

Out of Africa & Into the Sunshine State: Tracking an Exotic Invader

by

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Submitted to the Department of Comparative Media Studies/Writing  
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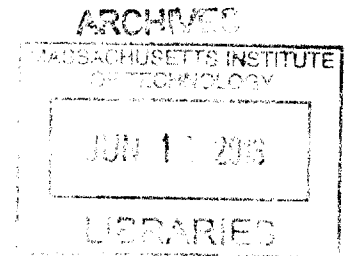
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ABSTRACT

This is the story of an invasive species and one man's quest to eradicate it. The Nile monitor lizard (*Varanus niloticus*), smaller cousin of the famed Komodo dragon, grows into six feet of carnivorous, ill-tempered muscle. The animal's size and aggression make it a poor candidate for the exotic pet trade, but the species nevertheless obtained popularity in the 1990s. Two decades later, the descendants of released Nile monitors are breeding in the coastal town of Cape Coral, Florida, where the lizards benefit from extensive drainage canals and a buffet of native wildlife—and they're spreading.

Herpetologist Todd Campbell has devoted more than a decade of his research to these reptiles, attempting to understand how they got here, how their invasion is wreaking havoc on native ecosystems, and most of all, how to eliminate them for good. The challenges he's faced along the way echo the wider concerns of fighting invasive species, which represent one of the greatest threats to global biodiversity and ecosystems but are poorly studied and rarely prioritized. This thesis follows the trajectory of the Nile monitor from its native Africa to southern Florida, exploring what it is about this lizard's natural history, ecology, and allure to reptile enthusiasts that has made it a charismatic symbol of the perils of biological invasion.

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Photo courtesy of Kiril Strax via Flickr

Todd Campbell was driving southbound on I-75 when he got the call that changed his life. The year was 2002, and a friend and fellow biologist called to talk reptiles. Campbell mentioned he was en route to Miami, about to cross the bridge from Cape Coral into Fort Myers.

“You gotta go see the monitors,” his friend said.

“What the hell are you talking about?” Campbell recalls asking.

“Go to Cape Coral, trust me,” his friend promised. He suggested Campbell head to the very southwest tip of Cape Coral and cruise the streets, talk to local residents. See what he could stir up. An invasion was unfolding that few outsiders knew about: Nile monitors, enormous carnivorous lizards, had become established and were breeding in the city—potentially a lot, Campbell’s friend believed.

Beside himself with excitement, Campbell took the advice and made a beeline for Cape Coral. The pony-tailed, suntanned herpetologist was in the middle of a post-doc position at the University of Tennessee, working in the lab of one of the world’s foremost experts on invasive species. His research on a small lizard called the Cuban brown anole brought him to south

Florida, where the animal had been displacing the region's native anole species for decades. Despite the glut in subjects to study, he'd had several false starts and was now unsure of the direction his work would take. Rumor of a giant lizard run amok was a godsend.

Cape Coral lies on Florida's Gulf coast, about two-thirds down the state's length, on a thick peninsula ringed by barrier islands. A little to the north lie the white sand beaches of Sarasota; a couple hours to the south lie the iconic green vistas of the Everglades. Few unpaved places remain in Cape Coral, but you can still catch a glimpse of the remnant pine flatwoods and mangrove-thick wetlands that formerly covered the area. You might imagine exotic lizards would be attracted to these tropical refuges, but instead, Campbell headed for the city's matrix of canals and neighborhoods. Unlike Floridian icons like the manatee, leatherback sea turtle, and panther, which are highly sensitive to development, the Nile monitor thrives in close proximity to humans. Campbell's visit didn't take long to pay off. Within five minutes of driving around the southwest corner, he spotted a pair of older men power walking down the street. He asked if they'd seen any big lizards around the area.

"Yeah," one of them answered. "I watched one shred a bunny in my backyard two weeks ago."

Nile monitors, smaller cousins to the famed Komodo dragon, grow into six feet of carnivorous, ill-tempered muscle. Their size and aggression make them poor candidates for the exotic animal trade, but cheap, diminutive juvenile Niles nevertheless obtained popularity as pets in the 1990s. Now the descendants of released and escaped pet monitors were growing fat on a buffet of Florida's native wildlife—and spreading.

Back then, Campbell may not have even known these basics. Beyond the locals, he wasn't sure who, if anyone, was aware of the population or researching it. All he knew was if the first people he'd spoken to on the street had recently seen the predator, the problem was likely to be big. He'd stumbled into a herpetologist's gold mine, and he wanted to be the man to tackle the job.

Chancing upon the Niles was the most exciting thing that's ever happened to him, Campbell says. Overcome by the thrill of scientific discovery and possibilities, he couldn't sleep for days. *I've arrived*, he thought. Little did he know his work on the monitors would go on to consume over a decade of his life, winning media coverage across the continent, on public airwaves, and in the pages of the *National Geographic* and the *New Yorker*. In it would crystallize all the quandaries, controversy, and intrigue inherent to the open-ended question of invasive species.

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**T**he story of the Nile monitor in Cape Coral is a how-to in ecological invasion. At a time when many top predators are in steep decline and even headed for extinction due to habitat loss, climate change, and poaching, the Nile monitor is proliferating. The lizards have

been spotted in eleven counties across south Florida, captured in backyard pools, near airplane runways, and even at the beach. Some are rogue, released pets, some are established but not breeding, and some are reproducing like mad, but one thing is clear: Cape Coral is the epicenter of the invasion.

Knowledge of the African lizards, just one among Florida's more than 2,000 nonnative species, remains mostly confined within the state. The topic of invasive species, however, has justified no shortage of textbooks, news articles, popular books, scientific journals and papers, conferences, centers, collaborations, and even congressional hearings. Scientists define invasive species as those that arrive in a landscape through human agency and cause damaging ecological, economic, and/or health effects. These threats are global in scope, with alien species disrupting ecosystems, reducing crop productivity, and infecting new hosts everywhere humans trade and travel. Ecologist E.O. Wilson famously indicted the phenomenon as the greatest threat to native ecosystems and biodiversity after habitat destruction. "Extinction by the invasion of exotic species," he wrote in the foreword to a book about Florida's invasive problem, "is like death by disease: gradual, insidious, requiring scientific methods to diagnose."

The United States' history is one of immigrants, both human and nonhuman, deliberate and accidental. The arrival and establishment of foreign species is no new phenomenon—the discovery of the Americas and the ensuing traffic of microbes, flora, fauna, and goods cracked open the structure of global economies and ecologies forever. Since then, only the magnitude of exotic exchange and our cultural response to it has changed.

In the late 1800s, exotic species were regarded as a national fixation rather than a crisis. Immigrating individuals, gardening societies, and the government itself all clamored to shape the growing nation into a cosmopolitan likeness of Europe. Familiar flowers, birds, and crops streamed into ports; sometimes for economic purposes, but often for mere whim. Despite the passion for importation, limited trade and mobility in the nineteenth and earlier centuries sometimes made the origin of nonnative species a little easier to pinpoint. We know kudzu, the viney bane of southern landscapes, made its debut in a 1876 Philadelphia garden celebrating 100 years of U.S. sovereignty. The South American nutria, better known in Gulf states as the swamp rat, escaped after its 1899 introduction for the fur trade. The ubiquitous European starling overtook the entire country in the half-century after sixty birds were released in New York's Central Park in 1890. These species are so firmly entrenched, or "naturalized," that many Americans don't even realize they're detrimental newcomers, but at least we have the satisfaction of knowing exactly when and where they began colonizing native ecosystems.

In today's globalized world, that kind of knowledge is a bygone luxury. In a millennium "dominated by the ethos of unfettered international trade," writes environmental historian Peter Coates, virtually any plant or animal imaginable—excluding those protected by international trade agreements on endangered species—can now turn up anywhere, at any

point in time. As a result, uncertainty and blame feature as central threads in most invasive species origin stories.

Of all cases in the United States, several have come to epitomize the costs of invasive alien species. Feral hogs, unleashed on American soils by early European colonizers, now number in the millions across thirty-three states. In addition to carrying disease and reproducing at astonishing rates, wild swine devastate landscapes with their aggressive rooting and wallowing behavior. The animals use their noses to churn up the top meter of fragile soil, wreaking havoc on agricultural fields and native plants. European and Asian carp outcompete and prey on native fish in forty-five states, to which they've dispersed since their incidental nineteenth century introduction as a food fish. The fish grow rapidly, eat without discretion, and flourish in polluted waters. In Guam, the invasion of the brown tree snake has ushered in an unplanned experiment by driving most of the island's native birds to extinction. Spider densities have exploded in the birds' absence, while the snakes cause power outages every week as they traverse utility lines in search of new prey.

These are often cited as some of the most egregious animal invaders of U.S. soils and waterways, yet they're a drop in the bucket of the 50,000 species of nonnative plants, animals, and microbes that have landed in American ecosystems. That's not to say all are harmful. It is important to distinguish between nonnative species—those transplanted from somewhere else through human initiative—and truly invasive ones, of which the U.S. Department of Agriculture recognizes a few hundred. Whether or not a nonnative species becomes invasive often hinges on the presence or absence of predators in their new environments, as well as the defense mechanisms of potential prey. Many native plants of the American Southeast, for example, evolved to withstand fire but possess no protection against wild pigs' ground disturbances. Guam's endemic birds were easy pickings for the brown tree snake because they evolved on a snake-free island. Native flora and fauna, of course, are not the only casualties of nonnative species. One study estimated that nonnative and invasive species, collectively, cost the United States some \$120 billion *every* year in weed control, agricultural disease, and property destruction.

Scientists cannot predict when or where a species might go rogue, but many researchers cite the "tens rule," which states that ten percent of imported species will subsequently become established, and ten percent of established species will eventually disperse and become a nuisance. In simpler terms, the theory holds that one in 100 introduced species will become invasive. But in 2005, a pair of researchers discovered a more disturbing ratio held for birds, mammals, and freshwater fish—between the fifteenth and twentieth centuries, one in four vertebrates introduced between the United States and Europe became invasive.

Lest we fall into the trap of demonizing certain species, it's important to remember that living things are not inherently invasive. Most animals and plants are not invasive across their entire range. When populations do spread out of control, it's because they find themselves in an

environment conducive to growth, under which circumstances any species would do the same. Yet each is also native to *somewhere*—an idea that often gets lost in the popular imagining of invasives as unstoppable, consuming, reproducing machines. We forget that even the most destructive plants and animals possess a home range, where they hang in relative ecological balance, kept in check by coevolutionary forces. They're not born monsters, in other words.

“The worldwide total of species introduced to new geographic regions by human agency probably approaches half a million species,” biologist George Cox writes. In the case of each invader, there is a profusion of science to consider; each example is flanked by its own political players and policy, ecological repercussions, natural histories, management strategies, and philosophical attitudes. But there might just be something to learn by telling one story out of hundreds of thousands.

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**M**an and the Nile monitor (*Varanus niloticus*) have interacted as long as the two species have coexisted. In Africa, where the lizard's distribution extends across most of the continent and up into the Nile River Valley, humans have both revered and exploited the animal. The Lele, a people of the Democratic Republic of Congo, regard the Nile monitor as a spirit animal—a water creature laden with sacred power and closely tied to fertility. The monitor has also traditionally been heavily harvested for its skins and meat. Africans in some regions have even partnered in recent years with fashion design houses to supply lizard leather for expensive handbags and boots.

Fifty-two other species of monitor lizards inhabit the Old World, occupying every niche from the dunes of Australia's deserts to Asian mangrove swamps. Some species are tree climbers, some are excellent swimmers, and some are common landlubbers. Monitors vary in size by several orders of magnitude, ranging from the Australian pygmy monitor—a pretty red lizard as heavy as a Sharpie marker—to the legendary Komodo dragon of Indonesia, which can weigh as much as a fully grown lioness. The fossil record demonstrates even more astounding diversity, including a beast four times as massive as a Komodo dragon that lived in Australia as recently as 20,000 years ago. It was the ecological equivalent, one expert thinks, of saber-toothed cats, and probably even ate our human forebears. The most gigantic of the monitors is now extinct, but overall the group has enjoyed enormous evolutionary success. The monitor body plan first appears in the fossil record around the late Cretaceous era some 80 million years ago, when progenitors of today's monitors shared present-day Asia with the likes of *Velociraptor* and *Tyrannosaurus rex*. While still in their infancy, the monitor family survived the extinction event that killed the dinosaurs.

That may be why today, as any enthusiast will tell you, monitors comprise the largest, most intelligent, and most impressive group of lizards. Researchers speculate they may be the branch most closely related to snakes, a connection echoed in the monitors' long, low-slung

bodies and forked tongues. Yet their remarkable intellect seems more akin to mammals—studies have indicated that some monitors can count up to six prey items at a time, probably as a result of their preference for nests that contain similar numbers of eggs. They use their forearms in sophisticated ways, reaching deep into crevices to grab food like a curious primate. When you look at a monitor, many handlers attest they look back in a way reptiles rarely do. Their sharp eyes pivot and dart, constantly scrutinizing their surroundings, looking at rather than past you. It's a cool and critical gaze. You can't help but feel you're an incidental and inconvenient feature of the lizard's view.

Research on the Nile monitor in its native range has been limited, but the exploitation has not appeared to put a dent in this generalist's population. Their extensive range is evidence of the species' ecological and dietary plasticity. They are undiscerning and adaptable when it comes to food and habitats, which goes far to explain their ability to colonize a foreign habitat like Florida. They are excellent swimmers and divers, happy to remain underwater for an hour at a time. Aside from proximity to water and a burrow for shelter, they're not too picky. The carnivorous lizards will eat anything they can overpower, and have been observed on several occasions to hunt cooperatively—one lizard will distract a nesting bird or crocodile while an accomplice digs up the eggs. Like some other monitors, they appear to possess powerful immune systems that even tolerate snake venom.

Juvenile Nile monitors show off a striking, complex skin pattern of spots and strips, their backs a pristine black and their bellies ranging from cream to jungle green. Looking at their prehistoric features—the inquisitive, reptilian eye, the slightly awkward five-fingered claws—gives you the feeling of looking back in time. They truly resemble tiny dinosaurs. For no more than \$30, you can buy your own tiny dinosaur anywhere in the United States. Of course, the diminutive size and beauty of the young animals gives little indication of the kind of adults they will become. Their scales grow muted and mottled gray-green. Males reach lengths of six feet or more, though their tails make up a large proportion of their body—and they pack a punch. Monitors use their muscular tails as powerful whips when they feel defensive, which, when human beings are around, is often. Their impact leaves throbbing bruises. Even as juveniles, their teeth can break the skin and cause bleeding and infection due to the unique bacterial fauna of their mouths. When they hiss their displeasure, most people would do best to back away.

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Still buoyed by excitement, Todd Campbell began making calls and researching grants to inform the extensive Nile monitor study he was already envisioning. He didn't want to step on the toes of other researchers, but he soon discovered that while others in Florida were documenting and cataloguing the monitors' presence, nobody was actually planning to do anything about the population.



Before long, Campbell secured two grants totaling \$51,000—a modest sum considering its ambitious purpose: Campbell wanted that money to help eradicate the entire population of Nile monitors in Cape Coral. If eradication wasn't feasible, he hoped to at least lay out a management plan that would eventually lead to their demise. Along the way, he wanted to learn everything there was to know about a Nile monitor.

The war effort commenced in the summer of 2002, when Campbell's small advance team, recruited from his lab at the University of Tennessee, landed in Cape Coral and planned a multi-pronged attack with local agencies. They needed to collect intel on the lizards' habits by polling locals. They planned to build public awareness and support by publishing press releases and cooperating with local news stations. Then it would be time to send ground troops into the town.

Color postcards from the 1960s depict Cape Coral, Florida, as a seaside resort with unnaturally turquoise waters and lush palms. In one, children splash in a pool while parents playing cards look on from the shade of colorful umbrellas. Inside a hotel, a blonde lounge singer plays the bongos. In a 1965 promotional film still, a debonair white family smiles from behind the dashboard of their Chevrolet convertible. The streets they cruised were adorned with names like Honeysuckle Road, Whippoorwill Way, and Tangerine Court. Another shot shows two women in heels and pearls in front of a giant welcome sign.

"Cape Coral," the sign reads. "A Waterfront Wonderland."

This picturesque portrait of Cape Coral was part of one of the most concerted marketing efforts ever known in the state. Cape Coral in the 1950s was not a town at all, but the massive holdings of a single realty company owned by two land speculators—brothers Leonard and Jack Rosen. In 1957, the pair purchased about 100,000 acres on the Gulf coast of southern Florida for less than \$700,000.

The land then was a far cry from the postcards: nothing but wetlands and sandy, barren-looking pine savannas that stretched as far and flat as the eye could see. A modern visitor might have seen the acreage as a wildlife sanctuary or a crucial part of the south Florida watershed. Back in the 1950s, however, there was little conception of the importance wetlands play in controlling floodwaters, cycling nutrients, and supporting biodiverse ecosystems. They were regarded as unproductive land, useless unless drained and "improved" by development—which is exactly what the Rosen brothers did.

Twelve million dollars of heavy machinery steamed into the region in the late 1950s to dredge, bulldoze, and pave the first tracts of land. One piece of equipment had immense grooved wheels each the size of a sedan—it was simply called the tree masher. To cope with the troublesome fact that their land inundated seasonally, the Rosen brothers perfected a strategy that had been popularized across the Southeast and other parts of Florida: they built canals to

drain the wetlands. To this day, Cape Coral boasts 400 miles of canals, more than any other city in the world. The earthen material dredged from the construction of the waterways provided filler to build up the surrounding land, thereby intending to keep the new neighborhoods above sea level. The canals offered another benefit to the developers, though—promising canal access to every new homeowner would help them market their new community as a “waterfront wonderland.” They had no premonitions of the curse their canals would become, turning idyllic backyards into the stomping grounds of a giant water-loving reptile.

The Rosen brothers enlisted the help of low-grade celebrities to advertise Cape Coral across the country. Like the postcards, they promised Americans sun, fun, and a peaceful retirement. Their efforts paid off as out-of-state buyers snapped up building sites by the hundreds of thousands, shortly followed by the construction of mass-produced houses and condos.

In a newspaper retrospective of Cape Coral, Eileen Bernard—the town’s unofficial historian and a former employee of the Rosen brothers—reflected that the company had been full of “great pitchmen” but “terrible misogynists.” She recalled some of the buyers were disappointed when they finally settled into their new homes. Having come from “places infinitely better in living conditions,” they were unaccustomed to the humidity, isolation, and increasingly displaced wildlife of southern Florida. They got lost in the repetitive network of roads and canals. They disliked the flat vistas and scarcity of drinking water. They “could not go out at night because of so many bugs and snakes,” she said. Yet many others found Cape Coral the perfect place to reinvent themselves, and they grew to love the afternoon thunderstorms, the “velvet-dark” nights, and the lazy pace of life. Over the next several decades, the Rosen brothers’ aggressive realty campaign made Cape Coral the fastest-growing place in the state.

They’d built the perfect city—not only for middle class retirees, but also for Nile Monitors. The canals, tropical climate, and unrestricted pet trade coalesced into the perfect formula for an invasion.

Authorities first confirmed the presence of Nile monitors in Cape Coral with a roadkill specimen in 1990. Over the next decade, we can only imagine the population followed the classic model of biological invasion, simmering until their juveniles reached sexual maturity and spread.

Cape Coral kept no records of its monitors until 2000, when a city biologist began to document public sightings of the lizards. When Todd Campbell and his crew arrived to begin research, the city was averaging around a hundred reports a year. They set to work tapping the energy and knowledge of locals, many of whom were eager to share the stories of the predators menacing their backyards.

“These are horrific beasts to many,” Campbell says. “They’re scaring the crap out of these

people.” It’s difficult to enjoy your waterfront property when you’re afraid a territorial reptile might charge you. Residents feared letting their children or pets go outside when puppies and feral cats started going missing. Nile monitors took up residence in artificial ponds, snacking on peoples’ goldfish and making a mess of their landscaped yards. A schoolteacher interviewed for a feature in the *New Yorker* claimed a monitor had once “taken a chunk out of her hand.”

When researchers or officials decide to tackle the problem of an invasive animal species, they often start with little baseline knowledge. The scientific literature may or may not provide information about a species in its native range—and even if it does, an animal’s biology and behavior may be different in their new range. Researchers are thus plagued by a hundred seemingly basic questions: What time of day is the species active? At what age are they sexually mature? What is their reproductive cycle, and is it tied to seasonal changes in temperature and rain? How far and how fast can they travel? Are they vulnerable to any parasites or diseases?

Campbell’s funders wanted him to answer all of these questions and more. “They said go trap them, figure out where they live, find out about their diet and reproduction,” Campbell recalls. All of this, “so that I [could] kill them.” Campbell knew immediately that he wanted to attempt eradication. The population of Nile monitors was still new and confined to Cape Coral, and their threat to native wildlife was evident. A study like this might be able to make a name for a young, driven scientist like Campbell. For many scientists and government entities, though, deciding to do *anything* about an invasive species—much less attempt to eradicate it—is an unusual choice.

“There are very few examples of studies like what Todd has successfully undertaken,” says Kenney Krysko, a herpetologist at the Florida Museum of Natural History. Krysko was the friend who first tipped Campbell off to the monitor population in Cape Coral, though he’s long since forgotten the conversation. The reasons Campbell’s study was unusual are manifold. “Most people just don’t have the funding, nor the time, nor drive to try to exterminate these exotic species once they become established,” says Krysko.

Whether you speak with state and federal officials or individual scientists, they always list deficient resources as the first culprit.

“First and foremost,” says Tessie Offner, a University of Tampa student working with Campbell on multiple exotic species in Florida, “invasive removal costs money, and that money comes from tax dollars. It’s hard to get people, both in the government and the community, behind trapping and removing... when they are more concerned about other tax-based programs.” Even in cases of extreme or extensive damage to natural resources, communities can be reluctant to allocate funds toward what will often prove a long, labor-intensive process. Add an economic recession to the pressure of reducing taxes, and the incentive and resources to combat nonnative species dwindle to nothing. When proactive scientists like Campbell want

to independently take on removal, they face funding difficulties for the same reason. Grants for long-term studies involving eradication are nearly impossible to come by because funders prefer discreet projects with short-term measurable goals.

The irony, of course, is that prevention and early response to invasives cost a fraction of long-term consequences. “It’s gonna cost you two million to clean these up in ten years’ time,” Campbell says of a Nile monitor population, “but it’s only gonna cost you fifty [thousand] to clean them up now. A couple of warm bodies in the field with a truck and some traps and some chicken necks, and we’re done.”

Many scientists agree that it really *is* this straightforward. Experts have gotten very good at identifying new populations of exotic reptiles wherever they land and assessing their potential threat. They just can’t seem to muster the funding to put boots on the ground. And that, Krysko thinks, is the real problem: “People simply don’t care. That’s how they all got here—because people illegally released them.”

Indeed, the Nile monitor would not be in Cape Coral were it not for the exotic pet trade. One theory holds that a local pet trader released a number of monitors into the wild in hopes of recapturing and selling their offspring. Though illegal, this is not an unprecedented practice, and one bolstered by the admission of a reptile dealer that he captured and sold 40-50 wild Nile monitors in the years preceding Todd Campbell’s comprehensive study. A second theory blames the population on isolated releases by individuals after the thrill of an exotic pet wore off, the enclosure and food became too expensive, or the animal grew large and aggressive. A combination of the two scenarios is also possible.

For insight into what happens when officials don’t respond to new populations of exotic species, one need look no further than two hours south of Cape Coral. There, in the endless green swamps and prairies of the Florida Everglades, the abundance of biodiversity is evident. Herons and anhingas preen in the sun and stalk fish in shallow waters. Colorful songbirds flit among cypress islands and red mangroves. Deep in the national park, the oversized paws of the legendary Florida panther pad softly through forests thick with pine. Looking out across the “river of grass,” visitors can discern well-traveled paths through the sawgrass, perhaps made by white-tailed deer or American alligators—or perhaps made by fifteen-foot Burmese pythons.

Burmese pythons, the most infamous of a host of Everglades invaders, offer an eerie parallel to the Nile monitor and other intractable vertebrate aliens. They too arrived through the exotic pet trade. They too are semi-aquatic, elusive, insatiable. They too have been the subject of sometimes frenzied media attention. The large predators have upset the Everglades’ already unstable ecological balance by decimating small mammals and wading birds, preying even on fully grown alligators. Federal estimates places Burmese python numbers in the hundreds of thousands—an astounding figure that reptile industry advocates constantly push back against,

accusing federal studies of fear-mongering, being “exaggerated,” “dramatized,” and “grossly speculate[d].”

In January 2013, the Florida Fish and Wildlife Conservation Commission sponsored a high-profile event called the Python Challenge, which invited anyone with \$25 and a waiver of liability to enter the swampy wilds of south Florida and shoot Burmese pythons. Over 1,500 people signed up, and the media descended upon the region to follow the lurid contest. It was the latest in a trend of attempts—lionfish derbies, Asian carp fish fries, exotics cookbooks—designed to crowd-source invasive species management. These events seem to channel a dichotomous, nationalistic impulse that characterizes the American public’s relationship to invasive species. Americans dislike exotics in the abstract, condemning the threat they represent to native species and commerce. But barring colossal snakes in the backyard, management and eradication remain very low priorities.

When the month-long Python Challenge ended with a grand tally of a measly 68 snakes killed, many people were left scratching their heads over the purpose of the hunt, while others outright decried it as a cheap publicity stunt. The Commission, however, never acknowledged the hunt as anything but exposure: “The goal of the 2013 Python Challenge,” their website states, “is increasing public awareness about Burmese pythons and how this invasive species is a threat to the Everglades ecosystem, including native wildlife.”

Pythons are ambush predators, meaning they spend much of their lives lying exquisitely still until a meal wanders within striking distance. They’re spread out over hundreds of thousands of square miles of inaccessible landscape. Add to that their brown, black, and green camouflage patterning, and a monster snake becomes nearly impossible to detect underfoot for even the most seasoned veterans. The Python Challenge did much to educate members of the public about the dangers of illegally released pets, but it did little ecologically speaking. Burmese pythons are here to stay, offering a lesson in what happens when exotics go ignored.

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The media seized on the characterization of Cape Coral’s Nile monitors as bold and unafraid of humans, but soon into their research, Todd Campbell’s team formed quite a different impression. To catch a large, intelligent lizard, you’ve got to spend a fair amount of time thinking like them. The semi-aquatic Nile monitor thrives in wetlands with close access to breeding and hunting grounds, so the team did ground surveys of areas they believed monitors would likely frequent. They saw indirect evidence of Niles—tracks, scat, and burrows—but rarely the evasive animals themselves.

“[O]bservations of lizards lasting more than one minute were extremely rare,” the final report said, “and only a few still photographs and videos of live lizards were obtained during this study.” Active search and capture, they determined, would be a completely inefficient tactic.

Instead, the team tested traps. They altered long metal cages to accommodate Nile monitors' extra long tails, and they baited the traps with a variety of animal flesh. Niles capitalize on different food sources throughout their lives, but all are fully carnivorous. Juveniles dine almost exclusively on insects, since their small size precludes them from killing much else. Adults will eat anything they can swallow whole or rip limb from limb, from dog food to small dogs. They have a special fondness for eggs, which is a problem in a state home to many threatened and endangered ground nesters such as sea turtles, the American crocodile, and in particular, the burrowing owl.

The largest burrowing owl population in the eastern United States resides in Cape Coral. These pint-sized, brown and white birds earned their name from the nests they excavate in the earth, where they shelter and rear their young. Over 2,500 nests are scattered across the city in strange juxtaposition with their built-up surroundings. They take up in peoples' backyards and empty lots, whether those are next to a wetland or a strip mall. Though the birds don't seem to mind living in close proximity to humans, the disadvantage is evident in their mortality rates due to automobile collisions, domestic pets, and now, Nile monitors. Cape Coral provides special protections for burrowing owls, including roped off nests and posted signs to alert the public to their presence. But these measures mean nothing to lizards, for whom the burrows mean an easy meal and a place to stay. Officials' fears were confirmed in the early 2000s when a resident saw a monitor attacking an adult burrowing owl in her backyard. She threw a flower pot at the lizard, which dropped the bird and slinked away. It was too late, though—the bird died from its wounds, leaving its body as some of the first concrete evidence of the invader's potential impact on native species.

The trapping routine gained momentum as coverage in local media outlets heightened public awareness of Campbell's experiment. More awareness meant more eyes, which led to an increased number of calls to the city about lizard sightings. Campbell's team concentrated on catching the lizards where they seemed densest, in the southwest corner of Cape Coral. The team tried to trap in a scientifically consistent way, deploying twenty traps every few days with a few extras for responding to local calls. The lizards often continued to prove one step ahead of their hunters.

"The irony is, when somebody calls you," Campbell says, "Even if you get there in ten minutes, you can set fifty traps and you might not even catch that lizard. They move so fast." The lizards may be speedy, but in Cape Coral they also enjoy the benefit of the perfect getaway. Millions of years of evolution have streamlined Nile monitors for swimming and diving. And just as the Rosen brothers promised, you're still never far from a canal in the "waterfront wonderland." At the slightest threat from humans, off they slip into waters that can function not only as a quick escape, but also as a lizard highway. In the dark waters of Cape Coral's canals, where humans and traps cannot follow, the reptiles can disperse with ease.

Since the team couldn't outrun the lizards, they had to figure out a way to outwit them. Nile monitors are driven, like all living things, by the twin impulses to feed and breed. As pets, the animals are renowned for their insatiable and indiscriminate appetites. Campbell's team had little success baiting the lizards with frozen mullet, chicken eggs, and chicken meat. Instead, what they found was an overwhelming fondness for common squid.

Frozen squid did the trick, and soon they were trapping one to four lizards a week. Several times a week, twenty or so traps would go out at an early hour. The trapper set the long contraptions along canal walls and under foliage, then checked back once or more a day. They stopped leaving traps overnight when they realized they were catching far more feral cats, raccoons, and other "by-catch" than the intended diurnal reptiles. Some residents, "Monitor Dundee" types as Campbell called them, were enlisted to help check traps near their homes.

A captured Nile monitor had to be approached with care, as the pugnacious animals will draw blood if not handled carefully. The team then transported the animal to a nearby vet, where the lizards were humanely euthanized in a cylindrical container using chloroform. Next blood was drawn, bodies were measured and checked for parasites and injuries. Between 2003 and 2005, not a single lizard showed external parasites. "Nearly all were in very good condition," the final report says. The Cape Coral lifestyle, it seemed, looked great on Nile monitors.

Todd Campbell did not set out to estimate how many lizards were in Cape Coral, but he hazarded a guess in his final reports. Two years of trapping in just two square miles resulted in over 100 lizards. At that density, he believed there might be about 1000 Nile monitors in the city. Of more concern was where those thousand lizards might disperse and what they might eat along the way. Based on its range in Africa, Campbell wrote in the final report that "[T]his species will likely be able to spread throughout Florida, and possibly the entire southeastern United States; a significant problem indeed." Moreover, there was still the problem of turning off the source.

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Reptile shows, or expos, form an integral part of reptile enthusiast culture. Hundreds of these conventions take place across the country each year, typically as popular weekend attractions near metropolitan areas. Expos offer reptile breeders and dealers an opportunity to sell directly to the public, while buyers can admire rare breeds, buy animals and products at reduced prices, and enjoy the company of other hobbyists.

Walking into an average reptile expo, you might see hand-painted signs advertising frozen mice for sale by the hundred. Less squeamish owners can take their pick from writhing piles of live, newborn mice called "pinkies" for their hairless hue. Expos usually unfold over the course of a day or two, quickly enough that they don't acquire the musty smell of a reptile house. Teetering shelves of plastic foliage can lend the space the same artificially tropical feel as the

terrariums for which they're intended. If you're not in the mood for scales, you might try your luck with arthropods—rainbow crabs, tarantulas, and scorpions are also popular with the reptile crowd. You might see excitable children begging their parents for pet geckos, or perhaps a gaggle of girls fawning over a four-foot tegu lizard on a leash.

But none of these are the centerpieces of an expo. That distinction belongs to the tiny plastic boxes that fill reptile shows by the thousand, lining the tables of every seller. Housed in these makeshift containers, perhaps with a handful of gravel or pine shavings, is a kaleidoscopic collection of snakes, lizards, and turtles. Devised for easy transportation and quick transactions, the boxes provide just enough space to fit one animal. The reptiles come in every size, shape, and color nature has seen fit to produce, as well as many that nature did not dream up. Here you'll find "designer" boas and ball pythons, snakes intensively bred for unique colors and patterns (morphs) that function more as collector's items than pets. With morph names like black lace, silver bullet, lavender champagne, and ivory coral glow, these stunning animals sell for thousands of dollars among a select group of breeders who regard the snakes as low-maintenance investments. Ball pythons are typically docile, and the standard breeds are among the most common creatures for sale at expos.

Visitors with an eye for the even more unusual can seek out poison dart frogs in striking jewel tones or primitive Surinam toads that float in water like dead leaf litter. Some of these specimens will set you back a few hundred dollars, but for the most part, price does not necessarily reflect the maintenance or expertise required for a reptile's care. Because Nile monitors breed so prolifically, juveniles sell for very little.

Many dealers take care to learn the husbandry of each animal they sell and steer customers accordingly. Allen Both, a New Jersey-based reptile dealer who sells Nile monitors at expos around the Northeast, calls them "nasty animals" and "a dime a dozen." He'd rather direct customers to the smaller, more mild-mannered monitors he markets, like black-throated monitors or savannah monitors. But Both will continue to sell Niles as long as they're legal and there's a market.

Reptiles are a lucrative business. Somewhere between one and four percent of American households own reptiles, a demographic that generates enormous profits for the reptile industry each year. "In less than two decades," says an industry report, reptiles "grew from a marginal side business for a few pet stores to a complex industry with annual revenues approaching \$1.4 billion."

Between 2005 and 2010, dealers in the United States imported close to seven million live reptiles destined for the pet trade, to say nothing of illegal imports. (Large as that number is, it represents a steep decline in recent years as domestic breeders have come into their own.) Imported animals arrive in trays and crates by the thousand, each tiny plastic container housing its own baby snake or wild-caught lizard. When you add up the top ten most popular



imported reptiles—including common iguanas, ball pythons, and two gecko species, among others—they comprise a mere seven percent of total reptile imports, giving you an idea of the sheer volume of different species entering American ports. If you can dream it, you can probably buy it.

Over half of imported reptiles enter the U.S. through Miami, which means that a disproportionate number of reptile breeders and distributors also base themselves in Florida for close proximity to the port. Breeders range from homegrown, converted-basement hobbyists to multimillion dollar facilities on huge tracts of land. There's no need for expensive, climate-controlled housing in tropical south Florida, where larger animals like tortoises and iguanas can be enclosed outside. But imagine what happens when something goes wrong—maybe a disaster like Andrew, the costliest hurricane in American history at the time. In late August, 1992, flimsy outdoor enclosures suddenly didn't seem like such a good idea.

Andrew unleashed a bizarre, apocalyptic menagerie on south Florida. Burmese pythons, sacred ibises, and lionfish are just a few among many species whose now invasive populations have been attributed to the storm's destruction of zoos and animal distributors. The potential for devastation should not have come as unexpected: hurricanes are an inextricable force in the ebb and flow of southern ecosystems, and Florida receives more hits than any other state in the country. Yet natural disasters provide a convenient scapegoats for an industry and individuals that want very much to discount the better known cause of introduced exotics: irresponsible pet owners.

Who are the Americans spending their discretionary income on lizard enclosures, turtle treats, and snake medication? According to market research reports, reptile owners tend to be younger, less affluent, and less educated than other pet owners. A survey found them more likely to be single, between the ages of 18 and 24, and not employed full time. They live all over the country, equally concentrated in urban and rural environments as the rest of the population. They skew white and male.

The reptile-loving Everyman may be a young single man, but members of his community differ greatly in their depths of interest and knowledge. Many are novice and first-time pet owners, often children, who choose low-maintenance animals like corn snakes and bearded dragons. More experienced enthusiasts spend about four times more on reptile products and purchase more—and more exotic—animals. Sometimes these enthusiasts take their hobby to the professional level. They might begin breeding programs out of their homes or operating small exotic pet businesses. Their lives often feature similar narrative veins, such as an absorbing fascination with animals since childhood.

Sarah Kelly falls into this last category. The twenty-two-year-old lives in southern Nevada, where she's a student in a veterinary technician program with hopes of becoming an exotic animal vet. For now, she runs an unofficial reptile rescue out of her home.

As a volunteer in local animal rescues and shelters, Kelly saw abandoned reptiles languish in their cages for months longer than friendly dogs and cats. She knew she could offer some of the cold-blooded animals better conditions until the right home appeared. Thus began her foray into fostering reptiles. Her current rescues came from acquaintances, online ads, and shelters, and they span the breadth of Reptilia: a bearded dragon, six Indonesian blue tongue skinks, a Sulcata tortoise, a ball python, and now, her latest and most challenging rescue to date, a Nile monitor.

“As soon as I saw his pictures,” she writes in an email, “I knew I had to help him.” The Craigslist ad showed a sallow, thin lizard confined in an unheated tank, conditions that would have killed it before long. The monitor’s owner was ignorant of its needs and decided to sell the animal after realizing it would grow much larger than he realized. The Nile monitor Kelly took home the following weekend was in even worse condition than she expected. Though sluggish, the young lizard brimmed with aggression. She intended to raise the animal until she could find it a permanent home—and a responsible owner.

Kelly named her fierce lizard Django after the protagonist of Quentin Tarantino’s 2012 film *Django Unchained*, about a brutalized slave turned vindicated freedman. Over the following month, Kelly spent countless hours and hundreds of dollars nursing Django to health. She discovered gross inaccuracies in most Nile monitor care sheets, which are distributed by pet stores for new owners. Very few individuals, she found, really knew how to care for a captive Nile monitor. So Kelly went back to basics, allowing her lizard’s wild counterparts to inform her research. As she watched online videos of Nile monitors in Africa, her admiration for the creatures grew. They’re lithe and streamlined hunters, she says. They have the impressive power and temerity to take on prey twice their size. They’re among the smartest lizards in the world. They’re also mean as hell.

What Kelly saw online, she then tried to recreate in her own home. She built an eight-foot enclosure instead of using the recommended forty-gallon tank. She raised the enclosure’s basking temperature from 100 to 120 degrees Fahrenheit. She started feeding Django a variety of prey options and nearly three times the standard number of mice. Rather than two inches of sand, she filled his cage with two feet of a clay and sand mixture, to allow him the indulgence of burrowing. He responded in kind by growing at breakneck speed and covering Kelly in bruises, bite marks, and scratches. It’s a significant amount of space, effort, and money for limited payoff.

“If I wanted something to tame and love,” she wrote in an online reptile forum, “I would have rescued a puppy.” After investing so much, it’s possible that Kelly may not find Django a more thoughtful and committed owner than herself. While she has the motivation to research and care for the unusual reptiles she loves, it’s an investment that most are unwilling to make.

“Even though I love my Nile very much, I would never recommend one as a pet,” she writes.

“[P]eople don't think about the long term cost and adult size of these animals.” Also at fault, in Kelly's mind, are sellers who mislead buyers—both intentionally, to make a sale, and out of ignorance of the species' basic biology. “They are beautiful and obviously intelligent animals, and buyers are captivated by that.”

When pet stores and small-time sellers care only about their bottom line, there's little incentive to stop captivation from turning into an impulse buy. That's when overconfident or misinformed buyers then end up going home with a \$30 juvenile Nile monitor. The consequences of a poorly researched purchase are predictable: a high-maintenance, too-large, aggressive animal in all but the most experienced and dedicated hands is likely to end up released, dead, up for grabs online, or at an animal shelter.

The Florida Fish and Wildlife Conservation Commission is trying to give owners a better option—one that doubles as a stopgap to prevent exotic animals from becoming established in the wild. Tasked with everything from conducting search-and-rescue missions to conserving game for hunting, in recent years the Commission has excelled at staging high profile, creative outreach events. They were the entity behind this year's Python Challenge.

The Commission's Exotic Pet Amnesty Day program has succeeded using similar marketing tactics. Five or six days a year, owners may bring in any legal or illegal exotic pet and surrender it without penalties. The state hosts each Amnesty Day at a different location, some recurring in exotic pet “hot spots” like Miami-Dade and Broward Counties. The events typically see between 50 and 100 animals brought in.

“Anything you can go into a pet store and convince your parents to buy for you” ends up at these events, explains Amnesty Day coordinator Liz Barraco, which is why reptiles that start out small and cheap constitute a majority of the surrendered pets. They often arrive as the casualties of life events like college, divorce, or health problems. Plenty of birds and mammals are also dropped off, including two of the weirder animals Barraco has seen as a coordinator: a kinkajou and a coatimundi, two rare South American mammals that require special permits to possess.

“We don't ask questions,” she says. One woman once brought in a cage of 26 sugar gliders, a small marsupial that has become somewhat common in the pet trade. She started with two.

The Amnesty Day program has grown steadily since its inception in 2006. By offering unlimited and guilt-free pardons to pet owners, is the state fostering a culture in which exotic animals are considered disposable and illegal ownership goes unpunished? That fear prompted officials in Connecticut, which instated its own amnesty program several years ago, to operate on an intermittent basis. But the threat of released pets becoming rogue invaders is dulled in Connecticut, where winter temperatures would quickly kill the mostly tropical species popular in the exotic pet trade. In Florida, the biggest priority is giving owners any option other than

releasing their animals. Amnesty Day provides even more than that—their impressive track record gives peace of mind. In the program’s seven year history, every healthy, abandoned animal has been adopted out to a new owner.

“Our stance,” Barraco says, “is that it’s the pet owner’s responsibility. In the age of internet, it couldn’t be easier to find out absolutely everything you need to know about that animal.” When Barraco is not hosting Amnesty Days or fielding calls about invasive species in Floridians’ backyards, she visits schools and reptile expos to drive home that idea. She hopes through her outreach to educate more people about responsible pet ownership, teaching folks to ask the right questions before coming home with, say, an African spurred tortoise that’s going to live for a century.

Unfortunately, that message does not always trickle down. While promoting an amnesty event in October 2012, the Fort Lauderdale-based *Sun Sentinel* wrote in its pages of the perfect chance for owners to “turn in pythons, Nile monitors, piranhas, rattlesnakes, marmosets or any other weird pet that once struck their fancy” or surrender any pet that has “worn out its welcome.” If members of the public take as cavalier an attitude, fears that Amnesty Day encourages a culture of irresponsible pet ownership might be founded. Barraco thinks those beliefs are still in the minority, and that Amnesty Day has largely succeeded in providing a solution to would-be releasers. Still, it only takes a few careless individuals to undermine their efforts.

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This summer marks the ten-year anniversary of Todd Campbell’s Nile monitor research. These days, Campbell teaches a heavy course load in the University of Tampa’s biology department, two hours north of Cape Coral. It’s taken him an entire decade to process the Nile monitor data, a testament to the enormity of answering even basic research questions about a single invasive population. He and a team of students have been grinding away at genetic analyses, studying gut contents, counting thousands of developing eggs in pregnant females. The bodies and parts of over 400 Nile monitors, both from the original study and caught by Cape Coral’s biologists since then, line the freezers of Campbell’s lab.

“These things are so damn big that I’m having to buy new freezers all the time,” he says. Campbell has been open about many of his findings as the analysis progresses, but most of the data has yet to be published. Painstaking and systematic, much of it merely confirms hunches that Campbell had in the early 2000s. “I always like to tell my ecology students, we’re using statistics to prove the painfully obvious.”

What we know is this: Cape Coral’s Nile monitors came from a small, closely related group of colonizers. They’re most active in the warmer months between April and September, when they’re breeding. Once a crop of juveniles is established somewhere, authorities have two years

before they become sexually mature and begin laying eggs of their own. They're eating a lot of insects, but also whole clutches of turtle and snake eggs, threatened rattlesnakes, burrowing owls and other birds, small mammals, and even other invasive species like the Cuban tree frog. They're spreading, but slowly. They're still in Cape Coral, but their density appears to be lower than it was in 2003.

Today, Cape Coral bears the scars of a city in economic recovery. The growth that seemed inexhaustible in the founding Rosen brothers' lifetimes plummeted in 2008, when the real estate market collapsed and sent tens of thousands of homes into foreclosure. Residents fled in unprecedented numbers. By early 2010, the town had the second-highest rate of foreclosure in the country, with banks taking possession of one out of every 92 households. Cape Coral, former monument to free enterprise, became a powerful symbol of the housing crisis. Before the recession, Todd Campbell and the town's biologists had succeeded in highlighting the city's first crisis, biological invasion. Yet in a familiar plot playing out across the country, the recession has led to deep cuts in the town's public programs and altered priorities. The threat represented by carnivorous reptiles suddenly paled in comparison to growing unemployment rates and the exodus of tax-paying citizens.

Even as the real estate sector lurches back to its feet, empty houses and abandoned lots abound among neighborhoods of quick construction. A new crop of residents and retirees, those not discouraged by giant lizards, are moving to the area. With them, the town's Environmental Resources Division faces the challenge of re-teaching its residents about the problem of invasive species.

"Education is now the biggest priority," Harry Phillips, one of the town's environmental biologists, says. Despite grand hopes a decade ago, Cape Coral has failed to eradicate the Nile monitor. In fact, they stopped eradication efforts around the time the recession hit, preferring now to catch as they can with a trapping program that has changed little in a decade. Residents are still encouraged to call about any sightings of Nile monitors, and the town's trapper will lay out a few cages. The division receives a handful of calls a week, depending on the season. "Some regulars have been reporting less monitor activity," Phillips says, but it's difficult to say if that's due to fewer eyes or a dip in population.

"The moral of this whole story here," Campbell says of the town's management, "is since 2005 they've been trapping at a sort of catch-as-catch-can level, greasing the squeaky wheel—when the squeaky wheel calls and says, "There's a monitor lizard running across my backyard." And that's really it."

But something has changed, if not at the municipal level. In 2010, the Florida legislature passed a law banning the possession, sale, and importation of Nile monitors and six large snake species (including Burmese pythons). It may have come a decade too late for Cape Coral, but the statute marks the rare instance in which reptiles have been outlawed in the United States

as a direct result of their invasive or potentially invasive impact on native landscapes. Still, the regulation is elastic—257 permits were issued in 2011 for researchers and businesses to possess the lizards despite the ban—and Nile monitors remain legal in the rest of the country, after a failed bid to induce stricter regulation at the federal level. The lizard now hangs in legal limbo with several other constrictor snake species, waiting for the U.S. Fish and Wildlife Service to make a permanent decision to list or drop them as conditional species under the Lacey Act (which prohibits trade across state borders).

Wherever legal disputes over exotic reptiles crop up, the reptile industry is quick to raise its head. “We oppose the listing of any of the remaining species and are committed to fighting any such restrictions with all of the resources at our disposal,” says Phil Goss, president of the U.S. Association of Reptile Keepers, in a recent press release about the federal decision. “[W]e fully intend to fight for the rights of our members to protect their freedom to engage in their passion.” Goss’ group, the nation’s leading reptile advocacy group, rallies its members to lobby and fight every state-level bill seeking to limit the reptile trade—and impact its financial interests—in any way.

Twenty-one states have strict exotics laws, including bans on owning what are termed “dangerous wild animals.” Only seven have minimal to no regulation of exotic animals, but three of them—Alabama, North Carolina, and South Carolina—fall within the potential range predicted by the U.S. Geological Survey for Burmese pythons, should they expand northward or establish new populations. Pythons in the Carolinas may seem farfetched, but the truth is that the humid, subtropical climate of the American Southeast is suitable for a host of exotic, cold-blooded creatures. Some, like the small and endearing Mediterranean gecko that has expanded north out of Florida, are curiosities with unknown impacts on native wildlife. But given enough time and pressure from the pet trade, a serendipitous recipe like that of Cape Coral and Nile monitors could happen anywhere.

This knowledge has prompted an increasing number of voices even within the environmental community to vocalize their concern over the efforts officials do spend each year attempting to restore landscapes to some former version of themselves, whether that baseline be an Everglades before Burmese pythons, a Midwest prairie before Europeans, or a tropical island before any humans. We live in a mongrel world, they argue, and we’re wasting our energy chasing futile fantasies.

It’s true our planet has crossed a threshold into a world of new, hybrid ecologies. In Cape Coral, Nile monitors mix with several other invasive lizard species alone and countless nonnative plants. But ecology isn’t an on-off switch—native, good; nonnative, bad and beyond repair. Heavily disturbed and invaded landscapes are not inferior because they are different, argue ecologists; they’re inferior because they tend toward the homogenous and nonresilient. Campbell and others across the globe are engaged in the dirty, difficult work of fighting invasive species not because of ecological sentimentality for disappearing landscapes, but

because there's still so much to save.

To that end, Todd Campbell has one last undertaking in Cape Coral. His project is about to come full circle, with a ten-year restaging of the original experiment—but there's an added twist. This time around, Campbell plans to turn the collected animals' skins into high-quality leather.

"I dreamed it up immediately," he says of the idea. When he caught the first lizard in 2003, he thought, "I'd love a pair of boots out of this." He wasn't the only one with that reaction. "Every talk I've ever given, any person I've ever talked to, any interview I've ever done—that question comes up." To turn the idea into reality, Campbell obtained a small grant to run a cost-benefit analysis of selling lizard skins to finance an invasive species removal program. The grant covers the expenses of equipment and a trapper—Tessie Offner, his student at the University of Tampa. Just as a decade before, they will be laying out traps in a grid. The identical effort will allow Campbell to discern whether the population has shrunk, stayed solid, or grown since 2005. He'll do this by calculating the catch per unit effort, an estimate of how difficult it is to catch a single lizard. If less effort—fewer hours, traps, boots on the ground—is required now, we'll know the population density has risen. We won't know why, but a higher density would indicate that the town's laissez-faire approach to management is not sufficient. A lower density could mean the town's program is working, or that something else like winter freezes or disease have killed off some monitors. The meaning of no change at all in density would be even trickier to parse out.

In the meantime, Campbell will contact some leather traders or manufacturers to see what can be done with the skins he and Tessie Offner will be collecting. Campbell already has a connection at Hermès, the high-fashion luxury goods company, which has bought Nile monitors skins before from Africa. If the cost of the labor to capture and tan the animals is less than what Campbell can sell them for, the plan just might hold water. Leftover money could feasibly be funneled back into eradication efforts. It's a peculiar, self-defeating business model—success will mean the end of their source of leather—but perhaps emblematic of the creative ways in which we must think about managing invasive species in a world of limited interest and funding.

Campbell's foray into the leather business feels like the culmination of all his work. "This is... my last research endeavor on these guys," he says. He and Offner have been practicing on a few skins left in the freezers, even though the temperatures compromise the quality of collagen, the main protein found in skin. They've still had promising results.

"They're just gorgeous," Campbell says. "The ones we got done today, we took off the boards after we oiled them, and they're supple and beautiful and they're really gonna be something."





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