

NRS

N A T U R A L  
R E S E R V E  
S Y S T E M

University of California

# Transect

Spring 2001 • Volume 19, No. 1

A few words from the  
NRS systemwide office

**W**e are privileged to offer in this issue a tribute to Wilbur W. Mayhew, the man and his legacy. Bill Mayhew recognized in the 1950s that in California the “natural laboratories,” where students and researchers could find out how the natural world works, were vanishing under a wave of rapid development. He dedicated himself to securing reserves for the University of California, which later became the cornerstones of the NRS.

His selfless decision to put this quest ahead of his own research has already benefited thousands directly. Those, in turn, share their experience and knowledge with many others. And, with generous help, the NRS continues to build in many ways on the foundation laid

*Continued on page 16*

## In This Issue

**4** *New NRS reserve! Field scientists can order “surf and turf” at the Kenneth S. Norris Rancho Marino Reserve — our 34th site.*

**9** *Oak researchers at NRS sites plan how to protect an imperiled native habitat*

**12** *CA Coastal Conservancy helps two NRS reserves*

Wartime  
challenges  
prepared  
one nrs  
founder for  
future  
environmental  
battles



Wilbur W. (Bill) Mayhew, 1945.

**B**ill Mayhew was talking about his World War II experiences and his many close shaves with death: “I should not have made it through.”

But lots of folks are sure grateful he did, including thousands of former students and colleagues, and legions of others who have worked with this UC Riverside emeritus professor of zoology to solve diverse ecological dilemmas across California. Many people know Wilbur (“Bill”) Mayhew as one of the three founders of the NRS, along with Ken Norris and Mildred Mathias. Few understand how his combat and other military service experiences during World War II prepared this soft-spoken man for the many hard environmental battles he would later engage in.

*Continued on page 2*



Bill (front row, right) and other men of the 88th Reconnaissance Squadron, 7th Bombardment Group, at the Karachi Airport, India, 1942. Photo courtesy of Bill I Mayhew

## Wartime challenges

*Continued from page 1*

In October 1940, Bill was taking classes at Modesto Junior College, where he had recently completed an A.A. degree in biology. Bored with his courses, a mid-term looming, Bill abruptly enlisted in the U.S. Army Air Corps, along with three gung-ho friends. His plan, to the extent that he had one, was to save a little money during a year in the service to help underwrite his further education. Though he earned only \$21 a month (with about \$4 of that going to laundry), he still expected he would be able to put some money aside. This was at a time when the Great Depression had been grinding on for more than a decade, and, according to Bill, “You could have a lot of fun on one dollar during an evening in town.” Back in 1940, Bill estimates, “80 percent of the country was still isolationist.” But fourteen months later, the attitude of the American public would change abruptly.

Bill was assigned to the 88th Reconnaissance Squadron, which was attached to the 7th Bombardment Group of the Army Air Corps.\*

His close scrapes began in 1941. The troop ship on which he was traveling to Australia, passed through Honolulu on

*\*Bill's World War II experiences, and the friendships he has maintained with members of the 88th Reconnaissance Squadron, 7th Bombardment Group of the Army Air Corps, have profoundly influenced his life. He has served as photo editor of two books encompassing the history of the 7th Bombardment Group from 1918 to 1995.*

November 29, just nine days before Pearl Harbor was bombed. He and the other Yanks on board the *Republic* (referred to by some as the “Repulsive,” for its lack of grace) would become the first Americans in Australia in World War II.

Bill volunteered for combat duty and was made a ball turret gunner. To get into the ball turret, which hangs like a Plexiglas bubble from the belly of the B-17s on which he served, “you have to point the guns [two .50-caliber machine-guns] straight down and get in through a door that is also your seat. From this position, when the plane is flying and the door is back in place in the plane’s underside, you are surrounded by sky.” Bill said, “My first flight in a ball turret was very frightening. But it wasn’t so bad after that.”

Then, on September 13, 1942, at around midnight over Africa, Bill almost froze to death. It was during his first (and last) night mission. The Allies were trying to catch Rommel in Tobruk, Libya. A landing of 40,000 troops, some at Tobruk, some at Benghazi, was to take place at 3:00 a.m. The B-17 on which Bill was a crew member was supposed to “keep the gunners (on the ground) occupied. We were target practice, to divert attention from the convoys in the harbor.” The B-17’s crew flew at 25,000 feet through a layer of dense smoke and exploding shells. Bill could see Allies flying at 8,000 feet in Wellingtons — small, two-engine,

*Dr. Mayhew's conservation legacy is tangible and vast, protected within thousands of acres of diverse habitats. He has devoted most of his life to conservation, but most of his friends do not know that he served his country with equal dedication and courage. ... He flew many combat missions [during World War II], including one in which he survived serious wounds and a crash landing on Malta after an attack by German fighters. Bill completed his military service with a Distinguished Flying Cross, Air Medal, Purple Heart, and Presidential Unit Citation with two oak leaf clusters. ... [He] has worked most of his life in defense of natural habitats with the same steady courage and humility with which he defended his country.*

— Arturo Gómez-Pompa  
Distinguished Professor of Botany  
Botany and Plant Sciences, UC Riverside

British planes known as “Wimpies” (after Popeye’s friend, J. Wellington Wimpey) — and being shot down.

It was very cold in the ball turret, since the temperature inside that plastic-and-metal ball was not much different than on the outside. Worried about this mission and about the cold, Bill had borrowed another man’s electric suit, two thin layers of felt containing heating elements. But he hadn’t checked in advance to see if the electric plug on the suit was compatible with the outlet in his ball turret. It wasn’t. He couldn’t plug in the borrowed suit. And he had left his bulky leathers, his regular flying clothes, back at the barracks — there had been no room for them in the plane. “It was -50°F that night. I should have frozen to death. I think adrenaline is all that kept me alive.”

Back on the ground at the end of that mission — after a total of five hours in the air, with 45 minutes over the target at 25,000 feet, enduring subzero temperatures — Bill had to be lifted out of the ball turret.

Another time, the B-24 *Pink Lady* — on which Bill was a waist gunner — was lost in a storm over the Arabian Sea. The crew was returning to the Mediterranean from a mission to China. One of their four engines was out. The radio operator could not contact the base. The navigator could not get a fix from stars. He estimated they were five hours from base with only a few hours’ worth of fuel remaining. They flew on for two hours, blind in the storm, wings flaming with Saint Elmo’s Fire — a colorful brush discharge of electricity sometimes seen on planes and ships during thunderstorms. Suddenly they heard a voice calling them over the radio. They were just above the base! Bill is forever grateful to the gut instincts of the navigator for “finding” the base on that horrific night.

The *Pink Lady* and members of her crew were shot up and badly damaged over Messina, Sicily, on January 31, 1943. That afternoon the plane had headed into what seemed to Bill to be a “a solid wall of flying steel” and “clouds of smoke from the exploding ack-ack shells.” They saw their friends in the lead plane shot down and crash into the sea about 20 miles off the coast of Sicily. The entire crew was killed. But the *Pink Lady*’s crew managed to survive engine fires, loss of oxygen and hydraulic systems (no brakes, no landing flaps), German fighter pilots

chasing them, and a crash landing on Malta. The tail gunner, Augustus (Pat) Patrick, was shot through the feet by machine gun fire and would have to have his feet amputated. Bill was more fortunate: he recovered fairly rapidly from a leg wound. But the day’s events ended Bill’s combat duty. No wonder, decades later, he would look back to this time and say, “I should not have made it through.”

He returned to California in 1943 and served as a gunnery instructor for the remainder of the war, including oversight of 90 instructors at one point. Surviving extreme challenges to life and limb throughout his early years of military service proved highly motivating. As an instructor, Bill’s goal was to impart what he knew to young recruits and do it well enough to help them stay alive. This period gave Bill a keen appreciation for teaching. That’s when Bill decided teaching was a noble art.

Starting in 1945, with GI Bill support, Bill rapidly earned his bachelor’s, master’s, and doctor’s degrees in zoology from UC Berkeley (1948, 1951, and 1953). His graduate research was conducted under the mentorship of A. Starker Leopold. Bill subsequently worked a short stint in the UCLA Department of Nuclear Medicine and Radiation Biology, studying the effects of strontium 90 on living tissue (and “not really knowing what we were doing”). Meanwhile, he courted employment at the emerging UC campus being established in Riverside.

From 1954, when Bill began his tenure at UC Riverside as a founding faculty member, until his retirement from teach-

*Continued on page 14*



Bill teaching in the field, releasing a kangaroo rat, at Boyd Deep Canyon Desert Research Center, 1983. Photo by Galen Rowell



## New NRS site in central California offers excellent marine resources and rare terrestrial habitats

**G**reat new NRS reserves don't often come along nowadays. Not only are the pressures of development and competing land uses greater than ever in California, but any site proposed for NRS inclusion must meet stringent scientific, academic, and even administrative criteria. It's cause for celebration, therefore, that the NRS now announces its 34th site — the Kenneth S. Norris Rancho Marino Reserve — has become available for research and teaching.

Located in northern San Luis Obispo County on the southern edge of the town of Cambria, the reserve offers one of the most spectacular stretches of coastal intertidal habitat in central California. This “surf and turf” site encompasses 500 acres (200 hectares) that include such diverse habitats as an extensive rocky shoreline (about a mile and a half of it), nearshore kelp forests, a coastal terrace grassland, and slopes covered with Monterey pine forest with coast live oaks, grassy prairies and hill-sides, and coastal scrub.

### A little site history

Archaeological evidence of midden deposits at this site and the many artifacts collected on adjacent land suggest that a large Chumash village once existed here, supporting perhaps as many as 3,000 people.

Europeans developed dairy ranches in central California in the mid-nineteenth century. Each year, from the early 1900s through the 1960s, Chinese algae collectors would harvest algae from a narrow band along miles of the high intertidal zone.\* In the 1940s, this site became a cattle ranch.

*\*Editor's note: Each winter, these Chinese algae collectors used propane torches to scorch the intertidal rocks, killing algal spores and ensuring that *Porphyra* — a weedy algae species commonly known as nori and widely used in Asian food — would be able to settle and grow in these areas. Each spring, they harvested the *Porphyra*, then dried and sold it to markets in San Francisco and China. Modern-day marine ecologists use this same rock-scorching technique in their studies.*

University of California

This new site makes 1.5 miles of coastline available for research and study. Photo by Don Canestro



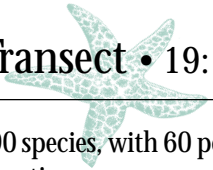
In 1966, the site was visited by members of the UC reserve system and its potential value as a reserve was pointed out by the NRS founder himself, Ken Norris. Again in January 1970, the intertidal area was visited by a group of biologists from UC Santa Barbara, who concluded that “this locality is a good example of exposed outer coast with high floristic diversity which warrants reserve status.”

But the course of natural resource management seldom runs smoothly. Another three decades would pass before interest and opportunity joined hands over this land. In January 2001, due to the generosity of the landowner, the NRS started its program at the reserve under a six-year use-agreement. Under this agreement, access is limited to university-level research and teaching.

### Outstanding marine resources

The Kenneth S. Norris Rancho Marino Reserve is unique for its marine resources. The intertidal area stands out as an excellent and increasingly rare example of central California coastline, particularly impressive because of how extensive it is. In fact, no other site available to campuses in California can compare with this one in terms of the undisturbed richness and extensiveness of its intertidal area. It is anticipated that, as part of the NRS, this reserve will become one of the major sites for marine research and teaching along the California coast.

Flanking the reserve and forming a nearshore band are extensive kelp forests, a combination of giant kelp and bull kelp. This is one of the largest beds



within this region of the coast. Giant kelp lives for up to three to four years, can grow to lengths of 200 feet (60 meters), and can cover an area varying from several hundred feet to one mile wide. It may extend for several miles and is found along the North American Pacific coast from central California down to Bahía Asunción, Baja California. Bull kelp, an annual that can grow up to 20 meters in length, is a major constituent of kelp beds from Alaska down to San Luis Obispo County, California. Kelp forests support millions of individual organisms and more than 1,000 species of marine plants and animals. Kelp is also important habitat for the recruitment of commercially important rockfish species and is itself an important crop with many commercial uses. Its harvesting is regulated by the California Department of Fish and Game.

The intertidal area at this reserve is algae-dominated and very robust. There are no distinct mussel or barnacle zones. Furoid brown algae predominate in the upper intertidal. A high species diversity of mostly foliose red algae is found throughout the intertidal. The low intertidal zone has seagrasses and laminarian brown algae.

**Rare grassland habitats**

Roughly one-quarter of the reserve harbors patches of coastal terrace prairie mixed with upland purple needlegrass prairie. Coastal terrace grasslands are among the most threatened and rare plant communities in North America. Grassland is the most altered of the reserve’s habitats — in old, cultivated fields, introduced grasses have almost completely replaced the native plant community. Yet, overall, the area remains a surprisingly vital example of coastal terrace prairie, characterized by good species diversity. The soils are deep, well drained, nearly level, and very productive. A current flora of terrestrial vascular plants lists approxi-

mately 90 species, with 60 percent (50+ species) native.

The northern end of the reserve is dominated by an introduced perennial, Harding grass. Extensive areas are comprised of dense mixtures of introduced grasses, mostly annuals. There is a large patch of kikuya grass near the owner’s residences. Native species maintain a hold in the vicinity of the blufftops, where stands of California oatgrass, Pacific ryegrass, and saltgrass are present. A few patches of saltgrass and an occasional patch of rush extend farther into the grassland. Along the lip of the bluffs are several native perennial forbs and prostrate shrubs, including goldenbush, sea thrift and species of clarkia, gumweed, and buckwheat. Introduced iceplant is present, but not extensive.

The northern end of the reserve was grazed by cattle until four years ago. In addition to the site’s good coastal terrace prairie mixed with upland purple needlegrass prairie, reserve

users have access to a large area (perhaps 65 acres) of fields relatively clean of persistent agricultural weeds. This area could be used for demonstration and as an outdoor laboratory for coastal grassland restoration. Restoration classes are in demand throughout the UC system, and this reserve is especially

*Continued on page 6*



Above: Reserve’s coastline, looking north. Below: Reserve’s coastline, looking south. Photos by Alex Glazer



## New NRS site

*Continued from page 5*

well suited for studies of grassland restoration ecology because of its current division into grazed and nongrazed areas. Researchers may also be interested in aspects of coastal influence on grassland restoration.

### Native Monterey pine forest

The reserve's grassland extends up into a forest of Monterey pine, native to the central coast of California. The pine forest runs along the ridgetop and slopes for most of the reserve's length, permitting fairly extensive replication of study plots. Although Monterey pines are fast-growing and raised throughout the world in plantations as a source of lumber (one of the world's largest timber crops), only a few small native forests exist — the Cambria area is one of just three places in the United States. Such remnant native stands are significant because native forests exhibit a natural genetic diversity not found in plantation trees. Indeed, they contain the entire genetic history of the species.

Because the Monterey pine is so restricted in its natural distribution (restricted to the coastal fogbelt), with such a limited number of individuals — and, in addition, is now threatened by a recently arrived and fast-spreading disease, pine pitch canker — efforts are being made to protect the species by having it declared threatened and listed under the California Endangered Species Act. Some 36 endangered or special status plants and animals are found in or near Monterey pine forest and may be dependent on that particular forest habitat for their survival.

The native Monterey pine forest at the reserve appears healthy, with even-aged stands that include many seedlings and saplings, and many large, dead trees are in various states of decay. (In contrast, forests to the north in the Monterey area are dominated by over-mature trees.) No fires have been reported since 1900, but clearly the pines are germinating successfully even in the absence of fire.

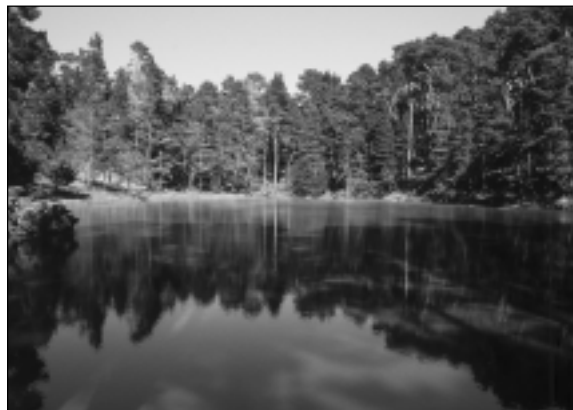
Considerable infestation by pine pitch canker is present here. This non-native fungus from western Asia, which is quickly spread by insects feeding on branch tips and by people moving bits of wood, is devastating Monterey pines. Although about one-quarter of the trees at the reserve are dead from pitch canker or infected with it, the forest appears healthier than more northerly examples. The U.S. Forest Service is conducting studies on the reserve and

throughout the Monterey pine's range to determine if resistance is a genetically heritable trait (see the website of the Pitch Canker Task Force: <[http://rap.cdf.ca.gov/pitch\\_canker/index.htm](http://rap.cdf.ca.gov/pitch_canker/index.htm)>).

Coast live oaks are an abundant understory in the pine forest, creating research opportunities on a variety of topics, including Sudden Oak Death, a new, non-native species of fungus that recently appeared in central and northern California and has been creating arboreal havoc in Marin County (see page 11). The understory of shrubs, forbs, grasses, rushes, and ferns is fairly diverse and mostly native. Grasslands within the woodland and on the slopes have not been cultivated like those on the lower terrace, with good stands of native grasses present. Poison oak is common in some parts of the forest, but not so dense as to discourage research.



All age classes of native Monterey pines are present on site. Photo by Don Canestro



A half-a-century-old stock pond provides wetland habitats. Photo by Alex Glazer

In the pine forest near the reserve's northern end is a turbid, 1.5-acre pond, 7 meters deep. It provides some wetland habitats and a fairly diverse shoreline of rushes and sedges. Constructed more than forty years ago, it appears to be fed by springs, in addition to winter runoff.

### Diverse fauna found on site

The north end of this site's coastal terrace grasslands is covered with a thick gray layer of thatch (made up of the oxidizing stems of annuals — the result of no grazing for the past four years) and this area is swiss-cheesed by the runways of voles, many of which can be observed running underfoot. Red-tailed hawks, white-tailed kites, kestrels, marsh hawks, common egrets, blue herons, and barn owls are often seen feeding here.



Common grassland birds include northern flickers, meadowlarks, blue-birds, and red-winged blackbirds.

Moving toward the south end of the reserve, where the native coastal prairie grades abruptly into coastal scrub dominated by California sage, woodrats and other mice are common. Bats, raccoons, skunks, coyotes, and bobcats can also be found on site. Turkeys travel the reserve.

The reserve's intertidal area supports a high density of turban snails, few mussels, and all three species of *Anthopleura* anemones. The invertebrate grazer communities differ here from those of other NRS reserves that include an intertidal component.

Also existing in the low intertidal zone are modest numbers of black abalone with no signs of "foot withering syndrome." This is the healthiest southernmost population of black abalone (see sidebar to the right above).

Ornithologically inclined reserve users will note the Brandt's cormorants, western and Heerman's gulls, black turnstones, wandering tattlers, blue herons, and common egrets that forage along the shoreline and on the kelpbeds.

California sea otters are present at this site, and their presence as a keystone predator may affect the entire marine ecosystem at the reserve. Currently, researchers from UC Santa Cruz and the California Department of Fish and Game are tagging otters off the coast in an effort to understand their recent movement to the south of Point Conception.

Bottlenose dolphins have been sighted between the kelp beds and shore. California sea lions and harbor seals are also present, and a survey of marine mammals at this site may reveal that the rock outcrops offer significant haul-out sites.

**Where did all the black abalones go?**

**B**lack abalones have practically disappeared from the Channel Islands off southern California and now are rarely found along the mainland coast as far north as Point Buchon, about 20 miles south of the Kenneth S. Norris Rancho Marino Reserve.



Photo by Kevin Lafferty

Currently there are no black abalones in the more southern NRS sites.

The reason for this decline is "foot withering syndrome," a condition thought to be caused by a parasite. Also called "abalone wasting disease," it is characterized by weakening and atrophy of the abalone's foot muscles, which makes it difficult for the shellfish to adhere to its substrate.

For information on the current worldwide geographic distribution of black abalones, check "ABMAP — The Abalone Mapping Project" of the Los Angeles County Museum of Natural History: <http://www.nhm.org/~dgeiger/ABMAP/index.html>.

**Site location and significance**

The extent of rocky intertidal habitat available and the lack of human disturbance here make the reserve unusual for this region of the state. Moreover, the site is suitable for year-round use and well located within reasonable driving distance from several UC campuses: two hours from Santa Barbara, three hours from Santa Cruz, and four hours from Los Angeles or Berkeley.

The reserve's location is important for conducting California marine biogeography research. It fills a biogeographic gap in a system of marine sites along the coast. The reserve is centered in a region, from San Simeon south to Point Conception, where there is growing evidence of unique oceanographic influences on community structure in coastal habitats. This section of coastline is characterized by intense, continuous coastal upwelling that elevates nutrient concentrations and generates currents away from the coastline. These effects lead to extremely rapid algal growth rates (because of high nutrients)

and low settlement rates of marine invertebrates and fish (because of strong offshore transport of larvae). As a result, coastal communities in this region are dominated by marine algae rather than sessile invertebrates, and the reserve bears greater resemblance to more northerly marine sites in terms of its dense algal cover, lower abundance of invertebrates, such as mussels and barnacles, and large size of seaweeds.

**Available facilities**

Thirteen acres adjacent to this site are owned by Camp Ocean Pines — for half a century a YMCA camp, now operated locally. The cabins and dining hall are assets to the reserve, able to accommodate large overnight field classes. No alternative field sites for intensive ecological courses exist anywhere else in the vicinity of UC Santa Barbara.

Although the reserve cannot provide laboratory space, running seawater on site, or vessel access at the beach, it may be ideal for field classes, such as the Ma-

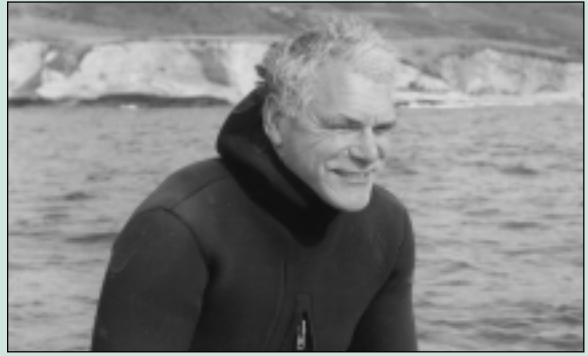
*Continued on page 8*



PISCO researchers from UCSB and UCSC conducting a comprehensive survey of marine intertidal organisms at the reserve. Photo by Don Canestro



Marine botany students from UCLA identifying and pressing algae collected at the reserve. Photo by Don Canestro



**New reserve gets buoyant new manager**

**D**on Canestro became resident reserve manager of the Kenneth S. Norris Rancho Marino Reserve in 2001, after nearly eight years as Diving and Boating Safety Officer at UC Santa Cruz. He has worked as a lifeguard and maintenance and operations park ranger for the East Bay Regional Park District in Oakland, a marine biologist for the Channel Islands National Park, a research associate at UC Santa Barbara, and a SCUBA instructor in various settings. He has dived in Antarctica and the Bering Sea on various University research projects. Canestro has a B.S. in Conservation of Natural Resources from UC Berkeley and an M.A. in Marine Science from Moss Landing Marine Laboratories. He has worked as an environmental consultant and is an expert on SCUBA diving standards.

**New NRS site**

*Continued from page 7*

rine Biology quarter at UC Los Angeles (which now operates from the Bodega Marine Laboratory and Reserve, 50 miles north of San Francisco).

Potential reserve users should contact the site's management for information on evolving housing options. The reserve's resident manager recently put in place a 32-foot travel trailer with kitchen, bath, three single beds, and one double bed.

**Reserve management**

Day-to-day administration of the Kenneth S. Norris Rancho Marino Reserve

is provided by UC Santa Barbara, which manages six other NRS sites: Carpinteria Salt Marsh Reserve, Coal Oil Point Natural Reserve, Santa Cruz Island Reserve, Sedgwick Reserve, Sierra Nevada Aquatic Research Laboratory, and Valentine Camp.

The faculty manager for this reserve is Steve Gaines, UC Santa Barbara professor in the Department of Ecology, Evolution, and Marine Biology and director of the Marine Science Institute at UCSB. He plans to use the reserve as a core, long-term monitoring site for a major new research program in intertidal studies under a grant recently received from the Packard Foundation. (The website for the research consortium called PISCO — Partner-

ship for Interdisciplinary Studies of Coastal Oceans — describes this work in its section on research into nearshore oceanography:

<<http://www.piscoweb.org/research/oceanography/index.html>>.)

Research and teaching use of the reserve is coordinated by the site's resident manager, Don Canestro (see sidebar above). Potential users can contact him at:

Don Canestro  
 Kenneth S. Norris  
 Rancho Marino Reserve  
 393 Ardath Drive  
 Cambria, CA 93428  
 Phone (and fax): 805-927-6833  
 Email: canestro@lifesci.ucsb.edu





Oak at Hastings Reserve. Photo by David J. Gubernick

## Oak woodl and network wel comes support of Packard Foundation

**O**ak woodlands and grasslands characterize much of California's rolling hills. Yet these graceful landscapes are in peril. A large portion of the state's old oaks have been destroyed, and most of its grasslands have been transformed into weeds or lost to development. Such losses have prompted ambitious protection efforts by agencies, citizens, and conservation groups. Since 1990 was proclaimed by the California legislature as the Year of the Oak, hundreds of acres of oak woodland have been protected or replanted, most by volunteer efforts in communities across the state.

As important as these efforts are, they have protected less than 5 percent of the state's remaining oak woodland, and native species continue to decline. Much publicized are the decline of blue oaks and valley oaks, the dwindling populations of native plants and animals, and the spread of invasive weeds. Clearly, protecting wildlands and open space is just the start to conserving California's oak woodland ecosystems.

NRS scientists have been studying oak woodlands in California for more than thirty years. This research has led scientists to examine many aspects of the landscape, from the influence of predators on acorn production to the effects of cattle grazing on perennial grasses and oak seedlings. A recent gift



Backlit oak.  
Photo by Galen Rowell

from the David and Lucile Packard Foundation will enable NRS scientists to greatly expand their research and monitoring of California oak woodlands, and to provide stewardship training to agencies and landowners who manage these ecosystems.

Through the continued generosity and foresight of the Packard Foundation, the NRS has received a \$263,600 grant to develop a framework for long-term study to restore and manage California's threatened coastal oak ecosystem. The grant will fund a 10-month planning process to develop a network of sites, scientists, managers, and landowners called the Coast Ranges Oak Woodland Network (CROWN). The goals of the network are to develop knowledge that will help support new policies and management to conserve, restore, and sustain California's oak woodlands and grasslands. The network will encompass a broad-based program for monitoring wildlands in the Coast Ranges and will bring together existing programs into a wide-ranging education network for landowners, students, and resource managers.

A vital part of this network will be a series of protected research sites where long-term experiments can be conducted. Three NRS reserves will serve as core areas for CROWN research: Hastings Natural History Reservation (Monterey County), McLaughlin Natural Reserve (Napa and Lake Counties), and Sedgwick Reserve (Santa Barbara County). These sites provide a broad geographic range in which to study oak woodlands, as well as an established body of previous research on which to build new knowledge.

The life cycle of an oak woodland is a very slow dance; it takes a long time to learn its secrets. A generation ago, Hastings ecologist Jim Griffin noticed the woodlands he studied contained very few young oaks. In 1971, Griffin was the first scientist to document the lack of regeneration of valley oaks in the Carmel Valley. Other studies in other places confirmed that the majestic old blue oaks and valley oaks that graced foothills throughout central California had no replacements. This so-called lack of recruitment in oaks prompted a series of scientific meetings during the seventies and eighties.

Much of the information presented came from scientists working on UC's

*Continued on page 10*



Oak tree after snow storm in Carmel Valley(!).  
Photo by David J. Gubernick

natural reserves. In their search for clues, NRS scientists examined acorn production and the many kinds of wildlife that depend on acorns as food. They found acorn production to be closely tied to spring weather, and the abundance of the acorn crop to be synchronized across long distances. They studied the habits of jays and squirrels that effectively plant thousands of acorns each year, and the consequences of deer and cattle grazing on the growing tips of seedlings. They examined the ecosystem dynamics affected by gophers and found that the churned earth created seedbeds for annual weeds that in turn sapped the soil of nutrients and moisture.

Much has been learned, yet more questions remain. Earlier studies examined ecological conditions at particular sites and at particular times. The proposed CROWN research extends the study to oak woodland ecosystems across the entire Coast Ranges and over a time scale of at least a decade, in order to learn how species develop adaptations to different local environments. New scientific tools enable inquiry at both very large and very small scales. In addition to geographic studies of adaptation, CROWN research proposes to examine the movement of genes among populations to determine how landscape fragmentation affects genetic diversity. In this way, CROWN research will explore questions from the molecular level to the ecosystem level in order to better understand the processes important to sustaining oak woodlands and grasslands.

Long-term research is necessary to understand natural processes that take one's lifetime to unfold. But the CROWN proposal recognizes that research alone is not enough to restore woodland ecosystems. Therefore, a large part of the proposal includes the translation of scientific knowledge into workable strategies to restore and manage the foothill landscapes of the Coast Ranges. Many partners will be engaged through outreach programs, and, through cooperation with

these partners, new techniques for restoration and management can be tested and monitored. Social scientists will examine the values people attach to these landscapes and explore how these values can be reflected in new policy designs.

Several NRS scientists are working to develop the Coast Ranges Oak Woodland Network, including NRS system-wide director Alex Glazer, who serves on the project's executive committee. Frank Davis (UCSB) is principal investigator and director; Susan Harrison (UCD) is associate director for the project. Hastings reserve director Mark Stromberg serves as education and outreach director. These scientists will work with an advisory committee representing a broad range of interests, from The Nature Conservancy to the California Cattlemen's Association, to ensure the project is closely connected with ongoing conservation efforts in all sectors.

The first work to be completed with the Packard Foundation grant will be to collect all that is known about oak woodlands from the scientific literature and from local experts. Informal workshops and small meetings will be held throughout the region to compare the experience of many people working to restore oak woodland ecosystems. From this collected knowledge, CROWN organizers will develop a long-term strategy that will strengthen the conservation of California's oak woodlands.

— Margaret L. Herring  
NRS Senior Science Writer

*For more information, contact:*

Susan Harrison  
Environmental Science and Policy  
University of California, Davis, CA 95616  
Phone: 530-752-7110  
Email: spharrison@ucdavis.edu



Majestic valley oak. Photo by Galen Rowell



## California oaks imperiled by new, exotic species of fungus

The fate of California's oaks has looked increasingly bleak since 1995 when scientists first became aware of a devastating new pathogen that causes Sudden Oak Death (SOD). Already SOD has killed tens of thousands of coast live oaks (*Quercus agrifolia*), black oaks (*Q. kelloggii*), and tanoaks (*Lithocarpus densiflorus*)\* in seven counties — Marin, Sonoma, Napa, Santa Clara, Santa Cruz, San Mateo, and Monterey — along 200 miles of coastline and as far as 35 miles inland.

SOD is caused by a brand-new strain of *Phytophthora* fungus — essentially a water mold, less related to mushrooms than to brown algae. It is similar to the type of organism responsible for the Irish potato famine of the mid-nineteenth century. In some parts of Australia, other exotic *Phytophthora* species have killed 70 percent of an area's woody species. SOD destroys a tree's living inner bark layer, girdling it and cutting off transport of water and nutrients from roots to crown.

SOD's first and most prominent symptom is typically a viscous, reddish brown to black seeping or "bleeding" from the trunk. Diagnosing SOD is tricky: other conditions can cause similar bleeding. Once a tree begins to decline, various opportunistic elements — defoliating and boring insects, root diseases, and canker fungi — join in to hasten its demise.

Relatively little is known about SOD and how it spreads. However, the

\* *The tanoak is actually a type of beech tree, not an oak.*

*Phytophthora* responsible is proving hardy and adaptable. It is found in rain-water, soil, and infested plant material. It thrives in a cool (50° to 60°F), moist climate, but can survive periods of drought, then revive when water is introduced. It has also been found on wild huckleberries in Marin County and on Shreve's oaks (*Q. parvula* var. *shrevei* — a new oak host for SOD) and commercial rhododendrons in Santa Cruz County. This exotic *Phytophthora* was first isolated by UC Davis plant pathologist David Rizzo and UC Berkeley forest pathologist/UC Cooperative Extension specialist Matteo Garbelotto.

SOD impacts include the loss of aesthetic values, property values, and habitat for flora and fauna supported by living oaks; the creation of hazard trees and increased fire hazards; the degradation of water quality; and significant costs of dead tree removal. In the long run, SOD could permanently change California's landscape.

Until recently, no cure or means of controlling the moisture-loving, quick-spreading new *Phytophthora* was known. However, this past winter, experimentation on 90 potted live oak trees in Sonoma County determined that a phosphonate compound, especially when administered by injection, can all but eliminate the lesions that occur in SOD. Although this treatment would be impractical for California's oak wildlands, it offers a first real reason for hope for oaks in public parks and on private lands.

### Things you can do to help prevent SOD:

- Learn to recognize the symptoms of SOD. Report suspected cases. Obtain a professional evaluation to determine whether SOD is present.
- Do not collect soil, wood, or other plant material (acorns, leaves, etc.) from areas where SOD has occurred.
- Do not import host plants, firewood, or chips that originated in SOD-confirmed areas.
- Hikers, dog walkers, bikers, sports enthusiasts, construction workers, and landscapers in SOD-infected areas should clean soil material from their shoes, pets' feet, tires, and sports, construction, and gardening equipment to prevent further spread.

If you think you have an oak afflicted with SOD or just want more information on the problem, check these two websites:

CA Oak Mortality Task Force — <http://suddenoakdeath.org>

Center for the Assessment and Monitoring of Forest and Environmental Resources (CAMFER) — <http://camfer.CNR.berkeley.edu/oaks/>.



Solitary oak. Photo by David J. Gubernick

## CA Coastal Conservancy boosts two NRS reserves

The Quail Ridge Reserve, located in Napa County on a southern peninsula of Lake Berryessa, got a big boost in February when the California Coastal Conservancy authorized \$268,392 in funding for the purchase of five inheld parcels totalling 339 acres.

This was the final phase of a two-phase project in which the conservancy provided a total of nearly \$400,000 to NRS sites. Last year the conservancy enabled purchase of a 210-acre inholding that had previously bisected Quail Ridge Reserve, thereby uniting its disparate sections and incorporating into the site a valuable canyon and creek. The Napa County Land Trust will hold a conservation easement across the property.

The conservancy will also provide an additional \$22,500 for development of a docent program at another NRS site, Stebbins Cold Canyon Reserve. This 576-acre reserve is located in Solano and Napa Counties, about 20 miles west of UC Davis.

Stebbins has a long history of public access, receiving 2,000 to 4,000 visitors each year. It was therefore decided that enhancing access there would do more to further the conservancy's public access goals than enhancing access at the more biologically vulnerable Quail Ridge Reserve, where increased public access would conflict with resource protection goals. Conservancy funds will be matched by the NRS systemwide office for the development of trails and other amenities at Stebbins.

Quail Ridge Reserve holds outstanding remnants of extremely rare native grassland, savanna, and oak woodland habitats that harbor a diverse mix of oak species. Conservation of the Quail Ridge peninsula began in 1984 when Frank Maurer and Lenora Timm purchased 151 acres threatened by development; in 1989, they created the Quail Ridge Wilderness Conservancy, which is dedicated to preserving the Quail Ridge region as a wilderness area. Quail Ridge Reserve was established as an NRS site in 1991 and currently encompasses 1,937 acres.

Protected sites in this area are also part of a regional-scale conservation effort, the Blue Ridge-Berryessa Natural Area Conservation Partnership, a consortium that includes the UC Natural Reserve System, California Coastal Conservancy, Homestake Mining Company, Land Trust of Napa County, Quail Ridge Wilderness Conservancy, California Department of Fish and Game, U.S. Bureau of Land Management, and U.S. Bureau of Reclamation.

Stebbins Cold Canyon Reserve offers a variety of relatively undisturbed habitats, including valley and foothill grassland, blue oak woodland, chamise chaparral, lower montane chaparral, mixed riparian woodland, and intermittent

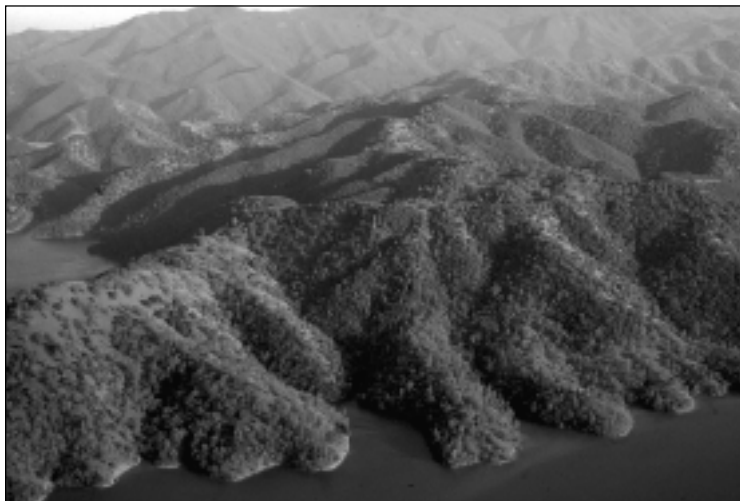
foothill stream. The site was named in honor of world-renowned plant geneticist and long-time professor at UC Davis and Berkeley, G. Ledyard Stebbins.

Although both Quail Ridge and Stebbins are inland sites, administered through UC Davis, the conservancy is able to benefit them because new conservancy guidelines for the San Francisco Bay Area cover all nine Bay Area counties that surround and drain into the bay — including Solano and Napa Counties, where these two NRS reserves are located.

The California Coastal Conservancy was established in 1976 by the state legislature and is a unique state resource agency that uses entrepreneurial techniques to purchase, protect, restore, and enhance coastal resources, and to provide access to the shore. The conservancy works in partnership with local governments, other public agencies, nonprofit organizations, and private landowners. To date, the conservancy has undertaken more than 700 projects along the 1,100-mile California coastline and around San Francisco Bay.

*For more information, contact:*

Virginia ("Shorty") Boucher, Reserve Manager  
UCD NRS, DESP/Wickson Hall  
University of California, Davis, CA 95616  
Phone: 530-752-6949  
Email: [vlboucher@ucdavis.edu](mailto:vlboucher@ucdavis.edu)



Quail Ridge Reserve. Photo by Frank Maurer

## 2000-01 Mathias winners shed light on NRS reserves

**F**ourteen years ago, the NRS began supporting student research through its Mildred E. Mathias Student Research Grants program. Since 1988, \$294,000+ has been distributed to 185 UC students.

In the 2000-01 awards cycle, 20 students were chosen from six UC campuses to share \$29,368 in conducting research at 16 (of 34) NRS reserves:

**From UC Berkeley —**

*Lisa Grubisha:* gene flow in an ectomycorrhizal fungus (Santa Cruz Island Reserve).

*Maria M. Soares:* social organization of voles (Hastings Natural History Reservation).

*Kenwyn Blakeslee Suttle:* effects of changing hydrologic regimes on grassland communities (Angelo Coast Range Reserve).

**From UC Davis —**

*Collin A. Eagles-Smith:* effects of community structure and trophic dynamics on contaminant movement through aquatic ecosystems (Eagle Lake Biological Field Station).

*Amy L. Freestone:* serpentine seep plant communities (McLaughlin Reserve).

*Michael A. Kennedy:* causes of intensified marine subsistence among Holocene hunter-gatherers (Bodega Marine Reserve).

*Mary Brooke McEachern:* mating system variations among dusky-footed woodrats (Eagle Lake Biological Field Station).

*Evan Preisser:* effects of soil moisture on a multi-predator trophic cascade (Bodega Marine Reserve).

**From UC Los Angeles —**

*Teresa Jolene Brennair:* successional pattern of, and fire's influence on, chaparral conifer-oak forest (James San Jacinto Mountains Reserve).

*Aviva Liebert:* reproductive flexibility in paper wasps (Stunt Ranch Santa Monica Mountains Reserve).

*Kristina D. Louie:* population genetics of eelgrass, a threatened habitat (Santa Cruz Island and Kendall-Frost Mission Bay Marsh Reserves).

**From UC Riverside —**

*Sharon J. Coe:* effects of water availability on reproductive success in desert birds (Sweeney Granite Mountains Desert Research Center).

*Amy E. Lindahl:* seasonal/spatial shifts in patterns of mycorrhizal fungi associated with coast live oaks and grasslands (Emerson Oaks Reserve).

*Abby Glenn Sirulnik:* effects of nitrogen deposition on ecosystem processes in exotic annual grasslands and chaparral communities (Box Springs, Motte Rimrock, and Emerson Oaks Reserves).

**From UC Santa Barbara —**

*John P. LaBonte:* foraging strategies of the Southern Pacific rattlesnake (Sedgwick Reserve).

*Stephanie Romañach:* effects of body size, food resource abundance, and social interactions on movement patterns of pocket gophers (Sedgwick Reserve).

*Sean Mark Watts:* evolutionary responses of plants to root herbivory (Santa Cruz Island Reserve).

**From UC Santa Cruz —**

*Lisa Ann DiGirolamo:* effects of invasive Argentine ants on grassland community structure (Fort Ord Natural Reserve).

*Joy Anna Hagen:* the role of insects in regulating invasive weeds (Younger Lagoon Reserve).

*Brooke Weaver:* demographic responses of coast horned lizards to invasive Argentine ants (Fort Ord Natural Reserve).

**A**lthough Mathias award amounts are modest (the maximum for a single award is \$2,500), the granting process is taken very seriously, with proposals reviewed first by the NRS campus committee, then by a system-wide committee. *This is a real-life exercise in raising money for research.* Students receive firsthand experience in applying for grants, meeting deadlines, managing budgets; each awardee submits a progress report to the NRS director.

Mathias awards are designed to benefit UC graduate students by encouraging their research at NRS reserves. In turn, such use recognizes the special values of NRS sites as distinct from other locations and helps document the value of the reserve system. Proposals for research that

seems likely to shed light on management issues concerning natural reserves are therefore especially welcome. Conversely, proposals for research that could readily be conducted at any number of locations throughout the state or country will probably elicit a less-enthusiastic response from the review committees — *unless* that research seems likely to assist in the management of reserves or to increase scientific understanding of local ecosystems.

An annual call for proposals is issued in September; awards are announced in December. Applications may be obtained directly through an NRS campus representative or from the NRS systemwide office (1111 Franklin Street, 6th Floor, Oakland, CA 94607-5200; phone: 510-987-0150).

## Wartime challenges

*Continued from page 3*

ing in 1989, Bill treasured his role as teacher. Of the 5,600+ undergraduate students he taught over his long career, more than a thousand were enthusiastic participants in field trips over long weekends spent investigating the bounties of natural areas throughout Southern California.

Bill always had an unassuming way of putting people at ease, but his war experiences strengthened him for the tasks ahead. Fortified by his convictions about the value of the natural world, Bill had the confidence to pursue every opportunity, no matter the obstacles, of championing habitat preservation throughout California. Bill and a researcher friend from UCLA — another NRS hero, Ken Norris — traveled around the state in the sixties and seventies, identifying parcels of land that represented California’s richly diverse but shrinking habitats. Their goal was to garner and protect these areas as reserves in the nascent NRS, then known as the “Natural Land and Water Reserves System.” Ever working to fulfill that goal, Bill remained campus director of the UC Riverside-administered NRS reserves until 1990.

With little funding, the NRS has a long history of acquiring lands through donation. Throughout his career, Bill

has demonstrated a phenomenal ability to talk people into giving land to the University. Perhaps because he figures it never hurts to ask. And also because he believes that “no only means *maybe*, at least for the time being.” His quiet perseverance and down-to-earth diplomacy are legendary.

Furthermore, over the years, Bill showed a remarkable knack for getting all the powers at the table — developers, land-owners, bureaucrats, attorneys, private citizens — to communicate and find resolutions to land-use and preservation dilemmas. He played a primary role in the establishment of numerous NRS reserves, including two of the original seven NRS sites: Boyd Deep Canyon Desert Research Center in 1959 and Box Springs Reserve in 1964. The NRS itself was established in 1965.

Fellow NRS founder Ken Norris once wrote of his colleague and friend Bill Mayhew:

*... Bill has repeatedly shown the way for people of all stripes and persuasions to take part in attempts to preserve and protect important parts of wild America, and he has often succeeded in the face of seemingly insurmountable problems in the way.*

*What Bill does is so simple. He radiates a transparent honesty that draws everyone into his plans. He is such a simple guy himself that there is no one he can't talk to, one on one, with no suspicion to sweep away.*



**Eco-baron Bill Mayhew**

*“They were accusing me of being the governor of the 51st state. They thought I was trying to establish University land from the Mexican border to the Oregon border... [but] I could see down the line that we were not going to have places for faculty and students... .”*

Throughout his career, Bill Mayhew coordinated or was an essential participant in the creation of these UC NRS and other reserves:

- 1955: Living Desert Reserve
- 1959: Boyd Deep Canyon Desert Research Center
- 1964: Box Springs Reserve
- 1966: James San Jacinto Mountains Reserve
- 1970: San Joaquin Freshwater Marsh Reserve
- 1972: Burns Piñon Ridge Reserve
- 1973: Sacramento Mountains Reserve (satellite to Sweeney Granite Mountains Reserve); Santa Cruz Island Reserve; Ryan Oak Glen (donated to San Diego State University)
- 1974: Chickering American River Reserve
- 1976: Motte Rimrock Reserve;

- Etiwanda Wash (property sold)
- 1977: Carpinteria Salt Marsh Reserve
- 1978: Sweeney Granite Mountains Desert Research Center; Landels-Hill Big Creek Reserve
- 1984: Santa Rosa Plateau Reserve
- 1986: Coachella Valley Preserve (formerly, Coachella Valley Fringe-Toed Lizard Reserve); King Clone
- 1987: Oasis de los Osos Reserve (satellite to James Reserve)
- 1991: Emerson Oaks Reserve

Bill was also responsible, principally or in part, for the addition of tens of thousands of acres to the NRS’s Boyd Deep Canyon, Motte Rimrock, Sweeney Granite Mountains, Scripps Underwater Reserves, and Sierra Nevada Aquatic Research Laboratory (SNARL).

*What I will always remember about Bill is he never got depressed. ... He approached every day with an optimism and an enthusiasm that I can only hope to emulate. I believe that to be successful in land conservation work, you need to be a pathological optimist. That's Bill, and that's his gift to all his students and colleagues.*

— Steve Hobbs  
Formerly Nevada's first state director of  
The Nature Conservancy;  
Currently director of land and water conservation  
for Hennepin County, Minnesota,  
and working on statewide conservation issues

*Bill is first and foremost a solid field biologist and teacher, rightly noted for his work on desert wildlife. This undergirds a passion for protecting wild things, starting with the land. He knows where he is trying to go, when many don't. Then he sweeps everyone along with him of whatever stripe: developers, businessmen, retired women in trailers, politicians, fellow scientists. He is superior to no one, on a level with everyone, and he shows the way.*

*What has he done? A great deal. Priceless wildlife reserves have been established because of him, including ones of thousands of acres of now totally unobtainable wildland adjacent to high-priced real estate...*

*We used to kid him that his ulterior plan was to walk across California, all on lands he had managed to save.\**

Two awards of which Bill is most proud are being the first recipient, in 1983, of the Aldo Starker Leopold Conservation Award from The Nature Conservancy's California chapter (that organization's highest statewide honor) and, in 1994, having an NRS facility named in his honor: the Wilbur W. Mayhew Building, a dormitory for visiting scientists at the Boyd Deep Canyon Desert Research Center, in Riverside County.

However, even more important to Bill than these kudos are the acknowledgements he has received from his students over the decades. One such student, Steve Hobbs, was still an undergraduate when he had the flora and fauna of the Mojave Desert revealed to him by Professor Mayhew. As a graduate student, Steve said, "Bill taught me what conservation means. From the pure physical labor ... to the intricate negotiations, [he] showed me the real world of what it

*\*Kenneth S. Norris to Chevron Conservation Awards, letter of support for Bill Mayhew, March 23, 1997.*

takes to save our natural heritage for future generations." And later, as Nevada director for The Nature Conservancy, Steve said of Bill, "He is why I became involved in conservation. I often think of what Bill would do in a particular situation and that mind-set has guided me to many notable conservation successes."

The great irony of Bill's career pleases his sense of humor. Because he spent much of the war hating the harsh Indian and Saharan desert landscapes where he was stationed, Bill's civilian intention was to stay as far away from deserts as he could get! Yet he devoted much of his career to investigating Southern California's deserts. Fortunately for California, numerous lands — including vast areas of desert — and their inhabitants across the state will be protected well into the future, in large measure, because of Bill Mayhew's courage and convictions.

— Jana K. Shaker  
Senior Writer and Photographer  
College of Engineering, UC Riverside  
— and currently working on an Australian travel book,  
Kangaroos and Kookaburras:  
The Natural Delights of a Year Down Under

For more information about Bill's life, his career at UC Riverside, and his land-preservation achievements throughout California, check out this oral history website: <http://ucrhistory.ucr.edu/mayhew.htm>.



Bill \* at Boyd Deep Canyon Desert Research Center, 1998. Photo by Alex Glazer

\*Thanks for everything, "Bugs"!

## A few words

*Continued from page 1*

by the Mayhew legacy. A newly added 34th reserve on the central California coast provides protected access to unique marine resources (page 4). Grants from the California Coastal Conservancy have substantially enhanced the Quail Ridge Reserve in Napa County (page 12). With a planning grant to the NRS from the David and Lucile Packard Foundation, researchers from several UC campuses have teamed up to launch a landscape-scale project to improve the understanding and management of California's oak woodlands and grasslands (page 9). The research will involve the McLaughlin, Hastings, and Sedgwick reserves.

The frequent assertion that the scientific advances of the twentieth century have far exceeded those made during the total past history of humankind is undoubtedly true. Even so, it is very clear that what we know of the Earth — its organisms, their biology, and

the dynamics of their interaction with each other and with their ever-changing environment — is very modest. The projects of Mathias award-winning students (page 13) exemplify the rich array of questions being explored on the reserves. The answers will certainly contribute to our sense of wonder at the natural world and may well contribute to the survival of humanity.

We are delighted to present Bill Mayhew with this report in evidence of the ever-growing appreciation of the value of his pioneering contributions.

— *Alexander N. Glazer*  
*Director, Natural Reserve System*



Wilbur W. Mayhew Building dedication plaque at Boyd Deep Canyon Desert Research Center. Photo by Alexander Glazer

Transect

Spring 2001 • 19:1

*Transect* is published biannually by the Natural Reserve System (NRS), part of the Division of Agriculture and Natural Resources (DANR), in the University of California Office of the President (UCOP).

Subscriptions are free, available upon request. Contact: *Transect* Editor, UC Natural Reserve System, 1111 Franklin Street, 6th Floor, Oakland, CA 94607-5200; phone: 510-987-0150; fax: 510-763-2971; e-mail: kara.gall@ucop.edu.

Recent past *Transect* issues are also available for viewing on the World Wide Web at: <http://nrs.ucop.edu>. Subscription requests can be made via this NRS website.

Managing Editor:  
 Susan Gee Rumsey  
 Senior Science Writers:  
 Margaret L. (Peg) Herring  
 Jana K. Shaker  
 Copy Editor: Linda Jay Brandt  
 Circulation: Kara Gal I  
 Web Mistress: Cyndi Lukk



100% Recycled paper  
 printed with soy-based inks

The University of California prohibits discrimination against or harassment of any person employed by or seeking employment with the University on the basis of race, color, national origin, religion, sex, physical or mental disability, medical condition (cancer-related), ancestry, marital status, age, sexual orientation, citizenship, or status as a Vietnam-era or special disabled veteran. The University of California is an affirmative action/equal opportunity employer. The University undertakes affirmative action to assure equal employment opportunity for underutilized minorities and women, for persons with disabilities, and for Vietnam-era veterans and special disabled veterans. University policy is intended to be consistent with the provisions of applicable state and federal law. Inquiries regarding the University's equal employment opportunity policies may be directed to: Office of Affirmative Action/Staff Personnel Services, University of California, Division of Agriculture and Natural Resources, 300 Lakeside Drive, 6th Floor, Oakland, CA 94612-3560; phone: 510-987-0096.

0460

**Natural Reserve System**  
 University of California  
 1111 Franklin Street, 6th Floor  
 Oakland, CA 94607-5200



Nonprofit Org.  
 U.S. Postage  
 PAID  
 University of  
 California