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Report from the Vice President-ANR:**NRS Long-Range Plan Is Now Complete**

Two years ago, I commissioned the NRS Steering Committee on Long-Range Planning to examine the current state and chart the future development of the Natural Reserve System. The steering committee, chaired by UC Riverside Chancellor Rosemary Schraer, recently completed its final report.

In the report's executive summary, the committee concludes that:

...The Natural Reserve System is central to the mission of the University of California. As California's natural resources become more scarce and global environmental problems more ominous, the value of the NRS will continue to grow, as will its role in teaching, research, public service, and resource management.

...The Natural Reserve System, in its 27 reserves and 3 affiliates, provides the basic natural resources necessary to support the University's academic programs in the environmental sciences.

...Nevertheless, the NRS lacks adequate support facilities and personnel, effective organization, and sufficient funding at all levels. If the NRS is to successfully support the University's mission and realize its potential as a world-class academic support facility for the study of the earth and its natural systems, then these problems must be resolved.

The committee goes on to make 18 recommendations that address these obstacles.

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Outstanding Davis Professor Is Appointed Interim Director of the Reserve System

A UC professor who's devoted her career to understanding California's environmental history is now in a prime position to influence its environmental future. On September 16, Deborah Elliott-Fisk became interim director of the Natural Reserve System, replacing retiring Director Roger Samuelsen.

To fulfill her duties as NRS director, Elliott-Fisk is taking administrative leave from UC Davis, where she is an associate professor in the Department of Geography and for the Graduate Groups in Plant Biology, Earth Sciences and Resources, and Ecology. She is also a research scientist at UC's White Mountain Research Station, an organized research unit with intellectual ties to the NRS. Elliott-Fisk's full-time appointment is for a minimum of one year, pending selection of a permanent director.

"Deborah has outstanding credentials to help the NRS in these pressing times, at all levels," says Jack Ives, chairperson of the UCD Department of Geography and Elliott-

Fisk's former major professor at the University of Colorado. "She is a tireless administrator, not only a good scholar with the essential field orientation, but a committed teacher and leader." Ives also cites her prodigious physical and mental energy (often under extremely challenging field conditions), her interdisciplinary expertise, her generosity, and her high personal standards as qualities that make Elliott-Fisk an ideal interim director for the NRS.

Elliott-Fisk is well acquainted with the Natural Reserve System. She sat on the Davis Campus Advisory Committee for five years, serving for three of those years as its chair and representative to the Universitywide NRS Faculty Advisory Committee. During this time, she visited more than half of the reserves, worked with



UC Davis Professor Deborah Elliott-Fisk is well equipped for her new responsibilities as interim director of the NRS. (Note: This photo was not taken at an NRS reserve.)

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Reserve Highlights

Emerson Oaks Reserve Joins the NRS

Four climatic influences converge at Emerson Oaks Reserve—the newest NRS site in Southern California—to support a unique, spring-fed habitat that combines century-old oak trees and a chaparral/coastal sage mix.



Ownership of the 180-acre core of the Emerson site in Riverside County was transferred this summer from The Nature Conservancy to the University, making this reserve the 30th in the NRS. Seven of these sites, including the Emerson reserve, are managed by the Riverside campus.

Emerson Oaks Reserve brings into the NRS a habitat not previously represented—the southern oak woodland.

"The Emerson Oaks Reserve sits at a focal point between desert influences, coastal influences, interior valley influences, and mountain influences," says Tom Scott, a UC Cooperative Extension natural resources wildlife specialist and authority on hardwood range management. "This sort of mixing is sometimes more biologically interesting than habitats that are kind of solid."

Located about five miles southeast of Temecula in the southern portion of Riverside County, the reserve protects a habitat rapidly disappearing because of development pressure. It also furthers the NRS effort to broadly represent California's rich ecological diversity.

While on-site facilities are currently very limited, the reserve is open to interested researchers and faculty members, according to Reserve Director Barbara Carlson, who also oversees Motte Rimrock Reserve.

Natural Features: Emerson Oaks Reserve lies about 45 miles south of the Riverside campus, about five miles off Interstate 15. With an elevation range between 1,460 and 2,000 feet, the rectangular-shaped reserve offers examples of Southern California coastal sage scrub, chaparral, and oak woodland habitats. Several artesian wells help support a wide variety of wildlife.

The reserve is bordered by the Pechanga Indian Reservation, Agua Tibia Wilderness, the Dorland Mountain Artists' Retreat, and Bureau of Land Management holdings, as well as agricultural land and scattered residences.

The higher, rugged elevations support dense stands of chaparral and one stand of



Barbara Carlson, reserve director at Motte Rimrock, has also assumed management responsibility for the new Emerson Oaks Reserve near Temecula. Here she examines mountain mahogany on the reserve, a site that contains good examples of Southern California coastal sage scrub, chaparral, and oak woodland habitats.

oak trees. The lower, gently sloping areas contain oak woodland and coastal sage scrub. Among the oak species found on site are coastal live oak and scrub oak. Engelmann oaks may be present, although none have yet been identified.

Observed fauna include mule deer, kangaroo rats, hawks (Cooper's, red-shouldered, and American kestrel), scrub jays, wrentits, Hutton's vireo, California thrashers, rattlesnakes (red diamond and southern Pacific), orange-throated whiptail, coast horned lizard, and a variety of butterflies, including the California sister and Lorquin's admiral.

"We still don't know what all exists there," says Carlson. "We're just beginning to get information on both the flora and fauna."

A number of non-native plants and trees, including pepper trees, iceplant, and some fruit trees, have been planted over the years near the main house on the reserve. A nearby pond, an estimated 15 feet deep, supports a variety of non-native fish.

Facilities and Use: Because the reserve lacks on-site research and teaching facilities, it is currently best suited for day use.

The site contains a main house not yet available for NRS use, as well as several out buildings. The reserve may remodel a cottage for overnight use by researchers and refurbish a stone shed for storage. A trailer on the reserve is now the residence

of Kelly and Jennifer Harvey, who are serving as caretakers. Eventually, it may be used by a resident director.

Research Potential: One notable field of inquiry at this site is the management of oak woodlands, a habitat that is in decline across the state as an increasing number of seedlings fail to survive to reproduce. According to Cooperative Extension Specialist Scott, "Hardwood rangeland is a key area for natural resources now. People are beginning to look at new uses and new ideas about landscapes that traditionally were thought to be of little value."

In addition, Carlson plans to begin a bird-banding program on the reserve within a year.

History: The Nature Conservancy obtained the property from Harvey and Trudy Emerson, who for many years maintained a ranchette there. It was their desire that the land be preserved in as natural a state as possible. When the reserve joined the NRS, the Emersons deeded an additional 30 acres directly to the University. They will retain use of the ranch house.

For more information on using this reserve, contact: Barbara Carlson, Reserve Director, Department of Biology, 1208 Life Sciences Building, University of California, Riverside, CA 92521; (714) 657-3111.

— Kathy Barton
Senior Public Information Representative
UC Riverside

Special NSF Grants Fund Facilities at Two NRS Sites

The National Science Foundation (NSF) recently awarded grants to two NRS sites through a special competition for equipment and facilities for research at biological field stations and marine laboratories.

Philip L. Boyd Deep Canyon Desert Research Center received \$140,000 to establish new laboratory, residence, and research support facilities, while Bodega Marine Reserve received \$81,620 to build a terrestrial plant research greenhouse. NRS and campus matching funds will double the amounts these two reserves receive for their facilities.

The awards to Deep Canyon will enable what Reserve Director Al Muth describes as "rebuilding Deep Canyon from one end to the other." This two-year development project will provide permanent residence space and support facilities for researchers, expand and upgrade the existing laboratory, and add a new well. The facilities will greatly enhance the reserve's ability to support research necessary to understand desert ecology and develop resource management policies in arid lands. Yet they are designed to have a minimal impact on the fragile desert environment of this site, located in the Coachella Valley about 10 miles southeast of Palm Springs.

Deep Canyon will begin by moving its biological collections and library to the existing dorm area, thereby doubling

available laboratory space. It will then install laboratory-grade furnishings, safety features, and equipment to make the newly freed space more usable to researchers. The three renovated labs will each accommodate two to three users.

In addition, the reserve will construct a new researcher residence, consisting of sleeping facilities for two to four people, restrooms, and a common area with kitchen facilities and a combination dining/meeting room. A second residence wing may be added in the future to provide separate sleeping quarters for nocturnal and diurnal researchers.

Finally, Deep Canyon will renovate a trailer currently located at the main lab complex and move it down the floodplain to provide additional facilities remote from headquarters and utilities. A photovoltaic system will be installed to power basic lab equipment, lights, and a composting toilet.

Meanwhile, back at the coast, Bodega Marine Reserve will use its grants to construct a 2,200-square-foot research greenhouse to support the study of such topics as plant-herbivore interactions, plant and insect community dynamics, and population genetics. Terrestrial plant ecology is the fastest-growing area of research at this reserve, which surrounds Bodega Marine Laboratory, on the Sonoma County coast about 70 miles north of San Francisco.

The new greenhouse will increase on-site greenhouse space more than tenfold, eliminating the need for reserve researchers to start plants on the Davis campus, located 100 miles inland. The greenhouse will be equipped with sinks, benches, and a soil

sterilizer. Automatic timed watering systems will allow each researcher to set individual watering regimes for each experiment. Seawater lines and drains will enable researchers to experiment with salt spray or other salinity effects. The greenhouse is also designed for the future addition of an attached headhouse and a small laboratory for microscope work and plant measurement.

In addition to supporting the work of resident and visiting faculty, the new greenhouse will be used by graduate and undergraduate students doing research on the reserve. It will also be used for experiments conducted as part of at least two field courses at Bodega Marine Laboratory.

Though the greenhouse grant runs two years, the reserve plans to have the facility ready for use in the spring of 1992.

Of the 69 proposals submitted to the National Science Foundation, 33 were funded. Both NRS reserves received more than the average award of \$75,750.

Because this funding competition requires field stations to provide a match of as much as 50 percent, the NRS has established its own program of awarding potential matching funds for NSF grants. Deep Canyon and Bodega received \$130,000 and \$20,000, respectively, in the NRS matching contest. Deep Canyon will apply an additional \$15,000 of reserve funds to its project, along with \$20,000 the NRS pledged for the new well. Bodega also received \$35,000 from UC Davis, which administers the site.

— Sarah Steinberg Gustafson
NRS Publications Consultant



M. L. Herring

Looking north across Horseshoe Cove at Bodega Marine Reserve—the new greenhouse will be located next to the laboratory (shown here center, near horizon).

Instruction and Research Highlights

Student Grants Prove Great Investment

The Mildred E. Mathias Student Research Grants are an important aspect of the Natural Reserve System's overall goals. These grants, awarded yearly, provide funding for UC students who wish to conduct research on NRS sites and help train new field scientists. In addition, when grant recipients advise the NRS on the progress of their work, the information they provide contributes to improved management of the reserves they use.

Rhoda Ascanio, a graduate student at UC Riverside, received a Mathias grant last year to study kangaroo rats at Motte Rimrock Reserve. She became interested in "k-rats" when she heard a fellow graduate student's talk on the subject; now she is deeply involved in her projects. Ascanio monitors interactions between the endangered Stephens' kangaroo rat (*Dipodomys stephensi*) and the common Pacific kangaroo rat (*D. agilis*).

Motte has a special area where grassland and coastal sage scrub habitats intersect, where both k-rat species occur and home ranges overlap. Ascanio compares population structures resulting from additions and removals of particular combinations of the two species. She follows the rodents' movements by radio-tracking them during their active periods at night. In future behavioral studies, Ascanio will use seed trays to investigate foraging interactions. Now that the grant Ascanio received has sent her research in the

right direction, she is learning how difficult, but satisfying, it is to collect field data.

Greg Lowenberg, a student in the Botany Graduate Group at UC Davis, received a 1988-89 grant to work at Bodega Marine Reserve, researching the effects of floral herbivory on yellow mats. His initial experiments revealed that plants damaged by herbivores in their first flowering respond by reducing the number of abortions during their second flowering, thereby producing a nearly normal-sized seed crop.

These results only show female compensation, though, so Lowenberg decided to study the male response. He is now examining daily demographic patterns of pollen shedding and reception, and comparing them using electrophoretic markers on germinated seeds — a seed paternity test. In addition, he is looking at the effect of herbivory on gender ratio to discover why the plant makes more females after herbivory.

A dedicated researcher, Lowenberg spends much of his time at Bodega lying on his stomach near a cliff, staring at his plants. He is known to Friday tour groups as the "resident dead body."



California mouse

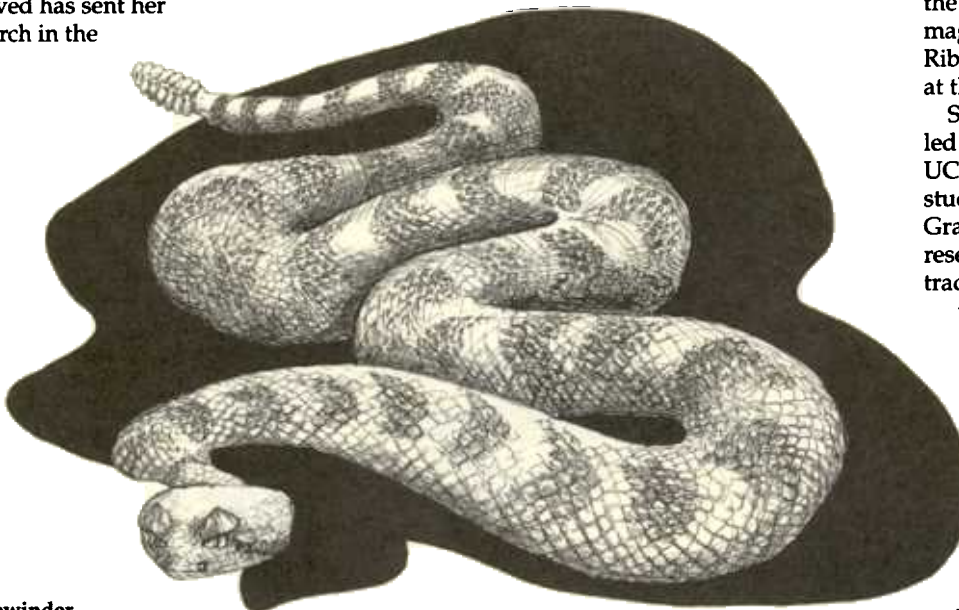
M. L. Herring

David Ribble, a former UC Berkeley student, has also been in the public eye quite a bit. His 1988-89 award enabled him to study the mating system and dispersal dynamics of the California mouse at Hastings Natural History Reservation. For three years, Ribble studied the mouse's monogamous behavior and parental care, including the effect of a chemical from the female that induces the male to take part in parenting. Dispersal was also researched because a monogamous mating system affects territoriality and mate selection by offspring.

Ribble's work has attracted the attention of the popular press nationwide, including the *San Francisco Chronicle* and *Discover* magazine. His dissertation now complete, Ribble has accepted a postdoctoral position at the University of Western Ontario.

Steven Secor's childhood love of snakes led to his later research interest. Secor, a UCLA student, received a 1989-90 grant to study coachwhips and sidewinders at Granite Mountains Reserve. He values the reserve because its loose sand allows him to track the snakes easily. There he compares the foraging mode, energy expenditure, and digestion of the coachwhip (a diurnal, active forager) with that of the sidewinder (a nocturnal, ambushing predator).

Secor has used two techniques to measure metabolism and activity: surgical implantation of radio transmitters that emit a signal pulse rate proportional to snake body temperature, and injections of double-labeled water isotopes that decline differentially over time and thereby



Sidewinder

M. L. Herring

allow energy use to be calculated from the difference between final amounts of hydrogen and oxygen. Secor admits: "The equations are confusing, so I just explain that the energy cost for one full year of activity, without reproduction, is in a McDonald's cheeseburger for a sidewinder, and in a Big Mac for a coachwhip."

Secor has received awards for his student talks at meetings of the Southern California Academy of Sciences, the American Society of Ichthyology and Herpetology, and the Herpetologists League/Society for the Study of Amphibians and Reptiles.

In terms of personal development, project success, and professional experience, these four grant recipients feel they have benefitted greatly from the opportunities the NRS gave them. As Greg Lowenberg says: "Over the years I have come to see more and more the value of the NRS. ...I can leave my project and know it will be there the next time I come back." David Ribble, too, is glad he received his grant: "The grant came at a critical time, enabling me to continue my field research and further my interests and skills." "I have a nice place to stay where I do my field research, and there is not the type of disturbance one finds in a state park," says Steven Secor, "so I have many jealous colleagues." And Rhoda Ascanio adds: "Getting the grant was emotionally supportive. I encourage others to be aware of the Mildred Mathias Grants and apply for them."

Applications for the 1991-92 Mathias Student Research Grants will be available soon. For more information, contact your campus NRS representative.

— Joy Schaber
UC Berkeley Undergraduate and
NRS Science Writer Intern

NRS Provides Forum For Two Decades of Public Health Classes

For twenty years, UCLA Professor of Public Health Telford H. Work has been teaching a graduate course that includes a two-day field trip to two NRS reserves: Burns Piñon Ridge and James San Jacinto Mountains. Why take public health students into the field? Because, says Professor Work,

we must give first consideration to the environment.

Whereas medical doctors see their patients case by case, public health professionals must view an entire population as the patient—and this patient is bound inseparably to its habitat. Different environmental situations support various illnesses, but each one can be altered to reduce or eliminate illness. In Work's class on the Ecology of Exotic Diseases, students are first taught the basic principles of infectious disease (such as antibodies and immune response), then introduced to the relationship that exists between a disease and the geographical environment in which it occurs.

Work explains how both inorganic and organic stimuli contribute to disease development. Temperature, humidity, wind, altitude, luminosity, soil composition, solar radiation, and magnetic fields all affect health, as do parasites, viruses and bacteria, "toxic systems" (all manner of poisonous flora and fauna), and such human-made embellishments as roads, reservoirs, sewers, and air pollution. A disease agent may require the presence of certain hosts, other than humans, during part of its life cycle. Even the tension and stress of modern life is a factor in this equation of human health.

However, a habitat is typically defined by its plant communities. Plants are especially sensitive biological indicators and determine what kinds of fauna are likely to be present. For this reason, Work's students are accompanied on their 350-mile field trip by Professor Emeritus of Botany Mildred Mathias, who teaches them to identify key plants and to recognize more than 20 distinctive vegetation types. Professor Work says that, although he has traveled throughout the world, he has found no other place like Southern California for the richness and accessibility of its biological diversity.

Habitat can be interpreted from many perspectives. Approaching habitat from the perspective of the medical geographer, Work's class studies maps and aerial photographs. Approaching it from the perspective of the field biologist, the students go directly into the environment. Only by entering a habitat, by temporarily becoming part of it, can they gain a complete and intimate understanding of all the ways in which it influences human health.

— Susan Gee Rumsey
NRS Senior Editor

A Year in the Life of the Hastings Reservation

In this issue of the Transect, we introduce a new column highlighting recent research at one or more reserves. Of all NRS sites, the Hastings Natural History Reservation is perhaps best integrated into the academic life of a campus. It enjoys strong support from long-time donor Fanny Hastings Arnold, as well as from the UC Berkeley Museum of Vertebrate Zoology. In addition, the site provides modern, well-equipped residence and laboratory space. As a result, it is one of the most heavily used reserves in the system and occasionally has to turn away qualified researchers for lack of room. A sampling of ongoing work at this upper Carmel Valley site follows.

•Walt Koenig, Hastings Research Zoologist, continued studies begun in the early seventies on the evolution of social behavior in acorn woodpeckers (see *Transect* 1(1):1). In collaboration with UC Berkeley Ph.D. students Philip Hooze and Mark Stanback, Koenig worked on several aspects of this species, including egg-tossing by cobreeding females, mate-guarding by breeding males, and brood reduction within nests. Hooze radio-tracked individuals to determine their home range and movement patterns and implanted several birds with testosterone to investigate the endocrinological basis of foray behavior.

continued on next page



Student researcher examines Hastings flora.

Norden H. (Dan) Cheatham

Instruction and Research Highlights *continued*



Research Ecologist Jim Griffin has collected decades of data on the oaks at Hastings.

A Year *continued from page 5*

•Janis Dickinson, Hastings Research Associate, conducted research on the mating biology of western bluebirds and blue milkweed beetles. She examined the relationships between mate-guarding behavior of male bluebirds, their parental care at the nest, and the number of offspring they sired as determined by DNA fingerprinting. Dickinson found more than half of the bluebird nests had at least one offspring not sired by the caregiving male. The beetle project involved experimental removal of guarding males and guarded females to determine how the costs and benefits of mate guarding vary with time of day.

•Morné Duplessis, University of Cape Town, provided supplemental food to selected groups of acorn woodpeckers to determine if the birds have more young when they take in more calories. He also collected data on California ground squirrels to see which individuals give alarm calls and which benefit from them.

•Elizabeth Ross, UCB, studied scrub jay ecology, specifically the role of non-territorial, unmated individuals in the social organization of the species.

•Jean Knops and Tom Nash, Arizona State University, Virginia Boucher, UCB, and Bill Schlesinger, Duke University, are

studying the morphology and photosynthetic budget of the lichen *Ramalina menziesii*. They analyzed samples of water collected under blue oak trees with varying lichen loads.

•Jim Griffin, Hastings Research Ecologist, worked on a variety of oak-related projects. He resampled seedling oaks originally marked in the 1960s to determine the fate of trees in eroded, open hillsides, all of which were apparently planted by scrub jays. With Pam Muick, UCB, he monitored seedling survival in gopher-proof experimental plots located in both shade and full sun. Griffin also collaborated with Koenig, Knops, and others to study how soil properties and environmental variables affect acorn production. The group is analyzing the habitats of more than 200 oaks of various species for which Koenig has 12 years of data on acorn production.

•John Barthell, UCB, who studies native bees, conducted field tests with north- and south-facing microhabitats to determine the relationship between nest-site selection and survivorship.

•UC Davis and UC Santa Cruz students sampled local ponds for native amphibians, in part to provide information to the California Department of Fish and Game on

various populations of the California tiger salamander, a candidate for endangered status. They found thriving populations of the salamander in a system of vernal pools on an adjacent ranch. Because many vernal pools in Carmel Valley are still relatively undisturbed, this area may be a stronghold for the species.

•Ricardo Fernandez, UCB, used magnetometers to pick up the electromagnetic waves produced by the impact of solar winds. By observing these deep-penetrating waves simultaneously from distant points, geologists can explore the structure of the San Andreas fault. Fernandez chose Hastings as a sampling site because of its low background level of human-generated electric and magnetic fields.

•Malcolm Hughes, University of Arizona Tree Ring Laboratory, examined growth rings on a section of a 500-year-old valley oak for possible correlation with drought cycles in Carmel Valley.

•Mark Stromberg (Hastings Manager), Jim Griffin, Dave Amme (California Native Grass Society), John Menke (UCD), Marion Stanley (UC Extension), and Mary Palmer (Humboldt State University) continued their study of the effects of cattle grazing and gopher activity on native perennial grasses (see *Transect* 8(1):6). The group is analyzing soil composition, slope, and aspect, along with grazing and cultivation history, to correlate vegetation patterns with site characteristics and management. Stromberg and Griffin collected vegetation data on 180 plant species in 80 sites at Hastings and adjacent ranches.

The researchers have already discovered dramatic differences between sites. Those that have been cultivated do not support native perennial grasses, nor is there any evidence of native grasses returning to such sites in both grazed and ungrazed areas. To see if introducing seed will stimulate the return of native species, the group will plant seed of five perennial grasses in 12 plots after the winter rains begin. Controlled grazing in early spring on half of the plots should clarify the utility of grazing in re-establishing native California grasses.

— Mark Stromberg
Hastings Reserve Manager

Editor's presstime note: UC Wildland Resources Center just awarded Reserve Manager Stromberg a gift for his research proposal, "Grassland Savannas and Biology and Suitability of Selected Perennial Native Grass Species for Agriculture." The gift will be one of five made from a \$35,000 donation by PG&E for "Awards for Research Excellence in Wildlands."

World's First Elephant Seal Conference Convened This Year

This spring in Santa Cruz, the first global conference devoted exclusively to elephant seals drew about 60 researchers from Australia, South Africa, Great Britain, Argentina, Japan, the United States, and several other countries.

The conference, held May 20-21, was organized by UCSC Biology Professor Burney Le Boeuf. Le Boeuf is faculty reserve manager for the NRS's Año Nuevo Island Reserve and has studied that site's major elephant seal rookery since 1967. He and the two dozen other UCSC scientists conducting elephant seal research at Año Nuevo are considered one of the best such teams in the world.

Much is already known about the lives of these enormous marine mammals, whose



abilities and behaviors run to extremes. Land-based studies have described their violent sex lives, population ranges, and physiology that permits them to fast for months and hold their breath for long periods.

Recent advances in increasingly sophisticated technology now allow scientists to follow the seals into their *marine* environment, to reconstruct their migratory paths and measure the shapes, speeds, and durations of their dives. Among the results presented at the conference were the following:

- Robert DeLong, of the National Marine Fisheries Service, Seattle, reported that some seals in his study reached depths of nearly 5,000 feet. No marine mammal, including the sperm whale, dives deeper.
- David Slip, of the Australian Antarctic Division, Tasmania, revealed that one southern elephant seal stayed underwater for two hours on a dive. Elephant seals typically spend 83 to 92 percent of their time at sea underwater, surfacing for a brief two minutes between dives.
- Yasuhiko Naito, of the National Institute for Polar Research, Tokyo, and

graduate student Dan Crocker, UCSC, described diving-speed measurements which indicate that the seals have at least five distinct patterns of dives—each pattern with a specific purpose. Questions remain about how seals navigate and whether they dive and forage by themselves or in groups during migrations.

In addition, several studies elucidated twice-yearly migrations that cover thousands of miles throughout the Pacific Ocean. Another important topic of discussion was the worldwide status of elephant seal populations. While northern elephant seals are now thriving (after being hunted to near-extinction in the late nineteenth century), southern elephant seal populations have fallen by 40 to 60 percent over the past ten years. Harry Burton of the Australia Antarctic Division, Tasmania, suggested the population decline may be due to global climate changes that have altered the ocean environment and reduced food sources for the seals.

The conference was sponsored by the U.S. Minerals Management Service, the Marine Mammal Commission, and two Antarctic-research organizations.

Scientist Studies Connection Between Seals and SIDS at Año Nuevo Island Reserve

In ongoing work at Año Nuevo Island Reserve, Michael Castellini of the University of Alaska is studying the ability of elephant seals to stop breathing for several minutes at a time while diving or sleeping (see *Transect* 6(2):2). Last year, Castellini found that the heart rate of baby seals can fluctuate wildly during periods of sleep apnea. Furthermore, young pups do not show the normal pattern of heart rate changes during breathing. As Castellini reported at the Santa Cruz conference, pups gain a great deal of control over their heart rate by the time they are about six months old.

This winter, Castellini will examine sleep apnea and cardiac control in newborn seals, which may prove to be a good animal model for the study of Sudden Infant Death Syndrome (SIDS) in humans. Like seal pups, human infants at risk for SIDS lack control over their heart rate while breathing and perhaps during normal sleep apneas; neither can tolerate holding their breath for long periods of time. Castellini hopes his work will lead to finding a cause—and perhaps a cure—for SIDS, which kills about one in 500 babies under the age of 12 months.

Don't Touch that Phone...Until You Know the New Area Codes

In September, the telephone area code for the San Francisco Bay Area counties of Alameda and Contra Costa changed from 415 to 510. Callers trying to contact the systemwide NRS office in Oakland or the UC Berkeley campus should now dial 1 + 510 + the seven-digit phone number they wish to reach.

This change was made because Pacific Bell is running out of phone numbers. A transition period from September 2, 1991, to January 27, 1992 was established to ease the changeover. During this period, callers can use either area code. The 415 area code is being kept in San Francisco, San Mateo, Marin, and parts of Santa Clara counties.

The 415/510 split is one of two area code changes that took place this fall. In Southern California, the 213 area has also been divided, with the transition taking place between November 2, 1991, and May 1, 1992. Parts of Los Angeles and Hollywood are retaining the 213 code, but the surrounding area, including all UCLA numbers, has now been assigned a new code: 310.

News and Notes

Contributions and Additions

Granite Mountains Receives Funds to Monitor Facilities

The facilities under construction at Granite Mountains Reserve will do more than provide a place for scientists to conduct research—they themselves will serve as an experiment. With a \$15,000 contract from Southern California Edison and equipment donated by Richard Schoen of UCLA, the reserve will monitor and evaluate the performance of its prototype stand-alone research residence and laboratory.

Granite Mountains Reserve is located in the East Mojave Desert, one of the most isolated areas in the continental United States. Because its facilities are distant from any urban power grid, they must be energy efficient and independent.

Reserve Director Philippe Cohen is working with Schoen, UCLA Graduate School of Architecture and Urban Planning, and with Balcomb Solar Associates (BSA) of Santa Fe, New Mexico, on the current facilities project, which is funded in part by a grant from the National Science Foundation (see *Transect* 8(1):1).

The new facilities will incorporate state-of-the-art architectural design and construction materials. The laboratory and residence employ two different design strategies for passive solar heating and cooling. Each building will be constructed using modular panels that consist of three-dimensional, welded wire frames infused with insulation material and enclosed in concrete. This system, called "shotcrete," creates a stable, well-insulated, inert structure capable of withstanding severe earthquakes.

Balcomb Solar's computer models of building performance suggest that the laboratory will be more than 95 percent energy efficient. Once the facilities are complete, Cohen and BSA will collect data on thermal transfer rates, air circulation patterns, and relative humidity from more than 60 sensors placed inside and outside of the buildings, as well as at varying depths within their walls. By monitoring how the building responds to everyday human activity and use patterns—as when researchers open windows or doors—Cohen and colleagues will be able to test how internal conditions respond to minor adjustments in air circulation.

The group will also monitor the buildings on a year-round basis in order to analyze the energy efficiency of different design strategies and receive feedback on performance under a broad range of environmental conditions. The data should also help the researchers improve the models used to predict performance of various building designs. In addition, Schoen plans on using the data in his courses at UCLA.

Rebuilt Barn and Bunkhouse at Hastings Retain Appearance of Original Historic Structures

Thanks to Fanny Hastings Arnold, long-time benefactress of Hastings Natural History Reservation, the reserve has been able to rebuild one important facility and is in the process of replacing another. When complete, both structures will outwardly resemble the original historic buildings, but will be modern and energy efficient within.

The lower barn, which is the reserve's primary facility for storing research and maintenance gear, has been a structural hazard since the October 1989 earthquake bent the building's support beams. In February 1991, reserve personnel removed the barn's 1913-vintage redwood siding. The local Cachagua Volunteer Fire Company then burned the building down as a training exercise. Firefighters practiced entering smoke-filled rooms with breathing apparatuses and using various pumpers, hose and nozzle arrangements.

By the end of June, the reserve completed the new barn. An exact replica of the old at two thirds the size, the new, woodrat-proof barn has a concrete slab foundation and a solar lighting system. With the original siding—complete with horseshoes and bits of scrap iron—in place, the new building fits well into this historic ranch setting.

The reserve is now at work replacing its bunkhouse. When complete, it will house six researchers in three bedrooms and offer reserve users a new community laundry facility. An "artistic recreation" of the original building, the new bunkhouse will be equipped with a modern kitchen and upgraded insulation, windows, and heating system. It will meet the University's requirements for handicap access and should be ready in time for the spring 1992 field season.

Many thanks to Arnold, whose gifts of \$78,000 for the barn and \$150,000 for the bunkhouse made these projects possible.

Valentine Camp Will Provide Full-service Lab On Site Soon

If you've been waiting to begin research at Valentine Camp until you could do your lab work there, you won't have to wait much longer. By spring, the reserve will finish converting a portion of a 1920s-vintage cabin to a full-service laboratory. The 250-square-foot lab will be outfitted with basic lab equipment, including benches, cabinets, and a sink. Though Valentine Camp has adequate residence space, past researchers have had to either make a 20-minute commute to facilities at Sierra Nevada Aquatic Research Laboratory or hold their samples until they returned to campus. The reserve hopes that providing a lab on site will spawn new areas of research.

People

Caretaker Couple Enriches Research at Desert Site

When the NRS acquired the Burns residence in 1990 and Burns Piñon Ridge Reserve became able to house a steward, Jerry and Helen Freilich (pronounced FRY-LICK) took on the job. They have proven the perfect choice.

Jerry Freilich spent his boyhood weekends in the Junior Curators Program of the Academy of Natural History, Philadelphia. He says: "I would lie in trap...loitering in the halls until I could latch onto a passing curator and drill him with questions."

Years later, with his wife, Helen, Jerry moved west to the Mojave Desert. For a time the couple were caretakers at the Keys Ranch, a historic site in Joshua Tree National Monument, and Jerry began working at the monument. After a stint at the University of Georgia, where Jerry received his doctorate, the Freilichs returned to the Mojave and now serve as stewards at the Burns Reserve.

As park ecologist at Joshua Tree National Monument, Jerry has initiated long-term monitoring of desert tortoise and bighorn sheep using global positioning, satellite interpretation, and computer mapping. Helen is recreation planner for the San Bernardino National Forest, currently laying groundwork for the new visitor center at Big Bear. And junior curator Alex, born this past September, keeps his own hours and agenda.

The Freilichs are working with Burns Reserve Manager Bill Bretz to plot the future course of the site. They would like to encourage more use of the reserve, particularly as a starting point for studying the larger ecosystem within the nearly half million acres of Joshua Tree National Monument.

"Ecologically, the Burns Reserve is a tiny island of Joshua Tree, separated from the rest of the park by Highway 62," Jerry says. "There are so many questions, even basic inventories, that have not been addressed at the park that could be done at the reserve. I can't think of a better site for desert research."

Reserve users who can trap a moment with Jerry and Helen Freilich will be rewarded with their knowledge of the Mojave and their enthusiasm for the Burns Reserve, which will certainly enrich research at that NRS site.

— M. L. Herring
NRS Science Writer

Volunteer Trail-blazer Marks Path of Science at Big Creek

A dedicated volunteer has nearly completed an ambitious trail-signing and -marking project at Landels-Hill Big Creek Reserve, located along the rugged Big Sur coast. An area resident, Steve Chambers, is deeply interested in local history and known by local hikers as "the Saint of Santa Lucia [Mountains]" for his volunteer trail work, which includes searching for abandoned trails of historical interest.

The Big Creek sign project covered about 12 miles of trail and involved placing not only directional signs, but also small redwood markers every 100 meters. These individually numbered markers will enable students and scientists to record the exact locations of their observations.

Chambers himself made all the signs out of old redwood and hand-split all the stakes. He and his friends—the "Pimkolam [Junipero Serra Peak] trail crew"—then installed the signs along the trails with the aid of a measuring wheel. In the process, he discovered two overgrown trails used by the homesteaders.

These labors have made a real difference in our efforts to develop a geographic database for the Big Creek Reserve. The NRS extends a hearty "thanks" to Steve Chambers and his hard-working friends for a job well done.

— John Smiley
Big Creek Reserve Manager



Margaret Fusari

Interpretive Kiosks Enhance Awareness at Coastal Reserves

UCSC Student Carleton Eyster stands next to the interpretive display he created to describe the seabirds and shorebirds of Younger Lagoon Reserve in Santa Cruz. The display is located at the reserve's coastal overlook, an area frequented by visitors to the adjacent Long Marine Laboratory.

Eyster created the panel as part of his senior thesis in environmental studies. He plans to design another on the bird life of the reserve's inland wetland habitat and outlying areas that will be incorporated into a new bird observation blind midway up the lagoon.

Visitors to two other NRS reserves—Carpinteria Salt Marsh in Santa Barbara County and the Kendall-Frost Mission Bay Marsh in San Diego County—can also learn more about coastal wetlands ecology, thanks to the California Coastal Conservancy (CCC) and Oakland's East Bay Conservation Corps (EBCC). These programs are working together to create and install interpretive kiosks at strategic points along the coast to heighten public awareness of endangered species and the fragile wetlands they inhabit. The redwood kiosks are designed to accommodate changing displays, with captions in both English and Spanish. The Kendall-Frost panel depicts bird migration, and the Carpinteria panel describes shorebirds on one side and mudflats on the other.

Coal Oil Point Natural Reserve, located on the Santa Barbara campus, received three such kiosks from the CCC and EBCC in 1990. These displays, which depict dunes, shorebirds, and wetlands, have greatly aided the reserve's public education effort.

Events

Spring Symposium Will Consider Land Development and Ecology in Golden State

Interface between Ecology and Land Development in California is the title of a symposium now being planned for May 1-2, 1992, at Occidental College, Los Angeles. The symposium, to be held at the annual meeting of the Southern California Academy of Sciences, is intended to bring

together persons involved in basic research, applied environmental consulting, and governmental policy.

It will begin with a plenary address by Peter Raven, director of the Missouri Botanical Garden, and is anticipated to consist of sessions on: (1) biodiversity and habitat loss, (2) mitigation and development, (3) restoration of damaged communities, and (4) urban wildlife and corridors.

For more information, contact: Jon Keeley, Biology Department, Occidental College, Los Angeles, CA 90041-3392; (213) 259-2697 (department), -2958 (FAX).

News and Notes *continued*

White Mountain Station Hosts Water History Symposium

The History of Water: Eastern Sierra, Owens Valley, and White-Inyo Mountains was the title of the recent fourth biennial research symposium of the UC White Mountain Research Station (WMRS). The goal of the meeting was to foster interaction of academic, private, and public concerns, as well as to better understand and manage the delicate hydrologic system of central-eastern California.

The symposium, which marked the 40th anniversary of WMRS, convened at the station's facilities in Bishop from September 19 to 22. Approximately 300 scientists, resource managers, policymakers, and

members of the general public attended the meeting, where 54 scientific papers and posters were presented.

The long-awaited University of California Press book *Natural History of the White-Inyo Range of Eastern California*, edited by WMRS Director Clarence A. Hall, Jr., was released at the symposium.

Publications

Botanists Cultivate Flora Of North America Project

More than 20 major botanical institutions in the United States and Canada are cooperating in the Flora of North America (FNA)

project to produce the first comprehensive description of all plants growing spontaneously throughout North America north of Mexico.

The first volume of this 13-volume Flora, published by Oxford University Press, is scheduled to appear in 1992. In addition, the information will be contained in a computerized database called TROPICOS, which will be regularly updated and maintained as a permanent resource.

The Missouri Botanical Garden serves as the organizational center for the FNA project, which publishes a quarterly newsletter to communicate news about the project. For more information, contact: FNA Newsletter, P.O. Box 299, St. Louis, MO 63166; (314) 577-5180.



White Mountain Peak from South (6-UC-5-2)

Mr. Adams's photographs taken in the area of the White Mountain Research Station (left) and at the Philip L. Boyd Deep Canyon Desert Research Center (below) are part of the Sweeney/Rubin Ansel Adams *Fiat Lux* Collection, California Museum of Photography, UC Riverside.

NRS Photos by Ansel Adams Still Available for Viewing

It's not too late to see several NRS reserves (and other UC resources) through the eyes of photographer Ansel Adams at an exhibit entitled "Ansel Adams: Fiat Lux." These images, part of a collection of 100 photographs signed by Adams, will be shown at UC Riverside in the California Museum of Photography from November 9, 1991 to January 5, 1992, and at UC Santa Cruz in the Art Museum of Santa Cruz County from April 5 to May 10, 1992.

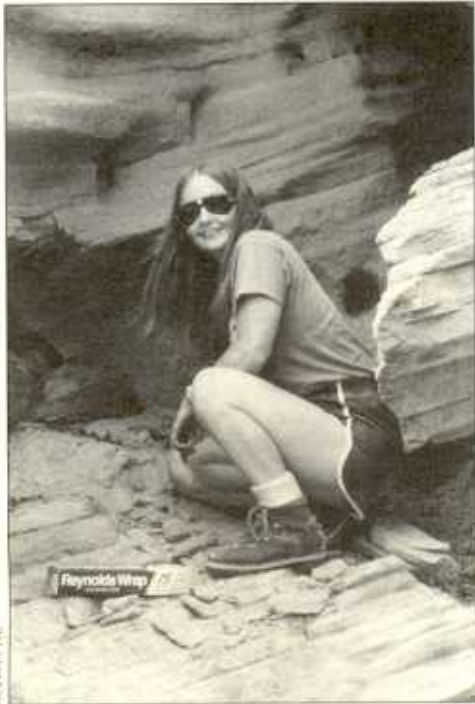
The photographs were taken to commemorate UC's 100th anniversary in 1968. They are being shown publicly for the first time on a 16-month tour, which began in January 1991, of six UC campuses and two public museums.

Accompanying the UC photos are 75 Adams classics owned by Pacific Telesis Group. Both exhibits have been funded by a \$190,000 grant from Pacific Telesis.



Cholla, Deep Canyon

(6-UC-b-10)



Interim NRS Director Elliott-Fisk's strong field orientation gives her special insight into the reserve system. She is seen here in rural Wyoming, wrapping up field work for a study in which millenia-old packrat scat is analyzed to reconstruct the history of the area's vegetation and climate.

Interim Director *continued from page 1*

NRS staff throughout the state, and served on several subcommittees.

As chair of the Davis Campus committee, Elliott-Fisk proved her ability to accomplish important objectives on a tight budget and in a timely manner. Under her leadership, the committee created a position for a campus reserve steward, brought Eagle Lake into the NRS (see *Transect* 5(1):1), acquired Putah Creek as a campus reserve, and advanced agreements for a serpentine site and an inner coast range reserve.

Elliott-Fisk is also a long-time NRS reserve user. "In my research and teaching," she says, "I analyze the earth's landscape as an ecosystem composed of biota, surface soils, geologic structures, and landforms that interact with the atmosphere and hydrosphere to form a functional, integrated system." Elliott-Fisk uses a system perspective, along with liberal amounts of field work, in all of the courses she teaches at Davis, from introductory physical geography through a graduate-level course on the principles and theory of ecology.

One of her favorite courses is one she developed in physical geography field methods, reputed to be the best in the country. Each spring, 25 upper-division students study California's biota, geomorphology, soils, and climate along a transect that runs from the Bodega coastline, through the Central Valley, over the Sierra Nevada, to the White-Inyo Mountains. "This class is different because the students don't just go and look," says Elliott-Fisk. "They study the environment by learning to collect and analyze various types of data, as well as how to formulate hypotheses, test them, and write up the results."

Elliott-Fisk's research program is every bit as holistic and hands-on. With grants from the National Science Foundation, the National Geographic Society, and the California Space Institute, she is examining how California's natural landscape has been shaped during the last five million years. Her ongoing work focuses on the mountains and basins of Eastern California and on the northern and central coastline, where she is piecing together current and past biota and physical features to understand the effects of changes in climate, glaciers, and in sea and lake levels. "As an ecologist as well as a geographer," says Elliott-Fisk, "I'm looking not only at patterns, but trying to understand the processes that shape the landscape as well."

Her research has taken on an agricultural component recently, as her coastal work expanded to studying how soils and geomorphic history influence grapevine

growth, grape composition, and wine properties. Many vineyards have solicited her recommendations on understanding and improving their soil.

When not in the field, Elliott-Fisk is often at her computer. She has been working with UCD colleagues to develop a Macintosh-based Geographic Information System for the campus reserve and arboretum.

Elliott-Fisk feels her academic interests dovetail nicely with the goals of the NRS. "I'm dedicated to using the diverse ecology of California as a natural outdoor teaching and research laboratory," she says. "I know firsthand what our reserves can provide to the University, and I believe the system should be used extensively and intensively by our faculty and students."

Her immediate objectives center on spearheading the review and implementation of the system's recently released long-range plan and budget. Later Elliott-Fisk will work on increasing reserve use in—not surprisingly—an integrated way. "I'd like to get the NRS up and running as a network of field monitoring stations that can support long-term research on environmental change across the state."

She'll begin by making more grant money available for work on NRS sites. She'll start the process of creating two new field ecology courses at UCD—one for graduate students and one at the undergraduate level. Both will be available to students throughout the UC system, be taught by an interdisciplinary team, and make use of reserves across the state. She also hopes to instigate some large research projects—both interdisciplinary work based on a single reserve and single-discipline projects based on multiple reserves. Finally, she will meet with personnel at the agricultural field stations and county extension offices to increase interaction between NRS and the agricultural component of DANR.

Elliott-Fisk's commitment to the NRS as an ecological and educational resource, combined with her experience in field teaching and research and her leadership skills, make her a valuable addition to the reserve system. According to UCD Geography Chairperson Ives, her appointment as interim director "is both a triumph and a disappointment for me and the department, and a sound investment for the NRS. Fortunately, the disappointment is a short-term affair related to selfish departmental needs, and the triumph a long-term benefit for all concerned."

— Sarah Steinberg Gustafson
NRS Publications Consultant

Long-Range Plan *continued from page 1*

The report also includes a Budget Augmentation Request that outlines three priority levels for incremental funding. The request identifies total nonrecurring needs of approximately \$8.5 million and total recurring needs of about \$1.5 million.

I have forwarded copies of the report to President Gardner, Vice Presidents Frazer and Baker, and to the Chancellors. It is also being circulated widely among other UC administrators and faculty for review at the campus level. During the next few months, Interim NRS Director Deborah Elliott-Fisk will visit each campus to discuss the report and will formulate a plan for its implementation. We anticipate presenting the report to The Regents and the Council of Chancellors in early 1992.

The Universitywide NRS Advisory Committee, chaired by Professor Emeritus Mildred E. Mathias and composed of faculty representatives from each campus, has adopted a resolution expressing deep appreciation for the efforts of the steering committee and declaring enthusiastic support for the final report. I join them in their endorsement of the report and am committed to doing everything possible to ensure its timely implementation.

— Kenneth R. Farrell
Vice President—ANR

Opportunities

NRS Student Grants Support Reserve-based Research

The Mildred E. Mathias Student Research Grants program offers UC students grants of up to \$2,000 for research on NRS reserves. A report on the progress of several past winners appears on page 4. For information on the upcoming competition, contact the NRS representative on your campus.

Switzer Foundation Offers Environmental Fellowships

Nominations are now open for the 1992-93 Switzer Fellowships in the Environmental Sciences. As many as 15 students engaged in advanced graduate study in environmental sciences at California universities will each receive a one-year grant of \$10,000.

Established by the Switzer Foundation and administered by The San Francisco Foundation, the Switzer Fellowship Program was designed not only to help graduate students complete their education, but also to advance the environmental sciences and gradually build a network of professionals dedicated to protecting and improving the environment. Switzer fellows are chosen for academic and scientific excellence, leadership potential, and commitment to solving environmental problems. Candidates may include scientists, engineers, policymakers, economists, writers, lawyers, and other professionals seeking graduate training in the environmental sciences.

Students may not apply directly for this program. They must be recommended in

writing to The San Francisco Foundation by a faculty member. The Foundation distributes an application directly to each student upon receipt of a letter of recommendation.

The deadline for letters of nomination is January 15, 1992—no deadline extensions. The deadline for completed applications from nominated students has been set for March 2, with winners selected by May 10.

For more information, contact: Carol Campbell, Environmental Program Associate, The San Francisco Foundation, 685 Market Street, Suite 910, San Francisco, CA 94105; (415) 495-3100 or (510) 436-3100.

Nature Conservancy Funds Management-related Research

The California Nature Conservancy (CNC) offers grants for work on natural areas through its Conservation Biology Research Program. *These grants are not limited to research on CNC preserves.* They are, however, intended to gather specific information for conservation and management of threatened and endangered species and natural communities.

CNC is also accepting applications to its Santa Cruz Island Fund, which provides grants for research on the island's ecology, particularly projects that bear on management issues.

Both grant programs accept applications the year round. For more information, contact: Oren Pollak, Stewardship Ecologist, California Nature Conservancy, 785 Market Street, 3rd Floor, San Francisco, CA 94103.

NRS Publications Program

New Site Brochures off Press

The NRS recently produced brochures for Philip L. Boyd Deep Canyon Desert Research Center, Carpinteria Salt Marsh Reserve, Kendall-Frost Mission Bay Marsh, and Scripps Coastal Reserve. Designed for prospective reserve users, each publication describes the natural resources of the site and contains information on access, facilities, and use. Brochures for many other NRS sites are also available. Contact the systemwide NRS office for a list and free copies of our publications.

Transect Available on Request

tran • sect (tran'sekt), *n.* 1. *Field Science.* A line along which physical and biological data are collected. 2. *Tech. Slang.* A cross-sectional slice of the environment under study.

In a broad sense, the Natural Reserve System is also a transect. It encompasses a cross-section of California's natural diversity in a system of natural areas and field stations specifically reserved for teaching and research. Recognizing this, we have chosen to call our award-winning newsletter the *Transect*. For back issues or a free subscription—two issues per year—write or call the systemwide NRS office.

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