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FREMONTIA

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MARY LEOLIN BOWERMAN (1908–2005)

VEGETATION MAPPING IN WESTERN RIVERSIDE COUNTY

IONE PLANTS

A NATIVE PLANT GARDEN

FREMONTIA

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California Native Plant Society

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CALIFORNIA NATIVE PLANT SOCIETY

*Dedicated to the Preservation of
the California Native Flora*

The California Native Plant Society (CNPS) is a statewide nonprofit organization dedicated to increasing the understanding and appreciation of California's native plants, and to preserving them and their natural habitats for future generations.

CNPS carries out its mission through science, conservation advocacy, education, and horticulture at the local, state, and federal levels. It monitors rare and endangered plants and habitats; acts to save endangered areas through publicity, persuasion, and on occasion, legal action; provides expert testimony to government bodies; supports the establishment of native plant preserves; sponsors workdays to remove invasive plants; and offers a range of educational activities including speaker programs, field trips, native plant sales, horticultural workshops, and demonstration gardens.

Since its founding in 1965, the traditional strength of CNPS has been its dedicated volunteers. CNPS activities are organized at the local chapter level where members' varied interests influence what is done. Volunteers from the 32 CNPS chapters annually contribute in excess of 87,000 hours (equivalent to 42 full-time employees).

CNPS membership is open to all. Members receive the quarterly journal, *Fremontia*, the quarterly statewide *Bulletin*, and newsletters from their local CNPS chapter.

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CNPS members and others are welcome to contribute materials for publication in *Fremontia*. See the inside back cover for manuscript submission instructions.

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A steep slope in the Berkeley Hills facing the Golden Gate Bridge is the setting for one of California's premier native plant gardens. Created by Jenny and Scott Fleming over the course of 50 plus years, this unique half-acre garden features a redwood forest floor planting, a Sierran meadow of grasses, wildflowers, and bulbs, and a stunning rock garden filled with countless treasures.



SPRING WILDFLOWERS FROM GRASSLANDS AND OAK WOODLANDS
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Enjoy a selection of photographs of spring wildflowers that might be found in your local grassland or adjacent oak woodland, or that you might find while enjoying the trails of Mt. Diablo in Contra Costa County (see B. Ertter's article on page 3).

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THE COVER: Goldfields (*Lasthenia* spp.) and new leaves on oak announce the arrival of spring in the woodlands along San Antonio Valley Road, east of Mt. Hamilton in the San Francisco Bay area. Photograph by C. Jones. For other images in this same theme, see pp. 29-30; for information on Carl Jones and other photographers contributing to this issue, see inside back cover.

GUEST EDITORIAL: THE BENEFITS OF MEMBERSHIP

What does membership in the California Native Plant Society (CNPS) say about us? First and foremost, it indicates that we are fans of California's native plants and natural landscapes, that we recognize and appreciate the authentic and natural flora, as it existed before weeds, before development and habitat destruction, and before extinctions. Beyond that, CNPS membership says different things for different members, indicated by the myriad activities that you, as a member, participate in. This diversity is one of the great strengths of CNPS and provides us with a cornucopia of ways in which we can express our appreciation of native plants and share that appreciation with a community of like-minded individuals.

What are the benefits of being a CNPS member? Your membership brings you *Fremontia* and the *CNPS Bulletin* four times a year. Your chapter affiliation avails you of programs, hikes, and chapter newsletters. Specialty books and posters are available to you at chapter events as well as online at www.cnps.org. Hard-to-find native plants for your garden are available for purchase at chapter plant sales, often with early entry or discounts as part of your CNPS membership.

Membership also provides each of us ways to make a positive difference in this world, through support or participation in schools programs, rare plant surveys, garden tours and wildflower shows, sensitive habitat management, weed eradication...the list goes on. In addition, your membership makes possible the continued availability of two publications essential to native plant conservation: the *Inventory of Rare and Endangered Plants of California* and the *Manual of California Vegetation*. And our status as a large, respected statewide organization, with over 9,000 members, including many plant science professionals, brings additional clout when CNPS sends letters containing policy recommendations to government agencies.

Membership in CNPS makes a distinct statement. It says that we appreciate California's genuine and often unique flora and that we value the need to conserve what is left of it for future generations. I hope you share your appreciation of native plants and your enthusiasm for the work of CNPS chapters and staff with friends and community members. Let them know the benefits of membership. If our numbers grow, we can accomplish even more.

Make a difference with your membership: be active, join in, share, meet, lead, follow, fund, plant, maintain, research, support, save, speak about, and enjoy California's authentic flora of beautiful native plants!

Brad Jenkins
President, CNPS

USEFUL WEBSITES AND CONTACT INFORMATION

California Native Plant Society (CNPS):

www.cnps.org, with links to conservation issues, chapters, publications, policy, etc.

For updates on conservation issues:

Audubon Society
www.audubon.org

Center for Biological Diversity
www.sw-center.org

Native Plant Conservation
Campaign www.plantsocieties.org

Natural Resources Defense
Council
www.nrdc.org

Sierra Club
www.sierraclub.org

Wilderness Society
www.wilderness.org

For voting information:

League of Women Voters
www.lwv.org, includes online voter guide with state-specific nonpartisan election and candidate information.

US Senate
www.senate.gov

US House of Representatives
www.house.gov

California State Senate
www.sen.ca.gov

California State Assembly
www.assembly.ca.gov

To write letters:

President George W. Bush
The White House
1600 Pennsylvania Ave. NW
Washington, DC 20500

Senator Barbara Boxer
or Senator Dianne Feinstein
US Senate
Washington, DC 20510

Your CA Representative
US House of Representatives
Washington, DC 20515

SAVIOR OF THE MOUNTAIN: MARY LEOLIN BOWERMAN (1908–2005)

by *Barbara Ertter*

On October 9, 2005, a diverse group of people gathered at the base of Mount Diablo, some in social wear, others dressed for a hike. Conservationists, landowners, scientists, agency staff, and dear friends alike had gathered together to pay tribute to Mary Leolin Bowerman, a woman whose interests and accomplishments were as diverse as the attendees themselves. Mary (Leo to her oldest friends) was extolled as cofounder and ardent supporter of the organization, Save Mount Diablo, as author of the definitive flora of Mount Diablo, as recipient of numerous awards for her tireless conservation efforts, as a dedicated scientist, and as a somewhat reserved, wryly humorous, self-assured, perceptive, tenacious (but ever-courteous), warmly remembered friend.

As is so often the case, Mary's life trajectory had taken numerous twists and turns, with little evidence at the beginning of her career of the form her future accomplishments would take. The only child of well-to-do parents (Lindley H. Bowerman and Ada Sarah Wesson Bowerman), Mary Leolin was born January 25, 1908, in Toronto, Canada, and spent some years in England before ending up in southern California as a teenager. Mary was strong-willed and a bit of a rebel, making choices and decisions as she saw fit (e.g., favoring boys' haircuts and clothing). She attended Pasadena High School and Junior College, where she later recalled:

My father had always wanted to be a physician, and he picked out the courses I should take at junior college, hoping to steer me in that direction. I was generally unhappy in my human

physiology class, but I had seen this nice classroom with plants in it through an open door, so I switched to botany about two weeks after I registered. Though I had never taken a botany or biology course, my interest went back a long way. My kindergarten teacher had sent a note home remarking that I was especially interested in natural history. When I was 15, I thought I wanted to be a landscape gardener.*

Several inspirational female teachers provided role models and seminal influence for future careers, not only for Mary but also for classmate Annetta Carter. In 1928, both young women matriculated at University of California in Berkeley (UC): "My father would have sent me to Stanford, but I said no. He saved himself some money because my botany teacher at junior college in Pasadena [Florence Brubaker, who received her Master's from UC] said I must go to Berkeley." Whereas Annetta would eventually achieve recognition for her devotion to the flora of Baja California (biography in *Fremontia* 19, No.4, pp. 12–14, 1991), Mary made the first steps on the path to a lifelong commitment for Mount Diablo.

STUDENT YEARS

Coinciding with the move of the Botany Department and University Herbarium into the newly completed Life Sciences Building in 1930, Mary

* Quotes from an interview of M.L. Bowerman conducted by Galen Rowell in 1996, published on pp. 187–191 of *Bay Area Wild: A Celebration of the Natural Heritage of the San Francisco Bay Area*, Mountain Light Press (published by Sierra Club Books), 1997.



Mary Bowerman as young girl. Photograph courtesy of Save Mount Diablo.

and Annetta received their AB degrees in botany with 5 other graduates, all women. The two friends remained at UC to pursue master's projects, at one of those heady times when a cohort of exceptionally talented and inspired students overlapped and contributed to a synergy of ideas from which all benefited. Notable among Mary's fellow students were David D. Keck (PhD, 1930), Katherine Esau (PhD, 1931), Herbert Mason (PhD, 1932), Lincoln Constance (PhD, 1934), and Daniel Axelrod (PhD, 1938), who were destined to make significant advances in fields as diverse as bio-systematics, plant anatomy, and paleobotany.

During the time that Mary started at UC, Willis Linn Jepson was the reigning professor of vascular plant systematics. When Mary began her graduate work in 1930, however, Jepson was on leave, visiting distant herbaria and participating in the International Botanical Congress in Cambridge, England. It was Herbert



View of Mt. Diablo, Contra Costa County, from the east. Photograph by B. Ertter.

Mason, acting as Jepson's assistant, who first directed Mary toward Mount Diablo, initially as a senior project. At that time, it was common for botany majors at UC to be assigned the flora of a local peak. Constance, for example, was doing a floristic survey of Redwood Peak in the Oakland Hills, published in 1932. As one of the only botany students to own a car, Mary was granted Mount Diablo:

I don't think I thought of Mount Diablo as being anything special, at least in the beginning. I was a student at Berkeley, and Professor Mason had suggested I do a study to identify all the plants up there, and that was all there was to it. I wasn't sufficiently knowledgeable to realize whether anything was special on Mount Diablo because I'd been living in England and then Pasadena.

Mary nevertheless threw herself whole-heartedly into the study, displaying the tenacious and exhaustive commitment to detail that represented both her hallmark and bane to scholastic productivity. Not being satisfied with a simple inventory of species, Mary accumulated data on climate, soils, geology, paleobotany, and the history of collecting efforts on Mount Diablo, including an effort to locate collections by the

California Geological Survey housed at Harvard University. Ecology, at that time a novel and still somewhat suspect addition to the family of biological sciences, caught Mary's special interest, resulting in a detailed analysis of plant communities and associated species. Putative hybrids, especially in *Quercus*, were also favored subjects, and a major fire in 1931 provided an abundance of post-fire observations. Mary was also well-situated to incorporate concurrent studies and revolutionary new ideas by her fellow students, such as the geoflora concept of Daniel Axelrod, and floristic assemblage comparisons

RIGHT: Mary on Mt. Piños in May of 1928.
BELOW: Mary and her car, a Nash Junior, at the summit of Mt. Diablo, in June of 1930. Photographs courtesy of Save Mount Diablo.

with Mount Hamilton, then being studied by Helen Sharsmith.

Given the scope of Mary's interests, it quickly became evident that her intended flora was well beyond the senior paper it had started as, and was accordingly continued as a master's project. In later years, Mary delighted in relating how she had the effrontery to *inform* Jepson that the Mt. Diablo project was furthermore going to be her doctoral project, not just a master's thesis:

... I made my way into Jepson's inner sanctum in the Life Sciences Building at Berkeley, and when I announced that my thesis was now going to be a doctoral dissertation, he looked a little startled and fell silent. ... I remember standing there while he discussed the pros and cons. After a while he said, "All right."

Mary made her first visit to



Mount Diablo in June of 1930, and continued making regular visits through 1935, totaling 150 days spent on the mountain. Field work was complicated by the fact that almost the entire mountain was in private hands. One of seven state parks created before the establishment of the California State Park System in 1927, Mount Diablo State Park began in 1921 as a 630-acre "state park and game refuge" and was only 1,463 acres at the time it was incorporated into the new state park system in 1931. The small parcel of summit was at one time owned by the Mount Diablo Development Company, which had constructed an automobile road to the summit (North Gate Road) with plans for a luxury hotel, but which then went bankrupt following World War I.

I started going up there every week about a year before the top became a state park, in 1931. There was a private toll road with a steep entrance fee, but when I went to the owner in Oakland and told him I was studying all the flowering plants and ferns and didn't want to pay each time, he graciously agreed. I was usually working on private property, even after the park was created.

Beyond the limited network of existing roads, Mary chose to do most of her exploring on foot, especially after an equestrian mishap left her stranded. She benefited by the creation of additional trails and improved roads built on Mount Diablo by the Civilian Conservation Corps during the Depression years of the 1930s. Botanizing was particularly limited on Lime Ridge, with special arrangements needed to access the quarries that were still being actively mined for calcium carbonate to make cement.

It took Mary six years to complete the requirements for her doctorate, bestowed in 1936. During this time she also served briefly as a teaching assistant in botany (fall

1935), published a paper on western skunk-cabbage (*Madroño* 2:106-107, 1933), and participated in field trips with other botany students in the Calypso Club. The year 1934 was a particularly eventful one, with turbulent departmental and regional politics forming a backdrop to Mary's success in passing her German and French examinations and advancing to candidacy for a PhD. William Setchell retired as Chair of the Botany Department, Herbert Mason assumed charge of the University Herbarium, and Jepson was in the throes of one of his periodic episodes of depression. And, on June 4, the herbarium observed "three hours cessation of activity out of respect to the Governor" (from UC herbarium records), following the fatal heart attack of Gov. James "Sunny Jim" Rolph, who had achieved notoriety for his praise of a lynching mob in San Jose the year before, in the depths of Depression-era turmoil.

FLORA OF MT. DIABLO

Mary's dissertation was titled "A phytogeographic analysis of the vascular plants of Mount Diablo, California." Eight years passed before an expanded version was published as *The Flowering Plants and Ferns of Mount Diablo, California: Their Distribution and Association into Plant Communities*, printed in 1944 by the Gillick Press and offered for sale at \$3.75. In addition to its utility as a synopsis of the flora of Mount Diablo, Mary's opus was trend-setting in its comprehensive approach to floristics, notably in the incorporation of ecological information. As noted in the foreword, "This is the first attempt in California to describe the habits of each species individually. The habitat, altitudinal range, abundance, period of blooming, associated species, and distribution upon the mountain have been independently determined for each species." Presciently, Mary also took note of the future conservation value:



Johnny-jump-ups (*Viola pedunculata*) from Mt. Diablo, as might have been seen by Mary on one of her many field expeditions. Photograph by B. Ertter.

The California landscape is changing rapidly as a result of the impact of man. Already we have to guess what the pristine vegetation was like; but we may at least leave for posterity the record of its composition today. Such a record is essential to knowledge and understanding of what changes are taking place and is prerequisite to any attempt at intelligent control. Conservation of our resources is contingent upon our understanding of the role of the various elements of the environment.

Parental resources allowed Mary to remain buffered from the Depression and financially independent, a particular boon in a time when suitable jobs were few and far between. One job she was considered for, which would have taken her back to southern California, was a *pro tempore* position at Pomona College, resulting from Philip A. Munz's departure in 1944 to accept



Springtime slope of Mt. Diablo with oak (*Quercus*) leafing out and the silver lupine (*Lupinus albifrons*) in full bloom. Photograph by B. Ertter.

a professorship at Cornell University. Instead, Lyman Benson was hired at Pomona College, and two years later Munz returned to California to take over the position vacated by Carl Wolf at Rancho Santa Ana Botanic Garden.

Although the opening at Pomona College did not provide Mary a portal into an academic career, it may have nevertheless had a significant effect on her research productivity. The same financial independence that served so well in other regards left Mary without the external pressure to produce, leaving her perfectionist streak unfettered. In a 1940 letter to Helen Mar Wheeler, his favorite former student and confidante, Jepson expressed his frustration with this aspect of Mary:

When I returned from luncheon, poor Miss Bowerman cheerfully caught me in the corridor (where so many persons lie in wait for me). I know when I'm caught and I try to be de-

cent about it! . . . Poor girl! She is seeking the impossible for her thesis—now six years plus 4 years old. . . . She would like, however, to talk it all over from now until Domesday [Doomsday]. She cannot reach decisions!

It is probably not mere coincidence that Mary finally published her opus and deposited her pressed collections in the University Herbarium in 1944, the same year as the opening at Pomona College; such is standard practice when aligning oneself for an academic opportunity!

FLORA OF BRITISH COLUMBIA

In lieu of a professional appointment, Mary remained at Berkeley and continued to pursue projects of interest in the University Herbarium. Evidently she continued her fieldwork on Mount Diablo, but the expectation of a new, updated edition somehow remained unmet even after the original book was long out of print. At some point, however, her focus shifted to a new floristic project, triggered by the British Columbia collections and influence of Thomas T. McCabe.

Purportedly a graduate of Harvard, McCabe and his wife Elinor Bolles McCabe (a direct descendent of writer/naturalist Frank Bolles) were living in a remote part of British Columbia in the late 1920s, when they contacted the Museum of Vertebrate Zoology at UC Berkeley with offers of zoological specimens. Eventually the McCabes moved to Berkeley, returning to British Columbia during the collecting season, and Tom became a research associate at the museum. Beginning in the early 1930s, he also began submitting plant collections from British Columbia to the University Herbarium, to be determined by a Mrs. Linsdale (presumably the wife of Jean M. Linsdale who also worked at the museum).

After a falling-out with the museum in 1934, Tom obtained space in the herbarium, where his increasing number of collections were housed as a separate unit on the eighth floor. Unwilling to distribute duplicates for fear of rivals, he nevertheless allowed the loan of particularly difficult groups to specialists, including willows and sedges. Violets were sent to Milo S. Baker at Santa Rosa Junior College, who described *Viola McCabeiana* in 1940.

Tom apparently had the gift of inspiring young researchers. Several zoologists cite his influence in their own careers (e.g., Barbara Blanchard, Ian McTaggart Cowan), and mycologist Vera Miller worked with McCabe on fungal inventories of British Columbia and the Bay Area. Deriving impetus from her own Canadian roots, Mary also fell under Tom's influence and became engrossed in his vascular plant collections, with the ultimate goal of producing a full-fledged flora of British Columbia. This project suffered a serious setback when Tom suddenly died of a heart attack in 1948. Mary's determination to finish the flora remained strong, but the manuscript was both incomplete and increasingly outdated as the years went by.

As a final setback to Mary's aspirations of an academic career, a space crunch developed at the University Herbarium, exacerbated by the flood of veterans enrolling on the G.I. Bill. With no formal appointment and a scanty publication record, Mary could not successfully compete for increasingly limited work space within the herbarium. Annetta Carter, then serving as Principal Herbarium Botanist, was given the unenviable task of informing her old friend that she would have to vacate the herbarium, taking her specimens with her. The McCabe collections from British Columbia were taken by Mary to her home in Lafayette and returned to campus only after many years had passed. They are now fully integrated into the main

University Herbarium collection, where they represent an invaluable record of the British Columbia flora.

SAVE MOUNT DIABLO

The eviction from Berkeley not only interfered with Mary's research activities, but also curtailed regular social interactions with the vigorous botanical community in the herbarium. While staff and students struggling to meet tight deadlines may have breathed a sigh of relief at the departure of someone with no such constraints, Mary now needed to seek elsewhere for a social outlet. Following her father's death in 1954, Mary and her mother (a major presence in Mary's life until her death in 1980 at the ripe age of 108) moved to Lafayette, closer to Mary's beloved mountain but more removed from the botanical scene at Berkeley. Once in Lafayette, Mary became involved in the local conservation group of the Sierra Club, which she had first joined in 1942 as an active member of the Natural Science Section. She led field trips, where she is remembered as "a very patient teacher," and also became active in the California Native Plant Society (CNPS).

Mary's life took a new turn in 1971, setting her on the course that would ultimately be her primary claim to fame, as well as deep personal satisfaction. Although some additional acreage had been added to Mount Diablo State Park, and some



nearby areas had also been preserved as public open space, huge swaths of bucolic pastureland and bountiful oak woodlands in the central East Bay were disappearing under suburban development. With the imminent arrival of Bay Area Rapid Transit (BART) to interior Contra Costa County in 1972, the situation was doomed to go from bad to worse. As recalled by Mary, at a meeting of the local Sierra Club conservation group:

In 1971, a member named Art Bonwell [an electrical engineer at Dupont] came up to me and said, "Don't you think we ought to do something about Mount Diablo?" He was referring to how moneys [sic] appropriated by the state to buy additional lands for Mount Diablo State Park had been diverted to buy Franks Tract in the Sacramento-San Joaquin Delta for a state recreation area.

Taking up the challenge, Mary and Art organized a meeting of representatives of local groups. Fifteen people attended the meeting on De-



cember 7, 1971, where Mary stated her dream "that the whole of Mount Diablo, including its foothills, should remain in open space." The organization Save Mount Diablo (SMD) was formed that night, with the objectives of educating the public and acquiring lands. SMD eventually grew into one of the dominant land-acquisition forces in the central East



TOP: View from Mt. Diablo looking west, with encroaching urban sprawl in the distance. Photograph by B. Ertter • ABOVE: Mary Bowerman and Arthur Bonwell hiking on a property (Kittrell) where development was proposed in Morgan Territory on Mt. Diablo's east side, 1993. Photograph by S. Joseph. LEFT: Mary Bowerman and Arthur Bonwell photograph for December 2000 *Diablo Magazine*, announcing their "*Diablo Magazine* 2000 Threads of Hope" award for lifetime achievement. Image by S.Hoover and S. Bromberger. Photographs courtesy of Save Mount Diablo.



Bay, working closely with both the rapidly growing Mount Diablo State Park and the East Bay Regional Parks District. Mary served as the group's vice president for resources until the end of 1995, and remained on its Land Acquisition Committee for the rest of her life.

Serving with Mary on this committee was Bob Doyle, who met Mary when he became a volunteer teaching assistant for Jane Helrich, an elementary school teacher and friend of Mary's. In the heady atmosphere of environmental activism that characterized the late 1960s and early 1970s, Helrich organized a field trip for youth representatives to Sacramento, to see first-hand the workings of environmental legislation. As recalled in *Bay Area Wild* by Doyle, who became one of Mary's closest friends and who went on to become Assistant General Manager of the East Bay Regional Parks:

Dr. Mary Bowerman joined us on that bus ride to Sacramento and voiced her own advocacy. She became a very dear friend before she cofounded Save



TOP: A solitary oak nestled within one of Mt. Diablo's many distinctive rocky outcrops. Photograph by C. Jones. ABOVE: Bob Doyle and Mary Bowerman at Save Mount Diablo 25th Anniversary, on December 11, 1996. Photograph by S. Kraughto, courtesy of Save Mount Diablo.

Mount Diablo with Art Bonwell. I was the kid among this group of elder statespersons, witnessing a series of battles that mustered grassroots support for funding of parks and conservation efforts. Their successes at that time—not just locally but also statewide and in Washington—are a fantastic legacy that I feel so lucky to have been part of at such a young age.

Save Mount Diablo provided the outlet and focus where Mary's particular blend of attributes finally bloomed. Her tenaciousness and inability to say "Enough!" were channeled into an unyielding effort to always acquire more land, and more, and a little bit more. At the same time her level-headed manners and positive outlook, combined with the inherent self-confidence of the well-to-do, enabled her to appeal effectively to potential donors, politicians, and landowners alike. Above all, she stayed true to her scientific roots, insisting on strict adherence to supportable facts and scientifically defensible arguments. According to Doyle, "Mary Bowerman was always, always, questioning me: 'Are you sure? Explain what you saw.' I watched her exercise that same precision in her land and financial dealings for Save Mount Diablo—taking the principles of natural sciences and applying them to the political world."

Mary's commitment to SMD became her crowning achievement for which she received multiple awards, including a State of California *Golden*

Bear award, John Muir Memorial Association's *John Muir Conservation Award* (1980), the *Chevron Times Mirror Magazine National Conservation Award* (1996), Contra Costa County *Women of Achievement Hall of Fame Award* (1998), Diablo Magazine's *Threads of Hope Volunteer Award for Lifetime Achievement* (2000), and the Daughters of the American Revolution's *National Conservation Medal*. She was recognized on September 9, 1998, in the *Congressional Record*, and on May 22, 1982, a trail at the summit of Mount Diablo was named the Mary Leolin Bowerman Fire Interpretive Trail.

A NEW EDITION (FINALLY!)

Although her work with Save Mount Diablo took up a majority of her time, Mary retained her self-identity as a botanist first and foremost. She continued to study and collect the flora of Mount Diablo and adjacent areas, sharing this knowledge with friends and colleagues in the Sierra Club and CNPS. James B. Roof, director of the East Bay Regional Parks Botanic Garden, paid homage to her efforts in this regard when naming a variant manzanita growing at nearby Black Diamond Mines Regional Preserve as *Arctostaphylos bowermaniae* (*The Four Seasons* Volume 5, No. 4, pp. 15–18, 1978):

This *Arctostaphylos* is named for

Dr. Mary Bowerman, native plant preservationist; life-long observer of and authority on the botany of Contra Costa County; distinguished author of *The Flowering Plants and Ferns of Mount Diablo* and numerous botanical and conservation articles. It is intended to commemorate her great affection for and knowledge of the native plants of California which she has generously shared with her fellows along many pleasant trails.

Mary's connection with the University of California was reinitiated in the early 1980s, when she struck up a friendship with a fellow member of the CNPS, Susan D'Alcarno. Mary's former mentor, Willis Linn Jepson, had left an endowment that established the Jepson Herbarium following his death in 1946, as an administrative unit separate from the departmental herbarium that ensured a continued focus on the California flora. A key provision was that his *Manual of the Flowering Plants of California* be kept current and in print. Susan had taken on the challenge of fundraising for a completely revised edition, and Mary became a significant contributor. The resultant book was published in 1993 as *The Jepson Manual: Higher Plants of California*.

Mary's ties to the Jepson Herbarium continued to grow, and in 1994 she agreed to lead a field trip

to Mount Diablo in conjunction with the first Jepson Herbarium Symposium. This in turn led to my own collaboration with Mary, beginning with a joint collecting trip to the summit of Mount Diablo on June 19, when we realized that both of us had regretted not being able to participate in the other's field trip! We hit it off well enough that arrangements were made in 1995 for the Jepson Herbarium to take on the challenge of updating *The Flowering Plants and Ferns of Mount Diablo*, by then an increasingly out-of-date and hard-to-obtain collector's item. I tackled the taxonomic updating, various sections were farmed out to appropriate specialists, and Susan served as project "midwife." Funds provided by Mary allowed graduate student Lisa Schultheis to serve as technical editor, beginning with the scanning of the original edition.

The initial plan was to produce a straight-forward update, staying as true as possible to the original book while incorporating any additional species discovered on the mountain since 1944 and whatever updates were needed to reflect current nomenclature and scientific knowledge. What was calculated to be a two-year project reached completion seven years later, with manifold reasons for the prolonged preparation period. Foremost was the sheer magnitude of changes needed, well beyond what anyone expected, especially given the exemplary nature of Mary's original survey. Amazingly, the number of species known from Mount Diablo was increased by one-fourth, consisting of a combination of new weeds, taxonomic "splits," and outright new discoveries.

Mary's inevitable reluctance to "sign off" on the manuscript also delayed final publication, further complicated by her seasonal routine of spending winters in Hawai'i at the home of her close friend Gordon Haas, who she had met at a financial convention, followed by the gantlet of tax season. All of this further-

The fifth and final Blackhawk development dedication to Mt. Diablo State Park, with Save Mount Diablo President Malcolm Sproul, Governor Gray Davis, Congressman George Miller, Mary Bowerman, Senator Tom Torlakson, and Blackhawk developer Ken Behring on May 15th, 1999. Photograph by S. Joseph, courtesy of Save Mount Diablo.





two months before Mary's 95th birthday. A well-attended book signing took place on December 6, co-sponsored by CNPS and the Jepson Herbarium. Mary, while undeniably pleased with the long-awaited new edition, was still chagrined that numerous species found on Mount Diablo subsequent to the decision to "close the book" to changes were relegated to an appendix. She was mollified only with the promise of their full incorporation in a third edition, and further expressed her hopes that the British Columbia flora could one day be completed.

Blessed with good genes and a temperate lifestyle, Mary entered her nineties in excellent health and continued to enjoy walks on her beloved mountain whenever possible. In 2000, she participated in a banquet celebrating the 50th anniversary of the Jepson Herbarium, as one of Jepson's last surviving students (the other such participant, Lincoln Constance, died the following year). Declining health was evident by age 95, however, and after several hospital stints Mary Leolin Bowerman passed away on August 21, 2005, at age 97. Fortunately this was not before she was able to enjoy the celebrated rediscovery by Mike Park of the Mount Diablo buckwheat (*Eriogonum truncatum*), a species which Mary was the last to see nearly 70 years previous. Mary was interred with her parents at Chapel of the Chimes in Oakland, and a celebration of her life was held by Save Mount Diablo at Mitchell Canyon on October 9.

Mary's judicious management of financial resources allowed her to be generous with friends and causes that she supported, and allowed her to leave significant legacies to Save Mount Diablo and the Jepson Herbarium. More important by far are the more intangible contributions she left, in the form of abiding friendships, lasting inspiration, and an ever-expanding vision of the extent to which her favorite mountain's



Mary at the summit lookout, 1998. Photograph by B. Ertter.

natural landscape could be, and should be, preserved. Above all else, Mary serves as the quintessential example of someone who, after facing severe setbacks in her initial career aspirations, went on to find a truer calling, yielding much more profound contributions than she would have ever achieved in academia. Mary saved Mount Diablo; who could ask for a better legacy?

RESOURCES

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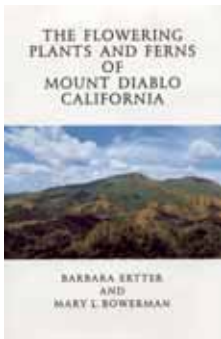
University Herbarium and Jepson Herbarium Archives, University of California at Berkeley.

Barbara Ertter, University of California, 1001 Valley Life Sciences Bldg #2465, Berkeley, CA 94720-2465. ertter@berkeley.edu

INSET ABOVE: Mary at the Blackhills dedication in 1997. Photograph by S. Kraughto, courtesy of Save Mount Diablo.



TOP: Barbara Ertter, Mary Bowerman, and Lisa Schultheis at lookout on Mt. Diablo, 1998. Photograph by B. Ertter. • ABOVE: Mary Bowerman with Susan D'Alcarno, Barbara Ertter, and Lisa Schultheis at the book signing celebration for the new *Flora of Mount Diablo* (LEFT). Photograph by T. Morosco.



more coincided with a period when CNPS itself was undergoing serious restructuring, with the publication program eventually coming under the wing of Susan D'Alcarno.

A final determined push resulted in the publication of a second edition by CNPS in November 2002,

A NEW MODEL FOR CONSERVATION PLANNING: VEGETATION MAPPING IN WESTERN RIVERSIDE COUNTY

by Julie M. Evens and Anne N. Klein

In southern California, conservation efforts have focused on identifying and protecting “coastal sage scrub” habitat, which is home to the California gnatcatcher and over 100 other imperiled plant and animal species (CDFG 2005). This habitat is fragmented across 6,000 square miles of southern California. The western portion of Riverside County makes up nearly one-quarter of this fragmented area and is under increasing pressures from growth and development (RCIP 2003). The pressures upon coastal sage scrub and other habitats have prompted an integrated regional planning effort with new resource-based methodologies.

Western Riverside County’s population is expected to double from 1.4 million to 2.8 million people by 2020 (RCIP 2003). The southwestern portion of the county includes the rapidly growing cities of Temecula, Murrietta, and Lake

Elsinore, which all border the wildlands of the Santa Ana Mountains. The northwestern portion of the county includes the ever-expanding developments of Corona, Moreno Valley, Perris, and Riverside. The central-eastern portion of western Riverside County includes the towns of Anza, Hemet, and Idyllwild, and these cities are surrounded in the south and east by the Agua Tibia Wilderness and the San Jacinto Mountains in the Cleveland and San Bernardino National Forests, respectively.

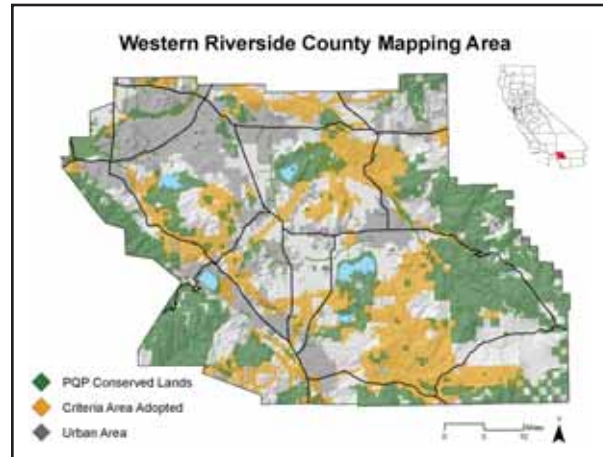


Figure 1. Map of Western Riverside County showing public/quasi-public (PQP), undeveloped and private (Criteria Area), and urban lands. The Habitat Conservation Plan will include 347,000 acres of PQP and 153,000 acres of Criteria Area as the core area for reserves (RCIP 2003). Map by K. Fien.

CAN CURRENT DIVERSITY SURVIVE FUTURE DEVELOPMENTS?

Until recently, western Riverside County was largely rural, agricultural, and undeveloped. The County spans 1.26 million acres and currently has over 800,000 acres of undeveloped land (see Figure 1). A diversity of climates and natural plant communities occurs across the remaining wildlands—from coastal and lowland areas containing coast live oak (*Quercus agrifolia*), California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and alkali grasslands; to foothill regions with chamise (*Adenostoma fasciculatum*), hoaryleaf ceanothus (*Ceanothus crassifolius*), interior live oak (*Quercus wislizeni*), and other chaparral or woodlands; to montane zones with Eastwood manzanita (*Arctostaphylos glandulosa*), Coulter pine (*Pinus coulteri*), black oak (*Quercus kelloggii*), and



A view showing intact vegetation in the Santa Ana Mountains and urban development in the Perris Plain, Western Riverside County. Photograph by K. Ironside.

other hardwood or conifer forests; and to semi-desert regions with Great Basin sagebrush (*Artemisia tridentata*), California juniper (*Juniperus californica*), honey mesquite (*Prosopis glandulosa*), and other scrublands.

The natural communities are declining rapidly due to the effects of historic development patterns and increased development pressures within the last 15 years. Past efforts to preserve natural communities have been haphazard and largely uncoordinated. Piecemeal efforts to mitigate development have little ability to sustain flow within and between ecosystems, including wildlife mobility and genetic flow within species. As development pressures continue to increase, so have conflicts between landowning interests and the state and federal regulatory processes associated with protecting endangered, threatened, and otherwise rare species (RCIP 2003).

Since local agencies need to respond to increased demands on natural resources, the County has begun a comprehensive regional planning effort involving the local cities, developers, landowners, environmental organizations, and other stakeholders. Specifically, the County has undertaken conservation planning through a federal Habitat Conservation Plan (HCP) in conjunction with a state Natural Communities Conservation Planning (NCCP) effort. The land-use planning efforts have been combined into a Multi-Species Habitat Conservation Plan (MSHCP; see sidebar for definitions). The MSHCP effort began in 1999, and includes the NCCP, an update of the county General Plan, and a transportation corridor plan (RCIP 2003). These plans were integrated to help address the intense demands by development while protecting multiple species and habitats under multiple jurisdictions (from undeveloped foothills and montane forests to urbanized centers in the valleys) (RCIP 2003).

DEFINITIONS OF CONSERVATION APPROACHES AND PROJECT COLLABORATORS

Habitat Conservation Plan (HCP), per Section 10 (a) (1) (B) of the Endangered Species Act of 1973:

To provide species protection and habitat conservation within the context of non-federal development and land use activities; to provide a process that promotes negotiated solutions to endangered species conflicts; and to provide an alternative to litigation, providing a species a pathway to stability and recovery. Private landowners minimize and mitigate the incidental take of listed, proposed and candidate species associated with their actions, and the Fish and Wildlife Service issues an incidental take permit as long as the action will not “appreciably reduce the likelihood of the survival and recovery of the species in the wild.”

Multi-Species HCP: To cover all listed species and species that may be listed in the future.

Natural Communities Conservation Plan Program (NCCPP), per Fish and Game Code 2805 and CDFG (2005a):

To identify and provide for the regional or areawide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth. “Wildlife” means and includes all wild animals, birds, plants, fish, amphibians, and related ecological communities, including the habitat upon which wildlife depend for their continued viability (Fish and Game Code 711.2).

Adaptive Management, per the California NCCP Act of 2002:

To use the results of new information gathered through the monitoring program of the plan and from other sources to adjust management strategies and practices to assist in providing for the conservation of covered species.

Species and Habitat monitoring, per the California Department of Fish and Game (CDFG) Resource Assessment Program (2005b):

The collection and analysis of observations or data repeated over time and in relation to a conservation or management objective. Over time, monitoring develops information on trends (increasing, decreasing, static) in species or habitats that can be related to conservation and management activities.

Project Collaborators (and acronyms):

- Aerial Information Systems (AIS)
- California Department of Fish and Game (CDFG)
- Resource Assessment Program (RAP)

Further, the County is implementing the MSHCP to initiate an open-space plan for the western part of the County.

In 2005, the MSHCP was officially adopted by the local and regional governing agencies to conserve over 500,000 acres of reserve land. The core area of reserves will include different habitat types across 347,000 acres of public land and 153,000 acres of private land (RCIP

2003). The core areas for the MSHCP were identified using a general habitat and vegetation map, which was completed by biological consultants in 1995 (PSBS and KTU+A 1995).

LIMITATIONS OF THE ORIGINAL MSHCP MAP

Since 1995, the extent and character of vegetation and habitats have changed within western Riverside

County. For example, suppression of fire has resulted in shifts from ponderosa pine and Jeffrey pine (*Pinus ponderosa* and *P. jeffreyi*) to incense cedar and white fir (*Calocedrus decurrens* and *Abies concolor*), while increases in fire frequency and nitrogen deposition have resulted in shifts from chaparral and coastal sage scrub to grasslands with exotic plant species (Allen et al. 2000; Keeley 1990; Minnich 1995; Minnich and Dezzani 1998; Zedler et al. 1983).

The existing 1995 map is not able to represent recent ecological changes in western Riverside County; further, it characterizes vegetation very broadly and anecdotally, without reliably differentiating the main plant communities (Allen et al. 2005; RCIP 2003). Because the map is based upon limited ground-truthing and out-dated data (e.g., early 1900s Weislander surveys), vegetation types are not accurately depicted. Common vegetation types are clearly under-represented, including black oak (*Quercus kelloggii*), Coulter pine (*Pinus coulteri*), and redshank (*Adenostoma sparsifolium*). Additionally, there is a lack of specificity within broad habitat categories of the map, such as montane coniferous forest, oak and riparian woodland, coastal sage scrub, and chaparral.

Likewise, rare vegetation types are under-represented in the 1995 map. Desert scrub types have not been differentiated, including types with jojoba (*Simmondsia chinensis*), lotebush (*Ziziphus parryi*), and Muller oak (*Quercus cornelius-mulleri*). Also, well-known but locally rare types have not been differentiated, such as conifer woodlands with lodgepole pine and limber pine (*Pinus contorta* and *P. flexilis*) and alkali plains with smooth tarplant (*Centromadia pungens* subsp. *laevis*), a List 1B rare plant. Understanding and mapping the distribution of rare plant communities statewide and locally is necessary for developing proper conservation strategies.

In addition, animal habitats are misrepresented or difficult to identify when vegetation patterns are not properly depicted in maps. For example, suitable habitat for target animal species are not easily identifiable using the 1995 map, because the map lacks structural features important to animal species, such as plant overstory height and cover, and the degree of exotic plant invasion and land clearing. Further, the different types of coastal sage scrub communities that California gnatcatchers prefer are not reliably captured in the 1995 map. However, this is an important species that the MSHCP aims to conserve in perpetuity. When detail is not included in vegetation maps for NCCPs, essential habitats for rare/target species are characterized poorly.

NEW RESOURCE-BASED ASSESSMENT EFFORTS

Current emphases within the western Riverside MSHCP are to integrate a monitoring program and an adaptive management plan, which will be guided by stronger resource assessments of species and plant communities. The first five years of the newly adopted MSHCP are devoted to gathering objective, baseline information on the distribution and abundance of plants, animals, and the habitats in which they live. This information will be used to determine long-term monitoring strategies and will include periodic evaluations of the adequacy of mitigation and conservation strategies. The California Department of Fish and Game (CDFG) is responsible for developing the strategy for the first eight years of the MSHCP (RCIP 2003), and the University of California (UC) Riverside, Center for Conservation Biology, has been hired to help build and implement the monitoring strategy.

In mid 2002, the CDFG's Resource Assessment Program funded a pilot study including a fine-scale



TOP TO BOTTOM: A rare vegetation community dominated by smooth tarplant (*Hemizonia pungens* subsp. *laevis*). Photograph by A. Klein. INSET: Close-up of smooth tarplant, a CNPS List 1B plant. Photograph by D. Taylor. • An association of limber pine and lodgepole pine with chinquapin (*Pinus flexilis-Pinus contorta/Chrysolepis sempervirens*), a locally rare community near San Jacinto Peak. Photograph by A. Klein.

vegetation inventory and mapping effort within the MSHCP area. They initiated the study to develop consistent and reliable monitoring strategies for the county's conservation plan. Since HCP-NCCP efforts have 50+ year lifespans, CDFG wanted to include reliable vegetation mapping substantiated by field data and map accuracy assessment. If that were done, conservationists, county planners, and land managers would be assured that the mapped locations adequately represented the different vegetation types found on the ground.

Knowing that the products and outcomes of this effort provide a new standard for future NCCPs and HCPs in California, CDFG partnered with other entities that

had already developed standardized techniques for vegetation inventory and mapping. The California

Native Plant Society (CNPS) Vegetation Program was hired to conduct field sampling and to develop

the vegetation classification, while Aerial Information Systems (AIS) was hired to create the map. CNPS

Table 1. Example showing fine-scale CNPS Alliances and Associations nested within broader MSHCP coastal sage scrub habitat types.

Diegan Coastal Sage Scrub Habitat	
Alliance	Association
<i>Artemisia californica</i>	<i>Artemisia californica/Amsinckia menziesii</i> <i>Artemisia californica-Malosma laurina</i>
<i>Artemisia californica-Eriogonum fasciculatum</i>	<i>Artemisia californica-Eriogonum fasciculatum</i> <i>Artemisia californica-Eriogonum fasciculatum-Malosma laurina</i> <i>Artemisia californica-Eriogonum fasciculatum-Salvia apiana</i>
<i>Artemisia californica-Salvia apiana</i>	<i>Artemisia californica-Salvia apiana</i>
<i>Artemisia californica-Salvia mellifera</i>	<i>Artemisia californica-Salvia mellifera</i>
<i>Encelia californica</i>	<i>Encelia californica-Artemisia californica</i>
<i>Eriogonum fasciculatum</i>	<i>Eriogonum fasciculatum</i>
<i>Keckiella antirrhinoides</i>	<i>Keckiella antirrhinoides</i> <i>Keckiella antirrhinoides-Artemisia californica</i> <i>Keckiella antirrhinoides-Eriogonum fasciculatum</i>
<i>Malacothamnus fasciculatus</i>	no association currently defined
<i>Malosma laurina</i>	<i>Malosma laurina-Eriogonum fasciculatum</i> <i>Malosma laurina-Eriogonum fasciculatum-Salvia apiana</i> <i>Malosma laurina-Eriogonum fasciculatum-Salvia mellifera</i> <i>Malosma laurina-Tetracoccus dioicus</i>
Riversidean Sage Scrub (Upland) Habitat	
Alliance	Association
<i>Artemisia californica-Eriogonum fasciculatum</i>	<i>Artemisia californica-Eriogonum fasciculatum</i>
<i>Encelia farinosa</i>	<i>Encelia farinosa</i> <i>Encelia farinosa-Artemisia californica</i>
<i>Ericameria palmeri</i>	no association currently defined
<i>Eriogonum fasciculatum</i>	<i>Eriogonum fasciculatum</i>
<i>Eriogonum fasciculatum-Encelia farinosa</i>	<i>Eriogonum fasciculatum-Encelia farinosa</i>
<i>Eriogonum fasciculatum-Salvia apiana</i>	<i>Eriogonum fasciculatum-Salvia apiana</i>
<i>Lotus scoparius</i>	no association currently defined
<i>Malacothamnus fasciculatus</i>	no association currently defined
<i>Salvia apiana</i>	<i>Salvia apiana-Encelia farinosa</i>
Coastal Scrub Habitat	
Alliance	Association
<i>Salvia mellifera</i>	<i>Salvia mellifera</i> <i>Salvia mellifera-Lotus scoparius</i> <i>Salvia mellifera-Rhus ovata</i>

and UC are working collaboratively with CDFG to ensure that data are collected consistently and are maintained within a centralized database system for this project and others throughout the state.

Use of concomitant efforts to inventory and map vegetation enables a broad-based and reliable approach, which can extend beyond the MSHCP area to all of California. Instead of using Holland's (1986) method to generally define and map vegetation, this study uses the National Vegetation Classification System (Grossman et al. 1998) and *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995). This system places vegetation into a multi-level hierarchy system, where "associations" are considered the finest level of vegetation (e.g., Engelmann Oak/Poison Oak/Grass Association), and "alliances" are at the next highest level (e.g., Engelmann Oak Alliance). Because the inventory is hierarchical in nature, different plant communities may be represented at multiple scales and may be cross-linked to other systems that define vegetation at coarser scales (see Table 1).

Agencies (such as CDFG, California State Parks, National Park Service, and the US Forest Service) have adopted the same system for documenting vegetation across California. Because the system has been used in Ventura, Los Angeles, and San Diego counties, the western Riverside County classification adds to the understanding of vegetation at the local as well as the regional level.

NEW DATA COLLECTION AND MAPPING STRATEGIES

In September 2002, CNPS began collecting field data to develop a vegetation inventory of western Riverside County. The primary sampling method used to develop the inventory was the CNPS "Vegetation Rapid Assessment" (see sidebar on p. 16). This method is used to collect a large number of samples

across an extensive landscape when time and funding are limited. The Rapid Assessment was most suitable for the western Riverside effort because field staff were tasked to collect as much information as possible across >800,000 acres of land in an 11-month timeframe.

During the sampling season, field staff traveled around the county collecting information to represent as many common and rare plant communities as possible. The information they collected was continually supplied to AIS staff who were working simultaneously on the map. In turn, AIS helped the field ecologists select their sampling sites by providing boundaries of existing natural landscapes within the MSHCP Area.

AIS created the vegetation map by manually photo-interpreting recent digital aerial photographs. They used environmental data layers and the survey data to guide their mapping. Since the mapping was based on the best interpretation of aerial photography (which had a base resolution of 1–2 meters), their polygons of vegetation had minimum mapping units of 1–2.2 acres. (The map can be accessed at <http://bios.dfg.ca.gov> by selecting the "Public BIOS Data Viewer" option. To view the map, click on the "Add Bios Layers" function button and add the data layer entitled: "Vegetation–Western Riverside Co. [ds170]").

The polygons were labeled with vegetation names using the CNPS reference data and classification, and the polygons were assigned attributes for structure (amount of overstory cover) and disturbance (degree of clearing or exotic species). AIS used the CNPS information to associate aerial photo signatures to vegetation types defined on the ground. Then they extrapolated those signatures to the rest of the study area by modeling characteristic environmental factors (e.g., slope and aspect, geologic substrate) that correlated to the field-defined alliances and associations. When AIS



TOP TO BOTTOM: California Buckwheat Alliance (*Eriogonum fasciculatum*), Brittlebush Alliance (*Encelia farinosa*), and mixed California Sagebrush—California Buckwheat Alliance (*Artemisia californica-Eriogonum fasciculatum*), three relatively common coastal sage scrub vegetation types in western Riverside County. Photographs by J. Evens (top), L. Vorobik (inset), and K. Ironside (center and bottom).

was not able to differentiate among plant communities, they merged combinations of similar alliances or associations into "mapping units." More detailed mapping may need to occur within the adaptive management plan as preserve lands are acquired and/or managed.

THE CNPS "VEGETATION RAPID ASSESSMENT PROTOCOL" IS DERIVED FROM THE CNPS "RELEVÉ PROTOCOL" (CNPS 1998)

Both protocols can be viewed at www.cnps.org.

Characteristics of the Rapid Assessment method:

- Surveys takes 15 to 30 minutes to complete
- Surveys can be collected year-round (with caveats)
- Surveys represent stands of vegetation varying from <1 acre to >5 acres

Examples of attributes collected using the Rapid Assessment method:

- List of dominant and characteristic species
- Percent cover of species
- Percent cover of tree, shrub, and herbaceous layers
- Slope, aspect, and elevation
- Soil texture and geology
- Site history, clearing, erosion, exotic plant and grazing intensity, etc.

Accuracy of the new map was assessed by the CDFG ecologists to establish the value of the final map and determine areas for improvement. Around 10% of the field samples, representing the main vegetation types in the map, were withheld from the photo-interpreters. The names assigned to these samples in the vegetation classification were compared to the names assigned to them on the draft map, and an accuracy assessment score of >80% was desired. The new map received an overall score of 84% and systematic

suggestions were provided to the photo-interpreters to improve the final map.

ADVANTAGES OF AN INTEGRATED APPROACH

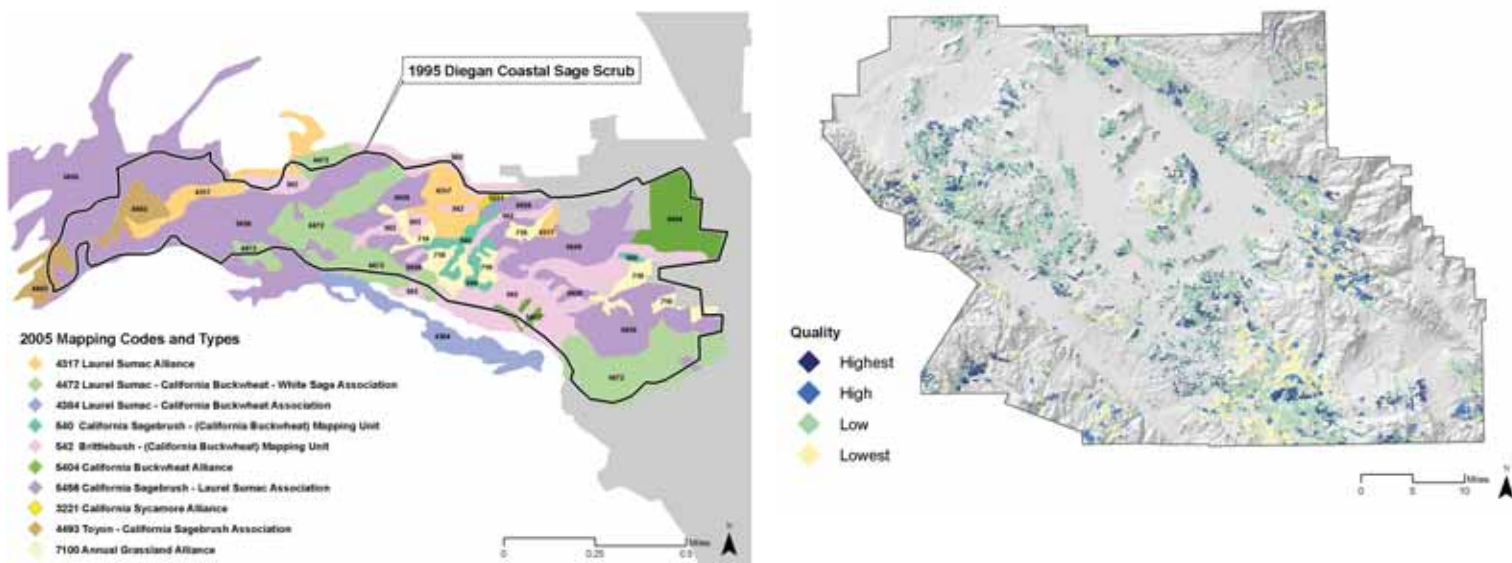
This is the first time that an integrated and standard approach has been used in an HCP-NCCP effort, and it provides a model for use in future conservation plans. This integrated approach results in several products that benefit conservation planning: the map, classification, and

the set of data collected on the ground. The map and classification afford better representation of target habitats for conservation planning because they are based on a unified state and national classification system that can be used at multiple scales.

The data collected in over 1,200 field surveys have a variety of applications. Land managers can use the information to effectively implement restoration projects, to monitor plant communities over time, and to model plant and animal habitats using the structure and composition data. Land managers also can use the data to identify "quality" stands of vegetation based on disturbances of invasive species or human impacts. Fire ecologists are already using the species and structural information to develop better fire fuels models and vegetation trend analyses. Continued collection and analysis of vegetation and habitat data will allow land planners and managers to adaptively manage the areas within the MSHCP.

The new map has additional applications for county planners to conserve species habitats within the MSHCP reserve area. CDFG has made broad comparisons of the new map with previous land coverages, providing rough estimates of how much agricultural land or natural

Figure 2 (BELOW LEFT). A comparison of the 1995 map's delineation of a Diegan Coastal Sage Scrub habitat with the 2005 map's fine-scale delineation of coastal sage scrub vegetation types. Figure 3 (BELOW RIGHT). Habitat features of gnatcatchers are modeled in GIS using the 2005 map from high to low quality. Gnatcatchers have shown a preference for coastal sage scrub dominated by California sagebrush and buckwheat, with shrub cover between 25-40 percent and shrub height less than 2 meters (Allen et al. 2005; Atwood and Bontrager 2001). Maps by K. Fien.



land has already been lost to development (see Table 2). This information will assist county planners in prioritizing areas to be conserved based on what natural habitats remain. Other possible comparisons include determining the proportion of rare and common alliances that occur within versus outside the currently conserved areas, so that planners can identify new areas for conservation on land that is not protected.

Wildlife biologists, botanists, ecologists, preserve managers, and others can use the new map for a variety of purposes because the new map, in addition to indicating the vegetation type, has multiple attributes associated with each polygon of vegetation. For example, wildlife biologists at UC Riverside are using the map to more accurately model and identify suitable habitat for the imperiled California gnatcatcher. Since gnatcatchers show preferences for certain coastal sage scrub species and certain overstory cover of shrubs, habitats correlated with gnatcatchers are modeled in GIS (see Figure 3).

Additional value is inherent in this type of integrated project. Specifically, the map and field inventory contain information on disturbance impacts from land clearing and exotic plant species. Land managers easily can use information to locate highly impacted stands of vegetation, so that they can restore them to more natural states. See the sidebar for various landscape-level

Table 2. The area of land covered by natural and non-natural features in the 1995 vegetation map as compared to the 2005 map.

MSHCP Name (Collapsed)	1995 acres	%	2005 acres	%
Agricultural Land	169,348	13.5%	151,999	12.1%
Water	12,197	1.0%	21,100	1.7%
Developed/Disturbed Land	218,098	17.4%	296,621	23.6%
Grasslands	154,024	12.3%	91,219	7.3%
Playas, Vernal Pools, and Marshes	10,194	0.8%	4,365	0.3%
Coastal Sage Scrub	156,330	12.4%	222,153	17.7%
Riversidean Alluvial Fan Scrub	7,937	0.6%	4,665	0.4%
Desert Scrub	14,575	1.2%	8,922	0.7%
Chaparral	434,622	34.6%	368,173	29.3%
Riparian: Scrub; Woodland; Forest	15,019	1.2%	21,950	1.7%
Woodland and Forests	34,478	2.7%	33,255	2.6%
Montane Coniferous Forest	29,884	2.4%	31,633	2.5%
Rock Outcrop	0	0.0%	650	0.0%
Totals	1.26 million		1.26 million	
Polygon Count	17,004		72,264	

analyses that could assist in targeting locations for new reserves.

In order to maximize implementation of the classification system for inventory and monitoring, we recommend that CDFG and the County of Riverside collect additional surveys, including those generated by the CNPS relevé method. Now that a consistent and more accurate classification system has been put in place, CNPS anticipates that additional data will build upon this base. Luckily, the adaptive management plan allows flexibility for future sampling and analysis, which will help provide a more complete picture of the diversity of plant communities occurring in western Riverside County.

IMPLICATIONS FOR LAND-USE PLANNING AND CONSERVATION

The MSHCP aims to conserve over 500,000 acres of land. This inventory and mapping approach allows for detailed assessments in reserve design and land management. Fortunately, the structure of Riverside's MSHCP allows updates and new information to be incorporated into the vegetation map during the term of the permit. There are many applications of using the new map and inventory for land use planning.

With the new vegetation map, survey data, and report produced in this project, resource managers have stronger and more scientifically-based tools for their land-use planning and conservation activities. Agencies and land managers are better equipped to prioritize specific reserve locations within the general footprint of western Riverside's core reserve lands by using more detailed on-the-ground information for vegetation and habitats. Further, they have more precise location information on habitats in which specific rare species may occur, and they

RECOMMENDATIONS FOR ADDITIONAL FIELD SAMPLING AND INVENTORYING

- Private lands that have not been surveyed
- Plant communities that are more accurately captured in moist or El Niño years
- Grass, forb, wetland, riparian, vernal pool, and alkali playa communities that should be visited during peak phenology using relevé/quadrate techniques
- Alliances and associations that have fewer than 5 samples

APPLICATIONS OF THE NEW MAP

In sum the new map can be implemented in numerous ways:

- To accurately identify habitat locations which are suitable for species covered in GIS modeling
- To accurately reflect current site environmental and habitat conditions (e.g., intact versus disturbed coastal sage scrub)
- To identify locations that need further study or monitoring for adaptively managing the region
- To identify areas converting from coastal sage scrub to grassland (as human population and nitrogen deposition increase)
- To identify locations that support high biodiversity of vegetation in GIS modeling
- To better identify the rarity and diversity of plant communities, so that adequate representative areas are conserved for all the different alliances and associations found in the region

can better quantify how much of a given habitat they already have in conservation versus how much they may still need to conserve. They also are better apt to identify areas on the map that have high vegetation diversity, so that they can better protect all of the unique coastal, montane, and desert environments found in the area.

Since the new vegetation map is based on standardized methods, repeat mapping of the vegetation can be done at set intervals (e.g., every 8-10 years) using the same quantitative rules. Thus, the baseline mapping and future re-mapping can provide a complete picture of the status and trends in vegetation and habitats, which could assist adaptive shifts in MSHCP management decisions over the lifetime of the plan. Further, land managers can assess the total number of acres per plant community that have been historically lost and the acres that could be potentially lost in the future, so that they can prioritize and drive conservation of vegetation types that may be experiencing significant losses.

The general public and resource managers also have more information on the importance, rarity, and abundance of vegetation, which can be applied to conservation planning and management decisions. With rarity rankings established for the new vegetation classification, local CNPS chapters and other groups can provide direction to local land planners on conservation strategies. People involved in restoration can make more informed decisions on how to restore vegetation to a more natural state, applying information from a mostly intact area to a disturbed area. Thus, they have better information to steer management efforts, as well as conservation efforts.

With the vegetation information and methods presented in this integrated project, people have a solid knowledge base in vegetation assessment and mapping to apply in their efforts. This information allows people to be more aware and engaged in scientifically-based conservation and management of natural plant communities, which can re-

sult in wiser land-use and conservation decisions in the future.

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*The following website contains the full vegetation report, PowerPoint presentation, and complete references associated with this project:
www.cnps.org/programs/vegetation/index.htm

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Habitat of Ione buckwheat (*Eriogonum apricum* var. *apricum*). All photographs by author except as noted.

THE UNCERTAIN FUTURE OF IONE'S RARE PLANTS

by George Hartwell

Within an hour commute southeast from Sacramento lies a geologic oddity known as the Ione Formation. Roughly 18 miles long and 3 to 4 miles wide, it is located in gently rolling Sierra foothills juxtaposed with pastoral ranchlands, strands of foothill woodland, vernal pools, swales, and meadows. The plant community that grows upon it is known as Ione chaparral.

From a hilltop perspective, low heath-like chaparral vegetation dominates the viewscape, punctuated with an abstractly patterned patchwork of chalky-white to sepia-colored sunburnt earth. As landscape architect Frederick Law Olmstead

wrote in 1865, “. . . there are more stupendous rocks, more beetling cliffs, there are deeper and more awful chasms, there may be as beautiful streams, as lovely meadows; there are larger trees.”

While he was actually describing a portion of the Yosemite Valley, his words may as well have depicted the austere, ascetic harshness and understated complexity of the Ione chaparral landscape. This unique island of rare endemic, edaphic plant species evolved to thrive in an otherwise barren ecologic niche on nutrient poor, highly acidic soils—saturated in winter, bleached-bone dry in summer, and hostile to most other plant life.

Olmstead also noted, “By no state-

ment of the elements of the scenery can any idea of that scenery be given, any more than a true impression can be conveyed of a human face by a measured account of its features.”

The US Fish and Wildlife Service (FWS) described the region's geology in 1999 in its petition for listing Ione manzanita, one of the area's rare plant species:

The Ione Formation, comprised of a unique Tertiary Oxisol, consisting of fluvial [stream or river produced] estuarine, and shallow marine deposits [Bureau of Land Management 1989] was developed under subtropical or tropical climate during the Eocene [35–57 million years ago]. The Ione soils are coarse-



Soil in the habitat of Ione buckwheat.

textured and exhibit soil properties typical of those produced under tropical climates, such as high acidity, high aluminum content, and low fertility [Singer 1978 in US FWS 1999].

The face of the Ione Formation is cratered by decades of surface mining, cleft by roads and highways, and blotched with an incongruous collage of agricultural, commercial, and residential development. Growing like persistent stubble beard from its weathered skin, a pair of endan-

gered buckwheats, a diminutive manzanita, and a couple of other unusual plant species of the Ione chaparral have managed to survive this austere wilderness, but their future remains uncertain.

Clay, sand, lignite (a form of coal), gravel, aggregate, and gold mining continue to chew away at the dwindling habitat for these rare species. The urban workplaces of Sacramento and Stockton drive new residential and commercial developments—upstart centers of economic sprawl—deeper into areas once reserved for rattlesnakes. Yet, the impacts of human tinkering with Ione’s suite of rare plants exceed even the obvious: the invasion of an often fatal plant pathogen, *Phytophthora cinnamomi*, is complicating any strategy for the conservation of at least the Ione manzanita, and may affect many other plant species that are commonplace in the area.

Perhaps the mostly widely known of Ione’s rare plants is Ione manzanita (*Arctostaphylos myrtilifolia*) and two forms of *Eriogonum*, Ione buckwheat (*Eriogonum apricum* var. *apricum*) and Irish Hill buckwheat (*Eriogonum apricum* var.



TOP RIGHT AND BOTTOM RIGHT: Irish Hill buckwheat (*Eriogonum apricum* var. *prostratum*). • BELOW: Ione buckwheat (*Eriogonum apricum* var. *apricum*). Photograph by S. Matson.



prostratum). Ione manzanita is a federally listed threatened species. Both varieties of *Eriogonum apricum* are state and federally listed as endangered.

There are at least two other uncommon upland plant species in Ione-associated soils, both of which also occur in Amador and neighboring counties in the same elevation ranges—Amador or Bisbee Peak rush rose (*Helianthemum suffrutescens*), and Parry's horkelia (*Horkelia parryi*). The former still buds in botanic limbo until debate over its specific status is resolved. Some botanists think of it only as a local aberration of the common sun rose (*Helianthemum scoparium*).

According to the Fish and Wildlife Service, "*Arctostaphylos myrtifolia* is reported from 17 occurrences. [It] may occur in about 100 individual stands which cover a total of about 404.7 hectares (1,000 acres) (Roy Woodward, Bechtel, in litt. 1994). It occurs primarily on outcrops of the Ione Formation within an area of about 35 sq. mi in Amador County. In addition, a few disjunct populations occur in Calaveras County."

"*Eriogonum apricum* is rarer," the FWS said (1999), citing a 1984 Nature Conservancy document: "*Eriogonum apricum* var. *apricum* is restricted to nine occurrences occupying a total of approximately 4 hectares (10 acres) on otherwise barren outcrops within the Ione chaparral . . . The two known occurrences of *E. apricum* var. *prostratum* are restricted to otherwise barren outcrops on less than 0.4 hectares (1 acre) in openings of Ione chaparral on private land."

Perhaps three-quarters of Ione's unique plant community exists on Rancho Arroyo Seco, site of the Howard Ranch, a 20,000-acre private holding established originally through a Mexican land grant in 1844 and operated, at this writing, by the heirs of Charles S. Howard, an entrepreneur who owned the leg-



Amador rush rose (*Helianthemum suffrutescens*). • Parry's horkelia (*Horkelia parryi*).

endary race horse Seabiscuit. It is one of the largest privately-owned ranches in California.

Other populations of rare Ione plants grow mostly on lesser-sized private lands. The California Department of Fish and Game (CDFG) and the US Bureau of Land Management own small protective reserves. Some rare plants grow on state highway rights-of-way. Others occupy the skinny edges of western Amador County's rural roadways, and some occur on the East Bay Municipal Utility District's Lake Comanche land holdings in northern Calaveras County.

The specter of potentially explosive land development in western Amador County may be the most obvious and imminent threat to the survival of Ione's rare plants. The Howard Ranch was offered for sale in 2005 at a market price believed to be in excess of \$85 million.

A sales brochure produced by real estate broker Grubb & Ellis heralded "A Once in a Lifetime Opportunity" for the potential buyer. "With its combination of size, wildlife, natural resources, and inherent beauty, Rancho Arroyo Seco is a unique and desirable property," the brochure declares. "The ranch's proximity within northern California to the employment growth areas of Sacramento, San Francisco, and the Silicon Valley creates opportunities to share in their burgeoning economies and real estate appreciation," the advertisement asserts.

According to Ken Noack (personal communication, December 6,

2005), senior adviser with the real estate company, "The property is under contract with a buyer and will likely close in the second quarter of 2006," in the absence of complications.

Amador County District 2 (Ione area) Supervisor Richard Forster (personal communication, January 9, 2006) commented on the ranch sale and the perceived intent of a prospective buyer: "Gold Rush Developers [is] talking about [building] 8,000 homes over 20 years. That would seriously impact plants and more species that have been identified under the Endangered Species Act as either threatened or endangered. Namely, there's the tiger salamander and vernal pool fairy shrimp."

While Forster is an advocate for the economic well-being of the area, including mining and related businesses, he also supports a realistic approach to environmental impacts. "Being cognizant that the native plants thrive in areas where mining occurs, we need to have a program that is protective of those native species and follows the mandate of the law." Whether Amador County will embrace natural resource conservation in the future is unclear. The county's General Plan (County of Amador 1996)—the local government document that prescribes a blueprint for community development—includes "wild west" language that promotes the philosophy of self-governance in the form of "home rule" at the expense of resource protection:

It is important to understand



Ione manzanita (*Arctostaphylos myrtifolia*), from the Carbondale Road area. Photographs by S. Matson.

that the value of minerals is not in the minerals themselves, but in the right to mine those minerals . . . Unlegislated or regulatory taking under the guise of the Endangered Species Act, the



Clean Water Act or others is nothing more than a de facto taking of the right to mine.

The General Plan goes further in its diatribe, stating in another paragraph:

Territories set aside for the protection of endangered species threaten every use of the land, including hunting and fishing.

Amador County's General Plan is under review in anticipation of revision by the end of 2008 or early 2009, according to Planning Director Susan Grijalva (personal communication, December 20, 2005). "We would assume and expect that our new general plan would address the issues of endangered species, possible habitat conservation, and things of that nature that the public has asked the Board [of Supervisors] to consider," she explained.

While continued land development will surely imprint additional permanent and irreversible scars on the face of the Ione chaparral, the subcutaneous emergence of the *Phytophthora* pathogen may produce an affliction from which there is no foreseeable recovery for Ione's unique manzanita species and others. Plant pathologist Ted Swiecki, founder of the consulting firm Phytosphere Research, was studying another fungal disease of Ione manzanita, *Fusicoccum* spp., cankers that causes branch and twig dieback, when he

discovered a pathogenic phenomenon that appeared ominous:

We were working in the CDFG [Apricum Hill] reserve. One day when I happened to be out there I took a stroll over to an area beyond where we had our [research] plots. This isn't *Fusicoccum*, it's something else, [Swiecki thought] It's worse than that. This mortality center obviously wasn't *Fusicoccum*. This was a patch that was totally devastated. Potentially, [it was] something more important than *Fusicoccum*.

Swiecki's subsequent reports to CDFG revealed the pathogen to be *Phytophthora cinnamomi*, a plant disease that he characterized as "a pretty aggressive" pathogen:

It's a root-rotting organism. It has a wide host range. It moves fairly rapidly. It can move with water. It spreads around a lot faster than some other soil-borne fungi.

He also points out that once it's established, getting rid of it is problematic:

It tends to be very long lived in the soil, and beyond that, also difficult to eradicate. Once the soil's infested there's not much you can do about it. *Arctostaphylos myrtifolia* is limited to certain soil types. Once those soils become infested with *Phytophthora cinnamomi* it's an almost irreversible loss of habitat for [Ione manzanita]. They can no longer support healthy stands of *Arctostaphylos myrtifolia*. If this pathogen gets spread throughout the range of Ione manzanita, those plant populations are headed for extinction. Since we aren't making new suitable habitat anywhere, that's a problem for the survival of the species.

The disease is affecting other California manzanitas, too, Swiecki noted. "It's almost as severe on *Arctostaphylos viscida* [white-leaf man-

zanita] as *A. myrtifolia*. Probably most manzanitas are going to be sensitive to *Phytophthora cinnamomi* to varying degrees.”

The extent of the disease and its relentless spread is worrisome from a macroscopic perspective. “It’s clearly affecting a native ecosystem,” Swiecki observed. “What’s uncommon is to see it taking out a chunk of native vegetation here in California. It hasn’t been seen as a major pathogen in these types of native habitats in California prior to these times, at least on a large scale.”

Phytophthora cinnamomi has affected plant species from Europe to South Africa to Australia and beyond. In a paper presented for the Sudden Oak Death Online Symposium in 2003, writer Gretna Weste of the University of Melbourne dramatically described the effects of the disease on the native forests of Australia:

Phytophthora cinnamomi has caused severe dieback and disease in the native forests, woodlands, and heathlands of southern Australia. The Australian flora is entirely different from that of other countries; high species richness developed during a long period of isolation, . . . *P. cinnamomi* has devastated the diverse species of the understory, caused epidemic disease since 1973. More than 1,000 species are susceptible, and the rarer species are endangered and may become extinct. . . . The death and degradation of a complete, unique, and beautiful forest ecosystem is shocking.

Phytophthora cinnamomi has stewed in the soils or in horticultural and agricultural environs of California for decades, according to researcher Swiecki:

We’ve had it in California since the turn of the 20th century. It’s been in avocado and citrus orchards. It’s a pretty common disease of nursery container stock and consequently it becomes a



Chaparral about two miles southeast of Ione, on the north side of Highway 88 (Amador County). Photograph by S. Matson.

problem in planted landscapes. It also turns out to be a problem in various Christmas tree farms, including the foothill and Sierra regions. Curiously, it really hasn’t been found [to be] causing problems in native ecosystems in California until this particular finding. It may be [responsible] for coast live oak decline in San Diego County.

In the absence of known eradication methods, many researchers advocate avoidance of infected areas to prevent epidemic spread of the disease to healthy plant communities. Activities that cause the movement of soil from one place to another may spread the disease. These include vehicle traffic, especially off-road travel, mining, grading, construction activities, and even foot traffic. Infested soil is most readily moved when it is wet, so avoiding activities that spread the pathogen is particularly important throughout the wet season, Swiecki reported.

Storm runoff can exacerbate the problem.

According to Swiecki, two basic management strategies are critical to minimizing the impact of *P. cinnamomi* on *A. myrtifolia* populations:

First and foremost, it is necessary to prevent the spread of *P. cinnamomi* into stands that are currently free of this disease. Secondly, and of almost equal importance, the spread of the pathogen from existing disease centers within extant stands needs to be slowed or stopped.

In addition to the *Phytophthora* studies commissioned by the CDFG, the US FWS is developing management strategies for the recovery of Ione’s rare plants. A draft plan, prepared by consultant botanist Roy A. Woodward, is under review and revision by the Sacramento office of the FWS. It outlines ways the federal government, in collaboration with others, may implement effec-

tive species protection and recovery programs. FWS officials state that the plan may be released for public comment within a year.

Craig Aubrey (personal communication, January 12, 2006), FWS Sacramento Recovery Branch chief, reviewed the plan's major strategies. "A variety of tools are available under the Endangered Species Act to help states and landowners plan and implement projects to conserve species," Aubrey explained. The toolkit includes so-called "traditional" conservation grants:

Funded activities include habitat restoration, species status surveys, public education, and outreach, . . . propagation and reintroduction, . . . surveys, genetic studies, and development of management plans.

Conservation lands might be acquired through "Recovery Land Acquisition Grants," Aubrey added, stating:

Loss of habitat is the primary threat to most listed species, and land acquisition is often the most effective and efficient means of protecting habitats essential for recovery of listed species before development or other land use changes impair or destroy key habitat values.

I asked Aubrey whether the emergence of the *Phytophthora* pathogen would precipitate relisting of Ione manzanita from its current threatened status to that of endangered. He responded:

We are not currently considering upgrading the listing status of Ione manzanita. When we do our five-year review for Ione manzanita, we will evaluate relevant new information regarding the magnitude and imminence of previously identified or new threats to the species, and then provide an updated assessment of the status of the species and its threats.

The next review is expected within five years, he said.

Depending on your perspective, five or so years may be a lifetime or just a nanosecond in the geologic time required for the evolution of Ione's rare plants. Regardless, it's time enough for developers' bulldozers to wipe from existence any number of Ione's rare plants. It may be inadequate time to see the completion of effective recovery plans, the allocation of funding to advance them, or their final implementation.

Whatever the number of years, they may chronicle many more soggy winters in the Ione area like the one of 2005–2006, when rivers, streams, and drainages swelled beyond capacity, and washed eroded soil, silt, and debris far afield. Subtly blended into the muddy brew, a covert cascade of millions upon millions of living, motile fungal zoospores percolated deep into their new-found environs, some to touch the vulnerable roots of susceptible species with a caress of certain death.

It's only a matter of time—whether measured in years, months, or days—that the fate of Ione chaparral will be decided. With prudent management, some of its natural heritage may be preserved for future generations. Absent that, another of California's unique natural resources may disappear, suffocated beneath the concrete, asphalt, and greened front lawns of epidemic land development, or killed by a less visible but equally lethal enemy, *Phytophthora*.

As F.L. Olmstead (1865) wrote about another once-natural place:

The time will come when New York will be built up, when all the grading and filling will be done, and when the picturesque-varied, rocky formation of the Island will have been converted into the foundations for rows of monotonous straight streets, and piles of erect, angular buildings. There will be no suggestion left of its present varied surface.

If we intervene and act wisely, we can save some of this pristine wilderness. If not, time and those processes already in motion will decide the fate of the Ione chaparral.

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Douglas irises, checkerblooms, and bunch grasses grace the meadow portion of Scott and Jenny Fleming's garden. All photographs by S. Holt.

A NATIVE PLANT GARDEN IN THE BERKELEY HILLS, PART ONE

by Jenny S. Fleming

Our garden, which some knowledgeable people believe to be the oldest privately owned California native plant garden, surrounds our home on a very steep lot in the Berkeley hills north of the University of California campus. Our irregular, one-half acre lot rises about 110 feet from the lowest corner on Shasta Road diagonally across the property to the top corner, from about 760 to 870 feet in elevation.

The property is predominantly situated on a northwest-facing ridge adjoining a ravine cutting across the

neighbor's property on our north-eastern border. Our exposure curves around from the west to nearly north. Prevailing winds come from the west, through the Golden Gate, and often bring fog.

Our property was originally covered primarily with annual grasses,

two tall elderberry shrubs (*Sambucus caerulea* [Jepson = *S. mexicana*]), plentiful bulbs (*Triteleia laxa*, *Dichelostemma capitatum*), California poppies (*Eschscholzia californica*) and grass iris or blue-eyed grass (*Sisyrinchium bellum*). Much of the original cover was bulldozed out

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when we leveled an area to provide flat space for the house, patios, and a tiny lawn.

Creating a building site and some level outdoor living area required extensive excavation and grading, including scalping the topsoil across the center of the property down to what my husband calls “God’s own concrete”—a pebble-studded, heavy, hard clay. While excavating for a drainage line, my husband, Scott, found it easier to break out a concrete overflow from the foundation footings than to dig through the subsoil.

Our wide, exposed, aggregate driveway leads diagonally uphill to the garage level below the single floor living area of the house. You can reach the living area by climbing a concrete staircase in front or by a ramp going up along the west side. From a landing halfway up the front stairway, a path leads down along the top of the driveway retaining wall and a rock stairway leads up to the meadow and patios. From the southwest end of this level, a well constructed stepping stone path made of flat pieces of lava 3 to 4 inches thick switchbacks up the hill, providing foot and wheelbarrow access to the garden on the sunny upper hillside. A rock stairway built of the same natural stepping stones provides an alternate route up the hillside at the northerly end of the main yard level.

Drainage, a major consideration, is provided by drainlines under the uphill edge of the paths. These paths are sloped to direct water to the drainlines. Another major drainage feature is a recirculating waterfall, pool, and stream system that overflows into a 6-inch diameter drainpipe leading to the street along our northeasterly boundary.

Good sturdy retaining walls are essential for stabilizing areas of fill



Heast ceanothus gracefully drapes over boulders in the rock garden.

dirt resulting from the excavation. Our most attractive, along the street frontage, is a 4-foot high “dry rock” wall of Sonoma County fieldstone. By “dry rock” I mean a wall built only of rock stabilized by dirt compacted behind the rock. Our walls generally slope back about 15 degrees from vertical for increased stability and are built up from a firm foundation layer in a trench. These walls, ranging from 1 foot to about 8 feet high, have stood for nearly 40 years with virtually no displacement, despite numerous minor earthquakes and downpours. A dry rock wall assures excellent drainage.

We have also built walls of concrete rails and “deadmen”—concrete beams with wide ends to lie between the rails and project back into the slopes of dirt fill—to handle more demanding fill-retention problems. This was a necessary, though less attractive, means to support an 8-foot rise above the driveway and in

other potentially unstable areas of deep fill on steep slopes. These walls, especially the dry rock walls, are “self-landscaping.” Eventually ferns, heucheras, and other nice plants have filled the joints between the rails, a lovely sight. Over time, lichens have discovered much of the rock.

With our first child coming along in 1954, we needed to develop some paths and play space and build fences so a toddler would not “fall off the yard.” Before we had time to consider serious landscaping, we visited the Native Plant Botanic Garden in Tilden Park, just a mile up and over the hill. We soon developed the habit of taking lunch there on sunny weekend days.

We fell under the spell of the garden’s beauty and, following many long conversations with James Roof, founder and director, we decided to develop a native plant garden. This appealed to Scott, who liked many of the plants that he had met while hiking in the Sierra near his teenage home in Reno, Nevada.

When we started, did we plan to

Rockwork is a critical element to the architecture of the Fleming garden. Adjacent to the flagstone patio, the meadow garden is separated from the rock garden by a dry streambed that is flanked by a flagstone path.

be purists? I don't think we ever gave it a thought. These were beautiful plants and we wanted to use them. The idea of remaining purists came later. Jim put us into contact with Louis Edmunds, owner of a native plant nursery in Danville, and we were off on a lifetime commitment.



Blue dicks and sword fern soften the contact between a fence and adjacent rocks.

Ours is a collector's garden, not a landscaped garden. When we saw attractive plants new to us, we would make another trip to the Edmunds nursery, hoping to acquire them. We also obtained permits from the Forest Service to collect from the wild, using great care to minimize impact. I am pleased that casual collecting is no longer allowed.

The topography of our property helped make some plant placement

easy. The area in front of the house was on a steeply descending north slope, an obvious site for shade loving redwood plants. We have two large redwood trees and a big-leaf maple (*Acer macrophyllum*) shading the bank. Understory shrubs include vine maple (*Acer circinatum*), mock orange (*Philadelphus lewisii*), evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), and my prized western dogwood (*Cornus nuttallii*), collected from the wild as a tiny tree. Its growth is very slow now, perhaps from too much shade and too many years in our clay soil. I transplanted it, with a few incantations, on the lower part of the slope on April 8, 1958, a few hours after it collapsed into the driveway in a mudslide. The little dogwood kept growing in this shady site, spreading but gaining little in height.

Groundcovers for this area were easy to come by: wild ginger (*Asarum caudatum*), false Solomon's seal (*Smilacina stellata*), and redwood sorrel (*Oxalis oregana*) quickly covered the slope. I planted one or two sword ferns (*Polystichum munitum*) and their descendants proceeded to pop up in many available places, especially in the crevices between rocks. This area receives occasional summer water and the dense cover provides excellent protection from soil erosion. During the last two years of drought, thrips were an unsightly problem by summer's end; the salal was especially hard hit. We have pruned heavily and used Safer Soap with pyrethins, but with little effect.

There is a wide planting strip on the downhill side of the steep driveway, and a narrow, raised planting strip on the uphill side, topped by the near vertical concrete rail wall mentioned earlier. Overhanging redwoods shade the driveway and the planting strips on both sides.

The planting on the lower side, running the length of the driveway, continues the theme of redwood forest floor plants, with much redwood

sorrel and the herbaceous inside-out flower (*Vancouveria hexandra*) interspersed with iris (*Iris innominata*) and meadow rue (*Thalictrum polycarpum* [Jepson = *Thalictrum fendleri* var. *polycarpum*]). Featured here are some very special bulbs. Fetid adder's tongue (*Scoliopus bigelovii*) appears early in spring, with elegant, shiny, pleated leaves with purple dots close to the ground and small narrow-petaled flowers. The unpleasant odor is noticeable only very close to the plants. A fawn lily with mottled leaves and showy white flowers (*Erythronium californicum*), also appears in late February, soon followed by trilliums (*Trillium ovatum* and *T. chloropetalum*).

The narrow strip on the upper side of the driveway, elevated by a row of fieldstone, displays the same groundcovers and ferns plus sugar scoops, (*Tiarella unifoliata* [Jepson = *T. trifoliata* var. *unifoliata*]) and deer fern (*Blechnum spicant*).

The 8-foot high concrete rail wall, mentioned earlier, supports the next garden terrace. Between the rails of this wall I have used more oxalis, wild ginger, and vancouveria. Featured here are many clumps of five-fingered fern (*Adiantum aleuticum*) and other ferns—sword fern, California polypody (*Polypodium californicum*), and goldback fern (*Pityrogramma triangularis* [Jepson = *Pentagramma triangularis*]). In areas of light shade are sugar scoops, island alum root (*Heuchera maxima*) and a delicate pink form of common alum root (*H. micrantha* 'Martha Roderick'). In a larger rock pocket I have displayed the coastal bead lily (*Clintonia andrewsiana*), and wake robin, (*Trillium ovatum*).

[See the next two issues of *Fremontia* for a continuation of this delightful journey through the Fleming garden.]

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TOP: Lupines (blue—*Lupinus benthamii*; white—*L. microcarpus* var. *densiflorus*) in a sea of frying pan poppies (*Eschscholzia lobbii*) along Point Grade, Highway 120, just below Big Flat. Photograph by C. Jones. • ABOVE, CLOCKWISE: Blue-eyed-grass (*Sisyrinchium bellum*). Photograph by L. Vorobik. • Tidy tips (*Layia platyglossa*). Photograph by C. Jones. • Cream cups (*Platystemon californicus*). Photograph by L. Vorobik. • FAR RIGHT: Wall flower (*Erysimum capitatum*). Photograph by L. Vorobik.

SPRING WILDFLOWERS FROM GRASSLANDS AND OAK WOODLANDS

Photographs by B. Ertter, J. Game, G. Hartwell,
C. Jones, S. Matson, and L. Vorobik

So many wildflowers are in their full glory this time of year. Presented here are images of landscapes and flowers that one might see while strolling through the oaks or nearby grasslands. Many of these flowers might be discovered while enjoying the trails of Mt. Diablo in Contra Costa County (see B. Ertter's article on page 3).

Photographers are invited to submit their work for publication in *Fremontia*. For more information, contact the editor at Fremontia@cnpa.org. For information on individual photographers, see the inside back cover.



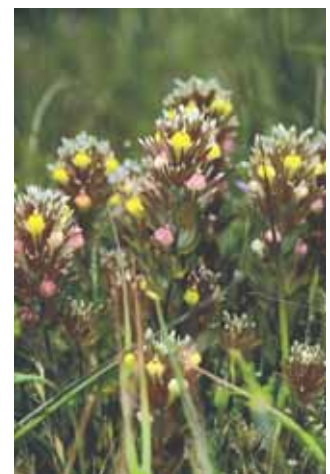


VERTICAL ROW ON LEFT, TOP TO BOTTOM: Mount Diablo fairy lantern (*Calochortus pulchellus*). Photograph by J. Game. • Ithuriel's spear (*Triteleia laxa*). Photograph by G. Hartwell. • Purple owl's-clover (*Castilleja exserta* ssp. *latifolia*). Photograph by S. Matson. • A brodiaea found on coastal serpentine (*Brodiaea stellaris*). Photograph by J. Game. • Close-up of disk flowers of balsamorhiza (*Balsamorhiza deltoidea*). Photograph by S. Matson.

TOP RIGHT GROUPING, CLOCKWISE FROM MIDDLE: Purple owl's-clover (*Castilleja exserta* ssp. *latifolia*), in a sea of goldfields (*Lasthenia californica*). Photograph by C. Jones. • Baby blue-eyes (*Nemophila menziesii*) with Johnny-jump-up (*Viola pedunculata*). Photograph by B. Ertter. • California poppies (*Eschscholzia californica*) with annual grasses and vetch (*Vicia villosa*), a non-native. Photograph by C. Jones.

LARGE PHOTOGRAPH, ABOVE: Hint of spring gold from California poppies on slopes east of Bakersfield along Highway 233. Photograph by C. Jones.

RIGHT: Johnny-nip (*Castilleja ambigua*), from coastal grasslands. Photograph by J. Game.



BOOKS RECEIVED

Field Guide to the Vernal Pools of Mather Field, Sacramento County, by Carol W. Witham. Copyright © 2006 Sacramento Valley Chapter, California Native Plant Society. Soft cover, spiral bound, 48 pages, 5³/₈x8³/₈, 130 color photographs, map. \$10.00. Visit www.sacvalleycnps.org for ordering information.

CLOCKWISE FROM TOP LEFT: Yellow carpet (*Blenosperma nanum*), Fremont's tidy-tips (*Layia fremontii*), vernal pool goldfields (*Lasthenia fremontii*), flying pan poppies (*Eschscholzia lobbii*). Photographs by C. Witham.



The vernal pools of California are biological communities that are not only unique to California, but also differ from each other—including nearby and adjacent pools. The author of what is likely to be a popular guide to the vernal pools of Mather Field explains in layperson terms the special conditions that, over millions of years, create these distinctive and stunningly beautiful communities, and the adaptations of the plants and animals that enable them to survive and exploit the demanding environment. She explains why the pools differ from each other, and from one region to another. The copious photographs—of the concentric-ringed pools as well as close-ups of plants and animals in various stages—tell why the author is passionate about them, and why we must save them.

Not the least fascinating aspect of these delightful areas are the close relationships between plants and the interacting fauna—many of which exist only in a given pool—and the fact that hundreds of plants and animals can exist nowhere else. The author por-



CLOCKWISE FROM TOP LEFT: Bluedicks (*Dichelostemma capitatum*), alkali checkerbloom (*Sidalcea hirsuta*), horned downingia (*Downingia bicornuta*), and Douglas's beardstyle (*Pogogyne douglasii*).

trays the different worlds of the aquatic and the flowering phases, both of which are intricate examples of the precious diversity we have inherited. Protecting this heritage is not easy; the very terrain that favors development of the pools favors the development of houses, and the pools are located in burgeoning areas of the state.

BOOK REVIEW

San Diego County Native Plants, by James Lightner, 2006. San Diego Flora, San Diego, CA. 320 pages, cloth, \$29.95.

Plant species are local. It always surprises me how few people know that the secret to accurate plant identification is to have a guide specific to plants of the region. If you are interested in southern California plants, even the best book on plants of northern California will result in many incorrect identifications. Even for regions within southern California, you are likely to misidentify roughly 5–10% of the species if, for example, you use a book on plants of the Santa Monica Mountains to try to identify species of the Santa Rosa Plateau, even though the two spots are less than 100 miles apart.

Since 1986, botanists comfortable with using technical plant keys have been well served for San Diego County with Beauchamp's wonderful *A Flora*

of San Diego County. That book is delightfully portable, ideal for identifying species in the field, and gives the essentials needed by professional botanists: a key and the locations and abundance for each species in the county.

Unfortunately, identifying plants using technical keys can be a difficult skill to learn, so most plant enthusiasts in San Diego County have been forced to use picture books from other areas. But when James Lightner came out with his first edition of *San Diego Native Plants* in 2004, amateur botanists interested in local plants were ecstatic. Finally, here was a book that concentrated on San Diego County and only featured species known to be in the area. The book was as portable as Beauchamp's, and was filled with wonderful pictures. Even advanced botanists were quite pleased with Lightner's book. There's nothing like a key to lead you to some horrible misidentifi-

cations that can quickly be caught with a photograph, so the book has proven a valuable complement to Beauchamp's *Flora*.

In his guide, Lightner takes an approach that needs to be used in more wildflower guides: Instead of providing a single picture for each plant, he typically includes two to three photos showing various aspects of the plant. I well remember my first days in the field puzzling over whether a picture matched a given plant or not. Often, seeing another picture—whether from a different angle, showing a different part of the plant, or at a different scale—helped immensely in deciding whether I had a match or not. Of course the only drawback to having more pictures, as this guide does, is that they tend to be a bit small and therefore show less detail.

Lightner organizes his book into two parts: Trees and Shrubs; and Her-

baceous Plants. By doing so, he immediately reduces the number of plants to be searched by about half. Each section is then further organized by family.

Amateurs may be unhappy that the book is not organized by flower color, since most beginners are unfamiliar with the plant families, and the guide makes no attempt to teach them to the reader. By and large, however, organization by plant family is far more useful.

Lightner's first edition covered only the non-desert portions of San Diego County, and he received many requests to cover the desert portion as well. His 2006 edition now includes about 350 desert species and an additional 150 cismontane species. Lightner has also tripled the number of grasses, sedges, and rushes to nearly 100. Advanced plant enthusiasts will especially treasure these added pictures and descriptions. The new book is truly a bargain; doubling the number of species only marginally increased the price. The book is dense with information and could almost be called a mini-*Jepson Manual* except that

this one is accessible to the beginning botanist! The new edition highlights which species are often confused, and in most cases gives the critical differentiating characters—an extremely valuable addition. Text has been added for many species, and the introduction does an excellent job in summarizing San Diego County plant life.

The most critical part of any plant guide is the accuracy of the identification of photographs of the species treated, which is quite high in this volume due to the pre-publication review of the book by Dr. Jon Rebman, an expert on plants of San Diego County. Lightner even has *six* accurately-identified *Cryptantha* species, instead of the typical "*Cryptantha* sp." given in most such books.

One useful feature in the book is the use of single-letter abbreviations to designate one of the many geographic regions (C for coast, F for foothills, etc.) in which each species is found. Each photo also lists the specific location where it was taken.

There are two unexpected bonuses to Lightner's guide. First, he has in-

cluded birds, insects, and spiders in his photos, and provides an index to them. Second, at the back is a list of naturalists associated with species in San Diego County, with biographical information on each person.

Having bestowed all this praise on Lightner's book, I'd like to offer a few suggestions for improving the next edition. First, two species are often discussed together, accompanied by a number of pictures. In a fair number of cases, he fails to specify which pictures go with which species. Second, the text is printed in too delicate a font, which makes it somewhat difficult to read. Apparently this font was used to save space. Third, a list of the very few misidentifications I've found, along with a few other comments, are available at <http://tchester.org/plants/lists/books/lightner.html>.

Notwithstanding these minor criticisms, anyone with more than a passing interest in San Diego County plants will most certainly want to get hold of this book.

Tom Chester
San Diego County Chapter

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John Game works for the Life Sciences Division of the Lawrence Berkeley National Laboratory and is a research associate at the University/Jepson Herbaria, UC Berkeley. More of his work can be seen at the Calphotos website, <http://elib.cs.berkeley.edu/photos>.

Saxon Holt is a professional photographer who specializes in garden landscapes and plants. He has been selling his work as fine art prints and licensing use of his images for over 20 years. His work can be seen at <http://saxonholt.com>.

Kirsten Ironside is a plant ecologist and GIS specialist at Northern Arizona University's Merriam-Powell Center for Environmental Research. She has taken many photographs in California while surveying vegetation.

Carl Jones is a professional illustrator, graphic designer, and photographer who has spent much time exploring California's scenic back-country with his camera. Carl's work can be seen at www.carlsgallery.com.

Steve Matson is vice-president of the CNPS Tahoe Chapter, botanist, and photographer. His images can be seen at the Calphotos website, <http://elib.cs.berkeley.edu/photos>.

Save Mount Diablo has graciously provided use of many of their images from an assortment of photographers. For more information on Save Mount Diablo, see www.savemountdiablo.org.

Dean Taylor is a professional botanical consultant and long-time member of CNPS. His photographs can be seen at the Calphotos website, <http://elib.cs.berkeley.edu/photos>.

Linda Vorobik is the editor of *Fremontia*, a professional botanist, and botanical illustrator. For information on her work, workshops, and illustrations, see www.VorobikBotanicalArt.com.

MATERIALS FOR PUBLICATION

Members and others are invited to submit material for publication in *Fremontia*. Instructions for contributors can be found on the CNPS website, www.cnps.org, or can be requested from the next *Fremontia* Editor, Bart O'Brien at bart.obrien@cgu.edu or c/o Rancho Santa Ana Botanic Garden, 1500 N. College Avenue, Claremont, CA 91711.

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FROM THE EDITOR

Ah spring, the time of change and renewal, and the California Native Plant Society (CNPS) is in step. As many of you know, our new Executive Director, Amanda Jorgenson, came on board this January, and our new *Fremontia* Editor, Bart O'Brien, will begin his tenure by co-editing the July issue. Welcome Bart and Amanda! I am also happy to report that all who have contacted me are very pleased with their color *Fremontia*. Please check the inside back cover for more information on those who have generously offered use of their photographs.

This issue begins with a tribute to one of California's premier women botanists and conservationists: Dr.

Mary Leonin Bowerman. Barbara Ertter shares rare insights into Mary's life, and helps us relive her exploration of Mt. Diablo and her work to save this botanical gem and east San Francisco Bay promontory.

The vegetation series that began in the January 2006 issue of *Fremontia* continues with a look at advances in vegetation mapping as used by the CNPS vegetation ecologists Julie Evens and Anne Klein. In supporting such research, CNPS is greatly contributing to the understanding of habitat diversity, and through it, protection of native plants. The next article is a case in point of an area that needs our attention now. George Hartwell, a champion of the Ione area and its

unique soils and species, educates us about these and about the threat to this area by development and by the invading plant disease, *Phytophthora cinnamomi*.

For pure pleasure and delight look to pages 29 and 30 for a photographic layout of spring flowers. And don't miss the Books Received note on Carol Witham's *Field Guide to the Vernal Pools of Mather Field*, or the review of the second edition of the 2004 volume, *San Diego Native Plants*, by James Lightner, which is replete with photographs useful for plant identification. Happy reading, but most of all, happy botanizing!

Linda Ann Vorobik
Fremontia Editor

CONTRIBUTORS

Tom Chester is a retired astrophysicist who got hooked on botany in 2001 and studies the flora of southern California full-time, now concentrating on the plants of Santa Rosa Plateau and Borrego Springs.

Barbara Ertter, PhD, is curator of vascular plants of western North America at the Jepson and University Herbaria, University of California, Berkeley. She and Dr. Mary Bowerman coauthored a new edition of *The Flowering Plants and Ferns of Mt. Diablo, California*, published by the California Native Plant Society in 2002.

Julie Evens is the lead vegetation ecologist for the California Native Plant Society. She provides outreach and manages a variety of projects to describe vegetation statewide.

Jenny S. Fleming is one of the founding members, and a long time Fellow, of the California Native Plant Society. Throughout her long horticultural career, and as an extraordinary volunteer on behalf of our native flora, Jenny and her garden have provided inspiration and plants to innumerable gardening enthusiasts.

George Hartwell is an amateur botanist and photographer. He is retired from an eclectic career that morphed from merchant seaman to radio/TV news reporter; book, magazine and newspaper writer; documentary film/video author, narrator and director; and, marketing and public affairs specialist. Some of his photos may be seen at the Calphotos website, <http://elib.cs.berkeley.edu/photos>.

Anne Klein is a vegetation ecologist for the California Native Plant Society, where she works on vegetation projects within California. Her current focus is on the Sierra Nevada foothills vegetation classification project.



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