



CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

CROSSOSOMA Vol. 16, No. 1
Managing Editor: Allan Schoenherr

February 1990

THE POLLINATION BIOLOGY OF
ANEMOPSIS CALIFORNICA HOOKER (SAURURACEAE):
Research in Progress

by

Julie A. Holtzman

Department of Biological Sciences
California State University, Fullerton
Fullerton, California 92634

ABSTRACT

Baseline data from pollination studies of two populations of Anemopsis californica (Saururaceae) indicate that this species is a generalist that is visited by a wide variety of insects acting as potential or actual pollinators. The most abundant and efficient pollinators appear to be vespid wasps (Vespidae) and a number of solitary native bee species, notably the Halictidae. Certain flies such as the Syrphidae may act as effective pollinators but the majority of fly species observed play only a minor role in pollinating these plants. Visitations by honey bees (Apis mellifera) and bumblebees (Bombus spp.) were infrequent or rare. Other insects that may play an occasional or peripheral role in pollination include ichneumonid wasps (Ichneumonidae), various beetles (O. Coleoptera), bugs (O. Hemiptera), orthopterans, (O. Orthoptera), and rarely butterflies and moths (O. Lepidoptera). Despite its generalist nature, A. californica cannot be considered to be a particularly primitive plant, due to the specialized nature of its inflorescences.

7

INTRODUCTION

In recent years, there has been a resurgence of interest in the reproductive biology of primitive angiosperms. Gottsberger (1988), in a review paper on this subject, has emphasized the importance of pollination studies of extant primitive plants as key factors in our understanding of the origin and evolution of the angiosperms. The classic view of primitive pollination syndromes, as shared by many experts, is of a generalist type of plant, with open and unspecialized floral parts, being pollinated by a broad array of insects that also are unspecialized and random in their visitations to these plants. Pollination research on extant primitive families such as the Winteraceae tends to confirm this classic point of view (Gottsberger, 1988). It would be interesting to see if any of the more primitive plants to be found in California exhibit some or all aspects of this mode of pollination.

Unfortunately, southern California displays a paucity of truly primitive plants, especially plants that are relatively abundant and/or whose pollination biology has not already been studied. However, a local member of a relatively primitive plant family, the Lizard-tail Family, Saururaceae (O. Piperales) was discovered to have met both criteria. Anemopsis californica Hooker, known as the Yerba Mansa, is a perennial herb common in wet, especially subalkaline places below 1900m (6500 feet) (Munz, 1974). It is found in abundance in such environs throughout Southern California. A. californica is one of only five genera and seven species within the Saururaceae, a family which is believed to be closely allied with the pepper family, Piperaceae (Cronquist, 1981).

Anemopsis californica plants tend to occur in dense clusters of vegetative ramets connected by vast systems of rhizomes. The individual plants stand 1-5 dm. high. Each plant has several large, elliptic-oblong basal leaves as well as one to three smaller leaves arising above a clasping leaf at axils along the stem. Flowering of individual plants occurs from approximately March through September. Each plant bears what appears from a distance to be one or two large, solitary flowers but which are actually inflorescences

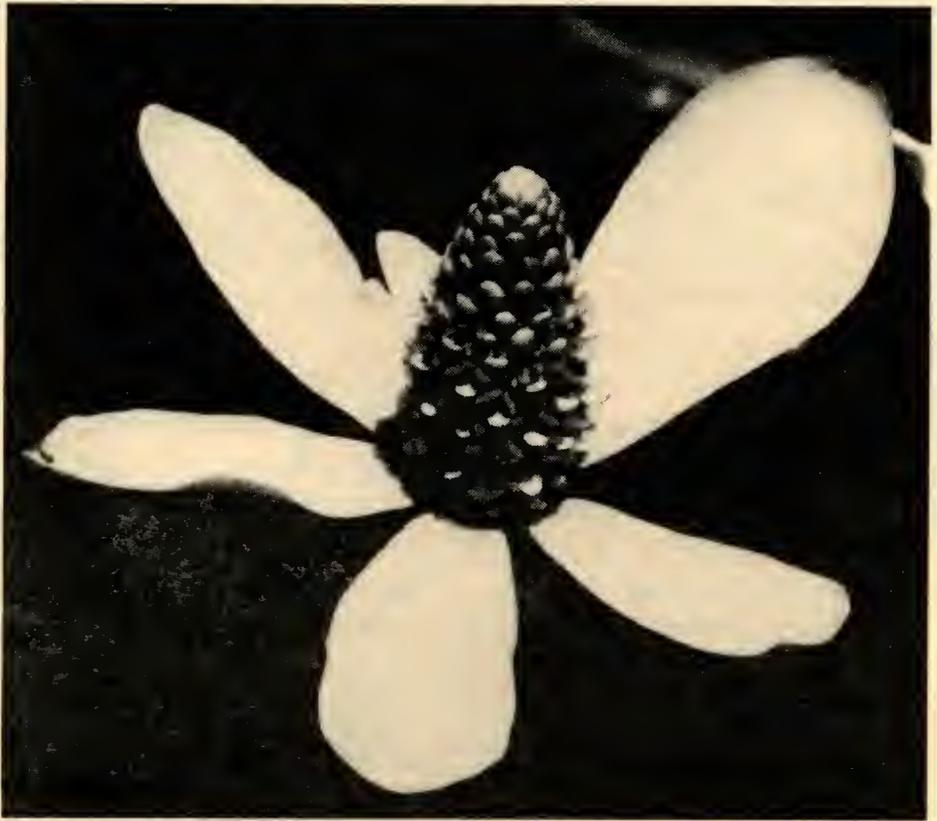


Figure 1. Yerba Mansa, Anemopsis californica. Photograph by Allan Schoenherr.

subtended by persistent, white petalloid bracts. Each inflorescence forms a dense, conical spike that is generally 15-30 mm. long and usually bears 65-160 minute, perfect flowers in nearly vertical rows. Individual flowers lack sepals or petals and are instead each subtended by a small, white, clawed spatulate bract. Normally, each flower contains six stamens and three carpels, although exceptions exist. The majority of the flowers in each spike are protandrous. The ovary is inferior; the common locule is actually "embedded in receptacular and cortical tissue of the inflorescence axis" (Tucker, 1985). The locule contains several ovules at each of three parietal placentae. The fruits of A. californica consist of a multiple of apically dehiscent capsules that mature in approximately 6-8 weeks after pollination.

Although work has been done on the basic anatomy and morphology of A. californica (Quibell, 1941) as well as its floral development (Tucker, 1985), no research to date has been conducted on the pollination biology of this species. In this paper, I present some results in progress on my baseline pollination study of Anemopsis californica, with some thoughts on what insights the pollination processes of this species might offer into primitive pollination syndromes.

METHODS

During the past three growing seasons, spring and summer of 1987-1989, I have conducted pollination field studies of Anemopsis californica at two separate research sites. My major study site was a large population of plants located in an area of poor drainage along the northern side of Pacific Coast Highway in Huntington Beach, Orange County, CA. Here I conducted the bulk of my research. This site, however, did not offer an opportunity for observations of pollinators in a more pristine and less disturbed setting. Therefore, in May and June of 1988 I also carried out some pollinator observations on a population within the Mojave Alkali Sink community at the Desert Studies Center in Zzyzx, San Bernadino County, CA.

My field studies were carried out in two phases. The first phase involved dawn-to-dusk observations of the behavior and frequency of visitation of potential pollinators of A. californica. I spent a total of twelve separate days in early spring, midsummer, and late summer observing and tallying insect visitors to plants at both the Huntington Beach and the Zzyzx locations. Each day of observation represented a time period from approximately 0500 to 2030 hours. During this period, I recorded all insect visitors to plants in randomly-selected plots one meter in diameter; each plot contained an average of 10 to 25 inflorescences each. For each visitor, I recorded various aspects of behavior, including whether it confined its visit to flowers of a single inflorescence (selfing) or whether it traveled directly from one yerba mansa plant to another (outcrossing). I also recorded handling time, or the duration time of each visit to individual inflorescences, for most visitors.

Phase two of my field studies involved only the Huntington Beach site. I carried out a series of bagging experiments in order to assess the effects of various manipulations on fruit and seed set. Five randomly-selected plots of five plants each were selected for most treatments. I was careful to match plants of similar size and approximate age. The treatments were: a) open, or natural pollination - plants were left unmanipulated as an index of natural fruit and seed set; b) bagging inflorescences without further manipulation so that visitation was prevented but potential self-pollination was not; c) bagging five inflorescences of five different plants and totally emasculating all flowers therein to see if fruit or seed set occurred in the absence of pollination; d) bagging five inflorescences of five different plants, emasculating the flowers, and hand-pollinating each flower with pollen from the same plant to observe maximum self-pollination efficiency; and e) bagging five inflorescences of five different plants, emasculating the flowers, and hand-pollinating each flower with pollen from other plants in the population to observe maximum outcrossing efficiency. All of these treatments were carried out at the height of the growing season, in midsummer. I collected the fruits for analysis just before seed dispersal, approximately six weeks after pollination.

In addition, I conducted two other experiments to explore further aspects of the breeding system of Anemopsis californica. I collected 25 randomly-selected, mature fruits each from early season, mid-season, and late season plants at both Huntington Beach and Zzyzx in order to study intraseasonal variation in fruit and seed set. Also, I ran a fifty-foot transect from end to end at each study site, Huntington Beach and Zzyzx, and collected mature fruits at set intervals along the transect; from these, I can check whether fruit and seed set (an indicator of pollinator efficiency) changes spatially within a given population.

Further work to be undertaken includes analysis of pollen and nectar constituents of A. californica flowers and a check of petalloid bracts for UV floral patterns.

RESULTS AND DISCUSSION

Phase One, Observations of Behavior and Frequency of Insect Visitors. As seen in Table 1, a wide variety of insects visited Anemopsis californica flowers at both the Huntington Beach and the Zzyzx study sites. I tallied approximately forty different species of insect visitors to the Huntington Beach population; approximately

TAXON	SITE	POTENTIAL POLLINATOR?	LIKELY OUTCROSSER?	ABUNDANCE/FREQ. OF POLLINATION
Hymenoptera				
Vespidae, e.g.				
<u>Polistes</u> sp.	HB	yes	yes	common
" , var.	Z	yes	yes	frequent
Halictidae, var.				
	HB	yes	yes	common
	Z	yes	yes	frequent
Ichneumonidae, var.				
	HB	yes	no	occasional
Apidae (<u>Apis</u>)				
<u>mellifera</u>)	HB	yes	yes	infrequent
Apidae, Tribe Anthophorini				
	Z	yes	yes	infrequent
Apidae, (<u>Bombus</u>)				
<u>sonorus</u>)	HB	yes	no	rare
Diptera				
Syrphidae, var.				
	HB	yes	yes	frequent
	Z	yes	yes	occasional
Asilidae	Z	yes	no	infrequent
Tabanidae	Z	yes	no	rare
Unid. var. spp.				
	HB	yes	no	frequent
	Z	yes	no	occasional
Coleoptera				
Chrysomelidae, var.				
	HB	yes	no	occasional
Cleridae	Z	yes	no	rare
Unid. sp.	HB	yes	no	frequent
Hemiptera (Homoptera)				
Cicadellidae	HB	perhaps	no	rare
Membracidae	HB	perhaps	no	rare
Miridae	Z	perhaps	no	rare
Orthoptera				
Acrididae	HB	perhaps	no	rare
Tettigoniidae	HB	perhaps	no	rare
Lepidoptera				
Hesperiidae	HB	yes	yes	rare
Pieridae	HB	yes	yes	rare
Nymphalidae	HB	yes	yes	rare
Unid. moth	Z	yes	no	rare
Spiders, Araneida				
Thomisidae	HB	perhaps	no	occasional

Table 1. Partial listing of observed insect visitors to Anemopsis californica. Visitors were counted as pollinators if they were seen traversing several flowers per inflorescence and/or traveling between inflorescences, thus making likely a transfer of pollen from anther to stigma. Pollinators were labeled as likely outcrossers only if they were observed traveling directly from one plant to another. Abundance/frequency of pollination was determined subjectively from field notes and observations. HB - Huntington Beach site

Z - Zzyzx site

***Note: Although insect species are grouped together in families, above, for ease of referral, virtually no species of insect visitors were pollinators common to both sites.

twenty-five different species were observed at the Zzyzx locality. Although representatives of the same kinds of insect families (bees, wasps, beetles, etc.) were present at each site, it is interesting to note that the two sites had virtually no species in common as potential or actual pollinators.

The most consistent and frequent visitors to A. californica flowers at the Huntington Beach site were vespid wasps, specifically Polistes fuscatis aurifer, the Golden Polistes Wasp. These wasps would forage from midmorning to late afternoon and were present in abundance on every day of visitation. Vespids would not only forage up and down individual inflorescences, spending up to one minute on each, but would travel directly from one plant to another, thus effecting not only incrossing but outcrossing as well. Wells and Wells (1988) have shown that certain vespid wasps do forage for nectar, but whether these wasps were seeking nectar or hunting for small insect prey among the flowers remains unclear.

A different species of vespid wasp (identification pending) was also a frequent visitor at the Zzyzx site, with a similar foraging pattern.

Several species of native bees (species identification pending, mostly Halictidae, etc.) were frequent visitors at both Huntington Beach and Zzyzx localities. Such small native bees comprised the most frequent, and probably most efficient, class of pollinators at the Zzyzx site, and were quite important at the Huntington Beach site as well. These bees foraged, mainly for pollen, from early morning through late afternoon. Individual bees spent up to ten seconds on each inflorescence and appeared to travel systematically from one plant to the next. Such bees were probably effective outcrossers. Because they tended to visit the upper, protandrous male phase flowers more often than the lower, female phase flowers, their efficiency as outcrossers would have diminished accordingly.

Various ichneumonid wasps also visited Yerba Mansa flowers at the Huntington Beach site. However, these wasps paid only fleeting and random visits to the inflorescences, presumably in search of prey. Although such wasps cannot be dismissed as potential

pollinators, they would have an unpredictable and minor role in pollen transport and are highly unlikely to be important to such.

Surprisingly, visits by honey bees (Apis mellifera) and bumblebees (Bombus sonorus, etc.) were infrequent to rare at Huntington Beach and entirely absent at Zzyzx. Honey bees and bumblebees were certainly present in the vicinity at each site; they could be seen visiting flowers of other plants nearby. I infer that Yerba Mansa flowers offered insufficient rewards to attract such relatively large, energy-needing pollinators and/or the whitish, drab nature of the inflorescences was a poor visual cue for such bees.

Considered on the whole, as a large group, flies (O. Diptera) comprised a relatively important group of potential pollinators at both study sites. Flies were present in abundance in the early morning and late afternoon to evening hours at both sites; their numbers tended to diminish noticeably during midday. However, on an individual or species basis, flies were notably inconstant and random in their visits to A. californica flowers. Flies appeared to alight on the inflorescences purely by chance, and spent only a few seconds on any given plant; they tended to dwell more on the vegetative than on the floral branches. Any pollination activity by such flies would be purely serendipitous. With the exception of the syrphid flies, who foraged among yerba mansa flowers at times and in patterns similar to the native bees, flies appeared to play a minor role in the pollination of these plants.

The few species of beetles (O. Coleoptera) observed at both Huntington Beach and Zzyzx possessed potential as effective incrossers but were unlikely to be effective outcrossers. These beetles spent the majority of the day on a single inflorescence or a single plant. Presumably, they could distribute pollen from one flower to another as they crawled about the inflorescence. Such beetles might be important in self-pollination of yerba mansa plants; any damage they inflicted to the inflorescences appeared to be minimal.

Other potential pollinators of a transitory and casual nature included various species of bugs (O. Hemiptera), grasshoppers and katydids (O. Orthoptera), and crab spiders (O. Araneida, Thomisidae). These species were infrequently to rarely encountered on the inflorescences proper; they were more likely to be found among the vegetation. Their potential as pollinators is extremely limited.

On rare occasions, I observed butterflies and/or moths (O. Lepidoptera) foraging briefly among the flowers at both sites. Such visits were of short duration, less than five seconds, and only a few of the upper flowers were physically contacted on each inflorescence. These species, therefore, are not likely to be important pollinators. No nocturnal pollinators were observed on any occasion at either study site.

Phase Two, Bagging Experiments and Mature Fruit Analysis.

Analysis of the results of the series of bagging experiments and intraseasonal and transectional mature fruit collection is far from complete. Therefore, it would be premature for me to speculate on any variations in percentages of fruit and/or seed set. I can note, however, that differences were apparent between the Huntington Beach and the Zzyzx research sites. Plants at the Huntington Beach site tended to be larger, with larger inflorescences and a longer growing season, from late April until late September. Mature fruits from this site were larger than those from Zzyzx. Zzyzx plants had a shorter flowering season, from early May through June, and the smaller fruits appeared to mature more quickly. I assume that such differences were due in large part to the arid desert environment to be found at Zzyzx.

CONCLUSIONS

Although my research on this project is not yet complete, it is apparent that pollination of Anemopsis californica fulfills at least one criterion in the classic view of primitive pollination systems. A. californica is a generalist type of plant in that it is visited by a wide variety of insect visitors, most of whom effect pollination in a somewhat haphazard manner. No evidence of any coadaptive specializations, or "pollination syndromes"

(Faegri and van der Pijl 1971) linking Yerba Mansa with any one type of insect pollinator was seen; presumably such coadaptations represent a more advanced evolutionary status. In this one aspect, A. californica is a "primitive" type of plant.

Studies by Tucker (1985) and Liang and Tucker (1989) within the family Saururaceae indicate that A. californica is a relatively specialized, or advanced, member of this family. Certainly, the reduction and fusion of floral parts seen in the inflorescences of these plants is an indication of a derived or more advanced condition. Yerba Mansa does not possess the whorls of multiple, unfused, somewhat fleshy floral parts that are seen in members of other primitive plant families such as the Winteraceae and Annonaceae (O. Magnoliales). If such extant primitive plants truly most closely resemble the first angiosperms, then A. californica is several evolutionary steps ahead of this scenario, and it may not be possible to use the pollination biology of this species to shed light on pollination strategies used by the earliest angiosperms and their ancestors.

The invasive nature of Anemopsis californica, especially its extensive vegetative propagation via runners and rhizomes, indicates that these plants rely rather heavily on asexual reproduction in order to expand distribution into new territory. In the absence of a stringent reliance on sexual reproduction, the plants would be under little selective pressure to evolve a specialized relationship with any one type of insect pollinator. In fact, Gottsberger (1988) suggests that a generalist strategy is a sound one in such invading plants, so that they can take advantage of whatever pollinators are available in their new, expanded surroundings. In a sense, such plants as yerba mansa are then "specialized to be unspecialized".

Much more work yet remains in my study before any final conclusions can be drawn. When this current research project is complete, it will be worthwhile to investigate further the role of vespid wasps in the pollination of yerba mansa.

ACKNOWLEDGEMENTS

I would like to thank the members of my thesis committee, Drs. C. Eugene Jones, Jr., Jack H. Burk, Phillip A. Adams, and Ted L. Hanes, of CSU Fullerton, for their help and advice. Thanks are also due to my husband, Robert P. Holtzman, for his help in dawn-to-dusk observations in the blistering heat at Zzyzx. I gratefully acknowledge funding by the Department of Biological Sciences of CSU Fullerton and the Southern California Botanists.

LITERATURE CITED

- Cronquist, A. 1981. An Integrated System of Classification of Flowering Plants. Columbia University Press, N.Y. 1262 pp.
- Faegri, K. and L. van der Pijl. 1971. The Principles of Pollination Ecology, 3rd ed. Pergamon Press, Oxford. 244 pp.
- Gottsberger, G. 1988. The reproductive biology of primitive angiosperms. *Taxon* 37(3): 630-643.
- Liang, H-X. and S.C. Tucker. 1989. Floral development in Gymnotheca chinensis (Saururaceae). *American Journal of Botany* 76(6): 806-819.
- Munz, P.A. 1974. A Flora of Southern California. University of California Press, Berkeley.
- Quibell, C.H. 1941. Floral anatomy and morphology of Anemopsis californica. *Botanical Gazette* 102: 749-758.
- Tucker, S.C. 1985. Initiation and development of inflorescence and flower in Anemopsis californica (Saururaceae). *American Journal of Botany* 72(1): 20-31.
- Wells, H. and P.H. Wells. 1988. Foraging patterns of yellowjackets, Vespula pensylvanica, in an artificial flower patch. *Bulletin of the Southern California Academy of Sciences* 87(1): 12-18.

Amateur and Professional Botanists. The journal of the Southern California Botanists, CROSSOSOMA, provides an ideal means by which you can publish things of botanical interest to southern Californians. If you have a favorite field trip, gardening hints, or some preliminary data that you'd like to have in print submit your manuscript to:

Dr. Allan Schoenherr
Division of Biological Sciences, Fullerton College
321 E. Chapman Avenue
Fullerton, CA 92634

FIELD TRIPS

February 24 (Saturday). Towsley Canyon Park. It is hoped that this new acquisition by the Santa Monica Mountains Conservancy will be the nucleus of the proposed Santa Clarita Woodlands Park. This trip sponsored by the Santa Monica Mountains Chapter of CNPS will be led by Don Mullaly. Bring water, lunch, and warm clothing. Meet at 10:00 AM. Drive north on I-5 to Calgrove exit, go left under the freeway (west) about 150 yards to a low building and parking lot. For information call George Stevenson at (213) 472-5464.

February 25 (Sunday), 9:00 AM Laguna Beach. Fred Roberts of the UCI Museum of Systematic Biology will lead this trip with the Orange Co. CNPS to examine some of the unique plant species found along the coast near Laguna Beach. Some of these species include the recently listed Crown Beard, Verbesina dissita, Multi-stemmed Dudleya and Western Dichondra. To reach the meeting site take the I-405 south to 133 (Laguna Beach freeway) and go south on PCH to the Parking lot just across from the Treasure Island trailer park just north of Aliso Beach. We will meet at the southwest end of the parking lot, near the stores For further information call Pat Stephenson at (714) 525-7335.

March 3 Saturday. Walnut Woodlands. This trip sponsored by the San Gabriel Mountains Chapter of CNPS is designed to acquaint visitors with the declining habitat of California's native Black Oak, Juglans californica. This trip is held in conjunction with a talk by Dr. Ronald Quinn of Cal Poly Pomona that will be held on February 15, 1990 (See announcements). For more information call (818) 794-1866.

March 10-11. Lower Desert Wildflowers. Scheduling of this trip to Anza-Borrego Desert State Park depends on the appearance of wildflowers. For more information contact Dave Bramlet at (714) 549-0647.

March 30-April 1 (Saturday-Sunday). Catalina Weekend. The South Coast Chapter of CNPS is sponsoring this trip to Catalina Island. It will be led by Terry Martin of the Catalina Island Conservancy. For information contact Ellen Frank (213) 534-8844.

April 29 (Sunday) 9:AM Bachelor Mtn. Steve Boyd of the Rancho Santa Ana Botanic Garden will lead this trip to examine unusual clay endemics found on the slopes of Bachelor Mountain. We will be looking for Munz's Onion, Palmer's Grappling Hook and Paysen's Jewelflower. The area has recently burned so a large number of wildflowers will also be present along the bare slopes of the mountain. We will meet at the Lake Skinner County Park at the old school house, which is just north of the entrance. Be prepared to pay the day use fee for the park. To reach the park take the I-15 south to Rancho California Rd (Temecula) and go east. Continue on Rancho California Rd. for about 7 miles until it deadends into Buck Rd. Go east (right) and then left onto Warren Rd and into the Park. Some aspects of the trip are still tentative, so please send a SASE to: David Bramlet, 1691 Mesa Dr. A-2 Santa Ana CA 92707, if you plan to attend.

May 6 (Sunday) 9:00 AM Chiquito Basin. Fred Roberts of the UCI Systematic Museum will lead this trip to the unique Deer Grass potrero found at Chiquito Basin in the Santa Ana Mountains. We will see large areas of chaparral, oak woodland and native grassland. This area also contains the largest population of the San Miguel Savory, Satureja chandleri, which should be in flower. Bring a lunch, sun protection, water and a hand lens. We will meet at the intersection of the Ortega Highway (74) and Forest Service road # 6S05 that leads to the Los Pinos conservation camp. Some aspects of the trip are still tentative, so please send a SASE to: David Bramlet, 1691 Mesa Dr. A-2 Santa Ana CA 92707, if you plan to attend.

Environmental Citizenship - Trail Maintenance and Newport Bay Weed-pulling. The UCI Cooperative Outdoor Program is sponsoring a series of trips in cooperation with the Sierra Club and the California Department of Fish and Game. The trips are as follows:

1. Saturday-Sunday, February 24-25. Holy Jim Trail Maintenance Trip. We plan to clear and repair this popular trail in the Santa Ana Mountains. No experience is required. Bring gloves, a shovel, a lopper, saw or mattock -- otherwise the Forest Service will have a supply of needed tools. This is an overnight carcamp in the beautiful Holy Jim Canyon. If you can only work Saturday, you are still urged to join us. Carpooling will be arranged. Contact Bill Mautz (856-4760) if you plan to participate.
2. Date to be arranged by the Department of Fish and Game. Exotic Weedpull and Native Plant-In at the Newport Back Bay. The fragile communities surrounding Upper Newport Bay are being degraded and eliminated by encroachment of introduced plant species, primarily pampas grass, ice plant species, and castor bean. Join the Cooperative Outdoor Program and the California Department of Fish and Game in removing these exotics and in replacing them with appropriate native plant species. Arrangements regarding equipment will be made by Fish and Game. Call the Upper Newport Bay Ecological Reserve (640-6746) and add your name to the list of eco-volunteers so that you can be notified when the replacement plants are available for transplantation.

ANNOUNCEMENTS

Planning and Conservation League Environmental Symposium. A symposium entitled **CALIFORNIA 1990: YEAR OF DECISION** will take place February 3-4, 1990 at California State University, Sacramento.

The purpose of this annual symposium is to inform California environmentalists and citizen activists on legislation affecting the environment, the views of policymakers, and to develop environmental and political agendas. For more information and registration contact: PCL, 909 12th Street, Suite 203, Sacramento, CA 95814. Phone: (916) 444-8726.

Spring Nature Walks in the Whittier Hills. Starting on February 3, nature walks in the Whittier Hills will be conducted on the first Saturday of each month. Walks will be lead by local naturalists, biologists, geologists, Sierra Club leaders, Rio Hondo College Faculty, Friends of the Whittier Hills, and Audubon Society members. For information contact Julie Schneider during the evening at (213) 908-3418.

Early American Springtime Tour. The Santa Barbara Botanic Garden is sponsoring a twelve-day tour to gardens and arboretums in Virginia and Washington, D.C. Timed to coincide with the peak of the spring bloom, the tour will be directed by Botanic Garden Director of Horticulture, Carol Bornstein, and Travel Coordinator, Lilla Burgess. For more information contact Lilla Burgess at (805) 682-4726.

Walnut Woodlands. Dr. Ronald Quinn of Cal Poly Pomona is speaking to the San Gabriel Mountains chapter of CNPS on Walnut Woodlands. If you missed his presentation at our last symposium this is your chance to hear it again. This presentation is designed to accompany the CNPS March 3 field trip. Meet at Eaton Canyon Nature Center, 1730 N. Altadena Dr., Pasadena. For information call (818) 794-1866.

A Symposium on California's Hardwood Rangelands. On October 31-November 2, 1990 the University of California, Davis and the California Department of Forestry and Fire Protection will host a research symposium to present the state of knowledge about California's hardwood rangelands. These rangelands occupy almost 10 million acres and proved forage, wood products, wildlife habitat, watershed protection, and aesthetic values. Concern has been expressed about the long-term sustainability of this resource and whether current management practices provide for adequate protection of public values. For more information contact Richard B. Strandiford, Dept. of forestry and Resource Management, 163 Mulford Hall, University of California, Berkeley CA 94720. Phone: (415) 642-2360.

Congressional Field Hearing on the Desert Protection Act. There will be a field hearing in Los Angeles on February 10, 1990. This is an opportunity for all interested persons to make their presence known. Off-road vehicle groups will be there in large numbers, and if you favor making National Parks in the Mojave Desert, now is the time to be counted. As of this writing the time and place of this hearing has not been decided. If you want to attend contact CNPS at (916) 447-2677 or The Sierra Club at (213) 387-6528.

Santa Rosa Plateau Threatened by Development. The Riverside County Board Of Supervisors recently voted to open the Santa Rosa Plateau to dense urban development including 6000 homes, two golf courses, and other developments. The area has been proposed as southern California's only United Nations Biosphere Reserve. Located near Murrieta, the plateau's pristine Englemann Oak Savanna and Vernal Pools have been the subject of articles in CROSSOSOMA and one of SCB's special publications. For donations or information contact Preserve Our Plateau, P.O. Box 1534, Wildomar, CA 92395. Phone: (213) 654-1456.

1990 - Year of the Oak. The California Oak Foundation has declared 1990 the Year of the Oak and has embarked on an ambitious statewide program to advance the status of these trees through a year of special events and tree planting activities. Already key legislators, citizens groups, individuals and foundations have joined the effort, ensuring that the Year of the Oak will be a significant and exciting celebration of our oak heritage. It will be a first step toward the accomplishment of their goals. Highlights of the Year of the Oak will include:

- * Native Oak Grove Restoration
- * Oak Plantings
- * Heritage Oak Registries
- * School Programs
- * Public Education
- * Publications

For more information contact the Foundation at 909 12th Street, Suite 125, Sacramento, California 95814.

Tropical Rainforests; A Disappearing Treasure. The Natural History Museum of Los Angeles County is hosting the SITES exhibit on Tropical Rainforests from March 3 to May 27, 1990. A number of activities are being organized to supplement this timely event, including a Biodiversity Fair. The fair will be held on Saturday and Sunday, April 21-22 in conjunction with the Los Angeles area celebration of EARTH DAY.

Research Funds Available. The California Conservation Biology Research Program is organized to support studies on top priority issues regarding the design and management of the Nature Conservancy (TNC) preserves in California. A clear understanding of why certain natural communities and species are declining is essential if TNC preserves are to be designed and managed to withstand the test of time. Research proposals for the program should address the conservation of rare elements or natural diversity on TNC preserves or proposed preserves. For more details contact: TNC California Field Office, 785 Market Street, San Francisco, CA 94103.

The James Brainerd Memorial Grant. A grant has been established by the Anza-Borrego Desert Natural History Association to honor James Brainerd and his dedication to higher education by offering financial assistance to scholars and researchers whose projects are of interest and value to Anza-Borrego Desert State Park. All subjects pertinent to the natural, cultural, historical, and ecological aspects of the park will be considered. One or more grants may be given annually, the total amount being approximately \$5,000. Application periods are April 1-20 and October 1-20. For details write to: The James Brainerd Memorial Grant, Anza-Borrego Desert Natural History Association, P.O. Box 310, Borrego Springs, CA 92004.

Plant Genetics Conference. The Center for Plant Conservation is sponsoring a conference on the genetics and population biology of rare and endangered plants March 9-12, 1990 at the Missouri Botanical Garden in St. Louis.

The conference brings together some of the foremost scientists in the fields of botany, population biology, genetics, and horticulture to discuss the latest developments in these fields and their implications for management of wild populations or rare and endangered plant species. For more details contact: Center for Plant Conservation, 125 Arborway, Jamaica Plain, MA 02130. Phone: (617) 524-6988.

BOARD OF DIRECTORS
1990
SOUTHERN CALIFORNIA BOTANISTS

OFFICERS

Curtis Clark (President)
Biological Sciences
Cal Poly Pomona
Pomona, CA. 91768
w (714) 773-3579

Diana Cosand (Vice President)
1349 W. Hill Ave.
Fullerton, CA. 92633
w (714) 773-3548
h (714) 525-5625

Alan Romspert (Treasurer)
605 N. Pomona Ave.
Fullerton, CA 92632
w (714) 449-7034
h (714) 870-0946

Linda Harris (Secretary)
605 N. Pomona Ave.
Fullerton, CA 92632
h (714) 870-0946

Allan Schoenherr (Editor)
Div. of Biological Sciences
Fullerton College
Fullerton, CA 92634
w (714) 992-7129
h (714) 494-0675

Marvin M. Chesebro (Legal Advisor)
1545 Wilshire Blvd., No. 716
Los Angeles, CA. 90017
w (213) 413-1117
h (213) 939-3081

David Charlton (Past President)
7601 Walpole, Apt 5.
California City, CA. 93505
h (619) 373-2661

DIRECTORS

Terry Daubert
1231 W. Arlington
Anaheim, CA. 92801
w (714) 869-4062
h (714) 533-8518

Colleen Cory
Dept. of Ecology
Univ of Calif Irvine
w (714) 856-6006
h (714) 642-4930

Kent Gordon
Div. of Bio. Sciences
Fullerton College
Fullerton, Ca. 92634
w (714) 992-7381

Julie Zwicky
5006 E. Lakeside
Orange, CA 92667
h (714) 998-4873

Peter Bowler
Dept. of Eco. & Evol. Bio.
University of Calif.
Irvine, CA. 92717
w (714) 856-5181
h (714) 494-7731

Jon E. Keeley
Department of Biology
Occidental College
Los Angeles, CA. 90041
w (213) 259-2898

John Wheeler
512 El Camino Dr.
Fullerton, CA 92635
h (714) 871-4262

David L. Walkington
Fullerton Arboretum
Cal State Univ. Fullerton
Fullerton, CA. 92634
w (714) 773-3579



SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SOUTHERN CALIFORNIA BOTANISTS is an organization of individuals devoted to the study, preservation, and conservation of the native plants and plant communities of southern California. The journal, CROSSOSOMA, published bimonthly, carries articles of interest to amateur and professional botanists. It is a non-profit organization formed in 1927.

Membership benefits include:

Field trips led by competent botanists and biologists.

A yearly plant sale featuring native California and drought-tolerant species.

An annual symposium on various aspects of California vegetation.

The SCB journal, CROSSOSOMA

Discounts on botanical and natural history books.

Membership categories include:

<input type="checkbox"/> Individual (family)	\$ 8.00	<input type="checkbox"/> New Member
<input type="checkbox"/> Group or organization	\$15.00	<input type="checkbox"/> Renewal

APPLICATION

Date _____

Name _____

Address _____

City, State, Zip Code _____

Phone (____) _____

In addition, I want to give \$_____ to help support SCB.

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS

Mail to: Alan P. Romsper
Southern California Botanists
Department of Biological Sciences
California State University, Fullerton
Fullerton, CA 92634

CROSSOSOMA (ISSN 0891-9100) is published bimonthly (February, April, June, August, October, and December) by Southern California Botanists, a California non-profit corporation. Back issues of CROSSOSOMA are available for \$2.00 an issue (plus 25¢ postage) or \$8.00 a volume (plus \$1.00 postage). Send a check with your request to Alan P. Romsper, Treasurer, at the above address. Manuscripts submitted for publication should be addressed to Dr. Allan A. Schoenherr, Editor of CROSSOSOMA, Division of Biological Sciences, Fullerton College, Fullerton, CA 92634.

SCB COMING EVENTS (DETAILS WITHIN)

February 24-25	Holy Jim Trail Maintenance
February 24	Towsley Canyon Park
February 25	Laguna Beach
March 3	Walnut Woodlands
March 10-11	Anza-Borrego Desert State Park
March 30-April 1	Catalina Island
April 29	Bachelor Mountain
May 6	Chiquito Basin

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

LIBRARY
The New York Botanical Garden
Bronx, NY 10458-5126
DEC89

LIBRARY
FEB 5 1990
NEW YORK
BOTANICAL GARDEN

NON-PROFIT ORG.
U.S. POSTAGE
PAID
FULLERTON, CA.
PERMIT NO. 145



CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

CROSSOSOMA Volume 16, Number 2
Managing Editor: Allan A. Schoenherr

April 1990

ORANGE COUNTY

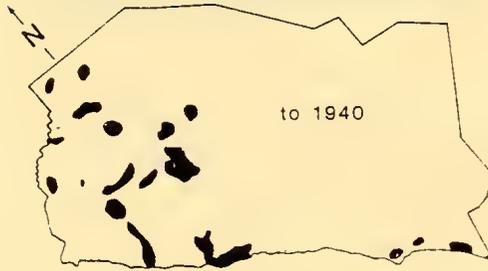
This and the next issue of CROSSOSOMA contain lists of plants found in Orange County. This issue features a list of Orange County's rare or endangered plants. It was compiled by Fred Roberts of the Museum of Systemic Biology at the University of California, Irvine. Fred is also the author of the Checklist of Vascular Plants of Orange County.

The next issue will include plants found in Crystal Cove State Park and was compiled by Sarah Jayne, a State Park Docent. She developed the list from herbarium specimens and several lists on file at the Crystal Cove Ranger Station. The final list was reviewed by several members of the SCB Board of Directors and by Fred Roberts.

The following series of maps illustrates the amazing increase in Orange County's urban development that occurred up to 1980. It does not even include the development that has taken place in south Orange County during the last decade. Neither does it indicate massive projects currently planned or underway. For example, grading has begun along the Irvine Coast between Corona Del Mar and Laguna Beach, and other huge projects are planned for Laguna Canyon and the foothills of the Santa Ana Mountains.

Allan A. Schoenherr, Editor

URBAN DEVELOPMENT - ORANGE COUNTY



After: Brattstrom, B. H. (1989). Habitat destruction in California with special reference to Clemmys marmorata: A perspective. In: De Lisle, H. F., et. al. (Editors). Proceedings of the Conference on California Herpetology. Southwestern Herpetologists Society Special Publication No. 4:13-24.

RARE AND ENDANGERED PLANTS OF ORANGE COUNTY¹

Compiled by Fred M. Roberts, Jr.

Museum of Systematic Biology, University of California, Irvine

Of Orange County's 810 native plant species, slightly over 10% have not been seen since 1950. Some of these are difficult to locate plants that occur in the Santa Ana Mountains or other hard to access areas. These may be found again. The majority, probably 8%, have succumbed to the ever growing pressures of growth and development in Orange County. At least one willow species was eliminated from the flora in 1989 when a Mission Viejo developer accidentally graded a wetland that was supposed to remain untouched. Several others are too rare to survive ever encroaching impacts for more than a few more years. Three species that once occurred in Orange County are now presumed extinct. Forty-eight other plant species, many represented in Orange County by fewer than six localities, have been listed by the California Native Plant Society as rare or endangered. The following list attempts to summarize the present distribution and status of Orange County's rare plant species.

Aphanisma blitoides Nutt.

CHENOPODIACEAE

APHANISMA

LOCALITIES: Known from coastal southern and central Orange County: Costa Mesa, Newport Beach and Arch Beach, South Laguna. Associated with coastal bluff scrub and coastal sage scrub.

RANK: CNPS Watch list (List 3), Federal Candidate List 2.

STATUS: Has not been collected in the county since 1932. Adequate habitat still exists for this species at San Clemente State Park, the Dana Point Headlands, along coastal South Laguna, Laguna Beach, Crystal Cove State Park and along coastal bluffs in Corona del Mar and Newport Back Bay.

REMARKS: This species is not distinctive nor particularly attractive and is easily overlooked. *Aphanisma* is more common farther south in Baja California.

Argemone munita Dur. & Hilg. ssp. *robusta* G. Owbey

PAPAVERACEAE

ROBUST PRICKLY POPPY

LOCALITIES: Santa Ana Mountains, scattered localities centering on Santiago and Modjeska Peaks along roadsides, openings and burns in chaparral.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: All recently seen populations occur on National Forest land. The species is not common but the populations appear to be stable and isolated from development. Primary threats: off-road vehicle use and National Forest road up-keep programs.

Astragalus brauntonii Parish

FABACEAE

BRAUNTON'S RATTLEWEED or LOCOWEED

LOCALITIES: Ridge between Gypsum and Coal Canyons at the northern end of the Santa Ana Mountains. Occasional wash down populations in bottoms of Gypsum and Coal Canyons. Associated with chaparral burns, possibly restricted to limestone derived soils.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: The future of this species in Orange County is uncertain. Presently, all known populations appear to be threatened by massive habitat destruction. Populations in Coal Canyon may be acquired for preservation but these efforts are still very preliminary.

Astragalus pycnostachyus Gray

FABACEAE

var. *lanosissimus* (Rydb.) Munz & McBurney

MARSH LOCOWEED or MARSH VETCH

LOCALITIES: In Orange County, known only from "La Bolsa", probably Bolsa Chica Salt Marsh.

RANK: CNPS List 1A; Federal Candidate List 1.

STATUS: Species is now considered extinct. It has not been collected in Orange County since 1882. It is possible the species may still exist at the Seal Beach Naval Weapons Station at Anaheim Bay or, less likely, on private land at Bolsa Chica Salt Marsh.

¹ This paper was first presented at a rare plant and animal workshop given for the Orange County Environmental Management Agency in January 1989.

Bergerocactus emoryi (Engelm.) Brit. & Rose
GOLDEN-SPINED CERES

CACTACEAE

LOCALITIES: None are known.

RANK: CNPS List 2.

STATUS: Persistent rumours and several references (Munz, 1974; Smith & Berg, 1988) continue to include this cactus as part of Orange County's historic flora but the past occurrence of this species has not been confirmed.

Boykinia rotundifolia Parry
ROUND-LEAVED BOYKINIA

SAXIFRAGACEAE

LOCALITIES: Santa Ana Mtns.: Lost Woman Canyon, Holy Jim Canyon, Central Santiago Canyon and Upper McVicker Canyon, 1800-3400ft, riparian woodland, bigcone spruce woodland.

RANK: CNPS List 4.

STATUS: All known localities are within the Cleveland National Forest boundaries or the proposed Fleming Regional Park and are relatively isolated.

Brickellia nevinii Gray
NEVIN'S BRICKELLBUSH

ASTERACEAE

LOCALITIES: In Orange County, known only from a narrow band along the western face of the Santa Ana mountains from 1400 to 2200 feet in Black Star, Williams and Santiago Canyons. Associated with south-facing brecca cliffs and slopes in relatively open coastal sage scrub or chaparral.

RANK: CNPS List 4.

STATUS: All known localities are within the Cleveland National Forest boundaries and are relatively isolated. Many populations, however occur on private inholdings and are not guaranteed protection. Outside the National Forest, this species should be sought in central Fremont Canyon.

REMARKS: First discovered in Orange County above Williams Canyon in 1985. Plant's range in Orange County is poorly understood.

Brodiaea orcuttii (Greene) Hoover
ORCUTT'S BRODIAEA

AMARYLLIDACEAE

LOCALITIES: Casper's Regional Park.

RANK: CNPS List 1B; Federal Candidate C2.

STATUS: The only known Orange County locality was confirmed in 1989.

Calamagrostis densa Vasey
SAN DIEGO REEDGRASS

POACEAE

LOCALITIES: In Orange County, known only from Coal Canyon in the northern Santa Ana Mountains. Associated with Tecate Cypress stands and chaparral.

RANK: CNPS List 4; Federal Candidate List 2.

STATUS: Very rare in Orange County. Presently threatened by potential development.

Calandrinia maritima Nutt.
SEASIDE CALANDRINIA

PORTULACACEAE

LOCALITIES: Unknown.

RANK: CNPS List 4.

STATUS: Presence in Orange County indicated by several references but not confirmed.

Calochortus catalinae Wats.
CATALINA MARIPOSA LILY

LILIACEAE

LOCALITIES: Santa Ana Canyon; Irvine: University of California; San Joaquin Hills: Upper Shady Canyon; Aliso-Wood Canyon Regional Park: Upper Wood Canyon; Rancho Mission Viejo; Lomas de Santiago: ridge between Limestone and Santiago Canyons; Casper's Regional Park; Santa Ana Mountains: Black Star Canyon, Trabuco Canyon. Formally along Hwy 74 adjacent to Casper's Regional Park. Frequently associated with grassy openings in coastal sage scrub or chaparral and grassland habitats.

RANK: CNPS List 4.

STATUS: Populations in Orange County are scattered but rapidly disappearing. The University of California, Irvine site was presumed destroyed in 1985 but plants may still exist on adjacent land until further planned University expansion takes place during the next decade. Plants occurring along the San Joaquin Hills Alignment will be eliminated when construction begins in 1991. Another population is threatened by the East Orange Project. The population along Highway 74 adjacent to Casper's Regional Park was completely removed during road widening work in 1986. The species is protected but scarce in Casper's Regional Park.

REMARKS: This species was added to the CNPS List in 1988 as evidence pointed to dwindling populations throughout southern California.

Cardamine gambelii Wats.
GAMBEL'S BITTERCRESS

BRASSICACEAE

LOCALITIES: Swampy sites; Huntington Beach.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: Considered extirpated from Orange County. Last seen in 1908. Very little habitat still exists for this plant and it is not expected to be found again.

Chorizanthe parryi Wats. var. *fernandina* (Wats.) Jeps.
SAN FERNANDO VALLEY SPINE-FLOWER

POLYGONACEAE

LOCALITIES: Near Santa Ana.

RANK: CNPS List 1A; Federal Candidate C1.

STATUS: Extinct, last seen in 1940; last collected in Orange County in 1902.

Chorizanthe procumbens Nutt. var. *albiflora* Goodm.
PALA SPINE-FLOWER

POLYGONACEAE

LOCALITIES: Sycamore Hills of Laguna Beach; associated with sandstone rock outcrops in coastal sage scrub.

RANK: CNPS List 4.

STATUS: Very rare in Orange County. Presently the only known locality is fairly well protected but it is close to the San Joaquin Corridor alignment.

REMARKS: Dr. James Reveal of the University of Maryland, an expert on the Genus *Chorizanthe* doubts this white-flowered form is distinct from the more typical and widespread yellow-flowered form (see *Phytologia* 66: 151-154, May 1989). Since it appears that there is no other apparent difference other than flower color, this conclusion may very well be correct.

Chorizanthe staticoides Benth. ssp. *chrysacantha* (Goodm.) Munz
ORANGE COUNTY TURKISH RUGGING

POLYGONACEAE

LOCALITIES: The San Joaquin Hills: Pelican Hill, Shady Canyon, Sycamore Hills, Pelican Point; Sheep Hills; Aliso Viejo; Laguna Beach; Temple Hill; Laguna Niguel; Niguel Hill; Rancho Mission Viejo in Canada Chiquita, above San Juan Creek, Christianos and Lower Gabino Canyon. Formerly: Dana Point Headlands; Newport Beach and possibly Mission Viejo.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: Scattered but common where found. Populations vary in size and quality depending on available rainfall. Roughly one third of the San Joaquin Hills populations presently or will receive protection. Another third occur within the city limits of Laguna Beach and receive marginal protection. The remaining third exist within potential or accepted development proposals. Unfortunately, this is a somewhat unbalanced view since more plants occur in unprotected locations than those proposed for preservation. Populations within parks or proposed Parks include sites at Crystal Cove State Park, Irvine Coast Wilderness Regional Park and Aliso-Wood Canyon Regional Park. Populations on Pelican Hill, Turtle Rock and Aliso Viejo have largely been eliminated in the last two years. Mitigation is being implemented at some of these sites such as on Pelican Hill, however, it has yet to be demonstrated that populations at the transfer sites will succeed. Several populations occur in the Christianos-Canada Chiquita region of southeastern Orange County. The future of these plants is highly dependant on the final alignment for the proposed Foothill Corridor.

REMARKS: This form is said only to occur within Orange County and at Torrey Pines State Park. The exact taxonomic relationship of the Rancho Mission Viejo plants to the San Joaquin Hills plants is still unsure. Dr. James Reveal of the University of Maryland, an expert on the genus, has questioned the validity of this form (Phytologia 66: 154-158, May 1989). Dr. Reveal feels that there is too much variation within the species to recognize any one group as a distinct subspecies. Coastal plants are certainly distinct but interior San Joaquin Hills plants and Rancho Mission Viejo populations are more transitional to the widespread form. A growth experiment currently being conducted at UC, Irvine should shed light on this question.

In 1988, this plant was proposed for State listing as Threatened. It was rejected by the Fish and Game Commission primarily because opponents argued that adequate measures were already underway to protect this form. Since then, a number of populations have been eliminated or largely reduced and some private land owners have discouraged further population investigations.

Comarostaphylos diversifolia (Parr.) Greene ssp. *diversifolia*
SOUTHERN SUMMER HOLLY

ERICACEAE

LOCALITIES: Niguel Hill; Santa Ana Mountains: San Juan Canyon along Highway 74; chaparral.

RANK: CNPS List 1B.

STATUS: The largest Orange County populations occurs on Niguel Hill. Aliso-Wood Canyon Regional Park offers protection for a part of the population but the majority of the population continues to be threatened by development. In the Santa Ana Mountains, limited to a single canyon slope reaching down to the highway within the National Forest boundary. The majority are little bothered except where plants along the highway are sometimes trimmed back. Proposals to widen Highway 74 could threaten this population.

Cordylanthus maritimus Nutt. ssp. *maritimus*
SALT MARSH BIRD'S BEAK

SCROPHULARIACEAE

LOCALITIES: Upper Newport Back Bay, Newport Beach. Coastal salt marsh obligate.

RANK: Federal and State Endangered Species; CNPS List 1B.

STATUS: All known populations in Orange County occur within the Newport Bay Ecological Preserve and receive frequent monitoring from private individuals and government agencies.

Cupressus guadalupensis S. Wats. ssp. *forbesii* (Jeps.) Murray
TECATE CYPRESS

CUPRESSACEAE

LOCALITIES: Santa Ana Canyon, Gypsum and Coal Canyons in the northern Santa Ana Mountains, from 400 to 2300ft. Restricted to certain soil types; chaparral, Tecate Cypress Woodland.

RANK: CNPS List 1B.

STATUS: Found in restricted areas but relatively common where found. Has received much attention in recent years yet still is threatened by development and man-related fire dangers. All populations occur on private land with no formal protection.

REMARKS: In 1989, the California Fish and Game Commission rejected a proposal to list this species as Threatened. Opponents to the listing argued that protective measures in Orange County were already under consideration and that listing was unnecessary. Orange County accounts for roughly one-third of the tecate cypress' U.S. range. Threatened populations in San Diego County apparently were not seriously considered by the Commission. Since the rejection of this species, a large scale development has been proposed that threatens the entire Orange County population through road construction, massive grading, suburban proximity pressure and increased fire danger.

Dichondra occidentalis House
WESTERN DICHONDRA

CONVOLVULACEAE

LOCALITIES: San Joaquin Hills, Niguel Hill, Dana Point Headlands and Chiquita Ridge east of Canada Chiquita. Associated with coastal bluff scrub and coastal sage scrub in sandy soils.

RANK: CNPS List 4; Federal Candidate List 3C.

STATUS: Dwindling in Orange County. Tends to occur on favored development sites such as Pelican Hill and the Dana Point Headlands. Scattered populations have survived development on Niguel Hill. Other populations live on Temple hill above Laguna Beach and in the Sycamore Hills. Future of Chiquita Ridge population uncertain.

Dudleya blochmanae (Eastw.) Moran ssp. *blochmanae*
BLOCHMAN'S DUDLEYA

CRASSULACEAE

LOCALITIES: Dana Point Headlands; San Clemente north of Pico Ave. and San Clemente State Park. Formerly found in Laguna Niguel and on hills of interior Dana Point and the Anaheim Hills. Associated with thin, rocky soils in grassland and open coastal sage scrub.

RANK: CNPS List 1B.

STATUS: Rapidly dwindling in Orange County. Of the three remaining populations, only a small population at the southern end of San Clemente State Park is protected. The largest population, discovered in 1983 on the Dana Point Headlands is threatened by a hotel development project that was approved in 1984. A complete survey and weak mitigation for this population were proposed by the California Coastal Commission at that time but there is no evidence they will be carried out. The Pico "Marblehead" population was thoroughly surveyed in February 1990 and found to contain an estimated 8,000 plants. However, the blufftop population was severely impacted immediately after the survey. Only a small portion of the population is expected to remain in situ. Roughly 2,000 plants were salvaged for transplant and their final fate has not been determined. One of the first plant species collected in Orange County. The site, collected in 1894 is very close to the Ritz-Carlton Hotel. Habitat for this plant no longer exists at this site.

Dudleya cymasa (Lem.) Britt. ssp. *avatifolia* (Britt.) Moran
OVAL-LEAVED DUDLEYA or LIVEFOREVER

CRASSULACEAE

LOCALITIES: Santiago Canyon in the Santa Ana Mountains. Associated with rugged cliffs in chaparral.

RANK: CNPS List 4.

STATUS: The only confirmed Orange County population occurs in the proposed Fleming Wilderness Park. No known threats exist or are expected at this time.

Dudleya multicaulis (Rose) Moran
MANY-STEMMED DUDLEYA

CRASSULACEAE

LOCALITIES: Numerous localities in the San Joaquin Hills (Pelican Point, Pelican Hill, Turtle Rock, Shady Canyon, Bommer Canyons, Sycamore Hills and Temple Hill in Laguna Beach); UC, Irvine and in the vicinity of Irvine Lake, Blind Canyon, Gypsum Canyon and Weir Canyon in the northern Santa Ana Mountains. Small populations are known in Audubon Starr Ranch, Aliso-Wood Canyon Regional Park and the Canada Chiquita and Christianitos Canyons area.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: Relatively frequent in the San Joaquin Hills and abundant in Gypsum and Blind Canyons, however, pressure to develop land where this species occurs increases with each year. Existing and proposed road and development projects will greatly reduce the number of plants over the next ten years. Very few populations exist under any form of management. There are small populations at Crystal Cove State Park, Aliso-Wood Canyon Regional Park and the plant is known from Casper's Regional Park. Overall, protected plants account for approximately 3% of the population. Areas where this species occurs that are planned for development are: Pelican Hill, all three Transportation Corridor alignments, the East Orange Project and the Anaheim Hills.

REMARKS: This plant was once fairly frequent outside Orange County in the Santa Monica Mountains, Hollywood Hills and foothills of the San Gabriel Mountains. It is now relatively rare outside of Orange County. Transplant mitigation is frequently proposed for this species but the method is untried and given only a narrow margin for success.

Dudleya stalanifera Moran
ALISO CANYON or LAGUNA BEACH LIVE-FOREVER

CRASSULACEAE

LOCALITIES: San Joaquin Hills, Laguna Beach and South Laguna: lower Laurel, Laguna and Aliso Canyons.

RANK: State Threatened; CNPS List 1B; Federal Candidate List 1.

STATUS: Relatively stable populations exist partly because the plant prefers steep, rugged cliff habitats. One population occurs within the proposed Irvine Coast Regional Park, another appears to occur within the Laguna-Laurel Canyons Regional Park while other populations have been incorporated within the Nature Conservancy Private stewardship programs.

Dudleya viscida (Wats.) Moran
VISCID LIVE-FOREVER

CRASSULACEAE

LOCALITIES: Santa Ana Mountains; Upper Hot Springs and San Juan Canyons, above 600ft.
RANK: CNPS List 1B; Federal Candidate List 1.

STATUS: All known populations in Orange County occur within the National Forest Boundary or Casper's Regional Park. Proposals to widen State Highway 74 could threaten the most extensive populations.

REMARKS: Orange County accounts for half of the known range for this species which is endemic to the Santa Ana Mountains in Orange and San Diego Counties.

Eleocharis parvula (R. & S.) Link. ssp. *parvula*
LITTLE SPIKE-RUSH

CYPERACEAE

LOCALITIES: Upper Newport Back Bay.

RANK: CNPS List 4.

STATUS: Infrequent. Found only once in Spring 1985 within the Upper Newport Bay Ecological Preserve.

Eriastrum densifolium (Benth.) Mason ssp. *sanctorum* (Mikn.) Mason
SANTA ANA RIVER WOOLLY-STAR

POLEMONIACEAE

LOCALITIES: Santa Ana River in Santa Ana Canyon.

RANK: Federal and State Endangered; CNPS List 1B.

STATUS: Extirpated from Orange County. Still occurs upstream along the Santa Ana River outside the county. Our habitat has been largely removed for flood control measures.

Euphorbia misera Benth.
CLIFF SPURGE

EUPHORBIACEAE

LOCALITIES: Corona del Mar, Laguna Beach, South Laguna and Dana Point. Limited to coastal bluffs and headlands overlooking the ocean.

RANK: CNPS List 2.

STATUS: Relatively common in a narrow restricted zone along the coast. The population has been reduced in recent years. The construction of the Dana Point Marina removed some habitat and continued development above the marina damaged habitat as recently as Fall 1988. The status of the plant in South Laguna and Laguna Beach is not well known (collections for these sites were made in the teens and thirties) while the Corona del Mar population was nearly eliminated by careless grading in the Fall of 1988.

REMARKS: Two small populations in Corona del Mar represent the northern limit of this species. One of these populations was destroyed in 1988 and the other was damaged.

Harpagonella palmeri Gray
PALMER'S GRAPPLING-HOOK

BORAGINACEAE

LOCALITIES: Dana Point Headlands; Casper's Regional Park and Gabino Canyon in Rancho Mission Viejo. Associated with grassy barrens.

RANK: CNPS List 2.

STATUS: Relatively rare and isolated. The Dana Point site was approved for development in 1984 but is still intact.

Helianthus nuttallii T. & G. ssp. *parishii* (Gray) Heiser.
PARISH'S SUNFLOWER

ASTERACEAE

LOCALITIES: Formerly Wintersburg (Huntington Beach), Newport Beach and presumably the Santa Ana River system.

RANK: CNPS List 1A; Federal Candidate List 1.

STATUS: Extinct. Species was unable to compete with development and flood control measures. Last seen in Orange County in 1933.

Hemizonia australis (Keck) Keck
SOUTHERN SPIKEWEED

ASTERACEAE

LOCALITIES: Irvine along scattered flood control channels; Newport Back Bay. Possibly still occurs at Bolsa Chica. Formerly in Santa Ana, Rossmoor, Cypress, Westminster and Garden Grove.

RANK: CNPS List 3.

STATUS: Occasionally encountered along flood control ditches in Irvine, otherwise once abundant in western Orange County. Habitat has been largely destroyed.

Hemizonia laevis (Keck) Keck
SMOOTH TARWEED or SPIKEWEED

ASTERACEAE

LOCALITIES: Uncertain, reported from Orange County.

RANK: CNPS List 3.

STATUS: Unknown. Presumably has not been seen in Orange County for 30 years.

Juncus acutus L. var. *sphaerocarpus* Engelm.
SOUTHWESTERN SPINY RUSH

JUNCACEAE

LOCALITIES: Bolsa Chica, Newport Back Bay, Monarch Beach; coastal salt marsh, seeps.

RANK: CNPS List 4.

STATUS: Largest population is within the Newport Back Bay Ecological Preserve, overall range in Orange County not well understood.

Lepechinia cardiophylla Epl.
HEART-LEAVED PITCHER SAGE

LAMIACEAE

LOCALITIES: Santa Ana Mountains: Claymine Canyon, Bald Peak, Upper Maybe Canyon. Associated with chaparral and cypress woodland.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: Populations extend from the National Forest to private land in the northern Santa Ana Mountains. Populations on private land are threatened by development while much of the populations within the National Forest boundaries occur on privately owned holdings and face an uncertain future.

REMARKS: Endemic to the Santa Ana Mountains.

Mimulus clevelandii Bdg.
CLEVELAND MONKEY FLOWER

SCROPHULARIACEAE

LOCALITIES: Santa Ana Mountains: upper Silverado, Trabuco and Hot Springs Canyons; Santiago and Modjeska Peaks; numerous other scattered localities above 2000ft.

RANK: CNPS List 4.

STATUS: Occurs exclusively on National Forest land. Relatively common at higher elevations in Orange County. Isolated from development; threatened primarily by recreational activities.

Mimulus diffusus Grant
PALOMAR MONKEY FLOWER

SCROPHULARIACEAE

LOCALITIES: Santa Ana Mountains in the vicinity of Trabuco Peak.

RANK: CNPS List 4.

STATUS: Uncertain: last encountered in 1980.

Monardella macrantha Gray ssp. *hallii* Abrams
HALL'S MONARDELLA

LAMIACEAE

LOCALITIES: Santa Ana Mountains: Modjeska Peak area. Associated with rock slides and scree slopes.

RANK: CNPS List 1B; Federal Candidate List 3.

STATUS: The scattered populations all occur on National Forest Land.

Ophioglossum lusitanicum L. ssp. *californicum* (Prantl.) Clausen OPHIOGLOSSACEAE
CALIFORNIA AADER'S TONGUE

LOCALITIES: Temple Hill above Blue Bird Canyon in Laguna Beach; vernal pool associate.

RANK: CNPS List 4; Federal Candidate List 3C.

STATUS: Known only from a single small population on privately owned land. The city of Laguna Beach is aware of the population.

Perideridia gairdneri (H. & A.) Mathias ssp. *gairdneri* APIACEAE
GAIRDNER'S YAMPAH

LOCALITIES: Huntington Beach, on swampy land.

RANK: CNPS 1B; Federal Candidate List 2.

STATUS: Presumed extirpated from Orange County. Last collected near the Bolsa Chica Gun Club in 1932.

Phacelia suaveolens Greene ssp. *keckii* (M. & J.) Thorne HYDROPHYLLACEAE
SWEET-SCENTED PHACELIA

LOCALITIES: Santa Ana Mountains: Pleasants Peak and Modjeska Peak. Associated with knobcone pine, coulter pine forest or chaparral.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: Rarely encountered; found only on National Forest lands at high elevations in the Santa Ana Mountains.

REMARKS: Found only in the Santa Ana Mountains. Recently observed in 1981 and 1988.

Physalis greenei Vasey & Rose SOLANACEAE
GREENE'S GROUND CHERRY

LOCALITIES: San Joaquin Hills: above Moro Canyon; Sycamore Hills and in the foothills of the Santa Ana Mountains north of San Juan Canyon. Frequently associated with burns.

RANK: CNPS List 3.

STATUS: Sporadic in occurrence. Two of three recently seen populations occur at Crystal Cove State Park or at Casper's Regional Park. The third site was eliminated in 1986 through grading of a residential project.

Polygala cornuta Kell. var. *fishiae* (Parry) Munz POLYGALACEAE
FISH'S MILKWORT

LOCALITIES: Laguna Beach: Temple Hill; Santa Ana Mountains: Lost Women Canyon, Upper Hot Springs Canyon, Blue Jay Campground and San Juan Canyon. Associated with mixed and toyon chaparrals.

RANK: CNPS List 4.

STATUS: Most populations occur within the National Forest boundary at relatively isolated sites. All coastal populations occur at the southern end of the San Joaquin Hills within the boundaries of Laguna Beach. The city is aware of these populations.

Quercus dumosa Nutt. FAGACEAE
COASTAL SCRUB OAK

LOCALITIES: San Joaquin Hills: Pelican Hill; Niguel Hill; Aliso Canyon and Dana Point Headlands. Restricted to within 2 miles of the coast.

STATUS: Very restricted in Orange County with nearly all populations threatened by proposed and approved development projects. The Pelican Hill population only confirmed in 1988 was eliminated 1989 by the Pelican Hill alignment. The Dana Point Headland population, smallest of all, occurs on a site that received preliminary approval for development in 1984 but was not discovered until that same year. The Laguna Niguel population was greatly impacted in 1985-1986 while the only untouched populations occur within the proposed Aliso-Wood Canyon Regional Park and in Los Trancos Canyon.

REMARKS: Dr. Kevin Nixon recently re-evaluated California scrub oaks and though much of his work is still in the process of completion, it became evident that *Quercus dumosa* should be applied only to a restricted form of coastal scrub oaks occurring from Santa Barbara County to Punta Banda, Baja California. Dr. Nixon's work will be completed shortly and a manuscript is in preparation. The restricted distribution and the development threats confronting this oak do not allow for the normal slow pace of science to take its course.

Quercus engelmannii Greene
ENGELMANN'S OAK

FAGACEAE

LOCALITIES: Casper's Regional Park and Rancho Mission Viejo.

RANK: CNPS List 4.

STATUS: Several plants occur within Casper's Regional Park, most occur on private lands without protection and face an uncertain future. True Engelmann's oak is very rare in Orange County.

Quercus lobata Nee
VALLEY OAK

FAGACEAE

LOCALITIES: Moro Canyon, Crystal Cove State Park.

RANK: CNPS List 4.

STATUS: Only known population in Orange County occurs on State Park land and is protected. The few remaining plants are relics.

Romneya coulteri Harv. var. *coulteri*
COULTER'S MATILIJIA POPPY

PAPAVERACEAE

LOCALITIES: Santa Ana Canyon; Rancho Mission Viejo along Highway 74; Audubon Starr Ranch; Santa Ana Mountains: Silverado, Santiago, Trabuco and San Juan Canyons, elev. 400-2500ft; associated with coastal sage scrub, chaparral or sycamore woodland.

RANK: CNPS List 4.

STATUS: Most recorded populations occur within the National Forest Boundary, the Audubon Preserve or Casper's Regional Park. Other populations are expected in the Fremont-Black Star Canyon area on private land. The status of the Santa Ana Canyon population is uncertain at this time.

Sagittaria sandfordii Greene
SANFORD'S ARROW-HEAD

ALISMATACEAE

LOCALITIES: Huntington Beach: East Garden Grove-Wintersburg Flood Channel.

RANK: CNPS List 3.

STATUS: Unknown but certainly rare in Orange County. Collected once in 1975.

Satureja chandlerii (Bdg.) Druce
SAN MIGUEL SAVORY

LAMIACEAE

LOCALITIES: Santa Ana Mountains: Hot Springs Canyon, San Juan Canyon, Blue Jay Campground and Chiquito Basin, mostly above 1100ft. Associated with oak woodland and canyon woodlands.

RANK: CNPS List 4; Federal Candidate List 2.

STATUS: All known sites in Orange County occur on National Forest land. The species is relatively common in the mountains of eastern Orange County. Primary threats are recreational activities and fire. In 1989, Los Pinos Portero (Chiquito Basin) was proposed as an International Airport site. Such a project would destroy 70% of the Orange County population.

Selaginella cinerascens A.A. Eat.
MESA SPIKE MOSS

SELAGINELLACEAE

LOCALITIES: Rancho Mission Viejo west of Christianitos Canyon and central Shady Canyon of the San Joaquin Hills within Irvine City limits.

RANK: CNPS List 4.

STATUS: Uncertain. Both populations in Orange County face development threats.

REMARKS: First discovered in Orange County west of Christianitos Canyon in 1986. The Shady Canyon population in the San Joaquin Hills of Irvine represents the northernmost known population of this species.

LOCALITIES: Anaheim Bay, Bolsa Chica Salt Marsh and Upper Newport Back Bay. Formally more common in western coastal Orange County. Salt marsh obligate species.

RANK: CNPS List 4.

STATUS: Relatively common where found but habitat, once fairly widespread is now greatly restricted. Populations occur mostly within Ecological Preserves.

Tetradococcus dioicus Parry
SAN DIEGO BUTTON BUSH

EUPHORBIACEAE

LOCALITIES: San Juan Canyon, Santa Ana Mountains, associated with gabbro derived soils in chaparral.

RANK: CNPS List 1B; Federal Candidate List 2.

STATUS: Unknown, collected only once in 1933 near Lower San Juan Campground. The site is on National Forest land.

Verbesina dissita Gray
BIG-LEAVED CROWN-BEARD

ASTERACEAE

LOCALITIES: Coastal slopes of Temple and Niguel Hills in Laguna Beach and South Laguna. Associated with Cneoridium sage scrub.

RANK: State Threatened. CNPS List 1B.

STATUS: Very restricted in distribution, total area approximately 20 acres (in U.S. or Orange County!) Since the plant grows on relatively rugged terrain that often affords sweeping ocean views, it is subject to slow, but persistent piecemeal residential development projects and associated road projects. The city of Laguna Beach is aware of the plant but frequently is one step behind fuel modifications and private ventures that occur within the plants distribution.

REMARKS: Elevated to State Listed Threatened in 1989.

REFERENCES

- Beauchamp, R.M. 1986. *A Flora of San Diego County, California*. Sweetwater River Press.
- Roberts, F.M. 1989. *A Checklist of the vascular plants of Orange County*. Museum of Systematic Biology Research Series No. 6, University of California, Irvine.
- _____. Unpublished. *Data Base for the Vascular Plants of Orange County*. Museum of Systematic Biology, University of California, Irvine.
- Smith, J.P & K. Berg. 1988. *Inventory of Rare and Endangered Vascular Plants of California*. California Native Plant Society Spec. Publ. 1, 4th Ed.

ACKNOWLEDGEMENTS: I would like to thank Dave Bramlitt, Karlin Marsh, Connie Spenger and others for helping me gather information toward compiling this list, Robert Allen and Carol Roberts for editing, and Kathy Nowak for forcing me to put it together in the first place.

FIELD TRIPS

March 30-April 1 (Saturday-Sunday). Catalina Weekend. The South Coast Chapter of CNPS is sponsoring this trip to Catalina Island. It will be led by Terry Martin of the Catalina Island Conservancy. For information contact Ellen Frank (213) 534-8844.

Wildflower Show - April 7-8 (Saturday-Sunday). Main foyer of the L.A. County Museum of Natural History in Exposition Park. Exit the Harbor Freeway at Exposition Blvd. and follow the signs to the museum. Admission: Adults \$3.00, Seniors and Students \$1.50, Children \$0.75. For information call Margaret Huffman (213) 454-4279.

Theodore Payne Foundation Open House and Plant Sale - April 7 (Saturday). Visit the 3-acre naturalized wildflower area called Wildflower Hill which might just be the best place to see wildflowers this year. Informative posters about California native plants available. Take advantage of special prices for spring planting season. Location: 10459 Truxford Street, Sun Valley.

Native Plant Project, Irvine Park - April 14 (Saturday). Volunteers are needed to mulch the native plants at Irvine Park. Work extends from 8:00 AM to Noon. It is helpful to have gloves, pitchfork, shovel, rake, or a wheelbarrow. Please call Susan Sheakley a week in advance so the leaders will know how many helpers they will have. Phone (714) 552-5974.

Ojai's "Bloomingest" Canyon - April 21 (Saturday). Rick Burgess will lead a moderate hike in the Ojai area. Rick promises to scout out the trails to find the canyon with the most spring wildflowers. We should see many of our old favorites (flowers as well as people) in addition to a few surprises. Meet at the Von's parking lot at the "Y" in Ojai (Corner of Ojai Ave. and Hwy 33) at 9:00 AM. Bring lunch and water. Trip should be over after lunch.

Featherly Park, Santa Ana Canyon - April 22 (Sunday). As part of a full slate of activities in honor of EARTH DAY, Allan Schoenherr will lead a walk along the Riparian Woodland in Featherly Park. Topics of discussion will include flood plain dynamics, the influence of Prado Dam, and the impact of further channelization projects on one of southern California's most endangered ecosystems. The trip will run from 9:00 to 11:00 AM. Meet at the entrance to Featherly Park. Exit Highway 91 at Gypsum Canyon.

Santa Rosa Plateau - April 22. The San Gabriel Mountains Chapter of CNPS is sponsoring this activity at the unique area of native grasslands, vernal pools, and Engelmann Oak south of Lake Elsinore in the Santa Ana Mountains. Leaders are Dr. Jon Keeley and Dr. Gary Bell of Occidental College along with the Nature Conservancy. Reservations are required. Contact Melanie Baer (818) 768-1802 or George Stevenson (213) 472-5464.

Fullerton Arboretum - April 28 (Sunday). Terry Daubert will lead this trip to examine native plants and native plant groupings at the Fullerton Arboretum. Meet at 9:00 AM at the Arboretum on the campus of Cal State Fullerton. Exit the Orange Freeway (57) at Yorba Linda Blvd. Go west to the first signal and turn south to enter the campus. The arboretum parking lot is on the left. For more information contact Terry Daubert at (714) 869-4062.

Red Rock Canyon and Edwards Air Force Base - May 5-6 (Saturday-Sunday). Join botanist David Charlton for a fascinating look at several desert ecosystems few of us have had the chance to visit. Plant communities we will see on Saturday include Shadscale Scrub, Creosote Bush Scrub, Joshua Tree Woodland, and sand dune areas. If we are lucky, we will find Alkali Mariposa Lily, Calochortus striatus, and Mojave Spineflower, Chorizanthe spinosa, both CNPS listed plants. Saturday evening we will camp at either Red Rock Canyon State Park or a primitive camp in the El Paso Mountains. On Sunday we will look for several rare plants at Red Rock Canyon, including Red Rock Tarplant, Hemizonia arida. The trip should be over about noon. Meet Saturday morning at 10:00 AM at the corner of 140th and B Street. Take Highway 58 east from Highway 14, turn right on Rich Rd., turn right at T and continue to Avenue B, turn right and continue to 140th Street. For information call Trisha Burgess at (805) 983-1312.

April 29 (Sunday) 9:AM Bachelor Mtn. Steve Boyd of the Rancho Santa Ana Botanic Garden will lead this trip to examine unusual clay endemics found on the slopes of Bachelor Mountain. We will be looking for Munz's Onion, Palmer's Grappling Hook and Paysen's Jewelflower. The area has recently burned so a large number of wildflowers will also be present along the bare slopes of the

mountain. We will meet at the Lake Skinner County Park at the old school house, which is just north of the entrance. Be prepared to pay the day use fee for the park. To reach the park take the I-15 south to Rancho California Rd (Temecula) and go east. Continue on Rancho California Rd. for about 7 miles until it deadends into Buck Rd. Go east (right) and then left onto Warren Rd and into the Park. Some aspects of the trip are still tentative, so please send a SASE to: David Bramlet, 1691 Mesa Dr. A-2 Santa Ana CA 92707, if you plan to attend.

Vandenburg Air Force Base - May 5 (Saturday). Space limited, reservations required by April 1st. Send \$5.00 check payable to CNPS to George Stevenson, 206 S. Saltair Ave. Los Angeles 90049. For information call (213) 472-5464.

May 6 (Sunday) 9:00 AM Chiquito Basin. Fred Roberts of the UCI Systematic Museum will lead this trip to the unique Deer Grass potrero found at Chiquito Basin in the Santa Ana Mountains. We will see large areas of chaparral, oak woodland and native grassland. This area also contains the largest population of the San Miguel Savory, Satureja chandleri, which should be in flower. Bring a lunch, sun protection, water and a hand lens. We will meet at the intersection of the Ortega Highway (74) and Forest Service road # 6S05 that leads to the Los Pinos conservation camp. Some aspects of the trip are still tentative, so please send a SASE to: David Bramlet, 1691 Mesa Dr. A-2 Santa Ana CA 92707, if you plan to attend.

Plants of the Passes, Santa Barbara area - May 12 (Saturday). This promises to be an extremely interesting trip. We will join Santa Barbara Botanic Garden botanist, Steve Junak, for a look at the relict woodlands of the mountain passes in and around Santa Barbara. As California's climate has become drier during recent geologic times, unique woodlands containing species with northern affinities have become isolated on mountain passes. We will visit San Marcos, Refugio and Gaviota Passes. If time permits we will also visit Jualachichi summit. Meet at 9:00 AM at the Santa Barbara Botanic Garden parking lot. Bring lunch and water.

San Rafael Mountain - May 26-27 (Saturday-Sunday). Backpack or mountain bike trip extending into wilderness area. Reservations by May 1 to George Stevenson. Meet at 10:00 AM at Cachuma Saddle Ranger Station. Bring all backpacking gear. Trip passes through various plant communities on the way up to San Rafael Mountain (6,593 ft. elevation). For information call (213) 472-5464.

Circle X Ranch, Santa Monica Mountains - June 9 (Saturday). This former Boy Scout Camp, newly aquired by the National Park Service, contains miles of hiking trails and the highest peak in the Santa Monica Mountains. Join Rick Burgess for a hike along the Mishe Mokwa trail where we should see lots of late spring/early summer wildflowers. Meet at 9:00 AM at the Circle X Ranch Headquarters, 5 miles north of Highway 1 on Yerba Buena Road. Bring lunch and water. For information, call Trisha Burgess at (805) 983-1312.

Trail Maintenance with the Sierra Club

APR 21-22

SAT-SUN

ORANGE CO/TRAILS

O: San Mateo Trail--Trail Maintenance: Celebrate State Trails Day with us and repair historic trail in heart of the San Mateo Cyn Wilderness. No experience reqd. Bring swim suit, gloves, tools if possible--otherwise USFS will supply tools. 4 to 5 mi 300' gain hike to camp. Overnight backpack, camp next to San Mateo Creek. Meet 7 am at Sta Ana Cyn carpool pt. Leader experience trip. Leader: BILL MAUTZ. Assts: KEN CROKER and DAVE SHUMAN.

MAY 19-20

SAT-SUN

ORANGE CO/TRAILS

O: San Mateo Trail--Trail Maintenance: 15th annual swimming and gourmet cooking trip plus help repair this trail in heart of the San Mateo Cyn Wilderness. No experience reqd. Bring swim suit, gloves, tools if possible-- otherwise USFS supplies tools. 3 mi hike to camp. Overnight backpack, camp next to San Mateo Creek. Single day volunteers welcome. Meet 7 am at Sta Ana carpool pt. Leader: KEN CROKER. Assts: CAROLYN CROKER and BERNIE LIPMAN.

Announcements

EARTH DAY 1990:

In honor of EARTH DAY the Orange County Fund for Environmental Defense is sponsoring a series of activities as follows:

For Earth Day 1990, OCFED is sponsoring "Celebrate the River" on April 22. Its member groups are sponsoring activities along the river between Featherly Park, its uppermost boundary in Orange County, to Pacific Coast Highway, where it empties into the ocean.

This concept is suitable because the River flows through many types of habitats; canyons, foothills, urban, riparian, etc. and thus has widespread significance to many residents and groups. The river also lends itself for activities because it has a bike path along its route and many parks for staging purposes. Earth Day 1990 will also draw attention to the fact that it is a much maligned and much threatened river. Of particular interest is the fact that the mouth of the river, our last unprotected estuary, is scheduled by the landowner for eventual development.

NATURE WALKS:

8 AM - 10 AM: Tri-County Conservation League naturalists will lead free 1-hour nature walks at Featherly Park, in Santa Ana Canyon. Call (714) 996-5078 for more information.

8 AM - 10 AM: Charlotte Clarke, author of Edible and Useful Plants of California, will lead a nature walk of the Victoria Pond/Santa Ana River area. Meet at Vista Park, corner of Victoria Ave. and the river in Costa Mesa. Sponsored by Friends of the Santa Ana River. Call (714) 786-8878 for more information.

9 AM-11 AM: Dr. Allan Schoenherr, author of The Natural History of California will conduct a free nature walk at Featherly Park, in Santa Ana Canyon. Sponsored by the Southern California Botanists. Call 992-7129 for further information.

BIRDWALK:

8 AM - 10 AM: Fullerton College Natural Science Professor Charles Leveall will conduct a birdwatching walk along the Santa Ana River. Meet at Yorba Regional Park parking lot 9. Bring binoculars. Phone 992-7541 for further information.

EARTHWALK:

8 AM: The Orange County Fund for Environmental Defense is presenting a seven mile walk along the Santa Ana River trail from Centennial Park in Santa Ana to the ocean. Shuttles will return walkers to the park. Walk starts at 8:30. Lunch available. \$1 donation requested. Many ongoing activities in the park all day. For a map and details, send a self-addressed stamped envelope to PO Box 9118, Fountain Valley, 92708. Sponsoring groups include: American Cetacean Society (phone 636-9714), Coyote Hills Committee (phone 525-8038), Huntington Beach Tomorrow (phone 536-8667), Bicycle Club of Irvine, (854-8106) Laguna Canyon Conservancy (859-HELP), Rural Canyons Conservation Fund (phone 858-0157), Sierra Club, Orange County Group (phone 751-1408), Sierra Singles (phone 671-5993)

BICYCLING:

8:30 - Noon: Bicycle Safety and Helmet Awareness Program at Centennial Park, Edinger and Santa Ana River, Santa Ana, sponsored by the Bicycle Club of Irvine (854-8106).

8:30 Orange County Sierra Singles will be conducting a bicycle ride of 30-35 miles along the Santa Ana River via the beach, Upper Newport Bay and Balboa. Meet at Centennial Park bike trail entrance on Edinger and the river, Santa Ana. Bring water, lunch, spare tube and helmet. Phone 631-8071 for further information.

9:00 Guided bicycle rides by the Bicycle Club of Irvine. Choice of 23, 30, 40 or 50 mile routes. Meet at Deerfield Community Park on Deerwood and Irvine Center Dr., Irvine. Ride to Centennial Park to view demonstrations and exhibits. (phone 854-8106).

1 PM: Little Critters Walk - Entomologist, Dr. Leonard Vincent of Fullerton College will lead a walk along the river at Centennial Park, Santa Ana. You'll be fascinated at the hidden secrets of nature's little things.

2 PM: Raffle and Drawing at Earth Festival, Centennial Park. Lots of valuable prizes. You need not be present to win. Tickets \$1.

3 PM: Weed Walk - Charlotte Clarke, author of Edible and Useful Plants of California - the Weed Lady of Orange County - will lead a walk among the local weeds to show you just how edible and useful they are. Autographed copies of her book will be on sale at the festival.

EARTH FESTIVAL

At Centennial Park, Edinger and Fairview in Santa Ana. An all day festival featuring earth day themes of Rainforests, Endangered Species, Energy Conservation, Recycling (get Cash for your Trash), nature artwork, transportation alternatives, nature walks and cycling events and costumed characters for the kids. Raffle for many valuable prizes.

OTHER EARTH DAY ACTIVITIES

John Muir's Birthday Event at Caballero Canyon - April 21. Meet at 8:00 AM with the Santa Monica Mountains Chapter of CNPS and the Sierra Club at the south end of Reseda Blvd. near "hiker" signs. Bring water and lunch. For information call (818) 344-8714.

Trail Days in the Santa Monica Mountains - April 21-22. Meet at 9:00 AM at the entrance to Big Sycamore Canyon. Jo Kiltz will lead thistle bashers in the area that burned along the first mile of the canyon. Bring heavy gloves, lunch, water, and a "goody" to share at the end of the day. Camping available for Saturday night. For information contact Jo Kiltz (818) 348-5910.

Biodiversity Faire - April 21-22. CNPS chapters in the L.A. area are participating in this event to be held at the L.A. County Museum of Natural History. For information contact Angelika (213) 519-8164.

Upper Newport Bay Ecological Reserve - April 22. Festivities will continue from 11:00 AM to 3:00 PM at the Big Canyon parking lot along Back Bay Drive. Activities will include guided walks, kelp pressing, fish printing, tree plantings, native hawks and owls, and environmental booths. For information call (714) 640-6746.



SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SOUTHERN CALIFORNIA BOTANISTS is an organization of individuals devoted to the study, preservation, and conservation of the native plants and plant communities of southern California. The journal, CROSSOSOMA, published bimonthly, carries articles of interest to amateur and professional botanists. It is a non-profit organization formed in 1927.

Membership benefits include:

Field trips led by competent botanists and biologists.

A yearly plant sale featuring native California and drought-tolerant species.

An annual symposium on various aspects of California vegetation.

The SCB journal, CROSSOSOMA

Discounts on botanical and natural history books.

Membership categories include:

___ Individual (family) \$ 8.00 ___ New Member
___ Group or organization \$15.00 ___ Renewal

APPLICATION

Date _____

Name _____

Address _____

City, State, Zip Code _____

Phone () _____

In addition, I want to give \$ _____ to help support SCB.

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS

Mail to: Alan P. Romsper
 Southern California Botanists
 Department of Biological Sciences
 California State University, Fullerton
 Fullerton, CA 92634

CROSSOSOMA (ISSN 0891-9100) is published bimonthly (February, April, June, August, October, and December) by Southern California Botanists, a California non-profit corporation. Back issues of CROSSOSOMA are available for \$2.00 an issue (plus 25¢ postage) or \$8.00 a volume (plus \$1.00 postage). Send a check with your request to Alan P. Romsper, Treasurer, at the above address. Manuscripts submitted for publication should be addressed to Dr. Allan A. Schoenherr, Editor of CROSSOSOMA, Division of Biological Sciences, Fullerton College, Fullerton, CA 92634.

SCB COMING EVENTS (DETAILS WITHIN)

March 30-April 1	Catalina Island
April 7	Theodore Payne Foundation
April 14	Irvine Park, Native Plant Project
April 21	Ojai "Bloomingest" Canyon
April 22	Featherly Park
April 22	Santa Rosa Plateau
April 28	Fullerton Arboretum
April 29	Bachelor Mountain
May 5-6	Edwards Air Force Base and Red Rock Cyn.
May 5	Vandenberg Air Force Base
May 6	Chiquito Basin
May 12	Santa Barbara, Plants of the Passes
June 9	Santa Monica Mountains, Circle X Ranch

SOUTHERN CALIFORNIA BOTANISTS
 Rancho Santa Ana Botanic Garden
 1500 North College Avenue
 Claremont, CA 91711

LIBRARY

APR 23 1990

NEW YORK

BOTANICAL GARDEN

*New York Botanical Garden
 Library - Serials & Exchange
 Bronx, New York 10458-5126*





CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

CROSSOSOMA Volume 16, Number 3
Managing Editor: Allan A. Schoenherr

June 1990

ORANGE COUNTY II

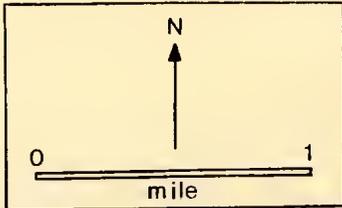
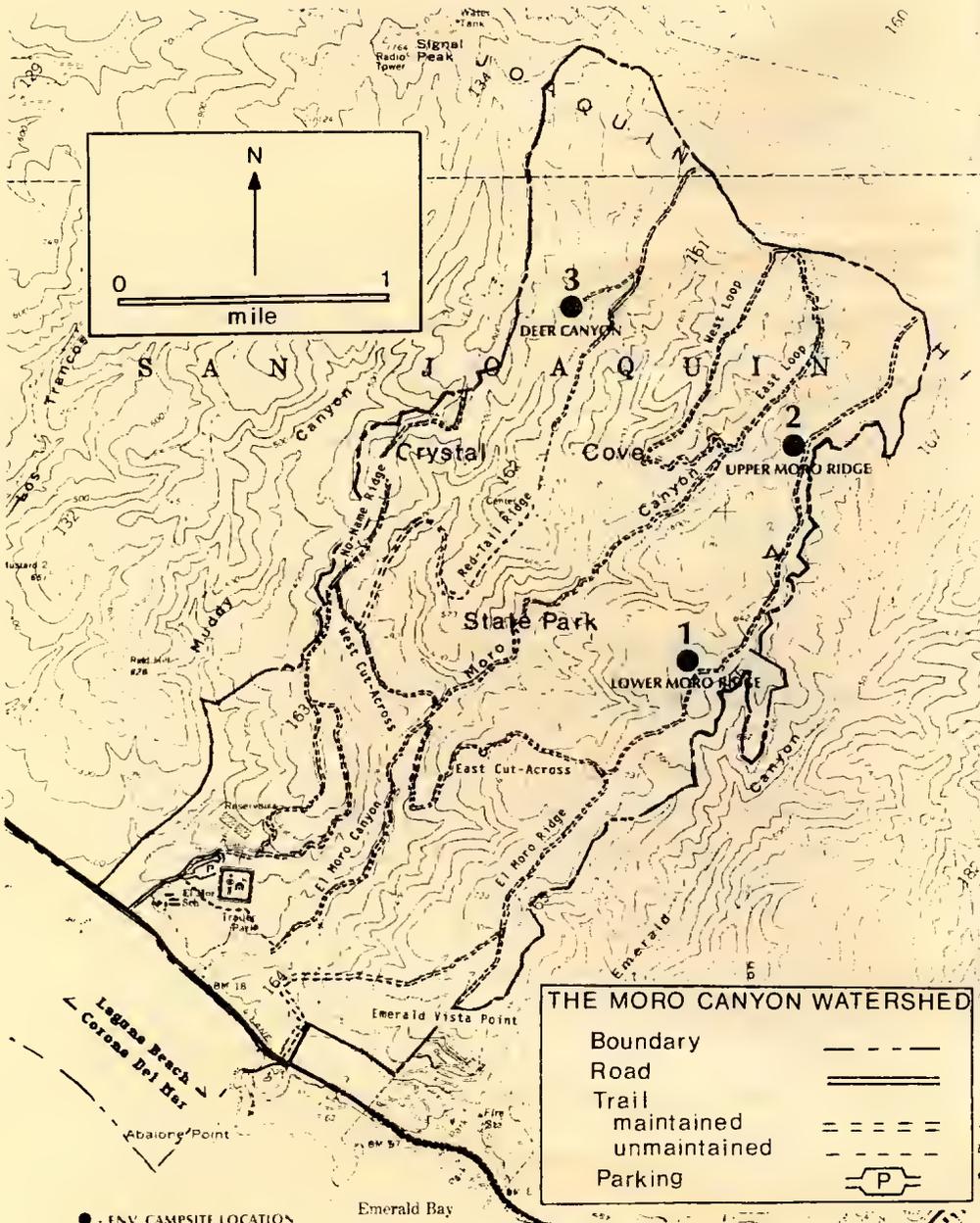
This is the second issue of CROSSOSOMA that contains a list of plants found in Orange County. The last issue featured a list of Orange County's rare or endangered plants. It was compiled by Fred Roberts of the Museum of Systemic Biology at the University of California, Irvine. Fred is also the author of the Checklist of Vascular Plants of Orange County.

This issue includes plants found in Crystal Cove State Park and was compiled by Sarah Jayne, a State Park Docent. She developed the list from herbarium specimens and several lists on file at the Crystal Cove Ranger Station. The final list was reviewed by several members of the SCB Board of Directors and by Fred Roberts.

Most of the native plants of Crystal Cove State Park are associated with Coastal Sage Scrub. As such, this list will be an important reference for species found in that community. Other communities found in the State Park include Southern Oak Woodland, and Riparian Woodland. Of particular interest among the plants of Crystal Cove State Park is the presence of a small number of oak trees in Moro Canyon that have been identified as MacDonald Oak, *Quercus macdonaldi*, a species that probably arose as a hybrid between California Scrub Oak, *Quercus berberidifolia* (= *Quercus dumosa*) and Valley Oak, *Quercus lobata*. MacDonald Oak usually is considered to be found only on islands, in which case this may be its only mainland locality. In his list of rare and endangered plants of Orange County, Fred Roberts considered these trees to be the southernmost specimens of Valley Oak.

Allan A. Schoenherr, Editor

CRYSTAL COVE STATE PARK



THE MORO CANYON WATERSHED

Boundary	-----
Road	=====
Trail	-----
maintained	-----
unmaintained	- - - - -
Parking	[P]

- - ENV. CAMPSITE LOCATION
- 1 - LOWER MORO RIDGE
- 2 - UPPER MORO RIDGE
- 3 - DEER CANYON

PLANTS OF THE CRYSTAL COVE BACKCOUNTRY

FAMILY NAME	SPECIES	COMMON NAME	H	I
ADIANTACEAE - LIP FERN FAMILY	<i>Adiantum jordanii</i>	California maiden-hair		
	<i>Peilaea andromedaefolia</i>	Coffee fern		
	<i>Pityrogramma triangularis</i>	Goldenback fern		
	<i>Pteridium aquilinum</i>	Bracken fern	Y	
AMARYLLIDACEAE - AMARYLLIS FAMILY	<i>Bloomeria crocea</i>	Golden stars	Y	
AMARYLLIDACEAE - AMARYLLIS FAMILY	<i>Dichelostemma pulchellum</i>	Blue dicks; wild-hyacinth	Y	
ANACARDIACEAE - SUMAC FAMILY	<i>Malosma laurina</i>	Laurel sumac	Y	
	<i>Rhus integrifolia</i>	Lemonadeberry		
	<i>Toxicodendron diversifolium</i>	Poison-oak		
APIACEAE - CARROT FAMILY	<i>Apium angustifolium</i>	Wild celery, mock parsley	Y	*
	<i>Apium graveolens</i>	Celery	Y	
	<i>Berula erecta</i>	Cut-leaved water-parsnip	Y	
	<i>Caucalis microcarpa</i>	California hedge parsley	Y	
	<i>Conium maculellum</i>	Common poison-hemlock	Y	*
	<i>Sanicula crassicaulis</i>	Pacific sanicle; snakeroot	Y	
ASCLEPIADACEAE - MILKWEED FAMILY	<i>Asclepias eriocarpa</i>	Indian milkweed		
	<i>Asclepias fuscicularis</i>	Narrow-leaved milkweed	Y	
	<i>Dryopteris erguta</i>	Coastal wood fern		
ASPIDIADACEAE - WOOD FERN FAMILY	<i>Amblyopappus pusillus</i>	Coast weed	Y	
ASTERACEAE - SUNFLOWER FAMILY	<i>Ambrosia psilostachya</i>	Western ragweed	Y	
	<i>Artemisia californica</i>	California sagebrush	Y	
	<i>Artemisia douglasiana</i>	California mugwort	Y	
	<i>Artemisia dracunculul</i>	Dragon sagewort	Y	
	<i>Baccharis pilularis</i>	Coyote brush		
	<i>Baccharis salicifolia</i>	Mulefat	Y	
	<i>Brickellia californica</i>	Callifonia bricckell bush	Y	
	<i>Chrysanthemum coronarium</i>	Garland chrysanthemum	Y	*
	<i>Coryza coulteri</i>	Couller's horseweed		
	<i>Corethrogyne filaginifolia</i>	Tomentose cudweed aster	Y	
	<i>Cotula coronopifolia</i>	African brass-buttons	Y	*
	<i>Cynare cardunculus</i>	Artichoke thistle; cardoon	Y	*
	<i>Encelle californica</i>	Callifonia encelia	Y	*
	<i>Ericameria palmeri</i>	Palmer's ericameria	Y	
	<i>Ericameria pinnifolia</i>	Pine goldenbush	Y	
	<i>Eriophyllum confertiflorum</i>	Golden yarrow	Y	
	<i>Filago californica</i>	Callifonia fluffweed	Y	
	<i>Gnaphalium beneolens</i>	Fragrant everlasting	Y	
	<i>Gnaphalium bicolor</i>	Bioletti's cudweed		
	<i>Gnaphalium californicum</i>	Callifonia everlasting	Y	

Y - in herbarium * - introduced species

PLANTS OF THE CRYSTAL COVE BACKCOUNTRY

FAMILY NAME	SPECIES	COMMON NAME	H	I
ASTERACEAE - SUNFLOWER FAMILY	<i>Gnaphalium chilense</i>	Cotton batting plant	Y	
	<i>Gnaphalium luteo-album</i>	Weedy cudweed	Y	
	<i>Gnaphalium microcephalum</i>	White everlasting		
	<i>Gnaphalium palustrium</i>	Lowland cudweed		
	<i>Gnaphalium ramosissimum</i>	Pink everlasting		
	<i>Grindelia robusta</i>	Gum plant	Y	
	<i>Helianium puberulum</i>	Rosilla		
	<i>Helianthus annuus</i> ssp. <i>lenticularis</i>	Western sunflower		
	<i>Hemizonia fasciculata</i>	Fascicled tarweed	Y	
	<i>Heterotheca grandiflora</i>	Telegraph weed	Y	
	<i>Hypochoeris glabra</i>	Smooth cat's ear	Y	
	<i>Hypochoeris radicata</i>	Hairy cat's ear	Y	
	<i>Isocoma veneta</i> var. <i>sedoides</i>	Succulent goldenbush	Y	
	<i>Isocoma veneta</i> var. <i>vernonioides</i>	Coast golden bush		
	<i>Leschenia coronaria</i>	Southern goldfields	Y	
	<i>Lasthenia glabrata</i> var. <i>coulteri</i>	Goldfields, smooth lasthenia	Y	
	<i>Malacothrix saxatilis</i>	Malacothrix	Y	
	<i>Raietmesque californica</i>	California chicory		
	<i>Senecio californicus</i>	California butterweed	Y	
	<i>Silybum marianum</i>	Milk thistle	Y	
	<i>Sonchus asper</i>	Prickly sow thistle	Y	
	<i>Sonchus oleraceus</i>	Common sow's thistle	Y	
	<i>Stephanomeria virgata</i>	Stephanomeria, tall wreath plant	Y	
<i>Xanthium strumarium</i>	Spiny clobur	Y		
<i>Xanthium spinosum</i>	Cocklebur	Y		
<i>Amsinckia intermedia</i>	Common fiddleneck			
<i>Cryptantha intermedia</i>	Common forget-me-not, common cryptanth	Y		
<i>Heliotropium curassavicum</i> ssp. <i>oculatum</i>	Salt or alkali heliotrope	Y		
<i>Brassica geniculata</i>	Shoripod or summer mustard	Y		
<i>Brassica nigra</i>	Black mustard	Y		
<i>Capsella bursa-pastoris</i>	Shepherd's-purse	Y		
<i>Cardamine californica</i>	Toothwort			
<i>Lepidium nitidum</i>	California shining peppergrass			
<i>Nasturtium officinale</i>	White watercress			
<i>Raphanus sativus</i>	Wild radish			
<i>Sisymbrium irio</i>	London rocket	Y		
<i>Sisymbrium officinale</i>	Hedge mustard	Y		
<i>Sisymbrium orientale</i>	Hare's-ear cabbage	Y		
<i>Opuntia littoralis</i>	Coastal prickly pear	Y		

Y - in herbarium * - introduced species

PLANTS OF THE CRYSTAL COVE BACKCOUNTRY

FAMILY NAME	SPECIES	COMMON NAME	H	I
CACTACEAE - CACTUS FAMILY	<i>Opuntia prolifera</i>	Coastal cholla	Y	
CAPPARIDACEAE - CAPER FAMILY	<i>Isomeris arborea</i>	Bladder pod	Y	
CAPRIFOLIACEAE - HONEYSUCKLE FAMILY	<i>Sambucus mexicana</i>	Blue elderberry	Y	
	<i>Symphoricarpos mollis</i>	Spreading snowberry	Y	
CARYOPHYLLACEAE - PINK FAMILY	<i>Cardionema ramosissimum</i>	Sand mat	Y	
	<i>Silene gallica</i>	Windmill pink; common catchfly	Y	
	<i>Stellaria media</i>	Common chickweed	Y	
CHENOPODIACEAE - GOOSEFOOT FAMILY	<i>Chenopodium album</i>	Lamb's quarter	Y	
	<i>Chenopodium amprosioides</i>	Mexican tea	Y	
	<i>Chenopodium californicum</i>	California goosefoot	Y	
	<i>Chenopodium murale</i>	Nettle-leaved goosefoot	Y	
	<i>Salsola australis</i>	Russian thistle; tumbleweed	Y	
CONVOLVULACEAE - MORNING-GLORY FAMILY	<i>Calyptegia macrostegia</i>	Bindweed; native	Y	
	<i>Convolvulus arvensis</i>	Field bindweed	Y	
	<i>Cuscuta californica</i>	Dodder; California witch's hair	Y	
CRASSULACEAE - STONECROP FAMILY	<i>Dudleya lanceolata</i>	Lance-leaved live-forever		
	<i>Dudleya multicaulis</i>	Many-stemmed live-forever		
	<i>Dudleya pulverulenta</i>	Chalk lettuce; chalky life-forever		
CUCURBITACEAE - GOURD FAMILY	<i>Cucurbita foetidissima</i>	Coyote melon; catabazilla	Y	
	<i>Marah macrocarpus</i>	Wild cucumber; manroot	Y	
CYPERACEAE - SEDGE FAMILY	<i>Carex</i> sp.	Sedge		
	<i>Scirpus cernuus</i> var. <i>californicus</i>	California club rush	Y	
	<i>Scirpus kololepis</i>	Long-leaved club rush		
	<i>Scirpus maritimus</i>	Alkali bullrush	Y	
DENNSTAEDTIACEAE - FERN FAMILY	<i>Pteridium equilinum</i>	Western bracken fern		
EUPHORBIACEAE - SPURGE FAMILY	<i>Croton californicus</i> var. <i>californicus</i>	California croton		
	<i>Eriemocarpus setigerus</i>	Turkey mullien; doveweed		
	<i>Ficus communis</i>	Castor-bean		
FABACEAE - PEA FAMILY	<i>Astragalus didymocarpus</i> var. <i>didymocarpus</i>	White dwarf locoweed	Y	
	<i>Lathyrus vestitus</i> ssp. <i>atefeldii</i>	San Diego sweet pea	Y	
	<i>Lotus scoparius</i>	Deerweed	Y	
	<i>Lotus strigosus</i>	Lotus	Y	
	<i>Lupinus albitrions</i> var. <i>eminens</i>	Silver lupine		
	<i>Lupinus bicolor</i>	Lindley's annual lupine		
	<i>Lupinus hirsutissimus</i>	Stinging lupine	Y	
	<i>Lupinus succulentus</i>	Succulent lupine; arroyo lupine	Y	
	<i>Medicago polymorpha</i>	Bur-clover	Y	
	<i>Meiblotus alba</i>	White sweet-clover	Y	
	<i>Meiblotus indica</i>	Yellow sweet-clover	Y	

* - introduced species

Y - in herbarium

PLANTS OF THE CRYSTAL COVE BACKCOUNTRY

FAMILY NAME	SPECIES	COMMON NAME	H	I
FAGACEAE - BEECH FAMILY	<i>Quercus agrifolia</i>	Coast live oak	Y	
	<i>Quercus berberidifolia</i>	California scrub oak		
	<i>Quercus lobata</i>	Hybrid valley and scrub oak (possible)	Y	
GERANIACEAE - GERANIUM FAMILY	<i>Erodium botrys</i>	Long-beaked filaree; storksbill	Y	
	<i>Erodium cicutarium</i>	Red-stemmed filaree	Y	
	<i>Erodium moschatum</i>	White-stemmed filaree	Y	
HYDROPHYLLACEAE - WATERLEAF FAMILY	<i>Geranium carolinianum</i>	Carolina geranium	Y	
	<i>Eucrypta chrysanthemifolia</i>	Eucrypta	Y	
	<i>Phacelia cicularia</i>	Caterpillar phacelia		
	<i>Phacelia distans</i>	Common phacelia		
	<i>Phacelia parryi</i>	Parry's phacelia	Y	
	<i>Phacelia ramossissima</i>	Branching phacelia	Y	
	<i>Pholistoma auritum</i>	Blue fiesta flower	Y	
IRIDACEAE - IRIS FAMILY	<i>Sisyrinchium bellum</i>	California blue-eyed grass	Y	
JUNCACEAE - RUSH FAMILY	<i>Juncus balticus</i>	Wire rush	Y	
	<i>Juncus xiphioides</i>	Iris-leaved rush	Y	
LAMIACEAE - MINT FAMILY	<i>Marrubium vulgare</i>	Common horehound	Y	
	<i>Monardella lanceolata</i>	Horse mint		
	<i>Salvia apiana</i>	White sage		
	<i>Salvia apiana x mellifera</i>	Hybrid sage	Y	
	<i>Salvia mellifera</i>	Black sage		
	<i>Salvia spathacea</i>	Hummingbird sage	Y	
	<i>Stachys rigida ssp. quercetorum</i>	Hillside hedge-nettle	Y	
	<i>Stachys rigida ssp. rigida</i>	Rigid hedge-nettle	Y	
	<i>Trichostemma lanceolata</i>	Vinegar weed	Y	
	<i>Lemma sp.</i>	Duckweed		
LENNACEAE - DUCKWEED FAMILY	<i>Calochortus splendens</i>	Splendid mariposa lily	Y	
LILIACEAE - LILY FAMILY	<i>Malacothamnus fasciculatus</i>	Bushmallow	Y	
MALVACEAE - MALLOW FAMILY	<i>Malva parviflora</i>	Cheeseweed	Y	
	<i>Mirabilis californica</i>	Wishbone bush		
NYCTAGINACEAE - FOUR-O'CLOCK FAMILY	<i>Carnissonia bistorta</i>	Southern sun-cup	Y	
ONAGRACEAE - EVENING-PRIMROSE FAMILY	<i>Epilobium canum ssp. augustifolium</i>	California luchsia		
	<i>Plantago erecta</i>	California plantain		
PLANTAGINACEAE - PLANTAIN FAMILY	<i>Plantago major</i>	Common plantain	Y	
PLATANACEAE - SYCAMORE FAMILY	<i>Platanus racemosa</i>	Western sycamore	Y	
POACEAE - GRASS FAMILY	<i>Agrostis exarata</i>	Spike reedtop		
	<i>Agrostis stolonifera</i>	European reedtop		
	<i>Avena barbata</i>	Slender wild oat		
	<i>Avena fatua</i>	Wild oat		

* - introduced species

Y - in herbarium

PLANTS OF THE CRYSTAL COVE BACKCOUNTRY

FAMILY NAME	SPECIES	COMMON NAME	H	I
POACEAE - GRASS FAMILY	<i>Brachypodium distachyon</i>	Purple false brome		
	<i>Bromus diandrus</i>	Common ripgut grass	Y	
	<i>Bromus hordeaceus</i>	Soft chess		
	<i>Bromus rubens</i>	Foxtail chess	Y	
	<i>Bromus willdenovii</i>	Rescue grass	Y	
	<i>Cynodon dactylon</i>	Bermuda grass	Y	
	<i>Elymus condensatus</i>	Giant wild rye	Y	
	<i>Elymus glaucus</i>	Blue wild rye	Y	
	<i>Elymus triticoides</i>	Beardless wild rye	Y	
	<i>Gastridium ventricosum</i>	Nitgrass		
	<i>Hordeum murinum ssp. leporinum</i>	Hare barley	Y	
	<i>Hordeum vulgare</i>	Cultivated barley	Y	
	<i>Lamarckia aurea</i>	Golden-top		
	<i>Melica imperlecta</i>	Small-flowered melic grass	Y	
	<i>Muhlenbergia microperma</i>	Littleseed muhly	Y	
	<i>Pennisetum setaceum</i>	African fountain grass	Y	
	<i>Phalaris paradoxa</i>	Paradox canary grass	Y	
	<i>Polygonon interruptus</i>	Ditch polyogon	Y	
	<i>Polygonon monspeliensis</i>	Rabbit-foot grass	Y	
	<i>Stipa lepida</i>	Foothill needlegrass	Y	
	<i>Stipa pulchra</i>	Purple needlegrass	Y	
	<i>Vulpia myuros var. hirsuta</i>	Foxtail fescue		
	<i>Eriogonum fasciculatum</i>	California buckwheat		
	<i>Polygonum aviculare</i>	Common knot weed		
	<i>Rumex conglomeratus</i>	Whorled dock	Y	
	<i>Rumex crispus</i>	Curly dock	Y	
	<i>Rumex salicifolius</i>	Willow dock	Y	
	<i>Polygonum californicum</i>	California polypody	Y	
	<i>Claytonia perfoliata</i>	Miner's-lettuce	Y	
	<i>Anagallis arvensis</i>	Scarlet pimpernel	Y	
<i>Samolus parviflorus</i>	Water-pimpernel	Y		
<i>Clematis ligusticifolia</i>	Western virgin's bower	Y		
<i>Rhamnus ilicifolia</i>	Holly-leaved red-berry			
<i>Heteromeles arbutifolia</i>	Toyon; Christmas berry	Y		
<i>Potentilla glandulosa</i>	Sticky cinquefoil	Y		
<i>Rosa californica</i>	California wild rose	Y		
<i>Rubus ursinus</i>	California blackberry	Y		
<i>Galium angustifolium</i>	Chaparral bedstraw	Y		
<i>Galium aparine</i>	Common bedstraw	Y		
POLYGONACEAE - BUCKWHEAT FAMILY				
POLYPODIACEAE - POLYPODY FERN FAMILY				
PORTULACACEAE - PURSLANE FAMILY				
PRIMULACEAE - PRIMROSE FAMILY				
RANUNCULACEAE - CROWFOOT FAMILY				
RHAMNACEAE - BUCKTHORN FAMILY				
ROSACEAE - ROSE FAMILY				
RUBIACEAE - MADDER FAMILY				

Y - in herbarium * - introduced species

PLANTS OF THE CRYSTAL COVE BACKCOUNTRY

FAMILY NAME	SPECIES	COMMON NAME	H	I
RUBIACEAE - MADDER FAMILY	<i>Galium nuttallii</i>	Nuttall's bedstraw	Y	
SALICACEAE - WILLOW FAMILY	<i>Salix goodingii</i> var. <i>variabilis</i>	Southwestern willow	Y	
	<i>Salix laevigata</i>	Red willow	Y	
SAURURACEAE - LIZARD-TAIL FAMILY	<i>Salix lasiolepis</i>	Arroyo willow	Y	
	<i>Aneupogon californica</i>	Yerba mansa	Y	
SAXIFRAGACEAE - SAXIFRAGE FAMILY	<i>Ribes speciosum</i>	Fuchsia-flowered gooseberry	Y	
SCROPHULARIACEAE - FIGWORT FAMILY	<i>Antirrhinum nuttallianum</i>	Nuttall's snapdragon	Y	
	<i>Castilleja affinis</i>	Coastal paintbrush	Y	
	<i>Castilleja foliosa</i>	Felt paintbrush	Y	
	<i>Keckiella cordifolia</i>	Heart-leaved bush penstemon	Y	
	<i>Linaria canadensis</i> var. <i>texana</i>	Larger blue toad-flax	Y	
	<i>Mimulus aurantiacus</i>	Bush monkey flower	Y	
	<i>Mimulus puniceus</i>	Coast monkey flower	Y	
	<i>Orthocarpus purpurascens</i> var. <i>pupurascens</i>	Red owl's clover	Y	
	<i>Scrophularia californica</i>	Coast figwort	Y	
	<i>Veronica</i> sp.	Speedwell	Y	
SOLANACEAE - NIGHTSHADE FAMILY	<i>Datura wrightii</i>	Jimsonweed	Y	
	<i>Lycium californicum</i>	California box thorn	Y	
	<i>Nicotiana bigelovii</i>	Indian tobacco	Y	
	<i>Nicotiana glauca</i>	Tree tobacco	Y	
	<i>Physalis greenii</i>	Greene's ground cherry	Y	
	<i>Solanum douglasii</i>	Douglas' nightshade	Y	
	<i>Solanum nodiflorum</i>	Small-flowered nightshade	Y	
	<i>Solanum umbelliferum</i> var. <i>glabrescens</i>	Blue witch	Y	
	<i>Tamarix chinensis</i>	Tamarix	Y	
	<i>Tropeaeolum majus</i>	Garden nasturtium	Y	
	<i>Typha latifolia</i>	Broad-leaved cattail	Y	
	URTICACEAE - NETTLE FAMILY	<i>Hesperocnide tenella</i>	Western nettle	Y
<i>Urtica dioica</i> ssp. <i>holosericea</i>		Hoary nettle	Y	
<i>Urtica urens</i>		Dwarf nettle	Y	
VERBENACEAE - VERVAIN FAMILY	<i>Verbena lasiostachys</i>	Western verbena	Y	
VISCAACEAE - MISTLETOE FAMILY	<i>Phoradendron tomentosum</i>	Chaparral mistletoe	Y	

Y - in herbarium

* - introduced species

FIELD TRIPS

Plant A Tree in Upper Newport Bay - June 2 (Saturday) 11:00 AM to 4:00 PM. Join the California Wildlife Campaign and Avila's El Ranchito Restaurant in order to plant 200 to 300 trees in the Big Canyon area of Upper Newport Bay. The restaurant will provide delicious Mexican food to the workers, as well as \$5.00 per tree to the Department of Fish and Game. It's a family affair, so bring the kids and teach them about protecting our environment. For more information contact John Scholl at (714) 640-6746.

Santa Rosa Plateau - June 9 (Saturday) 10:00 AM. Visit the Nature Conservancy preserve on the Santa Rosa Plateau, the most expensive investment the Nature Conservancy has made to date. This beautiful plateau in the Santa Ana Mountains features vernal pools and stands of Englemann Oak. Take I-15 south through Elsinore and exit at Clinton Keith Road. Drive 5 miles southwest and turn left at the Nature Conservancy gate. For more information call Terry Daubert at (714) 773-3579 or Nancy Backstrand at (714) 677-6951.

Circle X Ranch, Santa Monica Mountains - June 9 (Saturday). This former Boy Scout Camp, newly acquired by the National Park Service, contains miles of hiking trails and the highest peak in the Santa Monica Mountains. Join Rick Burgess for a hike along the Mishe Mokwa trail where we should see lots of late spring/early summer wildflowers. Meet at 9:00 AM at the Circle X Ranch Headquarters, 5 miles north of Highway 1 on Yerba Buena Road. Bring lunch and water. For information, call Trisha Burgess at (805) 983-1312.

Mount Pinos - June 16 (Saturday). The San Gabriel Mountain chapter of CNPS will lead this five-mile downhill hike starting high on the mountain. The route progress through Yellow Pine Forest where there should be good seasonal wildflowers. A car shuttle will carry hikers back to the top. Some people will camp overnight at the McGill Campground. Take I-5 north to Lockwood Valley exit. Go west to Mount Pinos Rd. beyond the Ski areas to the message board at the campground.

ANNOUNCEMENTS

Management of Endangered Habitats - October 27, 1990. Mark your calendars now for the 16th. annual symposium of the Southern California Botanists. Last year's symposium on endangered plant communities in southern California was so successful that we are following it up on the topic of how to manage endangered habitats. Speakers from various agencies that specialize in preservation and restoration will be featured. We expect to have speakers from the Nature Conservancy, World Wildlife Fund, University of California Reserve System, and the National Parks. The proceedings of the symposium on endangered plant communities should also be available by that time. Once again the symposium will be held at California State University at Fullerton.

Symposium on Mediterranean Floras and Landscape Uses at the Santa Barbara Botanic Garden - June 29-July 1 (Friday-Sunday) 9:00 AM to 5:00 PM. Fee: \$200 (\$250 non-members). Price includes lectures, tours, luncheons, and special reception. The emphasis will be on the unique floras and plant forms that have evolved in regions having a Mediterranean climate, with its pattern of winter rainfall and summer drought. Botanical talks will provide a survey of plants for each Mediterranean region, while horticultural topics will emphasize uses of those plants in garden design. For more information call (805) 682-4726.

Initiatives on the June Ballot. Environmentalists are supporting proposition 108 (Passenger Rail and Clean Air Bond Act of 1990, proposition 116 (Rail Transportation Bond Act), and proposition 117 (Wildlife Protection Initiative). On the November ballot, there will likely be three initiatives dealing with clear cutting and forestry. Environmentalists are supporting the Forest and Wildlife Protection and Bond Act of 1990, also known as the Forests Forever Initiative. They are also supporting the Environmental Protection Act, or the Van de Kamp initiative known as Big Green. The ringer in the lot is an initiative sponsored by the timber industry known as the Global Warming and Clearcutting Reduction, Wildlife Protection and Reforestation Act. Don't be fooled by this title, it is a measure sponsored by timber-cutting interests. If you would like to help with the Forests Forever Initiative contact (415) 647-9160.



SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SOUTHERN CALIFORNIA BOTANISTS is an organization of individuals devoted to the study, preservation, and conservation of the native plants and plant communities of southern California. The journal, CROSSOSOMA, published bimonthly, carries articles of interest to amateur and professional botanists. It is a non-profit organization formed in 1927.

Membership benefits include:

Field trips led by competent botanists and biologists.

A yearly plant sale featuring native California and drought-tolerant species.

An annual symposium on various aspects of California vegetation.

The SCB journal, CROSSOSOMA

Discounts on botanical and natural history books.

Membership categories include:

<input type="checkbox"/> Individual (family)	\$ 8.00	<input type="checkbox"/> New Member
<input type="checkbox"/> Group or organization	\$15.00	<input type="checkbox"/> Renewal

APPLICATION

Date _____

Name _____

Address _____

City, State, Zip Code _____

Phone (____) _____

In addition, I want to give \$_____ to help support SCB.

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS

Mail to: Alan P. Romspert
Southern California Botanists
Department of Biological Sciences
California State University, Fullerton
Fullerton, CA 92634

CROSSOSOMA (ISSN 0891-9100) is published bimonthly (February, April, June, August, October, and December) by Southern California Botanists, a California non-profit corporation. Back issues of CROSSOSOMA are available for \$2.00 an issue (plus 25¢ postage) or \$8.00 a volume (plus \$1.00 postage). Send a check with your request to Alan P. Romspert, Treasurer, at the above address. Manuscripts submitted for publication should be addressed to Dr. Allan A. Schoenherr, Editor of CROSSOSOMA, Division of Biological Sciences, Fullerton College, Fullerton, CA 92634.

SCB COMING EVENTS (DETAILS WITHIN)

June 2 Upper Newport Bay
June 9 Santa Monica Mountains, Circle X Ranch
June 9 Santa Rosa Plateau
June 16 Mount Pinos
October 27 16th. Annual SCB Symposium

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

LIBRARY

JUN - 5 1990

NEW YORK
BOTANICAL GARDEN

NON-PROFIT ORG.
U.S. POSTAGE
PAID
FULLERTON, CA.
PERMIT NO. 145



CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

CROSSOSOMA Volume 16, Number 4
Managing Editor: Allan A. Schoenherr

August 1990

Vascular Plants of the Undeveloped Areas of
California State Polytechnic University, Pomona

Curtis Clark
Biological Sciences Department
California State Polytechnic University
Pomona CA 91768

ABSTRACT

Prior to the July, 1989, wildfire, the undeveloped areas of the campus of California State Polytechnic University consisted of coastal sage scrub and adjacent ruderal and otherwise disturbed sites. A total of 107 species of vascular plants had been reported. The species with both the greatest dominance and the highest frequency were Brassica nigra and Artemisia californica.

INTRODUCTION

California State Polytechnic University, Pomona, is located in Los Angeles Co., California, southwest of the junction of the San Bernardino and Orange freeways, on the northeast slopes of the San Jose Hills. The campus encompasses 329 hectares (813 acres), of which more than half consists of buildings, landscaped areas, parking lots, and agricultural fields. The remaining area is designated "undeveloped" for the purposes of this study. It consists primarily of coastal sage scrub, some of which was grazed by cattle and goats as recently as 15 years ago. It also contains ruderal areas and other disturbed sites around the periphery of the developed portion of campus.

T

In 1986 I began a study of the vegetation of these areas, as a part of a larger study of the biota of the campus. One purpose of the study was to compile a complete list of the vascular plants of the areas. The other was to analyze the composition of the vegetation along seven transects that were also used for studying small mammals, reptiles, and birds.

On July 28, 1989, a wildfire began on the edge of a new housing development in the hills south of campus, and spread over more than 80% of the undeveloped area before it was extinguished. The vegetation studies are continuing, to document the recovery of the area from the fire. The purpose of this paper is to provide an account of the species present before the fire, and their relative importance.

METHODS

The species list was accumulated from collections and observations of the research assistants involved in the vegetation study, several students in my California Flora course, and myself. Vouchers of all but the commonest species are deposited at CSPU. Nomenclature follows Munz (1974).

The tables of dominance (cover) and frequency of the commonest species were compiled from data taken on the transect lines in the spring of 1987. Each line was marked by posts at 15 m intervals, and vegetation was sampled by estimating the Braun-Blanquet cover class of each species within a circle of 7.5 m radius centered on the post. I calculated relative cover by summing the cover classes for each species and dividing by the sum of all cover classes for all species. I calculated frequency as the percent of stations (individual circles) containing a species (out of 64 total), and relative frequency as this percentage divided by the sum of frequencies for all species.

RESULTS

One hundred nine species of vascular plants were reported for the area (Table 1). Of these, 63 are native to southern California, and 46 are introduced; the introductions are mainly weeds from Mediterranean Europe and Asia. There are no endangered or threatened species. The list is not complete--

there are a few other species which have been seen but not firmly documented--but it probably includes more than 90% of all the species that grew in the area.

Table 1. Vascular plant species of the undeveloped areas of Cal Poly Pomona. Introduced species are marked with an asterisk.

Class Filicæ	
Polypodiaceæ	
<i>Polypodium californicum</i> Kaulf.	Polypody
Class Angiospermae: Subclass Dicotyledones	
Anacardiaceæ	
<i>Rhus integrifolia</i> (Nutt.) Benth. & Hook.	Lemonade berry
<i>Rhus ovata</i> Wats.	Sugarbush
* <i>Schinus terebinthifolius</i> Raddi	
<i>Toxicodendron diversilobum</i> (T. & C.) Creene	Poison oak
Asclepiadaceæ	
<i>Asclepias californica</i> Creene	Milkweed
<i>Asclepias fascicularis</i> Dcne.	Milkweed
<i>Sarcostemma cynanchoides</i> Dcne.	
Asteraceæ	
* <i>Ambrosia psilostachya</i> DC.	Western ragweed
<i>Artemisia californica</i> Less.	California sagebrush
<i>Baccharis glutinosa</i> Pers.	Mulefat
<i>Baccharis pilularis</i> DC.	Coyote brush
* <i>Centaurea melitensis</i> L.	Tocalote
* <i>Chrysanthemum coronarium</i> L.	Carland
* <i>Cirsium vulgare</i> (Savi) Ten.	Bull thistle
* <i>Conyza canadensis</i> (L.) Cronq.	Horseweed
<i>Eriophyllum confertiflorum</i> (DC.) Gray	Colden-yarrow
<i>Cnaphalium bicolor</i> Bioletti	Cudweed
<i>Cnaphalium californicum</i> DC.	Cudweed
<i>Haplopappus pinifolius</i> Gray	Pine-bush
<i>Hemizonia ramosissima</i> Benth.	Tarweed
<i>Heterotheca grandiflora</i> Nutt.	Telegraph weed
* <i>Osteospermum ecklonis</i>	Freeway daisy
* <i>Picris echioides</i> L.	Ox tongue
* <i>Silybum marianum</i> (L.) Caertn.	Milk thistle
* <i>Sonchus asper</i> (L.) Hill	Sow thistle
<i>Stephanomeria virgata</i> Benth.	
Boraginaceæ	
<i>Amsinckia menziesii</i> (Lehm.) Nels. & Macbr.	Fiddleneck
<i>Cryptantha intermedia</i> (Gray) Greene	
Brassicaceæ	
* <i>Brassica geniculata</i> (Desf.) J. Ball	
* <i>Brassica nigra</i> (L.) Koch	Black mustard
* <i>Lobularia maritima</i> (L.) Desv.	Sweet Alyssum
* <i>Raphanus raphanistrum</i> L.	Jointed charlock
* <i>Raphanus sativus</i> L.	Wild radish
* <i>Sisymbrium irio</i> L.	London-rocket
* <i>Sisymbrium officinale</i> (L.) Scop.	Hedge-mustard
Cactaceæ	
<i>Opuntia littoralis</i> (Engelm.) Ckll.	Prickly pear
Caprifoliaceæ	
<i>Sambucus mexicana</i> Presl.	Elderberry

Caryophyllaceae	
<i>Silene laciniata</i> Cav.	
* <i>Stellaria media</i> (L.) Vill.	Common chickweed
Chenopodiaceae	
* <i>Salsola iberica</i> Sennen & Pau	Russian-thistle
Cistaceae	
* <i>Cistus villosus</i> L.	Rock-rose
Convolvulaceae	
<i>Calystegia macrostegia</i> (Greene) Brummitt	Wild Morning-glory
<i>Cuscuta ceanothi</i> Behr.	Dodder
Crassulaceae	
<i>Dudleya lanceolata</i> (Nutt.) Britt. & Rose	Live-forever
Cucurbitaceae	
<i>Cucurbita foetidissima</i> HBK.	Calabazilla
<i>Marah macrocarpus</i> (Creene) Greene	Wild cucumber
Euphorbiaceae	
<i>Eremocarpus setigerus</i> (Hook.) Benth.	Dove weed
<i>Euphorbia albomarginata</i> T. & C.	Rattlesnake weed
<i>Euphorbia polycarpa</i> Benth.	
* <i>Ricinis communis</i> L.	Castor bean
Fabaceae	
<i>Lotus scoparius</i> (Nutt. in T. & C.) Ottley	
<i>Lupinus bicolor</i> Lindl.	Lupine
<i>Lupinus polycarpus</i> Greene	Lupine
* <i>Melilotus indicus</i> (L.) All.	Sweet-clover
Fagaceae	
<i>Quercus agrifolia</i> Nee	Coast live-oak
Geraniaceae	
* <i>Erodium cicutarium</i> (L.) L'Her.	Redstem filaree
* <i>Erodium moschatum</i> (L.) L'Her.	
Hydrophyllaceae	
<i>Phacelia distans</i> Benth.	Wild-heliotrope
<i>Phacelia minor</i> (Harv.) Thell.	Wild Canterbury-bell
<i>Phacelia tanacetifolia</i> Benth.	
Juglandaceae	
<i>Juglans californica</i> Wats.	California walnut
Lamiaceae	
* <i>Marrubium vulgare</i> L.	Horehound
<i>Salvia apiana</i> Jeps.	White sage
<i>Salvia leucophylla</i> Creene	
<i>Salvia mellifera</i> Creene	Black sage
<i>Trichostema lanceolatum</i> Benth.	Vinegar weed
Malvaceae	
<i>Malacothammus fasciculatus</i> (Nutt.) Creene	
* <i>Malva parviflora</i> L.	Cheeseweed
Myrtaceae	
* <i>Eucalyptus globulus</i> Labill.	Blue gum
Nyctaginaceae	
<i>Mirabilis californica</i> Cray	Wishbone bush
Onagraceae	
<i>Zauschneria californica</i> Presl.	California fuchsia
Papaveraceae	
<i>Eschscholzia californica</i> Cham.	California poppy

Polemoniaceae	
<i>Eriastrum saphirinum</i> (Eastw.) Mason	
Polygonaceae	
<i>Eriogonum fasciculatum</i> Benth.	California buckwheat
* <i>Rumex crispus</i> L.	Curly dock
Portulacaceae	
<i>Claytonia perfoliata</i> Donn.	Miners' lettuce
Primulaceae	
* <i>Anagallis arvensis</i> L.	Pimpernel
Rhamnaceae	
<i>Rhamnus ilicifolia</i> Kell.	
Rosaceae	
<i>Heteromeles arbutifolia</i> M. Roem.	Toyon
<i>Potentilla glandulosa</i> Lindl.	Cinquefoil
Rubiaceae	
<i>Galium angustifolium</i> Nutt.	
* <i>Galium aparine</i> L.	Bedstraw
Salicaceae	
<i>Salix lasiolepis</i> Benth.	Arroyo willow
Scrophulariaceae	
<i>Mimulus longiflorus</i> (Nutt.) Crant	Monkey-flower
<i>Scrophularia californica</i> C. & S.	Figwort
Solanaceae	
* <i>Datura meteloides</i> A. DC.	Jimsonweed
* <i>Nicotiana glauca</i> Crah.	Tree tobacco
<i>Solanum douglasii</i> Dunal in DC.	Nightshade
Urticaceae	
* <i>Urtica urens</i> L.	Dwarf nettle
Class Angiospermae: Subclass Monocotyledones	
Amaryllidaceae	
<i>Bloomeria crocea</i> (Torr.) Cov.	Golden stars
<i>Dichelostemma pulchella</i> (Salisb.) Heller	Blue dicks
Iridaceae	
<i>Sisyrinchium bellum</i> Wats.	Blue-eyed grass
Liliaceae	
<i>Calochortus catalinae</i> Wats.	Mariposa lily
<i>Chlorogalum pomeridianum</i> (DC.) Kunth	Soap plant
Poaceae	
* <i>Avena barbata</i> Brot.	Slender wild oat
* <i>Avena fatua</i> L.	Wild oat
* <i>Bromus diandrus</i> Roth.	Rippgut grass
* <i>Bromus mollis</i> L.	Soft chess
* <i>Bromus rubens</i> L.	Red brome
* <i>Bromus tectorum</i> L.	Cheatgrass
* <i>Hordeum glaucum</i> Steud.	Foxtail
* <i>Lamarckia aurea</i> L.	Coldentop
* <i>Lolium perenne</i> L.	Ryegrass
* <i>Phleum pratense</i> L.	Timothy
* <i>Poa annua</i> L.	Wintergrass
<i>Stipa coronata</i> Thurb. in Wats.	Needlegrass
* <i>Triticum aestivum</i> L.	Wheat

Table 2. The dominant plant species on the sampling lines in the undeveloped coastal sage scrub of Cal Poly Pomona.

Species	Relative Cover
1. <i>Brassica nigra</i>	0.1389
2. <i>Artemisia californica</i>	0.1239
3. <i>Bromus diandrus</i>	0.0980
4. <i>Centaurea melitensis</i>	0.0686
5. <i>Bromus rubens</i>	0.0457
6. <i>Salvia mellifera</i>	0.0457
7. <i>Eriogonum fasciculatum</i>	0.0415
8. <i>Juglans californica</i>	0.0403
9. <i>Marrubium vulgare</i>	0.0391
10. <i>Avena fatua</i>	0.0343
11. <i>Sarcostemma cynanchoides</i>	0.0271
12. <i>Toxicodendron diversilobum</i>	0.0265
13. <i>Bromus tectorum</i>	0.0259
14. <i>Mimulus longiflorus</i>	0.0210
15. <i>Sambucus mexicana</i>	0.0198
16. <i>Heteromeles arbutifolia</i>	0.0186
17. <i>Quercus agrifolia</i>	0.0186
18. <i>Malacothamnus fasciculatus</i>	0.0168
19. <i>Bromus mollis</i>	0.0162
20. <i>Salvia leucophylla</i>	0.0144
21. <i>Brassica geniculata</i>	0.0132
22. <i>Stephanomeria virgata</i>	0.0114
23. <i>Salsola iberica</i>	0.0102
24. <i>Rhamnus illicifolia</i>	0.0096
25. <i>Lotus scoparius</i>	0.0090
All other species	0.0655

Table 3. The most frequent plant species on the sampling lines in the undeveloped coastal sage scrub of Cal Poly Pomona.

Species	Frequency (%)	Relative Frequency
1. <i>Brassica nigra</i>	79.69%	0.1149
2. <i>Artemisia californica</i>	67.19%	0.0968
3. <i>Centaurea melitensis</i>	51.56%	0.0743
4. <i>Bromus diandrus</i>	40.63%	0.0586
5. <i>Eriogonum fasciculatum</i>	37.50%	0.0541
6. <i>Marrubium vulgare</i>	31.25%	0.0450
7. <i>Bromus rubens</i>	25.00%	0.0360
8. <i>Salvia mellifera</i>	25.00%	0.0360
9. <i>Sarcostemma cynanchoides</i>	25.00%	0.0360
10. <i>Brassica geniculata</i>	23.44%	0.0338
11. <i>Sambucus mexicana</i>	21.88%	0.0315
12. <i>Avena fatua</i>	20.31%	0.0293
13. <i>Juglans californica</i>	20.31%	0.0293
14. <i>Mimulus longiflorus</i>	18.75%	0.0270
15. <i>Salvia leucophylla</i>	18.75%	0.0270
16. <i>Toxicodendron diversilobum</i>	17.19%	0.0248
17. <i>Heteromeles arbutifolia</i>	14.06%	0.0203
18. <i>Bromus mollis</i>	12.50%	0.0180
19. <i>Rhamnus illicifolia</i>	12.50%	0.0180
20. <i>Stephanomeria virgata</i>	12.50%	0.0180
21. <i>Bromus tectorum</i>	10.94%	0.0158
22. <i>Malacothamnus fasciculatus</i>	9.38%	0.0135
23. <i>Galium angustifolium</i>	7.81%	0.0113
24. <i>Lotus scoparius</i>	7.81%	0.0113
25. <i>Opuntia littoralis</i>	7.81%	0.0113
All other species		0.1081

The four most important species, both in dominance (Table 2) and in frequency (Table 3), were Brassica nigra, Artemisia californica, Centaurea melitensis, and Bromus diandrus; all but the second are Eurasian weeds. However, other typical species of coastal sage scrub, such as Galium angustifolium, Heteromeles arbutifolia, Juglans californica, Lotus scoparius, Malacothamnus fasciculatus, Mimulus longiflorus, Rhamnus ilicifolia, Salvia leucophylla, Salvia mellifera, Sambucus mexicana, and Toxicodendron diversilobum, were among the top 25 species in either dominance or frequency.

DISCUSSION

Although there is a preponderance of weedy species, at least as judged from the transects, the vegetation of the area is not atypical for coastal sage scrub. With an increase in development in recent years, the undeveloped areas of Cal Poly, along with adjacent areas of Mount San Antonio College, Forest Lawn Memorial Park, and the City of Walnut, constitute the only large area of native vegetation remaining in the San Jose Hills.

A number of new species have been reported since the 1989 fire, some typical fire-followers and others unusual weeds. The fate of these new species and of the existing vegetation will be addressed by the ongoing study.

ACKNOWLEDGMENTS

I thank Judith Bogdanoff-Lord, Gerald Braden, Chris Brady, Nancy Charest, Karen Jensen, Mary Laughlin, Joy Nishida, Cynthia Stubblefield, and Jerry Turney for their assistance. Funding was provided by a grant from the LandLab Research Committee of the Cal Poly Kellogg Unit Foundation.

LITERATURE CITED

Munz, P. A. 1974. A flora of southern California. Univ. Calif. Press, Berkeley.

ANNOUNCEMENTS

MANAGEMENT OF ENDANGERED HABITATS

On Saturday, October 27, 1990, Southern California Botanists will hold their 16th annual symposium on the topic of Management of Endangered Habitats. This topic is a follow-up to last year's highly successful symposium on Endangered Plant Communities of Southern California. Speakers this year will represent various public agencies and/or other organizations that are responsible for management and restoration of California's endangered habitats. The program will include the following topics and speakers:

Prescribed Burning as a Management Tool in California State Parks
Mike Wells - California State Park System, San Diego

University of California Natural Reserve System and its Stewardship of California's Natural Diversity
Bill Bretz - University of California Reserve System, San Joaquin Marsh

A Multi-agency Approach to protecting California's Natural Diversity
Marc Hoshovsky - Lands and Natural Areas Program, California Department of Fish and Game, Sacramento

Riparian and Wetland Restoration on Nature Conservancy Projects in Southern California
Gary Bell - California Nature Conservancy, Santa Rosa Plateau

Management of Rare Plants and Rare Plant Habitats in California State Parks
James Dice - California State Park System, San Diego

This program is cosponsored by the Department of Biology at Cal State Fullerton and will be held in the Ruby Gerontology Center on the Cal State Fullerton campus. Registration begins at 8:00 AM. Coffee and donuts will be served. Registration fee is \$10.00 for non-members of SCB, \$8.00 for students, and \$15.00 for members of Southern California Botanists (including renewal of the \$8.00 annual membership). For more information contact Diana Cosand at (714) 773-3548.

SCB is looking for volunteers - The Southern California Botanists are looking for volunteers to become active in the organization. We are looking for an environmentalist that would like to represent SCB as a senator for the Orange County Environmental Coalition. The purpose of the organization is to gather together all the environmental organizations in the area in order to take a unified stand on environmental issues. SCB is also looking for someone that would like to "man" a booth featuring Southern

California Botanists and their activities. We are frequently offered booth space at various events. For example, we could have a booth at the L. A. County Home and Garden Show that runs from Feb. 15-18, 1991, at the L. A. County Fair Grounds in Pomona. Of course SCB is also looking for members that would be willing to lead field trips and/or serve on the Board of Directors. If you are willing to volunteer for one of these activities, please call Linda Harris or Alan Romsperg at (714) 870-0946.

NEW PUBLICATIONS

Checklist of the Vascular Plants of Orange County by

Fred Roberts. UC Irvine's Museum of Systematic Biology has published this "Checklist which will serve as the framework for the first-ever complete flora for the county, due to be published sometime after 1990." The checklist includes all native, introduced, naturalized or escaped species of vascular plants that have become established or persist as part of the county's flora. As presently known, the flora of Orange County includes 1,157 species of vascular plants with an additional 99 subspecies or variations, for a total of 1,256 taxa. Of the total, 806 are native to the county. Copies of the checklist are available at several locations, including the Museum of Natural History and Science in Newport Beach.

Seed Propagation of Native California Plants by Dara E. Emery.

An indispensable reference for serious growers of native California plants, this 115-page book begins with a discussion of various seed treatments that enhance germination such as scarification, charate, fire, acid, and stratification. General parameters for growing native plants from seed are also discussed, followed by specific treatments for over 800 species of native plants, presented in tabular form. Dara E. Emery, head of the Plant Breeding Program at Santa Barbara Botanic Garden, has compiled the results of over 20 years of experience and experimentation into an easy-to-use reference that the nurseryman, professional, and home gardener will find invaluable. Includes helpful bibliography and a common name index for easy reference. Softcover. The price is \$9.95 plus \$2.50 for shipping and handling. California residents add 6% sales tax. Order from **Santa Barbara Botanic Garden**, 1212 Mission Canyon Road, Santa Barbara, CA 93105. Attention: Bookshop.

Sepulveda Dam Basin Wildlife Area Nature Walk and Weeding -

August 11 (Saturday). Join the Santa Monica Mts. chapter of CNPS for this event. Call Steve Hartman for details (213) 933-7136.

Malibu Lagoon Weed Eradication - August 18 (Saturday). Join the Santa Monica Mts. chapter of CNPS as they deplant Pampas Grass, Castor Bean, and other alien species. Bring lunch, loppers, and a box for seed heads. Contact Jo Kitz (818) 348-5910 for details.

SOUTHERN CALIFORNIA BOTANISTS



GRANTS AVAILABLE

SCB announces its annual program of grants to support student research in field botany, e.g., floristics, taxonomy, ecology. Both graduates and undergraduates are encouraged to apply. The amount of an award varies but cannot exceed \$200.00. A limited number of proposals can be funded. Grants may cover expendable items (gasoline, film, etc.) not otherwise available to the student.

Proposals containing the following information will be considered:

1. Title page.
2. Description of proposed research, primary objectives, and relationship of the research to the student's goals (two page limit).
3. Timetable for research, anticipated commencement and completion dates.
4. Budget, with justifications, and statement regarding availability of funds from other sources.
5. Brief resume stating current position, education, affiliations, qualifications and anticipated position and address at completion of research.
6. A letter of recommendation from a faculty member (may be sent separately to the Student Research Grants Committee).

Three copies of the proposal should be submitted before **DECEMBER 1, 1990**



to: Student Research Grants Committee
Southern California Botanists
Department of Biological Science
California State University
Fullerton, California 92634



SCB will publish the results of the research in its journal, *Crossosoma*. Awardees will provide SCB a formal report of the research completed, in a format suitable for publication, by not later than one year following receipt of the grant.

SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711



SOUTHERN CALIFORNIA BOTANISTS is an organization of individuals devoted to the study, preservation, and conservation of the native plants and plant communities of southern California. The journal, CROSSOSOMA, published bimonthly, carries articles of interest to amateur and professional botanists. It is a non-profit organization formed in 1927.

Membership benefits include:

Field trips led by competent botanists and biologists.

A yearly plant sale featuring native California and drought-tolerant species.

An annual symposium on various aspects of California vegetation.

The SCB journal, CROSSOSOMA

Discounts on botanical and natural history books.

Membership categories include:

___ Individual (family)	\$ 8.00	___ New Member
___ Group or organization	\$15.00	___ Renewal

APPLICATION

Date _____

Name _____

Address _____

City, State, Zip Code _____

Phone () _____

In addition, I want to give \$ _____ to help support SCB.

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS

Mail to: Alan P. Romsper
Southern California Botanists
Department of Biological Sciences
California State University, Fullerton
Fullerton, CA 92634

CROSSOSOMA (ISSN 0891-9100) is published bimonthly (February, April, June, August, October, and December) by Southern California Botanists, a California non-profit corporation. Back issues of CROSSOSOMA are available for \$2.00 an issue (plus 25¢ postage) or \$8.00 a volume (plus \$1.00 postage). Send a check with your request to Alan P. Romsper, Treasurer, at the above address. Manuscripts submitted for publication should be addressed to Dr. Allan A. Schoenher, Editor of CROSSOSOMA, Division of Biological Sciences, Fullerton College, Fullerton, CA 92634.

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SCB COMING EVENTS (DETAILS WITHIN)

August 11 Sepulveda Dam Basin
August 18 Malibu Lagoon
October 27 SCB Symposium - Management of Endangered
Habitats

New York Botanical Garden
Library--Serials & Exchange
Bronx, NY 10458-5126
DEC90

LIBRARY

JUL 30 1990

NEW YORK
BOTANICAL GARDEN

NON-PROFIT ORG.
U.S. POSTAGE
PAID
FULLERTON, CA.
PERMIT NO. 145

R74
16
15



CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

CROSSOSOMA Volume 16, Number 5
Managing Editor: Allan A. Schoenherr

October 1990

SOUTHERN CALIFORNIA BOTANISTS
In Association with the Biology Department at
Cal State University Fullerton

Presents
The
16th Annual Symposium
on the Topic of

MANAGEMENT OF ENDANGERED HABITATS

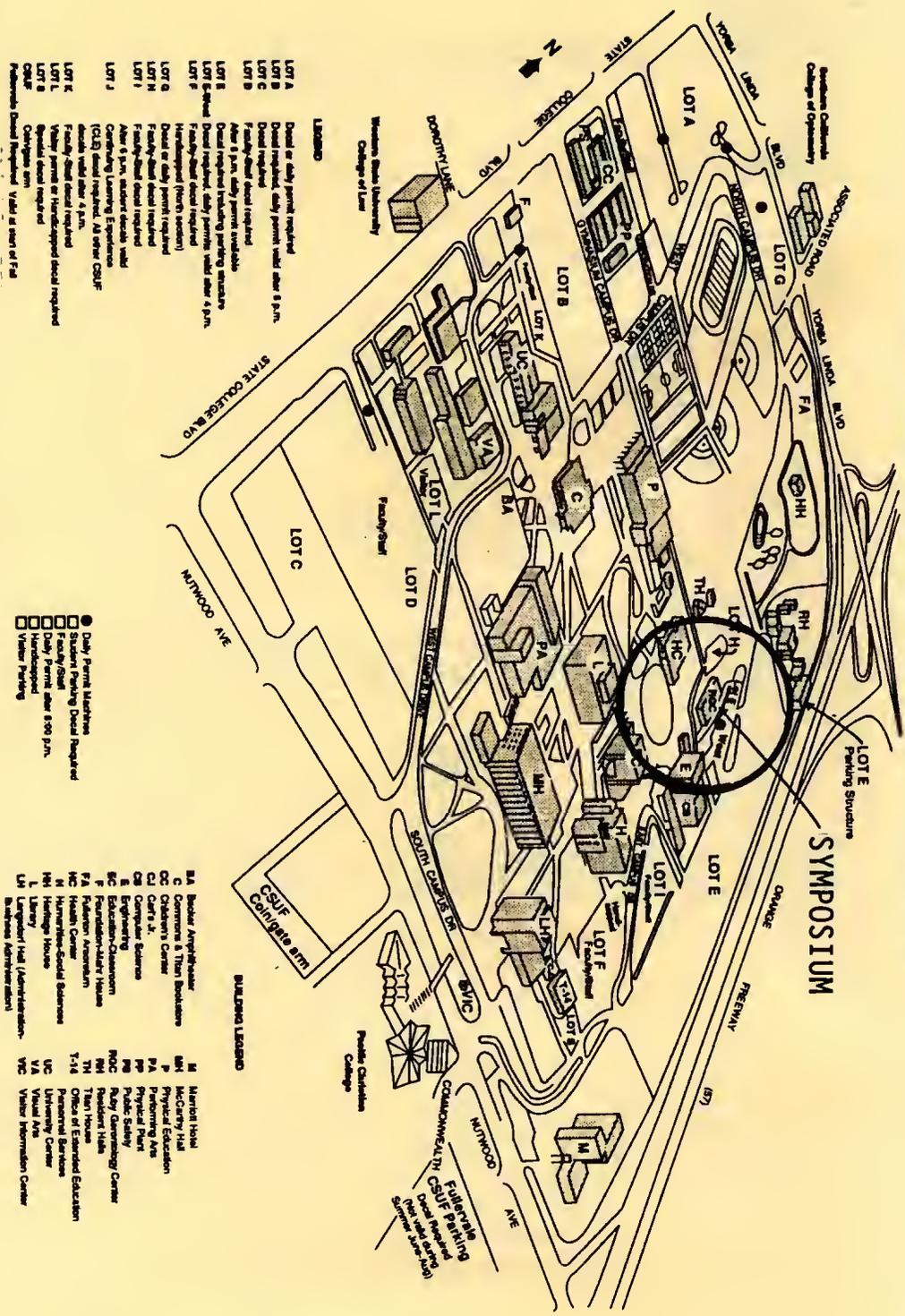
Date:	Saturday October 27, 1990
Time:	8:45 am to 4:00 pm
Place:	Cal State University Fullerton Ruby Gerontology Center

Admission:	\$7.00 for current SCB members \$8.00 for students \$10.00 for non-members \$15.00 for SCB membership & admission
------------	--

✓

CALIFORNIA STATE UNIVERSITY AT FULLERION

SYMPOSIUM



- LIBRARIUM**
- LOT A: Dated or daily permit required
 - LOT B: Dated required, daily permit valid after 8 p.m.
 - LOT C: Dated required
 - LOT D: Dated required
 - LOT E: Faculty/Staff dated required
 - LOT F: After 8 p.m., daily permit available
 - LOT G: Dated required including parking structure
 - LOT H: Dated required, daily permits valid after 4 p.m.
 - LOT I: Faculty/Staff dated required
 - LOT J: After 8 p.m., student tickets valid
 - LOT K: After 8 p.m., student tickets valid
 - LOT L: After 8 p.m., student tickets valid
 - LOT M: After 8 p.m., student tickets valid
 - LOT N: After 8 p.m., student tickets valid
 - LOT O: After 8 p.m., student tickets valid
 - LOT P: After 8 p.m., student tickets valid
 - LOT Q: After 8 p.m., student tickets valid
 - LOT R: After 8 p.m., student tickets valid
 - LOT S: After 8 p.m., student tickets valid
 - LOT T: After 8 p.m., student tickets valid
 - LOT U: After 8 p.m., student tickets valid
 - LOT V: After 8 p.m., student tickets valid
 - LOT W: After 8 p.m., student tickets valid
 - LOT X: After 8 p.m., student tickets valid
 - LOT Y: After 8 p.m., student tickets valid
 - LOT Z: After 8 p.m., student tickets valid

- Daily Permit Machine
- Student Parking Dated Required
- Faculty/Staff
- Daily Permit after 8:00 p.m.
- Handicapped
- Visitor Parking

- BA Booklet Assembly
- C Commons & Titan Bookstore
- CC Children's Center
- CG Carri's
- CC Computer Science
- EE Engineering
- EE Electrical Engineering
- FA Fashion Area
- HC Health Center
- HC Humanities-Social Sciences
- HH Housing House
- L Library
- LI Language/Int'l Administration
- LI Language Administration
- M Marriott Hotel
- MC McCarty Hall
- P Physical Education
- PA Performing Arts
- PA Public Safety
- PA Public Safety
- RQC Ruby Quenching Center
- RH Resident Hall
- TH Titan House
- Office of Extended Education
- UC University Center
- UC University Center
- VA Visual Arts
- VC Visitor Information Center

MANAGEMENT OF ENDANGERED HABITATS

Although the preservation of endangered species is in the public limelight, the preservation of endangered habitats is no less important. In many cases, an endangered habitat may be home to one or more endangered species. Even when the species of an endangered habitat are widespread elsewhere, their relationships to one another and to their environment may be unique.

Ideally, endangered habitats are best protected by leaving them alone. In reality, the impact of human activities and the small size of many of the remaining parcels make it necessary to carefully manage these habitats just to preserve their unique natures. Proper management of an endangered habitat is a difficult task. Many of these environments are only now becoming well understood, and, because of their rarity, there is little room for error. In this symposium, we will learn of the different approaches that are being used for this task, the successes that have resulted, and the remaining problems. As human activities continue to encroach on natural environments in southern California, we will see an increased need for careful management of the few remaining natural areas.

Curtis Clark, SCB President

- 8:00 Registration, coffee, donuts
- 9:00 **Curtis Clark**, President of Southern California Botanists
INTRODUCTION
- 9:10 **Marc Hoshovsky**, Lands and Natural Areas Program, California Department of Fish and Game, Sacramento
A MULTI-AGENCY APPROACH TO PROTECTING CALIFORNIA'S NATURAL DIVERSITY
- 10:00 **Bill Bretz**, University of California Natural Reserve System, San Joaquin Marsh
UNIVERSITY OF CALIFORNIA NATURAL RESERVE SYSTEM AND ITS STEWARDSHIP OF CALIFORNIA'S NATURAL DIVERSITY
- 10:50 Break
- 11:10 **F. Thomas Griggs**, California Nature Conservancy, Los Molinos
THE CALIFORNIA NATURE CONSERVANCY'S HABITAT RESTORATION PROGRAM
- 12:00 Lunch
- 1:40 **Michael L. Wells**, California State Park System, San Diego
PRESCRIBED BURNING AS A MANAGEMENT TOOL IN CALIF. STATE PARKS
- 2:30 **James C. Dix**, California State Park System, San Diego
MANAGEMENT OF RARE PLANTS AND RARE PLANT HABITATS IN CALIFORNIA STATE PARKS
- 3:20 Closing remarks

PROGRAM SCHEDULE

- 8:00 Registration, coffee and donuts
- 9:00 Introduction, Curtis Clark, President of Southern California Botanists.
- 9:10 Marc Hoshovsky, Biodiversity Protection Planner, Lands and Natural Areas Program, California Department of Fish and Game.

AN INTERAGENCY APPROACH TO PROTECTING CALIFORNIA'S SIGNIFICANT NATURAL AREAS

California is both simultaneously blessed with enriched biological diversity and plagued by a rapid population growth rate that places tremendous demands on this diversity. Many public and private organizations are concerned about the loss of biological diversity, but they often pursue their own goals with little coordination with others. The result is often unnecessary duplication of effort and oversight of important elements of natural diversity.

To improve the situation, the State Legislature mandated that the California Department of Fish and Game (DFG) improve natural area coordination. DFG has developed a working list of significant natural areas that other organizations find valuable in identifying priorities. It has also organized an interagency committee to help coordinate the natural area programs of nine federal and state agencies and the Nature Conservancy. This presentation describes the interagency approach to identifying and protecting natural areas, as well as highlighting the approach's current progress and future planning needs.

- 10:00 Bill Bretz, UCNRS, San Joaquin Marsh
- UNIVERSITY OF CALIFORNIA NATURAL RESERVE SYSTEM AND ITS STEWARDSHIP OF CALIFORNIA'S NATURAL DIVERSITY**

The University of California Natural Reserve System (NRS) was established in 1965 with the intent that the University would acquire and administer sufficient natural

areas within California to encompass the state's great range of natural diversity, and to make these sites useful and available as a facility for teaching and research.

The NRS is now an assemblage of 30 Reserve sites distributed throughout the state, amounting to more than 130,000 acres of land that includes more than 80% of the total types of California habitats identified by the 1975 Cheatham and Haller system of classification. A System-wide Director and small support staff advise and facilitate the management of these Reserves, which is divided among and carried out by the eight general University campuses around the state (each of which adopts its own specific management policies for the Reserves it administers).

The UC Regents own 18% of the lands that make up the 26 Reserves and four affiliated sites, with the remainder being made available to NRS administration through various easements, agreements or leases that assure long-term protection of the land and natural resources. The Reserves function as a secure system of outdoor classrooms and laboratories for academic and research purposes, and are made available to any qualified individual, group or institution. Through its basic facilities management and land stewardship, as well as through other programs such as field courses, workshops and symposia, grant programs, etc., the NRS supports the University's teaching and research missions in a variety of disciplines that require fieldwork in natural environments. The NRS is becoming increasingly involved with state and federal agencies, and with local and regional planning jurisdictions, in order to encourage and to help implement programs and policies that specifically support the preservation of natural communities and native biodiversity, the preservation of rare, threatened or endangered species, and the conservation of genetic resources.

11:10 F. Thomas Griggs, Restoration Ecologist, The Nature Conservancy.

THE CALIFORNIA NATURE CONSERVANCY'S HABITAT RESTORATION PROGRAM

The preservation of biological diversity has often been referred to as "saving the pieces". Unfortunately for many of California's native habitats the "pieces" that are left are too small, too degraded or too fragmented to function properly even if we managed to save all that is left. A person is tempted to walk away from these biological basket cases and go on to the next topic, but to do so would result in a disproportionate loss of diversity. To effectively preserve the diversity of California we must restore some habitats to their natural or potential biological diversity. The most important among these have either a high degree of rare or endangered species present or an intrinsically high species diversity. They include California's riparian forests, fresh water and salt water marshes, desert oases, old-growth forests, coastal dune communities, native bunchgrass grasslands and saltbush scrub habitats.

Traditionally, public agencies such as the U.S. Fish and Wildlife Service and the California Department of Fish and Game have been active in restoring and creating fresh and saltwater marsh habitats and the U.S. Forest Service has been the leader in the reforestation of coniferous forests. But, the remainder of these habitats have attracted only limited restoration attention. With this in mind we have designed a restoration program that focuses on the following habitat types:

- Riparian forest
- Coastal dune communities
- Native bunchgrass prairie
- Desert oases
- Saltbush scrub communities

12:00 Lunch

1:40 Michael L. Wells, California Department of Parks and Recreation, Southern Region, San Diego.

THE USE OF PRESCRIBED FIRE FOR HABITAT MANAGEMENT IN SOUTHERN CALIFORNIA STATE PARK UNITS

Climatic conditions have encouraged the incidence of wildfire in southern California since at least the end of the Pleistocene. The distribution of vegetation in this region has been greatly influenced by the frequency of wildland fire and by the modification of natural regimes of fire frequency due to human fire suppression activities. Individual plant species in some cases are dependent upon fire for the roles that it can play in reproduction and nutrient cycling. Other species within the post-flora are dependent upon fire as a disturbance factor, occurring only in the unique conditions created following a fire. The resource management policies of the California Department of Parks and Recreation (CDPR) consider fire to be a natural element of the environment. CDPR has sought to reintroduce fire within units of the State Park System through the use of prescribed burning.

Within the State Park System fire has been used as a tool for habitat management in both general and specific applications. Fire has been used to maintain the diversity of species composition and age class structure within ecosystems. It has also been used in combination with other techniques to maintain the integrity of native plant communities by suppressing invasive non-native plants. In a more specific role, fire has been used to create the special conditions necessary of the existence and/or propagation of special interest organisms. The discussion will include examples of the application of prescribed fire in southern California State Park units.

2:30 James C. Dice, California Department of Parks and Recreation, Southern Region, San Diego.

MANAGEMENT OF RARE PLANTS AND RARE PLANT HABITATS IN CALIFORNIA STATE PARKS

The California Department of Parks and Recreation (CDPR) manages 1.3 million acres of public lands throughout the state, including 707,000 acres (54 percent of the statewide acreage) within the Department's Southern Region. The Southern Region includes San Diego, Imperial, Orange, Riverside, Los Angeles, San Bernardino and portions of Ventura and Kern counties. Over 100 taxa of plants recognized as rare, endangered or threatened by the California Native Plant Society are known to occur within the 69 Southern Region state park units. These include twelve plant taxa that are officially listed by the California Department of Fish and Game as rare or endangered. Numerous state laws, codes and policies mandate that CDPR preserve, protect and responsibly manage rare and endangered plant populations found on state park lands. These include the California Public Resources Code, California Endangered Species Act, California State Park and Recreation Commission Statements of Policy and Rules of Order, CDPR Resource Management Directives and the general plans for individual state park units.

The need for, and role of, quantitative autecological data, plant demographic studies and basic life history information in the development of active management and conservation programs for rare, threatened or endangered plant species has been well-documented by numerous biologists and land managers. Without such information it is not possible to develop a prudent management program, or even to monitor the results of management efforts. Within CDPR's Southern Region a number of concurrent projects and studies designed to gather baseline autecological data,

monitor population levels, enhance rare plant populations and restore habitats have been initiated. Multi-year autecological studies, population monitoring and habitat resoration efforts are in progress at Crystal Cove State Park (Dudleya multicaulis), Cuyamaca Rancho State Park (Downingia concolor ssp. brevior, Limnanthes gracilis ssp. parishii, Delphinium hesperium ssp. cuyamacae and Cupressus stephensonii), Malibu Creek State Park (Quercus lobata, Pentachaeta lyonii), Mt. San Jacinto State Wilderness (Trichostema austromontanum ssp. compactum), Red Rock Canyon State Park (Hemizonia arida and Phacelia nashiana), and Torrey Pines State Reserve (Dudleya brevifolia and Pinus torreyana ssp. torreyana). Funding for this work comes from the Department's Resource Management Program and Natural Heritage Stewardship Program, with the work performed by DPR staff, university scientists and private contractors.

The individual and collective expertise available within organizations such as the Southern California Botanists, can be invaluable in identifying rare plant management needs and issues, developing and implementing management policies and plans, and in providing outside monitoring of DPR's efforts.

3:20 Closing remarks

ANNOUNCEMENTS

Big Bear Valley Preserve Wildflowers - The Friends of Big Bear Valley Preserve announces publication of The Rare and Unusual Wildflowers of the Big Bear Valley Preserve, by Tim Krantz. This booklet boasts over 40 color photographs of many of the endemic plants of the San Bernardino Mountains and their habitats. The booklet is available from the Friends at P.O. Box 2800, Big Bear City, CA 92314. Make checks for \$6.00 + \$1.00 shipping payable to the FBBVP. All donations go directly toward activities related to the Preserve.

Oak Woodlands and Hardwood Rangeland Management: A Research Symposium. Oct. 31-Nov. 2 (Wednesday-Friday). It will be held in Freeborn Hall on the UC Davis campus. The enrollment fee is \$110 with lunches or \$70 without lunches. This research symposium will present the latest information about this important natural resource. It is designed to allow interchange between researchers, policy makers, landowners, and the interested public. The major topics that will be covered include regeneration and restoration of oaks and other hardwood species on hardwood rangelands; wildlife habitat relationships on hardwood rangelands; factors influencing conversion of hardwood rangelands to urban uses or intensive agriculture, and policies to mitigate these conversions; management strategies to ensure sustainability of the hardwood range resource; and monitoring, classifying, and analyzing the hardwood rangeland resource. For more information on the symposium, or to enroll by phone, call (800) 752-0881. From Davis and Dixon, please call (916) 757-8777.

Job Opportunities at Rancho Santa Ana Botanic Gardens. Assistant Horticulturist (Salaried) and Gardener (Hourly wage) positions are currently available at Rancho Santa Ana Botanic Garden. These positions are in the Horticulture Department and require a background in horticulture and botany of California native plants. All candidates must possess demonstrable skills, interest, and knowledge pertaining to the following: cultivation of California native plants in Southern California; field work (collection and identification of seeds, cuttings, etc. for the Garden); pruning, pests, and diseases of California native plants; plant propagation; and plant identification skills. Candidates with degrees in horticulture/botany or direct experience with growing California natives preferred. All interested applicants are urged to contact Bart O'Brien, Horticulturist; Rancho Santa Ana Botanic Garden; 1500 North College; Claremont, California 91711; or phone him at (714) 625-8767, for full job description, desired qualifications, and additional information. To apply: Send letter, resume, and at least three references to Bart O'Brien at the address listed above. **Deadline for application is November 1, 1990.**

Yes On Propositions 128 (Big Green) and 130 (Forests Forever). But watch for industry-created initiatives given names to appeal to environmentalists. Volunteers are needed for the Environmental Protection Initiative (Big Green) and Forest and Wildlife Protection Measure (Forests Forever). Propositions 128 and 130 are a chance to put your Earth Day pledge into action for the betterment of California forests and many other related issues (pesticides, oil spills, waste water). Opposing (and confusing) counter-initiatives placed on the ballot by shortsighted agribusiness make it very important to work for the passage of the true protective measures. As it did for Earth Day, the Alliance for Survival is taking the lead in the local campaign on behalf of the environment. Call 547-6282 to volunteer a few much-needed hours or dollars.

Help Preserve the Bolsa Chica Wetlands. Amigos de Bolsa Chica is sponsoring its Eleventh Annual 10K FUN RUN and 5K WALK OR RUN on Saturday, October 13th. The starting point is at Bolsa Chica State Beach opposite the Bolsa Chica Wetlands at Pacific Coast Highway and Warner Avenue, Huntington Beach. Registration is at 7:00-8:00 a.m., North Parking Area, Bolsa Chica State Beach. At this time you will pick up your packet. There is free parking at Bolsa Chica State Beach before 8 a.m. The entry fee is \$15 for forms received after 9-25-90 (Includes T-Shirt) or \$8 (Shirt Not Included).

Volunteers needed for a plant survey in the Whittier Hills. FRIENDS OF THE WHITTIER HILLS is campaigning for preservation of the remaining Whittier Hills wild lands (2,500 acres) as open-space wildlife habitat and public park-land. One critical step in saving the hills is to document the plant and animal species that inhabit the area. It is especially crucial that they become aware of the presence of any rare, threatened, and endangered species. They are hoping that someone in SCB can arrange a study, or can conduct even a quick survey, for rare, threatened or endangered plant species. Call Julie Schneider at (213) 698-6059 for more information.

Voter Registration Hotline. The office of March Fong Eu operates a toll-free voter registration hotline. This number can be called free of charge from anywhere in California to request a voter registration form. It is open 24 hours a day and 365 days a year. THE NUMBER IS 1-800-345-VOTE (Spanish-language: 1-800-232-VOTA). The last day to register to vote in the November 6, 1990 general election is October 9, 1990.

Natural Areas And Yosemite: Prospects For The Future. The Natural Areas Association and Yosemite National Park In Cooperation with The Yosemite Fund are sponsoring A Global Issues Symposium Joining the 17th Annual Natural Areas Conference with the Yosemite Centennial Celebration. There are three separate events:

- | | |
|---------------------|---|
| October 13-14, 1990 | Yosemite National Park (\$75.00) |
| October 14-19, 1990 | Sheraton Conference Center -
Concord, California (\$160.00)
A symposium on natural areas
and Yosemite. |
| October 19, 1990 | San Francisco Hilton Hotel - San
Francisco, California. Topic:
Natural Areas: Strategies for
the Future. |

There also will be six all-day field trips (\$30.00 each) on October 20, 1990. For more information contact The Yosemite Fund, 155 Montgomery Street, Suite 1104, San Francisco, California 94104.

FIELD TRIP

Los Angeles Arboretum - October 20 (Saturday), 9:00 - 11:00 AM. Tour the Los County Arboretum with Allen Howard. This is a fine place to get ideas about your own landscaping. There is no admission fee for this special tour. Don't miss this opportunity to get a free, guided tour of one of the finest collections of plants in the Los Angeles area. Meet at 9:00 AM at the visitor's entrance. For more information call the Arboretum at (818) 446-8251.

SOUTHERN CALIFORNIA BOTANISTS



GRANTS AVAILABLE

SCB announces its annual program of grants to support student research in field botany, e.g., floristics, taxonomy, ecology. Both graduates and undergraduates are encouraged to apply. The amount of an award varies but cannot exceed \$200.00. A limited number of proposals can be funded. Grants may cover expendable items (gasoline, film, etc.) not otherwise available to the student.

Proposals containing the following information will be considered:

1. Title page.
2. Description of proposed research, primary objectives, and relationship of the research to the student's goals (two page limit).
3. Timetable for research, anticipated commencement and completion dates.
4. Budget, with justifications, and statement regarding availability of funds from other sources.
5. Brief resume stating current position, education, affiliations, qualifications and anticipated position and address at completion of research.
6. A letter of recommendation from a faculty member (may be sent separately to the Student Research Grants Committee).

Three copies of the proposal should be submitted before **DECEMBER 1, 1990**



to: Student Research Grants Committee
Southern California Botanists
Department of Biological Science
California State University
Fullerton, California 92634



SCB will publish the results of the research in its journal, *Crossosoma*. Awardees will provide SCB a formal report of the research completed, in a format suitable for publication, by not later than one year following receipt of the grant.

Two revised floras from the Southern California Botanists



A FLORA OF THE SANTA ROSA PLATEAU,
SOUTHERN CALIFORNIA. By Earl W.
Lathrop and Robert F. Thorne. 39
pages; paperback; comb binding;
\$7.00

FLORA OF THE SANTA MONICA
MOUNTAINS, CALIFORNIA.
By Peter H. Raven, Henry J.
Thompson, and Barry A. Frigge.
179 pages; paperback; Smyth
sewn binding; \$10.50



Name
Address

Please send:

Price

	copies of A FLORA OF THE SANTA ROSA PLATEAU @ \$7.00	\$
	copies of FLORA OF THE SANTA MONICA MOUNTAINS @ \$10.50	\$
Total		\$

Return to: So. Calif Botanists
Dept. of Biology
Calif. State University
Fullerton, CA 92634

Price includes tax, handling,
and postage.

Make check or money order payable to: Southern California Botanists



SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SOUTHERN CALIFORNIA BOTANISTS is an organization of individuals devoted to the study, preservation, and conservation of the native plants and plant communities of southern California. The journal, CROSSOSOMA, published bimonthly, carries articles of interest to amateur and professional botanists. It is a non-profit organization formed in 1927.

Membership benefits include:

Field trips led by competent botanists and biologists.

A yearly plant sale featuring native California and drought-tolerant species.

An annual symposium on various aspects of California vegetation.

The SCB journal, CROSSOSOMA

Discounts on botanical and natural history books.

Membership categories include:

___ Individual (family)	\$ 8.00	___ New Member
___ Group or organization	\$15.00	___ Renewal

APPLICATION

Date _____

Name _____

Address _____

City, State, Zip Code _____

Phone (____) _____

In addition, I want to give \$_____ to help support SCB.

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS

Mail to: Alan P. Romsper
Southern California Botanists
Department of Biological Sciences
California State University, Fullerton
Fullerton, CA 92634

CROSSOSOMA (ISSN 0891-9100) is published bimonthly (February, April, June, August, October, and December) by Southern California Botanists, a California non-profit corporation. Back issues of CROSSOSOMA are available for \$2.00 an issue (plus 25¢ postage) or \$8.00 a volume (plus \$1.00 postage). Send a check with your request to Alan P. Romsper, Treasurer, at the above address. Manuscripts submitted for publication should be addressed to Dr. Allan A. Schoenherr, Editor of CROSSOSOMA, Division of Biological Sciences, Fullerton College, Fullerton, CA 92634.

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

New York Botanical Garden
Library--Serials & Exchange
Bronx, NY 10458-5126
DEC90

LIBRARY
Oct - 1 1990
NEW YORK
BOTANICAL GARDEN

NON-PROFIT ORG.
U. S. POSTAGE
PAID
FULLERTON, CA.
PERMIT NO. 145

AC
R74
16
46



CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

CROSSOSOMA Volume 16, Number 6 December 1990
Managing Editor: Allan A. Schoenherr

**A Preliminary Lichen Checklist for the University of California,
Irvine, Campus and the San Joaquin Wetlands**

Peter A. Bowler

Cooperative Outdoor Program and
Department of Ecology and Evolutionary Biology
University of California, Irvine, CA 92717

Rick Riefner

Assistant Research Biologist
Museum of Systematic Biology
University of California, Irvine, CA 92717

Introduction

The 999 lichen species in 170 genera cited twelve years ago in Tucker and Jordan's (1978) literature review of taxa reported for California comprise some 29% of the North American lichen flora. This flora includes 3,409 species (Egan, 1987) and a few additional species appear in Egan, 1989. Many eminent lichenologists have studied various species groups or the local floras of portions of the state, especially during the last century and during the first third of this century. For example, between 1847 and 1884 Edward Tuckerman alone conducted 14 studies which included California taxa. Among many early twentieth century researchers, H.E. Hasse published 24 papers concerning California lichens between 1895 and 1915. The most frequently cited of his papers are his 1913 paper and 11 reports adding to the southern California flora between 1908

and 1915. Beginning in 1906 A.W. Herre produced 22 studies citing California lichen taxa, of which his 1910 paper on the Santa Cruz peninsula is perhaps best known. Finally, R.H. Howe published 11 research articles between 1910 and 1915 (see Tucker and Jordan, 1978, for complete literature citations). Though Tucker and Jordan (1978) list over 300 papers, the lichen flora of the state is still incompletely known. Hale and Cole (1988) provide the most complete key to the more conspicuous species and allows access for the non-specialist to California lichenology. Despite these studies, new species are still being discovered, and first reports for genera and species continue (see Hammer, 1989a; 1989b; Hammer and Ahti, 1990; Riefner, 1989; 1990; 1991, for example).

Southern California's rapid urbanization is accompanied by a large amount of habitat loss, especially in Orange County. As the University of California, Irvine campus is in an area suffering continuous and sustained development, we decided to publish a preliminary checklist of the taxa collected on the campus since habitat both on and adjacent to the campus will only diminish.

Description of Area

The University of California, Irvine is located in the City of Irvine in Orange County, 45 miles (75 km) southeast of Los Angeles, 20 miles (30 km) west of the Santa Ana mountains, and 1.25 miles (2 km) upstream of Upper Newport Bay. The average precipitation in this Mediterranean climate site is 12 inches (30 cm)/year, and the annual temperatures range between approximately 29° C (September) and 4° C (January). The University campus comprises nearly 1,500 acres (607 hectares), of which all but approximately 60 acres (24.3 hectares) which will remain in natural condition will be completely developed or altered under the University's Long Range Development Plan. The Ecology Preserve occupies the southern side of the campus along the San Joaquin Corridor alignment adjacent to Bonita Canyon Road. A majority of the taxa reported for the campus are from the Preserve. Remnant stands of coastal sage scrub and numerous rock outcrops provide good lichen habitat at this site. Most of the rock outcrops in the area are middle Miocene in age. Breccia composed of andesite fragments from the Paularino member of

the Topanga Formation underlies much of the Ecology Preserve (Vedder, et al., 1957). Its outcrops support many of the crustose lichens we report. Species occurring on the nearby Los Trancos member of the Topanga Formation, a dark-gray siltstone, were also collected. Grading for Pelican Hills Road and the San Joaquin Corridor along the southern margin of the Preserve eliminated the richest lichen-inhabited rock outcrops and coastal sage scrub on the campus. Although this site has had a long history of grazing, the coastal sage scrub represents a relatively intact community with a vascular plant community of 125 species, 66% of which are native to the area. Lichens occur primarily upon Coastal Sagebrush, Artemisia californica, and Bladder Pod, Isomerus arborea var. arborea, and to a lesser degree on some of the other subshrubs. We were unable to determine when the site was last burned, but it is clearly a mature stand.

The San Joaquin Wetlands consist of approximately 500 acres (202.3 hectares) of artificial, seasonally filled duck ponds, freshwater marsh, riparian habitat and coastal bluffs. The primary riparian substrate species are Black Willow, Salix gooddingii, and Mule Fat, Baccharis spp., but riparian substrate species are limited in the wetlands and many of the older willow trees have died. Overall, as the dead trees fall, bark-inhabiting species are losing substrate at this site. The bluffs and especially a thin soil layer partially covering an exposed rock outcrop not mapped by Vedder, et. al. (1957), support Cladoniae and other terricolous, or soil-dwelling, species. Recent earthquake activity centered in Costa Mesa appears to have shaken much of the soil off the face of the rock outcrop, thus scattering clumps of Cladonia squamules and sorediate podetia among the rubble along the base of the exposure. Old marine terrace deposits, including rounded boulders, support some lichens otherwise absent in the wetlands, most notably Acarospora schleicheri. An isolated concrete standpipe near the corner of Michelson and Carlson Drives sustains a luxuriant growth of a strange form of Xanthoria candelaria, otherwise uncommon in the area.

Four specimen trees of Coast Live Oak, Quercus agrifolia, from a site near Ramona in San Diego County were planted along Ring Mall in the summer of 1988 (Ned Reynolds, pers. comm.). Because they are introduced to the campus by transplanted, the oaks represent unique and isolated micro-habitats for lichens, which are listed separately in Table I. All of the species recorded from these trees are within their distribution elsewhere in southern California, so that they are not extra-range disjuncts.

Table I. Lichen species found in three habitats on the University of California, Irvine campus and the San Joaquin Wetlands.

Ca = Main Campus Oa = Oaks We = Wetlands

	Ca	Oa	We
Class Ascomycetes			
Subclass Ascomycetidae			
Order Caliciales			
Cypheliaceae			
<u>Thelomma mammosum</u> (Hepp in Hartung) Massal.	X		
Order Lecanorales			
Acarosporaceae			
<u>Acarospora schleicheri</u> (Ach.) Massal.			X
Buelliaceae			
<u>Buellia</u> sp.	X		
<u>Dimelaena radiata</u> (Tuck.) Hale & W.Culb.	X		
Candelariaceae			
<u>Candelaria concolor</u> (Dicks.) Stein.			X
Cladoniaceae			
<u>Cladonia</u> sp.	X		X
Heppiaceae			
<u>Peltula polyspora</u> (Tuck.) Wetm.	X		
Lecanoraceae			
<u>Lecania brunonis</u> (Tuck.) Herre	X		X
<u>Lecanora muralis</u> (Schreber) Rabenh.	X		
<u>Lecanora</u> sp.	X		
Leeideaceae			
<u>Bacidia phacodes</u> Korber			X
<u>Cliostomum griffithii</u> (Sm.) Coppins			X
<u>Lecidella stigmatca</u> (Ach.) Hertel & Leuck.	X		
<u>Psorula rufonigra</u> (Tuck.) Schneid.	X		
Physciaceae			
<u>Physcia ascendens</u> (Fr.) Olivier			X
<u>Physcia tenella</u> (Scop.) in Lam. & DC.			X
<u>Physcia stellaris</u> (L.) Nyl.		X	
<u>Physconia detera</u> (Nyl.) Poelt	X		
Parmeliaceae			
<u>Flavopunctelia flaventior</u> (Stirton) Hale	X		
<u>Mclanelia subolivacea</u> (Nyl. in Hasse) Essl.		X	
<u>Parmelia quercina</u> (Willd.) Hale		X	
<u>Parmelia sulcata</u> Taylor		X	
<u>Xanthoparmelia mexicana</u> (Gyelnik) Hale	X		
Ramalinaceae			
<u>Ramalina farinacea</u> (L.) Ach.		X	X
<u>Ramalina</u> sp.			X
Teloschistaceae			
<u>Caloplaca bolacina</u> (Tuck.) Herre	X		
<u>Caloplaca fraudans</u> (Th.Fr.) H. Olivier	X		
<u>Caloplaca saxicola</u> (Hoffm.) Wade	X		
<u>Xanthoria candelaria</u> (L.) Th.Fr.	X		X
<u>Xanthoria polycarpa</u> (Hoffm.) Rieber			X
Subclass Loculoascomycetidae			
Order Hysteriales			
Lecanactidaeeae			
<u>Lecanactis</u> sp.		X	
Class Fungi Imperfecti			
Chrysothriaceae			
<u>Chysothrix candelaris</u> (L.) Laundon			X

Discussion

As is displayed in Table 1, 32 species in 26 genera are reported for the campus and wetlands. There are undoubtedly numerous crustose species not included in this preliminary checklist. This anthology of species is likely typical of the lichen flora in the San Joaquin Hills, though a richer flora probably exists in larger stands of coastal sage scrub in areas such as Laguna, Moro and Emerald Canyons. Even these more extensive stands no longer support the historic flora which is reflected in early collections. As coastal sage scrub has become fragmented and reduced in extent, established "source" communities (Pulliam, 1988) have dwindled, so that successional epiphytes such as lichens are gradually becoming scarcer and simpler in community composition. The sequence and timeline of the re-invasion of corticolous (bark inhabiting) lichens in coastal sage scrub during the intervals between burns has not been studied, but the adjacency of unburned old stands which have a full representation of late successional species probably is important in providing "sources" for re-colonization. Thus, as coastal sage scrub is reduced in extent, as stands become isolated, and as natural fire frequency/ecology is altered, the capacity for the development of the species-rich historic communities is reduced. Lichens are usually patchy and uneven in occurrence, and while it is often difficult to pin down the reasons for species-poor sites, our observations of coastal sage scrub sites throughout southern California suggest that habitat loss has already profoundly simplified the lichen community to an extent in Orange County much greater than, though perhaps in synergy with, air pollution. As mature communities and preferred substrate species are eliminated through destruction of coastal sage scrub, the lichen communities on the remnants can only become poorer with each subsequent burn episode. Coastal sage scrub stands are increasingly sterile in terms of lichens as they regenerate and mature after burns.

While precise data on Diegan coastal sage scrub losses are not available, the Foothill Transportation Draft Environmental Impact Statement estimated that 90% of this vascular plant community has

been eliminated in San Diego County. As Beier (1990) noted, in 1987 the California Department of Forestry's "Forest and Range Resource Assessment" estimated that in Orange County some 24 square miles of this habitat (15,784 acres, or 6387.7 hectares) was destroyed through development in the 35 year interval between 1945-1980, and that between 1980-89 10 square miles (13,409 acres, or 5426.5 hectares) - or approximately 2 square miles annually - have subsequently been eradicated. While evidence is now clearly pointing toward coastal sage scrub being an endangered habitat (Westman, 1987; Bowler, 1990; O'Leary, 1990), the impact is already being seen in successional epiphytic invaders such as lichens. The only hope for conserving lichen communities lies in strategies such as that recommended by Westman (1987), which suggest large preserves established throughout the distribution of coastal sage scrub types, with accompanying staggered burning cycles in adjacent stands to allow both fire-tracking and later rare herb species to exist in the community. Lichens could conceivably survive in old stands and invade nearby burn sites as substrate vascular plant. Planned burning would have to be sensitive to waiting for lichen re-colonization rather than risking losing the lichen source community before it is established on adjacent maturing stands. Burn cycles at selected sites might have to be closer to 40 rather than 25 years to ensure ample lichen community re-establishment.

On the UCI Ecology Preserve the absence of fruticose genera such as Ramalina, Usnea, and Evernia, and the depauperate representation of foliose species suggests that this is a species poor corticolous lichen community - perhaps compounded by historic grazing impacts on the subshrubs - though the rock outcrop community is much richer.

The saxicolous species (rock inhabiting) reported are typical of this community elsewhere in the undisturbed open space areas of Irvine and Laguna Beach. It is unfortunate that by far the best development of this group of species was eliminated by grading the Pelican Hills Road and San Joaquin Corridor on the southern margin of the Preserve. In an attempt to salvage some remnants of this high quality saxicolous community, some of the larger breccia

fragments with well-developed lichen thalli on them have been moved to other parts of the Preserve and to the area of rock outcropping adjacent to the San Joaquin Marsh and with a similar exposure. This triage approach has no guarantee of success because substrate is limiting on the bluffs near the wetlands and the exposure which allowed maximum growth on the Preserve has been eliminated.

The four species found only on the oaks (see Table 1) can be expected at other sites in Orange County, especially in riparian or oak woodland habitat. It will be interesting to see if these lichens can survive in the micro-climate created by Ring Mall, and it is unlikely that they will form sources for establishment on other trees, nearly all of which are non-native species on the main campus.

The San Joaquin wetlands are species poor for a number of reasons, primarily because there has not been a sustained riparian woodland at the site, nor has the present declining woodland been connected with other riparian areas through a corridor of established native trees which would allow an easy pathway for lichens to follow in colonization. Thus, corticolous species now present probably arrived by dispersal from removed sources, rather than following a corridor of suitable substrate. Other undisturbed micro-habitats such as the single rock outcrop is similarly habitat-limiting for lichens. In effect the site is an island sustaining a few species, such as the sorediate Cladonia which is probably a survivor of the pre-disturbance flora (though this group also is a vigorous colonizer), but which has seen modest colonization since the construction of the dikes and ponds, and the subsequent establishment of willows. As dead willows snags fall, there is a significant loss of corticolous habitat, which might be mitigated to some degree by artificially installing some more permanent dead willow snags and managing them as lichen substrates.

Many lichens are extremely sensitive to air pollution, which may also play a role in simplifying the lichen flora in Orange County. Lichens are also likely sensitive to acid fog, known to reach pH levels as low as 2.3 along local coastal bluffs under some conditions. Bratt (1987) reported a decrease in foliose and

fruticose lichen species at Point Loma in a study comparing historic and recent collections, perhaps due in part to air pollution effects, but also due to habitat loss. Trichoramalina grinita (Tuck.) Rundel & Bowler formerly inhabited coastal sage scrub habitat in San Diego County, but is now extinct in the United States (Rundel and Bowler, 1974). In Orange County losses are also evident, though more difficult to document due to a lack of collection prior to massive habitat losses and possible air pollution impacts. Ramalina lacera (With.) Laund. (= R. duriaei (DeNot.) Bagl., or R. evernioides auct., non Nyl.) was collected early in the century at "Newport Beach," undoubtedly on former coastal sage scrub. This species is restricted to the coast and is now nearly extinct in southern California. It was not found on the UCI campus. Similarly, Niebla ceruchis (Ach.) Rundel & Bowler, which was likely abundant on coastal sage scrub in historic southern California, now is restricted to several of the Channel Islands and northwestern Baja California, Mexico.

Acknowledgements

We gratefully thank Dr. John W. Thompson (University of Wisconsin - Madison) for identifying many of the crustose species. Samuel Hammer (Harvard University Herbaria) and Fred Roberts (UCI Museum of Systematic Biology) reviewed a draft of the manuscript. Collections of most of these species, with the exception of those reported from the oaks which were not collected, are in the University of California Museum of Systematic Biology herbarium (IRVC). This study was supported by the UCI Cooperative Outdoor Program.

Literature Cited

- Beier, P. October 4, 1990. Letter of comment on the Foothill Transportation Corridor TCA EIR 3., addressed to the Transportation Corridor Agencies.
- Bowler, P.A. 1990. Coastal Sage Scrub Restoration - I. The Challenge of Mitigation. Restoration and Management Notes (in press).

- Bratt, C. 1987. Point Loma Lichens - now and then. pp. 289-293.
In Elias, T.S. (ed.). Conservation and Management of Rare and
 Endangered Plants. California Native Plant Society,
 Sacramento.
- Egan, R.S. 1987. A Fifth Checklist of the Lichen-forming,
 Lichenicolous, and Allied Fungi of the Continental United
 States and Canada. The Bryologist 90 : 77-173.
- Egan, R.S. 1989. Changes to the "Fifth Checklist of the Lichen-
 forming, Lichenicolous, and Allied Fungi of the Continental
 United States and Canada." Edition 1. The Bryologist
 92(1) : 68-72.
- Hale, M.E., Jr. and M. Cole. 1988. The Lichens of California.
 California Natural History Guide No. 54. The University of
 California Press, Berkeley, California.
- Hammer, S. 1989a. Cladonia thiersii: a new lichen from
 California. Mycotaxon 34: 115-118.
- Hammer, S. 1989b. Cladonia carneola: two new localities in
 western North America. Bryologist 92: 126-127.
- Hammer, S. and T. Ahti. 1990. New and Interesting Species of
Cladonia from California. Mycotaxon 37: 335-348.
- O'Leary, J.F. 1990. Californian Coastal Sage Scrub: General
 Characteristics and Considerations for Biological
 Conservation. pp. 24-41. In Schoenherr, A.A. (ed.).
 Endangered Plant Communities in Southern California.
 Southern California Botanists Special Publication No. 3.
- Pulliam, H.R. 1988. Sources, sinks and population regulation. The
 American Naturalist 132(5): 652-661.
- Riefner, R. 1989. Punctilla punctilla (Hale) Krog New to North
 America. Phytologia 67(3) : 254-257.
- Riefner, R. 1990. Pertusaria pseudocorallina and Ramalina
fastigiata New to North America. Mycotaxon 39 : 31-41.
- Riefner, R. 1991. The Lichen Flora of Morro Bay, San Luis Obispo
 County, California. In preparation for Mycotaxon.
- Rundel, P.W. and P.A. Bowler. 1974. The Lichen Genus
Trichoramalina. The Bryologist 77: 188-194.

- Tucker, S. and W.P. Jordan. 1979. A Catalog of California Lichens. The Wasmann Journal of Biology 36(1 and 2) : 1-105.
- Vedder, J.G., R.F. Yerkes, and J.E. Schoellhamer. 1957. Geologic Map of the San Joaquin Hills- San Juan Capistrano Area, Orange County, California. Oil and Gas Investigations Map OM 193. U.S. Geological Survey.
- Westman, W.E. 1987. Implications of Ecological Theory for Rare Plant Conservation in Coastal Sage Scrub. pp. 133-140. In Elias, T.S. (ed.). Conservation and Management of Rare and Endangered Plants. California Native Plant Society, Sacramento.

LEGISLATIVE ALERTS

THE U.S. SENATE: one day after the Kuwait invasion - passed the Murkowski Amendment to the Defense Authorization Bill (S. 2884), requiring the President to open the Arctic National Wildlife Refuge and other protected areas for oil exploration. Excepting National Parks, this amendment would supersede all environmental protection laws and allow drilling on all Federal land tracts.

Audubon led the swift reaction from the environmental community. Audubon President Peter A. A. Berle called the amendment an "outrageous proposal." Instead of pushing the oil panic button, Americans should use this opportunity to strengthen their commitment to energy conservation and develop alternative energy sources. America's last great Alaskan wilderness can be preserved.

If the Murkowski amendment becomes law, the oil-gas industry will be able to bypass the National Environmental Protection Act. To OPPOSE the Murkowski Amendment to the Defense Authorization Bill, please write to Senators Pete Wilson and Alan Cranston; U.S. Senate, Washington, D.C. 20510 --or--call (202) 224-3121 and ask for connection to the Senators' offices.

ATTACK ON FEDERAL ENDANGERED SPECIES ACT

We expect the strongest attack ever on the Endangered Species Act (ESA) when the U.S. Congress returns. Please contact your representative in the House and Senate to oppose any weakening of the ESA. You should: 1) Oppose any bill that would weaken the ESA. 2) Oppose any limitations on the power of citizens to sue to force full implementation of the ESA, National Forest Management Act. 3) Support H.R. 4492, the Ancient Forest Protection Act. This bill would halt logging of ecologically significant ancient forests until scientists chosen by the President's Council on Environmental Quality can decide how much can be responsibly logged. Write to: The Honorable Alan Cranston or Pete Wilson, U.S. Senate, Washington, DC 20510 and/or The Honorable (your representative), U.S. House of Representatives, Washington, DC 20510.

NEW BOOKS

The Natural History Foundation of Orange County has announced the publication of Volume 3 of its memoirs series, Endangered Wildlife and Habitats in Southern California, edited by Peter J. Bryant and Janet Remington.

Southern California, and Orange County especially, is suffering massive losses of natural biological resources as development spreads through our hills, canyons and coastal areas. The papers included in Volume 3 deal with some of our local rare and endangered species and threatened wildlife habitats, as well as some of the efforts that are under way to restore and enhance them.

Most of the papers originated as talks delivered at two symposia on the Natural History of Orange County, held at the University of California, Irvine on October 29, 1988 ("Habitat and Wildlife Restoration in Southern California") and May 21, 1989 ("Rare and Endangered Species in Southern California").

Single copies are \$10 each; bulk and set purchases will be discounted. For information contact the Museum of Natural History and Science at P.O. Box 7038, Newport Beach, CA 92660 or call: (714) 640-7120 or (714) 586-3550.

ENDANGERED PLANT COMMUNITIES OF SOUTHERN CALIFORNIA

Special Publication No. 3 of the Southern California

Botanists. SCB is proud to announce publication of ENDANGERED PLANT COMMUNITIES OF SOUTHERN CALIFORNIA: PROCEEDINGS OF THE 15th ANNUAL SYMPOSIUM, Allan A. Schoenherr, Editor. This, the third in our series of special publications, is a series of papers authored by the speakers at our highly successful symposium of 1989. Articles include a wealth of information on the status of southern California's endangered plant communities. Using photographs, tables, line drawings, and authoritative text, the authors have summarized the status of each the communities and outlined plans for preservation and restoration. This should be an invaluable aid to laymen, botanists, habitat managers, and environmental consultants.

After an introduction by the editor, Dr. Allan A. Schoenherr, Dr. Jon E. Keeley of Occidental College writes about California Valley Grassland. This article begins with a map showing the past and present distribution of native grasslands and concludes with a discussion of southern California locations where native perennial bunchgrass still occurs. Considering that only 0.1% of former perennial grassland remains this is a valuable list for those who would wish to see a habitat that formerly covered a fifth of the state. Jon Keeley's list of references alone makes this a worthwhile publication.

The second article about Coastal Sage Scrub is by Dr. John F. O'Leary from San Diego State University. Walter Westman alerted the "world" that Coastal Sage Scrub was an endangered plant community. His paper appeared in the CNPS publication on management of rare and endangered plants in 1987. John O'Leary, an associate of Westman has done a fine job of characterizing Coastal Sage Scrub, particularly with respect to southern California. He talks about species diversity, fire management, the effects of air pollution, and prospects for mitigation and restoration.

In the third article, Dr. Ronald D. Quinn of Cal Poly Pomona describes the status of California Walnut Woodland. It is

particularly appropriate that he write this article because the campus is one of the few places where Walnut Woodland remains in a relatively undisturbed state. This article is also of importance because so little has been written about California Walnut as a community, that Quinn has been able to summarize virtually all that is known in a single manuscript. The article discusses distribution, composition, phenology, fire ecology, plant-animal relationships, and concludes with a section on management.

Wayne R. Ferren Jr. is manager of the University of California, Carpinteria Salt Marsh Reserve. His discussion of southern California estuarine wetlands is extremely thorough. Illustrated with a number of fine photographs he characterizes a number of estuarine habitats. Most readers are already aware of the endangered status of southern California estuaries, but of particular significance in this article is Ferren's discussion of the potential impact of global warming and sea level rise to the future of the nation's and specifically southern California's estuaries.

The last two articles are about Riparian Woodlands, one of the most endangered habitats in southern California if not the west in general. Dr. Peter A Bowler of the University of California, Irvine, by means of a series of tables and graphics has thoroughly characterized the nature and importance of riparian habitats. He uses specific examples of local riparian situations in and around southern California and describes the degree to which they are disturbed.

Richard Zemball of the U. S. Fish and Wildlife Service has prepared the final article. It is a particularly thorough discussion of riparian habitat associated with the Santa Margarita and Santa Ana Rivers. Through a series of tables and accompanying discussion he characterizes the riparian habitats of these two rivers. Finally, he discusses the distribution and abundance of breeding birds in these habitats. Zemball is the author of a number of technical reports on the Santa Margarita and Santa Ana Rivers, and it is of particular value to have this wealth of information in a single publication.

ENDANGERED PLANT COMMUNITIES OF SOUTHERN CALIFORNIA is available from the Southern California Botanists for \$10.00 a copy plus tax, postage, and handling (See advertisement in this issue for details). Almost everyone who attended this year's equally successful symposium bought a copy of the book, and the feedback so far has been highly complimentary.

Rancho Santa Ana Botanic Garden has released its latest technical report, DROUGHT TOLERANT PLANTING BIBLIOGRAPHY. It was compiled by librarian, Bea Beck, and contains over 1,000 citations of articles, videos, and books on native and mediterranean plants, water-wise landscaping ideas, and drought-resistant edible plants. The index is easy-to-use and the list of citations comprehensive. The bibliography can be purchased at the garden's bookstore or by mail. For information contact Rebecca Caughman at RSABG (714) 625-8767.

FIELD TRIPS

Chaparral Hill - Fullerton Arboretum. December 1 (Saturday).

Join the Tree Society and the Orange County Chapter of CNPS for a session of planting native plants on Chaparral Hill. Holes already will be dug and the plants will be in place. They simply have to be placed in the holes and planted. The Tree Society plans to have refreshments and lunch. Planting session will be from 9:00 AM until noon. The arboretum is on the north end of the Cal State University campus just off Yorba Linda Blvd. Call Celia Kutcher (714) 773-3579 for details.

Santa Ana Mountains - Trail Maintenance. December 1 (Saturday).

Join the Sierra Club in their effort to refurbish the historic Joplin Trail near the top of the Santa Ana Mountains. Bring gloves, food, and water. The USFS supplies the tools. Meet at 7:00 AM in Tustin in front of the Stater Bros. market on Redhill Ave. just south of the Santa Ana Fwy (I-5). For more information call Bill Mautz (714) 494-1813.

Charlton Flat with Birds. December 1 (Saturday). Join the San Gabriel Mountains Chapter of CNPS and the Pasadena Audubon Society for a short, easy walk through conifers and chaparral in the San Gabriel Mountains. Charlton Flat is 24 miles up the Angeles Crest Highway from La Canada. Meet at 8:00 AM in the lower campground (1st right after the gate). For details call Micky Long (818) 398-5420.

El Segundo Sand Dunes Project. December 1 (Saturday) and December 15 (Saturday). Join the Santa Monica Mountains Chapter of CNPS in their efforts to restore the El Segundo Sand Dunes. Reservations are a must. Call Rudi Mattoni (213) 274-1052.

The Winter Chaparral. December 8 (Saturday). Join Doug Allan, Instructor at Santa Monica City College and the Santa Monica Mountains Chapter of CNPS for this trip in the Santa Monica Mountains. Meet at the Cold Creek Preserve at 9:00 AM. Call (213) 456-5625 for reservations and directions.

Pushwalla Canyon Tamarisk Bashing. December 8 (Saturday) and January 12 (Saturday). Join Bill Neil and The Nature Conservancy in their worthwhile effort to eradicate Tamarisk from our native desert riparian communities. After successfully eradicating Tamarisk (a five-year effort) from Thousand Palms Oasis, the project will now move a few miles eastward to a smaller infestation in Pushwalla Canyon. Meet at 9:00 AM in the Thousand Palms Preserve parking lot. The group will caravan to the work site in 4-wheel drive vehicles. 2-wheel drive vehicles may remain for the day in the parking lot. To find Thousand Palms Oasis take I-10 toward Indio and exit at Ramon Rd. Go east on Ramon 5.4 miles to Thousand Palms Canyon Rd. Turn north and go 2 miles to the preserve entrance on the left. For more information contact Bill Neil (714) 779-2099 (H) or (714) 528-7201 X2423 (W).

Santa Ana Mountains - Trail Maintenance. January 19 (Saturday). Join the Sierra Club in their effort to repair the Bluewater Trail along the ridgeline in San Mateo Canyon. Bring gloves, food, and water. The USFS supplies the tools. For more information call Bill Mautz (714) 494-1813.

MANAGEMENT OF ENDANGERED HABITATS: A RETROSPECTIVE

Our sixteenth annual symposium, "Management of Endangered Habitats", was a great success. Nearly 200 registrants enjoyed the interesting presentations, the excellent facilities of the Ruby Gerontology Center, the fine weather, and the lively discussions in the courtyard.

The talks encompassed a variety of approaches, by several different organizations, to managing endangered habitats. Mark Hoshovsky presented a system for enhancing communication between government agencies and interested citizens, so that management plans would involve coordinated effort. Bill Bretz talked about the University of California Natural Reserve System, and the San Joaquin Marsh Reserve. He recounted many of the problems he has faced in managing a marsh sharply bounded on all sides by roads, sewage treatment plants, light industry, and a university.

Tom Griggs spoke of the activities of The Nature Conservancy in the restoration of riparian habitat in the Sacramento Valley, and of the restoration projects planned and in progress in southern California. Mike Wells told of the use of prescribed burning as a management tool in the California State Park system. Jim Dice outlined the current projects for managing specific endangered species in southern California state parks.

All the speakers stressed the need for more solid scientific data about these habitats, and the need for adequate resources. Nevertheless, it was apparent that considerable progress has been made in many areas.

The officers and directors would like to thank the speakers for their fine presentations, and the registrants for their insightful questions and enthusiastic discussions.

Curtis Clark
President

Two revised floras from the Southern California Botanists



A FLORA OF THE SANTA ROSA PLATEAU,
SOUTHERN CALIFORNIA. By Earl W.
Lathrop and Robert F. Thorne. 39
pages; paperback; comb binding;
\$7.00

FLORA OF THE SANTA MONICA
MOUNTAINS, CALIFORNIA.
By Peter H. Raven, Henry J.
Thompson, and Barry A. Prigge.
179 pages; paperbsck; smyth
sewn binding; \$10.50



Name
Address

Please send:

Price

	copies of A FLORA OF THE SANTA ROSA PLATEAU @ \$7.00	\$
	copies of FLORA OF THE SANTA MONICA MOUNTAINS @ \$10.50	\$
	Total	\$

Return to: So. Cslif Botanists
Dept. of Biology
Cslif. State University
Fullerton, CA 92634

Price includes tax, handling,
and postage.

Make check or money order payable to: Southern Cslifornia Botanists

Amateur and Professional Botanists. The journal of the Southern California Botanists, CROSSOSOMA, provides an ideal means by which you can publish things of botanical interest to southern Californians. If you have a favorite field trip, gardening hints, or some preliminary data that you'd like to have in print submit your manuscript to:

Dr. Allan Schoenherr
Division of Biological Sciences, Fullerton College
321 E. Chapman Avenue
Fullerton, CA 92634

BRAND NEW FROM
SOUTHERN CALIFORNIA BOTANISTS:
ENDANGERED PLANT COMMUNITIES
OF
SOUTHERN CALIFORNIA



PROCEEDINGS OF THE 15th ANNUAL SYMPOSIUM

SOUTHERN CALIFORNIA BOTANISTS

SPECIAL PUBLICATION No. 3

ALLAN A. SCHOENHERR, EDITOR

114 Pages; chapters on California Valley Grassland, Californian Coastal Sage Scrub, Walnut Woodlands, Estuarine Wetlands, Riparian Woodlands and Their Breeding Birds.

Please send:

___ copies of **ENDANGERED PLANT COMMUNITIES OF SOUTHERN CALIFORNIA** @ \$10.00 PLUS \$2.00 tax, postage and handling.

Return to: Southern California Botanists
Department of Biology
California State University
Fullerton, CA 92634



SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SOUTHERN CALIFORNIA BOTANISTS is an organization of individuals devoted to the study, preservation, and conservation of the native plants and plant communities of southern California. The journal, CROSSOSOMA, published bimonthly, carries articles of interest to amateur and professional botanists. It is a non-profit organization formed in 1927.

Membership benefits include:

Field trips led by competent botanists and biologists.

A yearly plant sale featuring native California and drought-tolerant species.

An annual symposium on various aspects of California vegetation.

The SCB journal, CROSSOSOMA

Discounts on botanical and natural history books.

Membership categories include:

<input type="checkbox"/> Individual (family)	\$ 8.00	<input type="checkbox"/> New Member
<input type="checkbox"/> Group or organization	\$15.00	<input type="checkbox"/> Renewal

APPLICATION

Date _____

Name _____

Address _____

City, State, Zip Code _____

Phone ____ (____) _____

In addition, I want to give \$ _____ to help support SCB.

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS

Mail to: Alan P. Romspert
Southern California Botanists
Department of Biological Sciences
California State University, Fullerton
Fullerton, CA 92634

CROSSOSOMA (ISSN 0891-9100) is published bimonthly (February, April, June, August, October, and December) by Southern California Botanists, a California non-profit corporation. Back issues of CROSSOSOMA are available for \$2.00 an issue (plus 25¢ postage) or \$8.00 a volume (plus \$1.00 postage). Send a check with your request to Alan P. Romspert, Treasurer, at the above address. Manuscripts submitted for publication should be addressed to Dr. Allan A. Schoenherr, Editor of CROSSOSOMA, Division of Biological Sciences, Fullerton College, Fullerton, CA 92634.

SCB ACTIVITIES (DETAILS WITHIN)

December 1	Fullerton Arboretum
December 1	Charlton Flat, San Gabriel Mountains
December 1	El Segundo Sand Dunes Project
December 1	Santa Ana Mountains, Joplin Trail
December 8	Winter Chaparral
December 8	Pushwalla Canyon Tamarisk Bashing
December 15	El Segundo Sand Dunes Project
January 12	Pushwalla Canyon Tamarisk Bashing
January 19	Santa Ana Mountains, Bluewater Trail

SOUTHERN CALIFORNIA BOTANISTS
 Rancho Santa Ana Botanic Garden
 1500 North College Avenue
 Claremont, CA 91711

New York Botanical Garden
 Library--Serials & Exchange
 Bronx, NY 10458-5126
 DEC90

*Time to
 Renew.*

LIBRARY

DEC 3 1990

NEW YORK
 BOTANICAL GARDEN

NON-PROFIT ORG.
 U.S. POSTAGE
 PAID
 FULLERTON, CA.
 PERMIT NO. 145

