



# the Cactus Wren·dition



VOLUME LXXV NO. 3

FALL—2022



## CONTENTS

- 2 President's Message
- 3 Letter from the Editor and Announcements
- 4 Programs and Meetings
- 5 Field Trips
- 6 Tales from the Field  
By Kathe Anderson
- 8 Tales from the Field  
By Torin Waters
- 9 Book Review  
by Charles Babbitt
- 10 Just Add Water  
by Jim Burns
- 12 East Valley Wildlife  
by Vicki Hire
- 13 Green Scene: Arizona's Diminishing  
Groundwater by Vicki Hire
- 17 Crossword Puzzle  
Poem by David Chorlton
- 19 Burrowing Owls Losing Ground  
by Shirley Anne Baker
- 20 The Endearing Inca Dove  
by Tom Mangelsdorf
- 22 Nature through the Artist's Eye.  
Walt Anderson

### On the Cover

Burrowing Owls, 2020, 10" x 8",  
watercolor by Walt Anderson

An adult watches over a youngster just becoming familiar with the arid landscape outside of its natal den. Humans are now offering creative solutions to assist these fascinating birds, which have declined dramatically because of human activities.

pp. 22-23

## PRESIDENT'S MESSAGE



**Emily Thomas**

I would like to introduce myself and express my excitement at being part of Maricopa Audubon Society. I am a third-generation Arizonian, completing my Conservation Biology and Ecology degree at ASU. I love birds, Arizona, and the outdoors.

Next year will be MAS's 70th Anniversary. Since 1953, MAS has been a leader in conservation; protecting habitat and species throughout Arizona and the southwest. MAS efforts were instrumental in stopping Cliff Dam on the Verde River which would have flooded Bald Eagle habitat.

MAS limited the Mt. Graham telescopes

and prevented the flooding of Southwestern Willow Flycatcher habitat at Lake Roosevelt. MAS is currently challenging the proposed Resolution Copper Mine at Oak Flat, and destructive cattle grazing throughout Arizona's beleaguered riparian habitat. MAS (Bob Witzeman, Frank Welch, Scott Burge, Herb Fibel) and allies (Sierra Club, Ron Schilling, Kevin Dahl, Tom Wright, et.al.) and most notably Carolina Butler joined the Fort McDowell Yavapai Nation to stop the proposed Orme Dam which would have inundated miles of lush riparian desert-nesting Bald Eagle habitat and tribal lands at the confluence of the Salt and Verde Rivers. In 1981, after a 10-year fight, the dam was stopped. This monumental defeat is celebrated at the annual Orme Dam Victory Days where to this day MAS holds a place of honor in the parade (November 18). I hope to continue this 70-year legacy which includes fighting to restore the very area we fought so hard to save - the confluence at Coon Bluff - that is now overrun by feral horses.

There is much more to do on the Conservation front. Birds are telling us we are in a climate crisis. We need to listen. Global warming puts two-thirds of North American bird species at risk. Riparian areas, rivers, grasslands, and coastal communities are in jeopardy like never before. Natural spaces and wildlife are disappearing at an exponential rate.

There are many ways you can become active in efforts to preserve and protect our natural world. By substantially reducing our carbon footprint, we can lead by example.

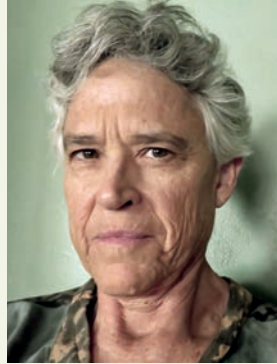
I have been able to volunteer on a number of surveys including endangered humpback chub in remote areas of the Grand Canyon, IBA's along the Agua Fria River, and endangered Western Yellow Billed Cuckoo. I find volunteering in conservation brings personal satisfaction, joy, and a sense of purpose to my life. Volunteering benefits our mental and physical health, keeps you connected, socializing, and networking.

I am eager to meet as many of you as possible. I hope you will join one of our monthly hybrid zoom/in-person meetings or birding trips. I will be leading a trip at the Gilbert Riparian Preserve November 30 (register at [MaricopaAudubon.org](http://MaricopaAudubon.org) or [Maricopa Audubon Ticketleap](http://Maricopa Audubon Ticketleap).) 🐦

# LETTER FROM THE EDITOR

by Laurie Nessel

The theme of this issue is water. Jim Burns extolls the joy of slow birding at a water hole, Vicki Hire discusses water scarcity in Arizona in Green Scene, and Tom Mangelsdorf describes Inca Doves and their unique relationship to water. Other articles include the plight of Burrowing Owls by Shirley Anne Baker, two trip reports, and a review of A Brief History of Earth in which Charles Babbitt examines, among other things, the critical role of CO2 on our planet.



Please consider a trip to Safford for the Annual AZFO meeting. This is a chance to expand your knowledge of birds and meet like-minded birders, whether you are an expert or novice birder. It's always worthwhile.

## ANNOUNCEMENTS

### Maricopa Audubon Society's 26th Annual Herb Fibel Big Sit! Fundraiser

Sunday, 9 October 2022 | Granite Reef Recreation Site | Tonto NF pass required

**To Participate:** There are a limited number of volunteer slots. Registration is required -email Kathe Anderson at [kathe.coot@cox.net](mailto:kathe.coot@cox.net) -by 30 September, 2022. Details will follow. Participants can donate on site. New option this year: Arrive 6 a.m. for Owling! Official sit is 8 a.m - 9:30 a.m

**To Donate:** Donate a set amount, or per species seen. Donations accepted through 15 November. Donate online (visit "Events - Big Sit!") or write a check payable to "Maricopa Audubon Society" (please write "Big Sit!" in the memo line) and mail to: MAS Treasurer Vicki Hire PO Box 603, Chandler, AZ 85244

The Big Sit! is open to birders of all levels. It is ideal for those who are mobility challenged. The goal is to see as many species as possible (40 is average here) from a single location while supporting a worthy cause. Money raised this year will benefit the MAS Youth Scholarship Fund.

#### Bonus for Non-Members!!!

Donate \$25 or more to the Big Sit! and receive a one-year membership to MAS. Please visit "Events - Big Sit!" on our website for details.

## 2022 AZFO 15th Annual Meeting in Safford



23-25 September  
Eastern Arizona College's Discovery Park Campus

Youth scholarships available. Please visit Arizona Field Ornithologists online for details.

## COMMITTEES/SUPPORT

### Bookstore

Sochetra Ly  
503 860-0370

### Poet Laureate

David Chorlton  
480 705-3227

[www.maricopaaudubon.org](http://www.maricopaaudubon.org)

*"There is no lack of water here, unless you try to establish a city where no city should be."*

- Edward Abbey, *Desert Solitaire*, 1968

## An Investment in the Future

Bequests are an important source of support for the Maricopa Audubon Society. Your chapter has dedicated itself to the protection of the natural world through public education and advocacy for the wiser use and preservation of our land, water, air and other irreplaceable natural resources.

You can invest in the future of our natural world by making a bequest in your will to the Maricopa Audubon Society. Talk to your attorney for more information on how this can be accomplished.



Support Maricopa Audubon as part of **Fry's Community Rewards Program**. Register your Fry's VIP card and select Maricopa Audubon #WW583 as your non-profit organization at no cost to you. Please visit Fry's Community Rewards online or visit your local Fry's to register.

### Sign up for the e-newsletter!

To subscribe, email:  
[laurienessel@gmail.com](mailto:laurienessel@gmail.com)

*Note: We do not use the email list for anything other than the described purpose.*



# MEETINGS . . .

Please check our website before the September meeting to be sure we are still conducting hybrid meetings. Please follow current CDC guidelines in person.

MAS holds meetings (membership is not required) on the first Tuesday of the month from September through May. All but the May meeting is at Papago Buttes Church of the Brethren, 2450 N. 64th Street, Scottsdale (north of Oak Street on the westside, between Thomas and McDowell roads). If southbound, turn right from 64th Street, 1/2 mile south of Thomas. If northbound, turn left (west) at Oak Street, 1/2 mile north of McDowell, and then right at the Elks Lodge. Continue past the lodge and turn right into the church parking lot. Look for the "Audubon" signs. Meeting starts at 7:30 p.m., come at 7 p.m. to socialize and browse the book table. Pre-meeting dinners are held at 6 p.m. at Saigon Bowl, 8213 E. Roosevelt Street, Scottsdale. Join us for a delicious meal, meet our guest speaker and say "howdy" to other birders. Meals average \$12.



Northern x Tropical Parula hybrid

Jacob Bagley

## My Experience at Rio Diablo Birding Camp

September 6

Jacob will recount the spectacular places and biodiversity he experienced at Rio Diablo Birding Camp, touring the Big Bend area last

year from the high-elevation Chisos and Davis Mountains, to the winding gorges of Seminole Canyon, to the banks of the Rio Grande River.

Jacob Bagley is a sophomore at Shadow Mountain High School where he takes honors and AP classes. He is involved in the Digital Academy of Advanced Placement Scholars, Veterans Heritage Project, and the National Honor Society. He has been birding since April 2020. What started as a quarantine hobby quickly became his number one passion. Jacob enjoys chasing a rarity as much as birding his local patch. Birding has enabled Jacob to establish many great friendships, expand his network, and explore the natural beauty of Arizona and beyond. He is excited to lead his first birding tour in Southeast Arizona, one of his favorite birding regions. You can read Jacob's article in the Summer 2022 edition of the Cactus WrenDition.

Jason D Struthers

## Let's Be Transparent About Windows and Reflect on Solutions: Anthropogenic Threats Facing Birds

October 4

Anthropogenic hazards are largely responsible for the net loss of nearly 3 billion birds from North America between 1970 and 2018. Bird-window collisions is estimated to indiscriminately kill 0.5 to 1 billion birds annually in the US. Unfortunately, this avoidable human-caused hazard receives little public attention and minimal research. Join me as we delve into this, and other anthropogenic bird hazards. Learn some solutions that you can do to ensure that birds can prosper, be enjoyed by future generations, and continue to provide key ecosystem services that we depend on.

Jason D Struthers obtained his Doctorate of Veterinary Medicine in 2011 from U of Montreal, his Masters in anatomic

pathology in 2013 from U of Saskatchewan and completed his anatomic pathology residency at U of Florida. He became a board-certified anatomic pathologist in 2015 and spent a year as such at Walt Disney World's Animal Kingdom. In 2016 he joined Midwestern University's College of Veterinary Medicine in Glendale. As associate professor, he divides his time among teaching, scholarly pursuits, mentoring the new Audubon on Campus chapter, and providing diagnostic pathology services to veterinarians, law enforcement, Arizona Humane Society, AGFD, Mayo Clinic, Phoenix and Reid Park Zoos, Arizona-Sonoran Desert Museum, etc. He is Education Chair for Maricopa Audubon Society. His scholarly endeavors include 15 peer-reviewed publications, dozens of conference presentations, and mentoring veterinary students and anatomic pathology residents. His scholarly publications include research on tamandua (anteater), Mexican gray wolf, Bornean rangutan, cattle, and bighorn sheep.

Larry Arbanas

## Montana and the West Coast

November 1

Nature filmmaker Larry Arbanas will present footage filmed last summer from Montana and the West coast from Washington to California. Arbanas produces bird, wildlife, environmental, social issue and documentary films for the Cornell Lab of Ornithology, PBS, USFWS, USFS and most recently the orientation room video for the redesigned River of Time Museum in Fountain Hills. He currently resides in Mesa with his bride of 3 months. Just to be clear, his bride is a bit older than 3 months.

Larry Arbanas was born in Chicago and spent most of his youthful years in the 'burbs. Summers were spent at his Grandfolk's rural Michigan farm, basically as free child laborers in Grandma's garden. "When the work was done, we were free to roam. The best spot was the swamp. just full of Pickerel Frogs, Bullfrogs, Northern Pike and all sorts of bird life. It was heaven on Earth!" This love of nature was instilled early and Larry has been pursuing, learning about and documenting natural history ever since.



# FIELD TRIPS

by Mark Horlings



- Please follow current **CDC Guidelines**. Participation in field trips comes with risk of exposure to infectious diseases. If you have any symptoms of illness or have been exposed to COVID-19, stay home. Please wear face masks (N-95).
- For Tonto **National Forests Day Use Passes** visit USDA Tonto Pass.
- If you **carpool**, please cover driver's gas-recommended 15 cents/mile per rider.
- The ABA has adopted principles of birding ethics. Search "ABA birding ethics" or ask your field trip leader about ethical birding.

- **Wear** neutral colors and sturdy walking shoes.
- **Bring** binoculars, sunscreen, sunglasses, hat, and water.

- **Registration** using Ticketleap required unless you have made other arrangements with Field Trip Chair Mark Horlings or the field trip leader. On Ticketleap, you can search using "Maricopa Audubon," or the field trip destination, or the leader's name. Or you can find links on the Field Trips section of MAS' webpage. To cancel a reservation, contact the leader (see Ticketleap) or Mark Horlings 602 505-3455 markhorlings@yahoo.com

## Pima Canyon, South Mountain Park Plants and Birds

Thursday, September 1

I'll show you the bushes in the arroyo where Costa's Hummingbirds nest in January and February. Start at sunrise (maybe we'll hear a Common Poorwill!) to enjoy the dawn chorus and avoid hotter temperatures. See typical Sonoran desert birds, including thrashers, wrens, Black-throated Sparrows, Gilded Flickers and raptors. Hopefully, monsoon storms will have boosted the plant and insect life for us to examine as we walk up the wash to the CCC structures, and possibly to the elephant trees! Meet at Pima Canyon trailhead parking lot ramada. Bring water, hat, walking shoes.

Time: 6-9 AM

Limit: 10

Difficulty: 2

Leader: Larry Langstaff



S. Mtn. Costa's Hummingbird. Photo by Larry Langstaff

## Glendale Recharge Ponds

Wednesday, September 7

Arizona can be a challenging place for finding shorebirds, but the Glendale Recharge Ponds, particularly in early fall, are one of the top places in the state for observing migrant

shorebird diversity. While the ponds aren't a pristine natural environment, they are known to attract rarities. In addition to shorebirds, we could see Burrowing Owl, Bald Eagle, Osprey, and Peregrine Falcon. Bring a scope if you have one, hat and water.

Time: 6-10 AM

Limit: 10

Difficulty: 2 (slow walking, frequent stopping and scanning, full sun exposure/high temperatures)

Leader: Torin Waters

## Route to Aravaipa Canyon

Friday, September 9

This trip will focus on the road into Aravaipa Canyon, without actually entering the canyon. The road offers a variety of habitats—fields, cottonwoods, streamside vistas and dense shrubbery. In the past, these areas hosted a Great Blue Heron rookery; Gray, Black, and Zone-tailed Hawks, roadrunners, and summer songbirds—tanagers, warblers and vireos. We may make a quick stop at Kearny Lake. We'll start about 5 AM from Scottsdale and catch lunch at a Mexican spot in Superior (depending on Covid) on our way back. Return about 3 PM. Meeting place and carpooling logistics TBD a few days before the trip.

Limit: 7 vaccinated participants

Difficulty: 1 Mostly car birding

Leader: Kathe Anderson

## Stewart Mountain Desert Tortoise Quest

Saturday, September 10

Hardy souls willing to trek in the early morning heat and humidity of September with a slight chance of finding a desert tortoise can join leader Laurie Nessel as we traverse steep, rocky hillsides searching for tortoises that emerge during the monsoon season. We will discuss the

con't on p. 6

# TALES FROM THE FIELD: MINGUS MOUNTAIN

by Kathe Anderson



Acorn Woodpecker  
Photo by Tom Cheknis

14 June, 2022

The highlight of the Mingus Mountain trip was undoubtedly the crawly\* of **Brown Creepers**. None of us had ever seen so many in one place. Defying their name, these moving bits of bark shimmied up the ponderosas, disappeared, reemerged, chased one another, flew between trees, and entertained us for several minutes. We estimated seven of them, but maybe there were more.

In the same area, at the Group Campground off Forest Road 104, the creepers joined **Pygmy** and **White-breasted Nuthatches**, **Dark-eyed Juncos**, **Western Wood-Pewees** and **Grace's Warblers**. While we could see the juncos (mostly juveniles) at eye level or below, the others had us craning our necks – until a Grace's Warbler obligingly fluttered to the ground, dazzling us with its lemony yellow eyebrow, throat and chest.

An **Acorn Woodpecker** sitting on a telephone wire greeted us as we pulled up. Perfect! Eliz who volunteers at a rehabilitation organization had brought a charming Acorn Woodpecker to release. The newcomer

*\*An improvised collective noun.*

con't on p. 7

## field trips con't from p. 5

behavior, life cycle, and status of this keystone species. Bring snacks, sun protection, hat, sturdy hiking shoes, a high power flashlight or mirror and plenty of water. Carpooling TBD.

Time: 5:30 a.m. - 11ish

Limit: 8

Difficulty: 4 (steep, rocky terrain, and hot, humid weather).

Leader: Laurie Nessel

## Northsight Park, Scottsdale

Saturday, October 1

We will explore the lush desert habitat for 2-3 hours, depending on what we find. Desert residents, wintering sparrows and a few migrants can be expected. Last year's sightings included Green-tailed Towhee, Lark and Brewer's Sparrows, Western Tanager, Wilson's Warbler, and Harris's Hawk. Meet 6:30 AM at the Park's south lot off Thunderbird.

Limit: 6

Difficulty: 2 (one mile walk on unpaved, level path)

Leader: Brian Ison

## Dragonfly Walk, Salt River Recreation Area

Saturday, October 8

We will visit several stops (Granite Reef, Phon D. Sutton, and/or Pebble Beach, depending on how long we spend at each place), each of which provides a slightly different set of species and is easily accessible. 22 species were seen at just Granite Reef last July. Recreation pass required. Carpooling TBD.

Bring close-focus bins, hat, water, snack. Meet at Starbucks, 2832 N Power Rd, Mesa 8:30 AM to carpool to the sites.

Time: 8:30 AM - 2 PM

Limit: 10 people

Difficulty: 2 (easy walking on dirt paths in hot weather)

Leader: Pierre Deviche

Be Social!

Find MAS  
on Facebook

[facebook.com/MaricopaAudubonSociety](https://facebook.com/MaricopaAudubonSociety)





**Brown Creeper.** Photo by Gordon Karre



**White-breasted Nuthatch.** Photo by Tom Cheknis

seemed immediately at home – and perhaps was the same bird that seemed to bid us farewell about an hour later.

The other active area was Mingus Lake – an exaggeration; it’s barely a pond. We found what looked like a Wood Duck nesting box inhabited by **House Wrens** busy feeding babies. They adults had stuffed the box to capacity with nesting materials. Grasses were hanging out of the oversized hole, but the arrangement seemed to work just fine.

least two pairs of **Brown-headed Cowbirds**. A small, active flock of **Chipping Sparrows** and an immature **Black-headed Grosbeak** wrapped up our day.

Thanks to Peter (for driving and donating his gas money), Eliz and Maria for donations to CEDO (the binational conservation/education/research organization MAS supports) and Sue for keeping the eBird lists. For the full list of species, look for Mingus Mountain records, June 14 from a now not-so-anonymous eBirder.



**Brown-headed Cowbird.** Photo by Tom Mangelsdorf



**Western Tanager.** Photo by Tom Cheknis

We got our best look at **Western Bluebirds** there, and a **Western Tanager** sat on a log in the pond giving us a sunny, unobstructed, splendid view. **Violet-green Swallows** swooped by, and an immature male **Broad-tailed Hummingbird** flitted about right in front of us. We’d heard a handful of **Cordilleran Flycatchers**, and this is where we finally saw one. We added **Northern Flickers** and, sigh, at

# TALES FROM THE FIELD: HASSAYAMPA RIVER PRESERVE

Text and Photos by Torin Waters



Vermilion Flycatcher

22 June 2022

Four of us birded from 7 - 11:30 AM, in temperatures from the mid-80's to the mid-90's. We were fortunate to have good cloud cover most of the day.

After a quick check of the entrance garden and its hummingbird feeders (only a few **Anna's** were chasing each other around), we began our loop around Palm Lake. We soon encountered our first small flock of **Phainopepla** (five up high in a dead tree), which would soon become a theme of the day. It turned out to be our most abundant species, they were all over the place! We were treated to the rambling songs of **Bell's Vireo** and **Song Sparrow**. We encountered a kingbird, but in poor lighting, determination of species eluded us. The sought-after **Tropical Kingbird** would have to wait. When we reached the main pond overlook, bird activity started to pick up, and we added **Willow Flycatcher**, **Bullock's Oriole**, and **Common Yellowthroat** to our list.

At the River Ramble trail we had to turn back due to a fallen tree that was being removed. We took the Lion's Trail instead, which was fortuitous since we had a satisfying encounter with two adult **Gray Hawks** there. First we heard distinctive descending screams, and then had good looks at these small but beautiful hawks, typically restricted to southeast Arizona and Central America. This was a life bird for several of us.

On the Mesquite Meander trail, we finally had good views of the **Tropical Kingbird**. It was mostly silent, but we were able to discern the brown tail in its sallying flights to distinguish it from the similar **Western Kingbird**. As we returned along Palm Lake, we picked out a skulking **Green Heron** hunting along the water's edge.

Other pleasures of this beautiful riparian preserve included opportunities to compare the similar **Ash-throated** and **Brown-crested Flycatchers**, and to easily observe colorful species such as **Vermilion Flycatcher**, **Yellow-breasted Chat**, and **Summer**

**Tanager**. The non-avian highlight was a small herd of mule deer coming down to the stream.

We ended up with 35 bird species, but my favorite part of group bird walks is the unanswered questions that inevitably arise: Why do we often see two **Verdins** chasing each other around, even in the non-breeding season? What do **Gray Hawks** eat? What kind of lizard/tree/insect is that? There is always more to learn about the natural world around us. Thanks to all the participants for a fun day. I look forward to leading my next trip!



Gray Hawk



Tropical Kingbird



# BOOK REVIEW

by Charles Babbitt

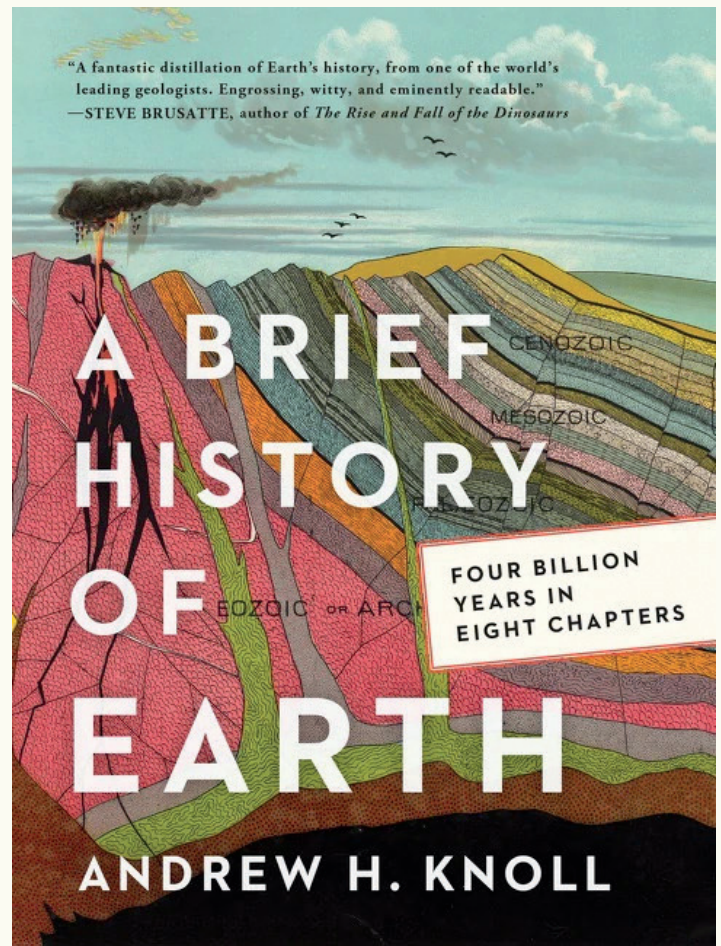
A BRIEF HISTORY OF EARTH:  
Four Billion Years in Eight Chapters

by Andrew Knoll

Customhouse; 2021, 272 pages;

\$18.99

Summarizing 4.6 billion years of Earth history in a 230-page book is no easy feat, but Andrew Knoll, Harvard professor of natural history, does just that in *A Brief History of Earth*. This book covers a lot of ground, starting with the violent and chaotic accretion of our planet 9.3 billion years after the Big Bang. Along the way readers learn about the physical Earth, the biological Earth, and the interplay between the two. A primer in geology adds plate tectonics, rock composition and chemistry, and Earth's geologic history as revealed by radiometric dating and fossils. The book's recounting of periodic mass extinctions is of particular relevance today as CO2 levels and temperatures rise.



By 4.4 billion years ago, Earth had rocks, water, and a thin layer of air. Have you ever wondered where the water came from? Early science suggested Earth-impacting comets but chemical analysis of comet water challenges that hypothesis. According to the author, it is now believed that Earth's water came from impacting meteors called carbonaceous chondrites which contain 3 to 11 percent water by mass. In the process of degassing, huge amounts of water vapor and other gases rose into the air, cooled and rained down, creating an ocean planet. Analysis of these meteors shows they not only brought water but the very building blocks of life – organic molecules that include amino acids, sugars, and fatty acids. By 3.5 billion years ago, Earth was a biological planet with archaea (single-celled organisms) and bacteria flourishing in an oxygen-free environment, engaged in non-oxygen producing photosynthesis.

A defining moment in Earth's history was the Great Oxygen Event. Iron deposits in sedimentary rocks tell of the presence of oxygen 2.5 billion years ago as oxygenic photosynthesizing cyanobacteria created enough oxygen for the eventual evolution of multi-cellular organisms and ultimately plants and animals.

I particularly like the author's description of Earth's carbon cycle, a thread that runs through much of the book. Volcanic activity creates most of Earth's CO2. The weathering of rock, respiration and burial of photosynthetically generated organic matter remove it. This cycle regulates the climate over time. When it becomes unbalanced and CO2 levels rise it can spell disaster for many life forms.

Earth's geological history is punctuated by extinction events attributable to increased CO2 levels. One of the most catastrophic occurred during the Permian period 252 million years ago (mya) when volcanic activity in Siberia released massive amounts of CO2. The resulting global warming, acidification and decreasing oxygen levels in the oceans caused the loss of 90 percent of marine animals. At the end of the Triassic period 200 mya, 70 percent of ocean species disappeared from high CO2 levels produced by volcanic activity. Rising CO2 levels resulted in the disappearance of 15 to 20 percent of all marine life on two occasions -183 mya

cont'd on p. 18



"Rainbow Bird"

# JUST ADD WATER

Text and Photos by Jim Burns

If you're getting a little jaded with "tick and run" listing or seeing the same old birds over and over again, here's a magic ingredient that will add spice to your birding life. Just add water! And I guarantee that it will also make you a better birder in the offing.

It turns out the answer to the question, "What do birds do all day?" is that their needs dictate their movements, and the primary need for birds is the same as ours. Water! Although some desert species such as roadrunners and wrens are able to satisfy their moisture needs with their food intake, most birds seek water, running or free standing, to drink. Additionally, there are two other reasons they gravitate to water. They need/love to bathe, and water attracts their prey, whether that be other avian species, small mammals, or insects.

Somewhere along my journey from outdoor lover to birder to bird photographer I realized water was key to the most rewarding aspect of my chosen pathway to

nature. Water attracts birds. Full stop. And a watering hole can be anything from a trickle at a mountain seep to monsoon runoff in a retention basin, from a backyard water feature to a fishing pond, from a waterfall pool to an oxbow of a river. Waterholes are one of the most overlooked and underutilized hotspots for most birders, many of whom just want to keep moving and/or run up a big list.

The most undervalued strategy for birding at waterholes is to sit, wait, and watch. This is also what will make you a better birder. Waiting at water demands that you slow down, spend more time observing, really learning, being in the moment with the beauty and behavior of the birds that show up, their life histories, and how the environment we have modified impacts their existence.

I find waiting for birds rather than chasing them is at once both calming and exhilarating. Even if one is knowledgeable about seasonal activity, terrain,

and habitat, surprises abound at waterholes. Locally uncommon species or even rarities may drop in at any moment, but avian activity at water provides a glimpse behind the curtain into the seldom seen secret lives of even our most common birds.

Birds at water are at their most cautious, but when they become comfortable around water they let their hair down, literally. If you enjoy birds for their plumage, nothing is more breathtaking than breast feathers spread, spray and ripples reflecting unimaginable nuances of color, dark skin exposed underneath. Birds at water always provide dazzling visuals along with their unforgettable action.

Water is one of the eternal avian verities, along with light and sky. Water is life for birds, and it can add immeasurably to the birding life of birders. Water reflects light and sky. Water implies depth and distance. Water takes on form and function. Water is both dynamic and dramatic. It makes both natural history and camera captures come alive. It will add spice to your birding life.

*Jim Burns is an outdoor writer/photographer based in Scottsdale. The image captions reflect the spirit but not the official AOU bird names. Consider this an intro to Jim's Bird Quizzes found on the MAS website under Birding AZ."*



"Peregrine Rising"



"Orange Crown"

# EAST VALLEY WILDLIFE REHABILITATION LEAGUE

by Vicki Hire



**Crystal White releases a Black-necked Stilt which was hit by a car and has made a full recovery. Photo by Megan Marshall**

Meet two Arizona natives, Crystal White and Tasha Ellsworth, the newly appointed president and vice-president of the East Valley Wildlife Rehabilitation League (EVW), a non-profit 501 (c) (3) that rehabilitates injured and orphaned wildlife.

Crystal is a certified veterinary technician, specializing in neonate care. “I grew up caring for many different animals. As a young adult, I got more interested in reptiles and birds. I started volunteering with EVW as a wildlife rehabilitator seven years ago, initially caring for small mammals and then birds.” Crystal says her favorite birds to rehab are quail and songbirds.

Tasha resides in Gilbert with her young family, “Growing up with an array of animals ..., I always had a love for animals. When the opportunity arose to help wildlife, I could not resist! I have been a volunteer with EVW a little over 2 years now training and learning as much as I can, and I could not be happier!”

EVW, was organized in 1989 by retiring founder Nancy Eilersten to care for and return animals to their natural environment as quickly as possible. With a team of in-home volunteers from all walks of life and professions, EVW rescues a variety of animals from songbirds, quail, and waterfowl to small mammals such as jackrabbits, cottontails, and squirrels.

“Our biggest challenge is raising money to cover costs. Our goal in the next five years is to get a facility so we can rehab on a larger scale,” says Crystal.

For assistance with an injured animal, call or send a text message to Crystal (480) 220-6930 or Tasha (623) 224-5846. It helps to provide the major crossroads and a photo of the injured animal to determine the closest rehabber. Monetary donations are tax-deductible and should be mailed to East Valley Wildlife Attn: Crystal White, 967 S. Palo Verde Street, Mesa, AZ 85208. Also welcome are donations of towels, blankets, pet carriers, straw, and dry cat food. For more information go to [eastvalleywildlife.org](http://eastvalleywildlife.org) and follow them on Facebook.



**Tasha Ellsworth examines the wing of a Gilded Flicker Photo by Vicki Hire**



**Tasha Ellsworth with Gilded Flicker. Photo by Vicki Hire**



# ARIZONA'S DIMINISHING GROUNDWATER

Text and Photos by Vicki Hire



Trees along the Santa Cruz River in Peck Canyon suffer from a dropping water table.

As availability of Colorado River water decreases, Arizona's reliance on surface and groundwater will increase. Groundwater is essential to Arizona's diverse wildlife and ecosystems, which is third only to California and Texas in the number of species that live or migrate within Arizona's borders. Groundwater allows Arizona's streams and rivers to flow even during extended periods of drought. It supplies 40% of the water used for drinking, industry, and agricultural irrigation. The remainder of the state's water comes from the Colorado River (36%), in-state rivers (21%), and reclaimed or effluent water (3%).<sup>1</sup>

**Did you know** when rainfall or snow melt seeps beneath the surface, it is collected and stored in aquifers made of gravel, sand, sandstone, or fractured rock like limestone? The groundwater moves slowly through the geologic formations of the aquifers, which are often misconstrued as underground rivers or lakes. The amount of time that groundwater remains in an aquifer is called its residence time, which varies from a few days or weeks to ten thousand years! Some of these ancient water reserves are being depleted to supply farmlands and desert cities with water, most notably in Sulphur Springs Valley.

**Did you know** the water table is the upper surface of an aquifer that is saturated with water? There are two general types of aquifers: confined aquifers with a layer of impenetrable rock or clay above them, and unconfined aquifers with a permeable layer of soil above them. Aquifers filter the groundwater naturally by forcing it through sediment which helps to remove some but not all contaminants. Groundwater can

resurface through springs to feed streams, rivers, and lakes or through man-made wells.

**Did you know** iconic rivers critical to wildlife, such as the San Pedro and the Verde, rely on groundwater to sustain their flows? The Verde River springs that used to feed the headwaters are nearly dried up and, combined with agricultural pumping of water, five miles of what used to be the Verde headwaters are now dry. The Santa Cruz River has disappeared in sections due to years of groundwater pumping, and the San Pedro has only intermittent flows part of the year.<sup>2</sup> Draining seven states including Wyoming, Utah, Nevada, California, Colorado, New Mexico, and Arizona, as well as Mexico, the Colorado River Basin has experienced a significant decline of once common breeding birds, like the Southwestern Willow Flycatcher, Yellow-billed Cuckoo, and Summer Tanager, due to lost habitat.<sup>3</sup>

**Did you know** in 1980, the governor of Arizona, Bruce Babbitt, signed new legislation called the Groundwater Management Act (GMA) which mandated water conservation and created a state Department of Water Resources to meet government requirements in exchange for launching the Central Arizona Project (CAP)? The CAP was built to bring Colorado River water to Arizona's interior to offset declining groundwater, with the



# CONNECTING WITH NATURE MAKES ARI

first water delivery in 1985. CAP is a 336-mile-long system from Lake Havasu to 14 miles south of Tucson that diverts up to 1.6 million acre-feet of Colorado River water annually. One acre-foot is the amount of water it would take to flood one acre to a depth of one foot, - 325,851 gallons!

The average size of the CAP aqueduct is 80 feet across the top and 24 feet across the bottom with a depth of 16.5 feet.<sup>4</sup>

**Did you know** Arizona's GMA established five Active Management Areas (AMAs) - Prescott, Phoenix, Pinal, Tucson, and Santa Cruz, which limit the right to withdraw groundwater and prohibit new irrigated agriculture within those boundaries, requires new subdivisions to have a 100-year water supply, and call for a comprehensive management plan? The act also established Irrigation Non-Expansion Areas (INAs), which include Douglas, Joseph City, and Harquahala, where irrigation cannot be expanded onto acres not already irrigated prior to creation of the INA. Located outside the AMA and INA boundaries is rural Arizona, roughly 80% of the state's footprint. This law explains how a Saudi company is pumping unlimited water from the Butler Valley aquifer to grow alfalfa to ship to cows in aquifer-depleted Saudi Arabia.<sup>5</sup>

**Did you know** there is an overdraft of groundwater in portions of rural Arizona? Overdraft occurs when the pumping of groundwater exceeds the rate of recharge (replenishment) of the aquifer. Rural Arizona groundwater is governed by "reasonable use" law. There is no concern about the impact new wells will have on existing wells. Out-of-state, corporate megafarms are draining water from rural Arizona, impacting river flows, drying up wells, causing ground fissures, and endangering wildlife habitat.

**Did you know** on June 1, 2022, Phoenix declared a Stage 1 Water Alert which activated its Drought Management Plan to address the mandatory reduction of Colorado River water distribution and deeper cuts that are likely to occur in the future? The city is asking customers to voluntarily reduce their water use in ways that will have minimal impact on their lifestyles. Fixing leaking faucets and toilets is the simplest way to reduce indoor water use, while correct landscape watering is one of the



**CAP canal looking south, with the Superstition Mountain Recharge Basins which supports the Central Arizona Groundwater Replenishment Districts needs in the East Phoenix Active Management Area. The basins are currently dry.**



**Agricultural irrigation field, Gila Bend**

# ZONA A FUN AND BETTER PLACE TO LIVE!



Western Tanager drinking surface water.

most effective ways to conserve water use outdoors. Phoenix has been designated by the state as having a 100-year assured water supply. Phoenix recycles nearly all its wastewater, delivering it for use in agriculture, energy production, urban irrigation, aquifer recharge, and riparian wetland maintenance.

**Did you know** that Phoenix partnered with the U.S. Army Corps of Engineers to develop a 700-acre wetlands along the Salt River in southwestern Phoenix? The Tres Rios Wetlands is Spanish for “three rivers,” the Salt, Gila, and Agua Fria Rivers. This project created an artificial riparian habitat by pumping treated wastewater from the treatment plant to the wetlands to support plants and animals before it is discharged back into the river.

**Did you know** on average, each Arizona resident uses about 146 gallons of water per day? Up to 70% of that water is used outdoors (watering plants, in swimming pools, washing cars, etc.) especially during summer, with the remaining used indoors (bathing, cooking, cleaning, etc.)<sup>6</sup> According to the Environmental Protection Agency, the average household loses more than 10,000 gallons of water each year through leaks - the same amount of water needed to wash 280 loads of laundry, take 600 showers, or meet the average family’s water needs for a month.

**Did you know** that according to the U.S. Geological Survey, about 1,400 gallons of water are used to produce a burger, fries, and soft drink? “In the Colorado River Basin,[water used for] cattle feed...is nearly three times greater than all the water used for urban, industrial and electrical power purposes combined.”<sup>7</sup> A slow dripping faucet leak wastes about 350 gallons a year. It takes 1,800-2,500 gallons of water to produce only one pound of beef, 1,000 gallons to produce one gallon of milk, 477 gallons to make one pound of eggs, and 900 gallons to make one pound of cheese.<sup>8</sup> By comparison, fruit takes 115 gallons of water per pound and vegetables take 39 gallons of water per pound.



Tres Rios Wetland

con't from p. 15

**What you can do:**

- Fix leaks inside and outside your home
- Upgrade to water-saving toilets and shower heads
- Choose a low-water use dishwasher and washing machine
- Plant native or desert-adapted plants
- Cover swimming pools to reduce evaporation
- Consume less, recycle, reuse, repurpose, don't trash-donate

*Vicki Hire is MAS treasurer. She is establishing a natural preserve on her southeast valley property.*

<sup>1</sup><https://www.waterforarizona.com/>

<sup>2</sup>*Understanding Arizona's Groundwater, Haley Paul, Policy Director for Audubon Southwest*

<sup>3</sup><https://www.audubon.org/news/10-things-you-should-know-about-arizonas-groundwater-management-act>

<sup>4</sup><https://www.cap-az.com/>

<sup>5</sup>*Arizona provides sweet deal to Saudi farm to pump water from Phoenix's backup supply, O'Dell and James, Arizona Republic, Jun. 9, 2022 (search alfalfa and Saudi Arabia)*

<sup>6</sup><https://new.azwater.gov/conservation/public-resources>

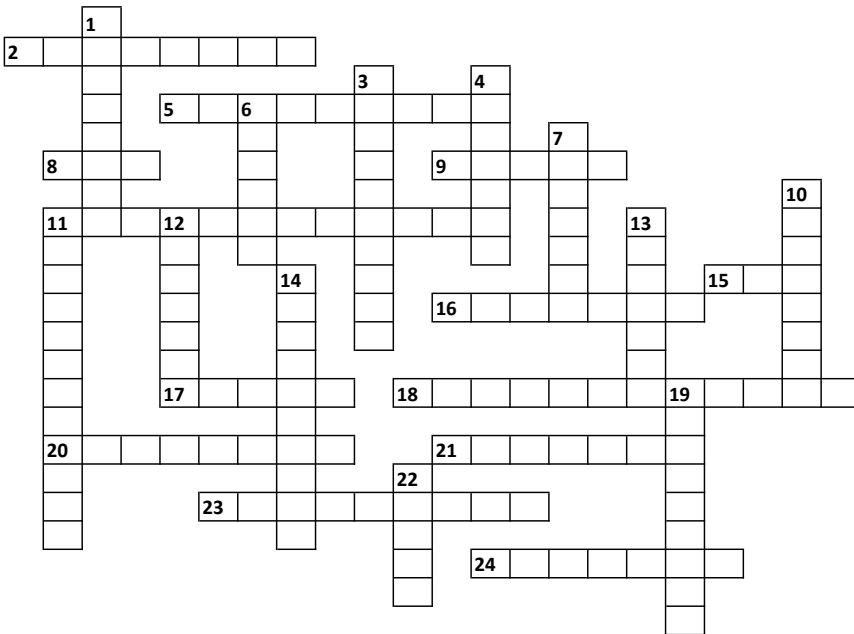
<sup>7</sup>*Ben Ruddell, Professional Engineer - Water Resources; NAU Professor, School of Informatics, Computing, and Cyber Systems*

<sup>8</sup><https://www.chc.edu/student-blogs/post/want-serve-water-eat-less-meat>



# CROSSWORD PUZZLE

## ARIZONA'S DIMINISHING GROUNDWATER



### Across

- 2 Groundwater can remain in aquifers up to ten \_\_\_\_\_ years.
- 5 Unconfined aquifers have a \_\_\_\_\_ layer of soil above them.
- 8 Rural Arizona groundwater is governed by a "reasonable use" \_\_\_\_\_.
- 9 On June 1, 2022, Phoenix declared a Stage 1 water \_\_\_\_\_.
- 11 The GMA mandated water \_\_\_\_\_.
- 15 In 1980, Arizona governor Babbitt signed the Groundwater Management \_\_\_\_\_.
- 16 The San Pedro and Verde rivers rely on groundwater to \_\_\_\_\_ their flows.
- 17 The Colorado River Basin spans \_\_\_\_\_ states.
- 18 Confined aquifers have a layer of \_\_\_\_\_ rock above them.
- 20 Groundwater supplies 40% of \_\_\_\_\_ drinking, industrial, & agricultural waters.
- 21 On average each Arizona resident uses about 146 \_\_\_\_\_ of water per day.
- 23 This occurs when pumping of groundwater exceeds the rate of recharge.
- 24 Sections of the Santa Cruz river have disappeared due to groundwater \_\_\_\_\_.

### Down

- 1 The CAP brings \_\_\_\_\_ river water to Arizona.
- 3 The upper surface of an aquifer that is saturated with water.
- 4 A significant \_\_\_\_\_ of breeding birds is due to lost habitat in the Colorado River Basin.
- 6 Tres Rios is Spanish for "Three \_\_\_\_\_".
- 7 Groundwater allows Arizona's streams & rivers to flow even in periods of \_\_\_\_\_.
- 10 The San Pedro and Verde rivers are \_\_\_\_\_ to wildlife.
- 11 Aquifers filter some, but not all \_\_\_\_\_ in groundwater.
- 12 Groundwater can resurface through \_\_\_\_\_ to feed rivers and lakes.
- 13 Tres Rios restored natural \_\_\_\_\_ by pumping reclaimed wastewater to the wetlands.
- 14 Phoenix recycles nearly all its \_\_\_\_\_.
- 19 Amount of time that groundwater remains in an aquifer is its \_\_\_\_\_ time.
- 22 Irrigation Non-Expansion \_\_\_\_\_ or INA's where irrigation cannot be expanded.

### CROSSWORD ANSWERS

11 contaminants  
12 springs  
13 habitat  
14 wastewater  
19 residence  
22 Areas

1 Colorado  
3 watertable  
4 decline  
6 rivers  
7 drought  
10 critical

17 seven  
18 impenetrable  
20 Arizona's  
21 gallons  
23 overdrift  
24 pumping

2 thousand  
5 permeable  
8 law  
9 alert  
11 conservation  
15 Act  
16 sustain

Down

Across

## Water for the Urban Wild

By David Chorlton

The lizard in the park  
was darkness on the run. Late morning on  
a heat alarm day and he turned  
into a dusty whiplash  
kicking up a few degrees behind him.

And suddenly

he was gone. Or else he  
grew a narrow trunk and sprouted leaves.  
Or evaporated,

the way water

turns to spirit and rises

through clear light. The noontime thirst  
descended. It came to rest

along the dry wash the coyotes follow  
at night when a star

directs them

to the pond a few streets

away, where they lap

at reflections of the nighthawks

who drink insects from

the desert's cup of darkness.



# BURROWING OWLS LOSING GROUND

by Shirley Anne Baker



Burrowing Owl  
Photo by Shirley Anne Baker

In the coolness of the early morning, a pair of yellow eyes peeks over the rim of a burrow in the dirt in Arizona farmland. A Burrowing Owl is preparing to hunt. Unlike other raptors, both sexes grow to the same size, 7-10" tall. And unlike other owls, they are mostly active during the day, especially in breeding season. They are the only owl in the western hemisphere in the genus *Athene*, named for the Greek Goddess of wisdom. *Athene cunicularia* translates as "wise burrower." They form permanent pair bonds and colonies of several nesting pairs. As with Turkey Vultures, they mimic the sound of rattlesnakes while nesting to thwart predators.

Burrowing Owls inhabit open, treeless areas with sparse, low vegetation in most of the western US down to the tip of Chile. They may live in burrows that they've made, but more often improve those dug by ground squirrels or other fossorial mammals. They adapt to PVC pipes and other man-made structures. Courtship entails the males flying up, hovering, then descending; gifting food, and mutual preening and cooing. The males line the nests with grasses and other material, including trash and dung at the entrance to discourage predators. They are terrestrial and more apt to run or fly low, or duck into their burrow to escape danger.

About April, the female lays 6-12 eggs. Females incubate while males provide her food. The eggs hatch in about four weeks. Both

con't on p. 19

## Book Review con't from p. 9

and 94 mya. Each of these events caused rapid ecological disruption and extinction. As Knoll notes "the rate of environmental change was as important as its magnitude."

Today, CO<sub>2</sub> levels in our atmosphere are over 420 ppm- up 66 percent from the beginning of the Industrial Revolution and up 20 percent just since 1958. It is projected to reach 450 ppm by 2040. The culprit this time is not volcanic activity. It is our burning of fossil fuels. Proof comes from Carbon-14, a radioactive isotope of carbon with a half-life of 5,730 years. Isotopic analysis shows the proportion of carbon-14 in atmospheric CO<sub>2</sub> has declined over time as it is being diluted with non-radioactive carbon from buried organic matter released when fossil fuels are burned. This decline points directly and unmistakably to the burning of coal, oil and natural gas as the major source of rising CO<sub>2</sub> levels. These are levels not seen since the Pliocene Epoch 5.3 to 2.5 mya.

On a geologic time scale, the climate change we are experiencing today is of little consequence; the Earth and life will go on and eventually the carbon cycle will rebalance. On a human time scale, however, as this book makes clear, rapid climate disruption due to rising CO<sub>2</sub> levels could make our planet a very chaotic and uncomfortable place to live, not to mention cause the extinction of many species unable to adapt to a rapidly changing environment.

*Charles Babbitt is MAS Conservation Chair.*

*Postscript: A recent ruling by the U.S. Supreme Court in West Virginia v. EPA will make it much more difficult for the EPA to regulate and reduce CO<sub>2</sub> emissions from fossil fuel burning power plants, a major source of CO<sub>2</sub>.*



The adult male typically stands guard over the burrow from a vantage point. Photo by Shirley Anne Baker

**con't from p. 18**

parents care for the owlets until they fledge in about forty days. I have been watching the burrows in the Buckeye area for many years. Fortunately, some of the agricultural land is still farmed, and thus suitable habitat for Burrowing Owls that prey mostly on insects from the fields. They will also eat small mammals and birds.

They are often perched at the entrance to a burrow, bobbing up and down to analyze their surroundings, sometimes calling to each other. They are cryptic and easy to overlook, even when in the open. They are charismatic and I enjoy photographing them with a long lens from the car so I don't disturb them.

While observing these owls, I've also observed something else – the gradual conversion of agricultural fields to urban development. I've watched an area for years, only to return one day and see it had been bladed. Alas, suitable habitat for relocation is diminishing. They are also threatened by climate change, pesticides, collisions with vehicles, shooting, hunting by cats and dogs, persecution of fossorial mammals such as ground squirrels, and more.

**What you can do:**

- Volunteer and donate to [wildatheartaptors.org](http://wildatheartaptors.org) or Audubon Southwest
- Report owls in conflict with development to Bob Fox, Wild At Heart, (480) 595-5047
- Provide a site for relocation. Contact Greg Clark (480) 961-4047
- Don't use rodenticides, insecticides or sticky traps

*Shirley Anne Baker has a BS in Clinical Laboratory Science and a master's degree in business. Her photographs and articles have been published in "Highlights for Children", and all of the "Bugs" books including Ladybug, Cricket, Spider and more.*



Juvenile has yet to develop mottled belly  
Photo by Shirley Anne Baker



Fledgling being fed by parent  
Photo by Tom Mangelsdorf



## THE ENDEARING INCA DOVE

Text and Photos by Tom Mangelsdorf

According to some early accounts, thirsty pioneers of the desert southwest would follow Inca Doves hoping that the birds would lead them to nearby water. Inca Doves would fly up to ten miles in search of water when their normal diet of seeds and grains failed to provide enough liquid. Today however, bird lovers simply enjoy spotting these endearing little birds.

Inca Doves' historic range has expanded northward from Costa Rica; following human settlements and irrigated fields, they are now common in the desert Southwest. Despite their name, they did not live in the ancient Inca Empire of South America. Given this territorial inaccuracy, the AOU's North American Classification Committee considered a 2011 proposal to rename them (slightly less inaccurate) "Aztec Doves." The proposal failed.

Their populations are expected to expand as human numbers grow. House cats and Cooper's Hawks are their primary predators. A few years ago, the unofficial state ornithologist, Troy Corman, noted that Inca Doves had disappeared from Tucson after rising winter temperatures ended the winter migration of Cooper's Hawks, thus adding to the toll of predation.

Inca Doves are distinctive for their diminutive size, white outer-tail feathers, rusty primaries (seen in flight),



Inca Doves have distinctive rust colored primaries.



and dark-tipped feathers which resemble fish scales. Often seen cooing and bowing close to their mate, they are monogamous and sometimes form life-long relationships. They huddle to conserve body heat in cold weather, either with their mate or stacked in pyramids of up to twelve birds.

A flock of Inca Doves is sometimes referred to as a “dule,” derived from the French word “deuil” for “mourning.” Indeed, their mnemonic call is “No hope.”

Whether you're looking for a water hole or simply out in the field, stay on the lookout for one of these charming desert dwellers.

*Tom Mangelsdorf is a thirty year resident of Scottsdale who enjoys photographing all aspects of the Sonoran Desert. For the past ten years he has concentrated his lens capturing the wondrous beauty of the area's bird life.*



Dark tipped feathers create scaled effect. Inca Doves sometimes form life-long relationships.

# NATURE THROUGH THE ARTIST'S EYE: WALT ANDERSON

Walt Anderson is an accomplished author, wildlife artist, photographer, lecturer, and expedition guide who taught environmental studies courses for 27 years for Prescott College in Arizona. He is a Signature Member of Artists for Conservation, a group of professional wildlife artists who also have contributed significantly to conservation work through their art: ([artistsforconservation.org/artists/8278](http://artistsforconservation.org/artists/8278)). Walt will be leading a Madagascar Ecotour this September/October, and a Tanzania safari in February 2023: ([search Cheesemans Tanzania](http://search.cheesemans.com/tanzania)).

**Artist Statement:** My goal as an artist is to interpret an organism with love, respect, and fidelity to essence. I love the delicacy of watercolor, which, though typically unforgiving as a medium, allows me to depict the softness of feather and the hardness of beak and claw equally well. I am now experimenting with other media, as the artistic process is enriched by media diversity the way a forest or grassland is enhanced through biotic diversity. Marvel at the beauty of an animal well portrayed, and you can for a moment escape the confusion of modern society and connect with something much bigger and grander.



*Feisty Finery: Anna's Hummingbird,*  
2022, 9" x 11", watercolor

The brilliant iridescence of a male Anna's Hummingbird is part of his reproductive strategy: attracting mates and repelling rivals. What an interesting challenge to convey with watercolor!

*Aircraft Carrier: Black Rhino and Red-billed Oxpeckers,*  
2021, 14" x 12", watercolor

2022, 11" x 16", Acrylic  
Critically endangered, Black Rhinos have been pushed to the brink of extinction by human demand for their horns, either for supposed medicinal properties (completely apocryphal) or for fancy dagger handles (male vanity). My painting shows 11 Red-billed Oxpeckers foraging on parasites on the massive body of a rhino. If Africa's megafauna should go extinct, other species would surely suffer, as well. The fate of these remarkable creatures is entirely in the hands of humans.





*Pint-sized Predator: Pearl-spotted Owlet,*  
2021, 10" x 8", watercolor

I have led safaris in East Africa for over four decades, and I believe that we should seek out and appreciate all of biodiversity. Safaris that concentrate on the "Big Five" miss so much. As an artist, I also want to celebrate the smaller, yet remarkably beautiful, creatures that don't get the exposure that the megafauna like elephants, rhinos, lions, and the like do. Let's spot those little pearls too!



*Riparian Riches: Wood Ducks,*  
2021, 14" x 12", watercolor

Riparian areas are already scarce in Arizona, and climate change predictions could mean the loss of all Wood Ducks in Arizona in about 30 years. I find watercolor to be the ideal medium to indicate texture in both birds and trees.

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Annual membership in MAS as a Friend gives you discounts on merchandise and books at our meetings, and guarantees a print subscription to The Cactus Wren • dition. 100% of your dues goes directly to MAS and its mission.

To become a Friend of MAS sign up at our Book Table at a monthly meeting; join online at [maricopaaudubon.org/join](http://maricopaaudubon.org/join) ; or send your name and address, phone or email along with a check to the MAS treasurer (right). We offer student/youth memberships for \$10/year, and base memberships for \$20/year. All dues above the base fee are considered tax-deductible donation.

## SUBMISSIONS

Copy for The Cactus Wren • dition must be received by January 15, April 1, July 1, and October 1. Articles not received by the deadlines may not appear in the upcoming issue. Some issues feature a theme. Feel free to enquire and take the theme into account. Editor: Laurie Nessel [laurienessel@gmail.com](mailto:laurienessel@gmail.com)

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The opinions expressed by authors in this newsletter do not necessarily reflect the policy of NAS or MAS.

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