

Why the Burrowing Owl hisses like a rattlesnake and decorates its burrows with manure — and why its best hope may be the golf course

by Neil Losin

You are unlikely to forget your first encounter with a Burrowing Owl. Mine came on a September afternoon on the outskirts of Wildhorse Golf Club in Davis, California.

I had learned that the course was managed to provide habitat for the owls, but I didn't quite know how to find them, so I decided to make my way toward a black plastic tube protruding from a mound of earth.

As I approached, a pair of bright yellow eyes appeared inside. Then a brown owl popped out into full view, like a little football on stilts.

Curious about the sound of my clicking camera, the owl tilted its head so far to one side I thought it might lose its balance. I'll never forget it.

Audubon's famous painting of the species is titled "Burrowing Day-Owl." Though no longer in vogue, the name continues to capture two of the chief reasons the bird catches the fancy of birdwatchers and other observers — its habit of living underground and its willingness to be active in daytime.

Innovative research is steadily chipping away at mysteries surrounding the bird's behavior — its curious habit of lining its burrows with dung and other manmade and natural objects, for example, and its astonishing ability to mimic a rattlesnake's hiss — yet many

DAY-OWLS: Burrowing Owls in Homestead, Florida, keep watch near their burrow.



Mac Stone

Underground Owl



PREENING: Burrowing Owls in Davis, California, recognizable as juveniles by their unmarked bellies, groom each other.

puzzles remain. One is why the owl is declining across most of its range — a problem that may find a solution, of all places, on the golf course.

Burrowing Owls are found in open, grassy habitats throughout the Americas, especially where burrowing mammals are plentiful. They usually eat insects and small rodents but will also consume birds, snakes, and lizards. And although they are active during the day, they typically hunt around dawn and dusk, making them more crepuscular than diurnal.

Birdwatchers know they can be devilishly hard to find, since their mottled brown plumage and small size, about 7-10 inches tall, make them difficult to distinguish from the clods of dirt and dung often found near their burrows.

Once you have located an active burrow, however, they are downright dependable. They like to loiter at the entrance, close to safety should a coyote, badger, ferret, or other predator — or a birdwatcher — approach too close.

Other owl species nest in burrows occasionally, but only the Burrowing Owl leads a truly subterranean existence. Western Burrowing Owls are probably capable of digging their own burrows but rarely need to. Instead, they use the abandoned burrows of mammals such as prairie dogs and ground squirrels. In Florida, where burrowing rodents are scarce, the owls dig — and fast. A Florida Burrowing Owl can excavate a 10-foot-long burrow in just two days.

Despite the owl's digging ability, the health of many populations seems tied to the fate of other burrowers. In the interior west, the Burrowing Owl is rarely found outside prairie dog towns, and owls nesting in large prairie dog towns suffer less badger predation than owls in smaller towns. This may be due to the vigilance of the prairie dogs, or it may be because hungry badgers have to search more burrows before finding a nest.

In South America, the Burrowing Owl prefers burrows dug by a large colonial rodent known as the vizcacha over similar excavations made by armadillos. Vizca-

chas graze on vegetation around their burrows, while armadillos, which eat insects, do not. It is thought the short vegetation maintained by the vizcacha lets the owls hunt more effectively and detect predators at a greater distance.

In South as well as North America, the owls line their burrows and decorate their entrances with a variety of objects, including feathers, shells, shredded paper, tin foil, and plastic. One nest behind a bar in Florida was decorated with cigarette butts, and owls nesting near golf courses often arrange divots in and around their burrows. A favorite lining material throughout the owl's range is dried cow and horse manure.

In Oregon, as elsewhere in North America, badgers are important Burrowing Owl predators. Scientists who compared predation rates of nests with and without cow dung, however, found that badgers were less likely to attack nests with dung. Perhaps predators avoid the smell of dung whenever possible, or perhaps the smell masks the scent of the owls — a sort of olfactory camouflage.

More recently, researchers at the University of Florida tested the predator-avoidance idea against an alternative hypothesis: that the Burrowing Owl uses dung as bait to attract dung beetles, a preferred prey species. If so, this would be akin to the famous fishing behavior of the Green Heron, which places insects or bits of vegetation on the water's surface to lure fish within striking distance.

The scientists tested the predator-avoidance hypothesis first. They baited 50 artificial burrows with quail eggs. Then they placed cow dung at half of the burrows and waited to see what happened.

The results cast doubt on the avoidance hypothesis: Predators destroyed most nests, and they made no distinction between nests with dung and those without.

Next the researchers tested the bait idea. They removed all dung and debris from a number of active owl burrows. Then, at half of the burrows, they added back a precisely measured amount of dung. Four days later, they collected the prey remains and any pellets that the owls may have regurgitated outside each burrow. The results were dramatic: Owls living in burrows supplemented with dung had eaten 10 times as many beetles as those in burrows without dung.

Yet to be tested is another hypothesis that is just as intriguing — that the owl uses dung to acquire carotenoids. Carotenoids are chemicals known to enhance the function of the immune system, and female birds deposit them heavily into egg yolk. Dung itself is a good source of carotenoids, and insects have greater carotenoid content than vertebrate prey. By eating dung directly (as do Egyptian Vultures) or simply by consuming insects attracted to the dung, it is possible that female owls could replenish their carotenoids after egg-laying.

Whatever benefits dung provides, one thing is certain: Any animal that uses a foreign object to influence its environment is a tool user. This makes the Burrowing Owl one of just a handful of

bird species known to use a tool — an odd sort of tool, certainly, but a tool nonetheless. Whether the owl uses tools innately or must learn to do so, no one knows.

However unusual the use of dung tools may seem, another Burrowing Owl behavior is even more surprising. The story begins in the early 1980s, when Matt Rowe, then a graduate student at the University of California, Davis, visited the Davis raptor center. "Come take a look at this guy," said biologist Terry Schulz, gesturing to a cardboard box. "He's really cute." Schulz opened the box just a few inches.

Rowe, now a professor at Sam Houston State University in Huntsville, Texas, will never forget what happened next: "I got very close and peered down into the darkness, and before my eyes could adjust, I heard this rattlesnake." Rowe was incensed. "I jumped back, and I swore at Terry for pulling such a stupid practical joke!" There had been a joke, all right, but Rowe was in no danger. "I thought for sure there was a rattlesnake in that cardboard box," he remembers. "It turned out to be a young owl."

For nearly a century, naturalists had reported a rattlesnake-like rasp produced by Burrowing Owls. Rowe had read the reports, but like most scientists, he had dismissed them.

He returned to the raptor center and recorded the sound. Then he played the tape for his dissertation advisor, Don Owings, who also was impressed. Early ornithologists had speculated that owls might mimic the rattlesnake's buzz to deter predators, but no one had ever examined the behavior scientifically. Rowe knew he had a unique opportunity. "I just had to test it!" he says.

Unfortunately, actual owl predators — such as coyotes, badgers, and ferrets — make uncooperative research subjects. Rowe would never gather enough data from them to test the acoustic-mimicry hypothesis.

Instead, he turned to something more familiar: the California ground squirrel. Owings had studied it and its anti-predator behavior for years.

No animal is as intimately familiar with both Burrowing Owls and rattlesnakes as the ground squirrel. Owls and rattlesnakes make their homes in squirrel burrows, and rattlers eat young squirrels. As a result, ground squirrels have become sophisticated about rattlesnakes. They can assess the threat posed by a rattler by listening to its rattle. If the squirrels fell for the Burrowing Owl's bluff, the mimicry must be very accurate indeed.

But not every California ground squirrel encounters rattlesnakes regularly. Some populations have not coexisted with snakes for thousands of years. As a result, the squirrels lack the anti-predator behaviors that exist in rattlesnake-aware populations, and they even have lower resistance to rattlesnake venom. Knowing this, Rowe predicted that the owl's hiss would startle rattlesnake-aware squirrels but not rattlesnake-naïve squirrels, and, amazingly, he found just that.

Presenting squirrels with one of four sounds as they entered an artificial burrow, he discovered that rattlesnake-aware squirrels reacted nearly as strongly to Burrowing Owl hisses as they did to real rattlesnake recordings. The other sounds — white noise and non-mimic

'As I approached, a pair of bright yellow eyes appeared inside. Then a brown owl popped out into full view, like a little football on stilts.'

Viewing the Wildhorse Burrowing Owls

You don't need a bag of clubs and plaid pants to view the Burrowing Owls at Wildhorse Golf Club.

A walking path that meanders through the surrounding greenbelt is open to the public. Some of the most accessible owls can be found on the north and east edges of the course.

Owls can be seen year-round but are most conspicuous in the summer months, when chicks are present.

The club is located on the north side of Davis, just 15 minutes from downtown Sacramento.

Wildhorse Golf Club
2323 Rockwell Drive
Davis, California 95616
(530) 753-4900
www.wildhorsegolfclub.com



CURIOS: An adult Burrowing Owl in Davis, California, tilts its head to get a better look.

Burrow buddies

Burrowing Owl Preservation Society
Dedicated to helping owls in California.
burrowingowlpreservation.org

Burrowing Owl Conservation Society of British Columbia
Working to restore Burrowing Owls to the grasslands of British Columbia.
www.burrowingowlbc.org

Burrowing Owl Conservation Network
Advocates for the protection and restoration of the Western Burrowing Owl.
burrowingowlconservation.org

Cape Coral Friends of Wildlife
Citizens who want to help the area's famous Burrowing Owls.
www.ccfriendsofwildlife.org

Neil Losin

ABOUT
250
OWL SPECIES IN
THE WORLD

4
OWL SPECIES IN
THE GENUS *ATHENE*

1
OWLS IN
THE GENUS *ATHENE*
IN NORTH AMERICA
(BURROWING OWL)

Burrowing Owl calls — did not evoke an alarm response. Rattlesnake-naïve squirrels did not respond strongly to any of the sounds. The result suggested that there was nothing intrinsically aversive about the hiss. Instead, the sound scared squirrels because it resembled a threatening rattlesnake.

So far, no one has overcome the logistical difficulty of testing the mimicry hypothesis directly with Burrowing Owl predators. But if any animal was likely to see through the owl's ruse, it would be the ground squirrel. Since even it was deceived, Rowe believes predators are probably fooled, too.

Such remarkable adaptations to life underground might lead you to assume the Burrowing Owl's future is rosy, yet the reality is very different. The species is listed as endangered or "of special concern" in a dozen states, and it is declining in most of its range. The causes are varied. Collisions with vehicles cause many deaths, while insecticide use on agricultural land reduces prey availability and causes poisoning.

The biggest problem, however, is habitat loss. Grasslands and shrublands — the areas where Burrowing Owls thrive — are among the most threatened habitats in North America.

Conversion to rangeland and farmland has made many areas unsuitable for owls, and the widespread eradication of burrowing rodents like prairie dogs, which are persecuted as agricultural

Three distant but close relatives

Burrowing Owl (*Athene cunicularia*) has three close relatives.

Spotted Owlet, *Athene brama*
Breeds in tropical Asia from India to Southeast Asia.

Little Owl, *Athene noctua*
Depicted on coins from ancient Athens. Resident in parts of Europe, Asia, and north Africa. Introduced to Great Britain and New Zealand.

Forest Owlet, *Athene blewitti*
Known from just seven specimens and considered extinct for over a century, then rediscovered in 1997. Endemic to the forests of central India.



Nikhil Devasar

LOST AND FOUND: Critically endangered Forest Owlet was thought extinct until 1997.

pests, has only made matters worse. Clearly, solutions are needed soon.

Wildhorse Golf Club, where I had my memorable first encounter with Burrowing Owls, has shown that people and owls can get along. The 10-year-old club, located on the northern edge of Davis, sits amid one of the densest remaining populations of owls in the state of California. In order to win approval for construction, the developers promised to create and maintain a 26-acre greenbelt around the course.

A few owl nest boxes were installed right away, and a handful of owls made their homes in the greenbelt from the start of the project.

Then, in 2005, assisted by the local Burrowing Owl Preservation Society and two classes of sixth-grade students, course managers installed eight artificial burrows on the course itself.

Rather than digging burrows, they piled mounds of earth over plastic nest chambers and entrance tubes. The response was immediate — owls began exploring the new burrows before they were even completed, and five of the artificial burrows successfully fledged young the next year.

The coexistence of owls and golfers is not entirely without incident, of course.

Not every player realizes that the owls need space, but such difficulties are surmountable. Stakes and ropes keep most golfers at a respectful distance from active burrows. Wildhorse also

maintains an educational display about the owls in the clubhouse, and information about the owls is posted in each golf cart.

In just a decade, Wildhorse has shown signs of becoming a Burrowing Owl success story, a model that might be adopted wherever development threatens existing populations.

When I walked the course a year after my first visit, I watched fledglings learn to hunt by following their parents on short forays. Two siblings delicately preened each other at a burrow entrance.

Yes, Burrowing Owls are in trouble. But at least in this human community, one that understands and appreciates them, the young birds seem to have a bright future. **🐦**

Neil Losin is a biologist, photographer, and filmmaker who lives in Los Angeles (www.neillosin.com). He is working on a Ph.D. in UCLA's Department of Ecology and Evolutionary Biology, where he is studying two Caribbean lizards that have become invasive in South Florida.

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