The Mascot and the Refugee: Survival Strategies for the New Urban Jungle

by

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ABSTRACT

As humans rebuild the world to suit our needs, many of our fellow creatures simply get out of the way—but others try their luck alongside us. Austin, Texas is home to two notable urban wildlife populations. In the early 1980s, one and a half million Mexican Free-tailed Bats moved into a bridge in the center of the city. Though initially greeted with fear and suspicion, they managed to turn their reputation around, thanks to the dedication of bat enthusiast Merlin Tuttle and their own set of helpful characteristics. Their nightly flight is now a popular tourist attraction, and the bats themselves are a beloved part of Austin's culture.

Meanwhile, the rare Barton Springs Salamander, which has lived for in the same spring system for millennia, has watched Austin grow up around its home, and has watched its citizens turn that home into a popular recreational swimming area. Now, as the city's growth threatens the salamander and its habitat, environmental activists, academic scientists, and city wildlife managers do their best to save the salamander, and to leverage its rarity to save Barton Springs. The story of each species illuminates the many different ways in which we relate to the animals that live alongside us, and what those relationships say about us—our values, our goals, and how we picture the future.

Thesis Advisor: Marcia Bartusiak

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If I had really wanted to make it a quick trip, I wouldn't have gone out at dusk. After just a few days in Austin, I know better. Sixish here is rush hour twice over. The gridded part of the grocery store lot is packed with vehicles, stopped mid-commute so their drivers can bring home dinner. Most of the other space—between and atop the cars; on the sidewalks; in the decorative trees—belongs to a massive gathering of grackles. The birds mob here nightly, like an iridescent motorcycle gang. They preen, hop around, and shriek like car alarms, and then, eventually, they take off for lots unknown. That's when I go into the store, already nostalgic. But no matter. By the time I emerge and approach the big dumpster, the foxes are out.

The earth has only so much room, and humans are taking up more and more of it. Our population grows by a little over one percent per year, and the cities that house the majority of us swell in turn. To connect them, we web the spaces in between with roads and railways, with sky-high wires and underground pipes. To repair, power, and feed them, we clearcut rainforests, dynamite mountains, and parcel valleys into cow pastures and fruit orchards. Other creatures that find their stomping grounds chopped, paved, or highway-sliced are left with a decision: stay on their shrinking ranges (and deal with the crowded consequences), or strike out into the un-wild.

Those who choose the second option are called synanthropes, from the Greek words for "with" and "humans." Defined by ecologists as "wild species that settle in human habitations of their own accord," synanthropes find niches and make homes all over what we call civilization. North America alone boasts scores of urban-adapted species, from cotton-tailed rabbits to wild pigs; global numbers are doubtlessly higher. We've got skunks in our garbage dumps and coyotes on our golf courses, hawks in our high-rises and rats in our sewers. No block is too developed; no phylum too untamed. Sand flies swarm around Brazilian hydroelectric power plants, drawn to the water in the retaining dams. House sparrows open automatic doors. The Thames Estuary—the rivermouth that, as Joseph Conrad had it, launched "the dreams of men, the seed of commonwealths, the germs of empires"—houses, now, a thriving population of harbor seals.

Austin, Texas, is a case study in synanthropy. Interspecies encounters are as much a part of city life as outdoor music and taco trucks (indeed, the grackles have been known to imitate electric guitars and to steal tortilla chips from hapless Tex-Mexers). I have met, on different twilit jaunts through the city, raccoons camped out in roadside culverts, coyotes howling at the Moon Towers, and a pair of falcons perched on adjacent telephone poles, scoping out prey. The reasons are practical: Austin has been growing steadily since its founding nearly two centuries ago, and its mild climate and embrace of green space are as appealing to animals as they are to people. But the results are palpable, experiential; it feels as though, with no more frontier left to explore, all that wild Texas energy turned inward and started attracting furrier, scalier pioneers. Even the species represented seem freakier than average, as though the animals, too, have read the bumper stickers, and have committed themselves to the business of Keeping Austin Weird. Any old city has pigeons. Austin has feral parakeets.

All these animals have settled into the city's ecological rhythms, finding ways to eat and sleep and mate despite the streetlights and the concrete. But when humans take over a space, they do more than change the landscape. A city like Austin has systems and dimensions beyond the

physical. It's a political, social, and economic entity, not just a bunch of side-by-side dwellings. Cities have laws, goals, and values that overreach their individual residents. They run on super-resources—money, power, attention—that draw competitive focus, and determine access to more traditional assets like food and shelter. Just by being around, synanthropes get cast in these human dramas. How well they perform can mean the difference between life and death.

This is the story of two little species in one big city, and the strange, intertwined trajectories of their very different fates. One, winging through the air from Mexico, settled in a piece of public infrastructure and caused a panic. The other, creeping between underwater limestone caverns for millennia, found itself trapped in a swimming pool and thrust into the heart of what some would describe as a battle for Austin's very soul. Both have helped to shape their city as sure as it has helped shaped them. And neither would be around without very committed friends.

But all that comes later. First, our synanthropes have to arrive.

Imagine you're a Mexican free-tailed bat, female, about three years old, in the prime of life. Wings outstretched, you're a foot wide; when you tuck them in for the day, you shrink to the size of a playing card (and about half of that is your eponymous tail, which sticks out past your back membrane, and is naked). You weigh as much as two quarters. Skim over the surface of a still lake, and you see your reflection: two small round eyes, a wrinkled upper lip, wide, bumpy ears, and large feet covered in curved white bristles.

You don't hibernate. Instead, for a few thousand generations, your maternal colony—a huge one, a million moms strong—has traveled in seasonal cycles. You leave your huge Mexican overwintering cave around February, wing northwards through the Sierra Madre Occidental mountains to the Southwestern United States for the summer, and flee back to Mexico with the first October cold front. Your daily routine is also cyclical and communal: starting at dusk, you set out en masse to hunt, each of you chasing down your weight in bugs. By day, you snuggle up together, sleep, and groom one another with your feet.

Your traditional summer spot is another spacious cave, this one right outside of Austin, a great place to birth and raise pups. But this year, 1981, you show up to find your traditional spot blocked up with concrete. Next door is a brand new shopping mall, itself raised to meet the needs of another growing population, that of the city's suburbs.

Where will you go? Nearby caves are packed, "dibsed" ages ago by other free-tailed bat groups. The mangrove and cypress stands are also all booked up, and the manmade habitats frequented by much smaller bachelor colonies—circuit boxes, brick walls, decorative palm trees—won't fit a million of you. You fly around, urgently house-hunting, until you all spot it at once: a huge bridge, nearly a thousand feet long, right over Lady Bird Lake, a huge insect-magnet of a waterway. You flock over to test it out, and it's perfect. After a few hours of bug-hunting, you

snag the porous concrete with your claws and swing yourself upside down, and, pulling your wings in for the day, settle into your new home, which may well be better than any cave.

With the Congress Avenue Bridge, the bats hit an ecological jackpot. It was a haven—tons of food, plus very few of the natural dangers presented by caves (birds wait at their narrow openings to snatch returning bats) or trees (weasels climb up and eat sleeping pups). A 1981 bridge remodeling added thousands of evenly spaced, inch-wide crevices, each exactly the right size for a few mom-and-pup duos. But moving so close to human territory presented a whole new set of dangers.

After all, the bridge was remodeled not to support an influx of bats, but to welcome a more favored demographic: young professionals. Consider you're one of those instead, new to town in 1981. You work in finance and are glad to have followed your dreams to Austin, which you've heard is full of great food and parks, and is a top-notch place to raise kids. After some house hunting of your own, you found a place in Travis Heights, just a short drive over the bridge from your new job in the recently erected JPMorgan Chase Tower. Austin is just as advertised: the exciting center of a new tech boom, growing fast and alchemizing into a true creative city, largely thanks to young people like you. Except that—after a few nights driving home distracted, trying to parse that big black cloud over Lady Bird Lake—you realize you have some unexpected neighbors. About a million of them, in fact. How do you react? What do you do with that shiver fluttering up your spine?

We experience fear as a feeling. It bypasses our minds and hits us straight in the hackles. Evolutionary biologists trace this instinct back to prehistoric times, when there was nowhere to hide from wildlife, and full-throttle flight-or-flight at the first sign of another predator was necessary for survival. But there are a lot of different ways to die, and so our fear of "disgusting animals" is just as hard-wired. Disgusting animals are common disease transmitters, like mice and rats (or they just remind us of things that are, like mucousy snails and corpse-eating maggots). Seeing them triggers those same get-me-outta-here feelings.

Fear can also be learned, and instinctive fear can be retuned, channeled, and selectively encouraged. Bats sometimes do carry rabies, but the species overall is less loaded with disease than they are with centuries of cultural referent. No animal escapes the human need to narrate, and bats' characteristics slot them right into a number of ready-made roles. Bats are shy and nocturnal—suddenly they're tricksters, thieves, and lords of the underworld, mythic embodiments of darkness, deception, and the unknown. Three species of South American bats feed on cow blood—suddenly bats aren't bats at all, but vampires in disguise. They're furry like mammals, but they fly like birds, so they are repeatedly cast as what folklorists would call "liminal" figures, weirdo hybrids that don't fit into the normal order of things. Modern myths bear this out: even Batman is afraid of bats.

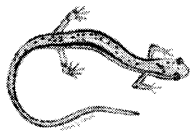
The Austin bridge bats couldn't outfly this reputation. Upon arrival, they received a mixed reception. Although most experts were calm, less informed reactions ranged from skepticism to terror. City officials considered wiring off the bridge crevices or filling them in with polyurethane rubber. Concerned citizens circulated petitions calling for the city to go one step

further and poison the interlopers en masse with cyanide (a strategy that would have ended with streets full of slowly dying bats). Journalists weren't immune; even "mildly pro-bat" articles were sent off to the printer with horror-movie headlines like "Bat Colonies Sink Teeth Into City." One news item describes a grisly scene in which University of Texas at Austin safety officers attacked bats who had gotten into a school building with brooms and tennis rackets, and a hired exterminator gassed a colony roosting in the football stadium. "Let them go to Carlsbad Caverns," he said. "That's where they belong." About 1,500 bats were killed over the course of three days.

In the early chapters of Bram Stoker's *Dracula*, the book that introduced the Western world to vampires, protagonist Mina Murray records this nighttime sighting in her diary:

> *Between me and the moonlight flitted a great bat, coming and going in great whirling circles. Once or twice it came quite close, but was, I suppose, frightened at seeing me, and flitted away across the harbour towards the abbey."*

Here, long before Mina's encounters with the Count, the bat is the scared one, and the human is scary. Even after the big reveal, you could argue not much has changed. If you think every bat is Dracula, of course you'll want to bash them all with tennis rackets. In order to stay in their new home, the bridge bats would need to mitigate that citywide shiver—or someone else would have to do it for them.



Two miles away as the grackle flies, just downstream from the bridge the bats moved into, another synanthropic struggle has been playing out. This story gets told less. It lacks a certain rabid tabloid appeal, but it is, I promise, just as weird. It has villainous dentists, and Al Gore, and futuristic amphibian bunkers. And it starts, fittingly, deep underground.

Far beneath Austin's shops and clubs lies a sprawling, subterranean labyrinth called the Edwards Aquifer. Nestled in the middle of the state, curved from central Salado down to the Rio Grande, it looks, on maps, like Texas's left kidney. It acts like it, too—half a billion gallons of clean, cold water move through it every day. Tip to tail, it hydrates about two million Texans.

The Edwards Aquifer is a relic of the Cretaceous period, famous for its dinosaurs, when Texas wasn't yet Texas and was instead a shallow tropical sea. Shells and algae fossilized into a huge expanse of porous limestone, which was carved into interlocking tunnels by moving water. Over time, the surrounding mud flats hardened into watertight shale and sheathed most of the limestone. (You can still see dino prints in dry riverbeds just half an hour northwest of the city.) When the sea receded, the whole thing became a massive stone sponge, soaking up rain and creek water, passing it through the tunnels, and forcing it to the surface again in the form of springs and wells.

The Barton Springs segment of the aquifer makes up the crook of the kidney. It's named after its discharge site, Barton Springs, which sits on the northeast corner of the segment and squeezes

water up out of the limestone and into the Colorado River via a network of four connected springs. The areas that drain into its underground passages, called "contributing" and "recharge" zones, stretch southwest across Travis County. Highway signs tell you when you're entering a recharge zone, where the water stays closer to the surface and is more vulnerable to pollution. Whether it's rainwater sloshed into a creek, sprinkler runoff whisked through a sewer grate, or the spit of an angry highway driver, pretty much every drop of water that lands on Austin eventually passes through Barton Springs.

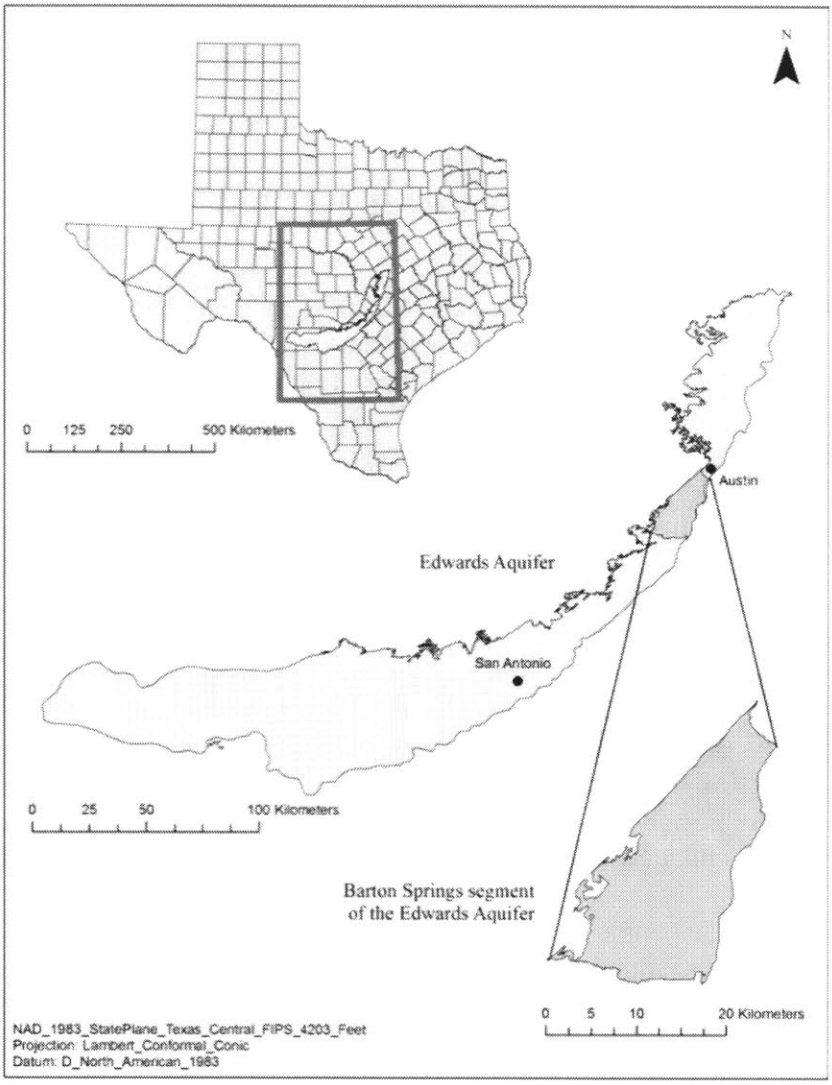


Figure 1: Map of Edwards Aquifer and Barton Springs

Every single wild Barton Springs Salamander does, too, because every single wild Barton Springs salamander lives there. The species boasts, in the words of one city herpetologist, "one of the smallest ranges of vertebrates in the United States, for sure." A good amount of this range is Barton Springs Pool, a dammed-up, city-managed section of creek that people swim in year-round—which makes this salamander likely the only species in the world who spends much of its life in a public pool.

How did this happen?

Bear with me one more time: imagine you're a Barton Springs Salamander. You're pink, and speckled, about the size of a Mexican free-tail bat, with stubby legs, a blunt snout, and external gills that wave around in the water like thin seaweed tendrils. Your ancestors lived like regular amphibians, crawling in and out of pools and streams, laying their eggs in water but spending most of their time on land. But by the time you come around, it's gotten so hot that you barely leave the water. Eventually, your descendants will stay submerged for life, develop permanent gills, and lose the ability to move around on land, which effectively sticks them in one spring network for good. This is okay, because it's a nice spring network—full of small edible creatures, with lots of rocks and weeds for hiding. From now on, your movements all occur within this underwater ecosystem. You lay your eggs in deep aquifer caves, and come up to the relatively shallow stream bottom to hunt.

Cut to around 8000 B.C., when your spring, an oasis in a dry state, begins drawing strange tall primates. At first, your descendants barely notice. Maybe a few slate arrowheads settle among their hiding rocks, but eventually the bipeds begin making more of an impression. Thirsty groups move through your home on their way to other springs. Many gather for ceremonies around the main spring, which, thanks to the pressure of the aquifer, shoots out of the ground like a fountain. The migrating buffalo, a yearly staple, start being trailed by groups of American Indians; a few centuries later, Spanish missionaries in turn start trailing the American Indians. In 1821, when the Mexican government declares open season on the territory, European settlers begin pouring in, bringing with them industry: mills, fish hatcheries, ice manufacturers, and limestone quarries. The springs begin to change. In 1837, William Barton comes to town, builds a cabin right above the main spring, and starts naming everything—the auxiliary springs after his daughters (Parthenia, Eliza, and Zenobia), and the system as a whole after himself. He brings more buffalo, tame this time, which attract the first wave of tourists. In 1839, Austin becomes the capital of Texas, thanks to your home, which boasts "the greatest and most convenient flow of water to be found in the Republic." Mostly, your descendants continue to hide. A few who get too curious and pop out end up in a jar of preservatives in the Texas Memorial Museum.

As infrastructure improves, people keep moving in. Entrepreneur Michael Paggi, who already had a gristmill on the banks, added a bathhouse and carousel in 1871 and lent some order to the proceedings. Families come on day trips to gather water, picnic, and fish. They start damming up some of the waterways with rocks and moss, and these obstructions pile on each other until the main spring loses its burble and becomes a bonafide swimming pool. Your descendants are now regularly snout-to-ankle with many facets of Austinian society. In one week, they might dodge the feet of splashing tourists, local politicians, bathing World War I soldiers, and huge groups of freshly-baptized Christians.

In 1931, Barton Springs and the surrounding acres are donated to the city, and Zilker Park is born. Now that it is city property, the soul of the capital of Texas is given star treatment. In 1928, Austin had already spent $30,000—$416,000 in today's terms—enlarging , deepening, and leveling the widest part of the spring. The hill is carved into stairs, the streambanks become

sidewalks, and the dams are finalized with concrete. Your species has spent millions of years in the same spot, but you don't really live there anymore. Now you live in Barton Springs Pool, and a lot of people want a lot of different things from your house. With everything that's going on, how can you possibly make your presence known?

This is the other side of synanthropy: an animal that moves into a human home gets a special title, but a human that co-opts an animal's millennia-old habitat is just a human.

Enter the park, walk over the tracks of the kiddie-sized Zephyr Express train and past the Zilker Cafe, and there it is: Barton Springs Pool, a stretch of spring water the length of three football fields, arrested in a limestone basin and flanked by grassy hills. The water is held in place by dams on either side. Lifeguards open and close them every morning, and clean the algae off the limestone once a week so people don't slip. Even though I know its history, I'm so used to city pools being hemmed-in and chlorinated that this one seems less like a piece of infrastructure than like something that just grew here on its own.

Even once they were official and contained, the Springs continued to evolve—shifting with the times and, as one of the many park posters has it, "reflecting changing attitudes towards recreation, community values, and environmental stewardship." Eight hundred thousand people come here every year, mostly in the spring and summer. At nine o'clock on this January morning, there are maybe twenty, a few stretched out on the lifeguard chairs, the rest criss-crossing the pool lengthwise in slow laps. The constant grind of human progress seems to have slowed, too, ossified into plaques commissioned by various historical societies. Other species have a livelier presence: mayflies drift around, focused cormorants squint and dive at things, and a half dozen ducks confer in the shallow end.

The salamanders, presumably, are doing salamander things—eating or swimming or hanging out between rocks. You will probably never encounter one, but you'd be forgiven for expecting to. Signs of them greet you at every turn—literal signs, with commanding rhetoric and pictures of slimy-looking pink amphibians, both slightly larger than life. "Home of the Salamanders," boasts a pathside placard, reminding visitors that "it is a privilege to swim with endangered species in such a unique place." Instead of the expected warnings against sunburns and shallow diving, the lifeguard chairs are backed by more pictures and entreaties, in ventriloquized salamander voices: "Please protect our home. We live under the rocks." And if these messages are too subtle, there's the "NO TRESPASSING" notice on fenced-off Eliza Springs, promising "PENALTIES OF $10,000-$50,000 AND UP TO ONE YEAR IN PRISON" to anyone hoping to imitate the pleasure-seekers of earlier centuries. "Most people have never seen one who have been swimming there their whole lives," the city herpetologist told me. You're not going to run into one while toweling off in the shallow end.

But just because you can't see something doesn't mean it isn't there. And the Barton Springs Salamander is there—very specifically *there*, in the springs it's named after, and nowhere else. Its movements are so small it never ripples the surface, but thanks to national law, local

priorities, and a small cadre of committed citizens, its there-ness is starting to make real waves. With the right lens, or the right tour guide, you start to feel them.

In 1982, as the bridge bats struck fear into the heart of Austin, Merlin Tuttle was far north in Milwaukee, working as a museum curator and occasionally answering his Batphone. He had listed his number in the Milwaukee Yellow Pages, under "Bats." Frightened people would call needing bat help, and he'd give counsel, convincing homeowners to batproof their windows instead of using pesticides, and telling one distraught woman that the "small orange bats" trying to get into her home were probably butterflies.

Tuttle had been correcting misconceptions about bats since he was seventeen, when he discovered that, contrary to what his textbooks were telling him, the colony of gray myotis in the cave near his house were heading south for the winter. He earned masters and doctoral degrees in ecology, and traveled all over for field research. In the process, he noticed that not everyone was as enthusiastic about these creatures as he was. A Tennessee potato farmer granted him access to a cave on his property provided he "kill all the bats he can find." He saw roosts in Florida buried under town dumps, bulldozed by landlords, and turned into spelunking tourist traps. If things continued this way, Tuttle realized, pretty soon he'd have no more study subjects.

And so Tuttle developed a humanitarian flair along with his science chops. He became an educator: when he went to a new town, he'd give public talks, complete with a show-and-tell bat. He became a diplomat: he'd cold-call government agencies and convince them not to fill in the abandoned mines that bats had repurposed for roosts. He became a photographer: when he realized that bats look scary in pictures because they themselves are scared (photographers would blow into their faces to make the bats snarl), he set out to literally change their public image. He bribed his subjects with worms or honey-water to calrm them down, and sometimes even shampooed them so that they'd look their best in front of the lens. Eventually, he had converted enough bat skeptics that he started an organization, Bat Conservation International, so that they had a way to help him out.

When, in the mid-80s, he heard there was a whole city suffering from acute bat phobia, Tuttle saw a golden opportunity. "I realized any town that had so many media outlets with nothing better to do than talk about bats would be a great place to center bat conservation efforts," he tells me, and in 1986, he picked up his fledgling organization and moved to Austin. He was, also, not immediately welcomed. He was a runner up for *Texas Monthly*'s 1986 "Bum Steer" award, given annually to bad ideas, but he was patient. He set to work with his unique mode of bat reputation rehab.

People call Tuttle "The Bat Man," but he's too earnest to be a superhero. He's a lot of other things, though. He's a Bat Lorax, speaking for the bats. He's a superfan, proselytizing about their great qualities; he's a bodyguard, keeping them out of harm's way; and he's a very savvy PR rep, literally and figuratively remaking his clients' image. But mostly, as fellow bat biologist Richard

LaVal puts it, he's a "natural-born salesman," one who really believes in his product. "The facts about bats are extremely powerful," Tuttle says. Simply share them, and people buy in of their own accord.

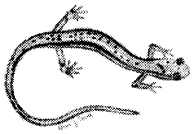
It turns out this is particularly easy to do with Mexican free-tailed bats, who are at least as multitalented as their spokesman. Their liminality, that crazy mix of attributes that makes them strange and otherworldly, means they have something for just about everyone.

Trying to win over a competitive athlete? Mexican free-tailed bats can fly nearly two miles high and break most small-town highway speed limits, and they jam each other's sonar when competing for food. A history buff? During World War II, top US military brass spend about two million dollars developing a "bat bomb," in which hundreds of napalm-armed bats would be loosed in Japanese target cities, roost in attics, and set the place on fire. (This project was eventually scrapped in favor of the bomb everyone knows about). A musician? Bats trill and chirp to find food and each other, but some sing, too, and the Mexican free-tail's song is as swoopy and expressive as an aria.

What's that? Your mother still isn't convinced? A Mexican free-tail mom can track her own pup by smell and sound, even in the million-strong crush of the Congress Avenue Bridge.

The most airtight argument of all, the bat's ace in the hole, is that she fits into the city's economic ecosystem, too—simply put, she has a job, and she's good at it. The bats are Austin's pest control, taking care of the real blood- and nutrient-suckers. Mother bats have to generate at least their weight in milk every night to feed their pups, which means eating their body weight in bugs. The Congress Avenue Bridge colony consumes about 140,000 pounds of moths and mosquitos every week, enough to fill ten large garbage trucks. They are so deadly that simply playing Mexican free-tail calls out in a cornfield reduces crop damage by half as terrified moths flee. And they're so prolific that confused TV weathermen used to predict storms over Austin crop county every evening, until they figured out their Doppler radar was picking up the enormous predator-prey chase. All of those moths and mosquitos can't bite tourists, spread diseases, nibble on leaves, and otherwise stick in the craw of the economy. One researcher estimates that the bats save the city $1.7 million dollars per year in pesticide and lost crop costs alone. They're practically low-bracket taxpayers.

Merlin brought these facts to the schoolchildren, press offices, and public works departments of Austin, and support for the bats grew. Meanwhile, Bat Conservation International was growing, too. The original budget, "$30,000 and one staff person," had grown to $600,000 and eleven staffers by 1988; according to their annual report, their 2014 budget topped $5 million. The Texas Department of Transportation began building bat-friendly bridges on purpose. Just eleven years after the bats' questionable debut, and with a jumpstart from one dedicated man, they had truly made it.



By early afternoon, the Springs start picking up. A man on a bicycle drifts in, buys a bottle of water at the Zilker Cafe, and then drifts off again. Schoolchildren elbow one another in line for the Zephyr Express. I'm waiting at a picnic table for Bill Bunch, a prominent local environmental activist, and one of the people who put the salamander in the spotlight.

Bunch, protector of rare things, is himself a rare thing—a local environmental law celebrity. He's had a hand in most of the major Austin conservation victories of the past two decades and has received a lot of the credit for the city's green turn, from "a once-ineffectual environmental community into a viable political force." People recognize him on the street. When his backpack got stolen in 2008, it made the *Austin Chronicle* news desk. ("He's terrified someone will discover it's loaded with salamander carcasses," joked one commenter.)

Barton Springs isn't just a social aggregator. Due to the interconnectedness of the Edwards Aquifer, Barton Springs is an ecological representative for Austin's whole water supply—the canary in the coal mine whose clear, cool song promises all is well, until it's not. This became abundantly clear in 1962, when a "lethal mass" of toxic pesticides filtered into the aquifer through a storm drain and swept through the Springs and out through the Colorado River, leaving thousands of aquatic creatures dead in its wake. Rachel Carson gave the spill a few pages in *Silent Spring*, a book that helped ignite a nationwide environmental movement that, itself, found some of its most passionate supporters in the Austinites who had grown up enjoying the Springs. Starting in the 1970s, pro-Springs groups proliferated, marshaling legal and political tools to help protect the pool and its water system from the various stresses of increasing development. They drafted petitions and clean water bills, sued developers, and lobbied the city to buy up property in the aquifer's recharge and discharge zones in order to keep out pollutant-leaching apartment complexes and water-impervious parking lots.

Bunch is the current executive director of the Save Our Springs alliance, the most successful of these groups so far. The SOS alliance came together in 1990 in order to prevent four thousand acres around Barton Creek from becoming "2,538 houses, 1,900 apartment buildings, three new golf courses and 3.3 million square feet of commercial development." A thousand strong from its very first day, the Alliance stormed a city council meeting, kept everyone there overnight, and defeated the proposal. Another major victory followed: they gathered 30,000 signatures and overwhelming votes to push through the Save Our Springs Ordinance, the first water quality law drafted by citizen initiative.

Bunch is a defender of the voiceless, so uncompromising he's been called "the Raging Bull of Austin's environmental movement." Articles from the 1990s have him sleeping on the floor of his office during long campaigns, getting "teary-eyed and choked up" at town meetings, and saying things like "I'm not going to make love to the people who are destroying the creek." He backs up his commitment to the cause with enough legal savvy that he actually gets things done. Critics usually call him out for not compromising *enough.*

As he walks up to greet me, Bunch tells me he's coming off a bout of walking pneumonia, but there's muscle in his handshake. His eyes are sharp and friendly behind wire-framed glasses, and his salt-and-pepper hair is mostly salt. It's noon by now, and the lunchtime wildlife is out: bees drift from table to table and squads of pigeons patrol the picnic area. Bunch speaks easily over

their racket. He's got the quick wit of a bout-winner, filtered through the slow, steady drawl of someone always thinking of the long game.

Barton Springs is his longest game yet. Bill has been fighting for the Springs since 1988, when he was hired to sue the Texas State Highway Department on behalf of the Save Barton Creek Association (SBCA), another local environmental group. The State planned to expand the MoPac Highway over the aquifer, and refused to take federal money to do so; the SBCA thought this refusal was an attempt to avoid federal environmental regulations. Bunch won the case at trial, buying time for a different groundwater conservation district to negotiate a deal with the highway department, which agreed to stricter environmental controls. Even after Bunch lost the case on appeal, he was hooked, and left his law firm to focus on conserving Barton Springs. "I didn't really go to law school to be a lawyer," he tells me. "I went to have the tools to be an environmental advocate."

There are a range of tools available to people like Bunch. One of the blunter ones, and one he wages regularly, is the Endangered Species Act. Passed by Nixon in 1973, the Act is meant to protect endangered and threatened species "and the ecosystems upon which [they] depend." Because of this, savvy environmental lawyers try to get particular species listed as endangered in order to protect their habitats. Bunch has gotten good at this and tells me about his greatest hit—1990, the Tooth Cave Spider. A development boom had hit the area around the Wildland Caves, surface openings that lead deep down into the aquifer, and suddenly the dentist who owned one of them, Tooth Cave, was threatening to "fill the cavity." Bill and a bunch of local activists staged a 'cave-in,' sitting in the cave so the dentist couldn't cement it in, and Bill drafted the spider an "emergency petition to list," which provides immediate protection. He started dialing all the press he could think of, including a fledgling network called CNN, who ended up sending a TV news crew. It worked like a charm. The Wildland Caves became a protected area, and the spiders thrive.

I realize halfway through that Bunch is describing a scenario so ideal it sounds like a conservationist fairy tale: a helpless creature in a contained environment, threatened by a cartoonish villain and rescued by a perfect storm of activism and law, publicity and pragmatism. He is cracking up remembering it. "Yeah, it was hilarious, it was so much fun," he says. If only they could all be like that.

When the Barton Springs Salamander was officially discovered in 1993, Bunch sensed a similar opportunity. The salamander, with its tiny range, was certainly qualified. If he could get it listed as endangered, the Springs themselves would be untouchable. But since all the water in the whole aquifer eventually passes through the Springs, a listing would also give him more concrete reasons to keep developers away from the whole shebang. Maybe he could even reach his ultimate goal: a series of preserves spread throughout the county, from the high plateaus at the edges of the watershed all the way to the spring itself. He set to work.

This time, it wasn't so easy. Listing is a political process as much as a scientific one. Once listed, species are lawfully entitled to management, care, and funds. Some leaders are more likely to help out than others. When the salamander came up for endangered species review in 1995, then-governor George W. Bush cut a deal with Secretary of the Interior Bruce Babbitt not to list *any*

species that year. Bunch felt a time crunch; species often die on the ESA "candidate list," while in line to find out whether they qualify for help or not. Avoiding that required a serendipitous encounter with local country music star Jerry Jeff Walker, who called up his buddy Al Gore. Gore agreed to stop listening to the developers who had first bent his ear. According to Bunch, Gore then encouraged Babbitt to "make an announcement on Earth Day that they're listing the salamander as endangered… turn it into a celebration, a good thing." Finally, after five years of battling through lawsuits, attempted cronyism, and marketing-savvy timing, they got their listing. "And yet, it's supposed to be the best available scientific and commercial information, and only that!" Bunch's eyebrows stretch upwards like they're attached to the strings he had to pull.

The listing has had some immediate effects: the city developed a comprehensive management and research plan, and the pool maintenance staff stopped using bleach as an all-purpose cleaner. Moreover, they established a captive breeding program, to ensure a lab population survives if disaster does strike. But the salamander's powers only stretch so far out of its immediate zone before they weaken. "Translating the listing of the salamanders to actual watershed protection has been very difficult," Bunch says, and he now considers his linked-preserves goal impossible. Bunch and the rest of his Alliance would have to keep fighting uphill for full aquifer protection. But in the meantime, the Barton Springs Salamander did get on a very important list.

A good job and legal protection both count for a lot. But to make it in a city, you need social clout, too. And for that, stories are the best form of currency. Everybody in Austin has a bat story, just like everybody has a bandana and a favorite coffee place. If you're new in town, you borrow one from friends, or, if you're Robi Robichaud, you ask the local paper. "I have heard so many conflicting, confusing, convoluted stories regarding the bat scene here, I just got to ask someone who can give me a few straight answers," she wrote the *Austin-American Statesman* in 1997. "Are these bats somehow less intelligent than your ordinary run-of-the-mill bats who 'get' that they're supposed to hang out in caves? Or are they radical, revolutionary bats—sort of the 'fringe' element or 'grunge' or perhaps 'GenXers'?"

A few people I meet are still very concerned about rabies. One man describes, in great detail, watching a bat die on the State House lawn, and, later, being followed home by a live one that circled his head. Another, Will, has a bachelor colony living in his attic, not an unusual occurrence in Austin, as removing roosting bats during breeding season is illegal. "I hear their little squeaks and stuff," he says. "I love bats."

Will tells me that when he first came to the city, he went with some friends to see the bridge bats. They joined a growing crowd on a hill, assuming everyone was out waiting for the same thing. "Suddenly, we heard this super loud BOOMBADABOOMBADABOOM!" Will plays the air congas. "And we were like, woah, the bats! We thought it was the beating of their wings, or something. But it turned out there was a flash mob at the same time, and they were just starting to have their pillow fight." Bats don't do much more than squeak. Will, of all people, should have known that. But their reputation is a lot louder than they are.

Conflicted, confusing, convoluted stories are the opposite of Merlin Tuttle's foolproof bat facts. But the lore lends the animal a different sort of power—the power to stand (or hang) for larger things, and to reflect a self-image that the citydwellers hold dear, but that is also full of contradictions.

"Austinites are very proud of the bats, and of the fact that there's a wild element to this bridge that connects the two main parts of Austin," one woman, Jessie, told me. "It makes sense that there is this bat presence. It's that kind of town."

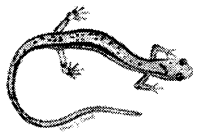
Aesop has perhaps the best bat story, one that I suspect may be an allegory specifically directed toward the bridge bats, though it was written long ago. In his tale, a bat ends up in a weasel's nest and is about to be devoured. "You are a Mouse," the weasel says, "and I am a sworn enemy of Mice."

The bat cries to be let free: "But I am not a Mouse! Look at my wings. Can Mice fly? Why, I am only a Bird! Please let me go!"

The weasel does. Days later, the bat finds himself in a similar predicament with another weasel. "You are a Bird," says this one, "and I am going to eat you."

"What!" The bat cries again. "I, a Bird? Why, all Birds have feathers? I am nothing but a Mouse."

The bat is once more released. Aesop's motto is: *Set your sails with the wind.* For Austin's bats, I would put it: *Embrace your contradictions. Be an allegory, then an encounter, then an opinion, then an attraction. Be whatever you need to be to survive.*



It's exhibition night at the Art-Science Gallery, and a party is in process. The back wall, tall and narrow, is hung with dozens of copies of Sophie Roach's "Self-Portrait at 10,000x," a painting of a human cell blown up to carnival size, with neon-rimmed ribosomes and mitochondria Ferris wheels. The gift shop has a sew-your-own amoeba kit, ink prints made from bat skins, and roadkill toads re-splayed carefully under glass. Gallery guests walk through, shuffling through brochures, trading business cards, and stroking their chins while peering at small details.

Dr. Hayley Gillespie presides from the doorway, wild-haired and greeting everyone. She sports a ready grin and a hand-printed "SCIENCE IS IN" shirt with the paint still wet. Gillespie has many official pursuits—evolutionary biologist, activist, Art-Science Gallery founder—but she's really a magician. Whether she's doing science or art, studying rare species or showcasing LEGO minifigures of women in science, she makes the invisible visible. Which makes her and the Barton Springs Salamander a good match.

Gillespie talks about the thirteen Texas salamander species like they're her favorite baseball team. She has loved them since she was a kid, and first saw a tank full of big Texas Blinds and slick San Marcoses while on vacation with her family. Years later, when she moved to Austin for school and learned about that relatively recent draft, the Barton Springs Salamander, she figured she was too late to make any real contribution to the field. "Scientists have probably answered all these questions," she thought.

But science, like any process, is bounded by its environment; its goals and outcomes are constrained by the available resources. The University of Texas at Austin's biology department, Gillespie says, is flush with phylogeneticists who have migrated to and from academic and management positions. They are great at solving evolutionary mysteries, like sequencing and comparing species' genomes and building a salamander family tree. But when it comes to the day-to-day life of the creatures in question—their ecology, their life stages, their behavior—Gillespie puts it succinctly: "Nobody knows anything!" She decided to turn her x-ray specs on it. In 2011, she completed her dissertation, "Ecology and conservation of the endangered Barton Springs Salamander."

It wasn't easy, she says. Everything gets weird in the Springs. In this strange half-natural habitat, with such a small research sample and such a small body of knowledge to draw from, simple questions flowered into complicated problems. For example, Hayley wanted to figure out what the salamanders eat—a basic, first-page-of-the-picture-book question, you'd think. So she checked the research, which, over and over again, named *Hyalella azteca*, a hard-shelled mini-crustacean and the salamander equivalent of a jumbo shrimp. Suspicious, she traced this assertion back to its source, a Fish and Wildlife Service document. It had started there and proliferated, unquestioned, throughout the literature. "That one observation went from a field note to this string of citations that just turned into an assumption about the whole species," she says. "It's not a study. It didn't include any information about how many individual observations of salamanders it was based on. It was just somebody's note that made it into the final generic description."

If you don't want to guess, what do you do? Traditional approaches involve pumping the salamander's stomach (about as difficult as you'd imagine, and often fatal), dissecting it (also fatal), or analyzing its fecal pellets (a method biased towards hard-shelled things like amphipods). In the end, Gillespie borrowed a method from mammal scientists called stable isotope analysis: analyze salamander tissue and a bunch of possible food sources, compare the proportions of different chemicals in each, and puzzle it together. If the same type of atom is in both, it raises the odds that the salamander ate it. It's the old adage run through a mass spectrometer—to figure out what a salamander eats, figure out what it is. Barton Springs Salamander tails fall harmlessly off when pulled, so Gillespie had a safe way to get tissue samples. She analyzed twenty tails seasonally for two years, and ended up with a new favorite salamander food—not crunchy amphipods, but slimy, protein-rich planarians.

Gillespie also proposed a particular life strategy for the salamander, one with implications for its study and management. Gillespie found evidence that the Barton Springs Salamander uses what's called a "storage effect" strategy. In this lifestyle, each generation has a high mortality rate, and individuals who do survive to adulthood are extra tough and live extra long. Research by another local biologist, Nate Bendick, suggests that these adults can transmogrify: they

change the size of their gills depending on oxygen levels, and reabsorb their own fat, muscle and bone tissue when times are lean. This means the city's study methods, of removing adults for testing or to manage the pool, might be very harmful. If you take, say, two individual adults for the natural history collections, you're effectively removing whole "little reservoirs of future baby salamanders." One day Gillespie fought with another biologist who wanted to take five of the thirteen salamanders they had just found in a particular spring. "On that day, I just sat by the springs until everybody else left," she remembers. "Who knows if they went back later and did it anyway, but I think it's worth having those discussions."

The more I listened to Gillespie, the more I wished some of this stuff had made it onto the springside signs. But I also understood why it didn't. It's too complicated, too in flux. Like the salamander's body, salamander knowledge stretches and compresses. It changes depending on what you want to use it for. To say "we don't know how many Barton Springs Salamanders there are" is an opportunity for some people to act under the assumption that there are thousands hiding underground, while others stage streamside sit-ins to protect the ones we *are* sure of. The Barton Springs Salamander's endangered species listing brought the critter unprecedented resources and attention, but that help is still being parceled out by people and institutions with different views.

Salamander mysteriousness may not translate well to easy education, but it ended up metamorphosing Hayley's life. When, as part of her dissertation work, she found herself trying to imagine their world—to translate her measurements and models into concrete ideas about the aquifer—she decided to visualize it through painting. Before that, swamped by grad school, she had done "basically zero art for like seven years"; when she picked up her brush and realized how much she had missed it, she ditched her academic plans and started up the gallery. She's been there ever since. During a break in the action, she leads me over to a couch, pulls a binder out from under a cushion, and rifles through it until she finds some salamander drawings she did last year. She licenses me to take one: "Do you have a preference? This is Austin Blind… this is a Jollyville… and here are some *sosorums*," Barton Springsers. I pick the *sosorums*, paired off and drawn lightly, the Springs' blue background showing strongly through.

The Congress Avenue Bridge Bats may be nocturnal, but their empire never sleeps. As is their nature, the bats have worked their way into every possible cultural crevice. They're artistic, political, and economic players. They're not just moth-eaters anymore.

The bats drive a thriving tourist economy. An estimated 125,000 people come to Austin annually to see the bats, and they spend about $12 million dollars while they're at it. Hotels, restaurants, and tour companies cater to this crowd. Tourists can kayak, paddleboat, or take a chartered dinner cruise underneath the bridge, and get a river's eye view of swooping bat bellies. Less adventurous ones who want a good view can just dine at a riverside hotel; a waiter will interrupt their meal to announce that the bats are emerging, lest anyone waste time looking at the plain old night. To one longtime local reporter, this is the surest sign of the bats' changing reputation:

"First naturalist types would come out, then the adventurous," he remembers. "Now it's cocktail hour at the Four Seasons."

Then there are the tchotchkes. South Congress, the town's biggest shopping street, is festooned with bat paraphernalia. Walk into any store, and you're bound to come upon homemade bat Christmas ornaments, or a stack of Build Your Own Bat Box kits. Once, Austin parents feared living in bat country, now, some dress their babies in "100% post-consumer recycled cotton" onesies with smiling felt bats on the front. A local food trucks sells a "Big Azz Taco!" or B.A.T.

The bats have the press literally under their claws. Beneath the bridge itself is the Bat Observation Area, sponsored by the *Austin-American Statesman* and unveiled at a 1993 ceremony attended by Austin's finest. The Observation Area is a grassy lawn flanked by educational plaques and kiosks, in which the story of the bats' past persecution becomes a cautionary tale, and their nightly emergence an all-caps "EXPERIENCE." When the bats arrived, the *Statesman* proclaimed "Mass fear in the air." In today's Observation area, the once-fearsome beasts are repeatedly compared to kittens.

The bats even have their own statue. "Nightwing," stationed just beyond the end of the bridge, is a crisp, gray bat about as big as a small car — a far cry from the bronze longhorns outside the UT campus center, or the eight-foot-tall Willie Nelson downtown. The statue is mounted on a spinning pedestal, and in a good wind, it wheels surprisingly fast, like it's about to wing it through a nearby billboard. It was made by local sculptor Dale Whistler, and funded by a city program that aims to make sure Austin's art "adequately represents the diversity of its residents." Close-up, you can see the granite is smudged and scraped, but from far enough away it's an icon.

Despite all this, the spectacle itself remains free of charge. It costs nothing to stand on the bridge and see what all the fuss is about.

Here's what all the fuss is about:

The first time I ever went to see the bats was in late June. My friends and hosts, who had been "a billion times already," convinced me that the best place to stand was not on the bridge but slightly under it, and we hung out on a stone wall next to the riverside path, looking up every once and a while to see whether the show had started. Dusk fell; the moon rose. I didn't believe the first flicker of activity I saw, or the second. I felt like Peter Pan, trying to chase my shadow. Buteventually my vision sharpened, and I could make it out: a trickle of bats, dropping from the bridge's belly, banking over the river and then shooting up again. They ribboned by for fifteen minutes, and then the ribbon thickened into a stream. I could walk up and down the path and watch the streetlight play off it differently. It all felt very private, like poetry: thirteen ways of looking at a bat.

I went again the next week, on the Fourth of July, with the same friends. This time we did what they called "the tourist thing," up on the bridge, crushed against the railing with what felt like thousands of others and truly might have been. It was hot; not good squished-together weather.

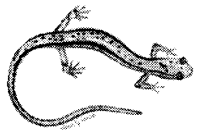
People walked up and down the rows hawking water bottles ("It's been a family business for 20 years!" a man grinned as he sold me one). The railing was sticky with melted rocket pop.

By the time we found space, the bats were out already, churning around, going impossibly fast. Fireworks burst behind them as though we were in an advertisement for a new kind of patriotism. I focused on the bats, forming and breaking clouds, shifting in ways that seemed contrary to laws governing group movement, the way the Northern Lights do. It was, indeed, deeply weird. Then I focused on the people, and it hit me that they, too, were not following any laws I would have expected. I toggled back and forth between these viewpoints for a while, not sure which one was stranger. Next to me, a kid on his dad's shoulders let out a whistle.

In his classic 1974 paper on consciousness, "What is it like to be a bat?" philosopher Thomas Nagel argues that we can never understand the experiences of other creatures. He chooses a bat for his central metaphor, he explains, because they're similar enough to us that we believe them to have consciousness, but different enough from us that we can't imagine being in their claw-toed shoes. Bats have sonar and echolocation. They sleep upside down. "Anyone who has spent some time in an enclosed space with an excited bat knows what it is to encounter a fundamentally alien form of life," Nagel says.

By living near us, the bats may be becoming more alien to non-city bats, including their ancestors. Recent research suggests that Mexican Free-tails modify their calls in urban environments, so that their hunts and communication aren't interrupted by human noise. They clear our air of insects, and we fill it with sound—traffic, bat stories, appreciative whistles. Will they be able to pass down whatever stories they tell about themselves?

As a million alien life forms streamed up into the sky before me and started dive-bombing bugs, I hoped Nagel was wrong, but figured he was probably right. I wished I could see us like the bats probably did, all clumped together, hanging upside down from their home.



When herpetologists study Barton Springs Salamanders, they find them at four connected spring sites, of which Eliza Springs is the strangest. It lacks the harmonic grandeur of Barton Springs Pool, the wildness of Upper Barton Springs (the untamed offshoot into which the Pool drains), or the ethereal quality of Sunken Gardens (an amphitheater of concentric stone rings, built in 1937 by the Youth Progress Association). Eliza Spring is an eyesore, a big lozenge-shaped thing, sitting low within a containing wall and overgrown with scrubby vegetation. Blue jays and grackles scream like reincarnations of the Elks Club members who built it out of coffee cans and concrete in the 1920s.

What it does have is salamanders—the most salamanders, in fact, of any place the city biologists are aware of. They found over a hundred there last year, Dee Ann Chamberlain tells me. We're headed to the captive breeding facility, but before we go, Chamberlain wants to make sure I understand why the program is necessary.

Chamberlain has been running the captive breeding facility since it was established as part of the first Barton Springs Salamander Habitat Conservation Plant. She's matter-of-fact and good-natured even when talking about the potential demise of this salamander, a creature she has probably spent more time with than any other human has. She's also pretty calm for someone with the fate of a whole species in her hands.

The first threat, she explains, is sediment. Because the Edwards Aquifer is made of limestone, it doesn't do as well as other types of aquifer at filtering out dirt and debris. Particulate matter is borne through the tunnels by the water and then settles out at the springs, where it fills in the spaces between the rocks. "You're talking about a little animal that needs to move in and out of the aquifer," Chamberlain says. "If they need to hide in between these rocks, and they need to breathe, and it's all filled in with sediment, where are they gonna go?" That's why the salamanders like Eliza Springs so much—the concrete bottom means the scientists can clean the sediment off completely, "and then put the habitat on top."

The second threat is overpumping. A fair amount of Austin gets its fresh water from the Barton Springs Segment of the aquifer. Every bit that people pump out that isn't then replaced by rain means a lower level in the aquifer as a whole, which means less flow out of the limestone and into Barton Springs, which means less flow over the Barton Springs Salamanders' feathery external gills—which means, again, less oxygen for them to breathe.

The third and most devastating danger, Chamberlain says, would be a waterborne toxic event: some kind of chemical spill out on the highway or, as in 1962, pesticides leaching into the soil. "Essentially, you could have a contaminant spill out in the recharge or contributing zone go into the aquifer, and come out at the spring sites all at the same time," she says, wiping out all of the salamanders in the system—which is to say all of the wild salamanders in existence. Seen through this lens, Eliza Springs starts to resemble a doomed metropolis. With that we head to the captive breeding facility, home of the salamander reserves.

The facility is across the expressway from the Springs. On the outside, it's small and unassuming, save for an eight-foot tile mural of a Barton Springs Salamander climbing up the side of the adobe wall—bigger , I'd wager, than all its living inspirations put together. Inside, it's a warren of a lab: tanks stacked on metal shelves up to the ceiling, filters burbling, and a network of tangled hoses pumping water in and out of each miniature home, to simulate spring flow. Each aquarium is furnished with plastic plants, big hammocks of white net (the netting calms them down, Chamberlain says — "it makes them feel like they're hiding"), and a tasteful amount of rocks. All together, it looks like a complex of glass-walled minimalist condos, something you'd see in one of Austin's up-and-coming downtown developments. As I peer into one, little spade-shape heads pop out at me, wondering if it's feeding time.

The facility's purpose, as the name suggests, is to raise up a viable population of Barton Springs Salamanders in case one or another catastrophe decimates their outdoor home. This involves careful tracing of pedigree and a whole lot of salamander matchmaking for maximum genetic diversity. It's working pretty well.They're up to 477, from an original population of about 100. "They do like to reproduce," Chamberlain says approvingly, as she checks the pH level in a tank

of month-old hatchlings. Skinnier and a bit shorter than their adult counterparts, they're all draped on the netting and look very calm indeed, as though they know they're the reason all of this exists. They're not even the newest generation; one of the plastic plants is festooned with eggs. They look like little alien worlds, sticky and resilient.

I have been excited to see this mysterious creature from the deep—this accidental synanthrope, this six-inch ecological synecdoche for a whole city, who looks so alien and speaks so commandingly on the poolside signs. But when I'm finally up close with one, nose-to-nose through the glass of his home, the Barton Springs Salamander is mostly just cute. He paddles vigorously with all four feet; he snuffles his head from side to side; he clings to the plastic plant like a security blanket. He looks like a pink puppy with red dreadlocks.

Being this close to the salamanders has also helped Chamberlain learn much more about them. Studying these guys in the wild is hard: they're quick and slippery and hard to see; they're underground half the time; and if you lift them too fast from the bottom, they can get an amphibian disease called gas-bubble trauma. As Dr. Gillespie learned, gleaning even small bits of information about how they live in the wild takes gumption and innovation, and even then a lot of it isn't for sure. Here in the lab, Chamberlain has made a lot of new discoveries, which she videotapes to show at schools and educational talks. She's the first person to have seen how Barton Springs Salamanders court, a slow dance characterized by special moves like the "tail-straddling walk" in which the female follows the male around, sometimes for hours, cajoling him until he drops a sperm packet and she picks it up. ("There's a lot of chin-rubbing," she says.) She has watched embryos develop in real time, eyes followed by gills followed by a tiny beating heart. "Any species that you really zoom in on, you get amazing abilities," Chamberlain says. She means this literally. At her computer, I watch a video of Barton Spring Salamander gills in slow-motion super-close-up, the red blood cells zooming through the filaments like a perfectly choreographed rush hour. The public has responded. "People are much more supportive of the salamander" now than when she started, she says. She attributes this to rising levels of knowledge, as well as reassurance that the pool experience they're used to won't change much.

I'm not going to give up my own chance to get a good picture of one of the rarest amphibians in the world. I imagine myself taking Chamberlain's lead, keeping the photo in my wallet and flashing it at strangers, telling them not to dump trash in the culverts. She bribes a salamander over with a scrap of net, scoops him up, and says "there you go, buddy," tipping him into one of the trays they use to take identification photographs. It's an anonymous clear arena, shallow and smooth, with nothing to hold onto, and he begins scrabbling around frantically—swimming in circles, bumping off the side. I suddenly feel awful. Clearly he just wants to go home, too, wherever that is.

Watching him struggle, my appetite for photos lost, I think of something Gillespie said, that no matter how well the recovery goes, the salamander will never be taken off the endangered species list. "It's not like the bald eagles, which can fly away," she said. Its range is just too small.

I found that sad. But later in the conversation, I listened to her spin it differently: "Texas likes to think of itself as a Republican nation in itself," she said. "Things like our state tree, state bird, we

think of these things as symbols of our identity… I always find it curious that we picked things like the bluebonnet and the mockingbird, which are actually not unique to Texas. Here's a thing that is here, and only here, and nowhere else. It's something that we really should be proud of! You can find bluebonnets here, or in San Antonio, or in freaking Oklahoma! But here's something unique about us, about our landscape, and I think that's worth something." Chamberlain puts the salamander back in the tank, and he immediately clings to the net.

I had wanted to meet with Merlin Tuttle, but when I call, he has some bad news. He's planning a conference in China, a workshop in Cambodia, and a talk at the local wildflower center; people are starting to link bats with Ebola in the popular press and he has to retort; basically, he's swamped, and he can't make the time. Tuttle retired from Bat Conservation International in 2009, but he keeps very busy. "I'm up to my armpits in alligators," he tells me. I picture him flitting from project to project like a bat among tropical flowers.

His resolve is bolstered by what he considers the Congress Avenue Bats' success. "I would never say you've one hundred percent won over everybody on anything, but let's just say that the preponderance of evidence is that bats are extremely popular and extremely well-appreciated in Austin these days," he says. They've become his model population, proof of the efficacy of education and of the possibility of peaceful coexistence between bats and humans, extremely important in a moment like this, when there are "headlines all over the world claiming that bats are the sources of the most scary diseases on the planet… Austin stands out in stark contrast to what they're trying to say," Tuttle says. Earlier this month, when hundreds of thousands of displaced Mexican free-tails flocked to nearby Texas A&M's recreational center, they were greeted not by cyanide and tennis rackets, but by educational signs, sympathetic articles, and nascent plans to build a giant bat house for them, similar to one built at the University of Florida in 1991. The bridge bats, safe in their nooks and in their place in Austin, have become global ambassadors.

Meanwhile, the Barton Springs Salamanders hang on tight right where they are. Without a huge public presence or a clear practical skill, their best hope is what they mean to others—the swimmers and water activists who need them to keep the pool safe, and the scientists and wildlife managers who, through attempting to understand them, have grown to love and value them for what they are. Still, the forces working against them might be too big to stop. David Johns, the city of Austin's hydrogeologist, worries about the falling oxygen levels in Barton Springs, which he attributes to "increasing urbanization." But all he can really do is test them. Trying to bring the oxygen levels back up would mean swimming against the tide of progress, a tide that, as Barton Spring's history shows, flows pretty much exclusively in one direction. "There's not a lot we can do about that," Johns says.

Saving the bats meant redefining them. Tuttle shed new light on a creature with an undeserved bad rap, they played the part well, and the whole city bought in. The salamanders have it tougher. To preserve them, Austin will have to redefine not just one creature, but the nebulous and very human concept of progress. Does progress for Austin, as for most cities, mean drawing

in more people and money and businesses, and building the housing and infrastructure necessary to support them? Or, for this weird place, can it mean something different—passing stricter clean water laws, or setting aside land for parks rather than expanding a highway? Can our human goals make room for our new, wilder neighbors? How much room?

The salamander's protectors fight hard for every inch, and sometimes they win. But a recent event reveals that larger gains are possible when everybody works together—the bats, the salamanders, and all the political, economic, scientific, and popular supporters each species has mustered. About sixty miles outside of Austin lies Bracken Cave, a deep limestone cavern that houses a colony even larger than the Congress Avenue Bridge. In fact, it's the largest colony in the world, somewhere between 15 and 20 million free-tails strong. Bat Conservation International bought the cave and a parcel of surrounding land in 1992 and set it aside as a preserve, but in 2013, developers announced plans to build apartments on 1,520 acres surrounding the cave, putting thousands of homes directly in the nightly flight line of the bats, who feed at the South Texas cotton fields every night. So many obstacles between the bats and their food source, experts feared, would mean confused bats downed near streetlights and porches and in swimming pools.

The issue also drew the attention of water conservationists, who feared that the proposed development, smack on top of the Edwards Aquifer Recharge Zone, would put too much pressure on the dwindling aquifer and dump even more sediment into the water system, not to mention increase the risk of a huge toxic spill. The salamander, too, had a dog in this fight. So the BCI machine and the Save Our Springs Alliance ground into action. They hit the pavement, alerted news agencies, and brought politicians out to the cave site (councilman Ron Nirenberg described watching the bats fly out as "a spiritual experience"). In the words of one of those news sources, "aquifer advocates and bat lovers" turned out in droves at city council meetings to make their views known. Eventually, Travis and San Antonio Counties, the Nature Conservancy, private donors, and others teamed up to buy back the land and add it to the preserve. They plan to cut trails so people can walk, and build a nature center to get people closer to the bats. The bats themselves made no comment, and neither did the salamanders. But Bat Conservation International and the Edwards Aquifer Authority spoke for them, and gave $5 million each. They finalized the deal on Halloween.

Notes & Sources

Section 1: H.E.B. Grackles/Wild City

"The gridded part of the grocery store lot..."
This gathering takes place pretty much every night at the Hancock Center H.E.B., on East 41st Street. It's a pretty good opening act for the bats.

"...a little over one percent per year..."
According to the CIA World Factbook, it's 1.064%. Central Intelligence Agency, *World Factbook*. Updated 27 May 2015. https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html

"Defined by ecologists..."
"Tomialojc (1970) defines synanthropy as the independent settling of wild species in human habitations." (179)
Tomialojc, L. 1970. "Quantitive studies on the synanthropic avifauna of Legnica and its environs." Translation from Acta Ornithologica, 12:293-392. cited in: Hannu Huhtalo & Olli Järvinen (1977) Quantitative Composition of the Urban Bird Community in Tornio, Northern Finland, Bird Study, 24:3, 179-185

"North America alone..."
Email correspondence with Prof. Paul. D. Curtis, wildlife specialist at Cornell University, 4 May 2015.

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DeStefano, Stephen & Elizabeth A. Johnson. (2013). "Species that benefit from sprawl." in Johnson, Elizabeth (Ed.), *Nature in fragments: The legacy of sprawl*. (206-235). New York: Columbia University Press.

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"House sparrows..."
"A bird either flew slowly past the sensor, at a distance of < 10 cm, or hovered briefly in front of the sensor at a similar distance, or landed on top of the sensor, leaned forward, and bent its neck until its head triggered the sensor and the door opened... In about 45 min of observations, we saw sparrows open this door 16 times."
Breitwisch, Randall & Margaret. 1991. "House sparrows open an automatic door." *The Wilson Bulletin*, vol. 103 no. 4 p. 725-726.

"as Joseph Conrad had it..."
"What greatness had not floated on the ebb of that river into the mystery of an unknown earth!... The dreams of men, the seed of commonwealths, the germs of empires." Joseph Conrad, *Heart of Darkness* p. 7

"...a thriving population of harbor seals."
Zoological Society of London. "Thames Seal Programme."
http://www.zsl.org/conservation/regions/uk-europe/thames-seal-programme

"...steal tortilla chips from hapless Tex-Mexers."
Interview with Hayley Gillespie, 1/19/15.

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For a history of the city's unofficial slogan, see: Yonan, Joe. 27 March 2011. "Can Austin stay weird?" *The Washington Post*, http://www.northjersey.com/travel/can-austin-stay-weird-1.911576

"Austin has feral parakeets."
Monk parakeets, to be exact. The richest information is on their Yelp page:
http://www.yelp.com/biz/the-wild-parrots-of-east-austin-austin

"...draw competitive focus..."
For an extremely detailed, more logically rigorous case study of similar principles at work, see: Callon, Michel. (1986). "Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St. Brieuc Bay." In Law, J. (Ed.) *Power, action and belief: A new sociology of knowledge?* London: Routledge, p. 196-223.

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Tuttle, Merlin. 1994. "The lives of Mexican free-tailed bats." *BATS Magazine*, vol. 12 no. 3. http://www.batcon.org/resources/media-education/bats-magazine/bat_article/656

United States Geological Survey. "Biological and ecotoxicological characteristics of terrestrial vertebrate species residing in estuaries: Mexican Free-tailed bat." US Department of the Interior. http://www.pwrc.usgs.gov/bioeco/mftbat.htm

"...with the first October cold front."
Why we call weather-opportunistic senior citizens snowbirds and not snowbats, I don't know.

"...you show up to find your traditional spot gone..."
This particular example is invented, but is similar to theories put forth by Dr. George Pollack in: "Urban Bats in Austin: Friend or Foe?" 1994, The Bat Shop.

"...much smaller bachelor colonies..."
Scales, Jeffrey A. & Kenneth T. Wilkins. 2007. "Seasonality and fidelity in roost use of the Mexican free-tailed bat, *Tadarida brasiliensis*, in an urban setting." *Western North American Naturalist*, vol. 67 no. 3 p. 402-408. http://www.jstor.org/stable/41717620

"...nearly a thousand feet long..."
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Many attributes that make a building structurally sound — strong materials; water resistance; repeating elements — also make it an ideal bat roost. e.g.: "Most bats in Florida seem to prefer buildings and other man-made structure over natural roosts... the use of buildings as roosts is likely a relatively recent, possibly expanding practice."
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And:
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French, Barbara. 1994. *Urban Bats in Austin: Friend or Foe?* Austin: The Bat Shop.

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1 acre foot = 325,851.429 US gallons
(687,000 x 325,851.429) / 365 = ~613,314,881 gallons/day = ~ half a billion gallons.
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Splash! Exhibit. "Glen Rose Limestone — The Contributing Zone"; "Edwards Limestone — The Recharge Zone"; "Del Rio Shale — The Confined Zone". Austin, Texas: Beverley S. Sheffield Education Center, 1999(?). Informational plaque.

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"...every drop of water..."
"The way the watershed is, is all of the storm runoff goes into the creeks, the creeks flow underground, and that all ends up in the spring, like, all of it... anything that's present on land gets washed into those creeks and into the aquifer and ends up in Barton Springs."
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Section 4: Barton Springs Then & Now

General Barton Springs Salamander morphology and life history information comes from:
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Major Interviews

Bill Bunch — Executive Director, Save Our Springs Alliance. 1/20/2015, in person, the picnic tables overlooking Barton Springs Pool

David B. Martinez — Activist; longtime Austinite. 1/17/2015, in person, Art.Science.Gallery (916 Springdale Road Building 2 #102, Austin, TX.)

Dee Ann Chamberlain — Endangered Salamander Captive Breeding Program Manager, City of Austin. 1/20/2015, in person, around Barton Springs and in the Captive Breeding Facility.

Dianne Odegard — Public Outreach Manager, Bat Conservation International. 1/22/2015, in person, in her home.

Hayley Gillespie — Founder, Art.Science.Gallery; PhD, Ecology, Evolution & Behavior. 1/17/15, in person, Art.Science.Gallery (916 Springdale Road Building 2 #102, Austin, TX). 1/19/15, in person, Once Over Coffee Bar (2009 S 1st St, Austin, TX)

Merlin Tuttle — Founder, Bat Conservation International. 12/20/14, by telephone; and 1/18/15, by telephone.

Tom Devitt — Environmental Scientist, City of Austin Watershed Protection Department. 1/13/15, in person, Epoch Coffee (221 W North Loop Blvd, Austin, TX)