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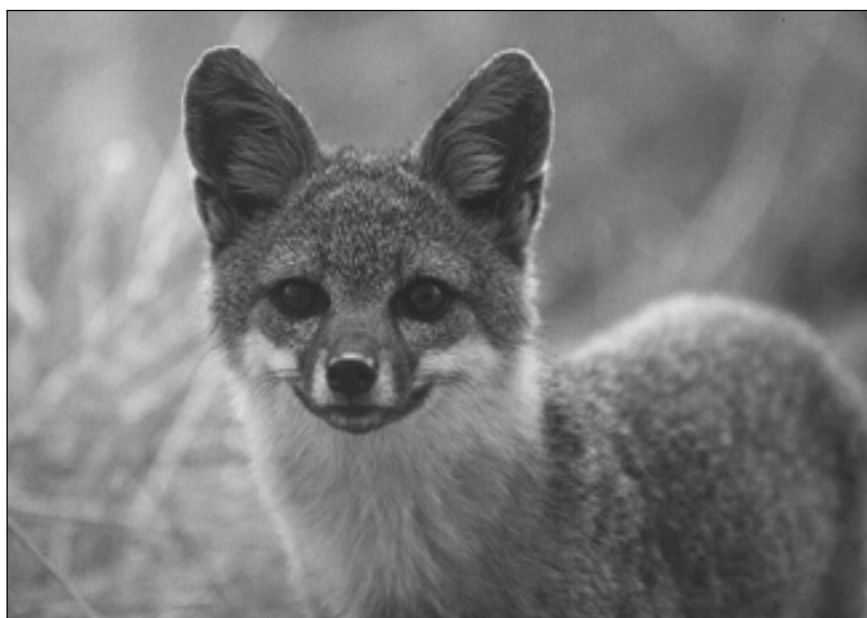
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A few words from the Director of the NRS

The NRS systemwide Mathias Graduate Student Research Grants program, now in its fifteenth year, has supported more than 200 research projects. In this issue of *Transect*, a sampling of such projects is seen in the account of the first-ever Mathias Symposium (page 6), while the opening story (page 1) describes the outstanding research on the island fox by two-time Mathias award recipient Gary Roemer and his colleagues.

In 1993, the estimated populations for the endemic fox on San Miguel and Santa Cruz Islands were 350 and 1,312 adults, respectively. By 1999, only 15 adult foxes were known to be alive on San Miguel and an estimated 133 on Santa Cruz. Roemer and his colleagues carried out a series of meticulous studies from 1993 to 1999 and concluded

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Santa Cruz Island fox. Photo by Gary Roemer

NRS research that revealed collapse of island fox population now focuses on halting species extinction

Developing a sound conservation strategy ... depends upon gaining demographic and genetic information for all populations of concern prior to the onset of any irreversible population declines. — Gary Roemer, 1994

Biologist Gary Roemer and his field assistant, Jeff Howarth, were stuck. January 1995 was the wettest month in recorded history at the NRS reserve on Santa Cruz Island, largest of the California Channel Islands. The pair were on the island to do fieldwork for Roemer's UCLA doctoral dissertation on the island fox (*Urocyon littoralis*). Twice each month for a year, they had journeyed out to Fraser Point at the west end of the island, set up camp in an NRS trailer, and collected data on the social structure and mating behaviors of a fox population that roamed the bluffs above the point.

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NRS research

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But once the rain began to fall that January, it didn't stop all month. "There was literally water running off the hill-sides," Roemer recalls. Not only was the road to their study site impassable, the road to the boat landing was also underwater. The pair couldn't even get off the island. So they took refuge at the field station and waited. "We passed the time doing data entry," Roemer continues, "reading books from the library, and helping Brian [Guerrero, the reserve steward]."

Roemer was anxious to get back out to Fraser Point. There had been a number of fox mortalities the previous year and he was concerned: "The first mortality was May of '94. Then we lost three to four more from May through December."

Even after the rains eased up, the muddy roads were still impassable for several months into 1995. Finally, Roemer and Howarth decided to hike to their study site. When they arrived in February, they discovered there had been three additional mortalities during their absence. Roemer was sure he knew the cause.

"The forensic information at the kill sites was clear," he explains. "Each animal's pelt had been pierced, some had holes in their skulls, and that requires powerful feet and sharp talons. Also, the limbs were often 'degloved' [the skin pulled back from the flesh], and the sites were often littered with feathers and droppings. There was no doubt in my mind that golden eagles had done the killing."

The big question was, why now? Golden eagles (*Aquila chrysaetos*) were a mainland species. Though they had occasionally been seen passing over Santa Cruz Island since the late 1800s, they had never been known to nest there or on any of the other Channel Islands. Now the fox kills were occurring so frequently, the birds must have taken up residence on the island. During his two-year study, Roemer lost 21 animals, at least 17 of these confirmed golden eagle kills.

Roemer's discovery triggered a flurry of follow-up research throughout the Channel Islands. Five of the eight islands — San Miguel, Santa Rosa, Santa Barbara, Anacapa, and Santa Cruz — comprise the Channel Islands National Park, and Park Service biologists soon discovered similar dramatic declines of fox populations on San Miguel and Santa Rosa. As the fox's dire situation became clear, The Nature Conservancy (TNC), which owns and protects most of the island, and the National Park Service, which manages it, would launch an unprecedented effort to save the species and restore the damaged Santa Cruz Island ecosystem.

Present-day Santa Cruz Island

A journey out to Fraser Point, at the far west end of Santa Cruz Island, reveals the island's rugged terrain. Even in the best of weather, only the sturdiest four-wheel-drive vehicles can handle the "road" west, which offers gravel- and boulder-filled riverbed alternating with short sections of improved dirt road, open fields, and occasional near-vertical plunges into, and out of, deeply eroded creek beds.

The views along the way are spectacular: to the north, looming out of the haze on the mainland 40 miles away, are the Santa Ynez Mountains; to the south, rugged canyons plunge toward the ocean, their flanks still scarred from decades of overgrazing by sheep. "There are still places down there I've never seen," observes the reserve's director, Lyndal Laughrin. Quite a statement, considering he's been working on Santa Cruz Island and running its field station for over 30 years.

Fraser Point itself feels almost as much a part of the ocean as of the land — waves pounding on the unprotected coast, cold windy fogs blanketing the bluffs.

"This was one of the two study sites Gary [Roemer] had set up." Laughrin gestures to the open bluffs above the point. "He had a grid here and another one in the central valley to compare the populations at the two different sites." The foxes have been the focus of basic research on the island since the field station was established in 1965. Lyndal himself wrote his dissertation on them in the 1970s, before shifting his focus to restoration ecology. Three other UC graduate students had also done theses on different aspects of the animals' behavior and social organization. None of these earlier works noted any major declines in their population.

"Back in the eighties, there was a major effort to remove sheep from the island," Laughrin recalls. "Overgrazing had really devastated many of the hillsides. We thought with the sheep gone, the island foxes would do great."

But ecological matters didn't play out the way everyone had envisioned. Over the next ten years, the fox population on Santa Cruz Island dropped more than 90 percent, from 1,300 individuals in 1994, to 133 animals in 1999, to between 70 and 80 today. That translates, roughly, as one less fox every other day. But what could have caused this dramatic shift?

Apparent competition

Roemer, whose UCLA graduate research was partially funded by two NRS Mathias grants, is now a professor at

New Mexico State University, Las Cruces. In a recent phone interview, he recalled the breakthrough. “The first golden eagle I saw on Santa Cruz I flushed off a piglet it had killed,” he says. “Later, it hit me that the eagle had two prey. There’s a concept called ‘apparent competition’ that was developed in the 1970s. It states that when two prey species share a predator, one of the species may be well adapted to high predation pressure, while the other species may be more vulnerable.”

In this instance, the two prey species were island foxes and feral pigs, the latter descendants of domestic stock brought to the island in the 1850s. The two species didn’t compete directly, but, as golden eagle prey, the fox was at a disadvantage. It reproduced quite slowly (one litter of one to five kits per year) and even the cat-sized adults were small enough to be prey. Feral pigs (*Sus scrofa*), on the other hand, could

have large, multiple litters each year, and adults quickly became too big to serve as eagle prey.

Interestingly, one major winner of this ecological shift was a true island fox competitor. The island spotted skunk (*Spilogale gracilis amphiala*) population soared as the fox population declined. When Laughrin conducted his studies in the 1970s, he rarely captured a skunk in his fox traps. Today researchers capture more skunks than foxes.

Feral pigs may have initially attracted golden eagles to the islands, but the foxes turned out to be the easier prey. Stable isotope studies conducted on various Santa Cruz Island samples, including eagle breast feathers, revealed that the golden eagle diet consisted of 51 percent fox, 34 percent piglet, and 15 percent skunk.

Roemer realized immediately that the fox population on Santa Cruz Island was in great peril. In collaborating with researchers doing work on other Channel Islands, it soon became apparent that the same pattern was repeating itself in those locations as well. On San Miguel Island, the number of island foxes was found to be dropping dramatically—from 450 to 40 in four years. By 2001, only 15 foxes survived there.

The rescue plan

Fast forward to 2002. The current status of the island fox on Santa Cruz Island comes clear on a high ridge overlooking China Harbor. A series of six large chain-link pens — four walls and a roof — have been scattered along the ridge as part of a captive breeding program begun earlier this year. Inside each pen, hidden among large branches, is a pair of foxes. The animals aren’t shy; when humans approach, they peer curiously from their den to see if it’s time to eat. One of the pens holds five kits, a single large litter that represents the only successful mating so far at the Santa Cruz Island facility. With 17 foxes here, and 50 to 60 still in the wild, the population is on the verge of extinction.

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How an exotic species turned native predators into prey at Santa Cruz Island



The bald eagle disappears from the island due to DDT



The golden eagle arrives at the island and stays because of readily available prey, filling a niche that opened when the bald eagle disappeared

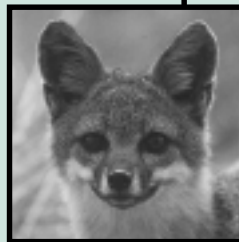


The island skunk — a predator itself, but largely spared eagle predation. As the island fox population is depleted, the skunk population rises

preys on



The feral pig, whose species is surviving golden eagle predation



The island fox — a predator, but its species cannot withstand golden eagle predation

(Photo of bald eagle by Brian Latta;
Photos of golden eagle, skunk, pig, and island fox by Gary Roemer)

NRS research

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On the next ridge is another nursery: a tall fledging tower that provides a panoramic vista for four bald eagle chicks. Bald eagles (*Haliaeetus leucocephalus*) once played a key role in the Santa Cruz Island ecosystem population and, because they fed almost exclusively on fish and carrion washed up on the beaches, they posed no threat to the foxes. In fact, many scientists believe the presence of bald eagles protected the island from encroaching golden eagles. But the once-common bald eagles disappeared from the Channel Islands in the 1950s, a decline believed to be the result of agricultural pesticides, primarily the insecticide DDT, dumped off the coast of Los Angeles into the ocean near Santa Catalina Island, about 75 miles southeast of Santa Cruz Island. The four bald eaglets on this fledging tower were hatched at the San Francisco Zoo from eggs taken on Santa Catalina. They were brought to the site to re-establish the Santa Cruz Island population. More chicks will be brought in over the next four years, 12 per year for a total of 60.

Elsewhere, predatory bird specialists are working hard to capture and remove the last three golden eagles nesting on the island. Since November 1999, 22 golden eagles (12 adults, 7 subadults, 3 chicks) have been captured and removed. The adults were radio-tagged and taken to the far northeast corner of the state. So far, none has returned to southern California. Each capture, however, has become more difficult.

“I knew it would get harder,” says Brian Latta of the Predatory Bird Research Group at UC Santa Cruz, “but I didn’t know it would get *this* hard. These birds are very smart and very cryptic. We have to constantly develop new capture techniques, because they won’t fall for the same trick twice.” The latest strategy — chasing the birds to exhaustion with a helicopter and then netting them when they land — has proven difficult on the island’s rugged terrain. The first week of work produced no new captures.

Meanwhile, thousands of feral pigs continue to roam the 96-square-mile island, and extracting them from the remote canyons will be extremely time-consuming. Under a Nature Conservancy effort beginning this fall, fences will be built that divide the island into six sections. The plan is that each year the pigs will be removed from one section until they’re all gone.

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The Prey: Island Fox

As often happens in island ecosystems, the island fox (*Urocyon littoralis*) evolved as a dwarf version of a larger species — in this case, the mainland gray fox (*Urocyon cinereoargenteus*). Island species tend to be smaller due to limited and uncertain food supply. About the size of a house cat, the island fox is omnivorous, feeding on insects, mice, birds, eggs, and fruit. Quick and agile, they are excellent climbers.

Their natural history is largely a result of what biologists call “jackpot selection,” a form of evolution unique to island ecosystems. It’s a jackpot because the food chain is created by random chance: whichever animals wash up on the island and survive become part of the system. At Santa Cruz Island, foxes and skunks are the largest surviving land fauna to make it from the mainland, crossing the channel about 15,000 years ago when the sea level was low and the four northern Channel Islands were a single land mass.

The fox has little reason to fear humans. The Chumash who arrived on Santa Cruz Island about 7,500 years ago co-existed with the foxes, even taking them as pets. It was the Chumash who carried the foxes to the southern Channel Islands. As late as the 1950s, humans made pets of the foxes, until the State of California gave them protected status.

The fox is native to six of the eight Channel Islands. Each island supports a genetically unique subspecies, and populations on all of the islands are in extreme danger. Currently, four subspecies have been recommended to be listed as endangered — on San Miguel and Santa Rosa Islands, where they are considered Extinct in the Wild (the only surviving animals being bred in captivity), and on Santa Cruz and Santa Catalina Islands, where the populations have dropped 90 percent over the last ten years. These recommendations were submitted to the U.S. Fish and Wildlife Service in December 2000 and are still pending.

Many scientists believe all six subspecies should be listed. They note that the San Clemente Island population has dropped 50 percent in ten years, while the San Nicolas Island population is now under 1,000 and contains so little genetic variability that it is vulnerable to potentially devastating diseases like distemper, which was passed to Santa Catalina foxes by house pets. — JB

The Predator: Golden Eagle

Golden eagles (*Aquila chrysaetos*) are large, with wingspans up to 80 inches, but they're not easy to spot. They nest in remote areas and disappear when they sense humans around. While hunting, they usually contour low along the ground, invisible to their prey (and to onlookers) until the last moment.

In the fall of 1999, researchers Brian Latta and Gary Roemer rappelled down to a nest on a steep canyon wall, looking for conclusive evidence that golden eagles were nesting on Santa Cruz Island and feeding on island foxes. The nest was huge — a foot-deep pile of sticks and branches, eight feet by three and a half feet, tucked into a “pothole” in the side of the cliff — and full of prey evidence: piglet bones, cormorant and gull feathers, and, significantly, two island fox mandibles. No eagle feathers were found that day, but the scientists collected a number of eggshell fragments. Tests later confirmed they had belonged to a golden eagle.

Santa Cruz Island is an unusual place to find golden eagles. Although they range over much of North America, from the Canadian Arctic to the deserts of central Mexico, no other population in the Western Hemisphere nests so near the coast. They prefer open woodlands and savannas, where they prey on small mammals, such as jackrabbits, prairie dogs, and squirrels, along with occasional birds and reptiles. One of their densest nesting populations is in the San Francisco Bay Area, near Altamont Pass.

The birds mate for life and often build alternate nests. On Santa Cruz Island, Latta later discovered a second nest right around the corner from the first, which the birds were apparently using every other year. When he reached it, he found two juveniles. An attempt to net the female with her young was unsuccessful, so Latta settled for moving the juveniles.

Currently, three golden eagles are still known to reside on Santa Cruz Island: the female described above and two others, thought to be her female offspring. Attempts to capture them will resume this October. Will that be the end of the story? Latta isn't so sure. “There have been a number of sightings on Santa Rosa Island,” he notes, referring to the next island in the chain. “We'll have to make sure they aren't nesting over there.” — *JB*

Future lessons

Island ecosystems have been crucial in the development of evolutionary theory. Beginning with Darwin's work on Galapagos finches, the rapid divergence of island species has fueled the fires of scientific debate on how life evolves. Islands have also served as major test cases for conservation strategies, because small population sizes and lack of genetic variation put island species at risk. Birds provide a good example of this. Fewer than 20 percent of all bird species are restricted to islands, but more than 90 percent of extinctions of bird species in historic times have occurred on islands, and 39 percent of all threatened bird species are island species.

Santa Cruz Island will be an important conservation story, because restoring a native ecosystem is like trying to put Humpty Dumpty back together again. All of the pieces must fit into place — the pigs and golden eagles successfully removed, the bald eagles reintroduced, and the island foxes restored — to reconstruct a species assemblage long since lost.

As animal populations throughout the world become fewer in numbers and more fragmented, the chances of entire food chains suddenly collapsing become greater. This is why it is crucial we do basic research on the animals that survive today to acquire an understanding of a species before it reaches a crisis.

It has taken eight years for us to assess and respond to the plight of the island fox. During that time, their situation has become much more desperate. Roemer observes: “The government has to be able to respond to scientific input much more quickly, in six months rather than four to five years. We also need to facilitate basic research before we get to a crisis like we have today. Without a basic understanding of how the system functions, we will be unable to institute any mitigating actions.” — *JB*

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First Mathias Symposium highlights graduate research

Graduate research, like professional research, requires quick adaptation, hard work, and careful observation. Its demands became evident when eleven recipients of the Mildred E. Mathias Graduate Student Research Grants for 2000-2001 gathered this past March at the NRS's Motte Rimrock Reserve, outside Perris, California, to discuss their research at the first-ever Mathias Symposium.

Mary Brooke McEachern, of UC Davis, planned to study a healthy population of dusky-footed woodrats near Eagle Lake. When she discovered the population was actually in steep decline, she had to switch gears, but soon adapted her research to examine the population's response to increased isolation.

When Stephanie Romañach, of UC Santa Barbara, set out to study the so-

cial interactions of pocket gophers (*Thomomys bottae*), she had no idea she'd need a backhoe to dig a kilometer of trench lined with wire mesh to control the subjects of her study. She's still trying to perfect techniques for tracking their extensive tunnel systems.

Aviva Liebert, of UCLA, and her advisor wanted to study paper wasps in their natural environment (rather than in nests on humanmade structures) in the Santa Monica Mountains, but she soon faced a major problem: she couldn't find them. Only after much careful observation did she discover their nests hanging in cracks in the dried soil.

This first Mathias Symposium was supported by the Kenneth S. Norris Endowment Fund for the California Environment provided to the NRS by the David and Lucile Packard Foundation. NRS

Systemwide Director Alexander Glazer, who conceived of the idea, was pleased by the outcome of the weekend event. "The diversity and quality of the presentations was excellent, really tremendous," he observed. "But almost as important was the opportunity the students had to interact with their peers and share their research experiences. The contacts they make at events like this can be extremely valuable later on in their careers."

Glazer notes that, by participating in the Mathias Symposium, students come to appreciate that in addition to belonging to a particular campus unit, they are also members of the Natural Reserve System graduate student community, a community with high respect for the complexity and value of field research.

As well as making their own presentations, participants also had the opportu-

Graduate student presenters at the first Mathias Symposium

From UC Berkeley —

Lisa Grubisha, *Analysis of gene flow in mainland and island populations of the ectomycorrhizal fungus* (*Rhizopogon rubescens*), at Santa Cruz Island Reserve.

Kenwyn Blakeslee Suttle, *Consequences of altered hydrologic regimes for a north coast California grassland community*, at Angelo Coast Range Reserve.

From UC Davis —

Collin A. Eagles-Smith, *Size plasticity in Daphnia pulicaria: evidence of parasitoid-derived chemical mediation?*, at Eagle Lake Biological Field Station.

Mary Brooke McEachern, *The genetic consequences of mating system variation in the dusky-footed woodrat* (*Neotoma fuscipes*), at Eagle Lake Biological Field Station.

Evan Preisser, *Moisture-mediated interactions in a two-predator trophic cascade*, at Bodega Marine Reserve.

From UC Los Angeles —

Aviva Liebert, *Reproductive flexibility in the paper wasp* (*Polistes aurifer*), at Stunt Ranch Santa Monica Mountains Reserve.

From UC Riverside —

Sharon J. Coe, *How does water availability affect reproductive success in desert birds? A test using water supplementation in the black-throated sparrow* (*Amphispiza billineata deserticola*), at Sweeney Granite Mountains Desert Research Center.

Amy E. Lindahl, *Seasonal and spatial shifts in patterns of ecto- and arbuscular mycorrhizae associated with coast live oak* (*Quercus agrifolia*) and grasslands in a southern California ecosystem, at Emerson Oak Reserve.

Abby Glenn Sirulnik, *Effects of nitrogen deposition on nutrient cycling in exotic annual grasslands and chaparral communities in southern California*, at Motte Rimrock Reserve, Box Springs Reserve, and Emerson Oaks Reserve.

From UC Santa Barbara —

Stephanie Romañach, *The influence of body size, resource abundance, and social interactions on movement patterns*, at Sedgwick Reserve.

Sean Mark Watts, *The evolutionary response of plants to root herbivory*, at Santa Cruz Island Reserve.



David Wake, UC Berkeley, and Mike Scott, University of Idaho. Photo by Jerry Booth

nity to interact with two leading field researchers, David Wake from UC Berkeley and Mike Scott from the University of Idaho. Wake and Scott provided feedback on the student presentations and discussed their own work.

Wake, a professor of Integrative Biology and curator of Herpetology at UC Berkeley's Museum of Vertebrate Zoology, discussed the tremendous effort currently underway to identify amphibians around the world and assess the factors that threaten their existence. A key challenge, he noted, is the lack of adequately trained researchers in all areas of the globe and their tremendous isolation. To foster communication among researchers and with the general public, Wake's team created a website that contains up-to-date informa-

tion from experts around the world, AmphibiaWeb: <<http://elib.cs.berkeley.edu/aw/>>.

Scott, a professor of Wildlife Resources and unit leader of the USGS Idaho Cooperative Fish and Wildlife Research Unit at the University of Idaho, has done extensive ground-breaking work on the effectiveness of current reserves in protecting endangered species. "We're preserving rocks and ice," Scott noted, "while two-thirds of endangered species occur on private property." Scott proposes the development of a coherent national policy that will maximize the effectiveness of the efforts to protect threatened plants and animals.

Both men also participated in a final discussion on careers, relating their own professional experiences and giv-



The NRS's Mathias Graduate Student Research Grants were named for the late Mildred E. Mathias, a professor of botany at UCLA and "founding mother" of the reserve system. Photo by Norden H. (Dan) Cheatham

ing students an opportunity to share their career concerns.

UC grad students net national awards

The quality of biological field research conducted by UC graduate students at NRS reserves becomes evident when one looks at their success with national award programs. For example, the Canon National Parks Science Scholars Program, which supports grad students conducting dissertation research in the National Park System, is widely regarded as offering the most prestigious research grants available at that level — \$75,000 to each student, \$25,000 per year. Of the eight Canon winners selected for 2002, two work extensively at NRS reserves:

Blake Suttle, of UC Berkeley, who also won a Mathias grant for 2000-2001, is studying the effects of global climate change in northern California grassland communities. He has test plots at Redwoods National Park and the NRS's Angelo Coast Range Reserve in Mendocino County. His goal is to test the predictions of leading climate change models by taking measurements of the grassland plants, herbivores, detritivores, and predators.

Elizabeth Brusati, of UC Davis, who is studying the interaction among introduced species in salt marshes, works at multiple sites, including the Point Reyes National Seashore and the NRS's Bodega Marine Reserve on the Sonoma County coast. She is focusing on Atlantic cordgrass (*Spartina alterniflora*), an introduced species from the east coast of the United States that is dramatically changing California's sensitive marine estuaries. — JB

Mathias graduate research grants provide up to \$2,500 to support UC-enrolled students conducting independent and field science studies at NRS reserves. Since its inception in 1988, the program has awarded 201 grants worth more than \$300,000. Information on current winners, as well as grant applications and procedures, can be found on the Web: <http://nrs.ucop.edu/info/grants_awards/grants.html>. Applications for this year's awards are due to NRS campus representatives by October 24, 2002. — JB



Sedgwick Reserve's historic buildings are still in use, but the long-planned-for, now-funded Tipton Meeting House will greatly improve opportunities for all educational, research, and cultural site users.

Art by Margaret L. Herring

Big gift will make big opportunities possible at Sedgwick

A long-held dream started to become reality for the NRS's Sedgwick Reserve when earlier this year the J. E. and Lillian Tipton Foundation granted a gift to that 5,896-acre, Santa Barbara County site: \$1.4 million to cover construction of its central gathering place, the first of several buildings proposed in its long-range master plan.

Sedgwick Reserve, administered by UC Santa Barbara, has been available since 1997 for teaching, research, and public service activities. Director Michael Williams describes the Tipton Foundation's contribution of his reserve's keystone building as "the critical first step towards realizing the collective vision of both the surrounding community and the University of California." In honor of its benefactors, the building will be designated the Tipton Meeting House.

The Tipton Meeting House will host more than 6,000 visitors each year, offering a formal classroom area for university classes, research meetings, public workshops, and K-12 outreach programs. The meeting house will also feature a spacious front porch and two smaller rooms — one intended to hold the reserve's natural history collection and

the other designed as a workshop area. The facility will be located prominently near the entrance of the reserve.

"To be able to make a gift to the Sedgwick Reserve is truly a blessing," a spokesperson for the J. E. and Lillian Tipton Foundation said, "for we know that this gift will have an enduring impact on teaching about and preserving nature."

The vision of the Sedgwick Reserve's long-range master plan blends the character of the historic, 150-year-old Sedgwick Ranch with a modern UC research and public education facility. To retain the original "feel" of the Sedgwick Ranch, which was named for Francis Minturn "Duke" Sedgwick and his wife, Alice de Forest Sedgwick, who acquired the property in 1952, the architecture of the Tipton Meeting House will be designed in traditional California ranch style, an aesthetic expression reflected throughout the entire Sedgwick village.

All new construction at the Sedgwick Reserve will follow sustainable and "green" design principles and, as such, will serve as a design model on the central coast of California. Use of recycled materials and energy efficiency will be

emphasized. Heating and cooling of structures will incorporate passive as well as active systems and will be environmentally monitored. Construction features will be highlighted with displays and signage. In keeping with this sustainable design approach, the Tipton Meeting House will offer both enclosed winter space (created using roll-down, wooden doors) and shaded, open summer space for additional activities.

NRS Systemwide Director Alexander Glazer summarized the significance of the Sedgwick Reserve and the Tipton Foundation's gift to this site: "The Sedgwick Reserve typifies all that is best about the Natural Reserve System. It attracts and rewards a large and diverse community of users from talented scientists to landscape painters, from graduate students to schoolchildren. This gift will provide not only a facility essential to the reserve's future, but also an inspiration for others." — SGR

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Land preserved, funds gained for Valentine Reserve

When potential donors consider giving land to the NRS, they are often trying to preserve a threatened ecosystem from development. So what can happen when a donor has a piece of ecologically valuable land that won't work as an NRS reserve?

Dan Dawson, reserve director for both Valentine Camp and the Sierra Nevada Aquatic Research Laboratory (SNARL) — the two component sites of the Valentine Eastern Sierra Reserve (VESR) in Mono County — faced this dilemma recently when a representative of the Haddad Family Trust contacted him regarding some land the family owned in the San Joaquin Valley.

"I got a call out of the blue from an accounting office in Encino," Dawson recalls. "They represented the Haddad family, who were prosperous Bakersfield farmers. The parents had passed away recently and their heirs were no longer interested in farming, so they were selling off the land. Already they had sold everything, except two parcels that totaled about 197 acres. The family was interested in donating these parcels to benefit the Valentine Reserve."

His interest piqued, Dawson drove down from his reserves near Mammoth Lakes to look at the Haddads' property, located in the Caliente Wash just outside Bakersfield. He soon realized it contained the federally listed Bakersfield cactus (*Opuntia basilaris*) and was perfect habitat for a number of endangered animals — the Tipton kangaroo rat (*Dipodomys nitratoideus nitratoideus*), the San Joaquin kit fox (*Vulpes macrotis mutica*), and the blunt-nosed leopard lizard (*Gambelia silus*). He also knew The Nature Conservancy (TNC) had established the nearby 270-acre Sand Ridge Preserve in 1965 to preserve similar habitat.

But how could Dawson preserve *this* habitat and, at the same time, benefit Valentine if the land was not to become part of the NRS? After making a few phone calls, he came up with a plan.

Nearby Bakersfield is one of the fastest growing metropolitan areas in the state. To mitigate the impact of this growth, the city established the Metropolitan Bakersfield Habitat Conservation Plan (MBHCP). Developers pay impact fees on each new subdivision or building, which MBHCP then uses to fund habitat acquisition and management. Since 1994, the city has used the funds to acquire more than 4,000 acres of habitat.

Dawson contacted the MBHCP Trust Group to see if they would be interested in purchasing and preserving the Haddad property, appraised at \$150,500. Their response, after field trips and agency encouragement orchestrated by Dawson, was positive. Dawson then discussed his idea with Margaret Haddad Abdun-Nur, executor of the Haddad Family Trust. She liked the idea of selling the land to benefit Valentine.

From that point on, the deal went relatively smoothly. The Regents of the

University of California received the land as a gift from the Haddad Family Trust, then sold it to the California Department of Fish and Game, with funds provided by MBHCP. California Fish and Game now holds the land and will manage it as endangered species habitat.

Because the gift is unrestricted, Dawson has the flexibility to use the funds to meet his reserve's most critical needs. His goal is to build up an endowment to fund Valentine in perpetuity. "We intend to use the proceeds as a cornerstone donation to grow a significant endowment," he says. "In the beginning, the modest annual return on the funds will be used for critical reserve staffing needs, but in the long term, I hope to put the entire program on a much stronger financial footing." — JB

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Bleak and windswept, the Haddad land near Bakersfield (*left*) is excellent habitat for the federally endangered Bakersfield cactus. The Bakersfield cactus is shown here (*above right*) being examined by Greg Warick, manager of the adjacent Sand Ridge Preserve, established by The Nature Conservancy in 1965 and now administered through the Center for Natural lands Management. Photos by Dan Dawson

Southern California marsh restoration receives another boost from the state Coastal Conservancy

The California Coastal Conservancy continued its strong support for the NRS's San Joaquin Marsh Reserve when, earlier this year, it awarded \$330,000 to fund the planning for the second phase of a program to restore the Orange County reserve.

The award will cover the cost of developing a feasibility study, conducting environmental reviews, consulting with permitting agencies, and preparing final construction designs and contract documents to complete the marsh restoration project. According to Faculty Reserve Manager Peter Bowler, one goal of the Phase II Enhancement Project is to "mimic the historic hydrology of the 150-acre marsh pond system and establish an upgraded connection between the ponds and other areas within the marsh."

Phase I of the project was initiated in 1997 with funding from the California Coastal Conservancy, the League for Coastal Protection, the San Joaquin Hills Transportation Corridor Authority, and the Irvine and Clarke Foundation. The work, which included enhancement of a number of seasonal ponds and restoration of coastal sage scrub habitat, is now largely complete.

The increasing numbers of birds and other wildlife that use the restored area of San Joaquin Marsh are evidence of the success of Phase I. Phase I also had a major positive impact on the reserve's public outreach. "Inside the Outdoors," a K-12 education program run by the Orange County Department of Education, uses the restored area as a site for teaching elementary ecology to grade-school children. Last year the program brought more than 4,000 students and teachers to the marsh from over 50 Orange County schools.

Reserve Manager William Bretz is still amazed at how well this development worked out. "It was real serendipity," he says. "We were more focused on restoring the area as a habitat, but it's ideal for introducing kids to the environment. And because it's on the edge of the reserve, they can get in and out without disturbing any of the research."

Karen Bane, the Coastal Conservancy's project manager, was very enthusiastic about providing continued support for the marsh restoration: "We've been working on this project with the University for many years, and Phase II really represents the culmination of all the work up to this point. ... I love managing this project and get down there every chance I can. It's great seeing the wildlife coming back since the completion of Phase I ... the incredible variety of resident and migrating birds nesting there. There are herons and ospreys, and California gnatcatchers are nesting in the scrub restoration on the bluff."

Bane has also been impressed by the reserve staff's commitment: "When some of the initial vegetation the contractor planted during Phase I didn't take, the reserve staff took it upon themselves to replant it. And this has turned out for the better, because now the plants are at different stages of development, and that's much more natural."

In contrast to Phase I, which restructured undesirable sediment elevations and plant communities, a primary goal of Phase II is to retain a large area of the historic, old-growth emergent vegetation (cattails) and its underlying sediment sequence, which has irreplaceable values for research into wetlands biophysical processes, according to Mike Goulden, UC Irvine professor in Earth Systems Science. Phase II will involve removal of several acres of

unnecessary dikes and roadways, as well as elevation adjustments to create the possibility for eventual restoration of natural tidal influence in the lowest portion of the marsh. Other Phase II components will provide additional open water, better control of water movement and depth, and improved connections between existing ponds.

From a regional perspective, the restoration of San Joaquin Marsh is part of the Coastal Conservancy's Southern California Wetlands Recovery Project, an alliance of federal, state, and local officials working with business and non-profit organizations to acquire, restore, and expand coastal wetlands and watersheds throughout Southern California.

The San Joaquin Freshwater Marsh Reserve represents one of the last remnants of the freshwater wetlands that once covered much of Orange County's floodplain. Located in an ancient river-cut channel at the head of Newport Bay, the reserve supports a variety of wetland habitats, including freshwater marshlands, shallow ponds, and channels confined by earthen dikes. Dry upland habitats with a remnant coastal sage scrub community rise on the margins of the reserve. The marsh is a critical stopping place for 100 migratory bird species using the Pacific Flyway. Altogether, more than 200 bird species (20 nesting) have been sighted in the reserve. The marsh is located within a ten-minute walk from UC Irvine, making it convenient for day use by faculty and numerous students. — JB

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State Coastal Conservancy's support to NRS reserve in Northern California enables a public outreach program

Over the years, the California Coastal Conservancy has offered crucial support to the NRS, providing funds for land acquisition, habitat restoration, and the development of outreach programs. Just last year the conservancy contributed \$268,392 so that the NRS could acquire 339 acres of inheld parcels at Quail Ridge Reserve on Lake Berryessa in Napa County. At the same time, they provided \$22,500 to establish a docent program at nearby Stebbins Cold Canyon Reserve.

Virginia "Shorty" Boucher, who manages the UC Davis reserves, explains: "Stebbins has a long history of public access, so they [the conservancy] decided it would be better to enhance access there, rather than at the biologically more vulnerable Quail Ridge site. These funds have allowed us to jumpstart the outreach program."

Under Boucher's guidance, the conservancy's outreach funds (along with matching monies from the NRS systemwide office) have been well spent. Her first step was to hire Helen Kota to develop the docent program. "When I wrote the job description," Boucher recalls, "I had this perfect person in mind. And when Helen walked in the door, she had it all: she's well connected in the community; she's retired; she's been an educator her entire life and has run a mentor program; she's done K-12 outreach around the country. I check in once a week, but she really runs the program on her own."

Conservancy funding pays a quarter-time salary to Kota for two years. In less than a year, she recruited about 20 docents, arranged for their training by University researchers, and set up a schedule of guided tours two days a week as long as the weather allows. Her current plans include bringing in a new



At Stebbins Reserve, docent coordinator Helen Kota, docent Shirley Jensen, and volunteer Jim Plehn examine a tree that is home to an ant colony. They are tapping on the tree to bring the ants out. Photo by Virginia Boucher



Reserve director Boucher sits on a small bridge that spans a spring intersecting the new trail she mapped out for Stebbins Reserve. Photo by Shane Waddell

group of docents and coordinating the Stebbins efforts with other groups doing outreach in the Putah Creek watershed.

In the meantime, Boucher and Reserve Stewards Shane Waddell and Dan Tolson mapped out a new trail that increases visitor access to Stebbins. "We financed it with systemwide funds [matching funds required by the conservancy]," she explains. "All I did was point. Shane and his crew from a nearby Department of Forestry camp did all the work, carrying in huge 4x4s to push the trail up to the top of the ridge. Now visitors can make a complete loop and enjoy dramatic views of Monticello Dam, Lake Berryessa, and the valley."

"The only problem," Boucher adds with a smile, "is that I get all these calls from people complaining how steep it is! There are a lot of switchbacks," she concedes, "so we're putting out a new trail map that includes the contour lines."

Kota and Boucher are working now with the Davis campus and a number of local, state, and federal agencies to make the Stebbins docent program permanent. — JB

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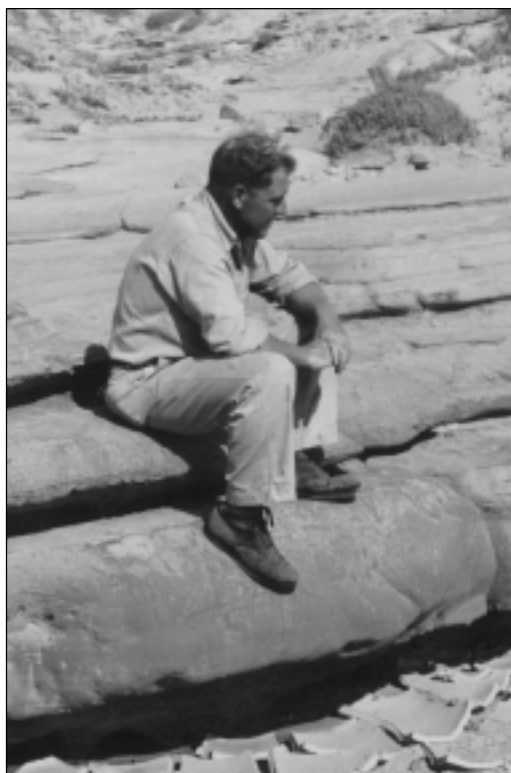
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NRS desert reserve becomes heir to the generous legacy of a true 20th-century explorer

Jim André, who directs the 9,000-acre Sweeney Granite Mountains Desert Research Center in San Bernardino County, always dreamed that his reserve would become a focus for the basic research that deepens our understanding of California's deserts. Over the last few years, his dream has come true ... almost too true!

"In just four years," he notes, "the number of active research projects at the reserve tripled from 30 to 90. We're one of the fastest growing field stations in western North America, which is great, but it's taxed our staff, facilities, and lands, especially on a limited budget that hasn't changed in nine years."

Fortunately, an "old friend" has come to André's aid, providing a much-needed financial boost to help him deal with the reserve's growing pains, while also offering a legacy that befits a life well lived. The friend is Al A. Allanson, and the most recent chapter of his story begins in 1994, when NRS founder Kenneth S. Norris decided to renew a relationship the pair had established during Norris's graduate school days at the Scripps Institution of Oceanography in San Diego.



Al Allanson ready to dive off the coast of Baja.
Photo by Sibyl Allanson

In the 1950s, Norris and Allanson had shared numerous adventures in the deserts of Mexico and the southwestern United States. Allanson had been a marine technician at Scripps, a great outdoorsman, and an intrepid explorer. He and his wife, Sibyl, had had many adventures working on assignments in such remote locations as Jarvis Island in the middle of the Pacific Ocean, the Australian outback, and the Arctic.

Allanson was a passionate man who set exacting standards for himself and others around him. His greatest passion was for Sibyl, but his love for nature was boundless as well. When Norris reconnected with him, Allanson was 75 and living alone in Colorado, since Sibyl had passed away a few years earlier. So Norris did what came naturally to him: he invited his old friend Al on an adventure.

Ken's brother, Robert M. Norris, a professor emeritus of geology at UC Santa Barbara who also knew Allanson from his time at Scripps, picks up the story:

Al Allanson on San Miguel Island, outermost of California's Channel Islands, November 1950. Photo by Robert M. Norris

“In 1995, Ken and I persuaded Al to take the train from Colorado to Barstow to join us on one of our sand dune trips. I hadn’t seen Al in more than 40 years, but he was easily recognizable... I took him out to the Bunny Club [the Norris brothers’ small cabin] in the Granite Mountains, where we joined Ken and some others for a wonderful camping trip down into the Algodones Dunes in Imperial County.”

The trip reignited a spark in Allanson’s life. He soon relocated to California and moved into a mobile home park in Moreno Valley. Allanson had always lived a frugal life — he often told stories of how he and Sibyl sometimes had to stop and pick vegetables to earn gas money so they could get home from trips.

Allanson’s new passion became the Sweeney Granite Mountains Desert Research Center, both the reserve and its staff. He started volunteering and helping at the reserve. André recalls: “We all loved to spend time with him, listening to his colorful stories and watching slides of his travels. Al had taken thousands of photos during his explorations and meticulously organized them into slide shows.”

The staff named the reserve’s laboratory center for him and his wife. The Sibyl and Al A. Allanson Library and Center includes a dining commons and researcher dormitories, an automated weather station, a library, a lecture hall, bibliographic and species databases, and plant and animal collections that support research and teaching. And now it holds all of Allanson’s personal ef-



Al Allanson apparently engrossed in a copy of *The Status Seekers*, Vance Packard’s classic analysis of the nature and development of social classification in the 1950s. Photo by Sibyl Allanson



The Sibyl and Al A. Allanson Library and Center at Sweeney Granite Mountains Desert Research Center: (*top*) a distance shot showing the residence building and laboratory in their dramatic natural setting and (*bottom*) a closeup of the residence building. Photos by Jim André

fects as well: 30 years of journals and photographs that provide a priceless look at the state of the environment in the middle of the last century. Whether it was the number of abalone on one of the California Channel Islands or the size and location of a Native American shell midden in Baja, Al Allanson was constantly assessing and recording information.

Allanson passed away in December 2001. His final contribution was to leave his entire estate of approximately \$600,000 to the Sweeney Granite Mountains Desert Research Center. André recalled his friend’s great generosity, achievements, and enduring modesty:

His donation is not just appreciated, it’s heroic. Before he died, I tried to explain this to him, but he was so modest and downplayed his role, just as he downplayed so many of his life achievements, which were extraordinary. I think deep down, though, he knew his donation was achieving something unique and special. His interest in nature was raw and true. He was simply compelled, so he didn’t understand when someone applauded his achievements and his observations.

Allanson’s final bequest is appropriate, for it will be used to deepen our understanding of the fragile desert that he loved so deeply. — JB

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Explorer and NRS benefactor Al A. Allanson lives on through three decades of journals and photographs

The journals of NRS benefactor Al A. Allanson sometimes read like a popular novel — part adventure story, part love story — filled with meticulous observations recorded during 25 years of fieldwork (from 1947 through 1972) in the North American deserts and throughout the Pacific basin. Al was one of the first deep-sea divers at UC San Diego's Scripps Institution of Oceanography, and his adventures ranged from being shipwrecked on an uninhabited island in the Gulf of California, to diving in sometimes frightening conditions in Alaska, to a three-month stay on Jarvis Island, a remote, treeless atoll 500 miles from Hawaii. Though his formal education ended when he graduated from high school, Al went on to become a crucial contributor to major breakthroughs in our understanding of oceans, deserts, and early Native Americans.



Al Allanson with his wife and fellow explorer, Sibyl Allanson, who regularly shared the hardships and adventures of his scientific assignments in remote locations. (Auto) photos by Al Allanson

Robert (Bob) Norris, UCSB professor emeritus of geology who did his graduate work at Scripps, met Al there in 1949 and recalled him in a recent letter: "Once Al joined Scripps, he quickly developed a reputation for personal reliability and meticulous attention to detail. After a run with the buoy boat (used for underwater surveys), Al would clean it thoroughly, check every detail, and be certain it was refueled and ready to go on the next assignment without delay... As a result, when Al was called on to record data, run the boat, or serve in other ways in fieldwork, everyone knew that it would be done with great care."

As a marine technician, Al worked with noted ichthyologist Carl Hubbs and marine geologist Francis Shepard. He also took another young graduate student, Ken Norris (the late UC Santa Cruz professor and NRS founder), under his wing. Bob Norris recalls: "Ken, who did his Ph.D. under Carl Hubbs, did various collecting trips for Hubbs in the Gulf of California, accompanied by Al. They had a series of wonderful experiences, some of which rather taxed Al's urge to see that everything was properly planned and nothing overlooked. Brother Ken was not famous for that sort of order and planning, and though Al respected and was devoted to Ken, he had to do what he could to keep disaster at bay, often with considerable difficulty."



Besides exploration, the other constant in Al's life was his love for his wife, Sibyl, who contributed regularly to the journal. Entries from the early 1950s describe a blissful life of poverty in which the couple enjoyed spending a full day cleaning the engine block of their old pickup. For many years, the pair worked odd jobs and saved all of their money to take month-long exploring trips. Their ideal vacation was a long desert camping trip spent searching for petroglyphs and stone tools. During one break, they had a fisherman drop them off on uninhabited San Miguel Island, the outermost of California's Channel Islands, for three weeks of beachcombing, hiking, and exploring the middens for arrowheads, beads, and tools.

Because of his reliability and self-reliance, Al was offered positions that required him to monitor scientific equipment in remote locales. His only requirement was that Sibyl be allowed to accompany him. "At first," Norris remembers, "those offering Al these positions were not keen on sending Sibyl along, too, but Al made it clear that he wouldn't go unless Sibyl also went... It was not unusual for the two of them to face serious water supply problems and sometimes a disgraceful lack of logistic support from those that sent them there. But they were so self-reliant and reliable that the data was collected without flaw."

Al and Ken Norris shared many adventures, rafting down the Colorado River, going on field expeditions to Baja, or just "bumming around" the desert. One of Al's journal entries from 1952 describes in detail how the two buddies, facing a few days without work, headed for the Anza-Borrego Desert. After a promising start filled with beautiful stars, intriguing evidence of bobcats, sidewinders, and birds, and a number of new archaeology sites, the two soon lost track of their position. It was only after a two-day, 50-mile hike, with little food and no sleeping bags, that Ken (who had sprained his ankle on this trek) and Al finally limped back to a run-down café. Allanson describes their rough night in the desert:

May 2 – Friday Santa Rosa to Borrego
"The Big Trek"
Norris and Allanson

...As we slid down the trail we heard toads or frogs and we knew we were at some water anyway. I soon recognized Hidden Springs and told Ken of the firewood I had seen there last week on my hike.



The Norris brothers, Ken and Bob, played a part in many of Al Allanson's adventures.

Left: Ken Norris on the trail with his students during a UCSC Environmental Studies field quarter in the late 1980s. Photo by Don Usner

Right: Bob Norris at the Kenneth S. Norris Rancho Marino Reserve, the NRS's 34th site (in San Luis Obispo County), during the spring of 2001. Photo by Chen Yin Noah

Refreshed by the cool water and a slice of bread we lay down by the campfire... As we rested, our muscles became more stiff... I knew what a long hike awaited us in order to reach Borrego the next day before the intense midday heat began. I suggested we walk awhile in the night.

With extreme effort we began hiking again. At a quarter to 12:00 we were staggering like drunk men and agreed that we were expending more effort than it was worth.

Ken built a fire and we slept beside it. A fair amount of moonlight had made it possible to make fairly good time walking, but I knew how far we had to go yet and it caused me concern as I rolled on the cool sand.

A more restless night I can't remember. I grew colder as the night wore on. One side of me kept warm while the other shivered. As the fire died down I rolled closer in my half-asleep condition. Ken would awake and throw on some more wood and a few minutes later I would awake nearly on fire by the re-fueled fire.

Jim André, reserve director at Sweeney Granite Mountains Desert Research Center, is currently having Allanson's journals transcribed into electronic form to make them more accessible, an effort that is about half completed. — JB

A few words

Continued from page 1

that: "... feral pigs acted as an abundant food that enabled mainland golden eagles to colonize the Channel Islands, increase in population size, and overexploit the unwary island fox." In support, they noted "(1)...that fox populations were at high density prior to eagle colonization and declined thereafter; (2) a decrease in the survival of foxes that coincided with an increase in eagle presence on the islands [the researchers estimate that a single 4-kg golden eagle could consume 125 foxes per year, provided it was feeding exclusively on foxes]; (3) physical evidence amassed at 28 fox carcasses that shows that predation by eagles was the principal cause of fox mortality; (4) the lack of other potential mortality agents, including micro- and macro-parasites; and (5) a mechanistic model that links the pig population to the decline in foxes." The references that follow offer the details. This research provides the scientific basis of the island fox recovery efforts currently undertaken by the National Park Service and The Nature Conservancy in the Channel Islands, described in this issue of *Transect*.

Anthropogenic impacts also enter the picture. Feral pigs have inhabited the Channel Islands for 150 years, yet the golden eagle colonization was not detected until 1994. It is speculated that, prior to 1994, the golden eagles were deterred from nesting on the islands by the larger, native bald eagles. Over time, DDT, hunting, and egg collection wiped out these fish-eating raptors. In particular, from 1947 to 1971, a chemical plant discharged approximately 1,800 tons of DDT into the Pacific Ocean on the Palos Verdes shelf.

— Alexander N. Glazer
Director, Natural Reserve System

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