



MCDOWELL  
SONORAN  
CONSERVANCY

# Mountain Lines

MAGAZINE OF THE MCDOWELL SONORAN CONSERVANCY    SPRING 2024







Dr. Amanda Hofmann-Hardy, CEO

As we embrace the invigorating spirit of spring, I am both honored and thrilled to extend my warmest greetings to you as one of the new faces of the McDowell Sonoran Conservancy. It is a privilege to introduce myself and offer insights into the exciting future that lies ahead for our organization.

Stepping into my role, I am deeply committed to upholding the Conservancy's legacy of preserving Scottsdale's McDowell Sonoran Preserve and fostering a bond between humanity and nature. I firmly believe that it is our collective duty to serve as stewards of this exceptional desert ecosystem, ensuring its vitality for generations

to come. The dedication and passion demonstrated by our staff, stewards, and supporters inspire me greatly, reinforcing the importance of our shared mission.

Looking forward, we have ambitious plans in store for the Conservancy, aimed at expanding our impact and engagement. We are dedicated to investing in innovative research, educational initiatives, and conservation. Community engagement remains paramount in all our endeavors. We are excited to unveil a host of captivating events, outreach programs, and volunteer opportunities, ensuring that everyone has the opportunity to experience the beauty of the Preserve firsthand. Together, we can cultivate a sense of stewardship and responsibility that transcends generations.

I extend a heartfelt invitation to each of you to join us on this thrilling journey. Whether you have been a steadfast supporter for years or are just beginning to engage with the Conservancy, your enthusiasm and involvement are indispensable to our success. Together, let us forge a future where the Preserve stands as a testament to the power of community, conservation, and connection.

Here's to a year brimming with growth, exploration, and a renewed dedication to our shared mission.

## About Us

The McDowell Sonoran Conservancy preserves and advances natural open space through science, education, and stewardship. We create a culture that ensures, preserves, and values natural open spaces for all to enjoy.

Connect with us:



Cover photo: This double-crested saguaro, located at the intersection of Desperado and Coyote Canyon Trails, dwarfs a nearby steward. Photo by Dennis Eckel

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# Expedition Days on the Trail brings Smiles to Students, Teachers, and Stewards

By Elizabeth Flaherty

It's 9:32 am on a chilly Tuesday in November and there is a palpable buzz among the stewards gathered at the Lost Dog Wash Trailhead in Scottsdale's McDowell Sonoran Preserve. They hear a faint rumble in the distance, the sound of the school buses arriving with excited 3rd and 4th grade students!

Planning for this November event began this past June, when the McDowell Sonoran Conservancy teamed a group of

staff members with steward volunteers and posed a challenge. How do we assemble groups of 120 3rd and 4th grade students at the Lost Dog Trailhead? And teach them about the Sonoran Desert? And allow them to exercise their critical thinking skills? And let them explore the Preserve? ...All while maintaining some semblance of order?

The committee discussed and modeled multiple lesson ideas. The activities had to align with Arizona State



Expedition Days' BioBlitz hiking allows students to explore the Preserve while collecting data that shows evidence of life in the desert including animal tracks, nests, holes, and scat. Photo by Jen Bruening





Volunteer stewards teach students how to identify the various animals in the Preserve. Photo by Jen Bruening

Academic Standards and be interactive, exploratory, and thought provoking for the students. The lessons also needed to be easily integrated into the teachers' lesson plans.

The committee developed three new activities. A mammal identification study for 3rd graders, a heat study for 4th graders, and a BioBlitz activity for both groups.

During the mammal identification study, students identify animals by their pelts and skulls. They also learn to identify their diets and determine if the animal was a predator or prey based on several clues. They discuss and hypothesize how the animals have adapted to life in the desert.

During the heat study, students



Students work together to gather temperature data from multiple surfaces in the Preserve using an infrared thermometer. Photo by Jen Bruening

define temperature and discuss the effects of weather, heat, and energy. They offer predictions about what surfaces will be warmer or cooler. They are tasked with testing their predictions by collecting temperature data with an infrared thermometer from multiple surfaces within the Preserve and discussing how heat affects the desert in urban environments.

BioBlitz activity involves both groups of students. They collect data that shows evidence of life in the desert including animal tracks, nests, holes, and the ever-popular scat!

So back to the original challenge... how can a learning opportunity for 120 3rd and 4th graders be facilitated in the Preserve? The answer: very methodically!

Students are broken into groups of 12, each with two volunteers and one school chaperone. Each group has a designated route to facilitate smooth transitions among the activities. For all activities the students are broken into even smaller sub-groups, allowing them to develop hypotheses



All smiles after the first Expeditions Days in November. Photo by Jen Bruening

and take turns recording their data. Stewards and teachers are there to encourage the expression of diverse perspectives and interpretations, to answer questions, and to ensure the lesson stays on track -- but the rest is student-led.

So, what are the students saying about the programs so far?

**"I can protect the Sonoran Desert by picking up trash and not littering!"**

**"I saw scat and learned how to tell what animal it was from."**

**"What is the next activity we get to do? I don't want to go home yet, this is fun!"**



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# How Do Snakes Move Without Legs?

By Won Fogel, Master Steward and Randall D. Babb

For snakes, which evolved from lizards, leglessness is perhaps their most widely recognized hallmark. Because of their lack of legs, snakes have developed a unique manner of movement which allows them to invade nearly every conceivable habitat – from the tops of trees to the oceans.

Leglessness is an interesting condition for many reasons. Among vertebrates it is not rare, but certainly not common. There are no legless mammals. But it does occur with a good deal of frequency in reptiles (birds and turtles excluded) and amphibians.

If you have ever marveled at a coachwhip (*Masticophis flagellum*) zipping across a trail on a warm summer morning, you have probably wondered “How do they do that?”

Simply put, snakes use muscles to flex and push their belly scales and sides of their body against the ground or objects to propel themselves forward. This often, but not always, results in the typical S-shaped movements with which we are all familiar.

There are four types of locomotion employed by snakes. All types share the flexing of the plate-like ventral scales – called scutes – to assist in movement. On most snakes, these scutes are fringed with microscopic rearward pointing spikes that enhance traction.

## Lateral Undulation

This is the typical serpentine movement we associate with snakes. The head and neck dictate direction. What appears to be a seamless, smooth

glide across the ground is actually a complicated series of muscle and scale movements that result in side-to-side bodily movements. This “wiggling” brings the snake’s body in contact with surface irregularities and objects off of which it pushes itself forward



A four-inch-long Neonate sidewinder (*Crotalus cerastes*), only weeks old, demonstrates lateral undulation locomotion. See video link on page 7. Photo by Randall D. Babb

By simultaneously and sequentially contracting and releasing muscles up and down the length of its body,

it creates force at multiple points propelling itself forward. In addition, ventral scutes which are in contact with the surface, grip the ground working in concert with the sides of the body to move the snake. While lateral undulation is the standard for most snakes, it also appears to be one of the most complex.

## Concertina Locomotion

In this form of movement the snake thrusts its head and forebody forward where its ventral scutes



This impression was made by a snake in the Preserve using the classic lateral undulation locomotion. Photo by Mary Pruikmsa

and sides of the body find purchase. The rear of the snake is then pulled forward where the scutes gain traction, allowing the head and forebody to be pushed forward. Much like an accordion being compressed and stretched out, this is the least common method of locomotion. Though it may be a simple movement, allowing snakes to move in a straight line, it is energetically demanding compared to other methods of locomotion. Additionally, it is a much slower method of travel.

Large snakes, such as pythons, often use concertina locomotion to climb straight, limbless trunks of trees by wrapping their bodies around the trunk and pushing their forebodies up. The trunk is then gripped, and the rest of the snake is pulled up. This is repeated until the canopy is reached.

## Sidewinding

Sidewinding is perhaps the most specialized form of snake locomotion. Basically, the snake “moon walks” across a surface by throwing its raised head and neck forward in a loop, gripping the substrate, and pushing back opposite to the direction of travel while bringing the body forward. When



Sidewinding is the fastest form of movement allowing snakes to travel at speeds up to 18 miles per hour. See video link right. Photo by Randall D. Babb



Western diamondback rattlesnake demonstrating rectilinear snake locomotion. See video link below. Photo by Won Fogel

about half the snake has been brought forward, the head and neck are again extended. Only two points of the body are in contact with the surface at any given time, creating series of tracks that resemble a “J” laying on its side. Though many New World snake species will sidewind for short distances, sidewinders (*Crotalus cerastes*) habitually travel in this manner.

Sidewinding is the fastest form of movement, allowing snakes to go up to 18 miles per hour. It is particularly effective on loose soils and helps snakes in sandy habitats across the globe avoid prolonged contact with hot sand. The microscopic spikes found on the ventral scales of non-sidewinding snakes would inhibit this type of locomotion and are greatly reduced or absent in sidewinding species.

## Rectilinear Locomotion

Similar to concertina movement in that it allows snakes to crawl in a straight line, this is the preferred form of locomotion for many larger snakes. The snake lies outstretched straight and glides forward by using abdominal muscles to flex its ribs and ventral scutes rather than laterally undulating its body in loops. The scutes

move forward and back to propel the snake forward much like the legs of a caterpillar or millipede. Rectilinear locomotion is the primary method of travel for many rattlesnakes. It is not typically associated with rapid movement.

The next time you encounter a snake, take a moment to watch it effortlessly slide across the ground, as if pulled by some unseen string. Appreciate the many millions of years of evolution that brought you in contact with such serpentine perfection. ▲▲

To see a short video of how snakes move, click on the link below:

<https://conservancy.smugmug.com/How-Snakes-Move/n-rtwbqv> or scan the following QR code.





# Meet the Specialists

The professionals employed at the McDowell Sonoran Conservancy include experts in conservation, biodiversity, education, development, and program management. Our staff members partner with hundreds of knowledgeable and skilled volunteer stewards to conduct dozens of conservation programs and projects, adult and youth education and creation projects, research studies, and other activities each season.

Meet some of our amazing specialists here!



## Annie Johnson, Education Coordinator

I was born in Arizona and lived here through college. I then moved around a bit before inevitably returning to the desert. My love for animals led to me getting a Bachelor of Science in Biological Sciences (with a concentration in Ecology and Conservation) from Barrett, the Honors College at Arizona State University. While there, I worked with the Arizona Center for Nature Conservation at the Phoenix Zoo and was the lead for their camera trapping project in Costa Rica. After college, I became an interpretive ranger at a state park in Georgia.

I am new to the Conservancy, where I help to create and implement interactive, student-led lessons for K-12 students across the valley, both in the classroom as well as on-site at the Preserve. When I was a child growing up here, I always heard people describe the desert as “dead” or “boring.” I love that our programs encourage students to be excited about living in the Sonoran Desert and to recognize the beauty and the biodiversity that is all around us.

*“Ever since I was little, I’ve been passionate about animals and the environment. I love that I found a job where I can instill that same enthusiasm for nature, and for the Sonoran Desert in particular, in future generations.”*



## Tyler Chandler, Development Manager

I am an Arizona native who grew up in a rural area north of Tucson. In my youth, the Sonoran Desert was my playground, which instilled a deep passion for the natural world. I earned undergraduate and graduate degrees from Arizona State University, with a Bachelor of Science in Education and a Master of Science in Sustainability. My studies focused on the intersection between the business sector and sustainable practices. I collected and analyzed data on a variety of metrics such as energy and water usage, waste streams, supply chains, and emissions. Prior to joining the Conservancy in 2021, I taught science for five years in public schools, followed by two years of roles in the sustainability field at NRG, U.S. Foods, and Adidas.

At the Conservancy, I manage the development data, database, and reporting initiatives to ensure accurate projections, acquisitions, growth, and retention. Additionally, I work to secure annual operational support through annual giving programs and fundraising events.

*“I am incredibly thankful I have the opportunity to integrate my knowledge of process optimization and data management with my dedication to advancing conservation and sustainability.”*



## Vickie McWatters, Director of Development and Marketing

As a third-generation native, I am excited to contribute my skills to an organization deeply passionate and dedicated to my hometown. After dedicating much of my career to the corporate sector, I intentionally transitioned to the nonprofit realm a decade ago. My passion lies in cultivating robust connections with like-minded individuals. In my role as Director of Development and Marketing at the Conservancy,

I am committed to diversifying our revenue streams and laying a strong foundation for the continued expansion of our exceptional programs. It’s my aspiration to strengthen our organization’s foundation and ensure sustained growth..

*“Working for the McDowell Sonoran Conservancy is not just a job; it’s a commitment to preserving the beauty of my home and sustaining it for generations to come.”*



# Conservancy Women Connect Have Fun, Make Friends, and Support the Conservancy

By Peggy Sharp Chamberlain

After a brief hiatus, the McDowell Sonoran Conservancy Women is making a strong comeback this season. They kicked things off this past fall with a New Friends Happy Hour where members confirmed goals, established special interest groups, and planned future activities.

Conservancy Women is a friend-raising and fund-raising group of individuals interested in learning more about the Sonoran Desert and sharing that interest and knowledge

with others. Each member makes an annual donation of \$200 to the McDowell Sonoran Conservancy, and the group is committed to members with opportunities for learning, giving back, and making new friends.

This season the group has already organized private tours of the Phoenix BioSciences Core, the Scottsdale Museum of Contemporary Art, the



Phoenix Herpetological Sanctuary, and the Japanese Friendship Garden. The highlight was a private tour of Liberty



Above photo and above right. The Conservancy Women received a guided tour of the Scottsdale Museum of Contemporary Art. Photos by Dennis Eckel



Conservancy Women enjoying a tour at the Phoenix Herpetological Society. Photo by Dennis Eckel



Wildlife with the director, Megan Mosby. The women learned about the research, programs, and animals during an informative and educational excursion that wrapped up with a picnic at The Farm at South Mountain.

### Excursions and activities planned for this spring include:

**LDV Winery's Charcuterie Class with Wine Tasting on April 2, 2024** – Make your own charcuterie board, accompanied by Arizona wine, to enjoy at the event or later at home.

**Trolley Tour of Scottsdale Outdoor Art Installations on April 17, 2024** – Take an exclusive tour of

Scottsdale's public art complete with a docent, wine, water, and snacks.

**Queen Creek Olive Oil Tour and Tasting on April 24, 2024** – Learn about this famous olive oil by touring the grounds, tasting the product, and enjoying a box lunch with your Conservancy Women friends.

In addition to outings, Conservancy Women offers a movie group, book club, hiking group, walking group, and walk-with-your-dog group.

If you want to support the Conservancy, make new friends, and learn about the desert where we live, be sure to join Conservancy Women – we have a place for you.

To join, visit [mcdowellsonoran.org/conservancywomen](http://mcdowellsonoran.org/conservancywomen). ▲▲



Regularly planned hikes are an important part of Conservancy Women activities. Photo by Dennis Eckel



Hikes like this one at Brown's Ranch are always full of new explorations and discoveries for Conservancy Women. Photo by Dennis Eckel

# Spotting Crested Saguaros in the Preserve

Steve Coluccio, McDowell Sonoran Conservancy Master Steward

The saguaro cactus (*Carnegiea gigantea*) is one of the defining plants of the Sonoran Desert. These plants are large, tree-like columnar cacti that develop branches (or arms) as they age. Saguaros are found exclusively in the Sonoran Desert and are the largest cacti in the United States.

But lurking among these magnificent specimens is something so special that, like collecting rare coins or

stamps, many people spend their spare time seeking them out. According to the National Park Service, they number only one in 200,000. These are the Crested (or Cristate) Saguaro.

Crested saguaros form when the cells

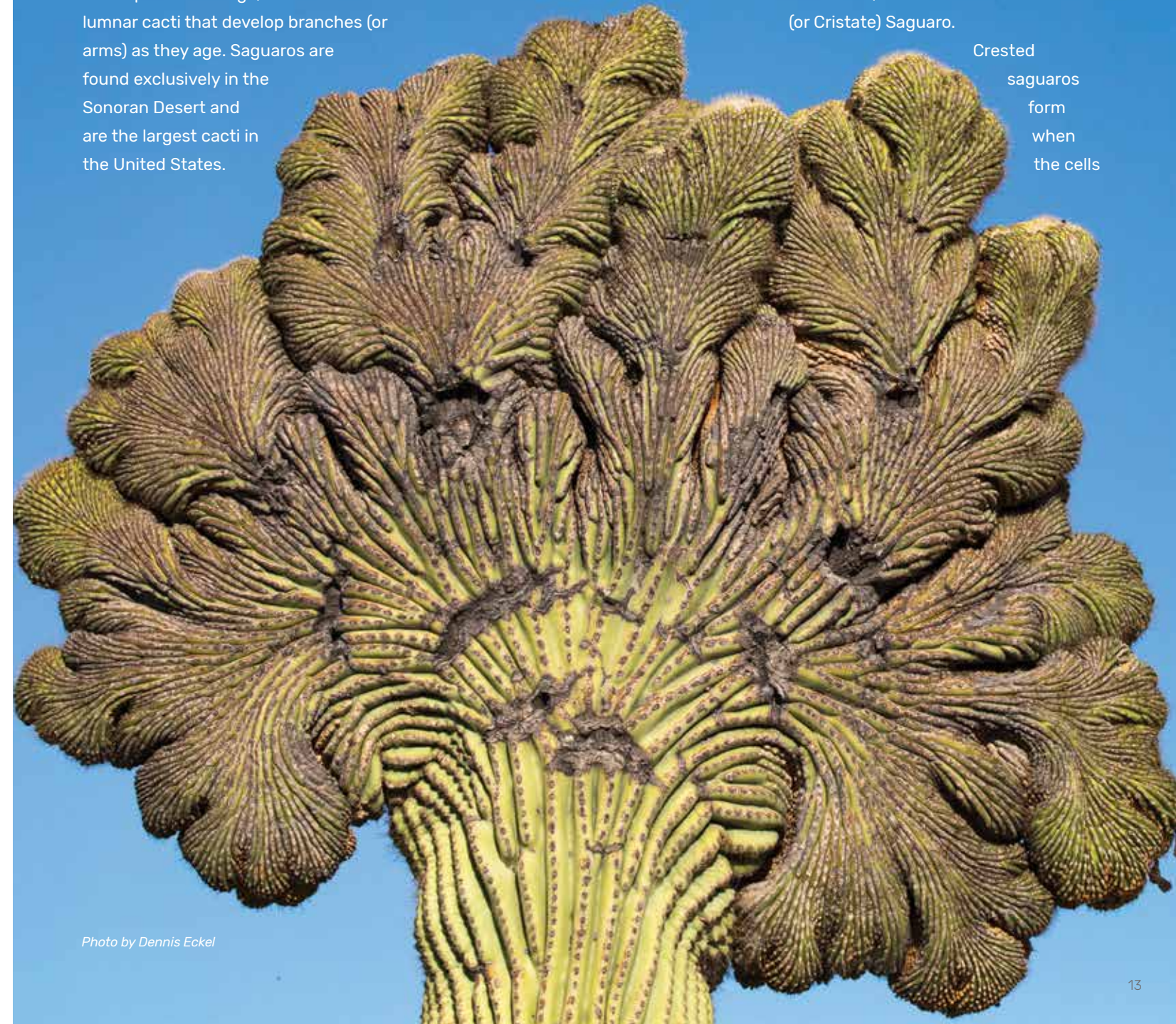


Photo by Dennis Eckel



in the growing stem begin to divide outward, rather than in the circular pattern of a normal cactus. This is an unusual mutation that results in the growth of a large, fan-shaped crest at the growing tip of a saguaro's main stem or arms.

There are other types of mutation that can occur in saguaros,

such as segmentation, bifurcation, or even trifurcation. But you can recognize the crested saguaro by the seam

(or zipper) that separates two sides of a mirrored image.

Is the condition caused by genetics? Lightning? Freezing temperatures? Or a virus? No one knows for sure. There are a couple of areas in Scottsdale's McDowell Sonoran Preserve where clusters can be found within a one-mile radius.

Does that tell us anything?

While crested saguaros are a rare occurrence, we have our fair share in Preserve. Most are in the Northern Region. Some are well known, such as the "Double Crested" one at the intersection of Desperado and Coyote Canyon Trails, the "Empress" on Sidewinder Trail east of the Pima Dynamite Trailhead, or the "State Land" one that can be seen by looking directly west from Axle Grease Trail at AG13.

But there are others along the trails that can be spotted if you just take the time to look around and train your eyes for saguaros that look different from the rest. If you do that, you might just be lucky enough to find one of the icons of the McDowell Sonoran Desert.

Please be sure to observe and photograph these beauties from the trail.

*Photo by Dennis Eckel*





Although not a crested saguaro, this cactus defies convention. Its unique features remain shrouded in mystery, much like its age. Nestled along the east side of Desperado Trail, it boasts arms that whimsically mimic the friendly Michelin Man. In recent years, this cactus has started to decline (photo on right).



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# Working Stewards: Getting it Done

By Dennis Eckel, Steward and Susan Matthews, Master Steward

**T**hey work full time. Yet they find the time, energy, and passion to serve as McDowell Sonoran Conservancy stewards. They use their work skills, and they also contribute in ways that are completely separate from their professional lives. They find this both rewarding and refreshing.

Meet just a few of the 50-plus Conservancy stewards who work full time.



## Katie Black, Steward

Vice president of strategy and business development at a tech company

I love being a trailhead ambassador and the best part is that moment when a visitor returns from a hike or ride that you have mapped out especially for them. The positive feedback feels incredible, and you know you improved their experience in the Preserve that day.

This is a wonderful community of like-minded individuals that is almost guaranteed to improve your quality of life! I have learned so much about the Sonoran Desert. I have met many incredible volunteers as well as staff at the Conservancy and the City since joining the program. This diverse group of individuals has such dedication and passion for protecting the Preserve and educating the community and visitors.



Katie is the trailhead lead at Brown's Ranch Trailhead.

Her tip: Participate in what works for you and your schedule. There are a ton of activities that take place outside of the Preserve. It's okay to say "no" when you need to, and you are always welcome to join in when you can.

## Clare Bailey, Steward

Project manager at a medical device company



Clare is active in the Youth Education program, where she participates in Expedition Days.

I always wanted to get involved in citizen science and happened to stumble upon the Stewardship tab of the Conservancy website when I was looking for outdoor wedding venues! The Stewardship program sounded like a perfect fit for me, so I started my applications to become a steward and to obtain a permit for my wedding on the same day.

I have a flexible schedule when I plan in advance, so I am typically able to sign up for opportunities during the workday about once a month. Otherwise, I get most of my volunteer hours completed in the late afternoons or on weekends.

I've formed relationships with people I probably would have never met otherwise. I get a lot of satisfaction from contributing to projects and studies that are aimed at supporting the health and longevity of the Preserve and surrounding areas. Plus, I am always happiest when I'm outside in nature.



I didn't realize how many different opportunities are available throughout the year. There is a lot of work that goes on behind the scenes to ensure activities are organized and available to as many stewards as possible.

A big factor in my success through engineering school, and in my career now, is the people who spent time teaching kids about math and science. I'm honored to have the opportunity through the Conservancy to be part of the community support to kids around the Valley today.

Her tip: You don't have to do it all! There are countless opportunities to get involved, and it can feel overwhelming trying to do everything right away. Patrol whenever it fits into your schedule and explore other programs and activities that work within your time constraints.

### Scott Weiss, Steward

Corporate transactional attorney who owns his own law firm

The first time I met a "blue shirt" in the Preserve, I



Scott is an avid foot patroller.

immediately wanted to become a steward, but figured it was something I would do when I retired. Friends who are stewards helped my wife and me realize that since this is a volunteer position, we could work as much – or as little – as we were able. We signed up right away.

My weeks are filled with work and meetings, so I try to plan a patrol hike or take a shift as a trailhead ambassador every weekend. Currently, I cannot enjoy the many great events and activities that are scheduled during the weekdays, but that just gives me something to look forward to in future years!

I have always been impressed with the City of Scottsdale and proud to live here. After becoming a steward and learning how the City acquired the land, formed the Preserve, and saved this beautiful land for all to enjoy, I was blown away! What an amazing City with such foresight!

My most memorable encounter was being involved in a helicopter rescue at Tom's Thumb. I followed the paramedics' orders and helped keep the trail clear. It was quite exciting, but I would rather not have that happen again!

His tip: Remember that this is a volunteer position – do as much as you are comfortable. Start now and enjoy the benefits of our Preserve and Conservancy!

### Amanda Dean, Steward

Product manager at a healthcare technology and analytics company

I enjoy volunteering as a patroller. I share knowledge and assist those who have questions about something they saw or need help with directions. It's equally rewarding when visitors express how much they enjoy their time in the Preserve. This highlights the Preserve's impact on the community.

I loved participating in a tortoise telemetry project hike. We had permission to go off trail and using special equipment, I helped locate one of the resident Sonoran Desert tortoises. I got to do tasks I hadn't done before, the work contributed to research, and I was able to see a tortoise – something one would rarely find on the trails.

By learning and experiencing new things as a steward, I have gained new interests. For example, I have taken an interest in learning how to identify wildlife as well as understanding what is native to Arizona.

Her tip: I set aside the same time block every weekend to



Amanda is a wildlife photo analyst and butterfly surveyor with the Citizen Science program.

patrol. I also sign up for events ahead of time so I can block out calendar time for events I have an interest in. Some weeks, I might not have the capacity to do a 2-3-hour patrol hike so I do what I can even if it's just 30 minutes.

Try new things and sign up for whatever works with your schedule. The Conservancy lets you set your own calendar. Balance scheduled activities, like guided hike/bike events, with those you can do individually, such as patrolling

### Jonathan Brechner, Steward

High school guidance counselor in Scottsdale Unified School District

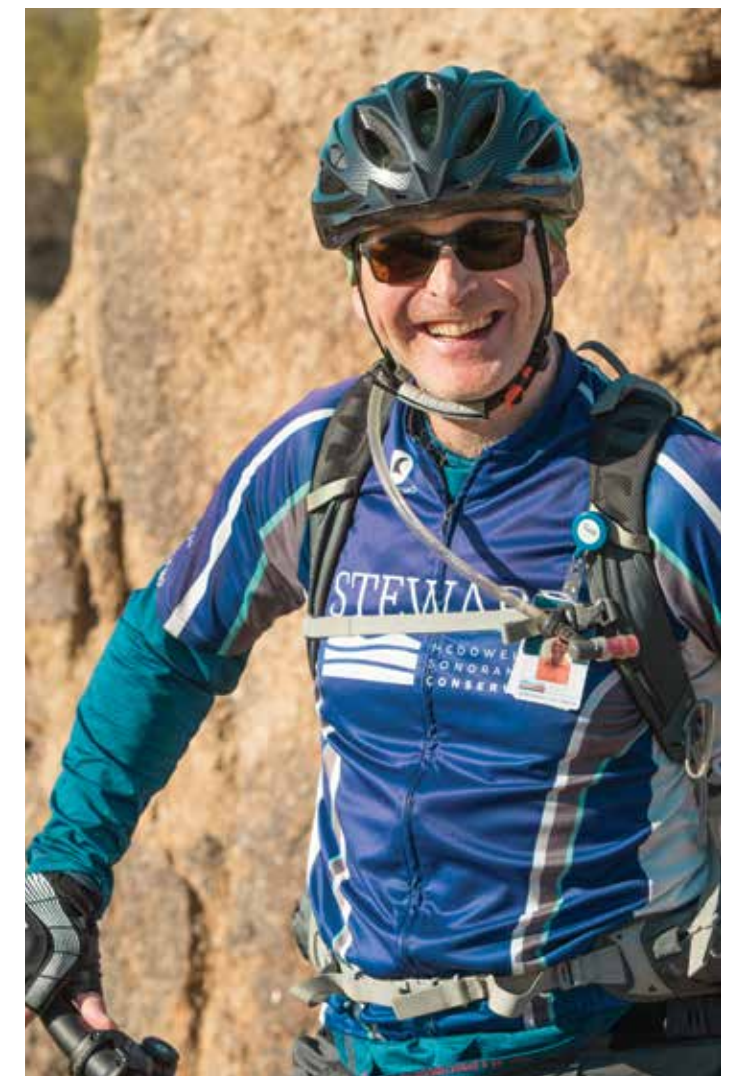
The wilderness and the Preserve are expansive, healing places we need to protect and promote. Being a steward lets me give back and help people in a place I love. I meet folks, give them directions and maps, pull out cactus barbs, help with repairs or, at times, call 911 and make sure injured folks

are safe. All of this is a joy for me.

I met a guy riding who got turned around and ended up back at the trailhead. I gave him a map and some advice ... then on a whim, asked him if he'd like to ride with me. Off we went on a cool ride up Hawknest Trail, looping around and eventually heading back via West Express Trail. He was stoked.

I had to cut back on citizen science work and focus more on patrol while going to school full time for my master's and working. With patrolling, it's easier. I help the Conservancy and still have time to recharge to face the students the next day.

His tip: It's about balance and the heart. What feeds you and fills you? I'm a bit of an introvert, so I recharge being alone. Sometimes I don't wear my blue shirt and go into the Preserve.



Jonathan covers many miles on bike patrol.





Photo credit: Shutterstock

## New Year, New Mammal: the American Hog-nosed Skunk

By Mike Wunch, McDowell Sonoran Conservancy Wildlife Camera Project Lead and Jessie Dwyer, McDowell Sonoran Conservancy Biodiversity Manager

A new species, the American Hog-nosed Skunk (*Conepatus leuconotus*), has recently been captured by a heat-and-motion triggered wildlife camera within Scottsdale's McDowell Sonoran Preserve!

It is rare to add a new mammal to the list, so we are thrilled to have documented this cryptic and fascinating species. Of the four skunk

species found in the Sonoran Desert, the hog-nosed is the least common and the largest, with lengths up to 90 cm. Skunks are members of the Mustelidae family, also known as "mustelids," along with badgers, otters, ferrets, and weasels. In the Sonoran Desert, the only common mustelids are badgers and skunks.

The hog-nosed skunk is a

nocturnal creature with a long snout and a naked nose pad resembling a small hog, from which the animal gets its name. The snout is used for rooting around to find insects and grubs, its primary diet. It also eats vegetation, arachnids, reptiles, and small mammals. Although nocturnal, in winter the hog-nosed skunk may forage by day.

The hog-nosed skunk has a very distinct bisected coat pattern. The top of the head, back, and tail are completely white, while the lower parts of the body are black. The hog-nosed skunk's front feet have long, heavy claws, and the front legs and shoulders have a strong muscular development for digging up insect prey, like a badger. This likeness has led to the use of the name "badger skunk" for these animals in some places. Their feeding strategy has also earned them the name of "rooter skunk."

Skunks have plantigrade hind feet; meaning they walk on the soles of their feet, giving them a distinctive waddling and shuffling gait. If you have ever had the pleasure of seeing a skunk in person, you are probably familiar with the skunk waddle! Plantigrades are not fast runners, but the skunk has other defenses. Skunks are infamous for their ability to spray a noxious fluid. Their

bold black and white patterns, easily seen at night, function as aposematic (warning) coloring, advertising the skunks' malodorous capabilities. The only major natural predator skunks have is the great horned owl, which has almost no sense of smell.

Its range is thought to be Southern Arizona, Southeast Colorado, most of New Mexico, and South Texas. Little is known about the natural history, distribution, and density of the hog-nosed skunk anywhere in its range; most research on its biology and ecology has occurred in Texas. The species appears to be associated with riparian areas, rocky canyonlands, pinyon-juniper woodlands, shrublands, and grasslands that contain brushy and rocky habitat. In 2012, two hog-nosed skunks were seen in the Grand Canyon along the Colorado River; the first sighting in Northern Arizona.

The hog-nosed breeds in spring

with their "kits" born in April or May. One to five kits will accompany the mother on her nocturnal hunting forays, becoming independent by August.

Biologists who have worked with this species, especially in Texas, believe that it is experiencing range-wide decline. While the causes of this apparent decline are unknown, suggested reasons include habitat loss, use of insecticides, roadkill, and perhaps disease. The apparent decline in numbers is exacerbated by the difficulty in detecting the animals.

With our improved Wildlife Camera Project, the McDowell Sonoran Conservancy can document rare and cryptic species, like the hog-nosed skunk. We look forward to discovering more about this species and adding to what little is known about their natural history. ▲▲



A heat-and-motion triggered wildlife camera recently captured an American Hog-nosed Skunk for the first time in the Preserve.



# How Unintended Consequences Affect Our Lives

By Dan Gruber, McDowell Sonoran Conservancy Legacy Steward

*Burning fossil fuels contributes to human-caused climate change, an unintended consequence that wasn't recognized for centuries. Photo by Adobe Stock*

Most of the time when we make a mistake, we realize it immediately or find out about it quickly. Think about hitting "Reply All" when you meant to reply to just one person, or making a snappy comeback when you should have said nothing. Fortunately, most mistakes like this are minor and often can be fixed with a little work and contrition.

What about when something bad happens as a result of our actions, but we didn't think we were making a mistake at the time and the undesirable effects only become obvious much later? When we finally realize the unintended consequences of the earlier actions, the necessary corrections may be difficult and urgent. Let's look at examples that have major impacts today.

## Climate Change

Probably the most obvious is human-caused climate change, which will fundamentally alter our lives and the lives of countless other species. A major cause is burning fossil fuels. The invention and rapid improvement of the steam engine in the 1700s largely replaced less reliable water, wind, and horse/ox power in Great Britain and much of Europe. Coal – which was abundant in Great Britain – became the fuel of choice. Steam engines powered newly emerged factories and made it possible to mine more coal fuel economically. The Industrial Revolution began.

These changes resulted in an explosion of innovation and productivity that improved the standard of living in countries that embraced them. Some downsides, however, became

apparent within a few decades.

London and other industrializing cities became covered with coal dust, and the sometimes-noxious effluents of production were released into the air and rivers. These ill effects were recognized, and early forms of environmental regulations were adopted in some countries in the 1800s, leading to improvements over time. But the most widespread and dangerous effect of using fossil fuels – a dramatic increase in atmospheric greenhouse gases and their impact on global climate – were not recognized for another century.

By the time we began to understand the impact of burning fossil fuels on climate and the impact of changing climate on us, we were 250+ years into a fossil fuel-driven world. Petroleum-powered engines had replaced coal-fired steam engines, and our cities

and countries were powered by these engines. We had developed enormous infrastructure to support economies built on petroleum, natural gas, and (still) coal.

In recent decades, we've figured out how to stop adding so much greenhouse gas into the atmosphere and how to ameliorate some of the impact of what's already there. But the necessary changes – switching and in some cases returning to renewable power sources or sources that don't generate much greenhouse gas, fortifying or relocating populations subject to worsening climate impacts, and other actions – will be enormously expensive and require huge social, commercial, and technological changes. We can do it – after all, we did it "in the other direction" as a result of the Industrial Revolution, and massive changes bring opportunities as well as disruptions. But whereas that earlier revolution took several centuries, we need to complete this revolution in one-tenth the time to escape the worst unintended consequences of our dependence on fossil fuels. This



*Renewable power sources, including wind and solar, add less greenhouse gas to the atmosphere than fossil fuels. Photo by Adobe Stock*



*Buffelgrass, imported to the southwest United States in the 1930 for feeding livestock and controlling erosion, spread beyond where it was intended. Photo by Dennis Eckel*

will require a global commitment at the highest levels and refocusing enormous resources onto the transition. Momentum is building to do this as the impacts of inaction become clearer, but we already are late enough to suffer some significant consequences of our earlier actions.

The McDowell Sonoran Conservancy's research center, the Parsons Field Institute, and associated steward programs have numerous projects underway to monitor the impacts

of climate change and urbanization on Preserve flora and fauna. Learn more about them under the "Science" tab at [mcdowellsonoran.org](http://mcdowellsonoran.org). We will use the results of this work to guide action by the Conservancy and the City of Scottsdale to help sustain the

Preserve's biodiversity in the face of these changes.

## Invasive Species

Here's another problem that's having a global impact decades after actions were taken for what seemed like good reasons: invasive plants and animals. Most of the plants and animals in any location on earth today probably originated elsewhere. Species spread over time by movement, relocation by wind or water, continental collisions or separations, etc. But most of these mechanisms work slowly enough so that ecosystems can adjust to new species. If new predators show up slowly and in small numbers, prey can evolve defenses to avoid population collapse. If new plants or animals appear, local carnivores or herbivores can develop a taste for them to keep them in check.

Humans, however, can relocate species on a massive scale very quickly.





*Buffelgrass, like many invasive plants, is more flammable than native plants resulting in increased fire risk and damage. Photo by Dennis Eckel*

If the new species are well-suited to their new environments, they may establish so quickly and profusely that they alter the ecosystem by outcompeting existing plants or animals. The result is a new ecosystem, often with less biodiversity and different characteristics than what existed before the new species arrived.

Buffelgrass (*Pennisetum ciliare*) is a perennial grass native to hot, dry regions of Africa and Asia where it is a common forage plant for livestock and other ruminants. It grows densely, produces large quantities of wind-borne seed, tolerates drought very well, and can reproduce both sexually and via rhizomes (underground stems that can produce a new plant that is a clone of the parent). Buffelgrass is native

to savanna ecosystems where fire is common, and it both burns readily when dry and recovers quickly after

being burned.

This plant was imported into the southwest United States and other arid



*Volunteer stewards address invasive plants by locating infections, manually removing smaller stands, and using herbicide for larger areas. Photo provided by McDowell Sonoran Conservancy*



*The remains of a prickly pear cactus following a fire. Photo by Dennis Eckel*

locations around the world beginning in the 1930s as a forage plant and for erosion control. It had mixed success in these roles, but what it did very successfully was to spread beyond where it was intended. It outcompeted native plants and crowded them out, resulting in dense monocultures of buffelgrass. In a positive feedback loop, it is more flammable than native plants and more resilient after fires because it's adapted to a periodic fire regime that was not common (before the advent of buffelgrass) in the Sonoran Desert and other transplant areas.

We now understand the ecosystem threat posed by buffelgrass to local biodiversity and also the increased fire

risk to nearby human infrastructure. The Conservancy has begun to address it aggressively and successfully in the Preserve and elsewhere by locating infestations, manually removing smaller stands, and

using herbicide to control larger areas. But clearly these efforts will have to continue for a long time and perhaps indefinitely to deal with the unintended consequences of importing this grass – consequences made even more severe by a hotter, drier climate.

### Individual interests and community impacts

Another source of unintended consequences that we increasingly feel in everyday life is called “the tragedy of the commons.” This process was identified in the 1800s and given its name in the 1900s. It means a situation in which individuals acting in

their own self-interest – maximizing benefits for themselves, their family, their “clan” – take actions that eventually make things worse for everyone, including themselves. The damage done by collective individual actions often is not evident until much later or long after the practices have become well-established.

Over-fishing is a prime example. In

some cases, this has led to depletion of species to the point where their availability plummets and cost skyrockets, or – in trying to ameliorate broader impacts – draconian regulation is required.

Here in Arizona, water use is an example of this problem. Individuals obviously need water for personal use, agriculture, and industry. Water use is largely uncontrolled – people and companies can use as much as they want – and water generally is inexpensive even though it is a limited and vital resource. As sources of water from the Colorado River, local precipitation, and groundwater diminish or are depleted without adequate monitoring or control, eventually we all may face the need for dramatic changes in how, when, and the extent to which we use water. Here again, the unintended consequences of past actions are being recognized and ways to deal with them are available and being improved rapidly. We just need the will to do what's needed today to avoid what could happen tomorrow.

History proves that humans have always been enormously adaptable and innovative. Clearly, we are capable of working together to respond to challenges when sufficiently motivated. We can hope that as the unintended consequences of some of our past actions become evident, we'll do what's needed – individually and collectively – to overcome them.

Sources and reference information available upon request at [dev@mcdowellsonoran.org](mailto:dev@mcdowellsonoran.org). ▲▲



*In Arizona, water use is an example of how individual interests and community impacts can have unintended consequences. Photo by Dennis Eckel*





MCDOWELL  
SONORAN  
CONSERVANCY

15300 N 90th Street,  
Suite 400  
Scottsdale, AZ 85260

Connect with us:



The Scottsdale McDowell Sonoran Preserve is owned by the City of Scottsdale and is managed through a unique partnership between the City of Scottsdale and the McDowell Sonoran Conservancy. Our shared goal for the Preserve is to maintain it in a natural state while providing appropriate recreational and educational opportunities for this and future generations.

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