

Shape the Future

Canyon Chatter

Friends of Madera Canyon

January 2025



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On the Cover. A view of the Santa Rita Experimental Range. Be sure to read Sarah Noelle and Brett Blums' historical overview of the SRER. The SRER surrounds much of Madera Canyon and shares much of its natural history.

Errata from November's Chatter. Cover illustration of Loggerhead Shrike was by Doug Moore. Photo credits from the Birding Report: Ladder-back Woodpeckers. From the United States and Mexican boundary survey, made under the direction of the secretary of the Interior by William H. Emory. (Volume on Birds, edited by Spencer Fullerton Baird.)

Ruby crowned Kinglet. NPS / Jacob W. Frank. Public domain scan of print / book page depicting birds, ornithology, free to use, no copyright restrictions image. Poison Ivy, *Toxicodendron radicans*. National Parks Gallery. *Ornate Treelizard, Urosaurus ornatus. JCM-Bewicks Wren, Thryomanes bewickii* pixabay.com

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Send comments, articles, & announcements to: Friends of Madera Canyon Chatter Editor email: FOMC.Chatter@gmail.com

How to Join Friends of Madera Canyon

Below are links to join as a new member, renew a membership or make a donation. The links will take you to a secure server to use a credit card or an automated payment. Do you have any questions? Let us know. If you prefer to help by writing a check, please make your check payable to Friends of Madera Canyon - mail to:

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Links

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From the President

Thank You Letter

After the holidays, Mom required us to write thank you notes to the people who had given us presents. There were the usuals—Nana and Poppa Braem, Nana and Poppa White, and Mom’s cousins Lillian and Catherine. Adopted aunts, Lorene and Marie, and Uncle Gene, also adopted, probably gave me gifts some years; that memory is less distinct. What is clear is that I was one lucky kid.

I was well-trained, too. To not write a thank-you note or express gratitude in person for a gift or a kindness is unthinkable. In that spirit, I ask you to think of what follows as a thank you note from that blessing of nature which binds us together in the Friends of Madera Canyon.

Thank you to the 774 people who are members of the Friends. It is you who provide on-going financial support for the work we do on behalf of the Canyon and those who enjoy its beauty. Thank you to the donors who contributed over \$33,000 in general and memorial donations, and those who supported Music in the Canyon, the Friends’ only fundraising event, with their ticket purchase.

Thank you to the more than 100 volunteers working in various capacities in the Canyon for giving time, an irreplaceable resource. When assigned a dollar amount per hour computed by the Forest Service, that time equaled well over \$250,000 of value. We know that our reports do not capture every hour, so that value is most certainly even higher. For a federal agency that is perennially underfunded, the time our volunteers contribute is recognized by the USFS as vitally important to their achieving their mission.

These volunteers include those who welcome visitors at the Visitor Information Station and on trails as Ambassadors; those early risers who clean the picnic areas after every weekend; those who “brush” trails or work to restore blown-out trails and areas on the forest floor laid bare by excessive human traffic; the docents and subject experts who assist Doug Moore when school groups and others visit; the folks who staff tables at various events in the area to share the story of the Canyon; those who collect car counts for the Forest Service; those who produce information for the benefit of the public, through the FOMC website, Canyon Chatter, NABUR, and stories in the newspaper; those who serve the Friends as members of the Board of Directors or committee chairs; and those who perform any act of kindness to any part of the Canyon or any visitor.

Thank you to the funders who have granted the Friends the dollars to complete the many specific projects we did in 2024: refinishing the picnic tables, improving our website, replacing benches, improving stair steps, purchasing equipment that our trail crews use, and completing the replacement of all fire grills in the picnic areas. Freeport McMoRan, Vulcan Materials, Country Fair White Elephant, the Greater Green Valley Community Foundation, the Burton Family Foundation, and anonymous donors; these are our partners in 2024 in providing the Canyon with key infrastructure repairs/replacements and FOMC with valuable improvements in our avenues of communication with the wider community.

Finally, thank you to those of you, a number unknown to me, who have stated your intention to include bequests to the Friends of Madera Canyon in your estate planning. I think all of us hope that the gifting in this instance happens later rather than sooner. But those of us of a certain age accept that, one day, we will all depart from this earthly existence. What the bequests say to those who will remain is that we wanted others to have the opportunity to find the same joy and peace we have in Madera Canyon. My list of people to thank is long, as you have seen. I still think that I am one lucky kid. **Continued on Next Page.**



SPECIAL THANKS

Below is an announcement that Dr. Tom Purdon is rotating off of the Honor Wall Committee. Tom earns special thanks for his co-creation of the Honor Wall with Jim Woodward, and for his many years of service to the Friends of Madera Canyon. Tom and Jim advocated for the Honor Wall with the Forest Service, a task requiring time, tact, and tenacity, and they established a committee to develop and implement policy and procedures for inclusion on the wall. Tom served as President of the Board of Directors at a time of significant contribution by the Friends to Madera Canyon and the work of the Forest Service. And, he has been a stalwart in defending the natural beauty of both Madera Canyon and the Santa Rita Sky Island.

One could not write the history of Madera Canyon without encountering the name Tom Purdon many times. So, Tom, many, many thanks.

Dan White, FoMC President



Communications

FoMC Web Site



FOMC is undertaking a major overhaul of the website which could be completed in mid-January. Some changes you will see:

- *The Home Page will be slimmed down a bit for better viewing on a SMART phone.

- * The new Family Activities page will be found under the Activities tab. It will have sections on Picnicking, Camping and Cabins, Hiking, and Games.

- *A “Search” icon at the far right of the upper menu bar.

- *Under the Madera Canyon tab, a new section called Canyon FAQs with answers to some questions that we often hear asked at the Visitor Information Station and organized into subsections for Birds, Animals, Canyon Geology, and Activity.

Family Activities

Families can do numerous activities in Madera Canyon as a group. These activities range from picnicking, hiking, and camping to simply playing games and enjoying nature together.

*The Education section will have a major reorganization. The four sections under the Education tab are Adult education, Students Education, On-Line Learning, and Videos. Click on the Education tab itself for an overview. Take a look at the Upper Level Learning Resources, as new material appropriate to all readers has been added. And the Video menu item now makes it easier to find the videos. This link to Videos now appears in other places on the website as well.

Please send general comments, suggestions, etc. on the website to Jim Burkstrand, Web Master, FOMC.BOD@gmail.com. Please send general comments, suggestions, etc. on the Education Page to Doug Moore, Director of Education, FOMC.Education@gmail.com.



The Birding Report

Rare Birds in the Canyon – 2024

Bob Pitcher

Many people come to Madera Canyon for its birds, for which our Canyon – and all of Southeastern Arizona, for that matter – is justly famous. Birds rare in the rest of the United States are regularly seen here, as well as strays from the East and the northern plains and mountains that can show up in the winter. During fall and spring migration, who knows what may turn up? So every year rarities are reported from Madera Canyon.

This year has been no different, except that last winter in the Canyon was relatively so severe that few birds, rare or not, were reported until spring was under way. Here I note nineteen reports I think worth a mention. A few pertain to birds whose ordinary range reaches little if any farther north, and which are typically found in Mexico and points south. Others are eastern strays that took a wrong turn in migration and wound up in the Canyon instead of the Gulf Coast. And there are a couple of species that while not terribly uncommon in southern Arizona, are almost unheard of at Madera's elevation. I also include three species that appear on the federal Endangered Species List for Arizona and which are found here in small numbers.

I have not included birds that while rare in the rest of the country are easily seen in the Canyon – birds like three of my favorites, the Bridled Titmouse, Yellow-eyed Junco, and Painted Redstart. Nor have I included birds that are only seasonal rarities -- a species that may be common in Madera in the summer that was seen late in the fall, when it should be far to the south. What's here are species that are unusual to see in the Canyon at all.

A word is needed on my source for these sightings: Ebird, www.ebird.org. Thousands of birders around the world report the birds they see at this site, according to the place – the Hotspot, in Ebird terminology – they found them, with the numbers seen, the date, and any notes they may want



Berylline Hummingbird (*Saucerottia beryllina*). Photography Charles Sharp and Wikipedia.

to add. For each Hotspot, Ebird posts a list of the species seen, arranged according to the latest date a species was reported. Because of its unusual diversity of habitats, Madera Canyon has been assigned 18 Ebird hotspots, from Proctor Road up to Josephine Saddle. So a birder perusing Ebird knows where a given species was seen in the Canyon, and the last day on which it was reported.

One must rely to an extent on the expertise of other birdwatchers in knowing what it is they're looking at, but Ebird does demand details for unusual sightings. Such sightings are reviewed, and sometimes queried further and eventually rejected.

Appropriately, perhaps, the two rarest birds this year were hummingbirds. A **Berylline Hummingbird**, a Mexican species common around Mexico City, appeared in early spring at the Canyon feeders and seems still to be coming to them as I write this in the middle of December. There's been a Berylline in the Canyon most of the last six or eight years, from spring through fall. A **Plain-capped Starthroat** appeared for a day or two at the Santa Rita Lodge late in September, another Mexican visitor.

A couple of rare hawks were seen soaring over Madera during migration. **Common Black Hawks** were seen during both fall and spring migrations. This is perhaps to be expected, since in the summer there are some 300 or more breeding pairs at various places in southern and central Arizona. Most follow the Santa Cruz River valley north through here, but they nest in more mountainous country. And a **Short-tailed Hawk** was seen in both May and June soaring over the upper Canyon. This species seems slowly to be colonizing some of the higher Sky Island ranges in Arizona, and a few pairs breed fairly regularly now in the Catalinas and Chiricahuas. We can hope for a pair in the Santa Ritas too, but there was no evidence of breeding this year.

Every year now it seems that the eastern **Yellow-bellied Sapsucker** shows up in Madera in the fall, along with the Red-naped Sapsuckers that are expected here. At least one Yellow-bellied has been seen this year since early in November. And a **Red-breasted Sapsucker** was found at Proctor Road at the end of October, along with a hybrid Red-breasted/Yellow-bellied farther up the Canyon. It's possible a Yellow-bellied might stay the winter.

A couple of rare Flycatchers were reported during spring migration. A **Buff-breasted Flycatcher** was seen high in the Canyon early in May and then again early in June. The spread of dates indicates the species may have nested here, though there's no direct evidence of that on Ebird. Carr Canyon in the Huachucas is the place to look for the Buff-breasted. A Thick-billed Kingbird was reported from Whitehouse Picnic Area one day in late May, and not



Short Tailed Hawk by Dario Sanches from São Paulo, Brazil. *GAVIAO-CAUDA-CURTA* (*Buteo brachyurus*) Uploaded by snowmanradio, CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=29745919>

again. This species is found in this country only in southern Arizona, and is not common even here. It has recently nested annually along the Santa Cruz in the neighborhood of Tumacacori, but seems to need permanent water that Madera rarely provides in early summer.

A **Bank Swallow** was seen and convincingly identified in the Canyon early in September. Uncommon in migration throughout Arizona, there seems to be no other record of a Bank Swallow ever being seen in Madera!

A **Winter Wren** was reported from the Upper Canyon late in October. This is presumably an eastern stray, even rarer in Arizona now that the closely related Pacific Wren has been split off from the Winter. Keep a lookout for this one in brush piles, as it might just stay through until spring.

A race of the **Eastern Bluebird** is found in Southeastern Arizona, along with the more common Western Bluebird. The Eastern is so unusual in the Canyon, however, that when the Friends revised our Madera birdlist last year, the Eastern was moved to the Accidental category from merely Rare. But a group of three Easterns was seen at the Madera Picnic Area in September.

In much the same category as the Bluebird was a report of a **Lawrence's Goldfinch** from the Santa Rita Lodge in October. The Lawrence is essentially a California bird, seen in small and occasionally in large numbers in Arizona in autumn. But these are lowland birds, practically never seen in mountain canyons.

Another finch, a **Purple Finch**, was reported from Proctor Road early in November, probably also a stray from California, though it might conceivably have flown here from the East, where they're also common.

Two warblers of interest were reported this year. A **Louisiana Waterthrush** has been moving up and down Madera Creek since at least late in August, and is still being seen into December. These eastern birds are rare but regular in southern Arizona in the winter, but worth a note. Much rarer was the **Bay-breasted Warbler** in breeding plumage reported on the Carrie Nation Trail for a couple of days in early June.

Rose-breasted Grosbeaks were reported off and on this year in May, July, and late October at various places high and low in the Canyon. This species is closely related to the Black-headed Grosbeaks that are common here. It might be worthwhile to watch for Rose-breasted/Black-headed hybrids.

Finally, all three of the recognized Endangered species that breed in the Canyon at least sporadically were reported here in 2024: the Yellow-billed Cuckoo, the American Goshawk, and the Spotted Owl. From the reports, it seems likely that the latter two species bred in the Canyon this year – the Goshawk certainly did last year.

A Happy 2025 to All!



Red-breasted Sapsucker, (*Sphyrapicus ruber*). iNaturalist.



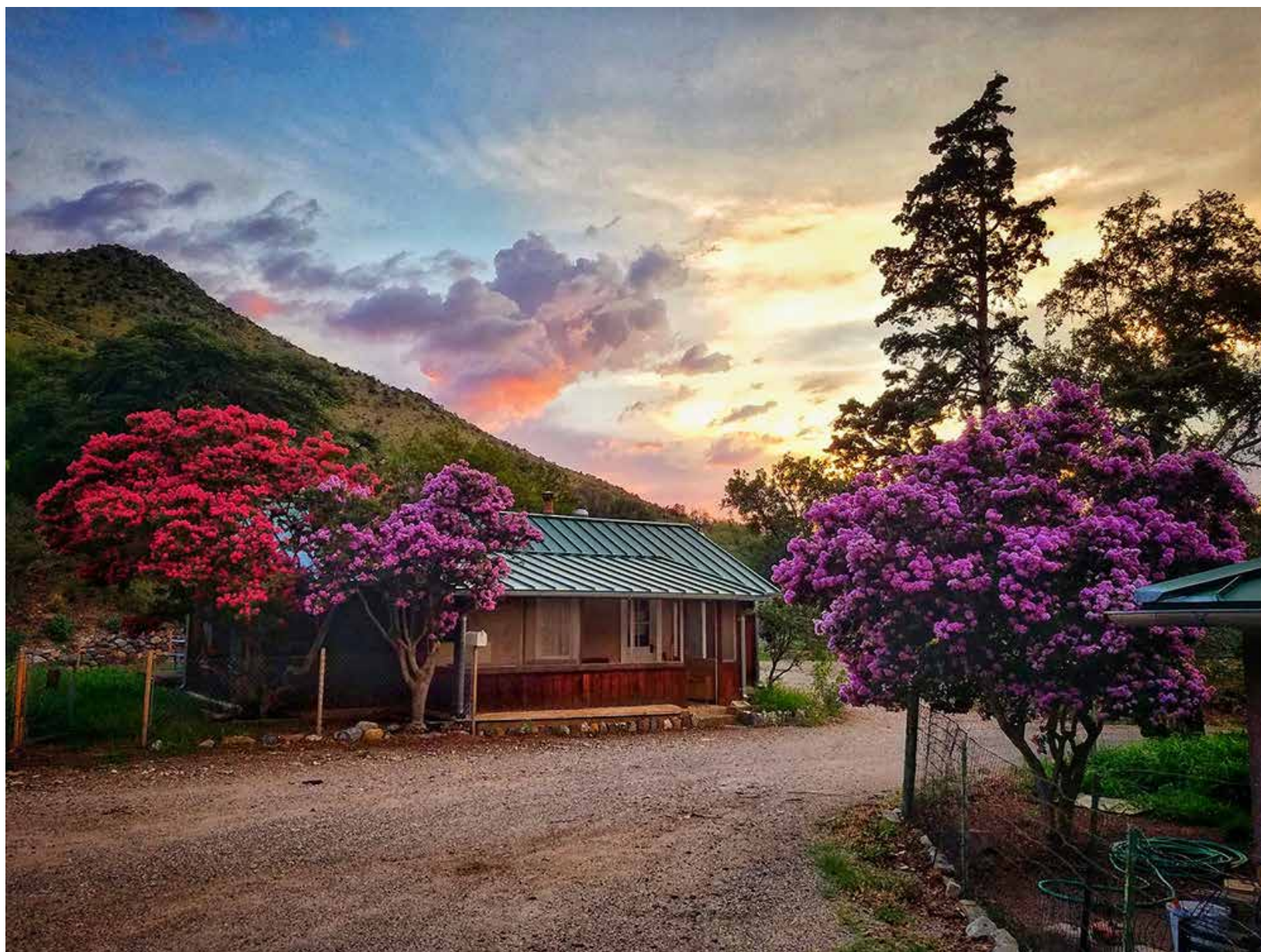
Winter Wren, Photo from Pixabay.com



The Santa Rita Experimental Range: *a brief history of ecological study in a semi-arid ecosystem*

Sarah Noelle and Brett Blum

Introduction



Headquarters of the SRER. Photographer Unknown.

Nestled in the heart of Southern Arizona, the University of Arizona, Santa Rita Experimental Range (SRER) is a prominent example of experimental field stations' role in shaping ecological study, education and outreach here in the Southwest. Located 45 minutes south of Tucson, this research facility is comprised of roughly 52,000 acres of Sonoran upland, mesquite savannah and oak woodland in the shadow of the Santa Rita Mountains. The SRER is the oldest experimental rangeland in North America and is among the top five oldest biological field stations in the United States. Originally founded to examine ecological interactions of livestock grazing and rangeland studies, this ex-

perimental rangeland now serves as a broad scale ecological laboratory managed by the University of Arizona, Arizona Experiment Station as a part of the UA land grant mission.

Worldwide, grass and shrublands account for roughly 50-60% of the earth's terrestrial environments (excluding Antarctica and Greenland). Within this context, the SRER and surrounding area are among the most biodiverse regions in the United States and serve as home to a wide array of plant and wildlife species. Many of these species are endemic only to the Sky Islands of southern Arizona and northern Mexico with some species found only within the Santa Rita Mountains. This biodiversity paired with global relevance as a semi-arid rangeland make the SRER an ideal location for critical research in conservation, sustainable land use practices and environmental change.



History and Establishment

The legacy of the SRER is rooted in the conservation movement of the early twentieth century. The waning decades of the 1800's saw an exponential growth of Arizona's cattle population. Tax assessments of cattle numbers in Arizona in 1891 estimate roughly 900,000 head statewide, with 377,474 head concentrated across Pima, Cochise, Santa Cruz, and Graham counties. For comparison, the human population of the Arizona Territory in 1890 was listed as 88,243, according to the US Department of Commerce. This elevated density combined with a multi-year drought from 1890-1893



Figure 2. Florida Station from above. Photographer Unknown.

that resulted in the die of 50-75% of the cattle across Pima and Pinal counties alone by late summer 1893. The event was a turning point in livestock management. The open space of the West was no longer to be viewed as an inexhaustible commodity but rather a finite resource in need of balance and further understanding. This change in perspective would ultimately have wide range of implications for ecological study and habitat management.

Robert Humphrey Forbes moved to Tucson in 1894 as a young professor and chemist for the *Arizona Agricultural Experiment Station* [Arizona Experiment Station today] at the University of Arizona. Forbes was influenced by what he saw in the years following the drought of 1890-1893 and began to take note of changes in landscape function he attributed to high density grazing practices. In 1901 Forbes stated, "The ruinous methods which seem inevitable upon a public range, which, being everybody's property, is nobody's care..." This acknowledgement, born from the *Tragedy of the Commons*, set in motion a desire to better understand the mechanisms and economics of grazing practices across the American West.

Around this time Gifford Pinchot, the pioneer of the United States Forest Service, was making progress in the conservation of America's timber harvest. Much like Forbes, Pinchot acknowledged the finite capacity of America's forests to meet growing demand for timber during the ongoing development of the West. As head of the Division of Forestry (the precursor to the US Forest Service) Pinchot advocated for the continued establishment and study of forest reserves to promote "planned use and renewal" under the Forest Reserve Act of 1891.

Robert Forbes met Gifford Pinchot at the American Forestry Association annual meeting in Denver, Colorado 1901. It was there Forbes persuaded Pinchot of the need for a large-scale reserve "for a proper economic and scientific study of the problems involved in unrestrained, open range grazing." Together Forbes and Pinchot presented their idea of an experimental range reserve to Theodore Roosevelt who had only recently ascended



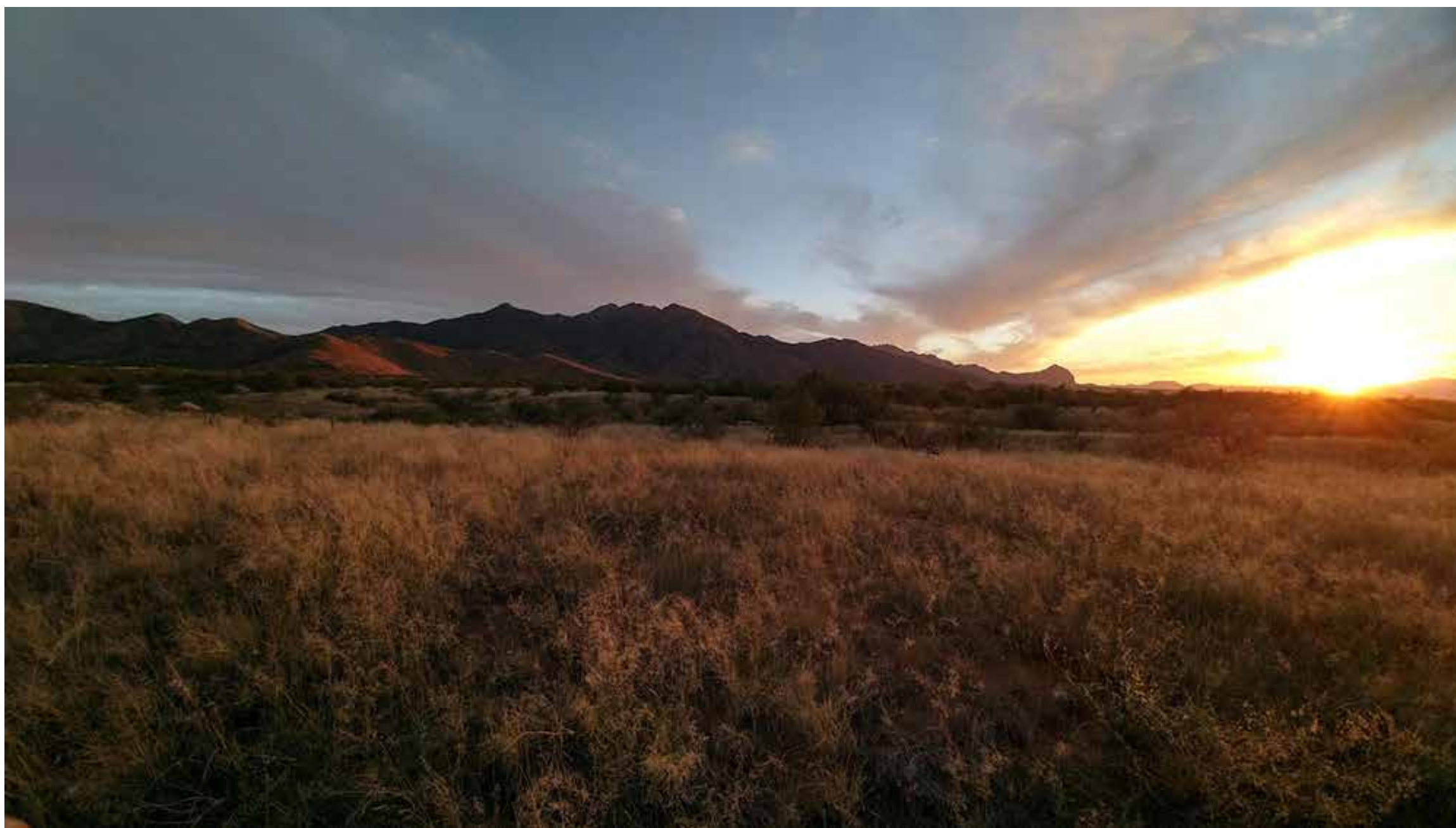


Figure 3. The view of the Santa Ritas. Photographer Unknown.

to the Presidency following the assassination of William McKinley. True to character, President Roosevelt seized on the idea and on April 11, 1902, issued Proclamations 467 and 468 establishing the San Isabel Forest Reserve of Colorado and the Santa Rita Forest Reserve (Santa Rita Experimental Range today) of Arizona. These were to be the very first federal lands reserved by President Roosevelt as a part of his long legacy of conservation minded actions. Though the Santa Rita Forest Reserve was designated as such, J. J. Thornber, a botanist and contemporary of Forbes at the U of A, states: “its [SRER] purpose was expressly understood to be the study of grazing range problems with a view, if possible, to a demonstration on a large and convincing plan, of range restoration and control.”

True to its designation the early years of the Santa Rita Forest Reserve were spent examining practices regarding revegetation and recovery. It was also during these early years that one of the most informative long-term data series began to develop. Across the range numerous repeat photography stations were established to visually assess change in range dynamics over time (<https://santarita.arizona.edu/data-resources/data-download/repeat-photography>). This ongoing data series continues to be one of the most enduring legacies of the SRER today.

Federal management efforts of this time were hyper-focused on conforming grazing practices to a fixed rate or fee structure across the West. As a result, there was pressure to develop a metric of fixed carrying capacity or stocking rate that was both easily conveyed and repeatable on a large scale. This simplistic financial imperative was at odds with the observations of the early researchers of the SRER. Much of the terrain on the early SRER was still largely denuded as a result of grazing practices from the decades prior. Erosion like channeling and head cuts





Figure 4

American Association for the Advancement of Science group at Rodent Station during the field trip over the Santa Ritas. 4-25-30

Photographer unknown.

and other factors related to grazing practices on the SRER. While primary research efforts through 1945 continued to focus on rangeland recovery techniques and the streamlining of grazing efficiency, new topics of study were also being implemented on the SRER. Research initiatives began quantifying wildlife/livestock interactions and focused

largely on competition and the perceived range degradation by rodents, lagomorphs and whitetail (Coues) deer. As a result, the formative ecological studies of this time were still largely a byproduct of an effort to maximize the utility of rangelands for economic gain.

The years following World War II saw a continued broadening of research focus on the SRER. While revegetation and range recovery efforts were still ongoing, new attention was also being paid to shrub and mesquite encroachment. The proliferation of woody species, documented decades earlier, was now reaching a grand scale across the research range. Questions of landscape function and habitat alteration became more common in trying to understand how the density of mesquite affected cattle forage, nutrient cycling and soil health. A decades long focus on vegetation control efforts ensued with varying degrees of success and consequence.

Despite intensive effort, the battle to manage mesquite began to wane in the mid 1960's. A multi-



Figure 5.

University of Arizona Bus at Box Canyon
Photographer Unknown. January 10, 1930.



tude of treatment methodologies resulted in only limited success in the implementation of effective shrub control practices. Revegetation and restorative efforts of this time lessened as did the number of mesquite studies overall. The economics of cattle grazing was still a prominent feature of the SRER but the concept of reverting back to the static state of a semi-arid grassland was now diminished and new attention was paid to better understand drivers of environmental change.

Grazing practices now began to include increased periods of rest and adaptive shifts based on measured forage availability. This approach was headed by Clark Martin who examined in detail the relationship between grazing, forage production, rest periods and drought cycling. All indicators from this period point to a renaissance of thought regarding the dynamic nature of ecosystem function on the SRER. Martin's work was among the first published on the benefits of pasture rest to promote long term forage production and rangeland health. Furthermore, Martin and others began to recognize the potential of grazing as a management tool when used properly. From this point forward livestock were managed as a component of the ecosystem that both contributes too and derives benefit from its environment rather than an extractive practice solely for profit. The effects of this novel change in perspective continue to inform adaptive management practices the world over.

The once denuded lands of the early SRER have now been transformed into one of the most productive rangeland systems in southern Arizona. This eventual breakout of ecological study and sustainability on the SRER was the logical end point for the progression of research that began on the range nearly a century before. Land management and grazing practices pioneered on the SRER are now represented globally with contributions including principles of rotation grazing, forage production and utilization monitoring, ecological modeling, and adaptive management techniques. In partnership with the Santa Rita Ranch LLC. the SRER continues to advance methodologies and understanding of sustainable environmental stewardship.

The University of Arizona

What started in 1902 as a novel concept for measuring landscape function and grazing has since developed into an internationally recognized research facility for semi-arid ecosystems. While the University of Arizona always maintained an influential role in the research of the SRER, management of the facility officially transferred to the Arizona Board of Regents and UA following a federal land swap for establishing the Buenos Aires National Wildlife Refuge in 1988. Under direction of the University of Arizona the research initiatives of the SRER have expanded ever further.

In his essay *Wilderness as a Laboratory* [*A Sand County Almanac, 1949*], Aldo Leopold put forth the idea that “A science of land health needs, first of all, a base datum of normality, a picture of how healthy land maintains itself as an organism.” Long-term datasets from the SRER have played a unique role in advancing our understanding of the dynamics of semi-arid ecosystems. Though we know now there is no static state, the data derived from the SRER provides significant insight in establishing Leopold's *base datum of normality* by aiding in the identification and characterization of the primary drivers of ecological change. Studies from subsurface soil nutrient cycling to fluxes in atmospheric composition and all points in between now inform our broader perspectives, with the predictive insights of ecological modeling first sought by Forbes and Griffith's now a reality. These data are all publicly available and hosted on the SRER website, comprising one of the world's largest ecological data series. The opportunity to pair and leverage these data with emerging technologies including virtual fencing, advances in remote sensing and a device driven Internet of Things (IoT) approach to continuous environmental monitoring now round out the utility of the SRER as a leading institution in ecological research.



Education support and outreach have always been central tenants of the SRER mission in addition to the SRER research profile. The range serves as an outdoor classroom for students, educators, and the public. Through field trips, workshops, and hands-on learning experiences, participants gain a deeper appreciation for the complexity and beauty of desert ecosystems. The SRER's educational programs inspire the next generation of conservationists and scientists, fostering a sense of stewardship for our natural world. Community engagement is further strengthened through collaborations with local schools, universities, and conservation organizations. These partnerships provide unique opportunities for experiential learning and community involvement in ongoing research and conservation projects. By connecting people with the natural environment, the SRER helps cultivate a community that values and actively participates in the preservation of desert ecosystems.

Visit and Support

Opportunities abound for partnership and collaboration. We encourage the Friends of Madera Canyon community to explore the Santa Rita Experimental Range and experience the diversity of work being done to advance our understanding of rangeland ecosystems. Whether you're a nature enthusiast, a student, or simply curious, the SRER offers a wealth of knowledge and a chance to connect with Arizona's natural heritage in compliment to the incredible resource that is Madera Canyon.

There are many ways to support the SRER including volunteering with the SRER Range Patrol, participating in citizen science projects, donating to help fund ongoing research and conservation efforts or simply by helping to spread the message on the unique history and value of all that desert landscape east of Green Valley and Sahuarita. It is community support and recognition that make the SRER what it is today.

For more information on how to visit or get involved, please visit us at www.santarita.arizona.edu or contact the Southern Arizona Experiment Station (SAES-Admin@arizona.edu).

Sarah Noelle is the Research Manager, Senior Research Scientist and the Executive Coordinator for the Santa Rita Experimental Range. Brett Blum is the Director of the Santa Rita Experimental Range. Recently, members of the FoMC Board and Brett Blum, Director of the Santa Rita Experimental Range, have begun conversations about possible ways in which the FoMC and SRER might collaborate to the benefit of the wider community. We invited Brett and Sarah Noelle to introduce SRER to the FoMC community as an important first step in making the case that we share important interests in the ecology of the Santa Rita Sky Island



The Editors' Desk

Interested in Hummingbirds?

A recently published article in the German journal *Jahrbuch für Goetheanismus* by Mark Riegner looks at hummingbird biology using comparative morphology. [Don't panic; the article is in English, not German.]

Hummingbirds hold many records in the world of birds, and Riegner looks at some of the extreme anatomy found in hummingbirds. He discusses how hummingbirds display extreme characteristics, from their tiny size (three grams) to their shimmering coloration, from their highly elaborated wing structure and advanced flight mechanics to their disproportionately large brain, and from their super-rapid wingbeats, enabling an ability to hover in place in three-dimensional space, to their racing heart and fast breathing rate, thus enabling these birds to exist at the edge of physiological possibility for an endothermic vertebrate. Riegner also compares the hummingbirds to the largest bird, the Ostrich, and the hummers' closest living relatives, the swifts. The article also examines the relationships between hummingbirds and people.

[The article is available on-line from the author's Research Gate page.](#) Mark F. Riegner is on the Faculty Emeritus, of the Environmental Studies Department at Prescott College. [Note there is a 6 euro download fee for a PDF. But you can read it on-line for free.]

Citation

Riegner MF. 2024. Flight of Shimmering Light: Exploring Insights into Hummingbird Biology from Comparative Morphology. Yearbook for Goetheanism 2024 :129-172 DOI: 10.18756/jfg.2024.129



Hovering is one of the extreme behaviors of hummingbirds. JCM

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John C. Murphy, Dan White, Penny France. Birding Report Columnist Bob Pitcher. Education Report Columnist Doug Moore.



Scout Troop 247, Nature Trail



Scout Troop 247, Nature Trail interpretive sign assessment hike, Dec. 14 photo credit: ScoutTroop 247. One more Thank You Note: The young women of Scout Troop 247 and their leaders have been engaged in many projects this year to the benefit of Madera Canyon and those who visit it. The photo above records their latest project. FoMC thanks and applauds the troop for exercising its “habit of helping” in the Canyon and looks forward to many more times we get to say thank you to the scouts who chose their troop number (24)(7) to indicate how much they want to be of service to others.

**Send comments, articles, & announcements to:
Friends of Madera Canyon Chatter Editor
email: FOMC.Chatter@gmail.com**

