ZooView

Fall 2017 | A Science Journalism Project | University of Arizona

Elephant Conservation: Tucson to Tanzania

In Photos: Bear Necessities

THE LAST OF US

Being a landmark institution means many things, including being old. In 2017 Reid Park Zoo, located in Tucson, Arizona, celebrated its 52nd birthday—and the passage of two propositions that will spruce up its aging infrastructure. Propositions 202 and 203, along with backing from private donors, secured a 10-year improvement plan that will also bring more animals to Tucson and create new habitats.

These improvements will help the zoo accomplish its mission of supporting conservation efforts in the wild and educating visitors of all ages. With more than 500,000 visitors each year, Reid Park Zoo is one of Tucson's top attractions.

As a Tucson native, I recall that my most memorable connections with wild animals took place at Reid Park Zoo when I was young. I will never forget the expressions on my parents' faces when I told them I had gone behind the scenes and watched a zookeeper feed a tiger. The amazement in their eyes made me feel even more special, as I had witnessed something that most people never see.

The zoo inspires visitors to leave with a newfound understanding of wild animals and how every individual can contribute to habitat preservation. Marissa Heffernan's story on elephant conservation sheds light on Reid Park Zoo's contribution to the work of Charles Foley in Tanzania. By paying $3 to feed the zoo's giraffes, visitors are donating money to Foley's work and other conservation efforts. The zoo's elephants are acclimated to Tucson's climate because it's similar to Tanzania's, as Sophie Daws explains in her story.

Modern zoos have come a long way from their days as traveling circuses. In her article Liz Kinney reveals how Reid Park Zoo ensures that its animals live in safe, naturalistic habitats. Hannah Hindley shows how the new Animal Health Center is a visionary work of architecture that will make strides in the evolution of zoo medicine. Nina Kolodij focuses on the links between humans and animals in the field of healthcare.

Other stories delve into Reid Park Zoo's education programs, plans to help save species from extinction, record-keeping to ensure genetic diversity and training techniques that reward positive behavior.

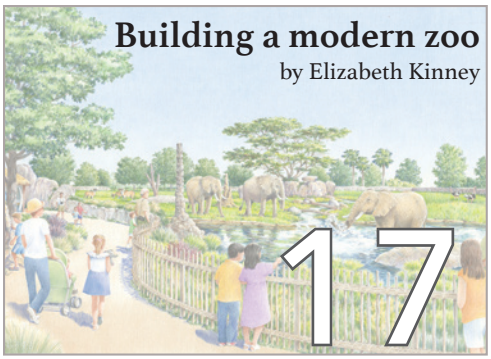
We hope this magazine can help communicate the different ways that zoo animals are ambassadors for wildlife worldwide. ■

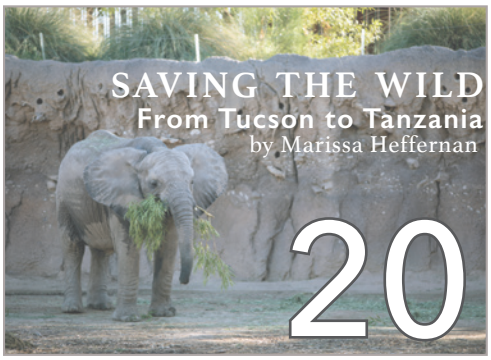
~ Carly OSERAN
Managing Editor

ACKNOWLEDGMENTS
The publication of ZooView *magazine would not have been possible without the generous support of alumnus Al Litzow, the University of Arizona School of Journalism, Reid Park Zoo and the Reid Park Zoological Society.*

CONTENTS

FEATURES





ON THE COVERS

FRONT COVER: East African crowned cranes use their "crown" as camouflage in tall grasses. PHOTOGRAPH BY NICK SMALLWOOD

BACK COVER: Several flamingo chicks have been born at Reid Park Zoo in the last few years. At birth, they start out downy and gray, but their feathers turn pink after a few months, thanks to the algae and invertebrates they eat. PHOTOGRAPH BY TIM DABROWSKI

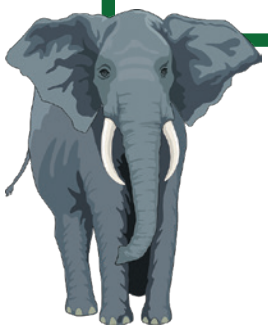
REID PARK ZOO BY THE NUMBERS

By Naomi Pier

Founded in 1965, Reid Park Zoo has been educating Tucson residents about wildlife and conservation for more than 50 years. Running a successful zoo requires funding, time, dedicated staff and a supportive public.

The zoo spans **24** acres.

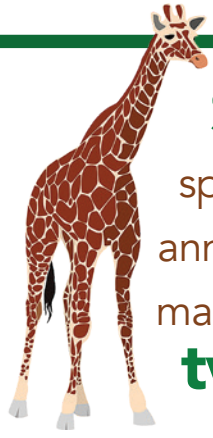
22 species at Reid Park Zoo are listed as threatened or endangered.



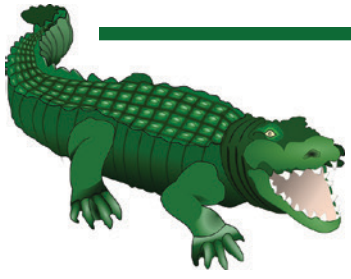
8 keepers care for **5** elephants.

1st

Nandi is the first African elephant born in Arizona.



$86,000 is spent on produce annually for the animals and is ordered **twice** a week.

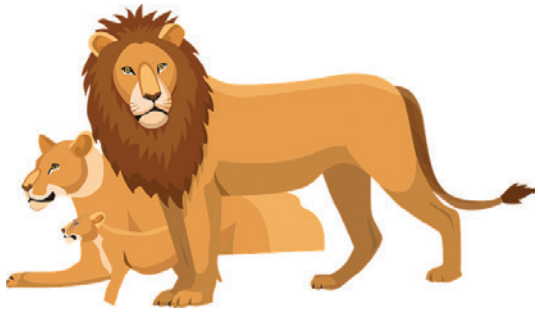


Zoo carnivores eat **45** pounds of meat and bones a day at a cost of **$32,000** annually.

More than $200,000 is donated to conservation efforts worldwide.

More than 350 animals make up the zoo's collection.

112 hours a day are devoted to animal care.



Sources: Adam Ramsey, Reid Park Zoo; Tong Cheng, Reid Park Zoological Society
Graphics: Pixabay.com

How veterinary medicine can translate to human healthcare

Reid Park Zoo broke ground for its Animal Health Center in January 2017. Illustration courtesy of Reid Park Zoo

By Nina Kolodij

In a brightly lit room a doctor analyzes the numbers and information displayed on a digital screen. A regular beeping sounds in the room, and the gentle breathing of the patient fills the intermittent silences. All the machines in the clinic look familiar, but it's hard to tell if the creature being cared for is human or animal.

Does it even matter?

In some respects, it does, but in others, not so much. "Medicine is medicine, no matter what species you're working on," said Dr. Alexis Moreno, head veterinarian at Reid Park Zoo in Tucson, Arizona. "And if you think about it, whether you're doing work on a gorilla or an orangutan or the other primates that we have here, it's almost identical."

The line between humans and animals can be blurred in terms of healthcare. Dr. Barbara Natterson-Horowitz, a cardiologist at the University of California, Los Angeles (UCLA), is one of the bold leaders of a movement called the One Health Initiative. It focuses on the links between humans and animals as well as the benefits of combining human and animal healthcare. One Health is gaining traction in medical practices, veterinarian clinics and zoos. Some 900 researchers, doctors and veterinarians worldwide have endorsed the initiative, according to the One Health website.

Medicine is medicine

Natterson-Horowitz codirects the evolutionary medicine program at UCLA and consults with the Los Angeles Zoo.

Oh, and she's also a *New York Times* bestselling author.

In her book *Zoobiquity,* which she coauthored with Kathryn Bowers, Natterson-Horowitz confronts the issue that medicine is medicine, whether for humans or animals. "We as physicians can benefit our patients so much by this species-spanning perspective, and I think patients themselves can benefit by increasing awareness that they are not alone," she said. "Getting sick doesn't have to be experienced with shame and guilt and secrecy. So many of the conditions that we struggle with as human beings, such a wide range of animals also are vulnerable to."

Animals suffer from the same things we do—from cancer and arthritis to depression and obsessive-compulsive behavior. "They also dislike taking medication, much like we do," said Dr. Sue Tygielski, the general curator at Reid Park Zoo.

Humans visit specialists for medical opinions, but that pool of resources can be limited. But what if we could expand that pool to benefit the lives of all beings by taking a broader approach? "The comparative method literally compares health and disease in a range of animal species," Natterson-Horowitz said. "Veterinary medical students learn about heart disease in mammals who have four heart chambers, and reptiles who have three heart chambers, and fish who have two heart chambers, but medical students, physicians in training, only learn about heart disease in one species."

Animals have a lot to teach us. One Health has made it a goal to learn from them and spread the knowledge to all healthcare professionals—and their patients.

Part of the family

As general curator, Tygielski oversees the health of the animals at Reid Park Zoo, which is moving toward preventive care in order to avoid urgent health issues. "We want to make sure that our animals aren't just surviving but that they are thriving," she said.

Tygielski and the keepers are the first line of defense should anything happen. "The keepers are really attentive to every single thing about their animal," said head veterinarian Moreno.

If an animal gets hurt or falls sick, the keepers call the veterinarian, whether it's a cough or a thorn in a paw. "Wild animals, too, are exposed to environmental effects that we humans are exposed to, whether it's solvents that we're using to clean or second-hand cigarette smoke," Natterson-Horowitz said.

Integrating human and animal medical sciences is the way to go, Tygielski said. "Often, our vet is in contact with and works very closely with human health doctors. It really benefits our patients, as well as puts a new light on medicine for the human healthcare doctors."

Making progress

Moreno is also bridging the gap between human and animal healthcare through her research. One of her recently published studies established the normal gestation conditions for the lesser anteater, also known as the tamandua. By comparing the measurements of tamandua fetuses with those of healthy human fetuses, Moreno was able to set standards for healthy tamandua pregnancy.

The One Health movement supports common techniques for diagnosing, treating and healing patients of all species. Yet "human exceptionalism makes the mistake that we sometimes begin thinking that we are uniquely unique," Natterson-Horowitz said. This perspective can be detrimental for all species involved.

All life is linked, so maybe we should be looking a bit more on the wild side.

LIONS AND LANCETS

As the lights flip on at Reid Park Zoo's new Animal Health Center, the future of conservation looks bright

By Hannah Hindley

Photograph by Hannah Hindley

The new, multimillion-dollar Animal Health Center at Reid Park Zoo features space for veterinary procedures on animals as large as zebras. The state-of-the-art facility is scheduled to open in early 2018.

Alexis Moreno's hands and arms are laced with a pale network of scars. Local emergency room staff have special instructions for how to handle her if she's brought in, unconscious. Certain drugs she handles when tending to large animals are so potent that "if I get one drop on my skin, that's it. I'm done."

Moreno is the primary veterinarian at Reid Park Zoo in Tucson, Arizona. Her job keeps her away from desks and puts her regularly at the feet of powerful creatures. "It's the humility and it's the majesty of the beast, standing in front of these animals and seeing how they interact and seeing how they respond to you." Despite the risk, she says, "being able to do that is a gift."

At the moment, the beast she is handling does not look particularly majestic. A scarlet ibis has broken the lower half of its beak, and it sits awkwardly, feet flexing and arching, in the arms of an experienced zookeeper as Moreno prepares to file down the bird's upper beak to match the snapped lower portion so the animal can eat again. The filling will draw a bright bead of blood—the bird's beak is a living part of its body—and Moreno will eventually set down her tool and give the ibis a chance to recover before the procedure continues on a later day.

In between the electric buzz and the moments of quiet in which the ibis rolls its eyes from inside the firm grip of the zookeeper's palm, the operating room echoes with a different kind of noise. Machinery whirs in the distance. The *zupp* of drills rings, rises and fades away. Reid Park Zoo is building a state-of-the-art Animal Health Center, and the scarlet ibis is among the first to see the burnished surfaces within.

It takes a special kind of construction company to build a hospital where, at any point, a full-grown male lion may need to be wheeled through the construction site or where the workers may need to drop their tools to allow the animal care team access

to the surgical suite. Building a health facility in the middle of an operating zoo requires all the same resourceful problem-solving and flexibility necessary to care for the animals themselves.

For Reid Park Zoo, which will open the doors to its $4 million Animal Health Center in early 2018, creative thinking and strong partnerships have been the basis for the construction process as well as for the zoo's veterinary aspirations for the future. The new Animal Health Center is a visionary work of architecture, and it may also be perfectly staged to make strides in the evolution of zoo medicine and the way we approach conservation.

No place like hospital

The new Animal Health Center shines with energy-efficient lighting and ingenuity. Most of its electricity will come from solar panels; most of its concentrated oxygen will be funneled through a central operating table where a crowd of zoo staff can gather without knocking elbows. Holding rooms for semi-aquatic animals such as tapirs have shallow pools where water will stream at precisely the right temperature—no one likes getting into a bath while the cold faucet is still running. Air recirculates in quarantine rooms to prevent cross-contamination. Double sets of doors ensure that anyone entering the building won't allow a rogue ibis or lion to scamper loose onto zoo grounds. A pharmacy glitters with a rainbow of pill bottles. An X-ray room stands, darkened, behind heavy doors. A built-in scale on the floor of the treatment room allows hefty animals like tigers to be weighed. With the flip of a switch, lenses in the ceiling open to allow in natural light for animals whose rhythms sync with the sun.

Most important, the new facility will have more space, Moreno says—space for animals, space for education, space for unhindered surgeries. "Whatever we do, we don't want it to be just minimal," says Nancy Kluge, president of the Reid Park Zoological Society. "We want it to be great."

A large amount of animal healthcare happens outside of the hospital setting, too. Zookeepers and veterinarians alike agree that medical procedures and routine care that can happen in an animal's habitat are less stressful on both the patient and the caretakers. There's "a lot less shifting of the animal," says Dr. Sue Tygielski, the zoo's general curator.

As a result of long hours of positive reinforcement, many of the animals at the zoo take responsibility for their own healthcare in their own homes. Elephants are "learning to present different body parts" for examination, Tygielski says. Zookeeper Alec Young works with an aging male lion that willingly accepts regular injections of fluids under his skin, and an Andean bear was trained to dip its hurt paw in water.

Animals at the zoo are learning to allow keepers and vets "to do voluntary vaccinations, voluntary blood draws, ultrasounds," Tygielski says. Just like the difference between choosing in-home care instead of hospitalization, these procedures are more relaxing for the patients than the immobilization and transport that would be necessary to treat them at the health facility.

Sometimes, though, a hospital is necessary. Not only can a health center provide a sterile setting for surgeries where, if anything goes wrong, the vet has easy access to all the tools she'll need, but she can also use the occasion of a hospital visit to take care of important routine animal needs, from tooth cleaning to annual physical exams.

Elaine Corbus, Reid Park Zoo's vet tech, has a favorite story about one of these hospital visits. "Our male African lion has chronic kidney disease, and we discovered that incidentally on a routine immobilization two years ago."

Because kidney disease is irreversible, the vets were lucky to have caught it when they did. Since then, the lion's condition has stabilized but, just as with human conditions that are left undiagnosed and, therefore, untreated, what we don't know can hurt us. Once the new Animal Health Center's surgical suite is complete, it will provide a sterile and safe space to monitor animal health.

Seeing what you pay for

The Reid Park Zoological Society, founded in the early days of the zoo, has a long history of fundraising success and donor retention, but finding money for the new Animal Health Center was "a little different," Kluge says. "Some of the folks who fund things for us regularly ... wanted to fund something that they would come to see. We talked to them about the health center, and they said, 'Oh, no, we're not interested in that.'"

Kluge has come to understand that often donors expect a reward in return, if only the satisfaction of coming to see the animals in a new exhibit. The work that happens in a healthcare facility occurs behind the scenes, away from the warm waft of churros and the bustle of foot traffic in the central part of the zoo. Sleek exhibits and busy concession booths don't serve much purpose without healthy animals to draw the crowds, though. "If we build these new exhibits for the animals, that's not any good if we don't have the underlying infrastructure to provide the very best care for the animals," Kluge says.

During the last accreditation review that Reid Park Zoo underwent by the Association of Zoos and Aquariums (a rigorous process that measures zoos against standards and best practices), its antiquated hospital, built in the 1970s, ranked as "minimally adequate," Kluge says. It seemed like a call to arms to create a facility that ranked among the best.

And the zoo community rallied to the call in unexpected ways. "We found that people who are closest to us ... came through like we have never seen before," Kluge says. The $4 million health center was funded entirely by private donations from zoo staff, volunteers and others.

In time, the sharing spirit that allowed for construction of the facility will come full circle for donors, students and visitors to the zoo. Although most animal healthcare tends to occur out of public view, Reid Park Zoo's Animal Health Center will have built-in observation features different from any other zoo hospital. "We have a camera system throughout the facility that will allow our guests to come to the zoo for behind-the-scenes programs to see surgeries up close," Tygielski says. "They'll have an opportunity to talk to the vet as she's doing these procedures or immediately after."

Kluge is comfortable acknowledging that other zoos have impressive veterinary facilities, but it's this observability that she believes makes the new health center "stand out as something that's truly unique and cutting edge." In addition to the camera

New Health Center fast facts

Source: Reid Park Zoo

Cost

$4 million

Funded entirely by donations made through the Reid Park Zoological Society.

Space

11,000 sq. ft.

Will have holding areas, a pharmacy and dorms for veterinary students.

Science

Full surgical suite

Will provide a sterile environment for surgeries with intensive care units close by.

system, which will provide bird's-eye views of surgeries, the treatment room is lined with floor-to-ceiling windows that will allow visitors to watch procedures as they occur.

In time, this windowed gallery will also help enable an educational partnership unlike any other. Pending accreditation, the University of Arizona's new School of Veterinary Medicine will provide its students with the opportunity to observe veterinary procedures at the zoo. Upperclassmen will be required to work directly with the zoo animals. Designs for the new Animal Health Center include residency rooms, where UA students will live and work on a rotating basis.

A partnership between a college and a zoo has never before happened "at this scale, breadth, and depth and level of integration and interdependence," says Shane Burgess, dean of UA's College of Agriculture and Life Sciences. "We are unique."

Seeing with new eyes

As Moreno cleans the orange neck of the ibis in the central room of the Animal Health Center, journalists lean in to watch. Their hands grip the far edge of the metal operating table; their phones glow with recorded video footage.

That new wave of zoo veterinary science will ride on the backs of many.

Moreno picks up a syringe. There is only one jugular vein that can be used to draw blood, she explains placidly. If done incorrectly, the bird could die in an instant.

The writers lean closer, watching the bird's strained feet paddle the air, watching the vial drip full of crimson blood, observing the zookeeper's tight grip around the animal's face and chest. A single sudden movement could twist the needle, burst the vein.

What is it that compels us to watch? It seems to be a common urge, from the donors who Kluge says were hesitant to fund something behind the scenes that they couldn't come to see, to this huddle of reporters in a glinting surgery room that hasn't yet been formally opened for public viewing, to the queues of observers all down the long corridor of history who have come to ogle the exotic through cage bars.

Long before the first scientific zoo opened to the public, traveling circuses passed through cities, and aristocrats kept menageries where peacocks strutted across cobbles and leopards snarled behind bars. When the world's first zoo opened in London in 1828, conditions for the animals were arguably no better than those of private collections. Kangaroos beat themselves—sometimes to death—against the bars of their cages. The first zoo veterinarian, Charles Spooner, had to resign because so many animals were dying at his hands. Many had been transferred from unhealthy menagerie conditions or had arrived in the city after months of sloshing sea voyaging.

Maybe Spooner was never set up for success. Although he purportedly detested experiments on live animals and would later go on to be an early proponent of anesthesia in animal surgeries, he was underequipped as the first zoo veterinarian in history, and undereducated as well, having spent only eight months in a veterinary college. He was fired from his position amid a cloud of criticism. His successor was a taxidermist.

Arguably, Reid Park Zoo's behind-the-scenes participants will be peering at sedated tooth-brushing sessions and surgically exposed innards through windows of the new health center with a different breed of curiosity than early menagerie-goers. Cages have morphed into sophisticated habitats. Zoo-dwelling kangaroos now lead long and low-stress lives.

But perhaps it is useful to recognize that Reid Park Zoo lies not at a tidy endpoint but along a continuum of zoo veterinary care history. The Animal Health Center—with its gleaming LED operating lights and centralized oxygen system, with its portals for natural light and perfectly moderated water temperature—will represent the current pinnacle of the evolution of zoo veterinary practice. Importantly, within its walls, that science will continue to evolve.

Evolutions and revolutions

Zoo veterinarians understand that their field is evolving. "You're working with species that nobody knows a lot about," Moreno says. "I can't just go look it up in a book." She and vet tech Corbus both talk about the creative comparisons and occasional leaps of faith that are necessary in zoo veterinary medicine, from using what we know about cat physiology to treat jaguars to using what we know about horse physiology to treat rhinos and elephants.

There are limits to where conjecture can lead. "The same anesthetics that I use on a lion would kill a tiger," Moreno says.

When vets stumble across an unfamiliar dilemma, they collaborate with colleagues elsewhere in order to build knowledge across borders. "We share with people, people share with us," Corbus says. "Everybody who does veterinary medicine is in it for the health and wellness of the animals, and it doesn't make any sense to keep information to yourself."

Zoo vets continue to refine their practice and take new risks for the benefit of the animals they care for. "Even just 15 years ago there were things that we wouldn't even consider doing," Tygielski says.

Birds, for example, are considered "very fragile," she says, to the point where until recently, vets avoided treating them "for fear the patient would die." Moreno, with her steady hands on the wild-eyed ibis, represents a new wave of animal care philosophy.

That new wave of zoo veterinary science will ride on the backs of many, which is to say, collaboration is the shiniest thing of all in Reid Park Zoo's new hospital. LED surgical lights and the glint of a centralized new operating table at a zoo in a little city in America's Southwest will likely not, on their own, change the scene in a grim world of habitat loss and mounting extinctions. However, the connections that spark inside that hospital might.

At its most elemental, the new health center is fed by oxygen and solar-powered electricity, running water and electromagnetic radiation, the tightly dialed trickle of anesthesia and a steady supply of anti-inflammatory drugs. But the real resources that will enliven the new building are relationships: the face of a child at the observation window as she watches a lion earn an extra chapter of life under a surgeon's careful hands; the rounds of new veterinary students serving their residency amid the flutter and rumble of animals in need; the crackling static of phone calls across the globe in search of the latest veterinary consensus on how to tend to an ailing rhinoceros. "When I see kids," Moreno says, "when I take their hand and put it on that animal, you can feel that—that's palpable." If "they can go on to be the person that advocates for that endangered species, that's it. I've done my job." ■

THE CIRCLE OF LIFE

Photograph by Hannah HINDLEY

Alexis Moreno, lead veterinarian, examines a scarlet ibis with a broken lower beak. Zookeeper Tracy Boerner holds the injured bird.

One Health Initiative links health sciences with conservation

By Hannah Hindley

Before veterinarian Dr. Alexis Moreno brings out a scarlet ibis for a beak operation, the treatment room in Reid Park Zoo's new state-of-the-art Animal Health Center echoes with the whisper of observers' voices and the buzz of unseen electric connections. A couple of tufty feathers flutter on the floor in the stir of recirculated air. They are brilliantly orange: flamingo pink meets salmon muscle meets late-night neon lighting. They look as if they fell loose from a bag of artificial fabric-store feathers or from the end of a cat's dangling toy—stained too impossibly bright to be real.

But when Moreno reenters the room with the colorful ibis, there's no doubt these feathers came from a real animal.

Moreno recounts how she likes to hold on to feathers when birds drop them, "but over time they'll lose their color." Her ibis feathers have worn pale. The color, she says, is tied up with the diet of the bird and its overall health. When separated from the living animal, the feathers fade. So, too, is the health of animals—captive and free—inextricably linked with the health of wild ecosystems and human populations.

Forging connections

Animals in the zoo, of course, are ambassadors for their wild counterparts. "We always connect our message back out to the wild population," says Dr. Sue Tygielski, the general curator at Reid Park Zoo. It's one of the zoo's foundational missions: conservation. In addition to tending to the collection as a sort of "genetic bank," as zookeeper Alec Young puts it, the zoo advocates for and funds conservation projects around the globe.

Moreno argues that animal healthcare at the zoo is tightly wrapped up in this mission. "The idea behind zoo medicine is conservation," she says.

The new veterinary school at the University of Arizona, in partnership with Reid Park Zoo, will take this mission a step further by emphasizing a new initiative in their program called One Health. It's a concept that has already gained some traction in the zoo field, Moreno says. It "has to do with the connection between zoo and veterinary medicine, human medicine, conservation, everything from food and crops to sustainable resources in the world to how our job correlates with human medicine."

The One Health Initiative might seem like common sense—of course, our own health is connected to the health of the environment and animals around us and vice versa. But it's also a revolutionary idea, especially in the ways in which the initiative is forging connections and conversations among scientists across diverse disciplines. In a world facing increasingly complex problems, including pandemics, habitat loss, food shortages, war and mass extinctions,

Photograph by John DE DIOS

Cassie Dodds, area supervisor for the elephants, works with her zookeepers daily to ensure that the animals are receiving the best care possible.

interdisciplinary partnerships seem vital in digging for solutions to our planet's flagging health. "In reality, everybody's a steward for everyone else," Moreno says, "because it's one health."

Dissenting voices

The One Health Initiative also has its critics. Some of them point out that although ecology and conservation fall under the initiative's umbrella, the emphasis still seems to be "anthropocentric and human medical driven," writes Chris Walzer in *Frontiers in Veterinary Science*. Which is to say, ecology tends to be used as a tool for solving human health crises and seldom the reverse. A shortcoming of One Health, in practice, seems to be "primarily highlighting wildlife as a source of illness, emerging infectious diseases, and threats to public health," Walzer writes, "while neglecting the value of biodiversity and the associated services." (An October 2017 article in *The Atlantic* explored this same fascination with non-human animals as sources for human disease, running with the title "Is it Possible to Predict the Next Pandemic?") A revolutionary philosophy at its core, the One Health Initiative might benefit in practice from, as Walzer proffers, "solving problems that impact the continued development of human societies, including the maintenance of wildlife health and the provision of ecosystem services."

Wellness instead of welfare

In some regard, Reid Park Zoo—staged now to open the doors to its new hospital—may be at the forefront of bringing a better-evolved One Health philosophy into practice. Tygielski emphasizes that animal health at the zoo involves much more than tending to illness and mending wounds. At the zoo, she says, "we really look at wellness instead of welfare. Welfare would mean that we're feeding and watering our animals and giving them the bare minimum of what they need to survive. Wellness is really the idea that we're giving them everything they need to thrive."

In time, perhaps that approach will extend to the One Health Initiative, too—a focus on the connections between humans, animals and shared ecosystems not just as sources of disease but also as hubs for improved wellness for all.

"I think we're moving more and more toward preventive care," Tygielski says, "and looking for excellence there so we can avoid having more urgent health issues." It's not hard to extrapolate how this same vision might apply to humanity, too: to focus less on sourcing disease and more on building health—for ourselves and for the planet.

Writing a new chapter

An ibis feather only stays orange when connected to a nourished living system, after all. With the right equipment, the right philosophy and the right partnerships, Reid Park Zoo might well be writing a new chapter in the history of both medicine and conservation.

And are the two so very different? One health center: one health. ■

Zookeepers encourage natural animal instincts and behavior

By Ysabella Zammit

Photograph by Nick SMALLWOOD

Shombay, the male African lion at Reid Park Zoo, is one of the animals that receives special attention because of his age and a genetic ailment that calls for him to receive subcutaneous fluids. After receiving positive reinforcement training that rewarded him for good behavior, Shombay now allows a zookeeper or veterinary technician to administer the fluids.

The adult male lion roared and grunted as the zookeeper entered his domain. Face to face, the keeper made eye contact with the golden-colored lion pacing behind the chain-link fence. Shombay's large amber eyes glinted with curiosity. The lion, which was probably born with polycystic kidney disease, allowed the keeper to stick a hypodermic needle in his flank and inject fluids under his skin to keep his kidneys hydrated. Shombay is used to this interaction and associates it with good behavior.

Shombay has a trusting relationship with his keeper, Alec Young. Their bond revolves around an animal care plan at Reid Park Zoo that's based on positive reinforcement, such as food and touch instead of punishment, force or coercion.

"The lions need to partake in their own healthcare," Young said. "These guys are like my family, and I want them to live long, happy, healthy lives, and that's what positive reinforcement is really for. It's what allows me to come in and make sure that Shombay gets fluids and his kidneys are functioning right and that he's going to continue to thrive."

Young started training Shombay by touching the 483-pound lion with his index finger, then with a needle-like tool to help prepare him for the medical procedure. When Shombay stood still, he received a treat. If he moved away, he was not punished but released back into his main habitat. That slow, voluntary progress is what positive reinforcement training typically looks like.

Back to Pavlov

Animals respond positively to happy people, Young said. Animals start to associate the combination of happy people and food with good behavior and completing an action correctly. "It's totally Pavlovian," he said.

Positive reinforcement stems from a technique in psychology called classical conditioning, which was developed by Russian physiologist Ivan Pavlov. He accidentally discovered a two-part learning response system. In the first part a potent stimulus, such as food, is paired with a neutral stimulus, such as a bell. Next, learning takes place when the bell (neutral stimulus) comes to elicit a response, such as salivation, that had originally been elicited by the food (potent stimulus).

No easy task

Administering medical procedures to large animals is no easy task. Positive reinforcement training helps zoo animals adjust to human settings, such as standing on a scale to be weighed, voluntarily accepting injections and offering body parts for examination. Young is now training Shombay to let him hold his tail to take blood instead of sedating him.

Sedation used to be the main method for examining and treating zoo animals. "Our understanding of animal behavior and animal psychology has helped zoos shift to using positive reinforcement," Young said.

Positive reinforcement is better than sedation, Young said, because it helps create a stress-free environment when handling animals. Sedation, however, is necessary for serious medical procedures, but it can cause renal or heart failure and is, therefore, a risky method.

Young has taught one of the female tigers to stand up on her hind legs and rest on a fence so he can apply lotion to her cracked paws. At the same time he can examine her underbelly for injuries—an ordinarily tough task for zookeepers.

A lifeboat in a genetic ocean

Positive reinforcement is one of many techniques used to improve zoo animals' health, well-being and, over time, the long-term survival of the species. "The goal of contemporary zoos is to balance the conservation value and animal welfare needs," said Dr. John Koprowski, a conservation biologist at the University

Continued on page 16: TRAINING

Grizzly bears Ronan (shown) and Finley were brought to Reid Park Zoo from Montana's Flathead Indian Reservation. They were slated to be euthanized had the zoo not accepted them.
PHOTOGRAPH BY NICK SMALLWOOD

TOP: Bear supervisor Rebecca Edwards prepares an enrichment activity for the grizzlies. ABOVE: Andean bears Lucy (top) and Worf (bottom) were introduced to Reid Park Zoo in 1996. Unlike grizzlies, these South American natives do not need to hibernate in winter.

Bear Necessities

Story and photographs by Nick Smallwood

Grizzly bears Ronan and Finley came to Reid Park Zoo as orphaned cubs after being found looking for food in residential areas of Montana's Flathead Indian Reservation. Their mother had been euthanized for the same behavior, said Rebecca Edwards, who oversees the zoo's bears. Staff members at the zoo worked closely with the Association of Zoos and Aquariums to find the grizzlies their new home at Reid Park Zoo.

Keepers rely on positive reinforcement to train the zoo's grizzlies and Andean bears, Edwards said. By understanding their behavior, the staff can motivate them with rewards, such as food and touch, rather than by force or coercion. The training, which is voluntary, allows keepers to monitor the animals' well-being each day and treat health issues. When Worf, the male Andean bear, needed to soak a sore paw in antibacterial solution, Edwards blew a whistle and gave him food to reward the desired behavior.

Reid Park Zoo supports the conservation of bears and other wildlife worldwide. "I would love for people to really understand that when they come to the zoo, they are supporting conservation because of all the information we have, the information we're sharing and the groups we're working with that are working toward conservation," Edwards said. "It's really important that we're taking care of our wild bear population because they are spreading plants and creating healthy ecosystems, which we really need." ■

EDITOR'S NOTE: Reid Park Zoo staff euthanized Lucy, 23, the female Andean bear, on Nov. 11, 2017, because of cancer and age-related health issues.

Zookeeper Debra Henley maintains the grizzly bears' habitat and washes their night houses daily. Henley also monitors the bears' behavior and communicates with the zoo veterinarian and nutritionist about their health.

Watch Online

Bear Necessities

Listen to Rebecca Edwards, area supervisor for bears, talk about the care of the grizzly and Andean bears at Reid Park Zoo.

Produced by Nick Smallwood

Medium.com/sciview/zooview

STAYING FIT

Ronan and Finley pass under a rock bridge that separates the flat section of their habitat from the rocky part. Crossing from one section to the other helps the grizzlies stay fit.

Photograph by Nick SMALLWOOD

A day with the lion keeper

By Clare DeCelles

Reid Park Zoo smells faintly of hay, dust and pond water. In the morning the air is crisp, but the desert heat is beginning to creep in. When the ringtail lemurs are hungry, they emit an unearthly screech, drawing the keepers' attention. The squawks, twittering and whoops of native birds pervade the otherwise still air.

The zoo is its own contained ecosystem. Although most species don't interact with each other, they do interact with the zookeepers, veterinarian, veterinary technicians, docents and even guests. All these humans play a role in the mental and physical well-being of these animals.

On the path between the lion and lemur habitats, zookeeper Alec Young stands squinting in the sun. He has a bubbly personality and bounces on the balls of his feet as he speaks, laughing often and loudly.

"I have been working with these guys [the lions] for about three years now," he says. "My actual favorite animal here at the zoo is a ferret named Dimitri. These animals are basically my family."

Training animals without force makes them willing participants in their own care.

~ Alec Young, zookeeper for big cats

Young uses food to train the lions to engage in their own care. When he interacts with a lion, he asks it to complete a task it is trained to do, such as lifting a leg so he can examine the underside of its paw for injury. Then Young offers it a reward, such as a morsel of meat. If the lion does not complete the task, there is no punishment. The lion simply does not receive the treat.

Training animals without force makes them willing participants in their own care. "When they go out on exhibit, there are going to be toys and scents, different stuff for them to experience," Young says. "Sometimes we put out frozen treats, so that's all positive stuff, and then when they come back into their night house, I have a treat waiting for them."

Making sure the animals in his care are physically active and mentally stimulated is a big part of Young's job. The lion habitat, for example, is filled with large plastic balls and wooden structures for the lions to climb up and rest on.

Lions are captivated by scents. Young puts a lot of thought into the new smells he covers their toys with. Sometimes he uses locally sourced rhino urine.

The relationship between Young and the animals in his care allows him to do his job effectively and keep the animals safe and healthy. Like other personnel at Reid Park Zoo, Young is passionate about his field. He has a bachelor of science degree in wildlife, fish and conservation biology from the University of California at Davis.

Young and the other zoo professionals are dedicated to the animals in their care. "I like wildlife," he says with a laugh. The lemurs join in behind him, cackling and whooping. ■

Training for species survival

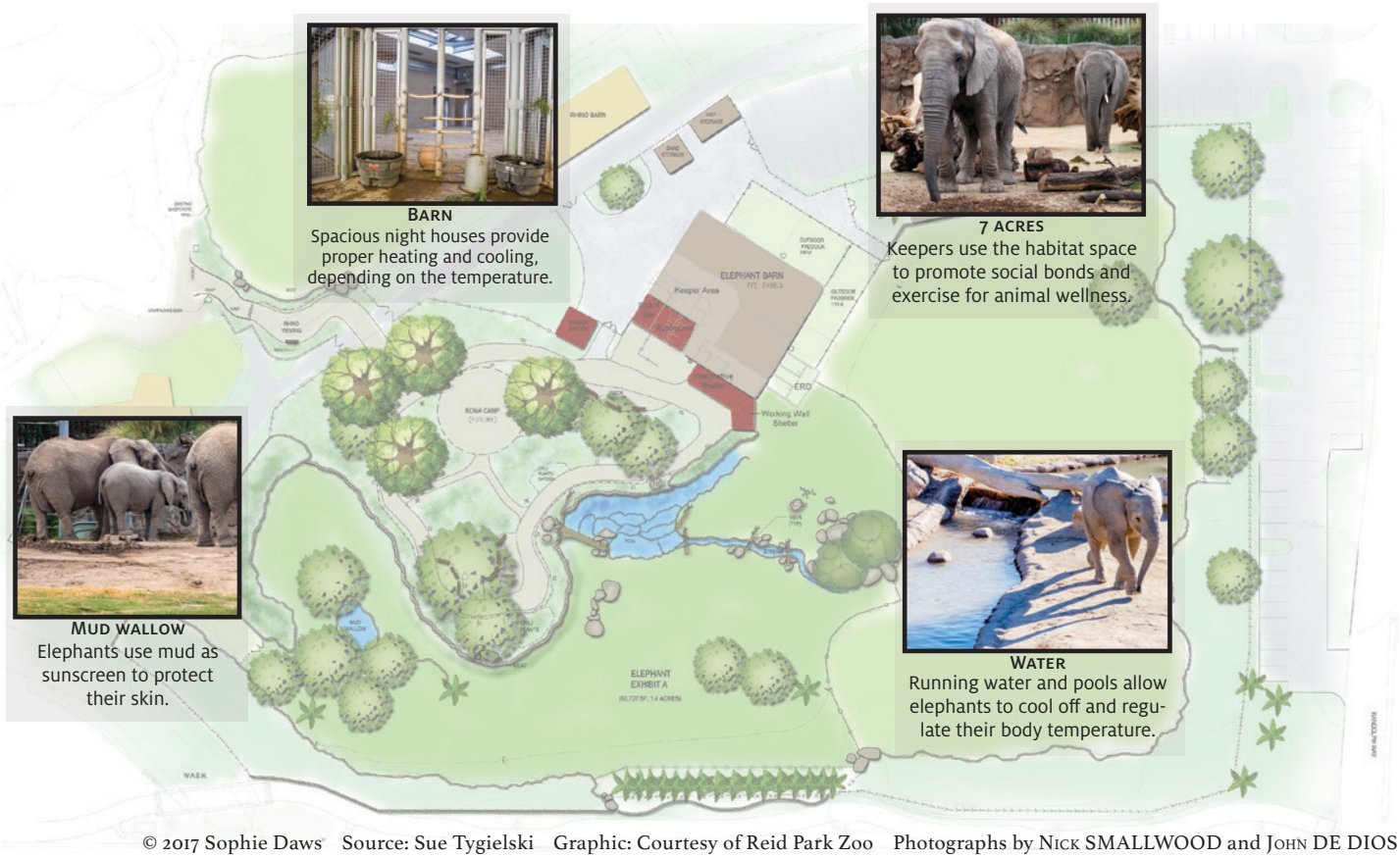
Continued from page 11

of Arizona. "Positive reinforcement greatly facilitates the ability to do this, as animals can be kept healthy and engaged. Reid Park Zoo is most definitely engaged in contemporary approaches to animal care and conservation in a zoo environment. This can be a challenge for smaller institutions, but Reid Park Zoo has embraced this approach and been successful."

Zoos are like a lifeboat in a genetic ocean of wild animals. Zoos are places to practice the conservation and restoration of species. "I'm doing this so that people can learn to appreciate these animals and to save them in the wild," Young said. ■

PHOTOGRAPH BY NICK SMALLWOOD

Rebecca Edwards, the area supervisor in charge of bears, works with Ronan, one of two grizzlies at Reid Park Zoo. When given a command, Ronan has been trained to touch the object in Edwards' hand with his nose. After doing so, he receives a treat as positive reinforcement for good behavior.



 Source: Sue Tygielski Graphic: Courtesy of Reid Park Zoo Photographs by NICK SMALLWOOD and JOHN DE DIOS

Reid Park Zoo helps ensure animal well-being year-round by re-creating natural habitats. For the small herd of elephants that inhabit Expedition Tanzania, "home" means a stream, pools, mud wallows and savanna grasses like those in their native Africa. Because Tucson's winter nights can be colder than those in Africa, the elephants can retreat to a heated barn and settle down on a cozy bed of sand. On sweltering summer days the mud wallows and pools provide cool havens.

Building a modern zoo

By Elizabeth Kinney

Punga, an adolescent male elephant at Reid Park Zoo, rushes to the back of his habitat to look for branches and hay hidden in holes in the outer wall. To keep Punga and the zoo's four other elephants mentally and physically stimulated, zookeepers hide their favorite treats throughout their habitat.

In another part of the 7-acre habitat, elephant calf Nandi pulls a branch off a pile of fresh-cut brush as her mother, Semba, hovers close by, chewing a larger limb. The sprawling habitat was designed to give these herd animals room to exercise, explore and socialize. In the wild, elephants travel miles each day.

The elephant habitat, called Expedition Tanzania, opened in 2012. "A lot of what makes that exhibit work is the staff and their dedication every day to making it enriching for the animals, dropping food at various times of the day to keep the animals active and moving," said Jason Jacobs, the zoo's director.

Exhibit designers also look at the animals' activity cycle. "If the animals are active at nighttime, we're designing exhibits where they can have access to those areas at night," Jacobs said.

PHOTOGRAPH BY SPENCER STREIPS

The meerkat habitat features tunnels, artificial termite mounds, sand and vegetation reminiscent of southern Africa's Kalahari Desert, which is the homeland of these small, sociable carnivores.

A great exhibit is going to resonate with people. It will help them learn and care.

~ Jason Jacobs, director of Reid Park Zoo

Modern zoos focus on animal well-being by constructing naturalistic habitats, which are a stark departure from the barren concrete pits and steel-barred cages once popular in menageries around the world. "In a zoo that resembles what you might see in a nature documentary or on a safari, your feelings of caring for those animals are going to be much greater than if you look at an animal in a concrete pit or in a cage," Jacobs said.

Naturalistic habitats make animals not only healthier but happier too. "Compared to 50 years ago, given all the improvements that zoos have made to make their habitats more natural, the animals are definitely happier," said Dieter Steklis, a primatologist at the University of Arizona. Animal happiness can be gauged by behavior, such as eating habits, willingness to play and interactions with other animals, he said.

Jacobs helped design some of the new habitats. The meerkat habitat contains a deep soil bed where these small mammals can burrow, as they do in the wild. A pool under construction for an alligator, scheduled to arrive in the spring, will be large enough for a 15-foot-long reptile to swim and search for prey.

Reid Park Zoo partners with Tucson-based Cemrock Landscapes to build naturalistic habitats. To make sure every detail is realistic, Cemrock designers travel to different parts of the world to observe the natural environments they are replicating in their zoo designs. "The goal is to mimic a habitat that animals would see in nature, like an African savanna," said Krista Luckow, Cemrock's vice president of business development. "Our goal with our artists is to hone in on the type of rock work in that area."

Over the next 10 years Reid Park Zoo will embark on an expansion and construction plan to enhance its conservation and education missions. Torre Design Consortium, based in New Orleans, worked with the staff to create the zoo's new master plan. Animals from South America, Africa and Southeast Asia will live in habitats designed to be similar to their homes in the wild.

"A great exhibit is going to resonate with people," Jacobs said. "It will help them learn; it will help them care. And it creates a better quality of life for the animals." ■

Watch Online

Home Improvements

Watch how Reid Park Zoo officials and habitat designers work together to build naturalistic habitats for zoo animals.

Produced by Elizabeth Kinney

Medium.com/sciview/zooview

Below: A large pool, logs and stumps give otters plenty of places to explore. Cemrock Landscapes, a Tucson construction company, has teamed up with Reid Park Zoo for the past few years to design and build habitats that favor animal well-being over public entertainment.

Photograph by Nick SMALLWOOD

Habitats designed for animal well-being

By Sophie Daws

Nandi, Reid Park Zoo's young African elephant, wades into a pool in her habitat, wraps her trunk around to her back and hoses herself off. Doused with cool water, her back glistens under the Tucson sun.

The 98,000-gallon pool where Nandi plays re-creates a waterhole that she and the zoo's four other African elephants would have frequented in their native Tanzania. Called Expedition Tanzania, the zoo habitat mimics the elephants' native environment. In this way, Tucson—though far from Africa—may feel a little more like home.

The elephants are acclimated to Tucson's climate because it's similar to Tanzania's. This is true for other animals as well. "Most of the zoo's animals are from regions similar to Tucson," said Reid Park Zoo director Jason Jacobs.

Most zoos worldwide try to obtain animals from places with a similar climate. Zoos in Chicago and other northern U.S. cities, for instance, house species like Siberian tigers, while zoos in hot areas, such as Tucson, have Sumatran tigers.

Cooling off

In the Expedition Tanzania habitat a 3-foot-wide stream flows into the pool. Edging the stream are wiry, yellowish savanna grasses. Along the stream bank, covered in mud, stands Punga, an adolescent male. In the pool an adult female named Semba sprays herself with water. Punga wades into the pool. The two elephants lock trunks and spray each another.

In addition to the pool, the elephant habitat contains mud wallows. Elephants in the wild use mud wallows to regulate their body temperature, said Dr. Sue Tygielski, the zoo's general curator. As the mud dries on their skin, their overall body temperature cools. Elephants also use mud as a sunscreen to protect their skin against Tucson's relentless sun. In addition, the herd can seek refuge from the sun under large canvas shade structures.

Photograph by Nina KOLODIJ

Sundzu, the second youngest elephant at Reid Park Zoo, munches on fresh-cut branches. Keepers set out treats like these for the zoo's five elephants throughout the day. Enrichment activities mimic the animals' natural behaviors and keeps them engaged with their surroundings.

A channel that runs through the habitat creates a cool draft, especially in the evening. The elephants like to stand on the edge of the channel or even venture into it to experience the natural air-conditioning.

A warm house on a cold night

On winter nights Tucson's temperatures sometimes dip below freezing. The lowest temperature that elephants experience in Tanzania is about 50 degrees Fahrenheit. Because of this range in temperatures, exhibit designers "must build two exhibits for every one habitat," said zoo architect Ace Torre of Torre Design Consortium. One exhibit is outside and viewable by the public. The second is indoors and temperature-controlled.

On cold nights the elephants can retire to their snug night house. Zookeepers flip a switch, and the central heat turns on. Heating pads in the floor and heaters in the ceiling warm the elephants' stalls. For extra warmth, keepers pile sand in the stalls to make comfortable beds for the elephants.

Room to roam

Building a home for elephants is no small business. Wild elephants can roam many miles each day for food and water. The 7-acre Expedition Tanzania habitat gives Reid Park Zoo elephants a choice of habitats. "They have lots of variety in the habitat in that they have multiple mud wallows, multiple sleeping hills," Tygielski said. "If they want to be in the shade or the sun, they can choose which hill."

Space also gives the elephants social choice. At times, they bond as a herd, but sometimes they prefer to be alone. "Certain elephants will interact and not want a third or fourth elephant with them, and so there has to be enough space in the habitat that the other can get away if needed," Tygielski said.

There is a hard truth about zoos: Habitats can't offer the same experiences for animals that they would have living in the wild. But zoos do what they can to protect elephants from the poaching and habitat loss that threaten their survival in Africa. By creating a small slice of Africa in Arizona, Reid Park Zoo is trying to ensure that the largest land mammals on Earth survive. "It's better to have some elephants rather than none," director Jacobs said. ■

SAVING THE WILD

Elephant conservation from the Southwest to the Serengeti

The Tarangire Elephant Project, led by Charles Foley, protects wild elephants in northern Tanzania. Conservation funds from Reid Park Zoo in Tucson, Arizona, support Foley's work.
Photograph courtesy of Charles FOLEY

By Marissa Heffernan
Photographs by Nick Smallwood

The standard way to identify elephants in the wild is by looking at their distinctive ear features, such as holes and jagged edges, because those small differences can be as unique as fingerprints.

But after 25 years of studying the elephants that roam the savannas of Tarangire National Park in northern Tanzania, Charles Foley doesn't rely on those distinctions anymore. "Once you know these elephants, it's like you taking your dog to the park," said Foley, who directs the Tarangire Elephant Project. "There might be 20 different dogs over there, but you know exactly which one is your dog. The color, the way it moves, its behavior—it's exactly the same with elephants."

Charles Foley

Elephants occupy a far more tenuous position than dogs, however. African elephants are listed as threatened under the U.S. Endangered Species Act. As of 2017, only 415,000 were left in the wild across 37 African countries, according to the World Wildlife Fund.

More than 9,500 miles away in Tucson, Arizona, the city-owned Reid Park Zoo supports Foley's work with part of its conservation budget. The zoo's five African elephants are visitor favorites, which is part of the reason the zoo chose to make elephant conservation a flagship project. "It seems like the animals that people really love and enjoy a lot are the elephants, the giraffes, lions, tigers—the charismatic mega-vertebrates," said Jason Jacobs, director of Reid Park Zoo. "At our elephant habitat we have an area where folks can make a direct contribution to help elephant conservation in Tanzania, and that's very important."

Murdered for trinkets

Overall, the biggest threat to elephants is poaching, Foley said. People illegally kill elephants to cut off certain high-value body parts. Ivory from their tusks is particularly valuable in both legal and illegal markets. "[Collectors on the black market] want the ivory because they like the trinkets or it looks nice, and they're prepared to pay money for it," Foley said. "And as long as people are prepared to pay money for ivory, there will be poaching in Africa."

Decades ago, most ivory went to Europe, America and Japan, according to Foley. Now, it mostly goes to Asia, specifically China. On average, 96 elephants are killed per day for their tusks, but China has recently taken steps in the right direction. "The Chinese government has now

Lungile, an adult female elephant at Reid Park Zoo, joins a family herd that includes matriarch Semba, sons Punga and Sundzu, and Nandi, the first African elephant born in Arizona.

RIGHT: Charles Foley has studied elephants in Tarangire National Park since 1993. African elephants face threats from poaching and expanding agriculture.

said that it's imposing a domestic ban on ivory, which is a huge step forward," Foley said.

Losing land

Beside poaching, African elephants face the growing threat of expanding agriculture. Land devoted to crops will increase by more than 10 percent by 2025, according to a 2017 Stanford study. "In most of East Africa, certainly Tanzania, none of the national parks are fenced, so animals can move in and they can move out," Foley said. "And so they'll go from a protected area onto community land."

While on community land, elephants sometimes eat or trample crops that farmers need to survive. "They will kill animals that come onto their farms for crop protection," Foley said.

Foley focuses on the issue of agricultural expansion because northern Tanzania is one of the few areas in Africa where poaching is not widespread. That's because the predominant land use is pastoralism, or herding cattle, Foley said. The Maasai, whose land extends from central Tanzania all the way up into southern Kenya, is the strongest tribe in the area, and Foley works closely with them.

Shifting traditions

The Maasai historically co-existed with wildlife because they don't eat game meat and raise more cattle than crops, Foley said.

But the tradition of cattle herding is coming under threat. "As the population increases, there's more demand for land, and there's more demand for agriculture," Foley said.

One solution is to offer the Maasai legal strategies for protecting their pastureland. "What we have been trying to do is to work with the Maasai to encourage them to set aside land specifically for cattle grazing, and this is to stop the gradual creep of agriculture into those areas," Foley said. "It's typically a win-win situation."

Defining conservation

Conservation means being a good steward of the biodiversity of the Earth, according to John Koprowski, a conservation biologist at the University of Arizona. "Conservation is preserving what we have, restoring what we used to have and providing those opportunities for future generations," he said.

Preserving land for grazing isn't traditional conservation, Foley said, but today it's an important method for ensuring the long-term survival of ecosystems. "If those lands are set aside for pastoralism, it, in effect, protects them for wild animals to use as well," he said.

Zoos also provide solutions to the alarming rates of habitat loss, Koprowski said. "We end up with a role that these populations in zoos or conservation facilities can really play in helping us augment populations in the wild to buy some time while we restore habitat."

Land protection is part of the big picture. "Absolutely every one of us depends on clean air, on having water, on keeping CO_2 levels in the atmosphere down in order for us to have sustainable futures," Foley said. "And ultimately, if we do not tackle this … it will basically annihilate us."

Zoos can, in part, help humans avoid annihilation, according to Nancy Kluge, president of the Reid Park Zoological Society. "It's important for us to teach the public how their actions in conserving water and conserving energy can protect species in the wild and really make those connections," Kluge said. "[The zoo] is really a living laboratory in many ways."

Top: Elephants at Reid Park Zoo are a tight-knit herd that includes Lungile (left), a mature female, and Nandi, the zoo's most popular animal. **Above:** Nandi, 3, is the youngest member of the elephant family. Zookeepers work with the herd several times a day, creating enrichment activities that encourage them to exercise, socialize and explore, as they would in the wild.

Small actions make a difference, Kluge said. When it comes to resources, every action has a ripple effect. Saving water in Tucson means pulling less water from aquifers, reservoirs and rivers. That conservation translates to more rain here, according to NASA, and also to more rain around the world. If watering holes all over the savanna are full, elephants don't have to travel long distances to find water, which gives them a better chance of survival.

One piece of a larger puzzle

Modern zoos are hitting their stride in their conservation role, Koprowski said. "The more progressive-minded zoos and aquariums are providing educational opportunities about the broader world and are also working actively on the conservation of those species," he said. Koprowski leads a breeding and conservation research program at the Phoenix Zoo for the endangered Mount Graham red squirrel.

Foley works on educational efforts with the Wildlife Conservation Society, which is the international branch of the Bronx Zoo.

With a sectioned 7-acre habitat to roam, the elephants at Reid Park Zoo—from left, Lungile, Nandi, Semba and Sundzu—can be kept together or separated, depending on their needs. The bull, Mabu, (not pictured) returned briefly to the San Diego Zoo Safari Park for a breeding recommendation. Mabu's move reflects what happens in the wild, where males often travel between herds to mate with different females. For elephants in human care, moving them from zoo to zoo increases the genetic diversity in different herds. In February 2018, Mabu rejoined the herd at Reid Park Zoo.

It partners with a handful of other organizations and zoos, including Reid Park Zoo. "Zoos need to be education advocates for elephants and for other wildlife," he said. "They have a captive audience, which is basically a complete, broad cross-section of the American community."

Being a conservation advocate means making sure people leave zoos with a message to act on. "In regard to elephants, the message should be 'Do not buy ivory,'" Foley said. "If all zoos did that, that would make conservation work a lot easier."

At Reid Park Zoo, director Jacobs has a three-pronged philosophy on conservation efforts. "First and foremost, you should definitely fund-raise to help animals in the wild, and that's usually by supporting conservation work," he said.

"The second part of conservation is building capacity within a zoological park to breed animals and safeguard them," Jacobs said. For animals that are critically endangered, such as tigers, zoos are sometimes a last chance to rebuild those populations. "If it comes down to a decision of having no tigers in the wild but having some in zoos, I'd like to see some tigers in zoos," Jacobs said.

The final part of Jacobs' philosophy is education. Reid Park Zoo educates visitors not just on the importance of conservation but also on what they can do in their daily lives to make a difference.

Those things don't have to be complicated, Jacobs said. "Maybe it's something as simple as recycling or using less water or planting foliage in your backyard that attracts butterflies or other local wildlife," Jacobs said.

No effort is wasted, Kluge said. Every individual can play a role in conservation. "Reid Park Zoo is one small cog in the wheel, but I feel strongly that if we can affect one person's behavior, it's worth it, and it's something we need to do," Kluge said. "Maybe that child who comes here as a 4- and 5-year-old and learns to love these animals, when they grow up will be one of our great conservationists that protects and saves these animals from extinction."

From the tiniest dart frogs to the critically endangered tapirs and hulking African elephants, zoo animals are ambassadors to the public. When visitors learn about wild animals they wouldn't otherwise interact with, they begin to care about them. "I think that every animal has a story to tell," Jacobs said, "and that's our job to tell it." ■

Watch Online

Seen and Herd

Zookeepers at Reid Park Zoo have found innovative ways to make sure their elephants are physically fit, mentally stimulated and socially engaged. Keepers emphasize overall animal well-being over welfare.

Produced by Marissa Heffernan

Medium.com/sciview/zooview

Coming Back from the Edge:

By Chris Stidley

If you scratch his belly, Fireball shakes his leg like a dog. It doesn't matter which side you rub, he'll lift his leg. While Dina Corrales loves to give him these caresses, she's careful because she's not stroking a vicious dog but a 4,600-pound southern white rhino.

Students and other groups visiting Reid Park Zoo in Tucson, Arizona, may also have a chance to stroke Fireball. "They get a touch of rhino," said Corrales, a zookeeper. For these supervised encounters, the visitors reach over the barred fence and touch Fireball's tough, dirt-encrusted skin.

The southern white rhino was thought to be extinct in the late 1800s, according to the World Wildlife Foundation. After fewer than 100 animals were found in South Africa in 1895, breeding in zoos and re-introduction to the wild helped their numbers grow to 20,000 today.

While the white rhino is considered a near-threatened species, other rhino species are in greater danger, mainly from poaching and habitat loss. Fewer than 100 Javan and Sumatran rhinos survive in Southeast Asia, according to the World Wildlife Foundation. With 3,000 to 5,000 animals, the black rhino of southern Asia and the greater one-horned rhino of India and Southeast Asia are considered critically endangered.

Protection of animals through conservation is a key mission of the Association of Zoos and Aquariums. This nonprofit uses three approaches to protect animal species: conservation in the wild, animal management and captive breeding to maintain healthy populations, and education to foster awareness and support among the 183 million visitors to its member facilities each year.

Fireball's home, Reid Park Zoo, is an accredited member of the Association of Zoos and Aquariums and promotes these conservation efforts. "If you're not doing conservation, in my mind you're not a modern zoo," said Jason Jacobs, the zoo's director.

Zoos step in

Zoos help imperiled species survive. "More and more zoos are actively involved in things like the propagation of rare species," said John Koprowski, a conservation biologist at the University of Arizona.

The 230-plus member zoos of the Association of Zoos and Aquariums care for more than 6,000 species, of which 1,000 are endangered. While the members are primarily in the United States, several are based in Canada, Mexico, the Caribbean, South America and Asia.

The association develops Species Survival Plans to best serve the needs of each species. Reid Park Zoo participates in 43 of the almost 500 plans, including the one for the white rhino.

Father Fireball

Fireball came to Reid Park Zoo from The Wilds, a safari park in Columbus, Ohio, in 2013. He was 10 years old and had sired 10 calves.

How zoos help save species from extinction

Fireball, a 15-year-old southern white rhino, arrived at Reid Park Zoo in 2013. He is on a breeding break after siring 10 calves. In a few years Fireball may be matched up with females here or at another zoo. Photograph by Kacey SEELOFF

Fireball was moved to Tucson not for a prolonged spring break but to take a temporary pause from fathering. This hiatus, which is part of the rhino Species Survival Plan, helps ensure a genetically healthy population by ensuring that breeding pairs are not closely related and that a variety of animals contributes to the next generation.

The Association of Zoos and Aquariums leverages the power of a much larger breeding population because animals are available from its member facilities. As part of each Species Survival Plan, the association works with animal geneticists to prepare a yearly breeding and transfer plan that is sent to members. "When this comes, the zoo nerds like me get really excited," said Adam Ramsey, an area supervisor at Reid Park Zoo. "I go straight to the page that says what's going on for the zoo at Tucson." When a species gets a breeding recommendation, "That's really exciting," he added.

Health and other concerns are taken into consideration when preparing the breeding and transfer plan. Some Reid Park Zoo animals have been removed from breeding lists because of health conditions. A female white rhino named Yebonga, for example, is too old to deliver a calf safely.

Living free

While reintroduction efforts for species such as the California condor and black-footed ferret have been successful, many animals that are bred in zoos will not be released in the wild. Fireball and Yebonga, for example, will spend the rest of their lives in human care.

Low-profile animals, such as small amphibians and insects, are easier for zoos to raise and release, according to Ramsey. These animals, however, are not big draws for the public. "It's hard to get people inspired about these animals, especially if they're standing next to a tiger," Ramsey said.

Pupfish may be small and drab, but many could be maintained in aquariums in back hallways or other small spaces. Visitors might be excited if Reid Park Zoo could release 500 pupfish every year, Ramsey said. "What a powerful message if we could tell our visitors that over 50 percent of our animals are part of a reintroduction program."

Ramsey recognizes the value of these low-profile species. "Every individual is important," he said. "Everything is important to the ecosystem."

Fireball's time in the sun

Besides supporting conservation in the wild, zoos will continue to raise rhinos. Reid Park Zoo plans to expand its rhino habitat. Perhaps in a few years, Fireball will have a couple of girlfriends, or he may be moved elsewhere if that is deemed best for the survival of his species.

In the meantime, zookeeper Corrales will continue working with Fireball. "He gets real funny," she said. "He likes to play."

Fireball will continue playing in the Tucson sun, giving visitors an up-close experience and following Corrales around like a 4,600-pound dog. ■

Crashing into

Fireball is one of the southern white rhino at Reid Park Zoo. The large hump on his neck and shoulders is a mass of muscles that moves his massive head and horn.

the future

Top left: A closeup of Fireball's eye reflects a camera flash. **Top right:** Southern white rhinos like Fireball have a wide mouth typical of grazers. In their African homeland, southern white rhinos feed exclusively by grazing. **Above:** Wild white rhinos can run at speeds up to 31 mph. Fireball, 15, sometimes dashes around the habitat, while Yebonga (not pictured), 44, leads a quieter life.

Story and photographs by Kacey Seeloff

Reid Park Zoo is home to two southern white rhinos: Fireball, a 15-year-old male, and Yebonga, a 44-year-old female. The two gentle herbivores, which share their habitat with three small Speke's gazelles, will be among the first of many animals that will benefit from the passage of the temporary tax initiative approved by Tucson voters in November 2017. In coming years Reid Park Zoo plans to expand the rhino habitat and bring in more rhinos, said Sue Tygielski, the zoo's general curator.

One goal for such an expansion is to allow Reid Park Zoo to take part in the Species Survival Plan for white rhinos. This program oversees the breeding of captive animals to ensure healthy, genetically diverse animals within member zoos.

Fireball arrived at Reid Park Zoo in 2013, partly to give Yebonga companionship. Fireball's transfer to Tucson gave him a rest after siring 10 calves. While Fireball waits to return to breeding, the 4,600-pound animal has become a popular attraction at Reid Park Zoo. ■

CHARTING A WHITE RHINO'S ANCESTRY

By Tony Perkins

The greatest tales of survival are not always found in adventure novels. Sometimes, they are recorded in the pages of a studbook that charts the family history of a zoo animal.

One of the best stories of species survival in the 20th century is that of the southern white rhino. The animals were almost hunted to extinction, but according to the World Wildlife Federation, fewer than 100 rhinos were found in South Africa and then relocated to breed and form new populations. The white rhino no longer faces immediate extinction, and zoos worldwide are dedicated to keeping the species off the endangered species list for good.

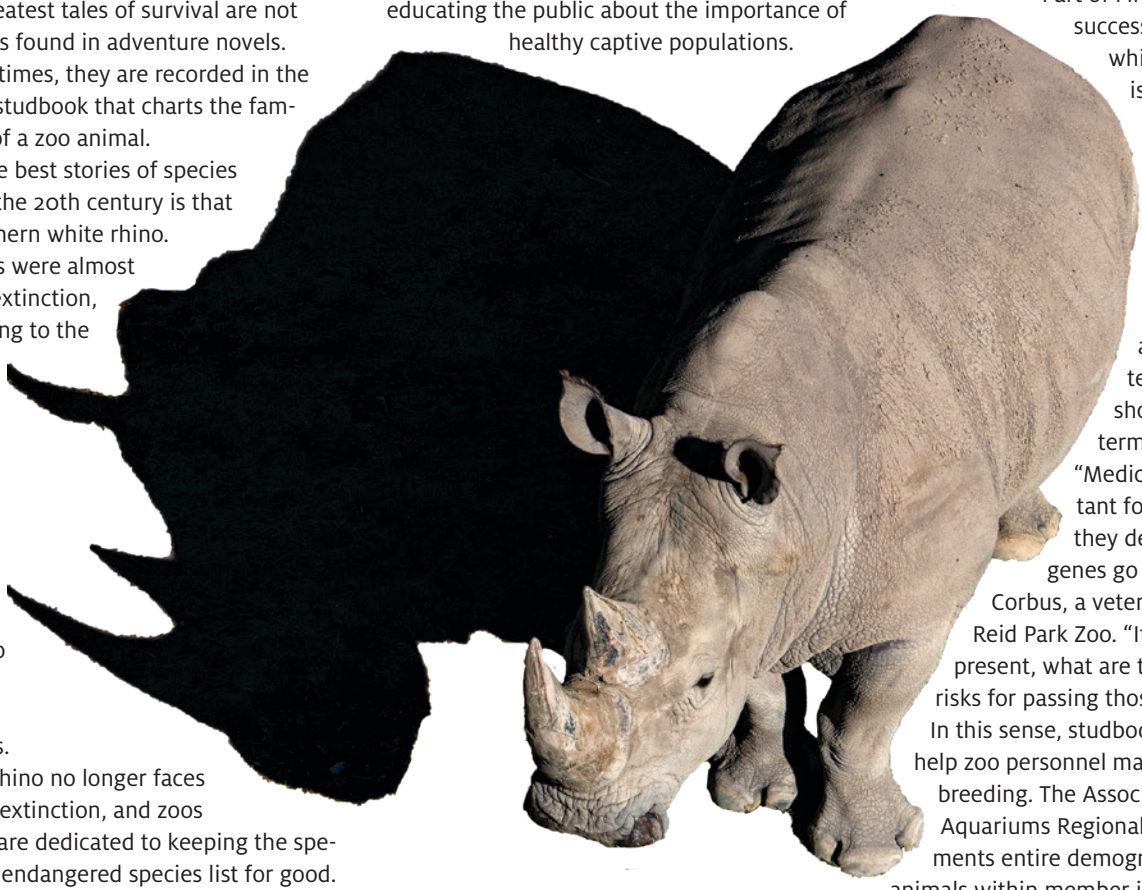
A key role for zoos in this conservation effort is keeping studbooks, which record the lineage of every wild animal in their care. The data are essential to a zoo's ability to document demographic and genetic information and prevent inbreeding.

For the record

Zoos don't just want animals to survive. They want them to thrive.

In the case of the white rhino, that's a big responsibility. White rhinos are the second largest land mammal on the planet—after elephants. Adult rhinos weigh between 4,000 and 6,000 pounds, according to the International Rhino Foundation. The organization says 20,000 white rhinos live in protected areas and private game reserves, mostly in South Africa, Namibia, Zimbabwe and Kenya. The animals can live to the age of 50.

Zoos worldwide consider species conservation among their top responsibilities, focusing on collecting and maintaining genetic information, implementing breeding programs and educating the public about the importance of healthy captive populations.



In the late 1800s overhunting almost wiped out southern white rhinos. Today, zoos are dedicated to keeping them off the endangered species list. Photograph by Nick SMALLWOOD

Detailed record-keeping allows zoos to follow an animal's history from birth through death. "Our keepers take daily notes that go into the record for every animal," said Rebecca Edwards, an area supervisor at Tucson's Reid Park Zoo. By observing patterns of behavior over several years, for example, keepers can pinpoint breeding signs for a particular animal during a particular season.

Studbooks: Deeper than a diary

The white rhino with the most significant studbook at Reid Park Zoo is Fireball, a 4,600-pound male rhino that has contributed a lot to the growth of the species in recent years. Fireball already had an extensive track record when he arrived in Tucson in 2013, having sired 10 calves in The Wilds, a safari park in Ohio.

Part of Fireball's reproductive success lies in his health, which studbook specialists monitor constantly. A studbook keeper doesn't just track an animal's family tree but also records information about the animal's nutritional intake and helps veterinary technicians discover short-term and long-term health problems. "Medical records are important for studbooks because they determine whose genes go where," said Elaine Corbus, a veterinary technician at Reid Park Zoo. "If [medical] issues are present, what are the benefits and the risks for passing those genes on?"

In this sense, studbook keepers also help zoo personnel match up animals for breeding. The Association of Zoos and Aquariums Regional Studbook documents entire demographic histories of animals within member institutions. If certain animals are known to have genetic issues, decisions can be made to prevent them from reproducing and delivering the same abnormalities to future populations. It is one way that zoos have managed to keep species like the white rhino healthy and growing over the past 20 years.

Studbooks enable zoos to work together to protect endangered species by increasing their numbers through breeding programs. Area supervisors say they shift animals not just to keep their facilities interesting for visitors but also to help preserve the genetic diversity of each species. "It's a monumental task to keep track of the genetics of thousands of animals," said Reid Park Zoo director Jason Jacobs.

Thanks to these breeding programs and careful record-keeping, animals like white rhinos will stay off the endangered species list. ■

Watch Online

Antsy for Love

Listen to Stephanie Norton, primary keeper for the giant anteaters, talk about breeding plans for Nico and Zola.

Produced by Kacey Seeloff

Medium.com/sciview/zooview

Keeper Stephanie Norton uses a tennis ball attached to a stick as a target for Nico, 15, one of two giant anteaters at Reid Park Zoo. As the holder of the giant anteater studbook, the zoo manages breeding recommendations for anteaters in zoos accredited by the Association of Zoos and Aquariums.

Antsy to be together

Norton, the primary keeper for the giant anteaters, gives Nico a yogurt treat after he touched a tennis ball during a positive reinforcement training session.

Story and photographs by Kacey Seeloff

Zola and Nico have only locked eyes from across their habitats, but many people are rooting for them to conceive. The two giant anteaters, which live at Reid Park Zoo, have been recommended for breeding by the Association of Zoos and Aquariums. This accrediting body developed a Species Survival Plan to help these animals live on. They are considered a vulnerable species, victims of habitat loss and hunting.

Tasked with breeding Nico and Zola are Reid Park Zoo's keepers. "We're very successful at breeding giant anteaters," said Stephanie Norton, the primary zookeeper for the gentle giants. If the two do conceive, the Species Survival Plan will dictate where, or if, Zola and Nico will be relocated for further breeding "to keep the population diverse," Norton said.

In the meantime, zookeepers will make sure the animals have ample space to roam and enrichment activities to keep them engaged and active. "The enrichment is very important," Norton said. "We provide them things that they do in the wild." The keepers hang treats high in trees to encourage climbing and hide tidbits inside logs for the anteaters to rip open with their long claws. ■

Beast and Breakfast

Top: Stephanie Norton, the primary keeper for the giant anteaters at Reid Park Zoo, prepares one of Nico's favorite treats—yogurt.
Middle: Norton uses yogurt as positive reinforcement to reward the giant anteater for good behavior.
Above: Nico gobbles up his breakfast of yogurt, pellets and worms. The giant anteater is the symbol of Reid Park Zoo. Anteaters face growing challenges in their native Latin America from habitat loss and the growing human population.

Top left: Positive reinforcement training encourages Nico, 15, to stand up at a fence for a health checkup. **Left:** The female giant anteater Zola, 5, sleeps on a cool fall morning. In the wild, giant anteaters become inactive during cold snaps.

Photograph by Carly OSERAN

Katie Hutchinson holds Amir, a fennec fox. Hutchinson is the primary keeper in charge of working with Reid Park Zoo's animal ambassadors.

Never too young to meet the wild

By Carly Oseran

What started off as an animal-themed birthday party evolved into something so much more for Margie Brown and her 3-year-old son, Coalton. Despite being surrounded by friends, Coalton was entranced by the hedgehog and the box turtle. These animal ambassadors for Reid Park Zoo, along with about two dozen others, are used for educational programs that give youngsters a chance to touch animals and see them up close rather than behind fences.

It was then that his mother realized the zoo was the right place for Coalton to explore his interest in wildlife. "His love for animals is seen in everything he does," Brown said. "I thought we should just have that flourish in his life."

Whether Coalton is attending the zoo's education programs or sharing his knowledge with family and friends, his mind is always on animals. He began attending zoo programs after his third birthday, starting with Little Critters and moving into Young Explorers.

Immersed in the wild

In the last five years Reid Park Zoo has embarked on a strong push for conservation and conservation education. This focus starts young. Children are immersed in the wild by going behind the scenes to visit rhinos and tigers. Youngsters leave knowing why it's important to care about animals and their natural habitats.

Conservation ethics are ingrained in the zoo's education programs, which range from pre-school to college. The older the students are, the more the zoo raises awareness of the plight of wild animals. Connecting people with animals and nature throughout their lifetime is one of the biggest roles that zoos play in spreading awareness, said John Koprowski, a conservation biologist at the University of Arizona.

One of Reid Park Zoo's main goals is to teach youngsters the importance of sharing the world with wild animals, said Jennifer Stoddard, the education supervisor. "Everybody needs food, water and shelter, just as animals do," she said. Like us, animals also need to feed and protect their young.

The Little Critters program encourages children from 2 to 5 to

start their journey with wildlife. Kids develop their motor skills while learning how to be gentle and kind toward animals, said Brittany Caldwell, an education coordinator at Reid Park Zoo. Participants practice how to properly touch certain animal ambassadors, such as the blue-tongued skink.

Educational encounters

Through these programs, the zoo's educators have witnessed how children like Coalton, now 11 and a veteran in the Young Explorers Program (6- to 12-year-olds), have grown from toddlers who love animals to older children wanting to know more about them.

At first, Coalton liked the programs for the arts and crafts and the exposure to animal ambassadors. Now, as a Young Explorer, he has learned how zookeepers care for small animals, such as the ring-tailed lemur, and he has even fed the anteater.

Coalton has shared these experiences with his peers. When he was assigned a school presentation on any nonfiction topic, Coalton jumped at the opportunity to teach his classmates about Reid Park Zoo's tamandua, a smaller relative of the giant anteater.

As a Young Explorer, Coalton has participated in a variety of programs—from shadowing a zookeeper for a day to learning about the myths behind ghosts and werewolves. "Having kids come back to our program is a great sign because they are constantly wanting to learn new things and do different things than they've done in the past," Caldwell said.

The zoo education team continues to create and revamp programs to make them as accessible as possible to the community. The educators have planned programs that will bring youngsters into the new, state-of-the-art veterinary health center, where they can learn more about animal care and health, Caldwell said.

"I think our education staff is really, really passionate about what they do, and that really shows through in the programs that they do," Stoddard said. "Additionally, the people that are coming to these programs, they're passionate too, and so it's just a great combination of people teaching the programs and attending the programs."

Coalton is already counting the days until he turns 13 so he can join the ranks of zoo volunteers and help keepers care for animals. "If we know more about animals and their needs," Coalton said, "we can change the world." ■

Watch Online

Young and Wild

See how early education is key to public outreach and conservation efforts at Reid Park Zoo.

Produced by Carly Oseran

Kids and Critters

Watch the video and meet Reid Park Zoo's animal ambassadors and their primary keeper, Katie Hutchinson.

Produced by Tim Dabrowski

Medium.com/sciview/zooview

Critter Callbacks: Selecting Animal Ambassadors

By Tim Dabrowski

Several wide-eyed kids stare, mouths agape, as the tamandua pokes her long snout at a thin wooden stick. The moment this 2-foot-long anteater touches the stick, her keeper blows a whistle to signal that she has completed a desired behavior. The tamandua then receives a sweet reward—a lick of honey.

The public can see the tamandua every Saturday and Sunday—if she feels up to it. "We're using her to help teach people about animals in the wild," said Jennifer Stoddard, the education supervisor at Reid Park Zoo.

Kept behind the scenes, the tamandua and other animal ambassadors participate in the zoo's education programs. On the team are more than two dozen animals, including mammals, birds, insects and reptiles. Children learn about wildlife conservation and animal care as they pat a hedgehog, touch a corn snake or hold a Madagascar hissing cockroach.

Naturally extroverted

How does an animal land such a sweet gig?

Most of the animal ambassadors at Reid Park Zoo are docile by nature, but because they are still wild, it can take time for some to overcome their fear of humans. Others, however, are natural performers.

Take Nadia the ferret. "She loves going out; she loves the attention," said Katie Hutchinson, the primary keeper for the animal ambassadors. "She loves seeing new things and smelling new things. That's really what we want in an animal ambassador."

But this isn't always the case.

"We had an armadillo who was a little bit nervous around people," Hutchinson said. "He got to go to a breeding center."

Slow and steady to the stage

The first thing the zoo does when introducing an animal to humans is to let it explore its surroundings away from its mother. The youngster faces new and potentially scary experiences, such as being handled by a keeper. If the animal is extroverted, it starts working with keepers and education staff to mimic the work it will do when in classrooms or out on zoo grounds. After the animal is calm with a small number of staff, then docents, teen volunteers and more staff can work with the animal.

Because animal ambassadors aren't on display, like other zoo animals, they live in smaller but still naturalistic habitats. To keep them stimulated mentally and physically, keepers create enrichment activities that encourage them to use their natural instincts to obtain food and treats. For the dung beetles, keepers go as far as giving them animal dung to roll into balls.

Public appearances can take place several times a week or once every few weeks, depending on the animal's comfort level.

Keepers don't rush or pressure animals to participate. "When working with animals, you have to be super-flexible and do whatever the animal wants to do," Stoddard said. ■

The Zoo Poo Games

By Tim Dabrowski

Reid Park Zoo is home to more than 350 different animals. About 200 zookeepers, specialists and docents work with them on a daily basis. With so many different types of animals, their diets also vary. But one thing they all share is that they all poop! From the tiniest of animal ambassadors to the largest elephant, keepers have plenty to clean up every day. Here are some fun facts about your favorite little critters and massive creatures at Reid Park Zoo. ■

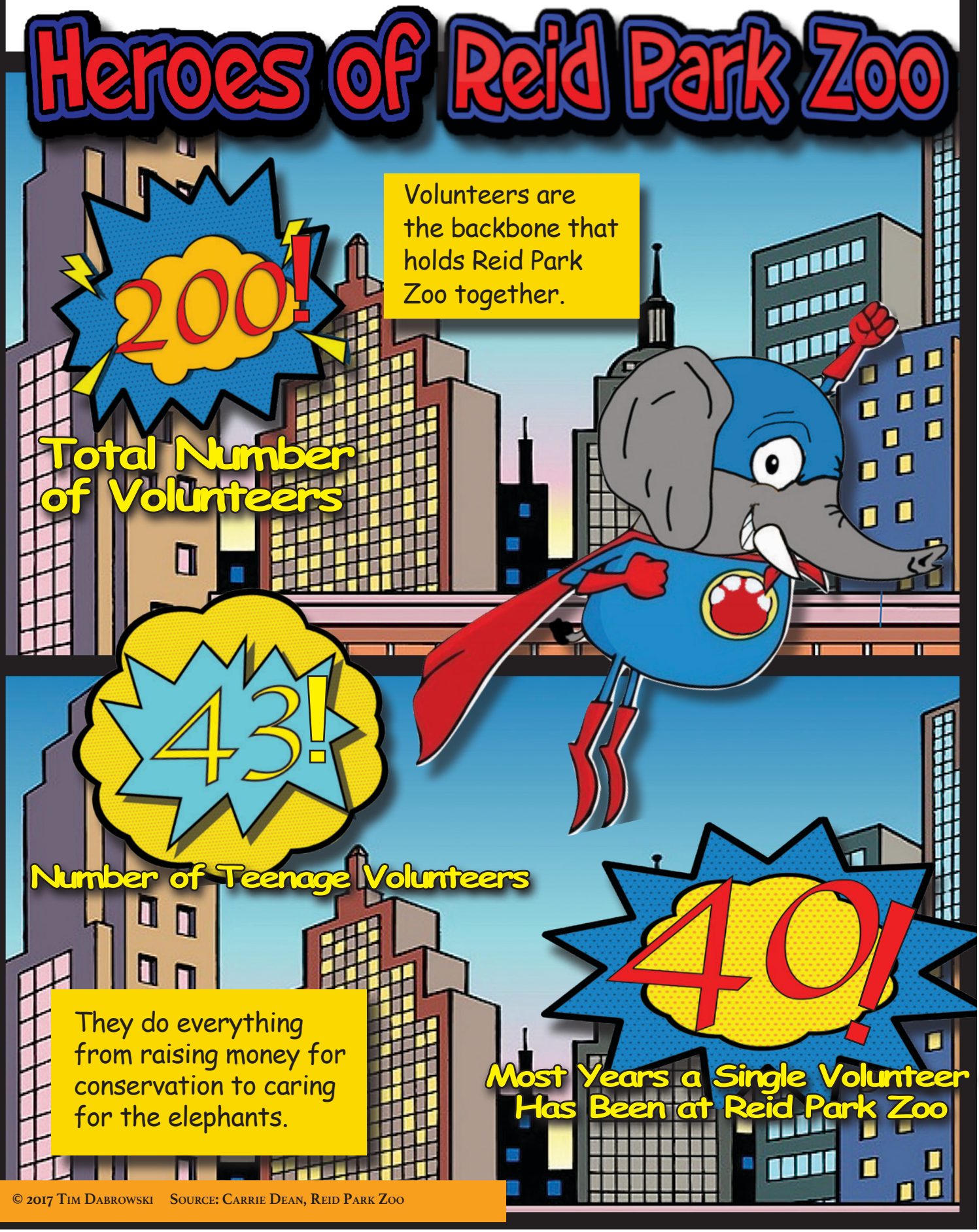
 Source: Jed Dodds, Reid Park Zoo Graphics: Pixabay.com

At Reid Park Zoo each giraffe eats about 75 pounds of food daily.

Mabu, Nandi's dad, pooped 128 pounds in one plop. A record!

The Aldabra tortoise, one of four species of tortoises at Reid Park Zoo, weighs 550 pounds!

Heroes of Reid Park Zoo



 Source: Carrie Dean, Reid Park Zoo

WATCH THE DOCUMENTARY ONLINE

A MODERN ZOO

WILDLIFE CONSERVATION AND REID PARK ZOO

SHOMBAY | Photograph by Nick SMALLWOOD

WWW.MEDIUM.COM/SCIVIEW/

By MARISSA HEFFERNAN
PRODUCER

Fifty years ago, conservation in zoos was an oxymoron. Today, the modern zoo advocates for and supports conservation projects worldwide.

With habitat destruction around the globe and a rapidly changing climate, more animals than ever before face extinction. To someone in Arizona, the plight of elephants in Africa murdered by poachers or edged off needed land by expanding agriculture is sad but remote.

Reid Park Zoo, located in Tucson, Arizona, brings those issues closer to home. Visitors not only learn to care about the zoo's five elephants but also how to contribute to conservation efforts for their counterparts in the wild.

As an accredited member of the Association of Zoos and Aquariums, Reid Park Zoo supports conservation efforts by donating to organizations that aid animals in the wild. It also works to augment declining populations through breeding programs.

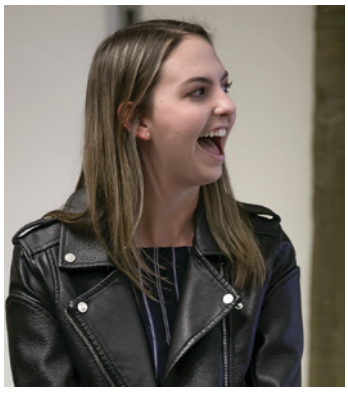
This documentary looks at the role that modern zoos play in conservation by zooming in on Reid Park Zoo as an example of what can be accomplished both locally and internationally. The video also lets each of us know what we can do in our daily life to protect wild places and wild creatures. ■

CREDITS

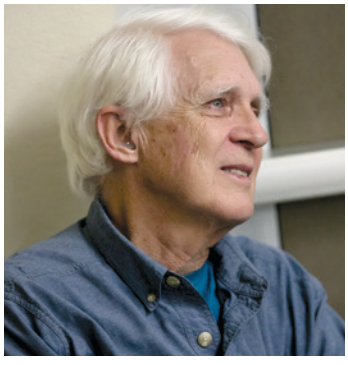
PRODUCER MARISSA HEFFERNAN
ASSISTANT PRODUCER CARLY OSERAN
DIRECTOR OF PHOTOGRAPHY ELIZABETH KINNEY
CINEMATOGRAPHER NICK SMALLWOOD
GRAPHIC ARTIST ALYSSA HILL
REPORTERS NAOMI PIER
CHRIS STIDLEY
ORIGINAL SCORE
NAT ANDERSON
AUTUMN DOMINGUEZ

EXECUTIVE PRODUCER ALAN SCOTT DAVIS
ASSOCIATE PRODUCER JULIAN YBARRA
ADDITIONAL FOOTAGE
BRONX ZOO MADDIE GOLDBERG
DRONE VIDEO REID PARK ZOOLOGICAL SOCIETY
OLD LA ZOO AT GRIFFITH PARK JULIAN YBARRA
REID PARK ZOO JED DODDS
TANZANIA CHARLES FOLEY, REID PARK ZOO
ANDREW PATRICK
THEINSIGHTTANZANIASAFARIS.COM

CAROL SCHWALBE • JOHN DE DIOS
A SCIENCE JOURNALISM PROJECT • FALL 2017



A Modern Zoo team members celebrate after the documentary's premiere at Reid Park Zoo. From left, John de Dios, Elizabeth Kinney, Marissa Heffernan, Alyssa Hill, Carly Oseran, Alan Scott Davis, Carol Schwalbe, Nick Smallwood and Julian Ybarra.



Top: Carly Oseran, assistant producer, presents her video on early education at Reid Park Zoo. **Above:** Cecil Schwalbe, science adviser, listens to presentations.

Above left: John de Dios, project manager, gives a short background on the project and the project team to more than 60 guests at the premiere of *A Modern Zoo* in Reid Park Zoo's Conservation Learning Center. **Above right:** Jason Jacobs, director of Reid Park Zoo, applauds the student video team members for their work.

Top: From right, Alan Scott Davis, executive producer, present gifts to Jason Jacobs, zoo director, and Candis Martin, marketing manager. **Middle:** Cinematographer Nick Smallwood chats with Sue Tygielski, Reid Park Zoo's general curator. **Above:** Nick Smallwood and his brother, Alex Smallwood, attend the premiere.

PREMIERE OF A MODERN ZOO

WILDLIFE CONSERVATION AT REID PARK ZOO

Photographs by Simon Asher for *ZooView* • Reid Park Zoo Premiere • December 12, 2017

Julian Ybarra served as the documentary's associate producer.

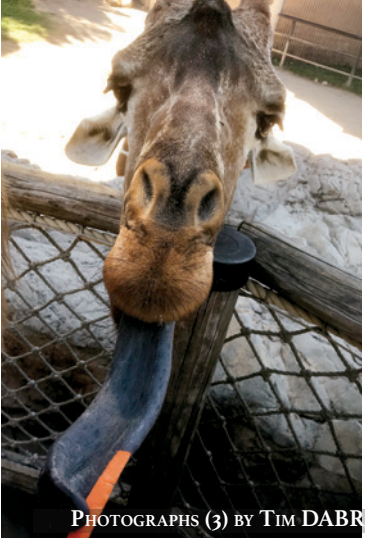
Nat Anderson (middle, with headphones), accompanied by spouse Grace Anderson, and Autumn Dominguez with guest Bryce Hill, composed an original score for *A Modern Zoo*.

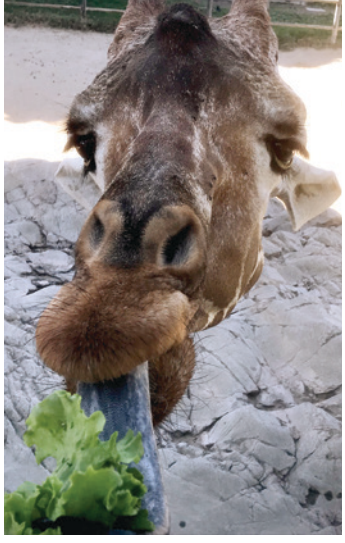
H. Dieter Steklis, left, and spouse Netzin Steklis, both primatologists at the University of Arizona, attend the premiere at Reid Park Zoo.

From left, Julian Ybarra, associate producer, joins Nick Smallwood, cinematographer, and Alan Scott Davis, executive producer.

Alyssa Hill, who designed the graphics for *A Modern Zoo,* and spouse Levi Hill pose at the Reid Park Zoo premiere.

Hannah Kaufman accompanies Tim Dabrowski to the premiere. Dabrowski produced one of six short videos that accompany the documentary.






PHOTOGRAPHS (3) BY TIM DABROWSKI

PHOTOGRAPH BY CHRIS STIDLEY

Feeding the giraffes at Reid Park Zoo is popular with visitors. The dark pigment in the giraffe's tongue may protect it from sunburn.

CREATIONS AND CRITTERS: A PHOTO ESSAY by *ZooView* staff


PHOTOGRAPH BY KACEY SEELOFF

PHOTOGRAPH BY SHANSHAN NIU

ABOVE LEFT: The Malayan tiger is among the endangered animals housed at Reid Park Zoo. ABOVE RIGHT: African spotted-necked otters close their ears and nostrils when swimming underwater. Their webbed feet and strong tail propel them quickly through the water.


PHOTOGRAPH BY NICK SMALLWOOD

PHOTOGRAPH BY TIM DABROWSKI

ABOVE LEFT: Ring-tailed lemurs face habitat loss in the wild. ABOVE RIGHT: A green tree python is on display in the zoo's Conservation Learning Center.