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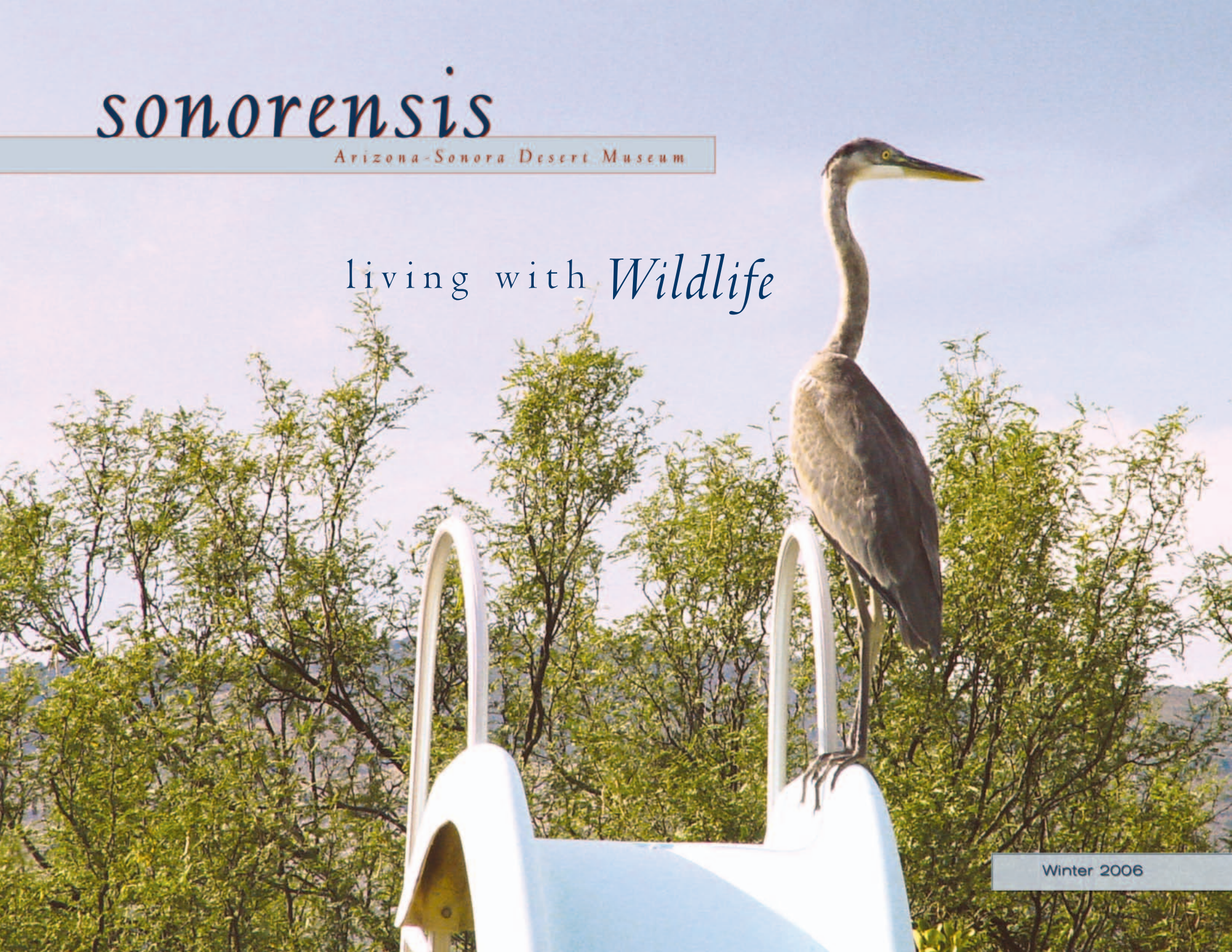
Arizona-Sonora Desert Museum

living with *Wildlife*



Winter 2006

sonorensis

Arizona-Sonora Desert Museum

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The Arizona-Sonora Desert Museum
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Arthur N. Pack and William H. Carr

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Executive Administrative Director

Richard C. Brusca, Ph.D.
Executive Program Director

Christine Conte, Ph.D.
Director, Center for Sonoran
Desert Studies

Camille Pons
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Editing

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sonorensis is published as a benefit to the Arizona-Sonora Desert Museum membership. It is intended to further our members' understanding of the desert and shape their sense of stewardship.

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Cover & back cover photographs by Norman Hower. Cover image - great blue heron *(Ardea herodias).*
Back cover image - greater roadrunner *(Geococcyx californianus).*

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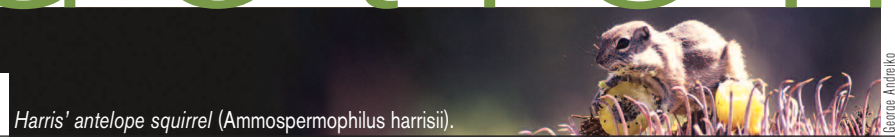
EDI

Introduction


George Andrejko

Harris' antelope squirrel (Ammospermophilus harrisii).

Richard C. Brusca, Ph.D., Executive Program Director, Arizona-Sonora Desert Museum

Those of us who love wildlife are fortunate to live in Arizona, where only 20 percent of the land is privately owned. What this means is that most of Arizona's beautiful landscapes are sparsely occupied, affording some degree of protection. But the pressure to expand our cities and suburbs is strong, and Arizona has one of the fastest-growing populations in the country. Fortunately, with some thought and care we can mitigate habitat loss, accommodate wildlife in our cities and suburbs, and reap the joy that comes with watching wildlife. Already we share our spaces.

In fact, urban, suburban, and undeveloped land grade into one another indistinguishably in a blurred mosaic. Desert habitat winds through most Arizona cities like bifurcating ribbons, especially along our riverbeds and washes, and many suburban homes sit on one to several acres—small human outposts embedded in desert wildlands. Furthermore, many urban residents landscape with native vegetation, creating miniature "wild" habitats. If you live in the Sonoran Desert, chances are that the wild side of mother nature is very close by. ▶


Donald Knight

Yucca in bloom (Yucca *sp.*).


George Andrejko

Coyote (Canis latrans).


EDI

Greater roadrunner (Geococcyx californianus).

Bruce Lasser

Puma (Puma concolor) *lounging on rock at Arizona-Sonora Desert Museum.*

C. Ivanyi

Gila monster (Heloderma suspectum) *camouflaged among leaves.*

If you live in the suburbs, especially on mountain bajadas or foothills, you can't help but be familiar with wildlife. Here, large animals like javelina, deer, coyote, and bobcat are common, and mountain lions make occasional appearances. Hundreds of smaller critters, from geckos to rattlesnakes to ground squirrels are unavoidable guests. Even inner city dwellers come face to face with myriad wild animal species—the real "urban wildlife." Many of us put out hummingbird feeders and bird baths, or we landscape our yards with native vegetation that provides all-important cover, attracting critters at the base of the food chain—insects, seed-eating birds, and small mammals. The herbivores attract predators, and pretty soon our urban or suburban neighborhood becomes part of the greater Sonoran Desert ecosystem—we begin to see coyote, raptors, and other predators. Watching desert creatures is amusing, instructive and deeply satisfying, but we must not be careless in our interactions or extravagant in our invitations. For them and for us, we need to know how to share our space safely, respecting nature's ways. Hence, the focus of this issue of **sonorensis** is "urban wildlife."

If you live in the suburbs, there are already thousands of animals running, hopping, flying, and crawling around your home. If your yard has hummingbird feeders, they will also attract Gila woodpeckers, verdins, finches, and other birds, as well as two species of rare nocturnal nectar-feeding bats, the Mexican long-tongued bat and the lesser long-nosed bat. Even if you don't "birdwatch,"

who can fail to notice the big bully white-wing dove and brilliant red cardinals that visit every summer!

Residents on the outskirts of town see desert cottontails and black-tailed jackrabbits, round-tailed ground squirrels and Harris' antelope squirrels, as well as the snakes that help control rodent and rabbit populations. Although rarely seen, nocturnal kit foxes and gray foxes are common. Bobcats are also common, but, like the foxes, are skittish around people and rarely seen unless you happen to have a swimming pool! In the foothills of our sky islands below 4,000 feet, you might see mule deer. Of course, the joyous and mythical coyote is abundant in the suburbs and not uncommon in the city, where they are seen with increasing frequency on their nightly foraging runs. Like many other vertebrates, coyotes tend to follow the washes into towns.

In the city, numerous species of insectivorous bats fly at night to capture insects on the wing. Summer's nightly emergence of Mexican free-tailed bats from their roost at the Campbell Avenue-Rillito River overpass has enchanted Tucsonans for years. Conspicuous in Sonoran landscapes—urban or rural—are the reptiles, including the ubiquitous blue-green bellied tree lizard and the much larger desert spiny lizard—a big, aggressive character. Another city thrill comes from the hawks and owls that hunt and nest in town.

If you haven't noticed the desert food web you're immersed in, you just haven't been paying attention. Read on. S

Mark Dimmitt

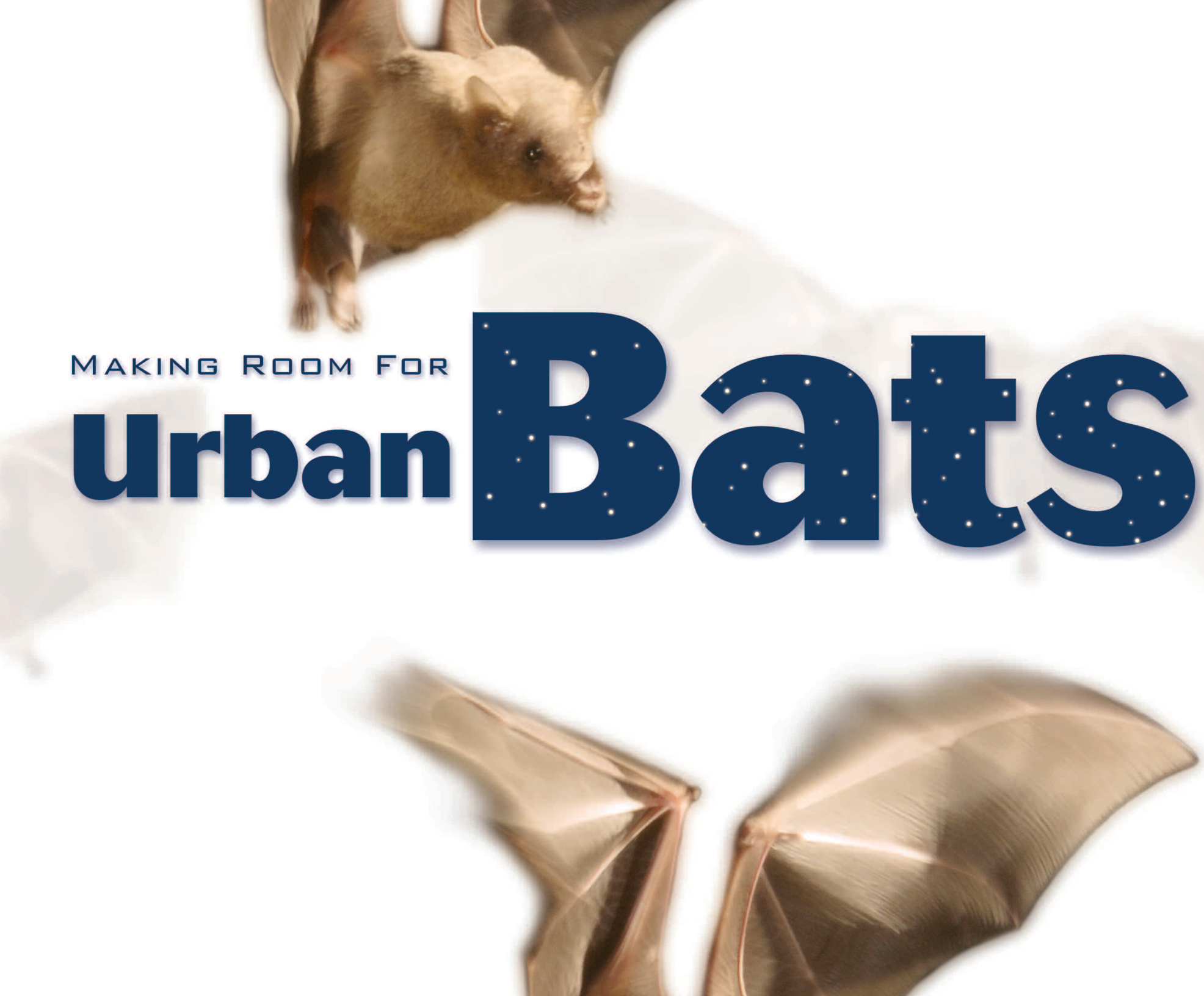
Morning doves (????).

Norman Hever

White-tailed (Odocoileus virginianus) *deer at backyard waterhole.*

Thomas Mahan

Harris' antelope squirrel (Ammospermophilus harrisii).



MAKING ROOM FOR

Urban Bats

George Andrejko

Afraid of bats? Why not? They hang upside down, shun light, fly without feathers, use ultrasonic echolocation instead of eyes, and look like weird rodents. Through the ages, their obvious dissimilarities to "normal" charismatic mammals left little room for empathy and plenty for fear. Stories of Dracula and his purportedly nasty companions linger in our memories. But bats have suffered from bad press far too long! Let's set the record straight. Just because they are different doesn't mean they're bad. They are a key species in the Sonoran Desert, providing people and the natural community with extremely valuable services.

Karen Krebbs, Conservation Biologist, Arizona-Sonora Desert Museum
Angie McIntire, Bat Management Coordinator, Arizona Game and Fish Department

Lesser long-nosed bats (Leptonycteris yerbabuenae).

Merlin D. Tuttle/BCI

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Merlin D. Tuttle/BCI

Upper left: Townsend's big-eared bat (Corynorhinus townsendii).
Middle left: Mosquito (Culicidae *family).*
Middle right: Organpipe cactus (Stenocereus thurberi).
Bottom left: Pallid bat (Antrozous pallidus).

The nearly 1,000 species of bats worldwide represent almost one quarter of the total species of mammals, and, with the exception of polar and extreme desert habitats, occur in every region on Earth. Each species has a well-developed evolutionary niche in its locale, and displays unique physical characteristics and behaviors. Some bats actually prefer using their eyes. Fortunately, biologists are beginning to understand bats and the important role they play in our ecosystems. We are learning why, in some parts of the world, bats are symbols of family unity, happiness, and good wishes. They are important indicators of a healthy environment, and we should welcome them into our neighborhoods.

It is true that the same caution must be afforded bats as to any wild animal, but dozens of species of bats in the Sonoran Desert render us great service. Insectivorous bats devour tons of insects each night, getting rid of innumerable pesky mosquitoes, no-see-ums, and various economically costly agricultural pests. *One individual bat can consume up to 600 mosquitoes in an hour!* Nectar feeding bats are the primary pollinators of columnar cactus like the organ pipe and cardon, as well as succulent agaves.

Many people fear bats because of the threat of rabies. About one in a thousand bats contracts rabies, but unlike dogs, cats, skunks, or other mammals, rabid bats are rarely aggressive; an infected bat becomes paralyzed and dies. This and other misunderstandings about bats lead to evictions and larger eradication programs.

People tend to view bats as a nuisance if they are roosting in or near their home, school, or place of work, but we are confident that negative perceptions can be turned around. Myths can be disbanded, buildings can be "bat-proofed," and bats can be provided with alternative shelters in the form of man-made "bat houses." It is an important goal of the Museum, as it is for the Arizona Game and Fish Department (AZGFD), Bat Conservation International, Programa para la Conservatión de los Murciélagos de México and Institute of Ecology of the National Autonomous University of Mexico, and other wildlife advocates to dispel fear and change human attitudes toward bats through education.

Houses for Bats

In the Southwest and throughout the world, bat habitat is diminishing at an alarming rate. Human population growth and concomitant development continues to eliminate natural habitat for bats, which require a safe roost and nursery to raise their young, in the same way we need a house. Although mines, caves, and structures like barns, sheds, and bridges once provided roost habitat, many of these natural and man-made structures are no longer available. So bat specialists came up with the alternative roost. Bat houses work for bats the way bird houses work for birds, and studies around the country have shown that many species of bats will take advantage of this artificial habitat.

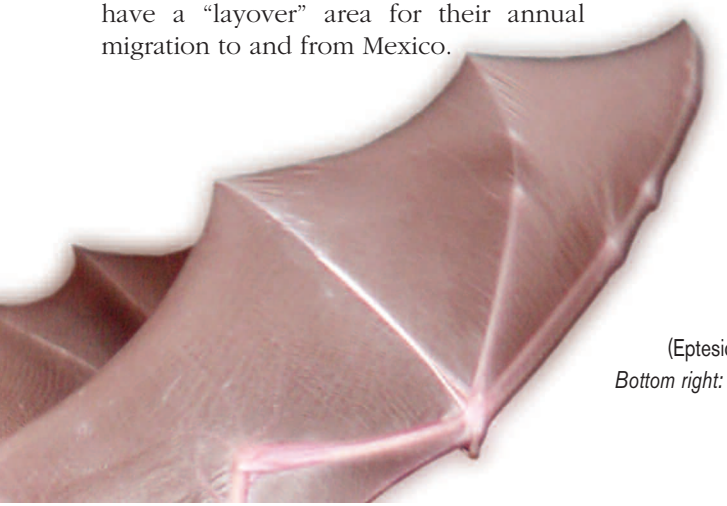
Karen Krabbs

In spring of 2002, the Museum initiated a bat-house study that continues today. With help from volunteers, staff, and Bat Conservation International

we installed around our grounds 33 bat houses varying in size, shape, and color. The "For Rent" sign was not out long! Within months of installation, a group of big brown bats *(Eptesicus fuscus),* a small-eared insectivorous bat weighing about one-half ounce, settled into several of the houses. Since then we have had three species of bats occupy more than 24 bat houses, two of which have used the structures as a maternity roost.


Karen Krebbs

This research at the Museum has been a huge success! As a result, numerous people and organizations, upon finding bats in their houses or workplaces, have opted to hang a bat house. Recently, staff at Maricopa County Flood Control wanted to extricate bats from their downtown Phoenix office, but eagerly collaborated with the AZGFD to provide alternative bat habitat. Two stucco-covered bat houses were hung on the exterior wall of the building to accommodate more than 400 Mexican free-tailed bats *(Tadarida brasiliensis).* Now these swift-winged marathoners have a "layover" area for their annual migration to and from Mexico.



Recently a group of insectivorous bats took up residence under the eaves of the Caterpillar Company in Green Valley, Arizona. Here, company staff collaborated with the Museum to not only install several large bat houses prior to evicting the bats, but also to develop an education program that helped dispel employees' fears. With great satisfaction, Caterpillar staff welcomed the night-flying mosquito-eaters to their new homes within a week of installation.

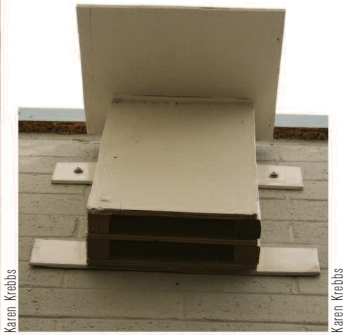
Another success story is unfolding with the Hualapai Indian Tribe in northern Arizona. This summer the tribe installed bat houses for several species of *Myotis* bats prior to the renovation of an historic schoolhouse. The tribe is also building a tower roost for Townsend's big-eared bats *(Corynorhinus townsendii),* which had also been using the schoolhouse. These insect-eaters are not known to use a normal bat house, preferring to roost in open areas rather than small crevices.

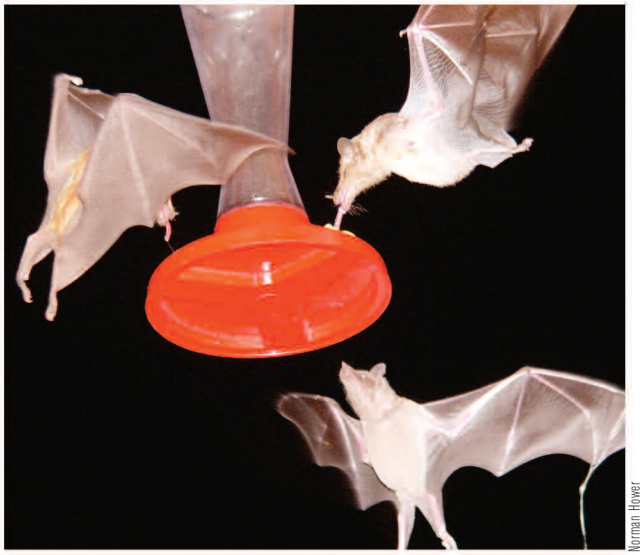
Bat houses work well in the desert Southwest as an alternative habitat for evicted insectivorous bats. Nectar-eating bats won't use bat houses, but they may visit gardens that have columnar cacti or agaves. Encouraging either desert pollinators or natural predators of night-flying insects is healthy for humans and the environment. Why not invite some bats to your yard for dinner? S

For more on bat houses, including a booklet with plans and mounting instructions, contact Bat Conservation International, PO Box 162603, Austin, TX 78716-2603, (512) 327-9721, www.batcon.org.


Merlin D. Tuttle/BCI


Karen Krebbs


Karen Krebbs


Norman Hower

Upper right: Lesser long-nosed bats (Leptonycteris yerbabuenae) *groom the pollen from their faces. Middle left: Bat house with big brown bats* (Eptesicus fuscus). *Middle right: Bat house at Caterpillar Company in Green Valley. Bottom right: Lesser long-nosed bats* (Leptonycteris yerbabuenae) *at hummingbird feeder.*

A Keen Eye in the Neighborhood:

Fate has a wry sense of humor. After years of fieldwork braving oven-hot summers in the desert, we had our first close look at how Harris's hawks share a kill while sitting in an air-conditioned truck in the middle of Tucson. Five hawks hunting in a group chased a cottontail across a residential street, under several parked cars, finally grabbing it on the gravel border between a bank and a convenience market. The large dusky hawks surrounded the kill and walked stiffly on the ground like miniature Hollywood velociraptors. The scene was elemental, timeless, and highly conspicuous to us, yet passersby went about their business without noticing the "wolves of the air" feeding as a pack a scant dozen feet from them.

Urban Raptors


Norm Smith


James Dawson


James Dawson

James W. Dawson, Executive Director, WildEdge Conservation Science

Sue Tygielski, P.h.D., Animal Behaviorist, Arizona-Sonora Desert Museum

Far left: Harris's hawk (Parabuteo unicinctus). *Middle & right: Cooper's hawk* (Accipiter cooperii).

Though most birds of prey are solitary, this hunting group of Harris's hawks was normal in all respects except in their choice of habitat. They were urban dwellers that lived and nested within a busy neighborhood. They had no inherent fear of people. For us, that day was a scientific epiphany; the urban hawks had revealed more to us than any of the hundreds of desert dwellers had. Here, between the bank and the convenience mart, scientific secrets of this social raptor were played out for anyone to see. No nature documentary could compete with this dramatic scene.

We found the bulky stick nest in an Aleppo pine in the front yard of an otherwise typical tract home. The homeowners had first noticed evidence of the hawks' presence—droppings, scattered bones and other prey remains under the tree—before seeing the birds themselves, but it was not long before most of the neighborhood was taking an interest in the conspicuous presence of these gregarious hawks. That summer they raised three fledglings.

Tucson harbors a healthy population of nesting raptors, and approximately one hundred Harris's hawk nests are now known in its urban and suburban area. The large hawks—Harris's hawks and red-tailed hawks—prefer areas of low-density housing with copious desert landscaping, while dashing Cooper's hawks tend to occupy older neighborhoods with large exotic trees and green lawns. Great horned owls will live nearly anywhere, while the small but colorful American kestrels are anywhere they can find a cavity to nest in—a hole in a saguaro or a space under your roof eaves.

It was not always this way; we know from biologists, falconers, and birdwatchers who have lived in Tucson that raptors are a relatively new component of the cityscape and suburbia. Raptors

Birds cannot change their *habitat* requirements at will in response to land-use *trends*.

did not breed within the city in historic times. The first known urban nesting Harris's hawks were found in northwest Tucson in 1988 by the senior author on the way back from a desert field site. Encouraged to look further in the Old Pueblo, he also found Cooper's hawk and great horned owl nests. Since that time, the number of nests has increased rapidly.

Finding raptors living in urban areas was important. It told scientists that our notions of hawks as "wilderness species" that need vast tracts of open country were patently wrong. Even Cooper's hawks, formerly considered a species sensitive to human disturbance, have successfully nested over a downtown sports park, feeding their young by the crack of Little League baseball bats and the glare of Friday-night lights.

So why did raptors not pioneer the cities earlier? Some people think that recent losses of natural areas have forced them into our cities. This idea might seem plausible in light of extensive urban development, but does not withstand scientific scrutiny. Birds cannot change their habitat requirements at will in response to land-use trends. But birds do tend to wander looking for a place with the food, water, and shelter resources they need. For some species, urban habitats are a Shangri La of abundant and constant water, tall trees for nest building, and a plethora of rabbits, quail, and packrats. Based on movements of our banded hawks into the cities, we suspect that urban habitats are magnetic to birds that wander into them.

Then why did hawks not nest in our cities prior to the late twentieth century? What is different today than just thirty years ago? Are there more water features in our yards and parks? Maybe so. But one salient factor is that the propensity for people to harm raptors seems to have declined sharply in the last twenty years or so, due in large part to educational efforts by conservation organizations such as the Arizona-Sonora Desert Museum. In addition, society

Great horned owl (Bubo virginiannus).

Prairie falcon (Falco mexicanus).

now has less tolerance for and more legal restrictions on the discharge of firearms, slingshots, and pellet guns within city limits. A few decades ago, a large tame hawk in the city would have been more likely to come to a bad end at the hands of people. A new tolerance may indeed be the reason that raptors are settling into our neighborhoods. If left alone, they become good neighbors.

A Great Horned Owl Myth

One feathered urban dweller has become so enmeshed into urban culture that it has spawned a bona fide urban myth. This myth is so widespread that we have even heard environmental educators repeating it. It goes something like this: great horned owls make a living catching and eating small dogs and cats. The myth is backed up by accounts such as: "I put my dog outside one night to do his business, and a great horned owl flew down and carried him away. My cousin saw it happen." Abductions occur at night, usually in a fenced yard.

Over the years we have investigated dozens of these stories, interviewing people and examining physical evidence at the site. Being sensitive to the loss of a cherished pet, our fieldwork was done gently yet methodically. The stories of owls killing pets have all turned out to have the same important details. First, despite claims to the contrary, we have never been able to locate a credible eyewitness that actually observed an owl killing a dog or cat. We have talked to people who came out after hearing the pet barking or screaming and caught movement in the dark on top of a fence. They usually recall owls hooting in the area earlier and link it with the pet's disappearance.

The myth-buster is that vanished pets usually disappear entirely from fenced yards, as if the pet was scooped up and carried away through the air. But even the largest great horned owl weighs only two or three pounds and can only lift a few pounds, certainly no more than four pounds. Owls

Right: Harris's hawks in nest (Parabuteo unicinctus).
Lower right: black vultures (Coragyps atratus).

are forced by physics to eat large prey on the ground because they cannot fly with it to a safer location in a tree. Only the smallest of pets could be lifted by an owl high enough to clear a six-foot fence.

In addition, when we have been able to examine remains, the evidence has always clearly pointed away from an avian predator. Teeth marks and the way the carcass was eaten have told us, in all instances we investigated, that the pets were eaten by a mammalian carnivore—probably one or more coyotes. Pet owners are surprised to hear it, but coyotes can scale fences up to six and possibly eight feet high. They are also common in urban areas and active at night. We would rather not replace one wildlife culprit with another, but that is where the evidence leads.

As scientists, we will not go so far as to say great horned owls never eat pets, but we will say that it is highly unusual here and has been overblown as an urban myth. Similarly, our research with Harris's hawks nesting in urban Tucson produced no evidence that pets are eaten—just the usual diet of rabbits, packrats, and birds. In any case, we encourage people with small pets to always stay with the pet while it is outside, particularly at night.

Staying in touch with nature is increasingly difficult in the modern world, and urban wildlife gives us a window into nature's wonders. For many, the urban hawk that swoops low over them in the grocery store parking lot will be the closest encounter they will have with a wild predator. Native wildlife brings the character of the desert into our cities, and gives us a sense of place. S

Coexist with Raptors

We can coexist with raptors and ensure their place alongside us provided we take steps to help them.

Reduce or eliminate the use of poisons to control native mice, packrats and rabbits. Raptors will readily scavenge dead rats or rabbits and may also ingest poison. Trapping rodents with live traps is a preferable alternative to poisoning.

Electrocutions on utility poles continue to be an issue for urban raptors, and homeowners should ask that power companies raptor-proof poles in their neighborhood.

Finally, all raptors are protected by state and federal laws against any type of harassment. Attempts to harm or harass raptors should be reported to the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department.

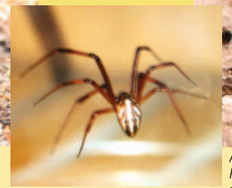
Gila monster (Heloderma suspectum).

Venomous Animals in Our Midst

It's been a long stressful day, but you're finally home. The sun has set, bringing another warm afternoon to a close. Your home—nestled in the foothills or on the valley floor—is the perfect escape from the hustle and bustle of the working world. After pouring a glass of wine, you venture onto the patio to absorb the moment. That's when your desert reverie ends, because a two-and-a-half foot western diamond-backed rattlesnake is coiled up next to the dog's water bowl. Your pulse quickens. Though the snake doesn't stir or seem particularly perturbed by your intrusion, you know that you need to do something, but what? You love wildlife and don't want to kill the snake, but certainly it can't stay where it is. Right?

The answer is anything but simple; in fact, it is highly debated. Though bites from venomous snakes are rare in the United States and the likelihood of death by snakebite is extremely remote (about 1 in 23 million), even enlightened nature-lovers are uncomfortable with snakes in their yards. Since most biologists don't want folks to kill snakes outright, we often suggest that the animal be moved to another location. However, translocating snakes, and most other wildlife, seldom achieves the desired outcome. If a snake is moved a short distance, it may return to the capture site, and several studies have shown that a snake does not fare well when moved outside its home range. If the new locality is out of the animal's home range, the snake will have to contend with established residents there who compete for the same essential resources. So short-distance translocation may fail to remove the threat permanently, long-distance translocation is apt to kill the animal, and you are disinclined to leave the animal alive in place. What's a person to do? ➤

Craig Ivanyi, **General** Curator, **Living** Collections, **Arizona-Sonora** Desert **Museum**
Leslie Boyer, M.D., **Medical** Director, **Arizona** Poison & **Drug** Information **Center**
Photography by **Craig** Ivanyi, **unless** otherwise **noted**



Above: Western diamond-backed (Crotalus atrox).
Upper right: Pena Blanca scorpion (Diplocentrus spitzeri).
Right: Male black widow (Latrodectus hesperus).

Above: Sidewinder (Crotalus cerates).
Right: Giant hairy scorpion (Hadrurus arizonensis).

Coming to Terms

Sunsets over mountain silhouettes, ochre valleys stippled green with cacti and agaves. The Southwest is an amazing place. But this landscape offers more than a static view; it's a stage for an incredible array of wildlife, much of which many people find unpleasant or downright scary, like snakes and scorpions. When these animals enjoy your backyard, too, what do you do? Rural lands and the urban fringes have more types of wildlife than cities do, so before moving into these areas, find out who your wild neighbors might be and think seriously about your tolerance level for unintended encounters with them. If you have major aversions or phobias to species there, consider living in an urban jungle rather than the wilder lands of the desert Southwest.

Before moving to the urban/rural interface learn about your natural neighbors. It's important to be able to distinguish between potentially dangerous creatures and those that are relatively harmless. In the Sonoran Desert, native non-venomous snakes pose almost no risk to humans or pets. Only two different types of native spiders, black widows and brown (fiddleback) spiders, and one family of scorpions pose significant risks to humans. Whenever possible, it's best to leave the rest in place and, in some circumstances, even some of these more formidable animals can be left alone.

Though there isn't any simple, sure-fire cure, until more studies are done, we still feel short-distance translocation may be the least offensive solution—to both human and snake. The snake gets to live another day; today's threat is removed; and we buy time to search for better solutions to this complex problem.

Eighteen varieties of rattlesnakes, just a fraction of the snake species native to the Southwest, find sustenance in the disparate landscapes of Arizona, which also support a rapidly expanding human population. Approximately 75% of Arizona's six million or so people live in or around two metropolitan areas: Phoenix, one of the fastest growing cities in the nation with roughly 50,000 new housing permits issued each year, and Tucson, which isn't far behind. Population projections indicate that most urban growth in Arizona will occur in undeveloped lands rather than through redevelopment of existing urban areas or substantial infill. As our communities expand and merge, we confront, surround, and displace wildlife. We eliminate their food with our roads, cars, traps, pesticides, and herbicides. In creating our own homes, we take theirs. Thus, the situation for reptiles and many other animals—from invertebrates and insects to fish, birds, and large mammals—continues to deteriorate. We harbor no true malice, but we're generally not interested in coexistence.

Venomous Residents of the Sonoran Desert

Broadly speaking, animals appear to use venom for three distinct purposes: immobilizing prey, digestion, and defense.

Scorpions sting and rattlesnakes bite primarily to immobilize prey. Scorpions are slow-moving predators that survive by catching and eating faster-moving prey, usually insects. Unlike a bear or lion, which can immobilize its lunch by sheer body strength, scorpions rely on quick-acting nerve poisons that can paralyze a cricket within seconds, allowing the scorpion to dine in peace. Rattlesnakes are also slow-moving predators with fast-moving prey. A rabbit injected by a snake's hypodermic-syringe fangs may escape briefly, but some of the toxins in rattlesnake venom work very quickly to damage the rabbit's blood vessels, so that generally the snake's lunch goes hop-hop-hop-plop, allowing the slow-moving diner to catch up.

Digestion is a complicated process for any animal. Most meat-eaters (including humans) start breaking down food by chewing before swallowing, after which specialized digestive juice chemicals, called enzymes, within the stomach and intestines work as meat tenderizers, breaking down the proteins and fats that hold a piece of meat together. Rattlesnakes face a special challenge because they have neither claws nor chewing teeth with which to tear up their meal before swallowing it. Not only that, but the piece of meat involved is often four times the size of the snake's head. Rattlesnake venom—injected well before swallowing begins—contains meat-tenderizing enzymes that start the digestion process even before the snake catches up with its fallen meal.

In the Southwest, the best examples of animals that use venom in self-defense are the almost ubiquitous honeybee and the not-so-common Gila monster. Worker honeybees are non-reproductive vegetarians, and the very act of stinging is a suicidal act resulting in irreparable damage to the bee's abdomen. A bee sting irritates the victim, inciting a bear, dog, or person to quickly retreat from the bee's territory. Not surprisingly, bee venom contains no digestive juices and no special paralytic poisons; it is a mixture of irritants and substances designed to encourage you to run away.

The carnivorous Gila monster is a nest raider that prefers to dine on eggs, baby birds, and newborn rodents. Though its venom may assist with digestion (the jury is still out on this), the toxins do not appear necessary for capturing such helpless prey. The sharp, grooved teeth and powerful jaws are arsenal enough to subdue these animals. However, it *will* bite larger animals in self-defense, and its venom contains chemicals that cause a strong pain response. Pain is something that animals remember. Combine this with the ability of the target animal to learn, and subsequently teach its young, and such venom becomes a powerful deterrent. The Gila monster is one of only two venomous lizards on the planet known to carry potentially life-threatening venom.

Above: Gila monster (Heloderma suspectum).
Upper right: Brown spider (Loxosceles *sp.).*
Right: Female black widow (Latrodectus hesperus).

Above: Sonoran coral snake (Micruroides euryxanthus).
Right: Tiger rattlesnake (Crotalus tigris). *Far right: Stripe tailed scorpion* (Vaejovis spinigerus).

Some of the Usual Suspects

It pays to be alert—look before you reach; watch where you walk; and wear closed shoes in the desert. Almost all of the wide variety of spiders and scorpions native to the American Southwest are venomous, but among arthropods only the widow spider, brown spider, and the *Centruroides* scorpions are generally of medical consequence to people. The Sonoran Desert is also blessed with a full complement of venomous snakes, but in the Southwest only the pit vipers (rattlesnakes and their relatives) pack enough punch to be potentially lethal to human beings. The other groups of snakes (rear-fanged and coral snakes) have dangerous representatives in other parts of the world, including the eastern United States and southern Sonora, but none of these are native to the southwestern United States.

What to Do When You're Bitten or Stung

Bites from rattlesnakes and Gila monsters should always receive prompt medical attention. So should any bite or sting from a venomous animal to young children, as well as envenomations that lead to any complications. When in doubt seek medical assistance. Keep in mind that there is little else that you can do that will favorably affect the outcome of an envenomation. Conversely, many outdated and dangerous remedies exist, many of which can result in further damage to life or limb. If you have any questions about bites or their treatments, contact your local poison and drug information poison center (such as the Arizona Poison and Drug Information Center, 1-800-222-1222).

To learn **more** about these animals, their venoms, or treatment of envenomations, navigate the websites of the Desert Museum and the Arizona Poison and Drug Information Center *(http://www.pharmacy.arizona.edu/outreach/poison/).* The Museum has produced inexpensive GetGo Guides *(Snakes of the Southwest* and *Venomous Critters of the Southwest),* which are handy to take in the field. You might also peruse the Museum's more comprehensive publication, *A Natural History of the Sonoran Desert*. Regardless of which resources you select, the take-home message is **learn about your environment** so that you, your family, your pets, and our wildlife can live safely in this unique place we all call home. S

Bobcat (Felis rufus).

Face to Face with Charismatic Mammals of the Desert

As a curator at the Arizona-Sonora Desert Museum, I had on many occasions observed with fascination the feeding behavior of our coyotes. I remained curious about capture and feeding in a natural encounter, but I had not envisioned my pet serving as the featured entrée. Late one afternoon last spring I was walking Waldon, my forty-pound mixed-breed terrier, off-leash, when out of nowhere flashed a coyote. He executed the take-down with the precision of a skilled marksman; my dog never suspected a thing. Desperately I yelled and clapped my hands, and the coyote scurried away. Waldon lived, but it was a bad scare. Moral of the story: never become complacent about the desert and its inhabitants.

Shawnee Riplog Peterson, Curator of Mammalogy and Ornithology, Arizona-Sonora Desert Museum
Elissa Ostergaard, Urban Wildlife Specialist, Arizona Game and Fish Department

URBAN DESERT DWELLERS

As our communities expand into areas occupied by indigenous wildlife, we should expect more human and animal conflicts. Already, it is common to see wildlife like bobcats, coyotes, and javelina in our yards, because wildlife is attracted to any place food, water and shelter is abundant, regardless of its legal or social designation.

So what can you do to prevent close encounters of a negative kind? What can you do to maintain a respectful and enjoyable relationship with the wild kingdom? Knowing the typical behaviors of our desert creatures helps, so if you are not versed already, please read the following sketches.

Bobcat (Felis rufus).

"In the end we will conserve only what we love. We love only what we understand. We will understand only what we are taught." –Philosopher Baba Dioum

Coyotes *(Canis latrans)* are masters of adaptation, equally at home in urban neighborhoods, golf courses, city parks, or open space. Social animals, a male and female pair often travels together, but solitary nomads or moderate packs of eight or more are not uncommon. Siblings or last year's pups often feed, play, and den together. Known as opportunistic feeders, coyotes prey on whatever is most abundant—rabbits, rodents, larger mammals, birds, reptiles, fruit, mesquite pods, insects and carrion. They've even been known to eat leather belts and boots in a pinch. Primarily active from dusk to dawn, coyotes hunt under the cover of low light. As with any wild animal, they weigh the benefits and hazards of pursuit, and it is easier and safer for them to snack from the smorgasbord of a garbage can than to take down prey.

Coyote (Canis latrans).

Bobcats *(Lynx rufus)* are much more reclusive than their canine counterparts, except in neighborhoods where they have been raising generations of kittens. They can live in a wide variety of habitats, and are, like coyotes, opportunistic feeders, stalking live prey—preferring small mammals, rodents, birds, and reptiles. Light on its feet at under 20 pounds, a bobcat can jump 12 feet high, so block walls are more of an inviting perch than a barrier. They are mostly ground dwellers, but climb trees with ease and are excellent swimmers. Usually solitary, males and females associate only during breeding season. Kittens stay with their mother until late winter.

Mountain Lions *(Puma concolor)* is the largest of the small wild cats in the Southwest. Due to their elusive nature, relatively few people have observed puma in the wild, but evidence—tracks, scat, or prey caches—is more commonly seen. Considered nocturnal and crepuscular, these large carnivores travel and hunt in darkness or penumbral light, which makes them difficult to see. Active throughout the year, puma are predominately solitary, coming together only for mating, though females do care for their young for as long as a year. Males practice mutual avoidance. Spatial separation gives each puma a better chance of finding enough prey—in the Sonoran Desert, mainly mule and white-tailed deer. This great cat quietly stalks its prey, leaps on its back, and bites the neck just below the skull.

Puma (Puma concolor).

Javelina (Tayassu tajacu).

Javelinas *(Tayassu tajacu)* are a type of peccary, hoofed mammals that originated in South America. Though they are sometimes called "pigs," javelina, or collared peccaries, are not in the pig family. They are social animals that live in herds and depend on each other for feeding, warmth, and protection from predators. Javelina on friendly terms spend time standing nose to tail, each rubbing the scent glands on the other's lower back. This not only reinforces their herd bond, but also helps them identify animals from an intruding herd. Mainly herbivores, javelina eat green plants, roots, tubers, mesquite beans, cactus fruit, and prickly pear pads, as well as insect grubs. They will also eat bird seed and garbage—usually at a cost to the animal's health. Naturally shy, these gray bristly-haired peccaries will lounge by day in the shade of a shrub thicket or near a pool of water, where they roll in mud to keep cool. Though they have poor eyesight and limited vertical jumping ability, javelina possess a keen sense of smell. They are armed with a set of sharp, tusklike canines, and can defend themselves if confronted.

Commonly Asked Questions

How can I protect my pets from coyotes, bobcats, mountain lions, and javelina?

Keep your dog on a leash at all times. Never leave your pet unattended, especially in the early evening or early morning. We recommend fences over six feet high with skirting. Build an outdoor enclosure, accessible from your pet's door, with a sturdy roof.

Will a coyote, bobcat, mountain lion, or javelina harm my child?

Not usually. Most wild animals want to stay far away from humans. However, children should always remain with a group when traveling in lion country. Bites or aggressive actions are most likely to occur when we inadvertently corner or try to feed them, or when the animal is sick. If you see an animal acting abnormally, please contact the Arizona Game and Fish Department (AZGFD).

Can these animals contract and transmit diseases like rabies?

Any mammal can contract rabies. That is why you should not handle wild animals. It is also very important to vaccinate your pets.

If I see these animals hanging around my yard, how can I safely discourage them?

Make a loud noise by yelling, clapping your hands or banging a spoon on a metal pot, throw pebbles, or spray with a garden hose. Look around to see what is attracting them. If you provide food, water, and shelter, they will come. Remember, you can't just feed the cute ones, and the ones you feed may attract predators—large predators.

What do I do if I encounter a mountain lion?

- Keep children close by and under control.
- **Do not run** as this may trigger a cat's natural response to pursue and attack.
- Face the lion; yell loudly, all the while maintaining eye contact. Back away slowly towards a group, building, or vehicle.
- Remember to leave an escape route for the animal.
- Change your shape to look larger by waving your arms and removing your jacket or shirt.
- If attacked, fight back. Use whatever is close to defend yourself and try to remain upright.

How can I help wild animals?

Do wildlife a favor: don't be indifferent or complacent about wild animals being in close proximity to humans. If you see one, discourage it by making loud noises, such as clapping your hands. Do **not** feed wildlife, intentionally or unintentionally. We inadvertently feed wildlife by leaving our trash, pet food, or even small pets out overnight. Be diligent about cleaning up fruit fallen from trees. Remember that water is scarce in the desert, so don't make it available in your yard.

What else?

Are we willing and able to reserve land so wildlife have space to live and corridors for moving through human-dominated areas? Can we afford to do this? Can we afford **not** to do this?

As wildlife populations diminish, the Earth's complex system of renewing natural resources—clean air, water, pollinators, decomposers, the food web itself—begins a potentially precipitous slide. Scientists have only begun to understand what a world with wildlife out of balance might be like. Planning for our communities to live in harmony with wildlife is our responsibility to future generations. S

Domestic Disturbers

House Cats

In North America, domestic cats are estimated to be responsible for the deaths of hundreds of millions of our feathered friends every year, and birds are not the only species on a cat's hunting card; reptiles and rodents are also targets. More than one billion small mammals are consumed each year, and scientists are concerned about domestic predators stressing populations of some species. The Desert Museum and The Arizona Game and Fish Department ask for your support in restraining pets. If you can't bear the thought of restricting your cat to the house, consider building a secure outdoor enclosure with a sturdy roof. Not only will this minimize cat hunting, but it will prevent the heartbreak of a car, coyote, or neighborhood dog taking your pet.

Unleashed and Feral Dogs

Dogs running off-leash may harass wildlife. The bighorn sheep once prominent on Pusch Ridge in the Santa Catalina Mountains are now nowhere to be found, in part because of harassment by domestic dogs. Feral dogs in suburban and rural areas form packs, hunting and defending their territory as a group. Even in cities, unleashed and/or feral dogs are known to roam at night in groups, attacking and killing domestic cats and other small animals.

Domestic Livestock

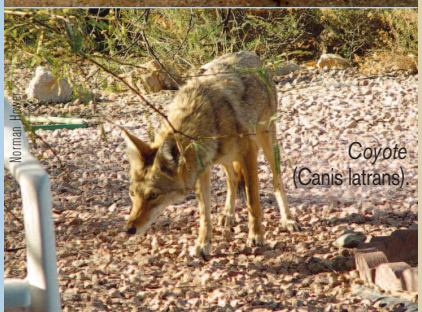
Livestock that mixes with wildlife can spread disease. In the Silverbell Mountains north of Tucson, where a landowner let hundreds of goats roam the hills, wildlife biologists were horrified to find bighorn sheep blinded by conjunctivitis caught from the goats. The sheep were falling off cliffs, eaten by predators, or starving to death, unable to find food and water.


Bobcat (Felis rufus).
Lee Conklin


Kasey Anderson
Javelina (Tayassu tajacu).


Bobcat (Felis rufus).
Connie Foster


Alison Sharp
Gila monster (Heloderma suspectum).


Norman Hoyer
Coyote (Canis latrans).

Wildlife Law in Arizona

The state of Arizona has specific laws intended to protect our wildlife, enforced by the Arizona Game and Fish Department (AZGFD). These laws are also meant to protect the public from being harmed by wildlife.

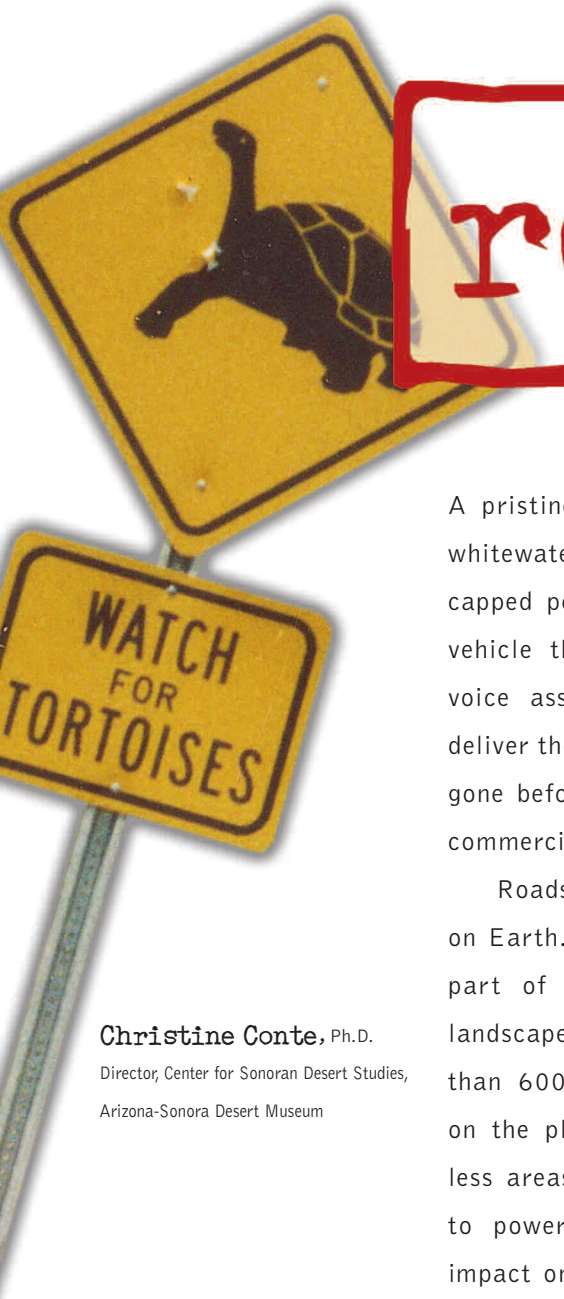
Feeding Wild Animals

While people are occasionally bitten or attacked by javelina, coyotes, bobcats, mountain lions, and other charismatic fauna, evidence suggests that the majority of these bites occur because someone was feeding the wildlife or their prey. When coyote or javelina become accustomed to handouts, they may lose their fear of people, but the instinct to bite can easily be triggered in an animal that seems docile and appreciative.

To prevent injury to wildlife and people, the state recently passed a law that makes it illegal to feed wildlife (except birds and squirrels) in Maricopa and Pima Counties. In addition to curbing bites and negative encounters for people and diseases, or health issues for the wild animals, this law also helps prevent the forced removal of aggressive, potentially dangerous animals from a residential neighborhood. Forced removal often results in the animal's death, either directly, or from exposure, predation, vehicular accidents, or starvation in its new, unfamiliar location.

Animal Artifacts

Most of our conservation-minded readers know that collecting or hunting live wildlife requires a permit or license. What may come as a surprise is that collecting dead animals or their parts (heads, antlers, feathers, eggs, nests, skeletal remains, etc.) is also highly regulated. Individuals must have permits to transport or hold a wildlife carcass or its parts. A hunting license and/or big game tag meets this requirement for wildlife lawfully taken during hunting season. However, if you find remains of animals in the desert, field, or road and wish to keep them, you must contact AZGFD. If an AZGFD officer determines that the animal died from a natural cause, you can keep the remains, but if the officer determines it died from an unnatural cause you cannot. Other factors apply if the cause of death cannot be determined. The main thing to keep in mind is that you **must** contact the AZGFD to legally possess the carcass, bones, or any remains of a wild animal, as clarified for us by Ron Day, chief of the Law Enforcement Branch of AZGFD.



road kill

Christine Conte, Ph.D.
Director, Center for Sonoran Desert Studies,
Arizona-Sonora Desert Museum

A pristine landscape. A forest glen with whitewater cascading from majestic snow-capped peaks. Suddenly, a high-clearance vehicle thunders across the frame as a voice assures us that this vehicle will deliver the freedom to go where no one has gone before. We've all seen the television commercials.

Roads are the largest human artifact on Earth. They have long been an integral part of our culture and our landscapes. Now, with more than 600 million vehicles on the planet, even road-less areas are accessible to powerful mechanical predators. The impact on wildlife is devastating. Habitat fragmentation, pollution, and noise are serious problems, but what about the direct hit—road kill?


Joe Gaus

Are There Really That Many Animals Killed on Our Roadways?

Yes. Preliminary results from a recent study at Saguaro National Park indicate that between 49,000 and 53,000 vertebrates are killed annually on 47.6 miles of roads that run through or along the boundaries of the park. These estimates are conservative. They do not account for injured animals that die "off-road" or for animal carcasses that could not be positively identified.

The problem clicks into higher definition when we consider that this study included a miniscule percentage (.08%) of the 58,000 miles of roads in this state. Most roads, of course, do not run through or past the rich habitat of a national park. But data from other regions are equally sobering. *Road Ecology* (Island Press, 2003) reported that "Increased traffic and habitat fragmentation has pushed the endangered Florida panther—one of the rarest mammals in the world—ever closer to extinction." It notes that while 20 panthers died and six were injured from collisions with vehicles between 1978 and 1994, in just three months of 2001, *seven* were killed on Florida highways.

What Can We Do?

- Moderate your driving speeds and be alert for four-legged (or legless) pedestrians on or near the road. Be especially careful after a rainstorm, when many animals are out on the pavement.
- Along roadway stretches where wildlife are vulnerable, encourage signage reminding motorists to be aware. You are probably familiar with deer- or elk-crossing signs, but have you ever seen the "Tortoise-Crossing" placards where desert tortoises are likely to lumber across the main road in the Tohono O'Odham Nation?
- Support the creation of habitat links between protected areas, parks, and monuments. (See page 24.)
- Support the construction of wildlife passageways across major roadways. To mitigate impacts on desert bighorn sheep near Hoover Dam, the Arizona Department of Transportation is incorporating wildlife overpasses or underpasses along U.S. 93 in specific locations determined by completed monitoring. Other wildlife will also benefit from the crossings. Not far from the Desert Museum, along Saguaro National Park, west, Pima County recently dug a large culvert designed to allow wildlife passage under Sandario Road. These and other efforts may be critical for animals like Gila monsters, desert tortoises, and bighorn sheep, whose survival strategies are not based on rapid and prolific reproduction. S

Desert tortoise (Gopherus agassizii).

Gila monster (Heloderma suspectum).

Bighorn sheep (Ovis canadensis).

Biological Linkages:

A Strategy for **Preserving** Sonoran Desert **Biodiversity**

Bill Shaw, Ph.D., Professor, School of Natural Resources, University of Arizona; Chair, Pima County SDCP Science Advisory Team

Mexican gray wolf (Canis lupus baileyi).

The population of *Homo sapiens* on Earth now exceeds 6.6 billion individuals, and no corner of the globe has escaped the influences of burgeoning human populations and the accompanying pressures to meet demands for food, water, shelter, and other resources. In the past, public parks and preserves have been our main avenue to assure the survival of our wild neighbors. Many of us share a passion for these areas and choose to live close to them because we value this biological heritage and because we appreciate the ecological importance of biodiversity for our own survival and quality of life. Now it appears that parks and reserves alone, globally or locally, will not be sufficient to sustain biodiversity, but the creation of landscape connectors could make a difference. In the Sonoran Desert we've taken our first steps.

Jaguar (Felis onca).

Parks and Reserves as **Habitat Islands**

Biologists have repeatedly observed that the diversity of species on oceanic islands is reliably correlated with the size of these islands and the extent to which they are isolated from other terrestrial bodies. Small islands distant from a continental mainland consistently support fewer species than islands that are larger or situated closer to other lands. In the 1960s, ecologists began to observe that these same principles applied in terrestrial parks and reserves. Protected land areas are like islands, isolated in varying degrees from other natural systems by a surrounding ocean of human-dominated landscapes, including lands used for grazing, agriculture, transportation, and cities. Just as with true islands, the diversity of species that a protected land can maintain over time is a function of its size and degree of isolation.

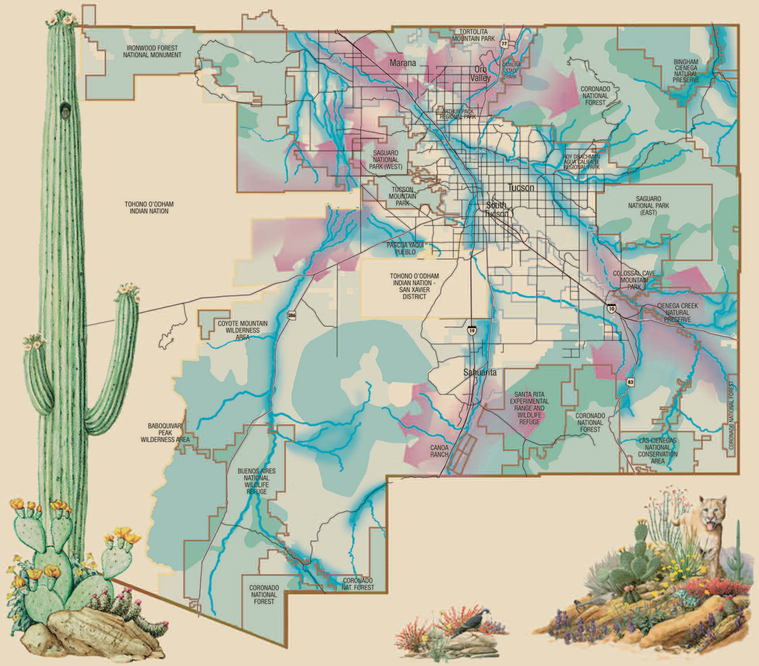
Linkages and **Corridors** in the Sonoran Desert

Even large reserves may not be adequate to sustain the full range of native species over time if they are isolated from other wild populations. For example, the Desert Museum is ideally situated in the midst of a large reserve complex comprised of Saguaro National Park (west) and Tucson Mountain Park. Together these parks protect a large part of the Tucson Mountains and their foothills. But as Tucson and Avra Valley develop, these mountains become increasingly isolated. Prior to the 20th century, wolves, jaguars, and desert bighorn were at least occasional visitors to this range and its bajadas. Now they are gone, and reestablishment of these species into the Tucson Mountains is not feasible. Though wildlife in these parks have some degree of protection, the space is simply inadequate to support viable populations of these species, and the mountains are now isolated from other populations.

Which **Species** Will Be the **Next** to **Disappear** from the Tucson Mountains?

Probably the figurehead for the Desert Museum's logo—mountain lions. A small but healthy population of lions still lives in this range, but as barriers to their movements increase, their living spaces are constricted and potential for inbreeding increases. This dilemma is being studied by the Arizona Game and Fish Department and the University of Arizona School of Natural Resources. These researchers are documenting how some lions in this region move in a circuit that repeatedly takes them from one sky island, across desert lowlands to other mountain habitats and back again. The ability of these lions to move freely is increasingly constrained by roads, canals, and by urban development rapidly spreading from Tucson into the Altar Valley and other surrounding lands.

This threat is not limited to animals that require huge areas to survive. In the long term, populations of smaller animals and even plants that are isolated may be lost. Environmental changes (climate change, fire,



Sonoran Desert Conservation Plan

Biological **Corridors** and **Critical Habitat**

LEGEND

- Important Riparian Areas
- Biological Core Areas
- Multiple Use Areas
- Wildlife Corridors

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Visit the Sonoran Desert Conservation Plan Web Site
www.pima.gov/sdcp

Sonoran Desert Conservation Plan
County Administrator's Office
130 West Congress, 10th Floor, Tucson, AZ 85701
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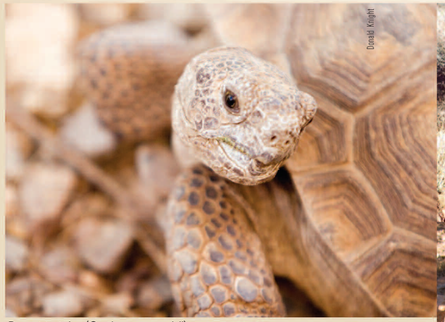
Puma (Puma concolor).

invasive exotics, etc.) can eliminate a species from an area, and even if favorable conditions return, repopulation may be impossible if there are no connections to nearby populations.

Some of the species we think of as having small spatial requirements may actually have evolved behaviors that facilitate the genetic exchange essential for them to adapt to environmental changes and avoid inbreeding. Studies have shown that desert tortoises can live for decades within a space as small as ten acres. This would seem to be a recipe for inbreeding, but new evidence suggests that occasionally, an adult tortoise gets the urge to hit the road. A couple years ago, a radio-tagged tortoise dubbed *Thelma* took off from her home in the foothills of the Rincon Mountains, heading due south. *Thelma* traveled about 18 miles toward the Santa Ritas before she turned around and headed home. Perhaps one solution for avoiding inbreeding is to maintain a gene for occasional wanderlust.

Solutions to Habitat Isolation

An obvious remedy for population isolation is to complement protected areas with lands that can serve as biological linkages between them. These habitat bridges or corridors allow the movement of large mobile animals. But these linkages are also crucial as genetic bridges for less mobile species. For example, the endangered Pima pineapple cactus is a small inconspicuous plant that survives south of Tucson, where its range is subject to fragmentation from rapid



Desert tortoise (Gopherus agassizii).

urban development. One important conservation strategy is to locate the densest patches of cacti and protect these lands from development. However, ecologists believe that these cacti may depend on pollination by a species of ground-nesting bee with a very short flight range. For this cactus, then, the solution for cross pollination may be habitat linkages between patches based on the behaviors of their pollinators.

Planning for Biodiversity

Skeptics may question whether society can afford to set aside lands from other uses in order to connect parks and reserves. But biological linkages do not necessarily have to be fully protected extensions of parks and reserves. A corridor can be useful as long

Top: Bighorn sheep (Ovis canadensis). *Middle left: Pima pineapple cactus* (Coryphantha robustispina). *Middle right: White-tailed deer* (Odocoileus virginianus). *Bottom: West side view of Tucson.*

as it can accommodate at least occasional interchange between populations. Thus, low density housing with ample natural vegetation may be all that is needed for some species, while linear parks and greenbelts primarily for recreation and aesthetics may also function as habitat bridges.

The principle of connectivity has been recognized by urban planners, land managers, and enlightened developers around the country. In fact, it is a cornerstone of Pima County's *Sonoran Desert Conservation Plan,* which uses a strategy of identifying and protecting those lands most crucial for sustaining biodiversity *and* bridging these conservation lands. Much of this connectivity is built upon riparian communities that by nature are interconnected and biologically rich. For human and natural communities, this bird's-eye view of land-use is crucial, considering the interdependence of life forms and ecological systems. Parks and protected areas *alone* are simply inadequate for ensuring the conservation of biodiversity in the long term—they are too few, too small, and too often isolated by surrounding land uses. Fortunately, our cities and towns have many opportunities to integrate habitat bridges into their planning processes. Using a combination of riparian corridors, habitat linkages, and "working landscapes" (lands in productive use, such as ranching, also managed for habitat values), Pima County and other visionary communities in the United States are striving to preserve a rich and inspiring landscape that will accommodate the needs of growing human populations while ensuring the survival of native plants and animals. S

Top: Costa's hummingbird (Calypte costae).
Bottom: Mexican gray wolf and pup (Canis lupus baileyi).

sonorensis

Arizona-Sonora Desert Museum

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