



MCDOWELL
SONORAN
CONSERVANCY

Mountain Lines

MAGAZINE OF THE MCDOWELL SONORAN CONSERVANCY SUMMER 2020



Enjoying the Preserve with
Our Equestrian Friends

Architecture in
The Desert

Connecting Youth
to Nature



Justin Owen, CNAP

As we are finalizing everything for this edition, we continue to navigate times like nothing we have experienced before. In the Spring the McDowell Sonoran Conservancy paused all of our public-facing activities to protect our supporters and community, including our stewards and staff. While the disruptions were significant, the work of the Conservancy continued moving forward with our staff working remotely and our stewards completing activities that allowed them to physically distance.

Every year, March and April are our busiest months in the field

for our Parsons Field Institute. In the face of these disruptions, we got creative and managed to complete all of our field work while physical distancing. Our teams collected over 8,000 data points on soil crust alone, and that data is being processed and evaluated over the Summer.

The results of our field work are contributing to global issues such as soil crust restoration, invasive plant species research and mitigation, and restoration of native flora in our arid environments. Read more about these projects on pages 20–21 and 24–25.

As well, we were able to introduce and transition our education programs online by leveraging our existing offerings and developing many more. These quick lessons and experiments are encouraging youth to explore the Sonoran Desert and their place in it from home. They are learning how to record their observations and findings, and we are inspiring them to seek out STEAM-based activities.

We thank you for your continued support through an unprecedented time. Social and physical distancing has taught us all many new things. That distance has led to a new closeness with the desert, and we know you're right there with us! ▲▲

About Us

Our goal is to empower awareness and actualize global preservation through science, research, learning and teaching. Through the work of our scientific team and the dedication of more than 700 tireless volunteer outdoor advocates, we care for and study the McDowell Sonoran Preserve.

Connect with us:



Table of Contents

Architecture of the Desert3
 Connecting Youth to Nature7
 It's a Hot One Out There 8
 Whose Scat is That?10
 City Council Bestows Distinguished Honors12
 Tips for Enjoying the Preserve with our Equestrian Friends!14
 Launching our New Volunteer Program18
 A Story of Science and Stewardship Successes in the Field in a Time of COVID-1920
 In Search of Tiny Plants:
 A Botanist's Eye View of Spring Field Season 24
 Our Spectacular Speakers Bureau 26

Cover photo: Equestrian riders explore Granite Mountain. Photo by Dennis Eckel

BOARD OF DIRECTORS

Don Martin, Chair
 Shirley Baum, Vice Chair
 Trish Stark, Treasurer
 John DeWulf, Secretary

Andrea Aker
 Ryan Backlund
 Richard Bourke
 Matt Cardenas
 Rick Cooper
 Michael D'Andrea
 Doug Diehl
 Gasper Genovese

Hon. Mary Manross
 Susan Mitchell
 Rick Pearce
 Jane Rau
 Lynne Russell
 Peter Schlosser, PhD
 John White
 Merl Waschler

Mark Winkleman

CORPORATE ADVISORY BOARD

Tony Bolazina
 Bernard Clark
 Bennett Dorrance

Steven Hilton
 Todd LaPorte
 Tammy McLeod, PhD
 Mike Tully

MCDOWELL SONORAN CONSERVANCY STAFF

Chief Executive Officer
 Justin Owen, CNAP

Chief Operating Officer
 Jakki Casey

Chief Development Officer
 Tim Crum

Parsons Field Institute Associate Director
 Helen Rowe, PhD

Marketing and Communications Manager
 Wendy Anderton

Administrative Manager
 Katherine Challis

Program Manager
 Luke Challis

Parsons Field Institute Manager
 Tiffany Sprague, MS

Parsons Field Institute Coordinator
 Mary Fastiggi

Education Coordinator
 Nicole Kallman

Administrative Coordinator
 Debbie McKeighan

Development Coordinator
 Jordyn Shafer-Frie

McDowell Sonoran Conservancy
 7729 East Greenway Road, Suite 100
 Scottsdale, AZ 85260
 480.998.7971

mcdowellsonoran.org
info@mcdowellsonoran.org

Mountain Lines is published quarterly by the McDowell Sonoran Conservancy, a 501(c)(3) nonprofit organization

Jakki Casey, editor
 McDowell Sonoran Conservancy
 Managing Director and Lead Steward

Creative design donated by
 McDowell Sonoran Conservancy
 steward Dennis Eckel

Eckel Advertising & Photography

Architecture of the Desert

By Jacques Giard,
 McDowell Sonoran Conservancy Master Steward

If you have spent any time in the Sonoran Desert, there will likely be one question that pops into your head: How did people who lived here a thousand or more years ago survive in such a demanding environment? It is arid, devoid of resources necessary for survival, and exceptionally hot in the summer. Yet people such as the Hohokam, who called the Sonoran Desert home, not only eked out an existence, they created a rich cultural life for themselves for hundreds of years.

Human survival is predicated on many factors – one of these being shelter. I can still remember first learning about the necessity for shelter in a Psych 101 class on Abraham Maslow's Hierarchy of Needs. His theory provided a framework for human behavior when it came to satisfying needs. Maslow's theory made sense to me when I was an inquisitive undergrad student; decades later, it makes even more sense to me now.

Maslow's theory emphasized the importance for shelter and protection, two of the most basic needs shared by all humans – something that Maslow classified as "safety needs." Their importance is underscored by the fact that the only needs greater than shelter and protection are our



Some great horned owls favor the saguaro as a nesting place because of the protection it provides. Photo by Jacques Giard

physiological needs, such as breathing, drinking, and eating.

Safety needs have everything to do with shelter and protection, which, in many ways, are inseparable from architecture – that is, the planning, designing, and construction of buildings of one kind or another. Architecture and people are also inseparable, going back millennia in human history.

Architecture and animals are equally inseparable, and their interconnectedness reaches even further back in time. Moreover, different regions of our planet with their different animals and different contexts have given us an almost infinite variety of architectural designs – from the baya weaver birds of India, with their elongated and meticulously-knitted nests that hang from palm trees, to the no-nonsense



A person could easily walk by a packrat's nest and not even see it because it is one with the natural desert environment. Photo by Jacques Giard

construction of the beaver lodge, with its underwater entrance leading to different chambers.

The animals of the Sonoran Desert have been no less innovative with their architectural designs of shelters despite several obvious challenges: the desert is not at all plentiful when it comes to building material; it is conspicuously arid; and temperatures (both hot and cold) range in degrees that threaten life, especially for several desert creatures who rely on external temperatures. Think of the snakes and those cute little lizards you encounter on the trail!

Despite these challenges, desert fauna has managed extremely well. In every instance, their architectural designs have been underpinned by an innate need for shelter and protection.

Generally speaking, animal architecture in the Sonoran Desert occurs at three different levels: below ground, at ground level, and above ground. Many insects find refuge underground, something that we quickly recognize on a desert hike when we come upon

a mound of dirt with holes of various sizes. Insects such as solitary digger bees live in some of these smaller holes, but tarantulas and small lizards also find shelter in slightly larger holes. Some mammals – the Harris's antelope squirrel and the badger – also make homes underground in even larger holes. Sheltering underground provides two obvious benefits. One is protection because there is safety in a tunnel that is almost impenetrable; another is insulation from the earth, which can protect them from outside heat and cold. There can be a difference of around 20°F in temperature because of the natural insulation provided by the ground.

Other animals prefer to live at ground level. Some of these shelters are basic and temporary. This is true for javelinas and mule deer, which do not form permanent homes. Instead, their shelters are minimal, such as a grassy area under a mesquite tree, which you can often see early in the morning. The grass has been crushed but only in a specific area. Look a little closer, and

you will most likely find hair from these overnight guests.

A few animals design and build more permanent shelters at ground level. The most prominent architects of these shelters are the white-throated woodrats, otherwise known as pack-rats. Their homes are well-designed shelters with many entrances and several interior chambers. Surprisingly, their elaborate designs often go unnoticed because they are made of material found in the desert that blend with the landscape. Their physical presence appears almost natural, like the trees and shrubs that grow in the Sonoran Desert.

There is yet another type of ground-level shelter. These are the dwellings found in rocky areas and include natural cavities in washes as well as cave-like habitats in the mountains of the Sonoran Desert. Which animals make these places their homes? A great variety of animals do – everything from chuckwallas and desert tortoises to bobcats and mountain lions.

One design factor is particularly important in these shelters: elevation. A tortoise's shelter must be high enough above the bed of the wash not to be swamped by the gushes of a monsoon, whereas a mountain lion's den must be high enough to permit an unobstructed view of the immediate territory. Once again, and much like underground dwellings, this type of above-ground architectural design provides both shelter and protection.

Who lives above ground? Most birds do. The cactus wren, the state

bird of Arizona, creates a football-sized nest often in teddy-bear or buckhorn chollas. Not only do these two plants elevate the wrens' shelter from the ground and remove them from any immediate danger, but they also provide additional protection with their spines. The most prominent and tallest nests, however, are those of the Gila woodpecker and gilded flicker. Both of these birds create their shelters in saguaros – the so-called "Sentinels of the Desert" – by excavating a cavity through the outside skin and into the pulp of the saguaro, known by experienced birders as "the boot," which then dries to a hard casing.

Abandoned boots are often used by other birds such as owls, flycatchers, wrens, and kestrels. By doing so, not only are they often eight or more feet above ground but the pulp of the saguaro creates excellent insulation, once again providing a difference of around 20°F with the outside temperature.

The Hohokam survived in the Sonoran Desert by using nature as a source of inspiration. For example, they built thick walls of mud and straw with only small openings, which protected them from extreme temperatures. Much the same design principles were used by the Salado people in the Tonto Basin. Their cliff dwellings had thick walls and few openings, all of them narrow. Physical orientation and location were also important; cliff dwellings generally faced south in order to capture the sun's warmth in the winter and were located high in a cave-like hollow, which afforded



The architecture of the Salado people was based on sound design practice: orientation, location, and the use of building material found locally. Photo by Jacques Giard

protection from intruders.

The building principles found in the shelters of the fauna of the desert as well as the design techniques of the early indigenous people have lessons for us in the 21st century. This is especially so with insulation, orientation, and location. All three

factors are critical for a sustainable architecture that provides both shelter and protection. The architect Frank Lloyd Wright was certainly aware of the particular conditions of the desert; he knew that these conditions could not be ignored and had to be reflected in his designs.



Frank Lloyd Wright was especially mindful of the desert light and designed Taliesin West accordingly. Photo by Jacques Giard



Because of the materials used in its construction, the trailhead at Lost Dog Wash does not appear to be totally out of place in the desert environment. Photo by Jacques Giard

Taliesin West is an exemplar of this design approach. Although essentially a winter residence and school, Wright designed it never forgetting that Taliesin West was located in a desert. He was very much aware, for instance, of the light and its intensity in the Southwest and, therefore, designed the location and orientation of the windows accordingly. Wright also designed exterior passages that incorporated the Venturi effect; by doing so, he created natural air currents to provide cooling breezes.

Later, Paolo Soleri, a student of Frank Lloyd Wright's, designed dwellings with a keen appreciation of and a close connection to nature. His early concepts at Cosanti were not far removed, at least in design principle, from shelters found in nature where dirt or soil is removed to create habitable spaces. With Arcosanti,

Soleri's architectural designs evolved based on "arcology," a conceptual approach that combined architecture and ecology. Soleri believed that, in order to be sustainable, architecture must co-exist with its environment, always respecting the overall ecology of the place.

Today, many of these same design lessons can be found in the architectural designs of trailhead buildings in Scottsdale's McDowell Sonoran Preserve. The building at Lost Dog Wash is an excellent example. Designed by the architectural firm of Weddle Gilmore, the building appears to be a natural part of the desert, belonging rather than intruding. In the words of the architects, the building "...is an example of commitment to the environment through its preservation of native habitat...materials that blend with the natural desert environment...

the rammed earth walls of the structure utilize earth material that was excavated during foundation construction."

Studying the natural architecture of the desert is a humbling experience. Driven by the need for shelter and protection, animals have created ingenious solutions, all of which are sustainable. Despite our advances in science, technology, design, and engineering, we, too, need to have some humility when we design for a desert environment. The fauna of the Sonoran Desert has survived and thrived in an inhospitable environment for millennia. They were here well before us and will be around long after we are gone. It is in our best interest to observe how the fauna has managed so well and derive lessons from these best practices of architecture of the desert. ▲▲

Connecting Youth to Nature

By Nicole Kallman,
McDowell Sonoran Conservancy Education Coordinator

At the end of February, more than 750 children experienced the incredible Sonoran Desert at the McDowell Sonoran Conservancy's Expedition Days. During the two school days, the Conservancy welcomed more than 620 third and fourth grade students, many from Title I schools, and engaged them in inquiry-based outdoor learning and exploration. Support from the City of Scottsdale, sponsors (Thunderbird Charities, Cardinal Charities, Cox Charities, Cox Communications, Arizona Public Service Company, and Arby's), and dedicated Conservancy stewards and volunteers (Arizona State University Medallion Scholars, middle school Chief Science Officers from the Avondale School District, Experian volunteers, and community individuals) made this event possible.



Expedition Days not only helped youth better understand the desert but also appreciate their place in it. Photo by Lynne Russell.

The program was planned around the new Arizona State Standards, which ensured that part of the new curriculum was delivered to provide support to both the students and their teachers. Six standards-based station lessons captured students' creativity and critical thinking, introducing them to concepts such as watersheds, non-native species, and ecosystems. Together, the stations acted like puzzle pieces, revealing a more complex perspective of humans' role in and connection to the environment. At one station, students played the role of different Sonoran Desert organisms, from a mesquite tree to a Gila woodpecker to a coyote. In a group brainstorm, students came up with relationships between these living things, representing connections with yarn until they created an intricate web. Students modeled what would happen if just one organism disappeared from the environment. Dropping their pieces of yarn one by one, students watched the collapse of the web, discussing what this means for the desert and for the humans who call this place home.

At the Saturday public event, more than 400 adults and children discovered the wonders of the Sonoran Desert through 13 interactive stations



Students teaching students provides an all-around learning experience. Here, a student Chief Science Officer teaches younger students about what a watershed is and how we can keep our water clean and plentiful. Photo by Lynne Russell.

put on by our stewards and partners (City of Scottsdale Fire and Solid Waste departments, Desert Botanical Garden, Pueblo Grande Museum, Southwest Wildlife Conservation Center, Arizona Project WET, Scottsdale Community College's Center for Native and Urban Wildlife, and Cox Communications) to bring the desert to life.

Place-based learning enables children to develop connections to the natural world and a deeper understanding of relevant phenomena. Such connections help with classroom learning and generate a sense of curiosity in a child's everyday life. Through Expedition Days and all our educational programs, the Conservancy aims to promote a societal culture of appreciation for nature and empowerment for individuals of any age to make a positive impact. ▲▲



Saturday's public event welcomed public attendees to engage with the amazing Sonoran Desert ecosystem. Photo by Lynne Russell.



It's a Hot One Out There

By Art Ranz,
McDowell Sonoran Conservancy Master Steward

With humidity so low we all need to remember to remain hydrated. Photo by Dennis Eckel

So you have spent a lot of the spring cooped up, watching cable television, and going crazy! Now you can get outside, but it's hot. There truly is a phenomenon of acclimatization to the heat. The blood does not get thin, but the body changes in many ways to allow us to survive and perform in the heat. This process can vary from a few days to six weeks, depending on the nature of the activity, age, weight, and a million other factors. So start off slowly.

The human body's main way to

control heat is by loss of water through vaporization. In Arizona, sweating is more efficient at cooling your body due to the higher evaporation rate as compared to the humid Deep South. Sweating can be less evident, making the loss of water more obscure. How do you know you are drinking enough when sweating is not an obvious guide? Just watch visitors get dehydrated because they think they are not losing water. There are as many guidelines on hydration as stars on a moonless night. One is that once

you are thirsty, it's too late, so drink a lot and drink continuously; however, research has shown otherwise. Drink as soon as you feel the least bit thirsty, but there is no reason to overdo it or drink on a schedule. The brain is also geared to help you not over drink by making it harder to swallow when you are well hydrated. The researchers call this approach drinking to thirst. Listen to your body. Do not sacrifice hydrating before you hit the trail to avoid having to pee out there. First thing in the morning, it is not unusual to need

almost a liter of fluid to make up for what is lost overnight. Dehydrated is a bad way to start a hike, so drink up before you go out. Research has shown that people drink more if the water is cold, so that helps.

Your body also needs salt and electrolytes. If you eat a typical U.S. diet, you already have plenty of salt to get you through the hike unless you are an elite athlete. Electrolytes might be needed after an hour or more of vigorous activity in hot weather. Snacks are great on the trail for many reasons, but be aware that more water is needed to digest that food. The good news is that almost all the food bars on the market have significant salt, reducing the need for special supplements.

Do not save water for later. Survival training shows that once you get very thirsty, the obsession and preoccupation with thirst causes bad decisions. Stay hydrated even if there is a fear of running out of water. Take more water than you think you will need. What if you twist your ankle and it takes much longer to limp home?

Bladder or bottle? A bladder in the backpack allows for convenient drinking and sipping during the outing and lends itself to more uniform hydration. Bottles are less prone to leak, and some let you easily see how much water you have consumed and have remaining. What about the sport and health drinks? For a typical day as a typical person hiking, they are probably not much of an advantage. Flavoring does, however, encourage some people to drink more. Be aware that no matter



Let's not forget our four-legged friends too. They need continual hydration while remaining active.

how much you drink, it cannot totally prevent heat sickness if your activity level is high and the outside temperatures are extreme. Even a short rest in the shade goes a long way for a healthy hike. So go out, have fun, listen to your body, and be safe. ▲▲



As the temperatures remain high, hydration remains a key consideration for all of us. This bladder hydration backpack is easy to carry and packs a lot of water.

Whose Scat is That?

By Sue Handke,
McDowell Sonoran Conservancy Legacy Steward



Photo by Dennis Eckel

While taking a hike in the Scottsdale's McDowell Sonoran Preserve, admiring the mountains, wildflowers, and cacti, I can't help but wonder about the animals that make this part of the desert their home.

We don't often see animals in the desert because they seek daytime shelter from the heat. Most desert animals are nocturnal, emerging at night, or crepuscular, seeking the cooler temperatures at dawn and dusk. So how do we know which animals live here? Their poop can help!

Identifying animals by their scat, or poop, takes a little detective work. Let's start with the most often seen scat, that of the coyote. Coyotes like running along the smooth trails. There are other animals that use the trails, too, so the coyote will poop to note his presence. Or, sometimes, he just needs to poop!



Coyote scat can contain seeds and plant parts. Photo by Sue Handke



Javelina are herbivores. Their scat contains plants, including roots and cacti. Photo by Sue Handke

cactus pads, fruits, and seeds and use its long tusks to dig up plant roots. Their oval-shaped scat contains long plant fibers and many seeds. Other examples of herbivores are the desert tortoise, which has a tubular shape scat, and also the pellet-shaped scat of the mule deer, jackrabbit, and cottontail. Chuckwallas, doves, and caterpillars are also herbivores.

Moving on to the carnivores, the meat-eating animals. The scat of a carnivore contains the undigested fur and bones of its prey. The largest carnivore in the Preserve is the mountain lion. Its scat is tubular and segmented, with blunt ends, and about 1.5 inches around. The contents are fur and bones, and their main source of food is the mule deer. Another carnivore is the bobcat, whose scat is similar to mountain lion scat but much smaller



The large scat of a mountain lion, being a carnivore, contains bones and fur. Photo by Sue Handke



Coyote scat can also contain the fur and bones of animals. Photo by Sue Handke

Coyotes are omnivores, which are both meat and plant eaters. Their tubular-shaped scat is full of plant fibers, seeds, fur, and bones. Examples of other desert omnivores are the pocket mouse and packrat, both of which have small rice-sized pellets.

Let's take a look at the herbivores, animals that are plant eaters. The contents of their scat include seeds and plant fibers. A javelina will eat



This scat belongs to a regal horned lizard. Its diet consists mainly of ants, so the scat contains ant parts. Also note the white part, called urates, found in reptile and bird scat. Photo by Sue Handke

at 0.75 inches around. Other desert carnivores include Gila monsters, snakes, and owls.

Insectivores are animals that eat bugs. Look for insect parts within Sonoran Desert toad or horned lizard scat.



This amazing scat comes from a caterpillar! Photo by Sue Handke

One really important factor to remember while figuring out scat are urates. Urates are essentially a dried urine and are present only in bird or reptile scat. It looks like a white clump at the end, or laced within, the scat. So while I mentioned toads, snakes, lizards, and birds in this article, look for the telltale sign of



Snake scat contains fur and urates. Photo by Sue Handke

urates, white clumps, and it will help you determine if what you've discovered could belong to a reptile or bird.

Animal scat is like a little treasure trove of information that tells you more about the place you're hiking. I hope this helps to make you a number one detective – of number two! ▲▲

30 & 70 MILE RIDES

TWO STUNNING ROUTES THROUGH THE SONORAN DESERT

START & END POINT AT DC RANCH MARKET STREET

VENDOR EXPO

BEER GARDEN

VOLUNTEER OPPORTUNITIES

PROCEEDS BENEFIT



At the time of this printing, COVID-19 restrictions could impact this event. Please visit mcdowellsonoran.org for updated information about the Tour De Scottsdale.

City Council Bestows Distinguished Honors

On March 17, 2020, the Scottsdale City Council bestowed a distinguished honor on two individuals who played an invaluable role in the creation of the Scottsdale McDowell Sonoran Preserve. The Council, acting on a recommendation from the McDowell Sonoran Preserve Commission, authorized naming the new interpretive trail at the Fraesfield Trailhead in honor of the Honorable Kathryn "Sam" Campana and the educational amphitheater at the Gateway Trailhead in honor of the Honorable Mary Manross.

The process of designing and building the interpretive trail at the Fraesfield Trailhead, a partnership between the City of Scottsdale and the McDowell Sonoran Conservancy, is underway and will be completed in the fall of 2020. The trail will provide an excellent opportunity for people to learn about the Preserve and the Sonoran Desert.

The Gateway Trailhead was opened for public use in Spring 2009 and includes a small educational amphitheater used for interpretive presentations. It is the location of many Conservancy education activities, including the popular Family Sonoran Sundays program, and is a popular gathering place for the public to learn

about and appreciate the Sonoran Desert and McDowell Mountains.

Sam Campana

Throughout her decades in Scottsdale, Kathryn "Sam" Campana has championed Scottsdale's environmental issues as a volunteer, non-profit executive, and elected official. As Scottsdale's Mayor, she led the city into the 21st century, facing head-on important urban issues such as balancing growth with historic and land preservation as well as redevelopment and economic vitality.

Sam Campana served on the Scottsdale City Council from 1986 to 1994, when Scottsdale and its



McDowell Sonoran Preserve Commission Chair Art DeCaboater, McDowell Sonoran Land Trust (now McDowell Sonoran Conservancy) board member Carla and Mayor Sam Campana cut the ribbon for the Lost Dog Wash Trail in the southern area of the Preserve in October 1997. Photo courtesy of McDowell Sonoran Conservancy.



Drew Brown, Dann Corrigan and Mayor Sam Campana celebrate the DC Ranch agreement in February 1998. Photo from Scottsdale Public Library Collection.

residents began discussing the possibility of creating a McDowell Mountain Preserve. As Scottsdale's Mayor from 1996 to 2000, she provided visionary leadership that secured the first McDowell Sonoran Preserve land acquisitions funded by the 1995 voter-approved sales tax and the 1996 voter-approved bonding capability. She and her City Council advocated expansion of the Preserve boundary to include greater than 19,000 acres of Sonoran Desert land north of the McDowell range, which voters approved in 1998. Mayor Campana worked with state officials on the Arizona Preserve Initiative with the Town of Fountain Hills and with developers like DMB to further expand the Preserve through key land acquisitions. During these



Sam Campana after the state of the city address in 1998, when the Arizona Preserve Initiative was the hot topic. Sam is joined by among others Robert Pettycrew, Bob Cafarella, Pete Chasar, Sam Campana, Suzy Wheeler, Mary Manross, Don Meserve, Carla, Lou Jekel and Senator Carolyn Allen.

significant public policy actions, she was also honored to officiate at the ribbon-cuttings for the first public access trails into the McDowell Sonoran Preserve.

Mary Manross

As a city commissioner, non-profit board member, and elected official, Mary Manross is a consummate champion of the McDowell Sonoran Preserve.

Beginning her service on Scottsdale's Parks and Recreation



After a court decision allowing Scottsdale to buy the land, ground was broken for the Gateway to the Preserve on June 7, 2008. Left to right Len Marcisz, Carla, Betty Drake, Jamie Drinkwater Buchanan, Mary Manross, Art Decaboater and Jane Rau with Tony Nelssen on his mule. Photo courtesy of McDowell Sonoran Conservancy.



Mary Manross along with Richard Thomas and Don Pryor celebrate the approval of the first land acquisition for the McDowell Sonoran Preserve which is the largest urban Preserve in North America.

and Planning commissions in the 1970s, Mary Manross realized the critical importance of open space to a community's quality of life. Elected to the Scottsdale City Council in 1992, she became a leading voice for preserving the McDowell Mountains, which were threatened by development. She worked diligently with the McDowell Sonoran Land Trust, Scottsdale residents, the tourism industry, the Scottsdale Chamber of Commerce, developers, and the media to create community awareness for the urgent need to create and fund a preserve.

She was proud to cast her vote at the October 3, 1994, Scottsdale City Council meeting to create the McDowell Sonoran Preserve. Then, in February 1995, the council put a funding mechanism for Preserve land purchases on the ballot. It received overwhelming community support. Councilwoman Manross also advanced the idea of expanding the Preserve beyond the McDowell Mountains to include more than 19,000 acres of Sonoran Desert land in the northern area of Scottsdale, an idea also strongly approved by voters in 1998.

As Scottsdale Mayor from June 2000 to January 2009, Mary Manross provided strong leadership for many Preserve milestones and statewide preservation initiatives. She was a strong, vocal advocate for land reform throughout Arizona, which greatly benefitted the expansion of the Preserve, and for scrupulous, methodical use of sales tax dollars to fund its land purchases and public access improvements.

We are so grateful for these Preserve Pioneers and are pleased their contributions will be honored through these Preserve location names. ▲▲



Mary Manross enjoying the Preserve.

Tips for Enjoying the Preserve with our Equestrian Friends!

By Jenny Powers,
McDowell Sonoran Conservancy Steward

Photo by Dennis Eckel



Most trails in Scottsdale's McDowell Sonoran Preserve are open to three user groups – hikers, mountain bicyclists, and equestrians. People worldwide are often familiar and comfortable interacting with hikers and their dogs and with bicyclists – both common in even the most urban of environments. That's not always the case when we interact with equestrians. Although horses were used as a major mode of transportation and necessity for Americans a century ago, today, it is common to find individuals who have never touched a horse or been around one. Regardless of experience, it is helpful to understand how horses view their world and how we can safely interact with equestrians on the trails we share.

Horses are prey animals and revert to instinct when anxious. Horses have

eyes located on the sides of their heads and have a range of vision of about 350°. Even so, a horse has two "blind spots" where the animal cannot see: directly in front and behind its head, extending over his back and behind the tail. Where do many trail encounters occur? You guessed it: usually someone coming directly at or directly behind the horse. Additionally, horses are farsighted, so things up close are blurry. When a bicyclist comes around a blind corner and suddenly appears within 50 feet of the horse, the horse cannot readily identify what is heading towards it. The good news is that when not stressed, horses are innately curious, and experienced riders use this curiosity to expand a horse's comfort zone.

When equestrians on well-trained horses and other responsible trail enthusiasts meet each other on the

trail, the encounters can be enjoyable and safe social exchanges if the groups understand how to work together by following these basic guidelines:

- When traveling on shared trails, continually watch for other trail users. Slow down when sight lines are poor and keep your speed low around other users.
- Keep pets under control and leashed at all times for safety and to be in compliance with the City ordinance. Dogs often have the instinct to maneuver to the rear of the horse, bark, and/or nip at back legs. This is a potentially life-ending tactic for the dog and puts everyone else in harm's way.
- Communicate – let equestrians know you are there with a simple "hello" or by saying "bike" and confirm that the equestrian acknowledges your presence.



Experiencing the trails by horseback provides a unique perspective of the Preserve. Photo by Dennis Eckel



Some riders may step to the side to allow other users to pass but let's all remember the equestrians have right of way. Photo by Terry Holmes-Steyck



Our equestrian stewards patrol the trails and also attend outreach events where the "minis" are always highlights for visitors. Photo by Dennis Eckel

- If in a group, let the equestrians know how many are with you so that the horses can give the other users plenty of space to pass.
- The rule of etiquette in the Pre-

serve is that hikers and cyclists yield to horses. It will probably require a runner to slow his pace or a cyclist to stop and give an equestrian time to respond – that

is what "yielding to horses" means.

- As a hiker or cyclist, when you see a horse and rider, stop and greet the rider in a calm voice. Speak in a soft manner and keep talking. Horses will often identify you as a human, not something interested in doing them harm. Ask the rider what they would like for you to do.

- An equestrian may pull to the side of the trail a safe distance away if they hear a bicycle approaching, but this does not necessarily mean it is safe for you to pedal by. Engage in a conversation with the equestrian to determine the safest method of passing, which is often determined by the horse's training, experience, and temperament.

The Preserve has unsurpassed opportunities to enjoy the landscape, heritage, and unique beauty of the environment. Help protect accessibility by playing nicely with other trail enthusiasts and treat these trails with reverence. We are all ambassadors to an amazing place – one that creates a bridge from the built environment into the natural one. Helping encourage safety and courtesy contributes to keeping the experience special. ▲▲



Our equestrian trail users really appreciate when other users give them space and share the trails. Photo by Terry Holmes-Steyck

Launching our New Volunteer Program

By Luke Challis,
McDowell Sonoran Conservancy Program Manager

To expand our reach, the McDowell Sonoran Conservancy launched a new volunteer program this year, and it has been a great success. Building on our learnings from the Tour de Scottsdale last fall, we developed a volunteer program to complement our steward program. This provides ad hoc and occasional volunteer opportunities for the public. We had a heavy lift coming at us with our flagship youth education program, Expedition Days, and our new-found ability to take Spring Training by storm.

Expedition Days

During Expedition Days, we were able to engage with more than 620 students, primarily from Title-1 schools throughout the Valley, over two school days. We also had more than 400 visitors on the public Saturday. See the article on p.7 to learn more about this special event. Our stewards are always the backbone to the success of this event and this year were joined by amazing volunteers!

Three key volunteer groups showed their support: Experian, Arizona State University's Medallion Scholars, and ASU's affiliated Chief Science Officers (CSOs). All of these groups, along with other public



Denise Hicks's 5th grade superstars played an integral role in delivering lessons during Expedition Days. Children are often able to connect with topics easier when taught by other youth. Photo by Lynne Russell.

volunteers, jumped right in to help where we needed them. One of many great stories we heard was from Chris Crum, the Conservancy's former Core Leadership Team Chair, who shared that the young volunteer who helped with his station was "maybe better than us" at presenting the material. This young volunteer was a 5th grade student from Avondale School District's CSO and STEM Club Program in Goodyear, Arizona! Mentored by Denise Hicks, each one of these students studied the lessons, memorized the materials, and, as Chris mentioned,

nailed the presentation.

The praise wasn't one sided, either. Ms. Hicks had this quote about our stewards:

"Our students had an amazing time with Expedition Days. You all have some of the most engaged, intellectual volunteers that we've ever had an opportunity to work with. Do keep us in mind for further projects. The students spoke so highly of this experience to family and friends! I truly believe in STEM work-based learning, especially when students have experiences like this one."



At our 2020 Expedition Days, Experian volunteers, community volunteers and stewards partnered to deliver standards-based education to local schools. This multi-generational community effort helped introduce hundreds of children to the wonders of the Sonoran Desert. Photos by Lynne Russell.



Spring Training

Another heavy-hitting event was our popular Spring Training concession stand staffing at the San Francisco Giants' home games at Scottsdale Stadium. Our team hit it out of the park. We began the season staffing one concession stand, nicknamed "Garlic-3." Teaming up with our partners at the City of Scottsdale and the folks over at

Delaware North, we were able to staff the stand, navigating tough deadlines and construction schedules. It truly was a team effort.

After staffing Garlic-3 for a few games, the manager at Delaware North asked us to rise to another challenge. She mentioned that "[our] volunteers are a dream to work with, and Delaware North would like [us] to take over Garlic-1," the sister stand on the other side of



Stewards, staff, and Board of Director members helped raise our profile and raise funds by cooking and selling signature garlic fries and chicken tenders. Photo by Jim Stinson

Scottsdale Stadium. Our volunteers and stewards rose to the occasion, and, before we knew it, we were double-booked, staffed, and ready-to-go. We raised a considerable amount of money

for the Conservancy but, most of all, built our Conservancy Community. Each team lead, each steward, and each volunteer brought their time and talents to make Spring Training a home run!

How can you get involved?

We will be further building our volunteer program in 2020 and beyond. The Conservancy has acquired the Children's Learning and Play Festival, which provides a free family opportunity to 13,000+ visitors each year, increasing our need for volunteers. We will also continue to partner with DC Ranch by providing more than 120 volunteers for the Tour de Scottsdale, as well as Delaware North for Spring Training.

The Conservancy is fortunate to have the most engaged and enthusiastic stewards available. We continue to build that legacy as we usher in new opportunities via our volunteer program. If you are interested in learning more, please visit our website

mcdowellsonoran.org ▲▲



A Story of Science and Stewardship Successes in the Field in a Time of COVID-19

By Tiffany Sprague,
McDowell Sonoran Conservancy Parsons Field Institute Manager

Thanks to its wide-open spaces, social distancing in the Preserve isn't hard to accomplish. Once safety guidelines were issued, we were able to make appropriate adjustments and continue most of our projects. Although patches of non-native fountain grass (Pennisetum setaceum) remained, Quartz Wash was a stellar place to spend a few days in March. Photo by Tiffany Sprague.

This year began as any other – wrapping up our 2019 projects while gearing up for another busy field season. Late winter/early spring is always a busy time for McDowell Sonoran Conservancy's Parsons Field Institute. Because many of our research projects focus on documenting plant communities' responses to restoration or control treatments, we must find the sweet spot during which both annual and perennial plants make an appearance. That time happens to be March and April. Combined with our other long-term monitoring projects, we squeeze a lot

into this short timeframe, often juggling about 10 projects during the two-month stretch. This year, we decided to make it even more interesting by adding two more projects (RestoreNet and soil crust field experiments), new plots to our trail restoration project, and a new treatment to our non-native plant experiments. The stage was set. For the past eight months, we had planned and prepared, carefully laying out a schedule that would allow us to accomplish every project but with very little wiggle room. Protocols were reviewed and refined, materials purchased, botanists hired,

and stewards were signing up and being trained to help. We were ready for a solid month of field work and eager to get out to study Mother Nature. But Mother Nature had other plans. First came the rain. During our very first week of field work, the forecast called for four days of rain. As a desert rat, I love the rain, but this was certainly not an optimal time for it. Determined not to panic, we decided to accomplish what we could and then reassess that "unwiggable" schedule. Thankfully, our incredible stewards came through. As the first day of sampling wore on and



Boy, this is tough work. Botanist J.P. Solves had to get as close to the ground as possible to identify tiny plants growing in our plots. He then relayed to data recorder Debbie Langenfeld how much of the plot was covered by each plant species. We call them "belly plants" for a reason! This project is helping us determine the most effective ways to restore disturbed areas, including old trails in the Preserve. Photo by Tiffany Sprague.



In March, we conducted our first plant sampling in our new RestoreNet plots. This collaboration with the U.S. Geological Survey and our partners at City of Scottsdale, Tonto National Forest, Scottsdale Community College, and Lake Pleasant Regional Park takes our restoration efforts to the next level. Prior to being set aside as part of the Preserve, this area near Granite Mountain was a hang-out for climbers and other outdoor enthusiasts. Photo by Tiffany Sprague.



The Conservancy's citizen science work takes us to remote and beautiful areas, including this spot on the side of Brown's Mountain. Over four days, botanists and stewards sampled vegetation in our non-native plant experimental plots to determine how control measures affect native and non-native plants. Photo by Mary Fastiggi.

everyone started to get a bit tired, when asked if we should call it for the day or carry on, the resounding response was, "Let's do this!" We accomplished a project that normally takes four days in only two very long days!

But Mother Nature wasn't done with us. On March 12, we had to make some tough decisions in the face of COVID-19 and safety guidelines. What projects could we continue? How could we ensure participant safety? As we made these decisions, the rain unleashed, delaying some of our carefully-laid plans.

With a safety plan in place, we set out the following week to accomplish what we could. We had to trim crews down to the bare minimum, leaving us with diminished but workable teams. We figured there was no way we could get everything done, but our stewards and botanists continued to amaze. Over the next two weeks, we set efficiency records for our established projects with long but very productive days. Everyone readily complied with our new safety regulations and flexed their schedules to accommodate the uncooperative weather and shifting priorities. And we got everything done!



Despite the challenges it caused our field crews, the Preserve's flora and fauna sure appreciated the late winter precipitation! Pollinators such as this desert black swallowtail butterfly (Papilio polyxenes) and bees enjoyed the abundance of native New Mexico thistles (Cirsium neomexicanum). During our spring butterfly count, we observed 747 individual butterflies representing 23 species. Photo by John Weser.

All told, over the course of March and April, we monitored 68 non-native plant experimental plots (6,800 data points), 130 trail restoration plots, 144 RestoreNet plots, and 222 soil crust plots (8,100 data points). We serviced 33 wildlife cameras (resulting in tens of thousands of images), visited our plant phenology sites 93 times (1,116 data points),

conducted butterfly surveys at five sites and arthropod surveys at four sites, did a bat emergence count, and surveyed and treated several acres of non-native plants (including removing 1,049 plants from our non-native experimental plots). None of this would have been possible without the hard work and tenacity of everyone involved. We cannot thank them enough!

We are eagerly looking forward to next year's field fun. Hopefully, Mother Nature will take it a bit easier on us. ▲▲



The Conservancy has 33 of these cameras deployed in the Preserve, which help us conduct long-term monitoring of the wildlife community. Every two months, stewards service the cameras and process captured images. Photos courtesy of McDowell Sonoran Conservancy



**ARIZONA CHILDREN'S
LEARNING
& PLAY FESTIVAL**
SATURDAY NOVEMBER 7, 2020

FREE!

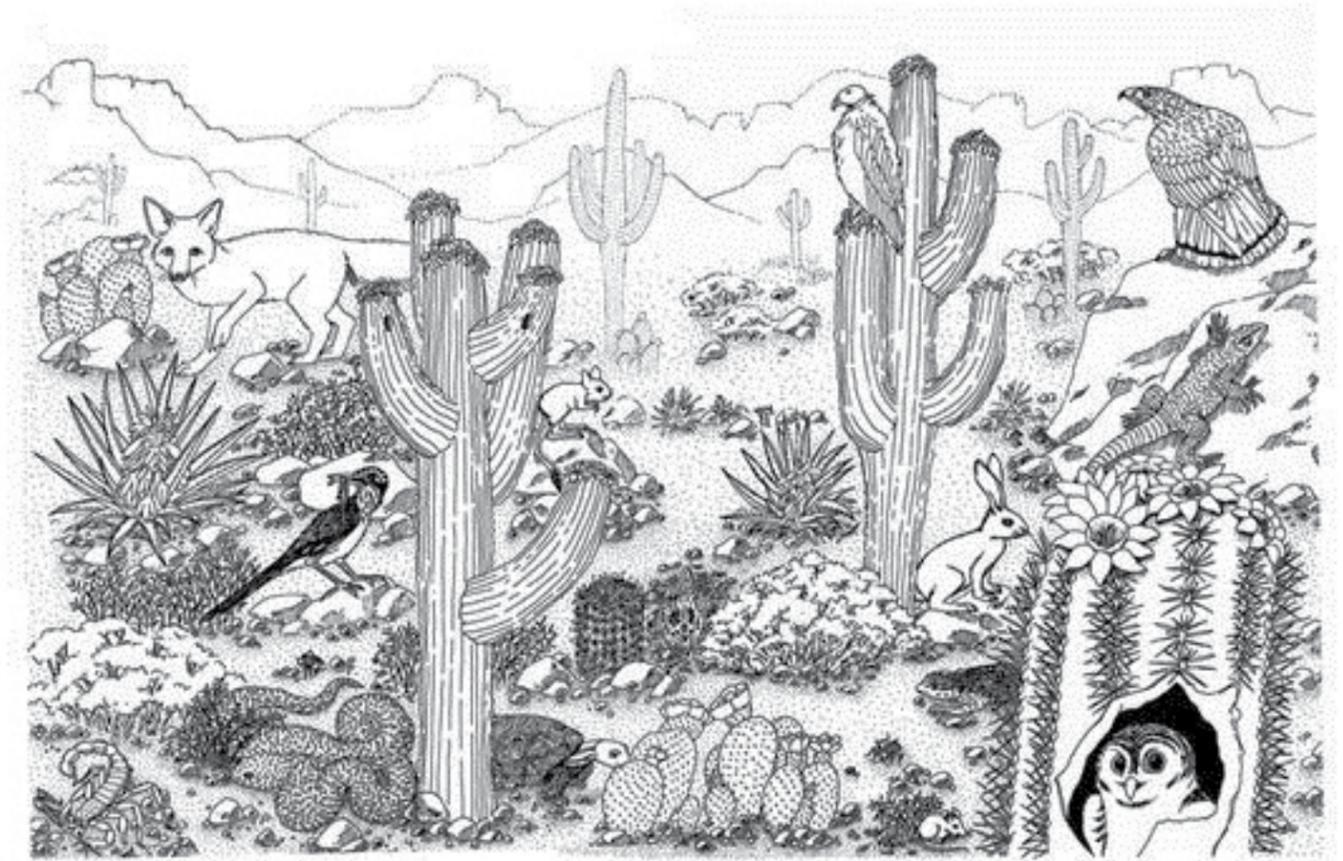
WESTWORLD OF SCOTTSDALE
LEARNING AND PLAY OPPORTUNITIES FOR ALL AGES



Science is in our nature

At the time of this printing, COVID-19 restrictions could impact this event. Please visit mcdowellsonoran.org for updated information about the Arizona Children's Learning and Play Festival.

COLORING PICTURE



WORD SEARCH

T A W B W G T H E F W G L G B
W A T E R S H E D P C U C C A
O D C L I M A T E U O U T C T
G B M X X Z E F O L N M R Z B
H G S P U H S B C E S B Y R N
B I K E S F N N A A E E Q A W
O M L Q R W U L C R R D A T I
B B S K H V A W T N V K M T L
C U H C B T A H U I A D P L D
A S E V I R L T S N T R L E L
T H S M W E A F I G I N A S I
J O P Q U E N V C O O P N N F
T X D V V E M C F K N O T A E
X Z I W E A T H E R S H B K E
W I L D F L O W E R T D R E N

- CONSERVATION
- SCIENCE
- PLANT
- BAT
- RATTLESNAKE
- WATERSHED
- CLIMATE
- BOBCAT
- OBSERVATION
- LEARNING
- WILDFLOWER
- TREE
- WILDLIFE
- CACTUS
- WEATHER
- BUSH



Scottsdale Community Services

Making Scottsdale the premier community for everyone!



Beautiful outdoor spaces and classes.



Support services and programs.



Free access to books, movies, music and programs.



Over 30,500 acres of Sonoran Desert waiting to be explored.

Visit ScottsdaleAZ.gov for more information.



Winter showers bring spring flowers, but some of those plants can be tiny and tough to identify. Careful not to crush anything in the plot, Steve Jones takes advantage of his myopic vision to get a close look at these "belly plants" in the Conservancy's trail restoration project. Photo by Tiffany Sprague

In Search of Tiny Plants: A Botanist's Eye View of Spring Field Season

By Steve Jones, botanist

Another spring season of field work has come and gone, and, as usual, I spent much of it on my knees trying to identify plants, some no more than a few millimeters tall. Blessed as I am with an extreme case of nearsightedness, I have no need for magnification tools for those; I just take off my glasses. A good set of kneepads is vital. Bike gloves for the hands help, as well, although there was one day that my hands found every cluster of cholla spines in my immediate vicinity.

My apologies to the stewards standing nearby; occasionally, I reflexively turned the air as blue as their shirts.

The good rains that came before and during the field work provided some challenges. The annual plants were remarkably abundant, just as they were last spring following the exceptional October 2018 rains. That made more work for us – more time to count plants or to estimate plant cover. But the work went smoothly, and we made good time.

We added one new species to

Scottsdale's McDowell Sonoran Preserve's plant checklist: prickly goldenfleece (*Urospermum picroides*). Unfortunately, it is a non-native annual that recently made its way into Arizona. It has only been collected from four locations in the Phoenix area.

One study, RestoreNet, took us to a plot in the Granite Mountain area and to three exotic locales outside the Preserve: Roosevelt Lake, Lake Pleasant, and a plot on the Scottsdale Community College (SCC) campus. At Roosevelt Lake, we had



Finding new species for the Preserve is always exciting, but that excitement diminishes when the species is not native to the area. The one new plant species we added to the Preserve's flora list is this non-native prickly goldenfleece, a Eurasian species that was only known from California until it was found in Phoenix in 2016. Photo by Steve Jones



This fuzzy seedling will be a desert marigold (*Baileya multiradiata*) when it grows up. The corkscrew-like objects in the photo are awns attached to filaree (*Erodium cicutarium*) seeds. When the awn gets wet, it uncurls and then re-curls as it again dries. In this way, the awn can screw the seed into the ground. Although non-native and not part of any seed treatment, the filaree seeds were abundant in the RestoreNet plots. Photo by Steve Jones



The RestoreNet project seeks to determine restoration practices that work in a variety of disturbance types throughout the region. Two of the seed species scattered in some RestoreNet plots were the very common local wildflower Coulter's lupine (*Lupinus sparsiflorus*) at left, and the native bunchgrass Arizona cottontop (*Digitaria californica*) at right. Photos by Steve Jones

a reunion with a former Field Institute intern, Robert Madera, forest botanist and ecological lead for the Tonto National Forest.

The RestoreNet sites each contain 30 treatment and six control transects. Various seed treatments were added to the transects last fall. The rains performed their magic, and most of the seeded species were found growing in the transects. Some seedlings that weren't in the seed mixes, and a few that were, were difficult to identify initially. But, with experience, we got better at clearing up the unknowns.

The Roosevelt and Granite Mountain sites are on somewhat coarse pediment soils, and tiny seedlings

were difficult to find. The SCC site is on former agricultural land with fine soil, and the seedlings were easier to see. One native grass that we did not see at the pediment sites was the native bunchgrass purple three-awn (*Aristida purpurea* var. *purpurea*). It was included in one of the seed treatments. In closely examining one SCC transect with my superpower vision, I saw an easily-identifiable three-awn seed stuck in the soil with a tiny, inch-long thread arising from its base. We kept looking and found more and more of the little purple, inch-long threads. We went back through the transects we'd already completed and found many more.

Another study focused on restoration of the wildcat trails common in the northern Preserve. Those trails were primarily developed by motorcyclists when the land was held in public trust by the state of Arizona. In that study, we regularly encountered very small specimens of plants that, outside of the plots, were normal-sized. We referred to them as bonsai specimens. Soil compaction and reduced nutrients can partially explain their small size, but another significant factor is



Restoration research focuses on improving damaged areas and restoring them to be comparable with the surrounding community. Thus, plant species must be selected carefully. One bunchgrass seed in some mixes is sand dropseed (*Sporobolus cryptandrus*), a common species in North America, although not often seen in the Preserve. It is known to occur along the Tom's Thumb Trail near Lookout Point Trail. Photo by Steve Jones

the absence of mycosymbionts. All vascular plant species have fungal partners that grow in and among their roots, assisting in the breakdown of organic material and in passing the broken-down nutrients to their host plants.

Where the soil was disturbed, those fungal symbionts were lost. Over time more organic material will find its way into the old trails, allowing the fungal symbionts to return. The vigorous growth that we observed in the past two spring field seasons will hasten that day as that growth dies, decays and returns to the soil. ▲▲



Finding tiny plants is hard enough; locating their seeds is even harder. This purple three-awn seed with its thin, threadlike cotyledon led us to realize just how small some of the seedlings we were seeking could be. Learning this helped us find many more seedlings of this species. Photo by Steve Jones



Our Spectacular Speakers Bureau

By Maxine Sukenik,
McDowell Sonoran Conservancy Speakers Bureau Coordinator

Toni Vallee presents how the flora that surrounds the trail is actually "Nature as Therapy." Photo by Dennis Eckel

Want to learn "A Dozen Ways to Die in the Desert"? How the flora that surrounds the trail is actually "Nature's Medicine Cabinet"? How about the stories the boulders could tell, "If Rocks Could Talk." The McDowell Sonoran Conservancy actually has speakers who can address these topics and so many more.

In our midst are knowledgeable, gifted, enthusiastic stewards willing to take their show on the road (so to speak). Through the Conservancy's Speakers Bureau, they use their talents to inspire residents and visitors alike at conventions, Desert Botanical Garden, Southwest Wildlife Conservation Center, and Homeowner Association events, just to name a few.



A presentation at the Legend Trail Community Center. Photo by Dennis Eckel

Some speak as retired professionals in their field, while others became self-taught experts because they want to share what they love and inspire others to do the same.

A walk in the park as a healing agent? Stewards Katy and Toni, both nature lovers and outdoor enthusiasts,

instinctively knew spending time in nature is good for mind, body, and spirit. Once they discovered scientific evidence to substantiate their claim, they were ready to create their presentation: "Nature as Therapy." It is informative and entertaining and speaks to the latest trend in seeking

health and wellness through holistic means. This presentation has become just one of many sought-after topics the Conservancy's Speakers Bureau has to offer.

Name a topic, and I would be surprised if there isn't someone who can address it. Biology, ecology, social science, human history, and even a presentation on something as simple as how and where to hike. "Hiking 101" gives you the



Len Marcisz presents A Dozen Ways to Die in the Desert. Photo by Dennis Eckel

basics to get out there and get started. What a remarkable vehicle to increase public understanding of the Sonoran Desert and promote becoming a guardian of natural open space, as well as the McDowell Sonoran Conservancy.

Who is the best speaker? I think the question actually is – who is the best speaker to fit the particular needs of each group. I spend time talking to the coordinator, learning their objective, and analyzing their venue and timeline. Our speakers are extremely flexible. I have seen them shorten or lengthen a presentation, speak in an outdoor venue on one of those extra chilly desert nights, or add an outdoor component to an indoor lecture if they think it will enhance the presentation. We start with a basic menu of

topics and presenters, but we can always explore special accommodations. Our goal is to inform and entertain and have participants leave with a new perspective on our beautiful Sonoran Desert.

Future topics of the Speakers Bureau are as limitless as the imaginations of our stewards and as vast as their love for the desert. Explore our new website, www.mcdowellsonoran.org, for more information and ways to book one of our speakers, or contact Max Sukenik, tothemax999@aol.com with the name of a group you think might benefit from one of our presentations.

We have an incredible gift, and as the Speakers Bureau Coordinator, I am honored to be able to share that gift with so many others. ▲▲

Four Easy Ways to Support the Conservancy



Shop from the comfort of your home and earn rewards for the McDowell Sonoran Conservancy using AmazonSmile. To link your Amazon purchases to the Conservancy, visit smile.amazon.com and select "McDowell Sonoran Conservancy" from its list of approved charities.



Now you can support the Conservancy when you shop at Fry's by joining its Community Rewards Program. Join the program by visiting frysfood.com and selecting "Fry's Community Rewards" under "Community" at the bottom of the page. Select "McDowell Sonoran Conservancy" from the list of eligible organizations.

Facebook Fundraising

You can create a Facebook fundraiser in support of the Conservancy. Just log into Facebook and click "Fundraiser" under "Create" in the left column. Click on "Nonprofit" and then search for "McDowell Sonoran Conservancy." from the dropdown list under "Nonprofit." Share your fundraiser with friends and family and let them know why you support our mission.



The McDowell Sonoran Conservancy is proud to announce that it's now a part of the Target Community Giving Program known as Target Circle. List the Conservancy as your non-profit partner and Target will direct a charitable donation each time you shop and use the Target Circle app.



MCDOWELL
SONORAN
CONSERVANCY

7729 East Greenway Road
Suite 100
Scottsdale, AZ 85260

Connect with us:



Funding for the printing of *Mountain Lines* is provided in part by the City of Scottsdale. The Scottsdale McDowell Sonoran Preserve is managed through a unique partnership between the City of Scottsdale and the McDowell Sonoran Conservancy. The City of Scottsdale owns and operates the Preserve and the Conservancy supports the City in the important work of managing and caring for the Preserve. 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.

PUPPY LOVE.



Good dogs deserve great gear.

Visit conservancymerchandise.org
to purchase your swag today!

mcdowellsonoran.org | info@mcdowellsonoran.org



MCDOWELL
SONORAN
CONSERVANCY