

UC Office of the President

NRS Transect

Title

The NRS Transect 4:2 (spring 1986)

Permalink

<https://escholarship.org/uc/item/80d8626p>

Journal

UC Natural Reserve System, 04(2)

Author

UC Natural Reserve System

Publication Date

1986-03-21



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Systemwide Office Column

Sustainable Agriculture and Natural Reserves: Seeing the Connections

In January more than 400 small organic farmers, large-scale conventional farmers, students, chemical company representatives, farm advisors, researchers, and educators came to Sacramento to attend the first public forum devoted to the sustainability of California agriculture. Organized by the University of California, the 2-day symposium featured more than 30 speakers who addressed 3 major issues: the concept of sustainability; the physical, biological, economic, social, and political factors involved; and future directions for research. One such direction potentially involves the NRS: the use of natural systems as models to design ecologically sustainable agriculture.

'Sustainable agriculture' is a multi-dimensional concept that treats agriculture as part of a strongly interconnected world. Thus, it is at once a production system, a social system, an economic system, a biological system, and a value system.

So far, most research has focused on the use of naturally occurring ecological processes as models for crop and animal production that minimize the use of irrigation, pesticides, and other synthetic chemicals. If the concept of sustainable agriculture is to some extent legitimized by reference to biological processes found in natural systems, it is important for researchers to ask:

"Can species and processes borrowed from natural systems contribute to the long-term stability of agricultural systems, and can research in agricultural

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Jan Cornett

The endangered Coachella Valley fringe-toed lizard is the subject of both a recently approved Habitat Conservation Plan and research being done by Deep Canyon personnel. See story, p. 4.

The NRS at 20

In just twenty years, the Natural Reserve System has evolved from the dream of Kenneth S. Norris and a distinguished panel of University of California faculty to the reality of the largest and most ecologically diverse system of teaching and research reserves in the world. Many have contributed to this evolution and several groups deserve special mention:

•**Board of Regents and Administration**—for their farsightedness and resolve in establishing the NRS and in nurturing development of the System ever since;

•**Citizens NRS Advisory Committee**—under the leadership of William A. Wilson—for their considerable time and energy in offering counsel and encouragement and in attracting private giving;

•**Donors**—individuals, foundations, and corporations—for their generosity and support in donating both land and money;

•**Governmental Agencies and Private Organizations**—for their exemplary collaboration in advancing common goals and objectives;

•**Faculty**—under the leadership of Mildred E. Mathias and Ken Norris—for their countless hours, constant vigil, and unflinching devotion as faculty managers and advisors; and

•**Reserve Managers and Stewards**—for their service above and beyond the call of duty, often under severe time and budgetary restraints.

I am also mindful that we could not have accomplished what we have without the extraordinary loyalty, commitment, and professional skill of my colleagues on the systemwide NRS staff.

Finally, I take this opportunity to pay tribute to James B. Kendrick, Jr., Vice President—Agriculture and Natural Resources, who is retiring on Sept. 30 after almost 40 years of distinguished service to the University. Jim has been instrumental in developing a firm academic foundation for the NRS, in acquiring additional resources, and in making the NRS better known both inside and outside the University. He will be greatly missed as a colleague but never forgotten as a friend.

—J. Roger Samuelsen
Special Asst. to the Vice President
and Director, Natural Reserve System

Reserve Highlights

Herbarium Creates Vernal Pools at Coal Oil Point

In the past 200 years, California has lost 90 percent of its vernal pools to urban and agricultural development. To explore the feasibility of providing new habitat for this ecosystem's diminishing species, I've been working with Wayne Ferren of the UC Santa Barbara herbarium to create and monitor several small vernal pools at the Coal Oil Point Natural Reserve, located on the West Campus of UCSB.

A wetlands habitat unique to areas with a Mediterranean climate, vernal pools are shallow depressions that flood during winter rains, yet dry out completely by spring or summer. Because the biota must be adapted to prolonged periods of both inundation and desiccation, it is often highly restricted to these habitats.

Over the past year, I designed and implemented a project intended to create a suite of interconnected vernal pools in a disturbed grassland area designated for instruction and habitat improvement. A private contractor excavated the pools in December, creating a low water-retention berm with the soil removed from the artificial depressions. This excavated substrate, which contains 65 percent clay, proved to be very impermeable to water percolation. I introduced seed of native vernal pool species into half of the pools the day after the excavation was complete.

The pools have an area of about 6,450 square feet and a relief of nearly 3.5 ft. This 'created' habitat should support plants such as *Eryngium armatum* (a coyote-thistle) and *Plantago bigelovii* (a plantain), two regionally rare annuals indicative of vernal pools in the Santa Barbara area. These and other species may become established either via my introduction of seed, or by dispersal from nearby natural vernal pools.

Fifteen pools resulted from the first rainfall on the site. Subsequent storms, however, deposited enough precipitation to temporarily connect all the pools into a single pond approaching 30 inches deep. The berm prohibited most water runoff from the site. As a result, vegetation at the created wetland now characterizes a freshwater marsh at the deepest portions, while being more representative of a vernal pool at the shallow periphery. Years with scant

Coal Oil Point's vernal pools after the first 4 inches of rainfall.

rainfall may cause a reduction in marsh vegetation and a subsequent increase in vernal pool species.

In order to evaluate how well the created pools resemble their prototype, I will continue to monitor the site, gathering information about soils, plants of both the project site and local vernal pools, fluctuations in water depth and duration, and correlations between plants and these hydrologic patterns.

The UCSB Chancellor's Office funded \$15,000 for the pools as part of a larger effort to construct faculty housing. The project is serving as an unofficial mitigation for the destruction of natural vernal pools at the construction site. Data from this project are assisting the Isla Vista Recreation and Park District in restoring and enhancing the Del Sol Vernal Pools, located between the main campus and the Coal Oil Point Reserve.

The preliminary results of the project indicate that vernal pools can be created successfully in areas that have flat topography, impermeable substrate, and are situated near sources of dispersal for vernal pool organisms. Creation of vernal pools, however, should be done to provide new habitat for diminishing species, and not to justify the destruction of natural examples of these unique ecosystems. Manipulative research of this kind may also yield important insights into the functioning—and hence the conservation and management—of natural vernal pools systems.

For more information, please contact Wayne Ferren or myself at the UCSB Herbarium, Dept. of Biological Sciences, UCSB, Santa Barbara, CA, 93106, (805)961-2506.

—David Pritchett
Herbarium Assistant
UC Santa Barbara



Connections—continued from page 1

systems contribute to the management needs of natural systems?"

The linkage of these questions reminds us that field ecology is no less appropriate in a corn field than it is in a mountain meadow or a tropical rainforest. The following list represents only a few kinds of research questions that bridge natural and agricultural systems:

1) Many unexploited native plants have potential economic value and, because they are adapted to local environmental conditions, may require less maintenance than is needed by commercial crop species. Desert plants, with their rich array of secondary compounds of interest as pharmaceuticals, hold particular promise for dryland agriculture. How then might these native plants be integrated into a crop system to produce a more water-conserving desert agriculture? Furthermore, how might the secondary-chemical diversity of such a crop mixture influence levels of insect, mite, and disease damage?

2) Ecologists have theoretical reasons to expect that patch size, shape, and resource concentration play important roles in determining levels of migration between and extinction within patches. Given the bewildering array of possible habitat types and taxonomic assemblages, an all-encompassing theory is unlikely to emerge. However, a broad research agenda that includes highly structured manipulative experiments—most appropriate in agroecosystems—as well as observational studies, would seem likely to produce secure generalizations. Information generated by this effort would be relevant both to pest-management programs in agroecosystems and to conservation and management programs in natural systems.

3) There is a clear need to maintain biological control agents and, often, pollinators in sustainable agroecosystems. The resources required to support

these beneficial organisms are likely to come from natural systems in the form of nectar-producing plants and alternative insect hosts. It is particularly important to study native species that are unlikely to become pests themselves. Though the nectar from introduced star thistles (*Centaurea* spp.) may support beneficial insects, this advantage is trivial compared to the thistles' negative impact as aggressive weeds in central California agriculture. By contrast, many non-weedy native plants that produce copious amounts of nectar might be used without harm as border plants.

Thus, three areas of research inquiry are called for: a) the production ecology of native species that may support useful pollinators, predators, and parasitoids; b) the consequences of their utilization in agriculture; and c) the development of technologies to make their utilization both cost-effective and appropriate to farms of varying size and composition. All must be addressed to successfully introduce ecological information about native species into agricultural production practices and to stimulate commercial interest in the production of useful native species.

4) Native species are sources of genetic variation that may improve commercial crops. Native strawberries, which occur throughout California in cool mesic habitats, are a prime example. Explicitly linking research on the ecological genetics of native plants to needs in crop improvement would open new opportunities for field work in both natural and agricultural ecosystems.

5) There is an especially pressing need to restore lands that have depleted nutrients, poor soil structure, or high levels of toxic chemicals. Native prairie grasses and legumes can contribute to the restoration of degraded pastureland by improving soil nitrogen levels, organic structure, and ability to hold water. Some naturally occurring microorganisms detoxify organo-phosphate pesticides, and the tiny aquatic plant duckweed efficiently scavenges heavy metals. Native plants and microorganisms have adapted to a wide range of environmental conditions, including low nutrient and high toxicity levels, but our understanding of the potential utility of these species to help restore degraded habitats remains rudimentary.

I want to end this essay with a cautionary note. The research of many proponents of sustainable agriculture has been too narrowly focused on the ecology of crop production as it exists within a field, ignoring the complex relationship that agriculture has with market

economies and societal needs. We must question the environmental trade-offs we may be accepting as we move away from conventional forms of agriculture. For example, economically important native desert plants may indeed permit a more water-conserving desert agriculture, but the conversion of natural desert habitats to vast monocultures of jojoba or other species would not be in the spirit of sustainable agriculture.

The development of a truly ecologically sustainable agriculture should encompass both the dynamics of the production unit—that is, what happens within the borders of the field—and the relationship of the new agriculture to the conservation of natural habitats. A crucial and very complex issue then, is the extent to which societal needs can be met through the conversion of conventional agriculture to "sustainable" agriculture without greatly expanding the agricultural land requirements.

—C. Ronald Carroll
Associate Director,
Natural Reserve System

Publications



One of the many line drawings that illustrate *Granite Mountain Spring*.

Springtime in the Granites:

"The land between Barstow and the Colorado River looks fired in a potter's kiln. It is colored in shades of brown, ochre, red, orange and purple. Desolate and wild-looking ranges rise starkly from hills and plains that are folded and wrinkled like the faces of old, old men. Wide, sand-filled washes and the glittering salt crystal flats of dry lakes are the only proof that rain sometimes falls."

So starts *Granite Mountain Spring*, a student's journal of a field season in

the Mojave Desert. This beautiful 78-page book is written and illustrated by Flora Pomeroy, edited and designed by Martha Brown. It is available for \$5.00, plus \$2.00 for postage and handling, from the Environmental Field Program, 223 Kerr Hall, University of California, Santa Cruz, CA 95064, (408)429-2836.

Directory to Expertise and Facilities Related to Wildlands: The Wildland Resources Center recently published a directory of UC scientists, extension workers, and research facilities involved with California's 83 million acres of wildlands. Compiled by Robert Z. Callahan and Alan G. Stangenberger, the directory is designed to improve communications both among wildlands researchers and between them, governmental agencies, and the general public.

The 302-page document consists of four parts. The first three list the affiliations, statements of interest, and keywords for each of the 780 individuals listed. The fourth part describes the field facilities operated by the University for research, extension, and teaching in the natural resources.

For a copy, send a check for \$6.00 payable to the UC Regents to the Wildland Resources Center, 145 Mulford Hall, University of California, Berkeley, CA 94720, (415)642-0263.

Need information on the NRS?

The following are available at no charge from the systemwide NRS office:

Back issues of the *Transect* :

- Volume 1, No. 1 (Spring '82)
- Volume 2, No. 1 (Fall '83)
- Volume 3, No. 1 (Fall/Winter '84)
- Volume 3, No. 2 (Spring/Summer '85)

Reserve Brochures:

Pygmy Forest Reserve, Ryan Oak Glen Reserve, San Joaquin Freshwater Marsh Reserve, Philip L. Boyd Deep Canyon Desert Research Center, and Santa Cruz Island Reserve. Designed for prospective reserve users, these publications describe the natural resources of the sites and contain information on access, facilities, and use.

Systemwide brochure:

Though somewhat out-of-date, this 1980 document contains vital statistics on every site in the Reserve System.

Twentieth Anniversary Report:

Natural Reserve System: The First Twenty Years. This 4-color 24-page booklet published early this year describes the purpose and history of the NRS, and highlights various teaching, research, and public service projects based on reserves.



Deep Canyon Helps Establish Coachella Valley Preserve System

Sometimes the cold-blooded make the best diplomats. Consider the Coachella Valley fringe-toed lizard (*Uma inornata*). This endangered reptile, found only in the valley surrounding Palm Springs, has united environmental groups, private developers, the governments of Riverside County and the nine cities of the Coachella Valley, and various state and federal agencies. Since 1982, these unlikely partners have collaborated to produce a Habitat Conservation Plan for the fringe-toed lizard that was recently approved by the U.S. Fish and Wildlife Service. Research by UC scientists provided much of the biological basis for the plan, and NRS' Drs. Wilbur Mayhew and Allan Muth served on the steering committee that prepared the document.

The plan's completion and approval was celebrated on April 25 at the Palm Springs Desert Museum with a reception honoring the groups involved and the premiere showing of "The Coachella Solution," an educational film produced by The Nature Conservancy.

This Habitat Conservation Plan is but the second of its kind to be prepared under the amended Endangered Species Act of 1973. It provides for the establishment of the Coachella Valley Preserve System (CVPS)—three reserves with the lizard's requisite blowing sand habitat: Edom Hill-Willow Hole (2,400 acres), White Water Flood Plain (1,200 acres), and Thousand Palms Oasis (13,000 acres). The plan also calls for



Thousand Palms Oasis, the second largest grove of California fan palms in the state, is now part of the CVPS. The Preserves' aquatic and sand dune habitats complement the Sonoran Desert scrub and Mojavean pinyon-juniper woodlands at Deep Canyon, located 10 miles to the south.

\$25 million in land purchases to be funded by the state and federal governments, the California Nature Conservancy, and developer's fees.

An Advisory Committee and a committee composed of primary land owners—California Department of Fish and Game (CDFG), the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (USFWS) and The California Nature Conservancy (TNC)—will manage the Preserve System.

The Philip L. Boyd Deep Canyon Desert Research Center has been involved with the CVPS since its inception. Because Deep Canyon does not contain any sand dunes—habitat rapidly being lost to development in the Coachella Valley—Reserve personnel have helped establish the Preserve System to insure the availability of this endangered habitat for future investigators.

In the early 1970s, Mayhew—professor of zoology at UC Riverside and

faculty director of Deep Canyon—assisted Riverside County in reviewing potential sand dune reserve sites. To facilitate the habitat protection process, he submitted requests to state and federal agencies to designate *U. inornata*, which depends completely on unstable, wind-blown sand, as needing protection. By the end of 1980, the U.S. government had listed the animal as threatened, and the state of California had listed it as endangered.

Because the Endangered Species Act prohibits 'taking' a threatened species, the listed lizard added momentum to the drive to protect a variety of Coachella Valley native habitats, including that of *U. inornata*. The resulting CVPS encompasses a unique combination of desert and aquatic habitats, with permanent palm spring oases and a dynamic water- and wind-driven sand system. It supports two rare plants and four rare animals in addition to the lizard. The Preserve System will serve as a valuable adjunct to nearby Deep Canyon, providing an opportunity for comparative research and for studies of the rare blow-sand fields.

In fact, Deep Canyon personnel are currently carrying out the first long-term study. Resident Reserve Director Al Muth and Reserve Biologist Mark Fisher recently started their second field season studying the demography of the fringe-toed lizard. As part of a Cooperative Research Program with the USFWS, the CDFG has awarded a contract to Muth for this work for two years running.

The study began in the fall of '84, when Muth and Fisher began setting up grids on a 5.5-acre plot in the White Water Flood Plain. During the following



Sand fields at The Nature Conservancy's Coachella Valley Preserve System. The fringe-toed lizard, which escapes predators by burying itself in sand and then swimming short distances beneath the surface, is wholly confined to this habitat type.

field season—mid March to late October—they marked and began monitoring more than 350 lizards, about 95 percent of the site's estimated population.

During the current field season, the researchers will continue to mark and monitor animals. "By following the life of individual lizards throughout the year, we're trying to get a picture of how their social behavior relates to their use of habitat and to various environmental variables," says Muth. Such information is central to understanding how best to protect endangered species.

As part of this long-term population study, Muth and Fisher developed a new technique for marking animals in the field. In addition to using the conventional method of clipping a lizard's toes, they sutured colored plastic beads into the tail with surgical steel. Using varying sequences of 3 beads of 10 different colors, the researchers can create up to 1,000 discrete markings. Unlike the toe-clipping method, this tagging system can be read from afar. By allowing the researchers to identify individuals without catching them, this new system enables Muth and Fisher to monitor the lizards frequently without being disruptive.

As a result, the scientists have discovered unexpected complexities in

fringe-toed lizard behavior. An iguanid lizard, *U. inornata* does not exhibit typical iguanid behavior in its activity cycles and territoriality. In other iguanid species, most individuals are active at least some part of every day, and the population as a whole is active all day long. *U. inornata* appears to be active at irregular intervals; individuals do not come out from beneath the sand every day, and there are times during what are considered peak hours when few of the population are out. "There's no pattern that we can discern," says Muth. "Only about 12 percent of a population will be active on any given day."

In addition, most male iguanids are very territorial. Male fringe-toed lizards, on the other hand, appear to tolerate other adult males in the same area. "So," says Muth, "you have to ask 'Why are these guys different?' Is there something about the environment or the demography of their population that can account for the differences?"

As well as answering such questions, the researchers hope to determine why the lizards' population at Thousand Palms Oasis Preserve, 10 miles to the east, has crashed drastically since the early '80s. "We don't know why this happened or what population fluctuations are normal for this species," says

Muth. Using demographic data collected at White Water Flood Plain Preserve, "we should be able to get a good idea of how the population should behave." From these data, the researchers hope to be able to estimate population recovery and to make informed recommendations on how to manage the habitat to enhance that recovery.

Fisher and Muth reported their initial results in January at the annual meeting of the California-Nevada branch of the American Fisheries Society. Their research will provide the basis for future work on *U. inornata* and for management decisions regarding this endangered species.

In the meantime, UC will continue its involvement in the CVPS by serving as a scientific consultant and reviewing proposed research on CVPS sites. Mayhew will represent the University on the CVPS Advisory Committee, enabling the Natural Reserve System to maintain close contact with the state and federal agencies involved, and to identify research needs and funding sources that might be available to University faculty and students.

—Sarah Steinberg Gustafson
Editor, Natural Reserve System

News and Notes

■ Donations

Artists Contribute to San

Joaquin Marsh: Pacific Southwest Waterfowl Arts—a Southern California group of artists—recently donated \$5,000 to the San Joaquin Freshwater Marsh Reserve. The gift will be used to improve waterfowl habitats in this 202-acre wetlands adjacent to the UC Irvine campus.

A non-profit club of about 250, Pacific Southwest Waterfowl Arts is dedicated to perpetuating the native American folk art of decoy carving and to promoting wildfowl art in general. The group is also becoming involved in conservation.

"Natural wetlands in this area are dwindling so fast that there are hardly any places for birds to go to," says Ron Kassay, a former president of the club. "We wanted to do something at a local level to give the birds a refuge." This past summer the club presented Reserve Manager Bill Bretz with a check for \$5,000. The University will use the funds to remove cattails and tules now invading the Marsh's areas of open



7/84 Kendal Morris

San Joaquin Freshwater Marsh Reserve.

water, thereby improving important habitat for more than 200 species of birds that visit or reside in the Reserve.

For more information on Pacific Southwest Waterfowl Arts, contact Joe Girtner, 409 Catalpa St., Brea, CA 92621, (714)529-2388.

Construction Company Aids

Freshwater Marsh: Over the past year, the San Joaquin Freshwater Marsh Reserve has received more than \$15,000 in labor and material from Valley Engineering, a construction company headquartered in Newport Beach. A spinoff from a nearby ecological restoration project, this donation has been a valuable aid in maintaining the Reserve.

The services provided include grading two miles of peripheral roadway along the northwestern edges of the Marsh, back-filling several eroded gullies that were down-cutting an old dam face, and regrading the dam's top slope and installing a buried culvert system and desilting basin to eliminate the problem

continued on next page

News and Notes—continued

that had created the gullies. The company also fabricated and installed an improved lock system on the Reserve's public access gate.

In addition to labor, Valley Engineering donated a 300 gallon per minute pump, 200 yards of 3-inch aluminum irrigation pipe, and a 35 mm camera. The pump and pipe will enable the University to shunt water from one area of the Marsh to another for management and experimental purposes.

A representative of Valley Engineering originally contacted Reserve Manager Bill Bretz while the construction company was carrying out a \$3.5 million restoration project in the Upper Newport Bay Ecological Preserve, a California Department of Fish and Game (CDFG) site located just downstream from the Reserve. The project called for excavating and removing more than a million cubic yards of sediment that washed down over the years through the watershed, seriously degrading the quality of the Preserve's habitats.

UC Irvine expedited the renovation by providing a parcel of land between the Reserve and Upper Newport Bay as a site to temporarily pile some of the excavated sediments, thus helping the company to complete the renovation before the first fall rains. In return, the contractor used sometimes-idle equipment to help the Reserve with its maintenance projects, and donated recycled supplies at the project's end.

A 'win-win' situation for Valley Engineering and the University, this collaboration also benefits the public, since money spent to upgrade the Preserve trickled down to the Reserve. As both the CDFG and the NRS are Trustee Agencies, Californians received double duty out of the money they spent on this wetlands restoration project.

Cold Canyon Reserve Expands: Mr. and Mrs. Petro Vlahos of Lake Hughes have donated 143 acres as an addition to the Stebbins Cold Canyon Reserve. The University is purchasing another 159 acres from Mr. and Mrs. Vlahos for \$54,000, and a fund-raising campaign for that amount is underway.

The new parcel includes about one mile of ridgeline along the western edge of the Reserve—an inner coast range site located on the northern slope of the Vaca Mountains near Lake Berryessa. It also adds an improved spring.

Petro Vlahos inherited the property from his father, John Vlahos, an immigrant from Greece who homesteaded



SNARL's newly completed housing facility, shown in foreground, adds living space for 28 researchers and students based at this eastern Sierra Nevada site.

the site in the late '30s. Living in a small hand-built cabin, John herded goats on the property and made cheese which he sold in town.

The NRS thanks Petro and Virginia Vlahos for their generosity in adding their property to the Cold Canyon Reserve.

■ Additions

SNARL Houses More: The Sierra Nevada Aquatic Research Laboratory (SNARL) opened its new housing unit on March 15. The 2,000-square-foot building can accommodate up to 28 people in 5 bunkrooms, a co-ed restroom with private showers and toilets, a large dining room and work/study area, and a communal kitchen. A laboratory addition with walk-in cold room will be completed this summer.

The facility was built, in part, with a \$95,000 2-year grant from the National Science Foundation's Biological Research Resources Program (see *Transect*, Vol. 3, No. 1). Reserve Manager Dan Dawson provided yeoman services for all phases of the project from conceptual design and grant writing through construction.

The first to use the housing facility were researchers from UC San Diego and UC Los Angeles for their on-going study of the lekking behavior of sage grouse. In addition to providing more space at SNARL for researchers, the facility is also available for field classes engaged in studies of the habitats at nearby Valentine Camp, which cannot accommodate large groups overnight.

For more information on SNARL's new housing facility, contact Dan Dawson, Route 1, Box 198, Mammoth Lakes, CA 93546, (619)935-4334.

Rebuilding Big Creek: Last summer's wildfire (see *Transect*, Vol. 4, No. 1) destroyed all of the Landels-Hill Big

Creek Reserve facilities save for the gatekeeper's cabin, a storage shed, and the Boronda back-country campground. In the months since, Reserve personnel have been busy planning for new facilities, including a Reserve headquarters with housing and laboratory space, and new and restored camps and bridges.

The steward's cabin—an 875-square-foot, one-room residence—was rebuilt this winter on the ridge just above the gatekeeper's cabin. In addition, a large house trailer was installed on the adjacent Gamboa Point Ranch to accommodate the resident reserve manager.

Redwood Camp—located a mile up Devil's Creek—was restored this spring and is now available for classes, as is a temporary campground installed last fall under the bridge at the mouth of Big Creek. The Reserve has also acquired a 17-foot mobile trailer, which is available for researchers to use in the field.



Big Creek's new steward's cabin, which sits atop a 600-foot ridge overlooking the Pacific, is one of the facilities rebuilt since the fire.

Granite Mountains Adds Trails, Cabin: Early this year, the University began constructing a ridgeline trail system at the Granite Mountains Reserve. A remote eastern Mojave Desert Range, the Granites are a high-elevation habitat 'island' in a 'sea' of low-elevation arid habitats. The Reserve serves as a field site for classes and research teams studying both the range and the surrounding desert region.

Designed to connect the Reserve's major base stations, the new trail system will make the range's remote highlands more accessible. One trail will lead east and south from the Granite Plateau to Granite Cove; another will branch off from this trail to Cove Spring, at the eastern base of the range. And, pending approval from the Bureau of Land Management, a third will head northeast from the Plateau to Dorners Camp.

Three undergraduates from UC Santa Cruz have blazed the entire trail system and are in the process of constructing the Granite Cove component. When complete, the three trails will provide students and researchers access to the entire ridge. And, by allowing rescuers to reach remote areas of the ridge more easily in an emergency, the trails will also serve as a safety feature.

Researchers are already using the incomplete trail system to reach the Reserve's newest facility, Château Plateau. On January 25, a collapsible cabin was airlifted by helicopter and assembled atop the Granite Plateau, in the southwestern part of the site. This temporary 120-square-foot structure is equipped with two collapsible bunks, a table, a sink, and a stove. A nearby spring provides water.

The first to use Château Plateau is a team of UCSC undergraduates conducting a survey of the biota of the plateau and the high altitude reaches of the range. Their work will form the basis for future management decisions, particularly regarding cattle grazing, habitat restoration, and preservation of the Granite's population of Big Horn sheep.

■ Events

Natural Areas Association

Holds Conference: Last fall, the Natural Areas Association (NAA) held its annual conference in Oregonia, Ohio. About 250 members attended the 1985 meeting, which included sessions on management-plan development, restoration ecology, and reserve monitoring.

A non-profit professional organization, the NAA grew out of a movement



of resource professionals who gathered to exchange information and explore new methods for protecting natural areas. Today, the NAA comprises more than 650 resource managers, scientists, naturalists, and interested individuals from the public and private sectors. At the meeting, Dan Cheatham—field representative for the NRS—was elected to its 15-member board of directors.

In addition to sponsoring an annual conference, the NAA publishes the *Natural Areas Journal*. This national quarterly includes articles on current research, land-preservation techniques, and environmental law, as well as book reviews, editorials, and notices of upcoming symposia and meetings.

For more information, contact the Natural Areas Association, 320 South Third Street, Rockford, IL 61108, (815)964-6666.

Friends of the NRS: As part of its twentieth anniversary celebration the NRS kicked off its Friends program in December with several field trips in the late winter and early spring. Among the upcoming activities planned are tours of the following reserves: Dawson Los Monos Canyon, James San Jacinto Mountains, San Joaquin Freshwater Marsh, Scripps Shoreline-Underwater Reserve, and the proposed Santa Monica Mountains Reserve. In addition, an open house of the Valentine Eastern Sierra Reserve will be held July 27 as a benefit for the Mammoth Lakes Hospital Auxiliary. Tickets and information are available by calling (619)934-4303.

For more Friends information, contact the systemwide NRS office (see back page).

■ People

Pritchard Visits the NRS: Thomas Pritchard, Director for Wales of the British Nature Conservancy Council, is spending spring semester at UC Berkeley as a visiting professor. In addition to teaching a seminar on the design and management of nature reserves in the United Kingdom, Pritchard is pursuing several special projects for the Natural Reserve System. He has visited a variety of NRS reserves, including Santa Cruz Island, Jepson Prairie, and the Granite Mountains.

Pritchard, who received his Ph.D. from the University of Leeds, has done extensive research involving cytogenetics, plant ecology, environmental management, and environmental education. In 1982, he chaired the Welsh Committee of the World Conservation Strategy.

As director of the Welsh Nature Conservancy Council, Pritchard is responsible for the management of more than 4,000 National Nature Reserves and Sites of Special Scientific Interest encompassing nearly 8 percent of the Welsh countryside.

Nuevo Rangers: The NRS welcomes two rangers assigned to the California Department of Parks and Recreation's Año Nuevo State Reserve. Steve O'Brien is now Chief Ranger for the San Mateo Coast Area, based in Half Moon Bay. And Gary Strachan recently became Supervising Ranger for Año Nuevo State Reserve, located on the coast 20 miles north of Santa Cruz. Both work closely with NRS personnel.

The Año Nuevo State Reserve consists of the 8-acre Año Nuevo Island and 28,000 acres of the adjacent mainland, which is open to the public. UC Santa Cruz undergraduates lead public tours of the mainland during elephant seal breeding season. The island has been available for scientific use as part of the NRS since 1967.

The University has enjoyed a symbiotic relationship with the Department for years, and looks forward to developing it further with the two new rangers. Welcome, O'Brien and Strachan!

Bodega Gets New Director:

James S. Clegg, a professor of biology, anatomy, and cell biology from the University of Miami, became the new director of the Bodega Marine Laboratory (BML) in January. He succeeds Cadet Hand, a UC Berkeley professor of zoology, who retired in June of 1985.

continued on next page

Opportunities

Research Fellowships in the Eastern Sierra

The Valentine Eastern Sierra Reserve will sponsor one or two undergraduates interested in doing independent research at Valentine Camp this summer. Each student will receive six units of academic credit, free housing in a rustic log cabin at Valentine Camp, and a part-time reserve maintenance job.

Applicants for this summer's program, which will begin mid June, must have a specific proposal and a faculty sponsor. For more information, contact Reserve Manager Dan Dawson as soon as possible at the Valentine Eastern Sierra Reserve, Route 1, Box 198, Mammoth Lakes, CA 93546, (619)935-4334.

Mead Mini-Grants Available

Do you need money for your reserve-based research? The Giles W. and Elise G. Mead Foundation is awarding grants of up to \$1,000 to students doing field research on NRS sites.

The Mead moneys, which are administered out of the systemwide NRS office, are to help fund fact-finding projects that will generate the data needed to make informed decisions affecting the management of NRS sites.

The grants have no application deadline; proposals will be considered as long as money is available. The funds are to cover expenses such as travel, data processing, and minor equipment costs. Grant moneys may also be used in producing the final report, which must present the findings and recommendations in a form useful to reserve managers and NRS administrators.

For more information, contact Dan Cheatham in the systemwide office.

News and Notes—continued

Administered by UC Davis, BML serves as a research and instruction center for marine sciences, both basic and applied. Current research programs fall into one of three major areas: marine biology, fisheries, and aquaculture; all emphasize population and organismal biology.

As director of BML, Clegg will oversee both the Laboratory and the surrounding Bodega Marine Reserve. This 416-acre site on Bodega Head includes coastal prairie, active coastal dunes, coastal brackish marsh, tidal mudflats, and both exposed and protected sandy and rocky shoreline habitats. It serves as a national baseline monitoring and intercalibration site for the US Mussel Watch Program, as well as a control site for an international research project studying shorebird migration between North and South America.

A member of the University of Miami faculty since 1962, Clegg received his bachelor's degree in zoology from Pennsylvania State University and his doctor's degree in biology and biochemistry from Johns Hopkins University. His research interests include physiological and biochemical adaptations of organisms to extreme environments.

Coon Directs EHSO: In November, Dave Coon became the new director of the UC Santa Barbara Environmental Health and Safety Office. Coon has served as manager of the Coal Oil Point and Carpinteria Salt Marsh Reserves since 1980, and will continue in this capacity. As director of EHSO, Coon will also oversee environmental sanitation, pesticide use, carcinogen and biohazard safety; he will closely monitor the impacts that offshore oil drilling have on the Santa Barbara campus and reserves. Congratulations, Dave!

Deep Canyon Directors Receive Conservation Awards: Drs. Wilbur Mayhew, Director of the Philip L. Boyd Deep Canyon Desert Research Center, and Allan Muth, Resident Director of the Reserve, have been recognized for their efforts in securing habitat for the Coachella Valley fringe-toed lizard, an endangered species.

Last year, the Riverside County Board of Supervisors and the Desert Protective Council gave each awards for their contributions toward preserving the species and establishing the Coachella Valley Preserve System.

And on April 25, 1986, Muth received the prestigious Silver Eagle Award from the U.S. Fish and Wildlife Service Department of the Interior for his involvement.

For more information on this project, see story on p. 4.

Free Subscription

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

In a broad sense, the Natural Reserve System is also a transect. It encompasses a cross-section of California's natural diversity in a system of natural areas and field stations specifically reserved for teaching and research. Recognizing this, we have chosen to call our newsletter the Transect. For a free subscription—two issues per year—write or phone the systemwide NRS office: (415)644-4211; ATSS 8-532-4211.

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04-UJ14

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