One unusually warm day in November, I took my 10-year-old daughter, Moriah, to the San Francisco Zoo. It had been a while since our last visit, and we meandered from exhibit to exhibit until we found ourselves in the section where the polar bears are displayed.

The first bear was alone in her grotto, sitting back on her haunches, staring off into space. Uulu, I read, was born in 1980 in Churchill, Manitoba, one of the breeding grounds for Canada's southern population of polar bears. I've seen videos of the area online. Though frozen, gray, and desolate, it still seemed less barren than the 1940s-era concrete space Uulu occupied. Clearly I wasn't the first person to have that thought, for another sign noted that Uulu, as well as the two polar bears in the grotto next door, received regular "environmental and behavioral enrichment" -- training, games, and exercises such as following man-made scent trails to "stimulate their minds and . . . give them fun things to do."

Polar bears in the wild are fearsome creatures, up to 11 feet tall and weighing 1,000 pounds. They can gallop 35 miles an hour and swim 60 miles in a day. But on this unseasonably warm afternoon, all three bears lay still, as if pinned to the concrete by the sun’s rays. A woman next to me made kissing sounds to entice one of the bears to turn his head so her daughter could capture his face on her cell phone camera.

"Let's go to the next exhibit," Moriah said, tugging at my hand.

"Why?" I asked.

"This one's sad," she said. "These polar bears are out in the hot weather on hot stones with no ice."

I don't know if the polar bears really were uncomfortable, but I understood my daughter's distress. Zoos have always aroused a discomfiting mix of feelings in me: the thrill of seeing wild beings close up; the depressing fact of captivity. Even in the best exhibits, the animals seem diminished by the inevitable bars. As Vicki Croke wrote in her history of zoos, The Modern Ark, "Cut off from its place in the world, an animal appears as only a shadow of its true self."

What about when an animal is not only cut off from its place in the world but loses that place entirely? The ceaseless press of human beings has whittled wild spaces down to just 17 percent of the planet. With each encroachment, wildlife dwindles, so that more than 5,700 species are now lurching toward the brink of extinction. That includes a quarter of all mammals and one in eight species of birds.

"There aren't many polar bears left in the wild," I heard a man tell his son. But the real point is, there's not much of a wild left for polar bears. If Uulu were set free, where would she go? Global warming is melting the Arctic sea ice so fast that experts fear in 50 years the only polar bears left may be those in captivity. Then a bear like Uulu won't even be a shadow of her true self; she'll be a ghost.

I've visited many zoos in my lifetime, and inevitably there's a moment -- when a gorilla looks me
square in the eye or I see a deeply social animal like an elephant penned up alone -- when I find myself wondering: What is the point of this place? It's a question that made headlines as I was writing this piece, when one of the Siberian tigers at the San Francisco Zoo escaped from its pen on Christmas day and killed one teenager and mauled two others before being shot dead by police.

Humans have been collecting and displaying exotic animals for more than 4,000 years. The earliest zoos were designed to display a ruler's wealth and power. They also served as an entertaining spectacle, and that role continues. Each year zoos draw more visitors -- 157 million -- than all professional sports combined.

As the signs in front of nearly every exhibit my daughter and I passed made clear, they also have a mission: wildlife conservation. Indeed, today's zoos operate as modern-day Noah's arks, gathering up threatened species, sustaining their populations through captive breeding, and, when possible, returning them to the wild. Sadly, it felt as though the only animals Moriah and I saw that weren't facing some kind of threat were the gulls flying in from the nearby ocean to scavenge for food.

Although zoos have historically focused on collecting charismatic crowd-pleasers like tigers and bears, the situation is now so dire that even the lowliest of creatures, such as frogs and newts, need a lifeline too. Amphibians are currently besieged by a wave of extinction rivaling the one that swept away the dinosaurs. About half of the 6,000 known species of frogs, salamanders, and newts are imperiled by a combination of threats: a lethal fungal infection, global warming, and loss of habitat to urbanization and deforestation.

Kevin Zippel coordinates teams of scientists who carry out rescue missions on behalf of Amphibian Ark, a group that works with zoos to find safe havens for threatened frogs and other amphibians. "It's overwhelming to see a place that's so beautiful and untouched but know that it's going to be decimated, and that the only future these things have is in captivity," he says. So far, zoos have been able to accommodate only about 10 percent of the 500 most endangered amphibian species.

Envisioning the countless generations of frogs that will be marooned in tidy glass terrariums, I can't help but think about Martha, the last passenger pigeon, who died in 1914 after spending most of her life in the Cincinnati Zoo in a condition of scarcely imaginable aloneness. Zoos often describe their animals as ambassadors of the wild, yet if their wild race is gone, their wild space vanished, what ambassadorial role is left for them to play? Does it make sense to save one piece of the wild if its only future is within the tame confines of a cage?

Tatiana, the marauding Siberian tiger, was a product of the Species Survival Program (SSP), a collaborative effort among zoos and aquariums to oversee the care and breeding of certain endangered species. Tatiana was born in the Denver Zoo to parents selected by the SSP Siberian tiger coordinator, who also recommended sending her to San Francisco in 2005 to be a companion to the zoo's other Siberian tiger, Tony. This sort of effort has helped preserve the genetic diversity of the species, while anti-poaching and conservation measures in Russia and China have helped raise the wild population of these tigers from about 50 at the time of World War II to about 400 today. Nevertheless, poaching and deforestation still go on. More Siberian tigers -- about 600 -- live in captivity than in the wild.

It's not clear what led Tatiana to cross the 33-foot moat and scale the 12.5-foot wall surrounding her enclosure, but there's no mystery about her behavior once she got out. She acted like a tiger. And when
she did, I think, she pierced the vital fiction that makes zoos possible. For all the appearances of a peaceable kingdom of docile shadows, the animals remember who they are: flesh-and-blood marvels of a tooth-and-claw world.

“I’m not going back there any time soon,” my daughter said after hearing about the tiger attack.

“Are you afraid it could happen again?” I asked, as I tried to think about how I would reassure her.

“No,” she said, struggling to explain. “It would just feel weird.”

It does feel weird. Once we get a glimpse of the animals’ true selves, putting them in zoos seems a sorry sort of salvation.

Noble as the zoo-as-ark idea may be, it’s no long-term answer for the world’s wildlife. Noah knew the floodwaters would recede one day, but for many animals, like the polar bear, the waters could well keep rising unless human behavior changes. Animals are safe in zoos, but they’re not saved in zoos, one zookeeper told me. The real salvation for wildlife lies in saving wild spaces. To accomplish that, more and more zoos are turning themselves into storefronts for field-based conservation efforts, as zoo managers shift their focus from the world inside the fence to the broader one beyond it.

I can see that new emphasis when I take a stroll through the San Francisco Zoo’s new Lemur Island exhibit, a grand space full of mature cypress pines, eucalyptus trees, and platforms where five species of this endangered animal can sport and hide. Signs inform me that the lemurs have been rescued from the dwindling forests of Madagascar and that the zoo is working with locals there to find economic alternatives to the hunting, logging, and slash-and-burn agriculture that destroy lemur habitat. Other zoos are doing similar things. The Saint Louis Zoo, for example, is working with Masai tribespeople in Kenya to carve out a corridor of safe grazing lands for a tiny population of Grevey’s zebra, and the Gladys Porter Zoo, in Brownsville, Texas, is protecting sea turtle nesting sites in Mexico.

Despite my qualms, I still believe in zoos. Even the best Discovery Channel documentary can’t match the experience of seeing wild animals in real life: the immediacy awakens our innate sense of connection to other creatures. I think of the time I got to feed a giraffe and felt its velvety, muscular tongue pluck eucalyptus leaves from my fingers, or the time my daughter and I watched a Sumatran tiger snooze just on the other side of the glass and saw his whiskers quiver and twitch the way our cat’s whiskers do. Those experiences are where the spark of conservation begins.

But it doesn’t require seeing a tiger or a giraffe, as I was reminded when wandering through the zoo on another day recently. I came across a woman and her 2-year-old granddaughter. They had stopped in the middle of a path and the girl was transfixed, not by any of the exotic animals around her but by a black and yellow caterpillar crawling along the ground. The woman, Charlotte Duren, told me she takes Mary to the zoo every week. “She loves animals,” Duren said.

Young as she was, Mary was respectful, careful not to touch the caterpillar or block its way. She toddled behind it as it crawled over the asphalt, across the mulched flowerbeds, and then disappeared into the bushes beyond. The girl watched it go. “Bye-bye caterpillar,” she called after it.