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NRS Director Guides Major Federal Study

NRS Director Deborah Elliott-Fisk has been appointed science team leader for a \$7-million, congressionally mandated study—the Sierra Nevada Ecosystem Project (SNEP)—funded by the U.S. Forest Service.

According to Elliott-Fisk, this study “will entail a detailed scientific assessment of the Sierra Nevada ecosystem by an independent panel of scientists, integrating state-of-the-science knowledge on the biological, physical, and socioeconomic environments of the region.” When assessment is complete, the panel will develop a range of strategies for “providing resources to meet human needs,” while preserving the region’s rich diversity of life.

The project will operate for more than two years under a cooperative agreement between UC’s Division of Agriculture and Natural Resources and the Forest Service’s Pacific Southwest Research Station. The UC Wildland Resources Center, directed by Don Erman, will administer funds. A six-member steering committee to oversee the study consists of one representative each from the Pacific Southwest Research Station, University of California, Research Office of the U.S. Forest Service, National Park Service, and California Academy of Sciences, plus one at-large member.

Barbara Weber, chair for the project’s steering committee and director of the Pacific Southwest Research Station, announced in August the selection of Elliott-Fisk to lead the independent scientific panel. Since then, Elliott-Fisk has worked with the steering committee to recruit 18 leading scientists in Sierra Nevada research, including experts in old-growth forest ecosystems, biological

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The endangered Stephens' k-rat makes its home at Motte Reserve. (Photo courtesy of UC Riverside)

Motte Reserve Receives Resources to Save Species

Survival odds have improved for the federally endangered Stephens' kangaroo rat and a slender, orange-throated lizard whose population is on the decline. A 100-acre gift and \$475,000 to the Motte Rimrock Reserve in Riverside County have granted the two species an added measure of security and the reserve a continued source of funding.

A complex real estate transaction involving the NRS, the Riverside County Habitat Conservation Agency (RCHCA), California Department of Fish and Game, and Charles L. and Otte Motte (trustees of the Rimrock Trust) has increased the University-owned portion of the reserve by more than 25 percent and established a perpetual funding source for operational expenses.

Among the chief floral and faunal beneficiaries are the nocturnal Stephens' kangaroo rat, the termite-eating, orange-throated whiptail, and the mixed grasslands and coastal sage scrub habitat they favor.

“The larger the reserve, the better off species like the Stephens' kangaroo rat and orange-throated whiptail are,” says Barbara Carlson, director of Motte Rimrock Reserve. “There are medium to high densities of Stephens' k-rat on this new addition to the reserve, which will give us a better opportunity to study them and to help design an effective conservation plan and preserve system.”

The 600-acre Motte Rimrock Reserve already serves as a de facto county preserve for the endangered kangaroo rat, according to Brian Loew, executive director of the RCHCA. Established by the county in 1990 to develop a conservation plan for the k-rat, the agency is now working to protect a variety of threatened and endangered species in the county. “In effect, Motte is going to be a permanent [RCHCA] reserve, and I imagine it will function as an ongoing research area,” Loew says (see *Research sidebar*, page 9).

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Instruction & Research Highlights

Native Grass Research Thrives at Hastings

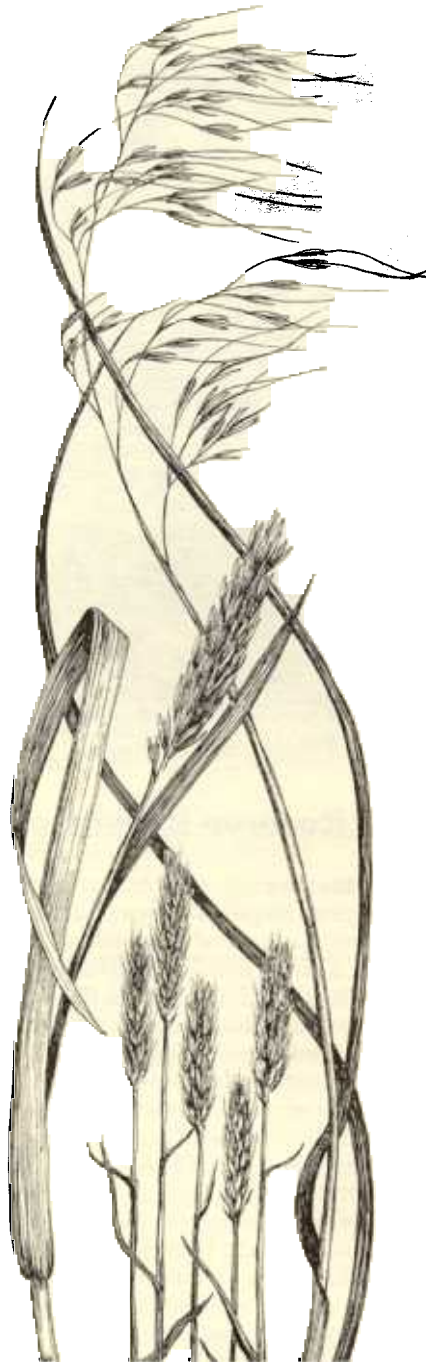
With two years of data now in, grassland researchers at the Hastings Natural History Reservation are beginning to understand the conditions necessary for native perennial grass seedlings to thrive in habitats now dominated by exotic annuals. If preliminary research sets seed, so to speak, ranchers and resource managers alike may find re-establishing native perennials makes as much sense economically as it does ecologically.

Perennial grasses benefit their ecosystem in many ways. According to UC Davis Professor John Menke, a collaborator on the Hastings project, perennial grass systems are more productive over the long run than annual-dominated systems. With their 6-foot-long roots (as opposed to a mere 6 inches for annuals), perennials make soils less vulnerable to erosion, recycle water and nutrients more efficiently, are less flammable, and help build more soil organic matter than do annuals. Because they have a much longer growing season, perennials are better able to support native wildlife throughout the year. Furthermore, experimental evidence indicates native oak woodlands are in decline, primarily because exotic annual grasses can outcompete oak seedlings for water.

Unfortunately, two centuries of cultivation and heavy grazing have allowed European annuals to invade virtually all of California's grasslands. Even agricultural fields long abandoned show no sign of being recolonized by native perennial grasses, as typically happens in less-arid parts of the country. As Hastings Reserve Manager Mark Stromberg explains, "On the rolling, golden hills of California, 99.9 percent of the ground is covered with grasses from the barnyards of Spain."

The grassland recovery work being conducted at Hastings and adjacent cattle ranches in the upper Carmel Valley consists of two separate but related parts: a research component and a project to maximize production of seed and forage. The overall goal, says Stromberg, is to determine the site conditions and management practices needed to restore native perennial grasses on public and private lands throughout the central Coast Ranges.

The research component of this work includes a seedling survivorship study, in which Stromberg and others planted native grass seed under several different regimes at nearby Carmel Ranch, Oak Ridge Ranch, and Rana Creek Ranch. Karen Rasmussen, a UCD graduate student, monitored the plots.



Three California native grasses: [top] Purple needlegrass (*Nassella pulchra*), [middle] Blue wildrye (*Elymus glaucus*), and [bottom] Barley (*Hordeum brachyantherum*). (Illustration by Margaret Herring)

After two years, the most successful plants grow in plots that researchers sprayed at planting time with an herbicide to suppress weedy annuals, then either mowed or allowed cattle to graze briefly but intensely in early May, while the annual grass seeds are in the soft "milk" stage.

Researchers also studied the benefits of wet-season burns, performed in winter just as the grasses emerge through the litter. Whereas annual seeds and seedlings are steamed to death in a wet burn, perennials—with their deep, well-entrenched roots—resprout quickly, then flourish with relatively little competition from the annuals. "Mowing, burning, or grazing at the right time deflates the annuals' impressive head of steam, and they have a hard time recovering in time to set seed that year," says Stromberg. "The perennials, which put much less of their energy into reproduction, spring right back."

In addition, Stromberg is analyzing the role gophers play in determining the composition of grasslands. He has compared establishment rates of both native and exotic seeds planted in soil broken up by gophers and in adjacent compact soil. Results confirm that the loose, fluffy gopher "tailings" hold much less water. Because the fast-growing roots of the large-seeded annuals are better able to penetrate this dry micro-environment to reach wetter soil below, the exotic grasses have a clear competitive edge in gopher tailings.

This grasslands research is supported by grants from Dan Lufkin of Carmel Ranch Company and UC's Excellence in Wildland Research Program, funded by Pacific Gas and Electric.

In the harvest portion of the project, Hastings researchers have been working with local ranchers to establish native grasses on their ranches for forage and seed production. Over the past two winters, Oak Ridge Ranch Manager Tim Curran planted native grass seed in a 6-acre dry field formerly dominated by wild oats. Early results show that—following a carefully timed series of planting, compacting the soil, mowing or grazing, spraying, and burning—even *unirrigated* fields of native grass could begin to pay off in large harvests of forage and/or seed after three to five years. Ranchers could use the highly prized seed to plant additional agricultural fields or sell it at premium prices to such buyers as CalTrans, the Department of Forestry, and commercial landscapers.

Once the perennials are established, ranchers can graze livestock fairly intensively on and off throughout the year, provided they coordinate grazing with plant reproduction.

Best of all, the fields produce forage in the fall and early winter, when annuals are dead and Central California ranchers typically must provide supplemental feed.

Because of the success at Oak Ridge Ranch, Stromberg also undertook a pilot project using irrigated bottomland at Rana Creek Ranch to determine optimal irrigation regimes as well as the best grass species for forage and seed. This summer, researchers planted more than 100,000 plugs of 12 native grass species on 1.5 acres of abandoned farmland, then gathered information on how the seedlings respond to various levels of moisture in the soil. Additional plantings will eventually cover nearly 200 acres of ranch land along Carmel Valley Road.

"This is a tremendous opportunity to develop and document new and promising sustainable agriculture for Central California," Stromberg says. "Rana Creek Ranch can use the irrigated fields to produce seed and forage, plant the seed to improve pasture on the drier uplands, and use the forage to reduce cattle-feeding costs."

For more information on the grassland work, contact Stromberg at the Hastings Natural History Reservation, 38601 East Carmel Valley Road, Carmel Valley, CA 93924; (408) 659-2664.

Sarah Steinberg Gustafson
NRS Transect Editor

And So It Grows...

If funding comes through, researchers will incorporate the grassland recovery work at Hastings into much larger projects investigating the ecology and restoration of native grassland systems throughout California. NRS Director Deborah Elliott-Fisk, along with Mark Stromberg, several other reserve managers, and UC Davis faculty, have applied for a U.S. Department of Agriculture grant to investigate the effect of climate on the success of native perennial grasslands.

The team hopes to conduct multiple planting experiments at the Hastings Reservation (upper Carmel Valley), Landels-Hill Big Creek Reserve (Big Sur coast), Button Ranch (inland Sonoma County), and Bodega Marine Reserve (Sonoma County coast), and to compare the results to existing data from the Jepson Prairie Reserve (Central Valley Delta).

In addition, Stromberg, Oren Pollak of The Nature Conservancy (TNC), and Kevin Rice (UCD) have received preliminary approval for TNC's Ecosystem Research Program funds to conduct experimental plantings of native grasses at Hastings and on several Nature Conservancy preserves.



Mentor Vic Chow and high school senior Angie Martin on Bodega's mudflats examine a fat innkeeper worm (*Urechis caupo*) to determine its sex in a study on invertebrate fertilization, larval development, and potential effects of pollution. (Photo by Neal Glasgow)

Bodega Scientist Mentors High School Students

The mentorship program at Bodega Marine Reserve makes it possible for high school students to engage in hands-on environmental education in the field—and, in this case, near the sea. Victor Chow, a biologist at Bodega Marine Reserve, helps students from Santa Rosa's Piner High School expand their understanding of science.

According to Chow, "The students are expected to actually do some science rather than learn just from textbooks and lectures." Since 1991, Chow's mentorship efforts have enabled two dozen students each year to perform a variety of research projects at Bodega Reserve.

The dynamic physical environment and variety of plant and animal communities at Bodega Bay offer countless project possibilities. Some students observe and analyze the foraging behavior of the octopus and social interactions among hermit crabs. Others study the harbor seal dominance hierarchy displayed during low tide. Student research on the reserve's feral cats had to be discontinued, however, because the project involved trapping rodents, with the potential for exposure to the hantavirus. Though Chow encourages his students to choose new projects each year, he notes that they often develop strong interest in their work and prefer delving deeper into their current projects.

Active involvement in the scientific process, as opposed to indirect learning through textbooks, benefits students in several ways. They develop techniques and methodologies, rather than rely solely on scientific description. They also acquire cross-disciplinary skills by integrating their field-acquired research abilities with other methods of learning. For example, some students serve as mentors to classmates and, in doing so, develop new ways to express scientific ideas.

Using techniques learned on site, students at Piner High School perform research projects in the classroom. They prepare an environmental newsletter, design conservation-related computer graphics, maintain a steelhead trout hatchery, and monitor pollution levels in their community. Producing meaningful results by utilizing skills developed through the mentorship program helps demystify the scientific process and, perhaps, motivates these high school students to pursue a career in environmental research.

The mentorship program also benefits the reserve. Scientists commonly use students' findings in their own research. For example, Chow remarked that student-compiled data "gives us a grip on ways to manage feral cats on the reserve." Also, reserve researchers plan to coordinate with students in monitoring green crabs, an exotic species that has begun to invade Bodega Bay. According to Chow, student/researcher collaborative projects work two ways: students learn and simultaneously contribute to the scientific community, thus "information gets into the system that wouldn't have otherwise."

This successful mentorship program meshes well with NRS systemwide efforts in youth education. A grant proposal to expand the Bodega Bay program has been submitted to the Division of Agriculture and Natural Resources. If funded, the NRS, in collaboration with UC Cooperative Extension, will design a science curriculum through which youths in the neighboring community will actively engage in experiential learning at the Bodega Reserve. A larger proposal will be submitted to the National Science Foundation's Informal Science Education Program this spring.

—Elaine Miller
NRS Assistant Editor

Reserve Highlights

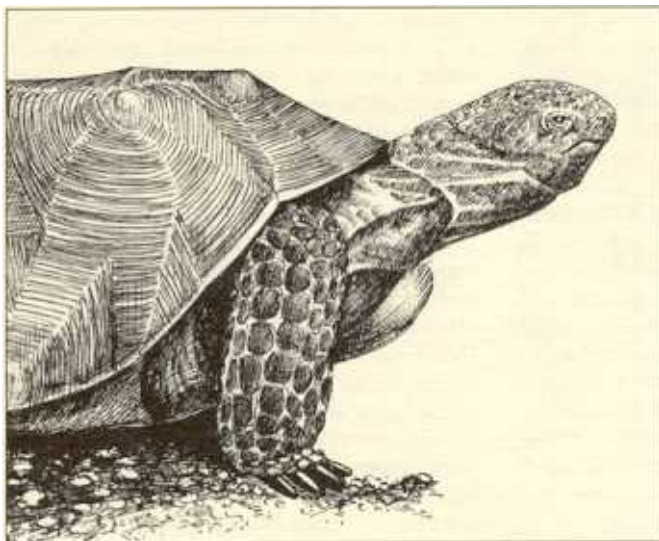
A Year in the Life of Deep Canyon

Editor's note: We continue our series highlighting recent reserve research with a visit to the Philip L. Boyd Deep Canyon Desert Research Center. Located on the outskirts of Palm Desert, Deep Canyon encompasses over 16,000 acres from the Santa Rosa Mountains to the Coachella Valley. The Deep Canyon Transect includes protected examples of Colorado Desert habitats from ridge top to valley floor in established checkpoints accessible by road or trail. The breadth of research at Deep Canyon is evident in an extensive library of books and other publications specific to the site.

* * * *

This year in the life of Deep Canyon finds the research headquarters at Boyd Center in the midst of a major facelift. Remodeled laboratories and a new director's office are scheduled to be completed by winter. Construction of a new, bermed residential facility is still at ground level, awaiting the realignment of budgets and bids.

The arid climate (annual average rainfall is less than six inches at Boyd Center) drives much of the research, as well as management, at Deep Canyon. However, this year resident Director Allan Muth reports: "The 11th Annual Well Failure Festival was canceled due to unanticipated reliability of the water system and an easing of the drought." Putting a crimp on future festivals, a backup well was drilled in July. Muth notes that the new well produces one gallon per minute, "not enough to water a golf course, but enough to satisfy the needs of Boyd Center."



Desert tortoise (*Xerobates agassizi*)
(Illustration by Margaret Herring)

Speaking of golf courses, rapid development in the Palm Springs area continues to sprawl toward Deep Canyon. A resort complex has been proposed for an area of palo verde wash near to the reserve's northern boundary. Extensive negotiations between the University and Lowe Development Corporation have concluded in a mutually beneficial agreement to mitigate impacts on the palo verde habitat within the development and to add 160 acres of contiguous palo verde habitat to the Deep Canyon research area.

* * * *

The history of research at Deep Canyon goes back to the 1950s and the earliest days of the UC Riverside campus. Some of this year's new and continuing research is listed below.

- Allan Muth and Mark Fisher (Deep Canyon staff biologist) enter the ninth year of their study on the population biology of the Coachella Valley fringe-toed lizard, an endangered species. They have combined a long-term study of animal demographics with on-site climatic monitoring to better understand the lizard's normal range of responses to environmental pressures. The fringe-toed lizard population crashed to about 10 percent of its 1985 level. Now, as the population stabilizes and shows signs of recovery, the researchers are following changes in population structure and age class distribution.

- Martin Daly (McMaster University, Ontario, Canada) and his research team begin their thirteenth year studying the behavioral ecology of Merriam's kangaroo rats. Through the use of radio-tag implants, Daly's team has linked k-rat activity to lunar phases. The animals travel farther from their burrows during the new moon darkness and stay close to home when the moon is full and bright.

- David B. Greenberg (UC Santa Barbara Ph.D. candidate) studies the behavioral ecology of speckled and red diamond rattlesnakes. He has



Fringe-toed lizard (*Uma inornata*)
(Illustration by Margaret Herring)

assessed the populations and local distributions of rattlesnakes throughout the reserve. This year Greenberg used radio-telemetry to monitor individual snakes, their daily activity patterns, and habitat preferences. He hopes to ascertain differences between warm- and cold-climate rattlesnakes and to determine if they migrate between distinct winter and summer habitats.

- Katherine Muller (UC Davis Ph.D. candidate) investigates the process of habitat selection in territorial animals, including a desert grasshopper, *Ligurotettix coquillettii*. Unlike most grasshoppers, male *L. coquillettii* actively defend territories. Mueller has monitored the movements and behavior of more than 350 individually marked males to determine their natural patterns of settlement. She has also investigated the role that established males play in the settlement decisions of incoming males. It seems that males are attracted to the calls of other males and will choose an occupied bush rather than a similar, but unoccupied, site.

- Park Nobel (UC Los Angeles) and his research team continue their long-term study of the physiology of cacti and succulents. This effort has already resulted in over 100 published papers and a definitive book based, in large measure, on work done at Deep Canyon. Most recently, Nobel's team examined the relationship between soil moisture and root structure. They found succulents tend to shed their lateral roots during dry spells to decrease the surface area from which water could be drawn back into the soil. Conversely, during wet spells, they sprout lateral roots to increase the surface area available for water absorption.

- Kelly Zamudio (University of Washington Ph.D. candidate) is developing a population dynamics model for the fringe-toed lizard using the extensive dataset developed by Muth and Fisher at the Whitewater River Preserve near Deep Canyon. Using these data, Zamudio will develop a projection model to guide future research and to time management strategies before there is a crisis in the population.

- Elliott Jacobson (University of Florida) bases his work on disease transmission in desert tortoises at Deep Canyon. A major contributing factor in the decline of the desert tortoise, a threatened species, has been the presence of an upper respiratory tract disease (URTD). Jacobson and others have isolated a mycoplasmalike organism that attaches to tortoise respiratory surfaces. He is now working with a research team to determine if this previously undescribed organism is the etiologic agent of URTD.

- Harold Avery (Bureau of Land Management) monitors the food preferences of the desert tortoise and the effects of exotic plants on tortoise diets. Avery is comparing the nutrient content of native and exotic annuals known to be eaten by free-living desert tortoises. He is also determining what captive tortoises choose when offered a selection of exotic and/or native plant species.

- Laura Cohen (California State University, Fullerton graduate student) is developing an ethogram—a record of postures and sequences—of the desert iguana from a series of videotaped images. Cohen's ethogram will provide detailed information about the behavior of the desert iguana and facilitate comparisons with the behaviors of other lizards.

In addition to supporting research, Deep Canyon hosts several university-level field classes. Students enrolled in courses on desert plant physiology, vertebrate biology, and desert ecology visit the reserve for short field trips throughout the academic year.

—Margaret Herring
NRS Science Editor

NSF Funds Facility for Nitrox Diving at Bodega

Underwater researchers at Bodega Marine Reserve will benefit from a diving facility recently funded by the National Science Foundation. The award will allow the Bodega Marine Laboratory, which is located on the reserve, to expand its existing dive locker and install a Nitrox SCUBA system.

Located along the north-central California coast, the Bodega Reserve and adjacent marine life refuge protect an exceptionally rich subtidal flora and fauna. The lab and reserve support numerous studies on subtidal algae, invertebrates, and fish in the fields of population biology, physiological ecology, biochemistry, and animal behavior.

But what makes the subtidal habitats of this area so rich—a high-energy oceanic upwelling system—also makes research difficult. Underwater dive time with conventional compressed air SCUBA is very limited. After setting up equipment in cold, rough water, researchers often have little time left for observation or measurements. The new facility will enable divers to spend more time per dive on the ocean floor, allowing them to address a wider range of research questions.

The facility will provide divers with Enriched Air Nitrox, an alternative to conventional air SCUBA that is fast becoming the technology of choice for research diving. Because Nitrox contains a higher percentage of oxygen than does ordinary compressed air, it allows divers to remain longer at depth without absorbing dangerous quantities of nitrogen into their blood. As a result, divers breathing Nitrox experience fewer symptoms of nitrogen narcosis, decompression sickness, and fatigue.

In addition to adding a Nitrox system, Bodega's new facility will continue to offer air SCUBA. The grant will also allow the lab to install bathrooms and new storage lockers and to purchase additional diving equipment. The upgraded facility will accommodate expanded training, including certification courses in Nitrox diving.

The National Science Foundation awarded the lab more than \$48,000 for the Nitrox system through a special competition for

field station facilities. The Davis campus Office of Research provided a matching grant that brings the total funds available for the project to almost \$73,000. Construction will begin this winter.

—Sarah Steinberg Gustafson
NRS Transect Editor

Bodega Breaks Ground and Builds Greenhouse

In other construction news, the Bodega Marine Laboratory (BML) has just broken ground for a new \$4-million administration building funded by California State Bonds. Scheduled for completion by 1995, the new building will include a lecture hall, a large library, and generous display space. It will also house all faculty and administrative offices, freeing up additional laboratory space in the existing BML headquarters, which will be refurbished. As a result, the lab will be able to provide increased support space for non-BML researchers doing field work at the Bodega Marine Reserve.

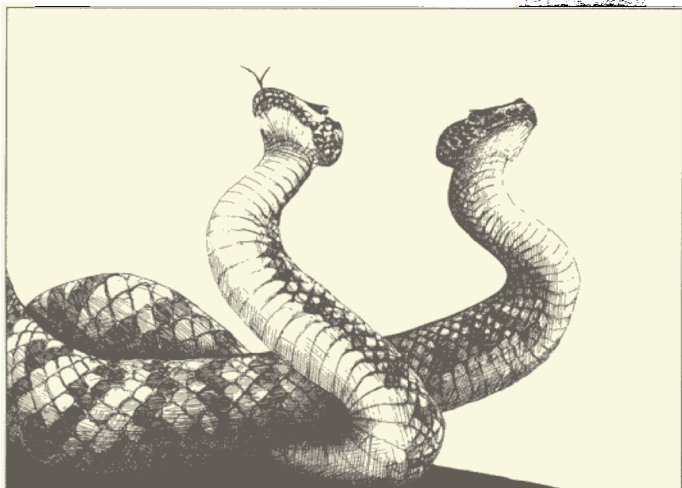
Reserve users are already employing the site's soon-to-be-finished research greenhouse. Funded by the National Science Foundation, the greenhouse supports research in terrestrial plant ecology by allowing scientists to grow plants on site, instead of at a distant campus. The main growing area and potting shed are complete; the reserve plans to add a headhouse in time for next spring's field season.

—S.S.G.

Long-time Leaders at Granites Head North

After managing Granite Mountains Reserve for seven years, Resident Director Philippe Cohen and Reserve Associate Cindy Stead swapped clean air for culture when they left the East Mojave Desert for the San Francisco Bay Area. On November 1, Philippe became administrative director of Stanford University's Jasper Ridge Biological Preserve.

It was their love for the place that drew Philippe and Cindy to the Granites in the fall of 1986 and kept them there during the reserve's rocky, but rewarding, adolescence. "When they arrived at the reserve, it was essentially a large acreage with a couple of cabins," says their former supervisor, UC Riverside's NRS Campus Director John Rotenberry. "Now, due entirely to their



Speckled rattlesnakes (*Crotalus mitchellii*)
(Illustration by Margaret Herring)

Reserve Highlights *continued*



Philippe Cohen, Cindy Stead, and Benjamin Cohen-Stead bid adieu to the Granite Mountains. (Photo by Sarah Steinberg Gustafson)

efforts, it's a real field station that gets a great deal of use."

The heart of the station is its innovative research and residential facility, featured in the last issue of the *Transect*. Philippe and Cindy were involved in every aspect of the facility's creation, from co-writing the successful National Science Foundation funding proposal and designing the buildings, to hiring contractors and hosting volunteer work parties, to pouring concrete and installing photovoltaic panels. All this would have been a major achievement anywhere, but at a site with a very limited budget, located 80 miles from the nearest grocery store and a 3.5-hour drive from its parent campus, such a feat is nothing short of remarkable.

Second to completing the facilities, Philippe and Cindy point to increased reserve use as their main accomplishment. During their tenure, both the quantity and quality of on-site research rose significantly, as did the numbers of field classes that use the reserve. On a personal level, their greatest labor was the birth of their son, Benjamin, in April of 1992.

Their desire to provide peers for Benjamin prompted Philippe and Cindy to consider leaving the Granites. The opportunity at Jasper Ridge, they say, was too good to pass up.

Located on the Stanford campus, 1,200-acre Jasper Ridge Preserve contains a rich assemblage of oaks, redwoods, and serpentine grasslands. It supports heavy research and instructional use, and has what Philippe describes as an "incredible" docent program. He anticipates many opportunities to enhance interaction between Jasper Ridge and the NRS through comparative studies and joint research projects that address regional and global environmental issues.

Following up on her success writing grant proposals for the Granites and other reserves, Cindy will pursue work as a fundraiser.

Though both Philippe and Cindy miss the Granites, they are enjoying the benefits of civilization, such as not having to repair their own phone lines after flash floods or carry coolers to the grocery store so their food doesn't spoil on the long drive home.

"I'm going to a great job in an interesting place, and I'm looking forward to it," said Philippe during his last days at the Granite Mountains. "But I'm leaving what is for me the most beautiful place on the planet. It's been a real privilege to be at the reserve for seven years, and I'm very grateful for the time we spent here."

And so is the NRS. Perhaps the greatest testament to the talents of reserve staff comes from what site users say about them. Eric McDonald, a geologist who worked out of the Granites for four years while getting his Ph.D. at the University of New Mexico, summed up the comments of many:

"Philippe and Cindy were incredibly helpful in every aspect of this project, from getting me access to BLM land, to sitting down and talking over the research, to making sure I got back from the field at the end of each day. I was particularly impressed with their ability to get people at the Granites to interact, share ideas, help each other select study sites, and even collaborate on interdisciplinary research. Being in that kind of environment was very exciting."

To Philippe and Cindy: On behalf of the entire Natural Reserve System, the *Transect* thanks you for what you have given the Granite Mountains and wishes you well.

—Sarah Steinberg Gustafson
NRS Transect Editor

Editor's Note: The search is on for a new resident director at the Granite Mountains Reserve. We hope to introduce you to the new director in the next issue of the Transect.

Director Guides Federal Study

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systems analysis, watershed ecology, human geography, and law and policy analysis. Nine of these individuals are University of California faculty. Joan Brenchley-Jackson, former NRS senior environmental analyst, will serve as assistant research ecologist for the project.

Elliott-Fisk's scientific and administrative accomplishments landed her the leadership position. She was heavily involved in the activities of the Sierra Summit, which drew together top scientists, policy- and decision-makers, and commodity and special interest groups to examine the integrity and future of the Sierra Nevada ecosystem. She also served as staff to the statewide Executive Council on Biodiversity. As an associate professor of ecology and geography at UC Davis, she has received numerous research grants from the National Science Foundation and U.S. Department of Agriculture for her environmental research throughout the state.

Elliott-Fisk describes her previous research as "both multidisciplinary and of a team nature." Years of work on the White Mountains, Mono Lake, and Eastern Sierras, along with extensive knowledge of California's environmental history, are the basis of her expertise in ecosystem study.

Under Elliott-Fisk's direction, the SNEP science team will take an innovative approach to studying the majestic mountain range. Instead of focusing on conservation of individual species, the team will analyze the entire ecological system, including the role of human activity. Forest Service Chief F. Dale Robertson explains that this project "will involve a detailed look at old-growth ecosystems, as well as all other ecosystems found throughout the Sierra Nevada. It will be one of the most significant, science-based assessments of resource options in recent years." The Forest Service asks only that the independent research team make a credible, scientific diagnosis, free from external influence by groups interested in the outcome.

To complete an ecosystem assessment, Elliott-Fisk will coordinate the synthesis and evaluation of existing data, including results from the Sierra Summit, Sierra Now, regional assessments, and local planning efforts. Informational gaps and targeted areas of research will be identified in the process and incorporated into the study.

The science team will develop a range of management options for preserving the natural vitality and diversity of the Sierra Nevada ecosystem, while providing resources to satisfy human needs. Input will be sought from federal, state, and local interests. Elliott-Fisk explains that the team

will outline the likely consequences of each management strategy, but will not recommend any individual plan of action.

The SNEP science team's assessment will provide the foundation for developing policies that balance the needs of the environment and of humans. Completing such an ambitious project is sure to be rigorous, but according to Robertson, it "will form the basis for important and complex decisions regarding the management of this vast and diverse region."

—Elaine Miller
NRS Assistant Editor

Report of the Director

On Sound Management Of Regional Ecosystems

Statewide efforts are now in place to promote the maintenance of California's rich biological diversity through sound ecosystem management. Some view this situation as the long-term result of the establishment of the National Environmental Policy Act, the California Environmental Quality Act, the Clean Water Act, the Endangered Species Act, and other environmental legislation passed in the 1970s.

However, it also reflects the priorities of the current state and federal political administrations. California's Secretary of the Resources Agency Douglas P. Wheeler has been instrumental in these efforts as the leader in such statewide programs as the Executive Council on Biodiversity, the Natural Communities Conservation Planning (NCCP) program, and the new wetlands conservation and restoration program. A number of conservancy groups—the Coachella Valley Mountains Conservancy, the Tahoe Conservancy, the Santa Monica Mountains Conservancy, and the Coastal Conservancy, as examples—have either matured or been newly created under Wheeler's administration.

Because much discussion on how to implement an ecosystem management program for an area necessarily involves land-use planning and land ownership issues, a broad group of people are engaged in the process. The Resources Agency has promoted and supported the formation of local workgroups to address such issues as watershed planning. Various federal agencies under the departments of Agriculture, Commerce, and the Interior are focused on ecosystem management of their own lands as well and are working closely with state agencies, counties, and local land trust and conservation groups.

Faculty, staff, and student users of the Natural Reserve System are taking part in many of these efforts, putting their scientific expertise to work. NRS Reserve Manager Daniel Dawson (Valentine Eastern Sierra Reserve) and many of his staff have been heavily involved in the Owens Valley Inter-Agency Taskforce, addressing ecosystem management in the upper Owens Valley. Reserve Director Allan Muth (Boyd Deep Canyon Desert Research Center) is an active participant in the new Coachella Valley Mountains Conservancy.

Meanwhile, Riverside NRS Campus Director John Rotenberry and Motte Rimrock Reserve Director Barbara Carlson are making significant contributions to the planning for preservation of Southern California's coastal sage communities through the NCCP program and the Riverside County Habitat Conservation Agency. Their efforts and the generosity of reserve donors and neighbors Charlie and Ottie Motte have resulted in land additions to and an endowment fund for the Motte Rimrock Reserve to preserve Stephens' kangaroo rat habitat (see page 1).

Many other examples could be mentioned here, as our faculty, staff, and students lend their scientific insights to a wide network of ecosystem management activities.

I am delighted to have been named science team leader for the Sierra Nevada Ecosystem Project (SNEP), California's first federally funded, science-based, regional ecosystem assessment. Nine of the 18 core science team members have been drawn from the University of California, and many more UC faculty, staff, and students are and will be involved in workgroups on various projects for the overall program. For the next two years, we will work with federal and state agencies, county administrative offices, and local experts to define the spatial extent and the dynamics of key structural, functional, and compositional features of the Sierra Nevada ecosystem. At the same time, we will carefully identify and consider the many benefits, both amenities and

commodities, that humans draw from the range. It will be a challenge to identify resource management alternatives and to assess their consequences. Unlike many regulatory agencies, however, the SNEP team will not recommend a single management strategy, but instead suggest various management scenarios, each of which is soundly supported by science.

It is appropriate that the University assume a leadership position in helping this state design and implement strategies for integrated resource management of its environment. Yet such leadership carries with it a certain degree of risk as we re-educate people to this important mission. My role as head of the science team for the Sierra Nevada Ecosystem Project calls upon me to create a visionary strategy and to lead objectively in extending our existing knowledge of the Sierra Nevada range, increasing people's understanding through outreach programs, and facilitating cooperation between all interested parties.

—Deborah L. Elliott-Fisk
NRS Director



Sagebrush Knoll at the NRS's Valentine Eastern Sierra Reserve. (Photo by Norden H. (Dan) Cheatham)

Motte *continued from page 1*

The Motte Reserve became the ultimate recipient of the added 100 acres and \$475,000 in a four-way land deal. The RCHCA purchased the property from the Mottes with funds from the county and the state's environmental license plate fund, administered by the Department of Fish and Game. Following the purchase, the RCHCA deeded the property to the NRS.

As a further benefit to the NRS, the Mottes donated \$475,000 of the sale proceeds to the reserve. They also gave an additional \$250,000 to the RCHCA in the form of a trust fund to finance research and purchase additional property for the conservation agency's k-rat preservation program.

Of the \$475,000 donated to the Motte Reserve, \$425,000 will be placed in a permanent endowment. Interest earned through investment—an estimated \$20,000 each year—will fund such operational expenses as utility costs and maintenance. For the first time, Carlson says, the reserve will have a guaranteed funding source and about double its current yearly budget, excluding her salary.

Several capital improvements have been made to the reserve with part of the remaining \$50,000, including plumbing upgrades and air-conditioning installed in its lab facility. Carlson also plans to purchase a reserve vehicle and have cabinets constructed for the site's herbarium and insect collections.

—Kathy Barton

Senior Public Information Representative
UC Riverside



Ross Goldingay from UC Riverside performs postdoctoral research on the nocturnal Stephens' kangaroo rat at the Motte Rimrock Reserve. (Photo courtesy of UC Riverside)



Looking northward over Motte Reserve. (Illustration by Margaret Herring)

Donors Charles and Ottie Motte Discuss Their Legacy

From their homestead 300 feet above the sprawling Perris Valley, Charles L. and Ottie Motte have a bird's-eye view of both the land from which they earned their livelihood and the reason they have for preserving some of it.

Less than a mile to the east, construction is underway to widen the I-215 freeway. New homes, shopping centers, and industrial complexes are springing up in the heart of rapidly growing Riverside County. To the west, on UC's Motte Rimrock Reserve, endangered kangaroo rats scamper across the hilly granite-strewn landscape, threatened gnatcatchers skim through the shrubs, and coyotes serenade the Mottes every night.

In a sea of increasing urban development, the Motte Reserve acts as an island—an ecosystem rich in flora and fauna, as well as Native American cultural history—made possible by the couple's deep and abiding love of the land. Since 1975, they have given the NRS some 400 acres that make up the bulk of the reserve.

"We are developers, but we try to keep open space. It's very necessary," says Charles Motte, who as a young farmer raised sheep and grew a variety of crops,

including wheat, potatoes, and onions on thousands of acres he purchased during the Great Depression. After quitting farming in 1966, the Mottes entered the real estate business, in which they bought, sold, and developed thousands of acres in the urbanizing western Riverside County.

Their success in farming allowed them to purchase, nearly 30 years ago, what is now the Motte Rimrock Reserve and to build a spacious, ranch-style home on its eastern edge. Acting on their desire to preserve some of the county's unique ecology, the Mottes have gradually deeded much of the remainder of their property to the NRS.

"We would like to see it remain as a wildlife preserve into perpetuity," Mr. Motte says.

"We were interested in the animals, so the wildlife would have a place to live," adds Ottie Motte, his wife of 55 years. Particularly important to Mrs. Motte was the University's commitment to preserve the land in its natural state.

The couple's latest gift of 100 acres was accomplished through a complex, four-way land deal (see main story). As an added commitment, the Mottes gave a total of \$725,000 from the sale proceeds to the University and the county to ensure the land's

protection and help fund research on endangered species.

The Mottes feel particularly gratified that the reserve will soon become an integral part of the county's preserve system for the endangered Stephens' kangaroo rat, although they continue to receive good-natured teasing from their colleagues in real estate over the controversial plan to save the rodent from extinction.

"Charles and Ottie are a very unique couple," says Barbara Carlson, director of the Motte Reserve. "While many people try to return some of their well-earned fortune to the community in which they live, the Mottes have carried this one step further by giving not only for their human community, but also for their natural environment."

The Mottes say they enjoy sharing the land with kangaroo rats and gnatcatchers, as well as myriad other wildlife, including bobcats, snakes, hawks, hummingbirds, and raccoons. And when they are not away on travel adventures in Europe, Asia, Russia, or Australia and New Zealand, they still take daily walks on the reserve that they made possible.

—K.B.

Research at Motte Aids K-Rat Conservation Effort

With habitats suitable for both the Stephens' kangaroo rat and its more common cousin, the Pacific kangaroo rat, Motte Rimrock Reserve serves as an ideal outdoor laboratory for scientists to learn what they can about the Stephens' k-rat to help save it from extinction.

In fact, the reserve is one of nine sites designated by the Riverside County Habitat Conservation Agency (RCHCA) as k-rat study areas. Located throughout western Riverside county, these study areas total 81,000 acres, about 60 percent of which is privately owned.

"It's fascinating to be involved in frontline conservation efforts," says Pat Kelly, one of several biologists who studied the k-rat at the Motte reserve under the direction of UCR Professor of Biology Mary Price (see *Transect* 9:1 (spring 1991), page 1). The team's research on the rodent's dispersal patterns, home range, reproduction, survival, and habitat use will influence the design of a preserve network. Says Kelly, "There's a lot of satisfaction in efforts to preserve a species and develop a conservation plan."

Data collected in the studies—funded by a \$212,000 contract from the County of Riverside—have been provided to RECON, a private consulting firm hired by the RCHCA to draft a conservation plan for the k-rat. The data are also being fed into a population model developed by Michael Gilpin, a biology professor at UC San Diego. The model is expected to predict how much territory the k-rat needs to survive and where that territory should be located.

The county's short-term habitat conservation plan, valid through the end of 1993, will likely be extended into 1994. By then, the county anticipates that both the state Department of Fish and Game and the U.S. Fish and Wildlife Service will approve its final plan, which will include protected areas encompassing more than half a million acres. A draft plan includes Motte Reserve as one of five k-rat preserves in Riverside County.

In the meantime, the RCHCA is collecting k-rat mitigation fees from developers and acquiring land that will become part of the permanent k-rat preserve. Some 5,000 acres have been purchased so far, including the 100-acre addition to the Motte Rimrock Reserve. Public agencies own an additional 60,000 acres that have been set aside for conservation (see main story).

—K.B.

News & Notes

People

In Memoriam

The NRS mourns the untimely loss of Jeanne M. Messier, a 27-year-old doctoral student from UC San Diego who died on July 30 after contracting the hantavirus. Ms. Messier was working and living at the Valentine Eastern Sierra Reserve at the time of her death, but it is not known how or where she was exposed to the rodent-borne virus. The University of California has developed guidelines for students and researchers in order to prevent additional cases.

Messier held outstanding academic recognition as a recipient of a Mildred E. Mathias Research Grant. Each year, these grants provide up to \$2,000 to each of a handful of UC students for their research at an NRS reserve. Messier was studying the begging displays of nestling robins at the Valentine Eastern Sierra Reserve and phainopeplas at the Boyd Deep Canyon Desert Research Center. Biologists debate whether the nestlings exaggerate their displays of hunger or if their begging truly reflects their appetite levels. There is also some question about the ways in which parent birds perceive and react to the nestlings' displays.

Messier aimed to publish new models for examining these complex questions as her dissertation. To Messier, this challenging research did not constitute work; rather, she simply referred to it as having fun. Her contribution to biology will be missed by the University as well as the scientific community at large. Her presence will be missed by all who knew her.

The Jeanne Messier Memorial Fund has been established to benefit graduate research. Donations may be made to the fund in care of Ted Case, Chair, Department of Biology, University of California, La Jolla, CA 92093. The University will match all contributions.

NRS Advisory Committee Welcomes New Members

Eighteen months ago, the NRS began reconstituting its Universitywide Advisory Committee. Chaired by Timothy Bradley, UC Irvine professor of ecology and evolutionary Biology, this diverse group now includes:

Campus Representatives

- Frank Davis, *Geography*, UC Santa Barbara
- Paul Dayton, *Marine Life Research Group* (Scripps Institution of Oceanography), UC San Diego

- Robert Gibson, *Biology*, UC Los Angeles
- John Kemper, *Mechanical, Aeronautical, and Materials Engineering*, UC Davis
- Deborah Letourneau, *Environmental Studies*, UC Santa Cruz
- Mary Power, *Integrative Biology*, UC Berkeley
- John Rotenberry, *Natural Reserve System*, UC Riverside
- Brian Vila, *Social Ecology*, UC Irvine

Reserve Manager Representatives

- Peter Connors, Bodega Marine Reserve
- Bill Bretz, San Joaquin Freshwater Marsh and Burns Piñon Ridge reserves (alternate)

Campus Coordinator Representative

- Jonellen Goddard, *Office of Research*, UC Davis

At-Large Members

- Henry Offen, *Chemistry*, UC Santa Barbara
- Harrison Dunning, *School of Law*, UC Davis

Office of the President Representatives (ex-officio)

- Gary DeWeese, *Office of the Treasurer*
- Karl Droese, Jr., *Office of the General Counsel*

Scientist Wins Lancaster Medal For Research at Big Creek

After conducting biological research at the Landels-Hill Big Creek Reserve in Monterey County, Cheryl Briggs won the Lancaster Metal for writing the best dissertation at UC Santa Barbara. Her Ph.D. thesis, "The Effect of Multiple Parasitoids on the Gall-forming Midge," examines the imprint of these organisms on coyote bush, a coastal chaparral species.

When gall-forming midge larvae hatch on a plant, they stimulate gall development on stem tips. In large numbers, galls prohibit proper plant growth, but parasitoids that infest the larval chambers prevent gall overproduction.

Briggs controlled midge contact with parasitoids by placing cages around the larvae, then meticulously monitored gall development. After analyzing her field work and complex mathematical models, Briggs concluded that the presence of parasitoids that counteract the effects of the gall-forming midge larvae influences the distribution of coyote bush within the chaparral.

Fellow scientists are considering using this award-winning work to help develop plant-control regimes in Australia. Currently, Briggs is working at London University's Imperial College.

News & Notes *continued*

Management

Moth Collections Pupate at Hastings and Burns Reserves

Hastings Natural History Reservation and Burns Piñon Ridge Reserve will soon have species lists and synoptic collections of their moths, thanks to the efforts of well-known lepidopterists Julian Donahue and Frank Sala.

At Hastings, located in upper Carmel Valley, Reserve Manager Mark Stromberg collected several hundred moths along Finch Creek over the course of several months. Sala, a retired lepidopterist now working as a volunteer research associate at Hastings, is in the process of identifying, labeling, and preparing the specimens for collection; updating the nomenclature on existing specimens; and creating a computer database for the collection.

The moths will be stored at the reserve in standard trays and cases purchased with generous gifts from UC Berkeley Professor Emeritus Frank Pitelka and the Rancho San Carlos Foundation. Sala, who has prepared tens of thousands of specimens for the American Museum of Natural History, the U.S. National Museum, and UC Riverside, expects to document more than 700 species of moths at Hastings, including several undescribed species.

At the Burns Reserve, near Joshua Tree National Monument, Steward Jerry Freilich is helping the Los Angeles County Museum of Natural History compile collections of moths of the California deserts. Freilich, who has been "casually" collecting moths from a single location at Burns for the past year, has already amassed more than 2,000 specimens representing about 170 species. He sends his samples for pinning, classification, and caretaking to Donahue, curator of

entomology at the museum. In turn, the museum will eventually publish a list of moth species found at Burns and provide a representative synoptic collection for reserve visitors to use on site. In the meantime, Freilich hopes to expand his collections to other reserve locations and taxa.

Fire Consumes Box Springs

One of the many late-October fires in Southern California burned Box Springs Reserve, located just above the Riverside campus in the Box Springs Mountains. This fire, which experts believe was set by arsonists, began near the base of Box Springs Mountain. After consuming much of the western side—including the entire 160-acre NRS reserve—the fire spread over the top and partway around both sides of the mountain, eventually encompassing some 3,500 acres.

Fire occurs fairly frequently in the area of Box Springs Reserve. Most of the site burned in July 1989; parts burned again in 1991. At the time of the October 1993 fire, no researchers or classes were engaged in projects on site.

Editor's note: On November 2, the fire that raged through Malibu destroying multimillion-dollar estates, also consumed Stunt Ranch, a 310-acre property that will soon be transferred to the NRS and designated the Santa Monica Mountains Reserve. Set by an arsonist, this conflagration engulfed the site's dense chaparral and oak woodland, as well as all its facilities. Most of the site's historical and scientific records, including photographs from the twenties and thirties, were destroyed with the ranch house. These were spared in 1970, the last time widespread fire scorched Cold Creek Canyon.

Santa Cruz Island Upgrades Field Station Housing Facilities

Santa Cruz Island Reserve is expanding and improving its housing facilities for the many researchers and students who visit the site. When complete, the field station will be more comfortable all year round.

Reserve Steward Brian Guerrero, Manager Lyndal Laughrin, and a host of volunteers enlarged and rearranged the communal kitchen/dining area, adding a wood-burning stove and a second cooking stove to better accommodate several groups at once. They also insulated and upgraded the bathrooms, bringing the total number of showers from two to four. Next, they will add a deck to the dining area, then enclose and insulate the screened sleeping porch. To make the sleeping arrangements more private (and



Prisoners' Harbor at Santa Cruz Island Reserve. (Illustration by Margaret Herring)

suitable for groups with different schedules), they will also compartmentalize the area into six rooms with bunks for up to 24 people.

Events

Set Sail for Islands Symposium

Yearn to learn more about those islands offshore? The Fourth California Islands Symposium will convene March 23-25, 1994, at Santa Barbara's Museum of Natural History.

This interdisciplinary symposium, organized by the Channel Islands Research Coordinating Committee, will include six major themes: cultural history; prehistoric archaeology; geology, geomorphology, and paleontology; restoration ecology; population and conservation biology; and marine biology. Noted Community Ecologist and Biogeographer Daniel Simberloff, of Florida State University, will deliver the keynote speech.

Several researchers will present papers on their work at UC's Santa Cruz Island Reserve, which encompasses much of this largest and most diverse island of the California chain. Reserve Manager Lyndal Laughrin is among the organizers of the event, which will be but the fourth major symposium on the California Islands since 1965.

Registration for the three-day meeting costs \$50 before February 21, \$65 after; both fees include a copy of the published proceedings. Daily registration, which does not include the book, costs \$20.

For more information, contact the Santa Barbara Museum of Natural History at 2559 Puesta Del Sol, Santa Barbara, CA 93105; (805) 682-4711, ext. 302.



Ceanothus Silkmoth (*Hyalophora euryalis*). (Illustration by Susan Gee Rumsey)

Publications

NRS Protégés Broaden Our View of Big Sur

A review of—

The Natural History of Big Sur



By Paul Henson and Donald J. Usner
With illustrations by Valerie A. Kells
UC Press, 1993, 416 pages, \$30.

In Big Sur, where the mountains of the Santa Lucia Range rise abruptly from the Pacific Ocean, the two utterly opposed elements of rock and sea contrast more dramatically than anywhere else in the United States. This unique geological circumstance creates both the fantastic scenery that draws thousands of visitors and the rugged maze of mountains that has deterred settlement and sheltered wildlife.

So begins *The Natural History of Big Sur*. In what follows, the authors synthesize from scattered and hard-to-acquire sources the story of how the combination of climate, geology, and biology have created the Santa Lucia landscape. Though this landscape is best known for the spectacular Big Sur coastline, the values of the region go far beyond its remarkable scenery. Recognizing this, Paul Henson and Donald Usner have recast Big Sur in terms of its rich but fragile ecology, describing the region from a biogeographer's perspective, for a broad audience.

In many ways, *The Natural History of Big Sur* is a direct outcome of Professor Emeritus Ken Norris's natural history field studies program at UC Santa Cruz, where both authors were undergraduates. Norris, who founded the NRS, exposed Henson and Usner to the concepts of natural history and the joys of firsthand study in his "classroom"—the wild areas of California. As students, both authors were surprised by the lack of information available on Big Sur

outside of the scientific literature. They each decided, independently, to write a popular book on natural history to fill this gap.

The authors' collaboration began during the mid-1980s, while Usner was serving as resident manager of the Landels-Hill Big Creek Reserve, an NRS site in the heart of Big Sur. It persisted as Henson received a doctorate in wildlife conservation from the University of Minnesota and Usner completed a master's degree in geography at the University of New Mexico.

The first book for both Henson and Usner, *The Natural History of Big Sur* is authoritative, informative, and easy to read. It will be sold in every gift shop in Big Sur and belongs on the bookshelves of every home and school in Central California. Even Big Sur old-timers will learn new things about this land they know and love. The rest of us will value the book as a traveling companion—a Professor Norris in our backpack, so to speak.

Illuminating the work of the two writers are beautiful drawings by Valerie Kells, who learned her craft in UCSC's scientific illustration program. There are 191 pen-and-ink illustrations, each depicting a resident species with such precision and clarity that identification in the field is simple.

The book is divided into two major, complementary sections. The first discusses regional natural history, emphasizing plant life because the authors feel that "describing plant communities is a way of beginning to understand the entire living landscape." Animals closely associated with given plant communities are discussed along with their habitats. Far-ranging and widely distributed animals, such as mountain lions, are included in a separate chapter on fauna. This refreshing approach to presenting biota works well.

The authors' abilities to organize and explain concepts lucidly carries over to chapters on geology, weather and climate, shoreline, fire ecology, and human history.

The second part of the book describes the public lands and trails of the region. "The information here is meant to complement part I so that you can go out and see, touch, and feel what makes Big Sur so unique among wild areas of the United States," states the introduction. This section alone, which is just as fascinating as the natural history, deserves shelf space in the libraries of the region's aficionados.

One of the strengths of the book is the ease with which it cross-references readers from one part of the text to another. The authors seem to know instinctively when we have been left with an incomplete picture, and they tell us where to turn to get the rest of it.

I do have one disappointment, however: though scientific names appear in the text, the index does not list them. I understand the need for common names, but not why UC Press overlooked indexing latinates as well.

Nevertheless, I commend UC Press for this publication. Amid a plethora of natural history books covering California from a statewide perspective, this focused, regional viewpoint is timely and welcome. I hope this book and Clarence Hall's *Natural History of the White-Inyo Range* mark the start of an important trend; they could be models for other regional natural history guides.

The Natural History of Big Sur is the kind of book I would want waiting for me if I were a newcomer to an area. It would be my constant companion as I explored and studied my new home range.

—Norden H. (Dan) Cheatham
NRS Field Representative Emeritus

NRS at the Movies

Answers to the quiz on page 12

And the envelope, please...

Peter Pan—Santa Cruz Island Reserve. During the teens and 1920s, Santa Cruz Island was a popular location for filming silent pictures. Other movies shot there include *Heart of My Heart* (1912), *Pearls of Paradise* (1916), *Male and Female* (1919, one of Cecil B. DeMille's first big extravaganzas, starring then-unknown Gloria Swanson), and *The Devil Master* (1926, starring Janet Gaynor and George O'Brien).

The Birds—Bodega Marine Reserve. The ill-fated farmhouse in *The Birds*, which was filmed before the land became a reserve, was on a former ranch site where the Bodega Marine Lab dormitories now stand.

True Grit—Valentine Eastern Sierra Reserve. This is a stretch. Rumor has it the director of this John Wayne western had planned to film a fall scene at Valentine Camp. But an untimely frost brought the aspen leaves down, so the movie crew went elsewhere.

Top Gun—Granite Mountains Reserve. In one of the aerial scenes, Maverick (Tom Cruise) flies directly over Granite Pass.

Poetic Justice—Landels-Hill Big Creek Reserve. The crew of this recent release by the director of *Boyz n the Hood* and starring Janet Jackson shot for several days in summer 1992 at the bridge over Big Creek.

Rancho Fandango—Hastings Natural History Reservation. This comedy about two sisters who disagree over whether the ranch they inherited should be turned into an organic farm or a tennis resort features several scenes shot at Hastings last fall.

NRS at the Movies

Pop some popcorn, sharpen a pencil, and see if you can match the reserve to the feature film in which it appeared (or, in one case, *almost* appeared). Winners receive a free subscription to the *Transect*.

Films

Peter Pan (Herbert Brenon, 1924)
The Birds (Alfred Hitchcock, 1963)
True Grit (Henry Hathaway, 1969)
Top Gun (Tony Scott, 1986)
Poetic Justice (John Singleton, 1993)
Rancho Fandango (Deborah Koons, 1993)

Reserves

Granite Mountains Reserve
 Valentine Eastern Sierra Reserve
 Bodega Marine Reserve
 Landels-Hill Big Creek Reserve
 Hastings Natural History Reservation
 Santa Cruz Island Reserve

For answers, turn to page 11

Get Mugged for the Holidays

Transect readers help to promote excellence in field-based education each time they make a donation to the Robert M. Norris Undergraduate Research Program. Named in honor of a long-time NRS faculty advisor and professor emeritus from UC Santa Barbara, this program supports research by undergraduates enrolled at any UC campus on all 32 NRS reserves or on any site under active consideration for inclusion in the NRS.

Any donor who contributes twenty-five dollars or more will receive a microwaveable, insulated mug with nonleak, commuter lid. This attractive stocking stuffer sports the NRS logo and systemwide site map. Contributions should be made payable to "The Regents of the University of California" and sent to the NRS systemwide office at: Natural Reserve System, University of California, 300 Lakeside Drive, 6th floor, Oakland, CA 94612-3560.



NRS insulated commuter cup (*Mug fundraissi*)
 (Illustration by Margaret Herring)

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NRS Plans to Develop Young People's Program on Coastal Ecosystems

Working with UC's Cooperative Extension over the coming year, the NRS will develop a field-based curriculum to offer environmental education to students in grades 5 through 7. This effort is supported by a \$19,100 grant from the UC Division of Agriculture and Natural Resources.

The NRS curriculum, which will focus on coastal ecosystems, will be tested and refined at UC's Elkus Youth Ranch in San Mateo County. Science teacher Kimberly Smiley, from the NRS's Landels-Hill Big Creek Reserve, will design hands-on activities to help young people understand environmental principles and processes. Smiley is the creator of Project REAL, an innovative ecology program she developed for her junior high and high school students at Big Sur's Pacific Valley School (see *Transect* 8:1 (winter 1990), page 2).

Many youth, especially those who grow up in urban areas, never establish a connection with the natural world. The Elkus Ranch already offers outdoor education programs each year to 7,000 students, many of them specially challenged. The NRS's coastal ecosystems curriculum will expand the ranch's available teaching materials and further demystify scientific and ecological processes for participating young people.

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