNTY LINE
POWERLINE
ROADS
CHANGE IN SOIL
HUNTER WALLOF 83

MAP 3

var. shrevei. The outlying groves and individuals of the Alameda manzanita along Skyline Boulevard are associated with coast live oak and the edge of the redwood stands. These areas were heavily planted with Monterey pines and cypresses and the Alameda manzanita occurs mainly on the road cuts and in light gaps of the forest. An old road cut above the Roberts garage has several Alameda manzanitas growing on the upper portions of the cut in a way that suggest natural regeneration following typical road cut disturbance. On the old fire road above Pinehurst Road are several Alameda manzanitas established only on the road. These plants appear to be natural establishment after disturbance. The nearest A. pallida plants to this location are on Huckleberry Ridge one half mile away.

Endangerment Factors

The Sobrante Ridge manzanita population has the least human impact of all the Alameda manzanita populations. There is no residential housing inside or on the edge of the chaparral and there are no planted exotic trees or shrubs. Effects of the root fungus disease were not observed on Sobrante Ridge. While the status and vigor of the Sobrante Ridge manzanita population can be described as good the population exhibits great age and is approaching senescence.

There is significant direct and indirect human impact on the Huckleberry Ridge manzanita populations where residential housing is built among the Alameda manzanitas on Manzanita Drive on the ridge top. Up to 50% of the original Alameda manzanita population has housing development or is privately owned. Associated with the housing is the presence of planted and escaped exotic trees, shrubs, and groundcovers. Map 3 locates the exotic plants within the Reserve borders. Several eucalyptus groves are present. A small grove of silver wattle (Acacia baileyana) is present as well as several Monterey pines. French broom (Cytisus monspessulanus) dominates along Manzanita Drive where the Reserve borders the road. Just below one of these sites is a large population of periwinkle (Vinca major) and a large area covered with German ivy (Senecio mikanioides). Large stands of French broom associated with eucalyptus are located at both the north and south entrances to the Reserve.

The shading of A. pallida plants by planted and naturalized Monterey pines and cypresses is perhaps the most outstanding endangerment factor upon the smaller outlying Alameda manzanita populations. The recent spraying and future spraying of herbicides along Skyline Boulevard has had and will have a deleterious impact upon roadside regeneration of the Alameda manzanita (see Photo 5).

Over half of the A. pallida plants on Huckleberry Ridge and along Skyline Boulevard showed recent signs of branch and stem dieback due to the root fungus. This dieback has ceased within the last year and most of the dead branches and plants are one to two years old. The leaves turn a reddish color the first year and take on a skeleton white-grey color the following year. Only a few plants exhibited recent dieback initiation during the survey. Despite the dead and dying branches, the remaining healthy branches and meristems exhibited good vigor and had flowered and produced a large crop of seed in 1986. Root fungus thrives in the soil with high moisture levels coupled with poor drainage. Weakened plants are more susceptible to attach by this fungus. The observed dieback is the

response to the branches not receiving moisture from the root system. Generally the status and vigor of the Alameda manzanita on Huckleberry Ridge is poor.

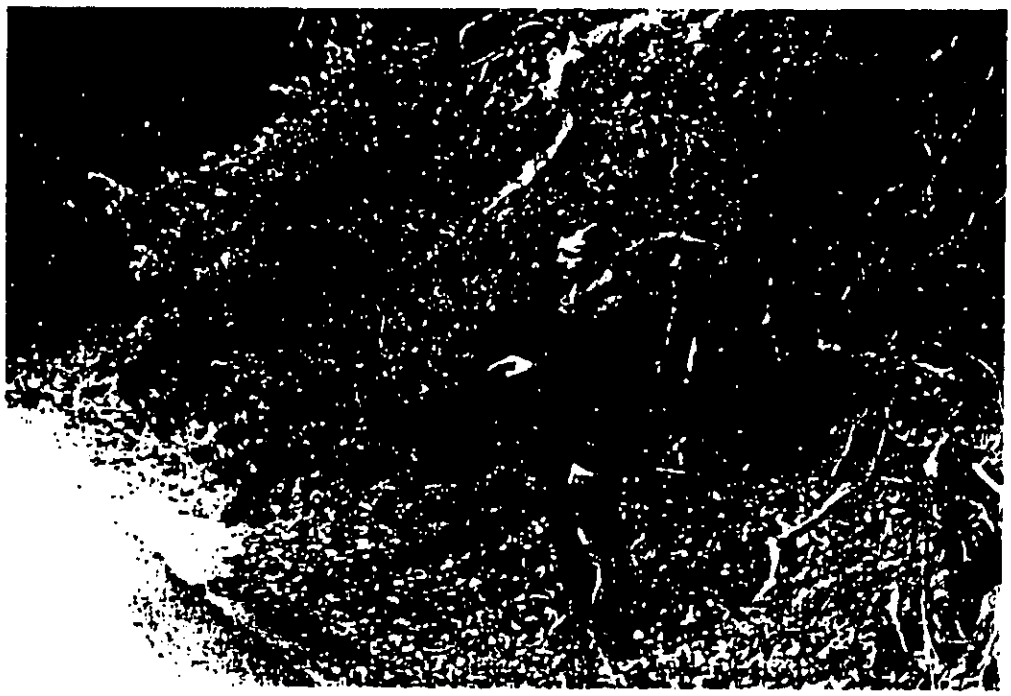


Photo 5. This manzanita is reaching for light beneath the Monterey pines along Skyline Boulevard near Roberts Recreation Area. Over-zealous road maintenance crews spray any greenery close to the road.

A subtle, perhaps significant, impact of human development upon the Alameda manzanita population is the introduction into local landscapes of "exotic" manzanitas. A. densiflora is planted in several landscapes on Manzanita Drive including the East Bay Municipal Utility District water tank landscape. These plants flower in December, the same month the Alameda manzanita begins flowering. Two A. Uva-ursi cultivars and two A. hookeri cultivars are planted in other landscapes (see Photo 6). The possibility of genetic introgression into the A. pallida population is great, assuming that the ease of hybridization of other members of the A. andersonii complex applies to the Alameda manzanita (Roof 1967.)

Conservation Efforts

Up to the present time there have been no conservation management activities or programs to improve the Alameda manzanita habitat. Based upon the findings of this survey it is concluded that the management and recovery of the Alameda manzanita should encourage the establishment of new plants and the enhancement of the health of the older plants. This must involve baring new sites on shale or sandstone, scarifying seed, consuming or removing allelopathic litter, planting new plants, and cutting and managing the overstory. In addition, more information is needed on the nature of the root fungus that most recently decimated the Huckleberry Ridge and Oakland Hills manzanita populations.

Phote 6. An A. Uva-ursi cultivar is planted next to healthy Alameda manzanita along Manzanita Drive.

Much can be learned from a prescribed fire in the Alameda manzanita habitat. The Sobrante Ridge population is a relatively safe area for a prescribed fire. The Huckleberry Ridge population is problematic in terms of fire management. Residential housing at the top of the steep slopes with a high fuel load seriously limits fire management abilities. Alternative methods that mimic the effects of fire need to be developed on Huckleberry Ridge. The homeowners need to be made aware that their homes exist in a high fire hazard area that will suffer serious damage if (when) a catastrophic fire occurs (see Photo 7). A fuel management plan must be designed that will reduce the fire hazard yet leave room for the growth and establishment of the Alameda manzanita.

One of the greatest threats to the Alameda manzanita is competition and shading from planted native and exotic trees. Exotic shrubs and groundcovers are also making significant inroads into the habitat. Eucalyptus, Monterey pines and cypresses, colonies of French broom, German ivy and English ivy all must be removed or appropriately pruned.

Within and near the Alameda manzanita habitat are several areas on shale and sandstone that offer good sites for the establishment of new plants and satellite populations. These sites include road cuts along Skyline Boulevard, areas where exotic competition can be removed, and new sites on adjacent parks and public agency lands.

Photo 7. This home on Huckleberry Ridge surrounded by senescent chaparral illustrates the extreme fire hazard.

The probability of genetic introgression needs to be carefully considered. Wells (1969) pointed out that each generation of the non-sprouter manzanitas is attended by rigorous selection and the intensity of natural selection is greater with the non-sprouting, obligate-seeding strategy in chaparral vegetation. Coupled with a high possibility of genetic introgression via bee pollination from the local exotic manzanitas, regeneration after a fire or disturbance may result in the beginning of a manzanita hybrid swarm that will herald the end of the purity of the A. pallida populations. The planting of exotic manzanitas on Manzanita Drive by the property owners was most likely done in the spirit of appropriate drought tolerant natives for the home landscape. An education program should be implemented that encourages property owners to replace their exotic manzanitas with the Alameda manzanita or appropriate non-invasive exotic groundcovers.

MANAGEMENT PLAN

Mission

The prime mission of the management plan is to determine and implement management activities which will improve the biological condition of declining Alameda Manzanita populations and help in ultimate recovery of the species. An Alameda Manzanita Advisory Committee was formed to oversee and review the developing management plan. The Advisory Committee consisted of local experts who have intimate knowledge of the Alameda Manzanita's ecology and history. The members were, Neil Havlik, resource manager of the East Bay Regional Park District (chairman), Steven Edwards, Director of the Regional Parks Botanic Garden, Walter Knight, manzanita expert and native plant taxonomist, Bob Martin, U.C. Berkeley Fire Ecologist, Marian Reeve, California Native Plant Society representative, and David Amme, open space management specialist and management plan coordinator. Several meetings were held the spring and summer of 1986. Six primary goals were developed by the Advisory Committee: 1) to control exotic and native plant competition, 2) to protect the gene pool, 3) to investigate the ecology and required habitat, 4) to establish new populations, 5) to develop a stewardship cooperation program with private and agency input, and 6) to compile an education pamphlet.

Outline

1.0 Competition: To remove or appropriately prune all exotic and selected native trees and shrubs that pose direct shading and competition dangers to the existing Alameda manzanita populations.

- 1.1 Assessment Objectives.
  - 1.11 Inventory
  - 1.12 Determine ownership boundaries
  - 1.13 Estimate removal costs
  - 1.14 Develop long-range plan for complete control
- 1.2 Protection Objectives.
  - 1.21 Public education and outreach
  - 1.22 Guidelines for restoration practices
  - 1.23 Land acquisition needs
- 1.3 Manipulation Objective.
  - 1.31 Removal of Competition
  - 1.32 Seeding and planting the Alameda manzanita (reintroduction)

2.0 Gene Pool: To protect the Alameda manzanita gene pool from genetic introgression through introduced exotic manzanitas.

- 2.1 Assessment Objective.
  - 2.11 Inventory
- 2.2 Protection Objective.
  - 2.21 Public education.

3.0 Ecology: To investigate the ecology and required habitat of the Alameda manzanita to aid in development of a management plan.

- 3.1 Assessment Objectives.
  - 3.11 Scarification/disturbance experiments
  - 3.12 Seed germination investigations
  - 3.13 Prescribed fire needs
    - 3.131 Sobrante Ridge

3.132 Edge of Huckleberry Preserve
3.133 Inside Huckleberry Preserve
3.14 Research opportunities

3.2 Manipulation Objectives.
3.21 Seed testing
3.22 Seeding with ground disturbance
3.23 Prescribed fire implementation

4.0 New Manzanita Establishment: To establish new satellite populations as well as new plants within existing populations by direct seeding and container planting.

4.1 Assessment Objectives.
4.11 Inventory
4.12 Propagation of plant material

4.2 Manipulation Objectives.
4.21 Seeding implementation
4.22 Planting implementation

5.0 Stewardship Cooperation: To involve the private homeowners and public land holding agencies in the development and implementation of a management plan that will both protect the homes and the manzanita habitat.

5.1 Assessment Objective.
5.11 Identify and contact homeowners and agencies

5.2 Protection Objective.
5.21 Fuel management plan

6.0 Outreach: To compile an educational pamphlet.

6.1 Protection Objective.
6.11 Educational Pamphlet

Narrative

1.0 Competition: To remove or appropriately prune all exotic and selected native trees and shrubs that pose direct shading and competition dangers to the Alameda manzanita.

1.1 Assessment Objectives.

Competition from exotic plants and introduced native plants exists on Huckleberry Ridge and the satellite populations along Skyline Boulevard and the surrounding hills. Plantations of eucalyptus and Monterey pine were extensively planted where the homeowners built their homes. Many of the eucalyptus were removed after the 1972 freeze, however, many were allowed to reestablish from seedlings and resprouts. Several homeowners have planted Monterey pines near their homes within the main Huckleberry Ridge Alameda manzanita population.

1.11 Inventory.

A detailed inventory of the exotic species, their sizes and numbers will be conducted. The main exotic plant competitive threat to the Alameda manzanita comes from the planted and resprouted eucalyptus trees along the edge of, and within Huckleberry Preserve. Planted and naturally established Monterey pines and cypresses pose the greatest threat along the Skyline Boulevard populations. French broom is a potential threat to the Alameda manzanita population if it is allowed to spread. Large thickets of French broom have established at the Huckleberry parking lot, along Villanova Drive, along Manzanita Drive, surrounding several homes on the ridge and at the south end of Huckleberry trail.

1.12 Determine ownership boundaries.

The actual boundaries between agency and private property are difficult to identify along Huckleberry Ridge. These boundaries will be identified before removal of trees can take place. Ownership of possible target trees or groves will be determined. These individuals will be contacted and advised of the Alameda manzanita habitat problem (See Stewardship Cooperation and Outreach below).

1.13 Estimate removal costs.

Some plants and small groves will be treated under this recovery contract (experimental plots). Many plants can be removed and pruned by EBRPD personnel within their yearly maintenance budgets. The larger trees and groves require contractor cost estimates for removal and clean-up. These cost estimates will enable the District to seek specific funds or grants for the completion of this phase of the Recovery Program.

1.14 Develop long-range plan for complete control.

The consensus of the Advisory Committee was that all threatening plants (determined to be competitive to the Alameda manzanita) shall be removed or appropriately pruned. A time table will be developed where complete control of target plants and groves is outlined with projected completion dates.

1.2 Protection Objectives.

During the exotic plant assessment phase, initial contacts with the homeowners and local land holding agencies will be established. Guidelines

for cutting, clearing, clean-up, and erosion control will be established to protect the manzanita habitat from the adverse effects of exotic plant removal operations. Finally, key property acquisition will be identified where exotic plant clearing operations will help preserve the Alameda Manzanita habitat.

1.21 Public education and outreach.

The best way to reach the local homeowners is to extend invitations by mail and phone to an informational meeting. This will be done as early as possible. At the meeting, information as well as informational materials will be available identifying the problems of exotic plant competition and outlining possible solutions. It is important to ask the homeowners what their needs are and what they want. One possible outcome of such a meeting is the establishment of a local steering committee for exotic plant control.

1.22 Guidelines for restoration practices.

The cutting and clearing operations should be conducted carefully to protect the manzanita habitat. All wood and slash must be removed. The timing of the cutting and clearing operations will be coordinated with appropriate seeding and planting windows. In the case of the removal of French broom, care must be taken that the operation is completed before seed set and all the cut debris is removed from the area. A two to three year maintenance program will be established to ensure that exotic resprouting is controlled and new seedling establishment is prevented. A special effort must be made to control the invasion of French broom into treated areas.

1.23 Land acquisition needs.

There are three sites where land acquisition will help preserve the Alameda manzanita and will require the cooperation of private and public agencies. The first site is overlooking the west entrance of Huckleberry Preserve where a checker board of undeveloped private property exists with eucalyptus trees that suppress Alameda manzanita regeneration. The second area is above Skyline Boulevard just below the main population of Huckleberry Ridge. This site is one of the best examples of Alameda manzanita regeneration in oak woodland type. Competing native vegetation and eucalyptus need to be cut and removed at this site. The third site is the Exeter Chaparral just below Skyline Boulevard on Exeter Drive. This site is surrounded by private development. The land where the Alameda manzanita grows is a brushy chaparral with many invading Monterey pine saplings. This area displays several soil changes from sandstone to chert to shale with dramatic vegetation changes including oak woodland, chamise chaparral, manzanita chaparral, and huckleberry stands.

1.3 Manipulation objective.

The result of the exotic plant removal operations will present an opportunity to seed and plant the Alameda manzanita.

1.31 Removal of competition.

The removal and pruning of native and exotic competing vegetation should be accomplished early in the management program following the appropriate guidelines for restoration practices. The removal process will create opportunities for planting and seeding (reintroducing) new Alameda

manzanita populations. Whenever possible competing vegetation should be removed from other agency lands (PG&E, EBMUD, City of Oakland) and private properties as well as the Park District lands. The removal of exotic plant competition in the initial experimental program had a clear and positive effect with the local homeowners and park users.

1.32 Seeding and planting the Alameda manzanita (reintroduction).

It takes at least a year to produce plantable Alameda manzanita plants in containers. The collection of seed and cuttings will be accomplished as soon as possible. For some experiments seed can be collected by raking the duff beneath pure Alameda manzanita populations. Whenever possible this seed resource should be spread on treated areas. The collection of cuttings and growing of liners and gallon can stock will be coordinated with the New Manzanita Establishment goals.

2.0 Gene Pool: To protect the Alameda manzanita gene pool from genetic introgression from introduced exotic manzanitas.

2.1 Assessment Objectives:

The probability of genetic introgression needs to be carefully considered, especially if any physical management is considered. Manzanitas of the A. andersonii complex naturally hybridize with other manzanitas along the California coast. A. uva-ursi hybridizes freely with A. imbricata on San Bruno Mountain. A. hookeri hybridizes with A. pajoroensis in Monterey County. An A. glauca X A. pallida hybrid has been found on Sobrante Ridge and several hybrids with A. crustacea were found during the survey. Hybridization is enhanced when the individual manzanitas flower at the same time.

2.11 Inventory.

Cultivated manzanitas near the Alameda manzanita populations will be inventoried. The cultivated manzanita species needs to be identified with their flowering dates at those locations.

2.2 Protection Objective.

Public education is the most important strategy for protecting the Alameda manzanita from genetic introgression.

2.21 Public education.

During the inventory an attempt should be made to contact the individual homeowners with exotic manzanitas informing them of the problem and potential solutions. An effective way to educate the homeowners is to make this issue part of the education pamphlet (See Outreach Goals). Many of the homeowners planted the cultivated manzanitas in the spirit of native plant landscaping. For example, the drought tolerant landscape around the EBMUD water tank on Manzanita Drive is composed mainly of Arctostaphylos densiflora. The cooperation of an agency like EBMUD in replacing the cultivated manzanitas with compatible substitute plants will add impetus to this program. A comprehensive list of substitute plants with their cultural requirements will be compiled for homeowner use (See Pamphlet). Invasive exotic plants such as French broom and ivy need to be avoided because of their threat to the Alameda manzanita habitat.

3. Ecology: To investigate the ecology and required habitat of the Alameda manzanita to aid in development of a management plan.

3.1 Assessment Objectives.

A limited program to determine the effectiveness and appropriateness of management activities is provided in the scope of this plan including competition removal and scarification/disturbance activities. Seed germination investigations and prescribed fire will also be conducted. In addition, there are important research opportunities that need investigation including the root fungus, insect problems, animal predation, disease hosts, and monitoring.

3.11 Scarification/disturbance experiments.

The Alameda manzanita regenerates from seed in areas of bare mineral soil resulting from home construction, cut slope activities, or fuel break maintenance activities. In addition, manzanita seed germinates after fire scarification which consumes competing vegetation and allelopathic litter. Sites need to be identified where a) removing surface live and dead material to bare mineral soil is possible, b) pile burning of debris or spot surface burning is possible, and c) seeding with Alameda manzanita seed that has been mechanically or chemically scarified is possible.

3.12 Seed germination investigations.

Seed germination tests have not been performed on either the Alameda manzanita or the burl-forming A. crustacea. Determining the conditions for seed germination are important especially if seeding or planting practices are to be employed.

3.13 Prescribed fire.

Introducing fire into a portion of the Alameda Manzanita habitat is extremely important for the regeneration of the habitat, especially for a fire evolved species like manzanita. Criteria and locations for such a prescribed burn have been discussed by the Advisory Committee. Criteria include: 1.) The site must have environmental characteristics similar to the main populations. 2.) The burn should exist primarily on EBRPD property or with the complete cooperation of adjacent property owners. 3.) The burn should be a safe distance from development. 4.) The site of the burn needs to be accessible for fire equipment and personnel. 5.) The site should not be too large a portion of the population: one or two acres was thought to be sufficient for the first burn. Three potential sites were identified which met these qualifications. In order of preference they are:

3.131 Sobrante Ridge.

By far the most ideal location for a prescribed burn, this location best fits the above criteria. It is located entirely on EBRPD property, it is distant from housing and private property, and it is accessible to fire equipment and personnel.

3.132 Edge of Huckleberry Preserve.

This site is on the edge of Huckleberry Preserve bordering and including land belonging to the tennis club. This site will require the cooperation of a private landowner. The site is remote from development and is accessible to fire equipment and personnel. This site is a

representative stand of the Alameda manzanita on Huckleberry Ridge and would provide meaningful regeneration information.

3.133 Inside Huckleberry Preserve.

This site is within Huckleberry Preserve at either one of the lower elevation manzanita stands identified as A. crustacea barrens (See Map). These two possible sites fulfill most of the criteria. They are not primarily Alameda manzanita sites as they are dominated by the burl-forming A. crustacea. Only a few Alameda manzanitas naturally exist near these sites. These sites are also surrounded by steep terrain and high forest fuel loads making fire containment more difficult.

3.14 Research opportunities.

The most important research opportunity concerning the ecology of the Alameda manzanita is the identification and life history of the root fungus that most recently decimated the Alameda manzanita populations on Huckleberry Ridge and along Skyline Boulevard. The information gathered in the survey was inconclusive mainly because the disease had apparently gone into remission. A plant pathologist is needed to continue this investigation. In addition, insect problems, animal predation, disease hosts, and monitoring experiments will be conducted and coordinated with the protection and manipulation objectives.

3.2 Manipulation Objectives.

Based upon the preceding assessments the following experiments will be implemented: 1.) Seed testing. 2.) Seeding with ground disturbance. 3.) A prescribed burn.

3.21 Seed testing.

The purpose of the seed testing is to determine the conditions which ensure seed dormancy breaking and seedling establishment. Several investigators have suggested that old seed in the surface soil seed bank be collected for germination trials. The seed of both species of manzanitas will be collected from the branches and from the duff. Germination of the seed may take more than one year. Collecting and testing of the seed should be a three or more year program. It was the consensus of the Advisory Committee that the seed collection and testing activities should not preclude the immediate implementation of the seeding and prescribed burn experiments.

3.22 Seeding with ground disturbance.

The purpose of seeding with ground disturbance is to simulate as closely as possible the physical effects of fire. This is especially important on Huckleberry Ridge where a safe effective prescribed fire is impossible without endangering lives and property. Experiments testing seed germination of scarified seed with ground disturbance will be implemented at the two main Alameda manzanita populations. Scarification of the seed consists of seed abrasion with sand paper, sulfuric acid treatment, or dry and moist heat treatments. Ground disturbance consists of disturbing the ground by removing all debris and allelopathic litter. An important part of this objective is the monitoring of seedling establishment and mortality for two or three years after the seeding and disturbance. These experiments can be coordinated with the clearing of

exotic and native plant competition and the establishment of fuel and fire breaks.

3.23 Prescribed fire implementation.

The main purpose of a prescribed fire will be to generate new seedlings by consuming competing vegetation and litter and scarifying the seed in the soil seed bank. A fire prescription will be written that outlines the area to be burned and the burning conditions. Given the sites and available burning days it was the consensus of the Advisory Committee to recommend a fall burn preferably in October. The prescribed fire could be permitted under the Bay Area Air Quality Management District's hazard reduction criteria or forest management criteria. The Advisory Committee recommends a prescribed fire for Sobrante Ridge as soon as possible in the fall of 1986 or late spring of 1987.

4.0 New Manzanita Establishment: To establish new satellite populations as well as new plants within existing populations by direct seeding and container planting.

4.1 Assessment Objectives.

Alameda manzanita populations presently exis : in two new sites that were not naturally established. Planted Alameda manzanita plants exist in the vicinity of the Botanic Garden in Tilden Park along Shasta Road and Golf Course Drive. These mature, healthy specimens were planted by James Roof (former Regional Parks Botanic Garden director). Another site called Manzanita Flat has several A. pallida and A. crustacea plants that spontaneously germinated and established from shale transported from Huckleberry Ridge. Other sites exist with similar soils and exposures where the Alameda manzanita presumably would grow. In addition, there exists many sites within existing populations where the Alameda manzanita could be established.

4.11 Inventory.

Potential sites (with similar soil and site characteristics) exist on private and public lands including EBRPD, EBMUD, PG&E, and in Oakland and El Sobrante. These areas need to be investigated and prioritized. Some sites will be appropriate for a small number of plants while other sites will suit larger populations. In this regard, the two main satellite populations, Exeter Road chaparral, and Roberts Recreation/Skyline Boulevard sites, could be expanded. Along Skyline Boulevard there exist several sites appropriate for the establishment of new populations on shale or sandstone in Sibley Regional Park. One of these areas, called "Sibley Island", has been recently cleared of eucalyptus and pine. In addition, the planting of Alameda manzanita plants within Huckleberry Preserve on the shale can be successful after the exotic eucalyptus are removed.

4.12 Propagation of plant material.

It takes at least a year to produce plantable manzanitas from seed or cutting. Therefore, the number of plants needed and their specifications must be determined soon. A budget for the collecting, growing and storing of the plants will be estimated.

4.2 Manipulation Objectives.

Establishing new manzanita populations without irrigation will take careful planning and coordination for both the seeding and container planting implementation. The seedlings will need deer and rodent protection for at least two years.

4.21 Seeding implementation.

Seeding is best coordinated with the other enhancement activities like clearing and burning. Separate areas may be identified for seeding trials. Where no fire scarification is possible, the seeds need to be pretreated before planting (See 3.22). The seed should be buried just beneath the soil surface to prevent desiccation. (Detailed direct seeding specifications are described in "Direct Seeding Woody Plants in the Landscape" by Harris and Leiser, 1979, U.C. Div. of Ag. Sci. Leaflet 2577.)

4.22 Planting implementation.

Healthy, hardened-off liner (2" or Leach tubes) or gallon can plants must be planted in the fall after the soil is deeply moist, usually after the first couple of 1" rains. In the event of a dry winter after planting, deep irrigation via tank truck as required should ensure establishment.

5.0 Stewardship Cooperation: To involve the private homeowners and public land holding agencies in the development and implementation of a management plan that will both protect the homes and the manzanita habitat.

5.1 Assessment Objective.

The City of Oakland has designated the Huckleberry Preserve and neighborhood a Hazard E Zone, the most dangerous classification possible Public Resource Code 4291 (Fire Hazard Reduction) requires 30 feet clearing and another 70 feet of fuel reduction around homes. If this law was enforced, a 30-100 foot fuel break would need to be constructed below the homes along Manzanita Drive. This would have a significant impact on the Alameda manzanita populations on Huckleberry Ridge. Over half of the largest manzanita stands are on this private property. Some of the private lots on Huckleberry Ridge are in Contra Costa County just below the ridge top adjacent to the county line. The EBPRD has protective easement rights on this property covering grading activities and disposal of water.

5.11 Identify and contact homeowners and agencies.

The area around Huckleberry Preserve is on the border of four fire protection districts: the City of Oakland, Contra Costa Consolidated, California Department of Forestry, and the EBRPD. These agencies and others (PG&E, EBMUD, Alameda Co. etc.) need to be contacted to determine their management policies and constraints. Meetings with private homeowners and landowners should be arranged to evaluate their needs in regard to fuel reduction and home protection.

5.2 Protection Objectives.

In order to protect the homes and the Alameda manzanita habitat on Huckleberry Ridge a coordinated program with the private homeowners and public agency land owners will be developed.

5.21 Fuel management plan.

The information gathered during the assessment phase will provide the basis for a comprehensive fuel management plan for Huckleberry Ridge. The ultimate goal of the fuel management plan will be to merge the protection of the Alameda manzanita with home protection activities. It has already been noted that soil disturbance offers the opportunity of Alameda manzanita seedling establishment. The fuel management plan will establish guidelines and recommendations to address the following problems: 1.) Weed invasion such as French broom, 2.) Hydrological changes down slope requiring engineering solutions, 3.) Homeowner irrigation practices, 4.) Planting of exotic or native fire resistant plants, 5.) Pruning practices, 6.) Yearly evaluation and maintenance practices.

6.0 Outreach: To compile an educational pamphlet.

6.1 Protection Objective:

The neighboring landowners on Huckleberry Ridge and near Sobrante Ridge will be the main participants in the stewardship cooperation program. Their help and cooperation will be vital to the Alameda manzanita Recovery Program.

6.11 Educational Pamphlet.

The original purpose of the pamphlet was to educate the neighboring landowners on Huckleberry Ridge about the Alameda manzanita and how it can be used and cared for in home landscaping. The Advisory Committee developed additional ideas that should be included in the pamphlet. Homeowner cooperation should be solicited in changing their exotic manzanita landscapes to protect the Alameda manzanita gene pool. In many instances the Alameda manzanita could be substituted. A list of compatible, non-invasive plants will be included in the pamphlet. Factual information concerning fire hazard reduction around homes with landscape alternatives will also be included in the pamphlet. Finally, information on controlling weedy exotics with special emphasis on French broom will be included in the pamphlet. It was the consensus of the Advisory Committee that the pamphlet be produced early in the planning process. The distribution of the pamphlet will be the first step in enacting the Alameda Recovery Plan (Appendix B).

PRELIMINARY IMPLEMENTATION SCHEDULE

Goal	Objective	Priority	Time Period	Responsible Party	Estimated Cost
I.	1. Inventory of exotic endangering plants	1	2 weeks	Contractor	$ 1,700
I.	2. Estimate removal costs	1	1 week	Contractor	1,000
I.	3. Develop long-range plan for exotic plant control	1	1 month	Contractor	3,000
I.	4. Public outreach--exotic plant control	2	1 month	Contractor/ EBRPD Staff	3,000
I.	5. Land acquisition of "outlier" stands	1	1-2 years	EBRPD	150,000
I.	6. Exotic and native plant competition removal	1	1-2 years	Contractor	100,000
I.	7. Seeding and planting treated areas	2	1-2 years	Contractor	8,000
II.	1. Inventory of exotic manzanitas	2	1 week	Contractor	1,000
II.	2. Public outreach--exotic manzanitas	2	2 weeks	Contractor	1,500
III.	1. Scarification and disturbance experiments	2	1 year	University Contractor	6,000
III.	2. Seed germination investigations	3	1 year	University Contractor	6,000
III.	3. Prescribed fire	2	1 week	EBRPD/ Contractor	1,700
III.	4. Investigate pathology and disease problems/monitor	1	1 year	University Contractor	6,000
III.	5. Seed testing	2	2-3 years	University Contractor	6,000
III.	6. Seeding with ground disturbance	2	1-3 years	University	8,000
IV.	1. Inventory of planting sites	2	2 weeks	Contractor	1,700
IV.	2. Propagation of plant material	3	1-2 years	Contractor	8,000

Goal	Objective	Priority	Time Period	Responsible Party	Estimated Cost
IV.	3. Seeding implementation	3	1-2 years	Contractor	$ 3,000
IV.	4. Planting implementation	3	1-2 years	Contractor	4,000
IV.	5. Monitoring seeding and planting areas	3	1-2 years	Contractor	1,000
V.	1. Homeowner and agency contacts	1	2 months	EBRPD Staff/ Contractor	6,000
V.	2. Fuel management plan	1	6-8 months	Contractor	18,000
V.	3. Fuelbreak program	1	1-2 years	Contractor	200,000
VI.	1. Educational pamphlet	2	1 week	Contractor	1,500
VI.	2. Ongoing education	3	1-3 years	EBRPD Staff/ Contractor	9,000

PRELIMINARY IMPLEMENTATION SCHEDULE

I.	Fuelbreak - Stewardship Cooperation	
	Priority 1; 1-2 years - District/Contractor	$230,000
II.	Removal of Competing Vegetation	
	Priority 2; 1-2 years - Contractor	$100,000
III.	Complete Acquisition of "Outlier" Stands	
	Priority 2; 1-2 years - District	$150,000
IV.	Continue Research	
	Priority 2; 1-2 years - U.C.	$ 40,000
V.	New Manzanita Establishment (grow, plant monitor)	
	Priority 3; 1-2 years - U.C./Contractor	$ 25,000
VI.	Ongoing Education	
	Priority 3; 2-3 years - Staff/Contractor	$ 15,000
		$560,000

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APPENDIX A

Experimental Programs Report

Introduction

Part of the Alameda Manzanita Management Program included testing appropriate management activities to enhance the manzanita environment and survival potential. The experimental techniques tested were hand work directed at improving the germination and establishment environment and removing shade competition posed by native and exotic trees and shrubs. The criteria for the treatment areas was that they had to be critical for manzanita survival, small enough for the limited budget yet large enough to make a significant environmental impact on the habitat.

Unfortunately it was not possible to conduct a prescribed fire in the Alameda manzanita habitat during this part of the program. A fall prescribed burn is planned in 1987 for a small portion of Sobrante Ridge.

Methods

The following experiments were conducted:

1. Removal of competing native oaks, bays and madrones at Sobrante Ridge. The main goal of this experiment was to allow more sunlight for the Alameda manzanita which was being overgrown and shaded. A secondary goal was to observe the sprouting rate of the competing vegetation and note the impact of deer browse. The trees and shurbs were cut at the base and hauled away to a location where the debris could be removed by vehicle to a final disposal site. The treatment area was approximately 5000 square feet.

2. Removal of acacia from site within Huckleberry Preserve. This was the only acacia infestation within Huckleberry Preserve. The site was chosen because dead Alameda manzanitas were found adjacent to the acacia and the acacia posing a threat to the surrounding manzanita habitat. The trees were cut at the base and the slash was hidden in a ravine below the site among the bay and oak trees. The ground was raked and left bare. The treatment area was approximately 1000 square feet.

3. Removal of eucalyptus tree slash and French broom along Villanova Drive, Huckleberry Preserve. This site was chosen because it defined an excellent potential manzanita regeneration area and it was in a high profile area where the local homeowners would see the results and be acquainted with the beginning of the Alameda Manzanita Management Program. The debris was removed in two large dumpsters. The treatment area was approximately 10,000 square feet.

4. Removal of dead manzanita debris and leaf litter with the seeding of untreated manzanita seed along Huckleberry Trail. This area was an eyesore along the trail where several Alameda manzanitas had died after being knocked down by heavy winds and snow in the early 1970's. The debris was removed and packed into a deep ravine under large bay trees below the chaparral environment. The leaf litter was removed to reduce any allelopathic effects on seed germination. The area was seeded with an

ounce of manzanita seed (1985 crop) which was raked into the surface soil layer. The treated area was approximately 1500 square feet.

5. Removal of eucalyptus and Monterey pine trees overtopping the Alameda manzanita near Roberts Recreation Area. The manzanitas were being greatly suppressed by the heavy shade. This site was one of the few outlying manzanita populations along Skyline Boulevard. Approximately fifteen 20 to 30 foot ecualyptus and Monterey Pine trees were cut down. The debris was packed along a fire road below the site where it could be later removed and burned. The treated area was approximately 3000 square feet.

6. Seed germination trials. Initial seed germination tests for the Alameda manzanita were conducted by Dr. Robert Martin at U. C. Berkeley. Various scarification treatments were tested including dry and moist heat. Stratification treatments were not tested.

Results

Generally it takes at least two complete growing seasons to evaluate the effects of these kinds of management experiments. The eucalyptus and acacia sprouts need to be treated; new manzanita seedlings may take more than one year to appear; and the native oak and bay sprouts may exhibit different growth rates and browsing effects at different seasons of the year. The following are the initial results of the experimental plots, techniques, and trials.

1. Sobrante Ridge competition removal. The amount of light to the manzanitas increased greatly and several manzanitas exhibited vigorous growth. The bay sprouts were heavily browsed. The oak sprouts showed some browsing but several sprouts were two to three feet high. No new manzanita seedlings were found.

2. Acacia removal. No new acacia or manzanita seedlings were sighted after five months during the winter and spring rainy season. This site is a potential seeding site in the future.

3. Villanova Drive debris and broom removal. The results of this project were dramatic. In addition to exposing the Alameda manzanita to increased sunlight, a bright panoramic view of Roundtop Mountain was exposed. The project was initially received well by the neighbors and was thus expanded with EBRPD funds. An information sign is planned by the District at this site that will explain the Alameda Manzanita Management Program.

4. Huckleberry Trail debris removal. No manzanita seedlings have emerged during the winter and spring of 1987. Some seedlings of native herbs and perennial grasses have appeared on the barren areas. It is too early to evaluate this site but it will be monitored closely by EBRPD personnel in the next few years.

5. Eucalyptus and Monterey pine overstory removal. The Alameda manzanitas are exhibiting fresh and vigorous spring growth at this site. The cut debris needs to be removed to expose fresh germination sites. Several small redwood trees also have been designated for future removal.

The taller eucalyptus in this area are also slated for removal to complete this project.

6. Seed germination. Very few seeds germinated under the various scarification treatments tested. Further tests are needed. Manzanita seeds are difficult to germinate in the lab and sometimes take two years to sprout after initial treatments. Today there are few coordinated or systematic programs researching this important subject. It is the feeling of Dr. Martin that a group meeting of interested and experienced investigators be arranged to outline criteria and avenues of research that can be applied to the Alameda manzanita germination problem.

Private property sites

Two important Alameda manzanita populations on private property have been closely monitored during this phase of the management plan. These are the Exeter chaparral and the Skyline Boulevard site below Huckleberry Ridge (see Map 1). No building has taken place at either site, however, the Exeter chaparral site appears to be the most likely building site in the future due to the gentle terrain. Recent clandestine eucalyptus cutting has taken place at the Skyline Boulevard site. Fallen trees and debris have killed two large Alameda manzanita plants. While the resulting sunlight may be favorable to the manzanita habitat it is questionable whether or not the eucalyptus cutters will return and kill the sprouts or clean up the debris. Both of these sites are high priority sites for purchase by the EBRPD.

Conclusion

With a relatively small amount of funds for experiments ($2500) and monitoring ($1000) approximately 20,000 square feet of critical manzanita habitat was treated. The initial results and public response to the experimental program was positive. Future efforts of this kind in the Alameda manzanita habitat are necessary on an on-going annual basis.

The greatest problem faced with the clearing and habitat enhancement is disposing of the debris. One possible solution is the piling and burning of the debris within and on the edge of the Manzanita habitat followed by seeding and planting the Alameda manzanita on these sites. This can be done in a rotation/mosaic fashion throughout the habitat reducing the fuel load and opening up new sites for Alameda manzanita regeneration.

APPENDIX B

Pamphlet Text

Title: THE ALAMEDA MANZANITA AND YOU

PRESERVE THE ALAMEDA MANZANITA . . . PROTECT YOUR HOME

The Alameda manzanita, one of California's most beautiful flowering shrubs, is officially designated by the State of California as an endangered plant. The homes along Manzanita Drive adjacent to Huckleberry Preserve were built in the center of the largest remaining population of this rare manzanita. Over the years much of the manzanita habitat has been replaced by exotic ornamental trees, shrubs and groundcovers. An aggressive fire suppression policy during this time has resulted in the excessive growth of competing trees and shrubs shading and suppressing the Alameda manzanita habitat. This has led to heavy fuel loads and a high fire hazard surrounding the homes. THE MANZANITA HABITAT IS FIRE ADAPTED. The City of Oakland has designated Huckleberry Preserve and the neighborhood as a Hazard E Zone, the most dangerous classification possible. The fire that would renew the manzanita habitat could destroy your homes!

WHAT IS BEING DONE?

The East Bay Regional Park District in coordination with the California Department of Fish and Game is now developing an Alameda Manzanita Management Plan. It is the purpose of this plan to improve the Alameda manzanita habitat and safeguard the surrounding homes. Huckleberry Ridge includes land owned by East Bay Municipal District, Pacific Gas and Electric and the Park District. In addition, the Park District has protective easement rights covering grading activities and water disposal on certain private properties on the ridge top adjacent to the Preserve. These agencies will soon be reviewing their management policies regarding the manzanita habitat situation. An important objective of the Alameda Manzanita Management Plan is a cooperative program that will seek the input and cooperation of private homeowners together with public agencies to coordinate fuel management and fire access.

WHAT CAN YOU DO . . .

To protect your home?

The California State Resource Code 4291 (Fire Hazard Reduction) requires clearing up to 100 feet around homes for protection against wildfires in the chaparral-urban interface. The key factors for fire protection are fuel reduction and breaking the fuel continuity. This can be done in non-destructive ways such as pruning and removing trees and shrubs or landscaping with low-growing groundcovers. Removal of deep-rooted chaparral species can reduce slop stability and contribute to erosion and slides, therefore, building retaining walls and drains may be necessary to augment the landscape plantings.

To protect the manzanita?

The Alameda manzanita can be incorporated in a non-irrigated, or occasionally irrigated, fire-protective landscape. It is important to widely space the plants and keep them away from the home. Perhaps more important than planting an occasional Alameda manzanita is not planting weedy exotic plants that contribute to the decline of the manzanita habitat. For example, the invasive French broom should be avoided. English ivy, periwinkle and cotoneaster are also common landscape groundcovers and shrubs that have been found competing for natural habitat with the Alameda manzanita. Caution must be exercised even when planting California native plants near Huckleberry Preserve. There are many species of manzanitas in California which are sold in the nursery trade. With the help of bees and other pollinating insects, the manzanitas are shameless hybridizers. The obvious choice of planting ornamental manzanitas on Manzanita Drive can cause cross pollination and hybridization and may produce genetic introgression in the Alameda manzanita. DON'T PLANT OTHER MANZANITAS.

In summary, the key to the program of integrating protection of both the Alameda manzanita and your homes is to clear strategically and landscape judiciously, incorporating, wherever possible, the rare Alameda manzanita into your plantings.

LANDSCAPING YOUR GARDEN

The following annotated list of native and non-native plants will give the homeowner and gardener on Huckleberry Ridge a good selection of drought-tolerant and non-invasive groundcovers and shrubs that are compatible with manzanita habitat and home protection.

PROSTRATE COYOTE BUSH (Baccharis pilularis) - This is a native light green prostrate shrub that spreads to five feet. It mixes well with other plants.

POINT REYES CEANOTHUS (Ceanothus gloriosus) - This native prostrate spreading shrub has dark green leaves and light purple lilac blossoms. This Ceanothus will not hybridize with the Jim Brush Ceanothus that is native to Huckleberry Preserve.

JUNIPERS (Juniperus species) - The prostrate varieties are best for fire protection. Junipers are low maintenance and drought tolerant, and come in a variety of green shades and leaf forms. Many cultivars hug the ground.

ROCKROSE (Cistus species) - These drought-tolerant Mediterranean shrubs and groundcovers have many showy varieties and forms.

SANTOLINA (Santolina virens and S. chamaecyparis) - Both the green and grey varieties of Santolina have yellow flowers and are drought tolerant.

BUCKWHEATS (Eriogonum species) - These native woody sub-shrubs with late summer blossoms have several low forms like Saffron or Red Buckwheat.

SONOMA SAGE (Salvia sonomensis) - This native prostrate groundcover is extremely drought tolerant and will thrive on the poor soil areas on Huckleberry Ridge.

PROSTRATE ROSEMARY (Rosmarinus officinalis var. prostratus) - This hardy Mediterranean groundcover has dark green needle foilage and showy blue flowers.

PROSTRATE MYOPORUM (Myoporum parvifolium) - This low Australian groundcover has small bright green leaves that densely cover the plant. The low branches root where they touch the ground. It has white flowers and purple berries.

ICE PLANTS (Delosperma and Drosanthemum species) - Avoid the freeway ice plant (Carpobrotus) if you want a mix of plants and textures. The small leaved ice plants are excellent for steep rocky soils and have showy pink and white flowers.

PLANTING AND MAINTAINING THE ALAMEDA MANZANITA

In the next few years the Park District and local private nurseries will be offering the Alameda manzanita in the hope that the Huckleberry Ridge homeowners and East Bay residents-at-large will plant them in their low maintenance landscapes. The Alameda manzanita is best planted from a gallon can container in the fall as the rainy season begins. Plant the Alameda manzanita in sunny locations in well drained soil. Deep watering the plant at first is important. Watering the young plants in case of drought may also be necessary. After the second rainy season has ended, the Alameda manzanita will normally not require any more irrigation. It will develop into a medium to large sized shrub with an even circular shape. The Alameda manzanita bears beautiful panicles of white and pink flowers in the late winter months.

YOUR HELP IS NEEDED

Your cooperation and assistance is necessary to preserve one of California's rarest plants. The East Bay Regional Park District staff is available to help. For more information call 531-9300.

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