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Report of the Director:

A day in the life of the NRS

How is a day in the life of the NRS spent? With 33 NRS reserves now available for teaching, research, and community outreach programs, our attention can be focused in a hundred different ways, every day of the week.

And who makes the NRS tick? A talented, generous, and caring cadre of faculty, administrators, donors, volunteers, managers, stewards, attorneys, writers, and researchers — collectively referred to as "The NRS Family" — tirelessly tackling each issue.

This *Transect* suggests the diversity of projects and issues that concern us. Our lead article addresses the current status of the mountain lion in California, increasingly a subject of popular news reporting (p. 1). NRS personnel — on site and on campus, too — are familiar with this stealthy predator who sometimes returns our interest in a most disconcerting way.

Two articles describe two very different areas newly available for study through the NRS: Fort Ord Natural Reserve, part of the former Army base near Monterey Bay, encompassing maritime chaparral and coastal live oak woodland (p. 6), and the North Fork Association (NFA) property, a rugged, undisturbed forest adjacent to the NRS's Chickering American River Reserve in the western Sierra Nevada (p. 8). Both areas are now open to NRS users — Fort Ord as the result of exemplary interorganizational cooperation, and NFA because of the generosity of its private owners.

Two more articles concern the communication of ideas through art, primitive and modern, as expressed at our reserves. In January, Sweeney Granite Mountains

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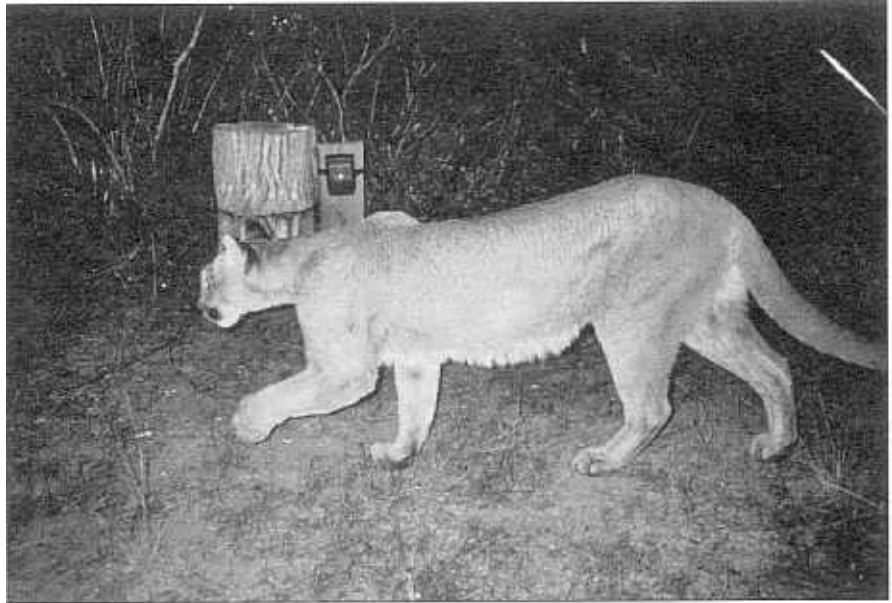


Photo by Tye DePena

This mature mountain lion, heavily muscled but young-looking, had her picture taken by automatic camera at the Landels-Hill Big Creek Reserve. A powerful and efficient predator, she embodies the wild spirit of the rugged Big Sur coast.

Cougars thrive as top predators

Mountain lions (*Puma concolor*, formerly *Felis concolor*) are elusive creatures, their presence in NRS reserves often known primarily from tracks, the remains of their kills, and other indirect signs. Roughly 62 percent of California is within the known range of mountain lions (also called cougars or pumas), and about 66,000 square miles (170,000 square kilometers) are moderately to highly suitable lion habitat, according to the California Department of Fish and Game (CDFG).

The size and demographics of the state's mountain lion populations, however, are the subjects of ongoing debate.

Sightings of the large, tawny cats are not unusual at some NRS sites, such as the Hastings Natural History Reservation, which is located in prime mountain lion habitat in the Carmel Valley. Yet the powerful predators have never caused any problems at Hastings, said Mark Stromberg, who manages this reserve.

"We encounter lions all the time, but they usually just look at us and walk away. With all the people doing field research here, we've never had any kind of threatening encounter," Stromberg said.

As the main predator of deer and other large mammals, mountain lions are an important part of the ecosystems in which they occur, said John Smiley, resident manager of the Landels-Hill Big Creek Reserve on the Big Sur coast, another site in prime cougar habitat. In California, mountain lions prey mostly on mule deer (*Odocoileus hemionus*), as well as on elk (*Cervus elaphus*) and bighorn sheep (*Ovis canadensis*) where they occur. Mountain lions also prey on smaller animals, such as rabbits, opossums, and porcupines.

Although recent attacks on humans in California, including two fatal ones in 1994, have heightened public awareness of mountain lions as a potential threat, no

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Photo by Ian C. Tait

No, this is *not* a tire skid on the road at Hastings Natural History Reservation. It is the mark left when a mountain lion dragged its deer kill to a secluded cache site.

Cougars *continued from page 1*

serious incidents involving people have occurred at NRS sites.

"We take a lot of precautions for our kids and never let them play outside without an adult around, but that's not only because of mountain lions — there are other hazards, like falling rocks, that are probably a greater danger," Smiley said.

Over the past 24 years, the CDFG has noted substantial increases in public safety problems involving mountain lions, as well as in lion "depredation incidents." (Depredation refers to the killing of livestock or pets by wild predators.) In a recent analysis, CDFG researchers attributed the increase to several factors, including the rapid expansion of the state's human population. Pet depredation was statistically correlated with increasing housing development in certain counties. These same regions accounted for most of the public safety problems, indicating that these problems resulted from the encroachment of human activities into mountain lion habitat, said Steve Torres, CDFG program coordinator for bighorn sheep and mountain lion management.

Livestock depredation, however, tends to occur in different regions from pet depredation, and its rise seems to reflect regional increases in the distribution and abundance of mountain lions, Torres said.

"We are seeing dramatic changes in large mammal populations in California," Torres said. Numbers of deer, the primary prey for mountain lions, are on a downward trend in many regions, and Torres speculated that mountain lions may be turning to other prey species and moving into new areas. In some places, they

appear to be preying heavily on nonnative feral pigs. In other areas, their effects on bighorn sheep populations have alarmed some biologists.

Studies by John Wehausen, a research associate at UC's White Mountain Research Station in Bishop, suggest that lion predation caused drastic declines in bighorn sheep populations in both the Granite Mountains in the Mojave Desert and the eastern Sierra Nevada. In the Sierra Nevada, lion predation has undermined efforts to reintroduce the California bighorn (*O. c. californiana*), a state-listed threatened subspecies, and has driven one native population to the verge of extinction, Wehausen said.

Wehausen began studying the Granite Mountains bighorn population in 1988, working out of the Sweeney Granite Mountains Desert Research Center and using radiocollars with mortality sensors to monitor survival among females. All five of the collared ewes that died during the study were killed by mountain lions. By 1989, the population had dwindled to only about eight ewes. After 1992, the lion predation stopped, perhaps because the lion (or lions) responsible had moved on to an area with more abundant prey. Wehausen counted 14 ewes in 1995.

"I watched the end of the decline, after which the population recovered somewhat; but at what point will another lion discover it and drive it back down again?" Wehausen said.

Researchers estimate that an adult mountain lion kills about 48 large mammals per year. But the overall effect of predators on prey populations is a matter of ongoing dispute among wildlife biologists. Some ecologists have theorized that, in general, top predators, such as wolves and mountain lions, are not capable of driving populations of ungulates (e.g., deer, elk, and bighorn sheep) to low densities, although they

may limit the rate of population growth. Other factors, such as habitat and forage conditions, may be more important in determining the size of ungulate populations.

CDFG scientists hope to sort out the effects of these various factors in a long-term study of the mule deer herd in Round Valley in Mono and Inyo counties. The Round Valley deer herd declined from more than 5,000 animals in 1986 to fewer than 1,000 in 1991. This decline was attributed to a prolonged drought that reduced the amount and quality of forage available to the deer. With the end of the drought, however, CDFG scientists were concerned that mountain lion predation might prevent recovery of the deer population, despite adequate forage.

"Mountain lion predation has been the most important cause of deer mortality in this study," said Vern Bleich, CDFG wildlife biologist and leader of the Round Valley deer study.

Before drawing any conclusions about the extent to which lion predation controls the size of the deer population, however, the researchers must perform a comprehensive analysis of data gathered during the past five years. In addition to tracking causes of mortality, they have been collecting data on deer body condition, diet quality, disease exposure, forage availability, and weather conditions. Wehausen's bighorn studies, in contrast, were much more limited in scope.

"John [Wehausen] has made some outstanding observations that support the



Photo by Ian C. Tait

This mountain lion was photographed at Hastings Natural History Reservation, Monterey County, feeding on a deer carcass that had been partially buried in leaves under an oak tree, about 0.1 mile from the apparent kill site.

idea of mountain lions as a primary cause of mortality of bighorn sheep; but some people feel he doesn't have enough data to show that mountain lions are driving bighorn sheep to extinction," said Jim André, staff reserve manager at Sweeney Granite Mountains.

Wehausen, who is also involved in the Round Valley deer study, presented his findings on bighorn mortality in October 1996 at the NRS Management Workshop at Sweeney Granite Mountains. He stressed that his findings apply only to a few specific bighorn populations and that mountain lion predation was not a problem for other bighorn populations he has studied.

Wehausen has been studying bighorn sheep for over 20 years and has kept track of various indicators of mountain lion activity, such as the frequency with which he sees their tracks. He rarely saw cougar tracks two decades ago in the bighorns' Sierra Nevada winter ranges, he said; however, by the late 1980s, he saw them on about half of his days in the field. He attributed the increase at least in part to the elimination of bounty hunting of mountain lions since 1963.

Mountain lion management has long been a controversial and highly political issue in California. From 1907 to 1963, lion hunting was encouraged through bounties. In the early 1970s, mountain lions were briefly classified as "game mammals," but only one complete hunting season occurred before a moratorium on taking lions was imposed in 1972. In 1986, state law again classified mountain lions as game mammals, but court challenges blocked CDFG plans for regulated lion hunts. A ballot initiative passed in 1990 designated the mountain lion as a "specially protected mammal" and banned sport hunting. In March 1996, voters rejected a ballot measure that would have relaxed the restrictions on killing mountain lions.

According to CDFG program coordinator Torres, the public mistakenly believes the state's mountain lion population is in trouble. "Wildlife management should be based on scientific evidence, but the public can really influence what we do," Torres said.

Unfortunately, solid scientific data on mountain lion populations are not easily obtained. Mountain lions are notoriously difficult animals to study, said Reginald Barrett, professor of wildlife biology and management at UC Berkeley. They roam large territories and are solitary, secretive, largely nocturnal, and highly mobile. Intensive radiotelemetry studies, which require capturing and collaring lions, are needed to accurately estimate the population

Lions make life more interesting for NRS reserve personnel

Field trips to NRS reserves enrich the educations of many public school students with valuable lessons in natural history. Rarely, however, do students witness nature "red in tooth and claw" as one high school class did on a visit to the James San Jacinto Mountains Reserve in Riverside County, near the town of Idyllwild.

On their first evening at the site's dormitory, the class saw a mule deer stagger part way down a slope toward them before collapsing. It had been attacked by a cougar, which soon emerged from the woods with a young cub to claim its kill.

"They fed on the deer all night long and scared everyone with their snarls and growls. They were quite vocal," said Reserve Manager Mike Hamilton.

In the morning, the carcass was gone. Mountain lions typically drag their kills to a "cache site" for hiding during the day, often burying the carcass in leaves under a tree and returning to feed for several nights. Mountain lions are very protective of their kills, making it potentially dangerous for humans to approach a cache site.

In this incident at the James Reserve, the cache site was fortunately not near reserve facilities. On the other hand, NRS staff at the Angelo Coast Range Reserve, in Mendocino County, were understandably nervous when they discovered a deer carcass cached under a fir tree next to the shower-bath facility.

"Nobody saw the lion, but the kill was very fresh, with only one meal taken out of it. I waited a few days until the carcass started to reek before I dragged it off," said Angelo's manager, Peter Steel.

For those interested in photographing a cougar, finding a fresh kill is a golden opportunity. But a June 1996 incident at the Hastings Natural History Reservation, in Monterey County, suggests that the spectacle of mountain lions feeding might be too unnerving for a photographer to witness firsthand.

Field assistant Josh Weisberg, who was helping zoologist Walt Koenig to

observe social groups of woodpeckers on the reserve, was walking back to the Robertson House, the site's housing facility for researchers. When he came over a rise, he saw two mountain lions, an adult and a smaller juvenile, feeding on a deer 50 feet below him in a ravine. Reaching into his pack, he pulled out a camera, snapped a picture — then dropped the camera, which rolled down the slope toward the lions. He retrieved the camera later.

"When I went back to the kill site with Josh, I was surprised how close he had been to the lions. He took the picture from about 25 feet," said Reserve Manager Mark Stromberg.

Mountain lions tend to be accomplished masters of stealth and often go unnoticed. Yet John Smiley, reserve manager at the Landels-Hill Big Creek Reserve in Monterey County, near Big Sur, had the unusual experi-

ence of following a mountain lion that was apparently unaware of his presence.

This lion, a juvenile, was walking down the reserve's dirt road in a light rain, when Smiley, by pure coincidence, came up from the creek and onto the road about 20 feet behind the lion. He followed the cat for about 30 feet as it headed down the road toward the house where Smiley's wife, Kim, was with their two young children. Smiley ducked into the shed where they keep a radio, used as an intercom on the reserve, and called to warn his wife and children.

"They all ran upstairs and gathered by the window where they could see it," Smiley said. The mountain lion sat under a bush in the Smileys' garden for about an hour before disappearing. Later, Smiley went outside to look around.

"I was walking up the road when I looked down to the side and saw these big yellow eyes looking back at me," he said. The mountain lion was only about 10 feet away from him, under a bush. Smiley backed away from it and it eventually left the area.

— T.S.



This cougar pawprint (with mechanical pencil for scale) was photographed at the Hastings Natural History Reservation.

Photo by Ian C. Tait



Photo by Vernon C. Bleich

This mountain lion and (the remains of) a bighorn sheep were photographed in Round Valley, Mono County. (Courtesy of California Department of Fish and Game Round Valley Project.)

Cougars *continued from page 3*

in even a relatively small area. No reliable estimates exist of the size of California's mountain lion population, and most experts won't even hazard a guess. The CDFG estimates the state's population at between 4,000 and 6,000 lions. Barrett gives it an even wider range: "It's more like 5,000-plus or minus-2,000."

As to whether their numbers have increased, Barrett said mountain lions have extended their range into some areas from which they had been eliminated or where they were not previously reported. But in other areas of the state, where suburban land development has destroyed and fragmented much of their habitat, mountain lions are not doing as well.

"There are probably a few more now than there were 20 years ago, but I don't think there's been a huge increase," Barrett said.

Researchers at UC Davis hope to learn more about cougar populations through DNA fingerprinting technology. Holly Ernest and her colleagues have developed techniques to extract and analyze DNA from mountain lion scat and tissue samples. They are collaborating with field researchers, including Smiley and other NRS reserve managers, to collect mountain lion hair and feces from kill sites. DNA analysis of the samples enables them to identify individual lions and determine

the genetic relationships among those killing prey within a given area.

"We are using genetic data collected by noninvasive sampling to study lion numbers and movements in certain areas," said Ernest, a veterinarian at UCD's Wildlife Health Center and a graduate student in conservation biology.

Ernest is also analyzing DNA from blood and tissue samples collected from radio-collared lions and from those killed throughout the state on depredation permits. This work will provide data on the genetics and demographics of mountain lion populations in different regions, and may also shed light on migration patterns.

— Tim Stephens
NRS Senior Science Writer



Photo by Susan Gee Rumsey

Schoolchildren visiting the Landels-Hill Big Creek Reserve learn about mountain lions from the site's collection of local fauna. This specimen joined the collection after losing its life-and-death fight with another larger cat.

Suggested Reading

Beier, P., D. Choate, and R. H. Barrett. 1995. "Movement patterns of mountain lions during different behaviors." *J. Mammology* 76(4):1056-70.

Torres, S. G., T. M. Mansfield, J. E. Foley *et al.* 1996. "Mountain lion and human activity in California: testing speculations." *Wildlife Soc. Bull.* 24(3):451-60.

Wehausen, J. D. 1996. "Effects of mountain lion predation on bighorn sheep in the Sierra Nevada and Granite Mountains of California." *Wildlife Soc. Bull.* 24(3):471-9.

Living in Lion Country

If you hike for a few hours in mountain lion habitat, you will probably be seen by at least one lion. You are unlikely, however, to see it watching you.

"If it was part of their natural behavior to look at people as prey, there would be a lot of incidents of people being eaten by mountain lions," said Douglas Updike, senior wildlife biologist for the California Department of Fish and Game (CDFG).

Lion attacks on humans are, in fact, extremely rare. Unfortunately, in recent years, their frequency has increased. For 75 years prior to 1986, there were no verified lion attacks on humans in California; since 1986, there have been nine such incidents. This is probably due primarily to the increasing numbers of people who spend time hiking and jogging in mountain lion habitat.

People may be able to reduce their chances of a dangerous encounter with a mountain lion. The CDFG offers the following suggestions:

- If you live in mountain lion habitat, do not feed deer or other wildlife whose presence will attract lions.
- Avoid landscaping with plants that attract deer.
- Remove dense or low-lying vegetation that could provide cover for lions, especially around children's play areas.
- Install outdoor lighting.
- Secure pets and livestock.
- Maintain a close watch on children whenever they play outdoors.
- In mountain lion habitat, being part of a group or with a companion will reduce the likelihood of an attack.
- Keep children close to you at all times.
- If you see a mountain lion, *do not* approach it, *do not* run from it, *do not* crouch down, *do not* turn your back on it.
- Running may stimulate the cat's chase instinct, while bending over or crouching makes a person look more like a four-legged prey animal.
- Do back away slowly and try to stay calm.
- Do pick up small children
- Do try to appear larger and more threatening. Raise your arms. Open your jacket to create a larger silhouette. Throw stones, branches, or whatever you can reach without crouching or turning your back. Speak in a loud, firm voice. (The idea is to convince the lion that you are not prey and that it would be more trouble than it's worth to attack you.)
- If you are attacked, *fight back*. Try to remain standing and face the attacking animal. Many people have successfully fought off mountain lion attacks.

For a copy of the CDFG's pamphlet, *Living with California Mountain Lions*, write the agency at 1416 Ninth Street, Sacramento, CA 95814.

T.S.

On-site art assumes a documentary edge

Picture this: five scorched redwood trunks jutting out of a confusing tangle of twisted, dead branches and green-tinged, rejuvenating shrubs — the mixed signals of forest recovery after a wildfire.

Next picture a collage of fallen leaves, pitted driftwood, and dried kelp mingling with disk-shaped rocks polished smooth by rushing water — the materials marking the interface of land, river, and sea.

These and other images of natural habitat systems at the NRS's Landels-Hill Big Creek Reserve have been captured on color film by Norman Locks, associate professor of photography at UC Santa Cruz. An exhibition of his recent Big Creek photographs, entitled "Work in Progress," was held at the UC Santa Cruz faculty gallery during the month of November 1996.

"Every time I go to Big Creek, something else strikes me," says Locks, who many times has investigated the site's lower elevations with his 4" X 5" view camera. In an expedition that goes beyond aesthetics, his work documents in exquisite detail the highly complex and often chaotic-looking order of natural habitats. Whereas a scientist may take precise measurements or employ tracking devices to analyze ecosystems, Locks uses his camera. "I refer to it as my research in art," he says.

Locks's "research in art" takes a *systems* approach to photography. In each photograph, he tries to give a complete picture of an ecosystem by showing all of the components of a habitat and how they work together. He believes that traditional landscape photography can be misleading when it glorifies a single habitat element, such as an individual tree. Locks prefers to document *all* of the different types of vegetation occurring together in one place. "My work is about integration," he explains. "When wilderness photography studies one stand or one object, it sets up a hierarchy: *this* needs to be supported or *that* needs to be supported. We can no longer do that. We need to support the whole system. There's not just one thing that makes Big Creek work — there are many things."

Locks's challenge is to present the complexities of natural systems, which may seem chaotic, in a way that is understandable. He relies on his expertise in art to judge how many natural elements he can fit into a frame while maintaining the aesthetic composition of the picture. But ultimately, he wants to maintain the busy appearance of nature. "Humans are constantly trying to order, to contain, to gar-

den," says Locks. "But I'm interested in looking at nature at its most complex, so that we can embrace complexity without weeding, straightening, or cleaning."

Locks has taught at UC Santa Cruz since 1978 and has a long-time relationship with landscape photography. For four years, he ran an Ansel Adams workshop in Yosemite, and he has done extensive photographic work in other natural areas in California.

Locks selected the Big Creek Reserve for its accessibility (a two-hour drive from the Santa Cruz campus) and for its relatively undisturbed condition. He is particularly interested in natural diversity, the trademark of that reserve. The elevation of this large site ranges all the way from sea level along its 5.25 miles (8.8 kilometers) of shoreline up to 4,000 feet (1,220 meters). The reserve also lies in the north-south "suture zone" between two biogeographic provinces, the cool Oregonian and the warm Californian. Locks has photographed the NRS's Santa Cruz Island Reserve as well, and he has taken a UC Santa Cruz class of graduating photography students to the NRS's remote Sweeney Granite Mountains Desert Research Center in the East Mojave.

His work provides a baseline record documenting how these ecosystems should look when left untouched. He also photographs developed areas in California

and studies them in contrast to the various natural areas he preserves on film.

At the Big Creek Reserve, Locks has so far concentrated on three major habitats: the beach/marine interface, perennial Big Creek, and low-elevation forest (as it rejuvenates after the Rat Creek fire a decade ago).

Each of Locks's photographs is an eloquent statement of artful interconnectedness of habitat systems at Big Creek. "These are not snapshots or typical views of a reserve," says Margaret H. Fusari, campus director for those NRS reserves administered by UC Santa Cruz. "They are a search for a sense of place through landscape art. His work demonstrates that the NRS reserves are applicable to a broad range of research projects beyond natural science."

Locks hopes his visual record of the Big Creek environment will inspire people to protect ecosystems in their entirety.

"There's a natural complexity you simply can't convey in a story," he explains. "We continue to build and encroach into these areas, and we don't fully understand the effects on the ecosystems and the habitat corridors. We need to start understanding systems, so we can look at a landscape as a whole instead of as a part."

— Elaine P. Miller
NRS Senior Science Writer

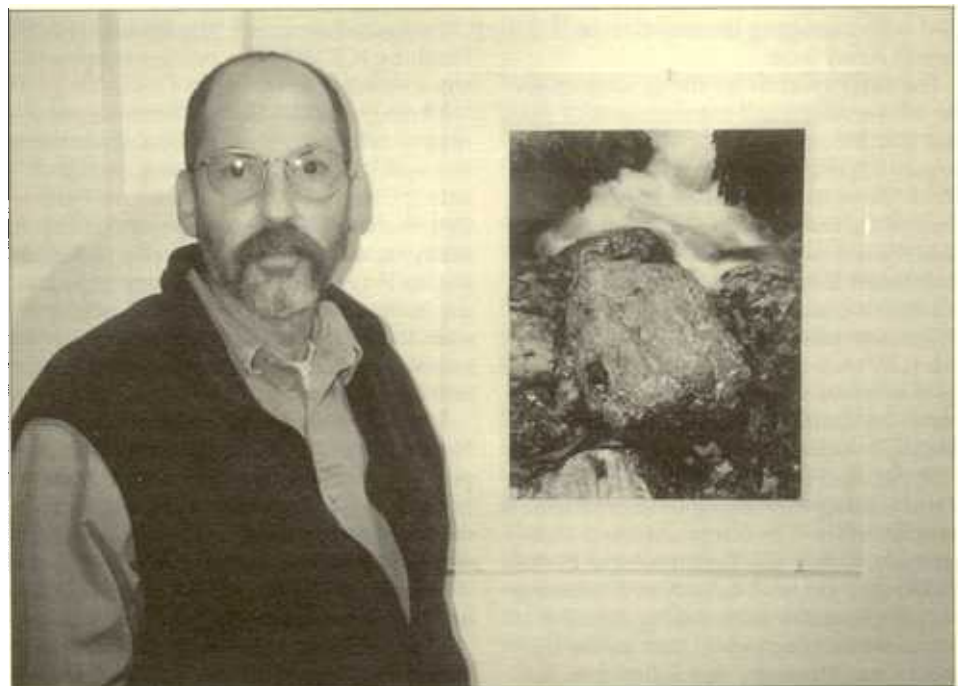


Photo by Elaine P. Miller

UC Santa Cruz Associate Professor of Photography Norman Locks with one of his recent Big Creek photographs at a November 1996 faculty gallery exhibition.

New NRS Reserve

Welcome aboard, Fort Ord!

A 600-acre portion of the recently decommissioned Fort Ord Army Base, located in the City of Marina and the County of Monterey, has been turned into a base for field research and teaching as the NRS's newest reserve. From 1920 to 1991 (the year it was decided to close the base), the installation was used by Army infantry for training exercises. Currently, the Fort Ord Natural Reserve is being used by investigators, educators, and students interested in its special-status species and rare habitats.

Fort Ord is the sole NRS site that supports the maritime chaparral endemic to the Monterey Bay region. These rare California communities are composed largely of unique plant species found only along the California coast. Varying from region to region in species composition, maritime chaparral is heavily impacted by coastal development. Fort Ord harbors excellent examples of this habitat and the species that comprise it.

Cooperative habitat management

Fort Ord Natural Reserve was established in June 1996 in accordance with the Installation-Wide Multispecies Habitat Management Plan (HMP) for Fort Ord prepared by the U.S. Army Corps of Engineers. Environmentally minded and ambitious, this HMP involves the cooperation of more than 15 federal, state, and local agencies that are all in some way associated with managing the reuse of the former Army base.

The HMP establishes the guidelines for the conservation and management of plant and wildlife species and habitats that largely depend on Fort Ord land for survival. These include 11 floral species — such as the federally endangered sand gilia (*Gilia tenuiflora arenaria*) and the threatened Monterey spineflower (*Chorizanthe pungens pungens*) — along with seven faunal species — such as the federally endangered Smith's blue butterfly (*Euphilotes enoptes smithi*) and the proposed-for-listing California black legless lizard (*Anniella pulchra nigra*).

Under the HMP, the NRS's Fort Ord Natural Reserve — along with the habitat reserves of the U.S. Bureau of Land Management, California Department of Parks and Recreation, and County of Monterey — was created as partial mitigation for economic developments, such as the UC Santa Cruz Monterey Bay Education, Science, and Technology Center (MBEST), which is being established on Fort Ord grounds adjacent to the reserve.



Photo by Laurel Fox

A central basin in the north portion of the new Fort Ord Natural Reserve with typical maritime chaparral and coastal live oak woodland.

Despite current and past heavy use of some areas within Fort Ord, the installation as a whole harbors 20,000 acres of undeveloped interior land, much of it relatively undisturbed. To manage and protect the undeveloped land, more than a dozen federal and state agencies — including the University of California, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, California Department of Fish and Game, and California Department of Parks and Recreation — agreed to a cooperative, advisory, land-use planning process called Coordinated Resource Management and Planning (CRMP). The process is open to any interested agency.

Through CRMP, installationwide environmental monitoring, habitat restoration, and species protection is being coordinated. CRMP also enables users of Fort Ord Natural Reserve to expand their investigations into other undeveloped lands within Fort Ord. This agreement enhances the use value of the reserve and emphasizes the importance of cooperation between the NRS and other land-management agencies.

The convenient location of the Fort Ord Natural Reserve gives the site a high use potential. It is located next to the UC MBEST Center and near a new state university campus — California State University at Monterey Bay. The reserve's administering campus, UC Santa Cruz, is a 45-minute drive away.

Maritime chaparral and rare species

Half of the Fort Ord Reserve is a mixture of coast live oak (*Quercus agrifolia*), coastal

scrub, mixed annual grassland, and native perennial grassland. The other half is maritime chaparral.

Maritime chaparral is unique, because unlike other forms of chaparral, it is found extremely close to the ocean. It relies on maritime climatic influences and extends as far inland as the summer fog belt. Along the Monterey Bay (which is now a national marine sanctuary), maritime chaparral grows on relict, well-drained dunes from the Pleistocene Epoch. Many species require some substrate disturbance, such as blowing sand or gopher mounding, for regeneration.

Like all other chaparral types, maritime chaparral is a fire-successional habitat. Burning is necessary to preserve its biodiversity because as chaparral senesces, it becomes overgrown, especially by manzanita, and other species are crowded out. Fire stimulates regrowth of maritime chaparral, generally either from stumps or the existing seed bank. To maintain healthy maritime chaparral, habitat management will require prescribed burning.

Fort Ord is crucial for the survival of the maritime chaparral of the Monterey Bay region. It is an important part of the range for two rare species: sandmat manzanita (*Arctostaphylos pumila*) and Hooker's manzanita (*A. hookeri*). The site not only supports the largest known populations of Monterey ceanothus (*Ceanothus rigidus*), Toro manzanita (*A. montereyensis*), and Monterey spineflower, but also provides at least one-half of the distribution of the federally endangered sand gilia and is the only place where Eastwood's ericameria (*Ericameria fasciculata*) can still be found.

Research and instructional use

The major attractions for research and teaching at Ford Ord Natural Reserve are the site's endemic maritime chaparral and associated rare species, the process of native species restoration, and the intricate political and economic processes needed to maintain habitat integrity within a complex context of other uses.

Already a team of UC Santa Cruz undergraduates, led by NRS Reserve Steward Grey, has begun restoring seven acres of disturbed maritime chaparral. Funded by the Santa Cruz campus, the students are working to remove invasive South African ice plant (*Carpobrotus edulis*) and pampas grass (*Cortaderia jubata*) and to replace key maritime chaparral species and associated rare annuals. Other student investigations include a preliminary study of birds and their habitat-use patterns, a comparative morphological analysis of two populations of sand gilia, and distribution and genetic studies of California black legless lizard (*Anniella pulchra nigra*), a state species of special concern and proposed species for federal listing (see sidebar at right).

A major two-year investigation to be conducted at the reserve and the nearby Army landfill property, which lies at approximately the same level on the maritime gradient as the reserve, will enable researchers Laurel Fox, Karen Holl, and NRS Reserve Campus Director Margaret Fusari to identify the habitat and management requirements of two rare annuals that are part of the maritime chaparral: the federally endangered sand gilia and the threatened Monterey spineflower. This study on the rare plants of the maritime chaparral is a \$200,000 research program, funded through a cooperative agreement by the U.S. Army. It is hoped that this and other research projects will help guide future habitat management at Fort Ord.

To protect valuable research projects and sensitive habitats, access to the NRS's Fort Ord Natural Reserve is by permission only. To use the reserve, contact:

Margaret Fusari
NRS Reserve Campus Director
UC Santa Cruz Natural Reserves
254A Applied Sciences Building
University of California
Santa Cruz, CA 95064
Phone: (408) 459-4971
E-mail: fusari@cats.ucsc.edu

— Elaine P. Miller
NRS Senior Science Writer

A snake? Not!

The legless lizard *Anniella* is not a snake. There are seven major groups of legless lizards, including snakes, with levels of limb loss ranging from reduced toes to all gone:

- (1) Pygopodidae
- (2) Amphisbaenia (possibly three separate groups)
- (3) Dibamidae
- (4) Gymnophthalmidae
- (5) Scincidae
- (6) Anguillidae, and
- (7) Serpentes (the snakes).

Within these seven groups, several different subgroups have evolved limblessness separately.

Evolution takes advantage of opportunity. The detritus food web offers that opportunity in the form of rich food availability and protection from many predators. However, getting to this food requires relatively small heads and no limbs in the way. Some snakes have re-emerged from the subsurface habitats and developed large heads again, but their limb loss was forever.

You can't speak of legless lizards without including snakes. If you say legless lizards and snakes, you are committing systematic heresy because there is no taxon *lizard* unless you include snakes.

That's the problem: we named the snake, not realizing there were other legless lizards — then we learned differently.

To put it another way, snakes all evolved from one common ancestor, but the other six taxa did not evolve leglessness from that same ancestor and so are not related to snakes by virtue of being legless. We call that "convergence" — evolving the same character separately.

— M. H. F.



Photo by Margaret H. Fusari

Silvery legless lizard (*Anniella pulchra pulchra*)

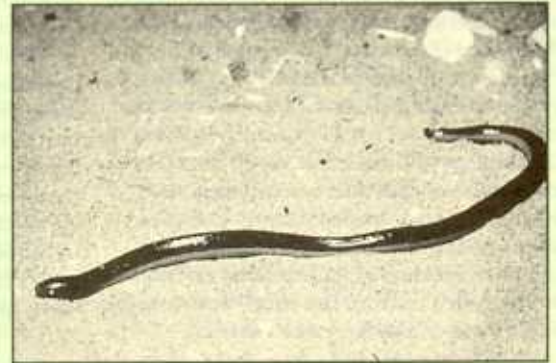


Photo courtesy of Margaret H. Fusari

Black legless lizard (*Anniella pulchra nigra*)

Ft. Ord's Black Legless Lizard (*Anniella pulchra nigra*)

The California legless lizard, *Anniella pulchra*, occurs in two forms, a silvery form and a black form. The silvery form ranges throughout coastal California into Baja California and into the foothills of the great Central Valley; a black form is found near Morro Bay and around Monterey Bay.

Both forms of legless lizard have suffered habitat loss due to urban development and conversion of native habitat to agriculture in the Central Valley and on the coast. The black form is currently proposed for listing as federally endangered, although the decision has been postponed pending further data collection.

Related to the alligator lizards, *Anniella* literally swims through loose sand. It is dependent on a healthy decomposer community in the litter under shrubs and trees. It eats termites, insect larvae, and other small denizens of the fossorial world. About the size of a pencil, *Anniella* has smooth, shiny scales and is seldom seen on the surface.

DNA analysis by UC Santa Cruz student Devon Pearse and Professor Grant Pogson

indicates not only that the silvery and black forms are distinct, possibly at the species level, but also that the two populations of the black legless lizard (near Morro Bay and around Monterey Bay) are even more distinct from each other than either is from the silvery form. This indicates that a black form has evolved twice and that our animal at the Fort Ord Natural Reserve may be a distinct species, endemic to the Monterey Bay region.

We are setting up transects at Fort Ord Natural Reserve in cooperation with similar efforts by the U.S. Bureau of Land Management, California Department of Parks and Recreation, U.S. Army, County of Monterey, and City of Marina. Working through the Coordinated Resource Management Planning (CRMP), we will clarify the distribution and abundance of the legless lizard at Fort Ord.

— Margaret H. Fusari
NRS Reserve Campus Director
UC Santa Cruz

From North Fork flow research opportunities

The expansive and near-pristine North Fork Association (NFA) property — roughly 6,000 acres of rugged western Sierra Nevada wilderness near Truckee in Placer County — has recently been made available to the NRS for limited, environmentally sensitive research.

Use of NFA lands, located adjacent to the NRS's existing Chickering American River Reserve, is made possible through a use agreement with the NFA, which has owned and protected the property since 1901. The NFA currently consists of 31 environmentally minded members (most of whom are direct descendants of the original 25 members), locally known as "The Cedars," named after the majestic incense cedars (*Calocedrus decurrens*) that grace North Fork's lower elevations. This diverse site has an elevational range from 4,800 to 8,800 feet (1,463 to 2,682 meters) and includes most of the headwaters of the North Fork of the American River.

The NFA property is a scenic basin surrounded by high, rocky peaks. Most of this varied terrain is covered by undisturbed first-growth Sierra forest — ranging from lower montane forest to subalpine forest — mixed at the higher elevations with montane chaparral, open meadows, and some alpine terrain. Tree species well represented include Jeffrey pine (*Pinus jeffreyi*), lodgepole pine (*P. contorta* var. *murrayana*), sugar pine (*P. lambertiana*), western white pine (*P. monticola*), Douglas-fir (*Pseudotsuga* spp.), white fir (*Abies concolor*), California red fir (*A. magnifica*), Sierra juniper (*Juniperus occidentalis*), mountain hemlock (*Tsuga mertensiana*), and incense cedar.

NFA lands are part of a larger basin — covering nearly 30 square miles — in the western Sierra Nevada, which in its entirety contains 500 vascular plant species, representing one-third of California's plant families. The basin harbors one of the largest continuous stands of old-growth forest in the Sierra Nevada, an ecosystem that has suffered greatly from urban development and logging.

The NFA property and the Chickering Reserve are unique sites within the NRS, located as they are on the windward western slopes of the Sierra Nevada. The other two NRS reserves in the Sierra Nevada — Valentine Camp and Sierra Nevada Aquatic Research Laboratory (SNARL) — are found on the leeward eastern side of the mountain range.

Rich in vertebrate species typical of western Sierra Nevada slopes, the headwaters basin of the North Fork property supports more than 100 bird species — including rare species Northern goshawk (*Accipiter gentilis*), harlequin duck (*Histrionicus histrionicus*), and California spotted owl (*Strix occidentalis*) — and over 30 mammal species — including pika (*Ocotona princeps*), mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*), and mountain lion (*Puma concolor*, formerly *Felis concolor*) (see cover story). The declining mountain yellow-legged frog (*Rana boylei*) is among the more than 15 amphibian and reptile species observed on site. NFA lands are within the habitat range of the state-listed threatened wolverine (*Gulo gulo*), which has long been a subject of research at Chickering Reserve.

Largely untouched by humans for the last 100 years, the area is of considerable historical interest. During the nineteenth century, the county road that crosses the area today provided access to the Soda Springs Hotel, a short-lived, but famous destination for visitors to the Donner Summit region, located in what is now the Chickering Reserve. During its heyday from the 1870s to the 1890s, the hotel burned down, was rebuilt, burned again, and was at last put to rest. Offering evidence of a more distant human history, petroglyphs and projectile points are found throughout the area. Occupation sites probably exist in relatively level locations at lower elevations.

Both the NFA lands and the Chickering Reserve are without facilities. The NFA lands are limited to day use. Heavy snow during the winter months generally restricts the research season to June through October. To protect sensitive ecosystems, access to NFA lands and the Chickering Reserve is by permission only. Applications for research at these sites are coordinated by the reserve manager:

Jim Kirchner
Associate Professor
499 McCone Hall
University of California
Berkeley, CA 94612
(510) 643-8559

SNARL or bust! One database center to go, please

A large building — 1,500+ square feet and two stories high — was acquired from CalTrans and moved to the NRS's Sierra Nevada Aquatic Research Laboratory (SNARL) in Mono County, where it is being refurbished and turned into a new database center.

The building was moved about 2.5 miles. Over half the trip blocked both northbound lanes of state Highway 395 and had to be coordinated with the California Highway Patrol. The journey itself took only three hours, but the project required nearly five days, as the building was first separated from its foundation, then jacked up and a framework with wheels built underneath. The building was wider than the SNARL road and, at various points in its migration, had to be made to pass under power lines that were too low (the lines were lifted) and over fences that were too high (the building was raised). Finally, though the new foundation at SNARL was square, with right-angle corners, the old building was not. Yet, in the end, the moving crew managed to set the structure down with remarkable accuracy: to within less than one-eighth of an inch of perfect!

Currently, databases are being developed for the meteorology of SNARL and Mammoth Mountain and for the hydrology and bibliographies of SNARL and the NRS's nearby Valentine Camp. Species lists (aquatic invertebrates, birds, plants), aerial and remote-sensing data, and spatially related data sets (in the form of computerized geographic information systems, known as GISs) will be added to these databases. It is hoped the databases will eventually be made available to the public via the World Wide Web.

Funding for the facility was provided by the National Science Foundation, NRS Donors Fund, and UC Santa Barbara Office of Research. UCSB environmental monitoring specialist Peter Kirchner was hired to expand monitoring of SNARL and Valentine Camp and to collect data for integration into the database system. UCSB database manager Robert Jellison was hired to maintain the databases.

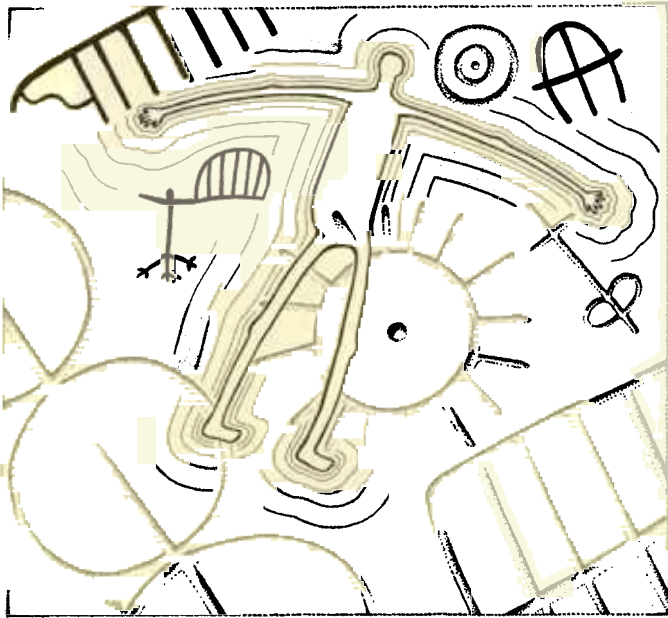
The new facility is expected to be ready for use late this summer in time for the 25th anniversary of Valentine Camp, which is administered together with SNARL as the Valentine Eastern Sierra Reserve.



Photo by Dan Dawson

E. P. M.

— Elaine P. Mill
NRS Senior Science Writer



Art by David Lee

Researchers revel in rock art resources

Seven millennia of rock art resources and more than a year and a half of investigation and preparation were celebrated in January 1997 when the Sweeney Granite Mountains Desert Research Center hosted the first East Mojave Rock Art Conference.

The proceedings were moderated by Frank Bock, the pioneer of rock art research in the Mojave and co-founder of the American Rock Art Research Association (ARARA). The conference drew archaeologists, museum curators, and rock art researchers from organizations as diverse as the Museum of Man, Desert Research Institute, Nevada State Museum, U.S. Bureau of Land Management, Aha Ma Kav Tribe, San Bernardino County Museum, and UC Natural Reserve System (NRS).

This invaluable opportunity for data sharing and ideas exchange was the brain-storm of two researchers, Don Christensen of UC Irvine and independent researcher Jerry Dickey, who are involved in an ambitious and long-term documentation of prehistoric rock art. After investigating numerous sites, they wanted to bring together experts to discuss the significance of East Mojave Rock Art for the first time.

Christensen and Dickey started conducting research at the Sweeney Granite Mountains Desert Research Center in the spring of 1995. Impressed by the many nearby rock art sites, Christensen, Dickey, and Reserve Steward David Lee, with support from the center's co-managers, Jim André and Claudia Luke, commenced a project of recording these sites within the reserve and the adjacent Mojave Desert National Preserve administered by the National

Park Service (NPS). They documented 16 petroglyph and pictograph sites, contributing to the database for an extensive article to be published in the *Pacific Coast Archaeological Society Quarterly*.

The abundance and diversity of archaeological sites at Sweeney Granite Mountains, paired with that reserve's ongoing role as an outdoor classroom and research laboratory, suggested the need to develop a cultural resource management plan. Creating the plan required a records search of existing site

data in the California Archaeological Inventory (a database required by state and federal regulations), an examination of relative ethnography from the early historic period, and a field reconnaissance and survey to determine the spatial distribution, density, and type of the area's archaeological resources.

With the help of Robin Laska of the San Bernardino County Museum, the records search was completed, revealing the existence of 43 previously recorded sites. As of March, 58 new sites have been recorded, and 20 previously noted sites have been updated to more-current standards. These sites (including habitation and food-processing sites, lithic quarries, trail systems, and rock art) cover the temporal span from at least 7,000 years ago up to the historic era and the advent of the cattle industry and mineral extractions at the turn of the twentieth century.

The potential for long-term study and monitoring of archaeological sites in this and other NRS lands is great, because these sites largely escape the cultural impacts — ranging from the disappearance of diagnostic artifacts to the infliction of graffiti and vandalism — to which regions outside the NRS are subject.

The unique ecological zones protected by the NRS have always attracted researchers in the biological and physical sciences. However, as this first East Mojave Rock Art Conference demonstrates, NRS reserves also offer exciting opportunities for archaeological investigation.

— Don Christensen
Researcher, UC Irvine
and David Lee

Reserve Steward, Sweeney Granite Mountains
Desert Research Center

Protecting snowy plovers at COP is strictly for the birds

The NRS's Coal Oil Point Reserve along the Santa Barbara coast is one of the few remaining places in Southern California visited by the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*). Masters at freezing still among the rocks (which are the same size and color as the 6-inch plover), these well-camouflaged birds are difficult to spot, even when one is looking out for them.

Coal Oil Point (COP) Reserve provides habitat and forage for relatively large numbers of plovers. Unfortunately for these shy shorebirds, the beach immediately adjacent to the reserve provides a popular setting for surfing, swimming, sunbathing, and running for large numbers of people — and their dogs. This creates significant disturbance for the small, hard-to-see plover.

What the situation seems to call for are posted signs alerting the public to the presence of these rare birds. (Although off-leash dogs, which obviously cannot read the signs, pose the greatest threat to the plovers.) Reserve caretakers Kevin Lafferty and Cristina Sandoval have considered posting new, colorful snowy plover signs at the reserve.

But there's a problem: the plovers act nervous about anything that stands over three feet tall, including the very signs designed to protect them. (One tall sign has successfully been posted on a well-used trail — with the help from the Audubon Society — far enough away from the plovers so that it does not seem to disturb them. However, most people tend to ignore the sign, since they cannot actually see the birds.)

Some experts believe the snowy plovers perceive tall structures — including the signs — as perch sites for birds of prey. Yet shorter signs — less than three feet high — are problematic, too: hard to see, easy to trip over, and vulnerable to the ravages of shifting sands.

Lafferty and Sandoval have been searching *high and low* for a solution. "There's an answer somewhere," says Lafferty. But you may need a bird brain to figure it out.

— Elaine P. Miller
NRS Senior Science Writer



Art by
Susan Gee Rumsey

Report of the Director *continued from page 1*

Desert Research Center hosted the first East Mojave Rock Art Conference, shedding contemporary light upon human art-making that, in some cases, dates back 7,000 years (p. 9). Meanwhile, we profile Norman Locks, a UC Santa Cruz photography professor who uses modern tools, media, and methodology to document complete ecosystems at Landels-Hill Big Creek Reserve and other NRS sites (p. 5).

With sadness, we note the passing of Ida Dawson, daughter of one of California's pioneering families. With gratitude, we remember this remarkable woman who loved her land and its creatures, and gave us the Dawson Los Monos Canyon Reserve in San Diego County (p. 10).

Finally, we announce two grant programs, each made possible by generous NRS supporters. It's not too soon for UC students contemplating graduate-level research on NRS reserves to plan ahead for next year's Mildred E. Mathias Graduate Research Grant competition (p. 11). And UC Riverside graduate students who make Boyd Deep Canyon Desert Research Center their research site have a new scholarship fund available to them: the Bill Mayhew Travel Scholarship (p. 11).

Two years ago, the NRS celebrated its 30th birthday and entered its fourth decade of existence — a short time in the natural world, but an eternity for our students. We are proud to have achieved so much in this relatively brief period. More and more, though, we find ourselves pressed by the issue of how to maintain the excellence of our reserves: we must protect their often-pristine resources, while providing for the ever-increasing research, instruction, and public service use that we encourage as the fulfillment of our NRS mission, our reason for existence.

We have teaching and research facilities to construct, upgrade, and maintain. Our fragile ecosystems, unique in California, must be protected and nurtured. Our on-site personnel must be increased. We need funding for field courses and field-based research that will lead to new discoveries as yet unimaginable. Under the circumstances, it's no surprise we find we must devote growing amounts of shrinking time and energy to raising new funds and garnering new support for the NRS.

But we know our ever-expanding NRS family, now spanning several generations, will help us accomplish these goals. It's worth pausing in our busy lives to say thanks to everyone who keeps the NRS ticking and on the path towards achieving its mission.

— Elizabeth Riddle
Acting Director, Natural Reserve System



Photo by Elizabeth (Liza) Riddle

For years Ida Dawson toured her land by golf cart. In this 1992 photo, she points out some local features to former NRS Director Deborah Elliott-Fisk.

Farewell to pioneering donor Ida Dawson

The NRS truly misses Ida Dawson — donor of Dawson Los Monos Canyon Reserve in the San Diego County foothills — who died in November 1996 at age 95.

A descendent from one of California's pioneer families, Dawson lived in a century-old ranch house on the reserve, a portion of the property which her family originally obtained through an 1842 Mexican land grant. Since that long-ago time, a gold rush of development hit the foothills, and in many places bulldozers became more common than bobcats. But Dawson chose a different fate for her beloved land, entrusting it to the NRS for research and education.

NRS Faculty Reserve Manager Paul Dayton characterized her in this fond recollection:

"My favorite memory of Ida actually was the first time I met her. I was a very junior assistant professor who had just been given the chair of the UC San Diego NRS Advisory Committee in 1972. I knew absolutely nothing about the NRS or the San Diego campus reserves, and one Sunday I loaded my wife and infant son into the sainted VW bus and drove out to try to find the Dawson Reserve. In those days, you had to follow winding country roads. Finally the narrow road wound up a hill where I had to go around a large rattlesnake warming herself in the road.

"When we got there — having no idea who this owner was — I timidly knocked on the door. Before I blurted out an incoherent introduction, Ida wanted to know for sure that I had not disturbed her rattlesnake that always sunned itself on the road.

"Once that was resolved, she ushered us into the kitchen for lemonade and explained the buzzing sound on the back

porch. It seemed that another rattlesnake had come in behind her kitchen stove. The snake had been there a day or so, and she was sure it was trying to help out by catching rodents. But it had made her nervous, because she couldn't be sure where it was at night. So she had gently swept it out the back door with her broom, and it was rattling its mild protest. She had many snakes under and around her house, and she assured me she was taking good care of them.

"She pointed out the nests of two hawks and a great horned owl and told me where they foraged. She showed us the room where she was born and described the fascinating land-grant history of the place. She well understood the role of fire and told me the exact turn-of-the-century date of the last fire. She was worried about a serious fire to come with the fuel build-up. (She lived to see the next fire, and she very much understood and appreciated all the wonderful effects it had for the habitat.)

"Over the years, we had many interactions, and every one left me with even more respect for this remarkable person. She was one of the wisest, most knowledgeable people I ever met. I often thought that the main reason I continued with my NRS responsibilities was the pleasure of working with Ida Dawson to help realize her dream of preserving that wonderful habitat. Ida was unique — I will never know another like her."

Ida Dawson is survived by two daughters, Elaina Blankinship and Betsy Schaefer, five grandchildren, and nine great-grandchildren.

— Elaine P. Miller
NRS Senior Science Writer

It's time to plan your NRS student grant proposal

This year the NRS Systemwide Office will again call for proposals for the Mildred E. Mathias Graduate Research Grants. This program, which began in 1989-90 and will soon enter its ninth funding cycle, supports graduate-level research conducted by UC-enrolled students at UC NRS reserves.

The maximum single award is \$2,000; overall funds available for the year total \$20,000.

These grants not only encourage students to conduct research, but also provide experience in applying for grants, meeting deadlines, and managing a budget. The awardees are expected to produce a paper or report, or present their findings in a suitable forum; awardees who fail to fulfill this condition forfeit the chance to be considered for future funding.

The call for proposals will be issued September 9, 1997. Applications can be obtained by contacting the NRS Systemwide Office (see return address p. 12). Proposals are due to campus NRS contacts (see list below) by October 28 and will be forwarded November 17 to the NRS director for review. The awards for 1997-98 will be announced December 17.

1997-98 Campus Contacts for Grants

UC Berkeley: Harry W. Greene, Integrative Biology, Museum of Vertebrate Zoology; (510) 642-3567; e-mail: crotalus@socrates.berkeley.edu.

UC Davis: A. Sidney England, Planning and Budget; (916) 752-2432; e-mail: asengland@ucdavis.edu.

UC Irvine: Peter Bowler, Ecology and Evolutionary Biology; (714) 824-5183; e-mail: pabowler@uci.edu.

UC Los Angeles: Philip W. Rundel, Medicine/Biology; (310) 825-8729; e-mail: rundel@bes.medsch.ucla.edu.

UC Riverside: John T. Rotenberry, Biology; (909) 787-3953; e-mail: rote@citrus.ucr.edu.

UC San Diego: Ted J. Case, Biology; (619) 534-2312; email: tcase@ucsd.edu.

UC Santa Barbara: Frank Davis, Geography; (805) 893-4127; e-mail: fd@ventana.geog.ucsb.edu.

UC Santa Cruz: Margaret H. Fusari, UCSC Natural Reserves Office, 254A Applied Sciences; (408) 459-4971; e-mail: fusari@cats.ucsc.edu.

1996-97 Mathias awardees

Of the 100+ proposals received, 13 were selected. The following is a list of the current year's Mathias grant awardees (and the NRS reserves where they are conducting their research).

From UC Berkeley:

Adrianna P. Smyth (Angelo)
Jonathan Levine (Angelo)
Marjorie Denise Matocq (Sweeney, SNARL, Valentine, Hastings)
Vance T. Vredenburg (SNARL)

From UC Davis:

Sean Brady (Stebbins, McLaughlin)
Emilio M. Bruna (Sedgwick)

From UC Irvine:

Priyanga Amarasekare
(San Joaquin Marsh)

From UC Los Angeles:

Michael H. Kohn (Stunt Ranch)

From UC Riverside:

Kevin Ellison (Motte Rimrock)

From UC San Diego:

Marc S. Dantzker (SNARL)
Anne Fetscher (Dawson)
Drew M. Talley (Kendall-Frost)

From UC Santa Barbara:

James E. Byers (Carpinteria)

Mathias honored with recently published symposium book

Proceedings of a symposium held October 27, 1995 in honor of the late Mildred E. Mathias, NRS founding mother, have been published by the Mathias Botanical Garden at UC Los Angeles. Entitled *Neotropical Biodiversity and Conservation* (1996), the book was edited by Art C. Gibson, professor of biology and long-time friend and colleague of Mathias. It is 200 pages long and contains 11 sections (half symposium papers and half invited chapters) on topics ranging from tropical conservation to adaptive strategies and physiological ecology in rain forest plants. Gibson's introduction to the volume describes Mathias's life and cites her many publications. The book's price of \$25 includes sales tax, shipping, and handling within the U.S. and Canada (\$28 outside North America). For more information, call (310) 825-3620.

[ISBN: 0-9655575-0-2]

New travel scholarship for UCR grad research at Boyd

The new Bill Mayhew Travel Scholarship is making it easier for UC Riverside graduate students to conduct research at one of the NRS's largest reserves, Boyd Deep Canyon Desert Research Center near Palm Desert.

The scholarship was created with the intention of compensating UC Riverside graduate students for reasonable transportation costs (for example, gas, not airfare) to the site, plus the reserve's overnight fees. UC Riverside Professor Emeritus Bill Mayhew, for which the scholarship is named, recently established the fund with a generous challenge gift. The fund continues to grow, thanks to the generosity of dedicated donors, many of whom are Mayhew's former students. Mayhew's own connection with Boyd Deep Canyon runs deep, as he had a close relationship with the site's original owner, former UC Regent Philip L. Boyd, and taught zoology field courses there for 35 years.

Truly a center for research and teaching, Boyd Deep Canyon has continued to increase in popularity since Mayhew's early days: more than 200 university-level students and over two dozen researchers now use the site annually.

Habitats range from Sonoran desert to a major portion of an entire drainage system for montane forest. The Deep Canyon transect supports a variety of animal species: 228 birds, 46 reptiles — including the federally and state-listed threatened desert tortoise (*Xerobates agassizi*) — and 47 mammals — including state-listed threatened peninsular bighorn sheep (*Ovis canadensis cremnobates*).

On-site facilities include two laboratories and housing facilities for 14 researchers, making the reserve suitable for day use or longer stays.

To apply for a Bill Mayhew Travel Scholarship, contact:

Allan Muth, Reserve Manager
Boyd Deep Canyon Desert Research Center
P.O. Box 1738
Palm Desert, CA 92261
(619) 341-3655
Fax: (619) 779-8076

Donations to the fund may be mailed to:

James Erickson, Vice Chancellor
University Advancement
4108 Hinderaker Hall
University of California
Riverside, CA 92521

— Elaine P. Miller
NRS Senior Science Writer

California Coastal Access Guide provides sea of information for shoreline visitors

The incredibly diverse California coast, stretching from redwoods and rocky shores in the north to palm trees and sandy beaches in the south, is an area of unsurpassed beauty. No wonder some 50 million people are drawn to our state's shores each year. The new fifth edition of the *California Coastal Access Guide*, prepared by the California Coastal Commission and published by UC Press (1997), is an essential handbook for anyone — hikers, swimmers, boaters, wheelchair-users, campers — exploring California's 1,100 miles of spectacular shoreline.

The guide contains 125 maps and up-to-date information on 850 public-access areas. (Forty-two percent of California's coastline is publicly owned and accessible, while 58 percent is privately owned or held by federal, state, or local government and is not open to the public.) Organized by county and easy to use, the guide

details exactly where to go, how to get there, the facilities available, and the type of terrain to expect when you get there. The history, environments, landmarks, and industries of each of California's 15 coastal counties are also contained in the guide.

The NRS manages 10 shoreline, water/marine, and island reserves in California's coastal zone — from the Hans Jenny Pygmy Forest Reserve in Mendocino County to the Kendall-Frost Mission Bay Marsh Reserve in San Diego County. The guide provides brief general information about the NRS's research and instructional and research users can gain access to some coastal NRS sites.

The extended introduction of the *Coastal Access Guide* focuses on such issues as safety at the coast and environmental protection. It also provides a fascinating yet concise history of California's coast, going as far back as its geological formation by plate tectonics. Additionally, more than 40 feature articles with 300 illustrations cover just about everything having to do with the coastal zone, including California gray whales, camping, tidepools, tsunamis, sand dunes, and surfing.

The sea of practical information provided by this new edition of the *California Coastal Access Guide* makes this a reference volume better suited for your backpack than your bookshelf.

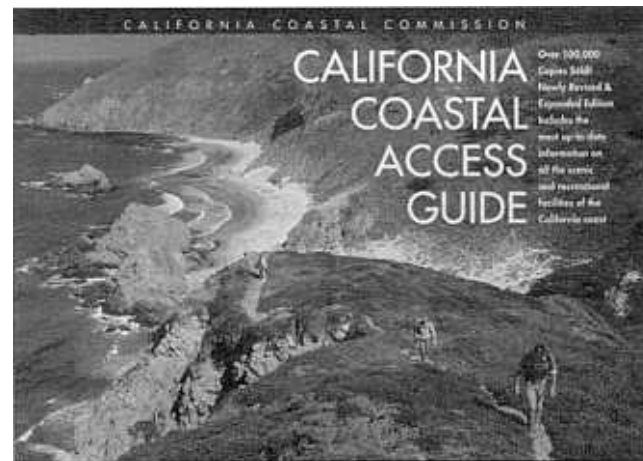


Photo by Alisa Fineman

Big Sur coastline

Errata for Fall 1996 Transect

Some errors made their way into the Fall 1996 issue of *Transect* (14:2).

Contrary to what was reported in the story, "Big Creek manager reels in data from anglers using sustainable fishery," fishing is *not* allowed on the Big Creek Marine Reserve.

Low-to-moderate fishing is permitted *beyond* the reserve boundaries as part of the Big Sur Skiff Fishing Survey (mistakenly called the Big Creek Hook and Line Kelpfish Survey). The survey, a cooperative effort between scientists and fishers, allows limited boat launches (sorties) in exchange for data on fish catches from waters *outside* the reserve. Fishers who stray illegally into the reserve have received citations.

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— Elaine P. Miller

NRS Senior Science Writer

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Natural Reserve System
300 Lakeside Drive, 6th Floor
Oakland, CA 94612-3560
(510) 987-0150
World Wide Web site:
<http://nrs.ucop.edu>

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