Field Report 2025 - Chiricahua Sky Island
An Independent Ecological Study

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CHIWI KAWI



Abstract

This field report details the environmental dynamics of the Chiricahua Mountains in SE Arizona. Adding to the previous 2022-2023 field report, these observations begin with the impact of the 2023 summer monsoons and the extreme drought conditions leading into 2025. Extraordinary stories from 2024 include wildlife observations of blonde and ginger coati, a lone wolf, jaguar tracks, and a yearling bear. It uncovers more of the adaptive responses of the forest ecosystem in the aftermath of the Horseshoe II wildfire in 2011 that burned more than 200,000 acres. Through observational methodologies, the report reveals a dominant 3-5 year ecological cycle characterized by recurring climate events, such as monsoons and wildfires, influencing species distribution from Mesquite to Douglas Fir across varying elevations. The findings indicate a remarkable interplay between flora and fauna, showcasing inherent conservation behaviors among trees during drought conditions and adaptive wildlife strategies in response to hydrological changes. The Chiricahua Mountains, as a unique geological formation and cultural landscape, serve as a critical site for understanding ecological resilience amid climate change. The report is structured chronologically, capturing the dynamic and evolving relationships within this diverse ecosystem through detailed monthly observations and narratives of extraordinary occurrences.

Summary

Chiwi Kawi, meaning "Turkey Mountain" was so named by the Opata people for the mountains we now know as the Chiricahuas. This Chiricahua field report picks up where it left off in the previous report in May 2023. It starts with the monsoon season of the summer of 2023 and continues on with more details about forest ecology, drought, a wildfire in July 2024 and exciting reports of blonde and ginger coati, a lone wolf, jaguar tracks, a curious yearling bear and amazing synchronicity amongst some very old trees. 2024 was a year of extreme drought and it continues on as same into 2025. However, not all sides of the mountain act the same and this report will capture the detailed nuances of these ecosystems from east to west. As a Field Scientist, my methods are based on observation over time, and if one is lucky, at the right time, in the right place, a story makes itself known. Observations show that nature is working together as allies to adapt and regrow the changing forests after a devastating wildfire in 2011 burned more than 200,000 acres of the Chiricahuas. The ancient landscape is regenerating and also surviving the pressures of climate change. It became very apparent upon this return that there is a dominant 3-5 year cycle observed in the diverse and adaptive environment here. Cycles of repeating climate events include monsoon rains, winter snow, and wildfires, as well as in the diverse tree species that range from Mesquite in the grass lands at 4,000ft to the Douglas Fir at the highest peaks at nearly 10,000 feet. An inherent conservation was observed when only some trees chose to fruit during drought and how the wildlife adapted to a time when the creeks did not flow. Not one character acts independently. However the Chiricahuas are a unique Sky Island, geologically diverse, consisting of Paleozoic and Cretaceous sedimentary rocks formed around the Turkey Creek Caldera which exploded some 27 million years ago. For thousands of years many cultures have moved through these rocks and volcanic ash, with the current northern section of 12,000+ acres under protection of the National Park Service and the southern area protected by the National Forest Service. My return to the Chiricahuas in 2024, is noted as daily observations written through the lens of time in segments of monthly changes punctuated with stories of extraordinary observations.

Intro

In the following field report you will find details of my adventures as a hiker and park ranger, and as one who has spent years in the Chiricahua Mountains in Arizona. I am always amazed and amused at the voracity of life in this Sky Island. I am French Indian from the bayous of Louisiana and it is there where I truly learned about the connections of life and the vital adaptations every living thing goes through adapting to their environments. It is always a joke that the mosquitoes in the bayous are big enough to carry you away, and alligators live in your front yards, mudbugs make mounds to

breathe when the rainfall saturates the water table which is inches below the horizon. It is the old cypress trees that I watched grow their knee roots up out of the flood waters to breathe, and the mosses in the canopy providing a new ecosystem and habitat for canopy dwellers. Pelicans scooping fish and herons squawking their guttural jurassic calls. The diversity of life is incredible because of the warm rich muddy waters. And so when I moved to the desert southwest in 1990, it was winter, cold and snowing! It wasn't the hot dry desert I was expecting, at least not yet. We crossed mountains and rivers and forests on the drive and like most, had limited my view to what was told of this place, one of parched death, and baked hard sand with a huge city in the middle. Needless to say I fell in love with the desert, its diversity of life and the rock. Becoming a rock climber I ventured to Cochise Stronghold first.

- **Daily Report: The Turkey Creek Caldera is what is left of a giant Super Volcano**

The geology of SE Arizona is quite diverse. The Dragoons and Cochise Stronghold make up the western mountain range of Cochise County and the Chiricahuas are the eastern boundary before crossing into New Mexico with its parallel mountain range called the Peloncillos. Between them, an ancient sea bed, which today has been reduced to salt flats and small dunes as you travel north to Willcox. To the South is the great Sonoran desert shared with Mexico. Millions of years ago the volume of this geographic area was taken up by a super-volcano, and although we call these places mountains, they are remnants of the decaying lava rock known as hoodoos, being weathered by rain and wind all these years. In the long term climate profile of this place it has been wet and swampy, dry and bitter cold, and moving towards hot again. It has seen the Clovis people and ancient agriculturalists building amazing water canals, and more recently the Chiricahua Apache. In more recent days and the last of free roaming there were bison, mammoth, ancient horse, dire wolf, and North American camels. To the West the San Pedro River runs north and has never been dammed, a rarity in this country. When all of the waters receded, what was left in the making are what we call Sky Islands and there are approximately 52 named in the Alliance of Sky Islands. Each one, in isolation, has developed and sustains unique life and diversity. My adventure in collecting information about this place began with

the trees. Using the Globe Observer App created by NASA I have been using this tool in the Pacific Northwest to train people how to collect information on trees and the forest. I continue to use this tool wherever I go as it is easy to collect the height, and circumference of trees which then is stored into a universal data bank to share. I am a big proponent on free and equal access of information. So it began in 2022, I hiked the San Pedro from Bisbee to St. David and collected info, and then to the Ironwood forest and found these trees to be the only ones on this planet in a forest of Saguaros. I travelled north to the Apache Forest to the land of the reintroduced grey wolves and found a unique Blue Forest of ancient trees. Returning south to the Dragoons and Cochise Stronghold, and Cave Creek Canyon and the Chiricahua Wilderness, a fortunate turn of events brought me to work periodically as a park ranger for Chiricahua National Monument and volunteer as a research scientist at the Southwestern Research Station in Cave Creek Canyon on the East side of the Chiricahuas.

- **Daily Report: Citizens Scientists are valuable collectors of observational data**

The information gathered and shared here is as an independent scholar and field scientist, curious about life and in love with nature. All of the data and observations were collected from public trails and places where anyone could see and experience what I write about here. The daily observations are a privilege of living and working in a National Park, doing research in a National Forest and who I am eternally grateful for every place I land. This report is not meant to be an exhaustive report and because I am building upon a previous report from 2022-2023, I leave the detailed summaries of place and culture to the first report and offer in this field report a snapshot of one year, 2024. I encourage everyone to read more and visit and explore. The Daily Report lines are from my daily notes that I have dropped into the report in random orders. Enjoy!

- **Daily Report: The near-distant San Pedro River flows north from Mexico. It is the lifeblood of the desert**

Climate and Weather beginning with the monsoon of 2023

In the previous field report, the 2022 season turned out to be very wet, with double the average monsoon rains and an unexpected abnormal winter that followed with 68 inches of snow at the 5200′ level of the visitor center and 90″ of snow at Sugarloaf at 7,000′. What followed in 2023 was a sharp decline in monsoon rains with annual rainfall being below normal. Summer 2023 lacked the moisture leadened storms that came the year before, but the winter snow pack had saturated the soils and the plants and streams retained the moisture for a while.

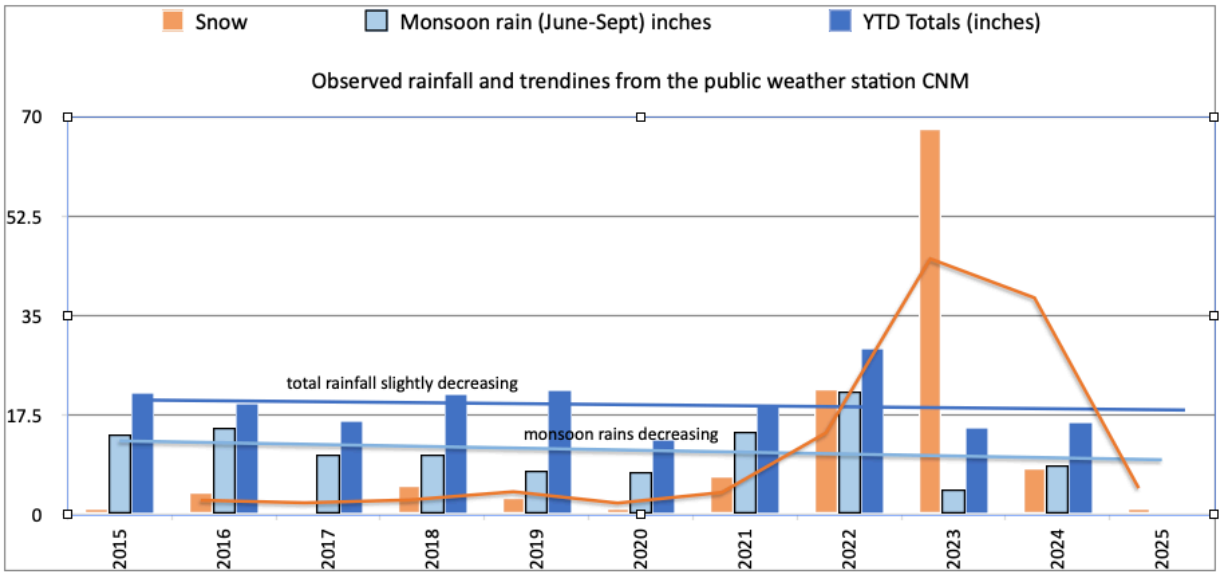
May brought 1.38" of rain and then it fizzled. Things became dry again. Monsoon season from June to September barely brought any rain in comparison to the previous overwhelming rainfall season. 2023 monsoon season totaled 4.48" and it felt eerily like 2020 that brought only 13 inches for the whole year with no snow and 7 inches of monsoon rain totals. Ranger friends tell me that the grass never got green in the valley between Willcox and the park, the creeks didn't run during monsoon season, no mushrooms bloomed and wildflowers were silent.

Throughout the year the moisture evaporated and when winter returned in 2024 with a couple of mild snow storms, the monsoon rains that followed, were only half the average and total rainfall was in extreme drought mode. In January there was 1.24 inches of rain with 2.75" at higher elevations. February increased rainfall to 2.45" and it snowed 4.5." March which is usually wet and snowy had only 1.2" of rain and April with 1.73" rain and an inch of snow. May and June were silent and very dry. The first monsoon rain fell on June 21 with only 0.01 inch to measure. June ended with a half inch of rain and July and August had approximately 4 inches each and then the rains stopped. No rain in September or October. As winter cold arrived in November there was an inch of rain that fell with December being silent once again.

As I am writing this report in April 2025 from the East side of the Chiricahuas, there have been a couple of snow dusters in March on the upper peaks near 10,000ft but no snow below in the canyon. A nearly snowless and record breaking winter drought. March 13 was a lunar eclipse and a blood moon that brought light rain and snow to both sides of the Chiricahuas. There has been no water in the creeks on either side and only small pools at the spring locations making the migration slow for hummingbirds and small owls as they are awaiting the budding of the sycamore trees, and everything is waiting for water to arrive.

- **Daily Report: A very deep red moon eclipse! silence was palpable, not a peep from the animals**

Ten year trend lines in the graph below show a slow decrease in monsoon rains as well as total annual rainfall between 2015 and 2025. What is significantly changing in the observations are the storms which seem erratic including an increase in upper atmosphere lightning. There is a lack of moisture in the clouds that still arrive from the Southwest during monsoon season but they do not drop any rain to the ground. The snow in winter seems to have a 3 year pattern of increase followed by a 3 year pattern



of decrease, making the 3-5 year cycles obvious in the adaptive qualities of the ecosystems of Chiricahua. It is the snow however that is key.

Snow saturates the soils retaining moisture and keeping a more continuous water flow in the creeks below ultimately sustaining a longer life for all species. Without the winter snow all moisture is evaporated away with increasing warming. This is the nature of an overall global warming, where jet streams may not bring cold wet winds in winter when hot pressures are pushing against from the South. The Sky Island depends on upper atmosphere moisture to be trapped and retained by the forests which then sheds towards the creeks below. It is the remaining Douglas Fir, Ponderosa and Apache Pines, the Engelmann Spruce and very old alligator junipers that hold the integrity of the upper forests. The entirety of the forests have been badly burned and strained from recent wildfires. Where there was once thick forest cover are now open grasslands where Aspen and Oaks have now succeeded. Eventually the valley below will notice as it has begun to now, that there will be less water coming down the mountain, the soils will dry and temperatures will rise without the moisture.

When the earth's surface warms, there is a higher attraction for lightning in the ionosphere above. A phenomenon called Schumann Resonance has been observed that correlates the number of lightning strikes hitting the planet's surface (about 2,000 every second) keeping a consistent electromagnetic frequency around 7.83hz. And when surface temperatures rise there are more lightning strikes. In the desert southwest, the trees on high mountain tops can act as both attractors and buffers for lightning strikes. Their height and high conductivity compared to the surrounding dry air make them

more likely to be struck, acting as a natural lightning rod. However, once the tree is struck, the moisture and sap inside can help conduct the electricity to the ground, minimizing damage. Root fires during drought are common for this reason.

What I have noticed with the ecological succession from old growth Pine forest to Oak forest, is that the oaks are not as resilient as are the pines. They are brittle, dry and limbs break more often in wind storms. It is a common statistic that oaks are hit more often by lightning which leads to more wildfires. A pine tree full of moisture will not burn like a dry oak, and as can be expected with losing the old growth pines, there will be less moisture in the forest overall. With increased lightning in the upper atmosphere during monsoon season, there will be, predictably, more lightning strikes and more wildfires.

- **Daily Report: Before the fires, big old grand pines reached for the sky and covered this mountain**

Changes since the 2011 Horseshoe II wildfire

Visiting the West and east side of the mountains are quite different. Visitors liken the flattened pillars of the East to a Little Yosemite. In the little town of Portal, there is a photo of the gateway with the name "Yosemite of Arizona". On the West side is Chiricahua National Monument, where the rock seems stacked like the hoodoos of Bryce Canyon people say, but these stacked hoodoos are volcanic columns created from cracks in a once solidified volcanic ash flow. The stacked rocks are indeed fused together and some of these rock forms have names like Duck On A Rock and Big Balanced Rocks.

- **Daily Report: Rhyolite, a 27 million year old volcanic ash solidified the rocks we know at Chiricahua. Similar Rhyolite exists in Lake Superior but is dated to 1.1 billion years ago.**

The Rock is what attracts visitors. Geologically speaking its the Rhyolite created from volcanic ash and lava flows from the Turkey Creek super-volcano, now 12 mile gaping Caldera, that had its main explosion 27 million years ago. The volcanic rich and fertile

mountain-scape along with the rocks 10% porous nature, have created a forest ecosystem with periodic creeks and springs along its watersheds.

There are 5 biomes within this Sky Island beginning at 4200ft as a desert landscape changing into grasslands with riparian ecosystems that change with elevation into chaparral, deciduous and coniferous forests. There is great diversity of flora and fauna here with many endemic species. The national monument is a small part of the Chiricahua Mountains as it is in unity with the convergence of the Rocky Mountains, the Sonoran Desert, the Chihuahua Desert and the Sierra Madre. There is a unique adaptation constantly happening in these mountains where trees become hybrids, unexpected allies pop up, and each has a unique characteristic that defines it as a Chiricahua creature. The Chiricahuas are also pathways for migratory animals like monarch butterflies, sandhill cranes and jaguars.

However nothing exists in isolation, and the boundaries of a national park or a national forest are still connected to the outlying areas, the transition areas. What I found during 2022-2023 is that the rate of destruction to the mesquite landscape in the lowlands surrounding the mountains is increasing. Particularly on the lands leading up to the monument on the West side have been cleared, one owner at a time, of all the old growth mesquite trees, placing them in burn piles to leave barren land sitting with a For Sale sign. Without water regulations in Cochise County, private ownership of land is has changed and sold to foreign prospects to grow corn and for mining. The waters which shed from the Chiricahuas feed the valley and aquifers below and when these waters become deplete it affects the draws and shallow ponds that offer birds and animals a refuge. Mesquite is a valuable food source and an excellent protein for humans and animals, its greatest benefit is that mesquite is a nitrogen fixer for soils wherein their roots live. It was quite sad to see ravens and hawks and vultures sitting upon the burn piles whereas before there were mesquite trees and native grasses growing. These changes on the outside will eventually be felt on the inside of these protected places, it's just a matter of time. Ecology is the understanding of the connections of life and it is vital that we all understand these connections.

In 2024 the mesquite landscape continues to be erased. With extreme drought these fields become dust with all of the dry and baked soils. Winds have increased and storms now come as dry dust devils. There is little green plant food sources in the grasslands. But closer to the springs and inner forest ecosystems some very extra-ordinary events were happening in 2024. Stories of some unique events follow below:

1. The Lone Wolf: On September 23, 2024, I was driving out of the park heading to the west 4 miles then turning north. I remember spying what I thought was a coyote and slowing to take a very quick photo as he was passing through the fields at the foothills. Upon a closer look when I began writing this report I enlarged the distant "coyote" and realized it was a Mexican Grey Wolf (*Canis lupus baileyi).* This wolf was very dehydrated and emaciated with what seemed like a large head on a skinny body. That day it was overcast with clouds looming low over the peaks. Lobo looks directly into my camera as I get to take that quick shot and we both continue on. *The Mexican wolf, also known as the Lobo mexicano is a subspecies of grey wolf native to eastern and southeastern Arizona and western and southern New Mexico and fragmented areas of northern Mexico*. Spying a lone wolf is rare, and yet promising. In the photo there is no radio collar noted. So it is unknown whether this is a new adventurer coming north from the Mexico wolf introductions or a wolf coming from New Mexico.

The Fish and Wildlife Service, along with the Arizona Game and Fish Department, the Mexican government, and the states of New Mexico, Colorado and Utah, have all been working together on a recovery plan since 2011, but with current defunding of these government programs I am afraid that all of the endangered species will face dire consequences from ranchers and hunters. As of 2025, there are at least 286 wild Mexican wolves in the US and 45 in Mexico, and 380 in captive breeding

programs in the United States and Mexico. Here is to you, strong adventurous wolf, Have a grand long life and thank you for letting me see you that day in September!

- **Daily Report: a Red Fox-tail Squirrel has been sited in CNM. Previous reports claim they disappeared after 2011 Horseshoe II fire. Welcome back to the West side!**

2. The Yearling Bear: In the Chiricahuas there are black bear of many colors, some are brown, cinnamon, blonde and black, but all are black bears (*Ursus americanus*). In the desert southwest these black bears are the only bear species and have a life span of 20-30 years. Bears do take a long nap over winter for about 3 months, but its always a question if the winters are warm and without snow, if the bears fully hibernate. However, finding food would be extremely sparse during this time. Mama bears are smaller than their male counterparts, but can grow up to 300 lbs especially if they are growing many cubs. They will gestate for about 220 days and sometimes in the Chiricahuas we see one, two or even three tiny cubs come springtime. While the bears den in winter, this is when the cubs are born, hairless and small. In a few months when spring bursts with new buds and berries, all will arrive out of their dens into the sunlight of spring. In the early summer of 2024, a new yearling bear appeared in the park.

He had long legs, a thick black coat and seemed to like hanging out in the dry creek as he looked for new manzanita and juniper berries. This bear would have been born in 2022 and might be one of the two cubs with mom we spied down at the entry to the park. These young bears normally leave their mom when about 18 months old. This bear that I began seeing walking amongst the trees and leaving scat piles about, was a very curious character. One day that

turned into weeks, a water valve broke in the road between the visitor center and the campground. Being in extreme drought this water brought all animals and birds to these water spots on the road. The coati, Mexican jays, squirrels, became the roadside attraction here and the bear also found the water too. We put up orange cones to slow down cars until the valve could be fixed.

One day the bear was spotted playing with the cones, batting them around. Then he wandered around the administration building and seemed to find the cones also in the back of the maintenance trucks. He climbed on a few trucks and was photographed standing up on his two back legs peering into the bed of the trucks. As curious as he was the bear was also motivated to find food. He was seen walking in the creek around the campground too, but he always kept his distance. Remember bears can sniff food 20 miles away, so it wasn't hard to imagine he could easily smell food cooking and rotting in the trash cans from the top of Chiricahua Peak at 9776ft (2980km) where he may have come from. This bear, everyone excitedly spotted on the road for a quick glimpse and would report at the visitor center all throughout the summer. In September however this curious bear found his way to the park dumpsters which were not bear proof, but rather had plastic lids where maintenance would throw the trash, once they cleaned up the bear proof trash cans around the park. One day maintenance showed up to throw the bags and found the bear sitting in the dumpster with peanut butter and pizza on his face. He had fallen in. Bear quickly scrambled out when the maintenance guy arrived, but it was already too late. A fed Bear is a dead bear. He knew exactly where the food stash was. Immediately control was placed on the dumpsters with chains and forklifts and cameras set up to see if any other animals were also coming around. I guess the

bear was not the only sniffer out there as many animals were captured on the cameras: coati, foxes, ring tails, cougars, turkeys and birds were all sneaking around. The bear was not aggressive, still shy of people, just food habituated. The leadership team decided the bear should be removed from its homeland and brought to another mountain range nearby. US Fish and Wildlife baited the bear with more peanut butter, hot dogs, and other smelly food and he was trapped. This young bear was over 100 pounds and very docile. It was a very sad day to see him driven out on a really hot desert day to a place not so beautiful and plentiful for the rest of his life. Things learned, things changed, but we should always remember the best way to take care of wildlife is to leave them alone. The forest provides everything they need, and every interception we think we do out of kindness, like throwing bread and food tidbits, or leaving smelly things out on a picnic table, and not using bear boxes will set them up to die. We sometimes love things to death!

- **Daily Report: The Pinyon Pine cones have hollow seeds this year. No rain, no flesh in the shells.**

3. Blonde and Ginger Coatis and the mohawk gang: The name *coatimundi* is said to be reserved for the males, as they are generally solo. C*oati* is used for the females as they stay together. In Mexico they are all called *Chulo*. Most of the white-nosed coati that are found north of the border are darker brown with a thin ringed tail of various colors of black, blonde, brown and red. In 2024, we all noticed that there were many blonde-haired coati. There were also special patterns noticed like in 2022 when one baby was born with a white ring half-way up his tail (up because the coati tail stands straight up instead of hanging down like most tailed creatures) and with a white ring above his head I named this coati, *Halo*. In the summer of 2024 a new baby Halo was amongst the troops, but none had seen the older, possibly father of this new *Halo, Jr.* He was born to a blonde-haired mother. Matter of fact most of the troop was collectively blonde and ginger mothers and grandmothers, with brown babies. We all wondered where the blonde gene infiltrated the coati troop. A few speculated someone released a captive coati into the Chiricahuas, others think that a coati from Mexico made its way north. Like any animal however, expressive hair color is in the genes, what triggers specific genes may be the mating choices or environmental forces. Hair color is not determined by a single gene but by the complex interaction of multiple genes inherited from both parents. Darker colors are commonly dominant, whereas blonde is recessive. Genes produce

melanin. Eumelanin contributes to darker shades like black and brown, while pheomelanin results in red and yellow hair color. **Genes like the MC1R gene, play a crucial role in regulating melanin production.** When the protein associated with this gene is active, it stimulates the production of eumelanin. If it's not active, melanocytes produce more pheomelanin. When the environment is stressed, perhaps during a drought year and food resources are more scarce, certain proteins and vitamins may be lacking which have physical changes in animals, including, perhaps hair color.

- **Daily Report: Daily Report: In 2024 Halo Jr was sited! This year there are many blonde and ginger coatis**

After all in humans, the term premature grey hair (PGH) is linked to vitamin B12, D3 and Calcium deficiencies. It is noted, without known cause, that in 2024 there were a lot of female coati of all ages. Along with the arrival of the blonde coati in 2024, the *mohawk gang* also showed up. There was a troop of coati that included 20 or so young adult coati with a striking fur ridge on their

backs. This morphological feature that stood out, literally, was a ridge of hair starting from the occiput to their tail, (i.e., a short stub of hair standing straight up from their head to their tail). The shape of the neck also seemed short and stubby in comparison to the common coati noted over the years in the Chiricahuas. The Mohawk gang seemed to be young adults in the same family groups that stayed within the blonde coati troop. An interesting new dynamic noticed in this years coati indeed!

- **Daily Report: Acorns are nuts, and they are out on the Silver Leafs oaks. They are the only ones this year!**

4. Jaguar (*updated report of tracks in 2023*)

The 2023 tracks disappeared and there were no more sitings by camera of the lone Jaguar I had observed. However Sky Island Alliance and the Northern Jaguar Project in Sonora work tirelessly to maintain protection, continue to collect camera data and information, as we in the desert southwest have fallen madly in love with the big cats and work to ensure a future for them. In May 2024 the latest jaguar to be caught on camera near Whetstone and the Huachucas, now has a Tohono O'odham name. *O: had Ñu:kudam*, which means jaguar protector. "The return of jaguars to our land is a source of immense pride and profound hope," said Austin Nunez, chairman of the tribe's San Xavier District, in a written statement. "Since time immemorial, the Tohono O'odham have shared our homelands with the jaguar. We are committed to working to ensure a safe and thriving future for *O: had* and one day hope to see the return of a breeding population of jaguars to this region."

The jaguar has a special foot print. Like all felines, the nails retract and you will never see claw marks in the track, unlike their canine friends whose nails are always visible on a dog, wolf or coyote. The digit pads are wide just as the whole footprint is large and larger than most big cats. The unique metacarpal pad has an indention at the base of the pad separating the two sides and appearing more pyramidal in shape in contrast to the large bulbous rounded pad of a puma. During the winter of 2023 the heavy snow made it easy to find many tracks on sugarloaf trail including: bear and bobcats, birds, small mammals and the large prints of the puma and possibly jaguar.

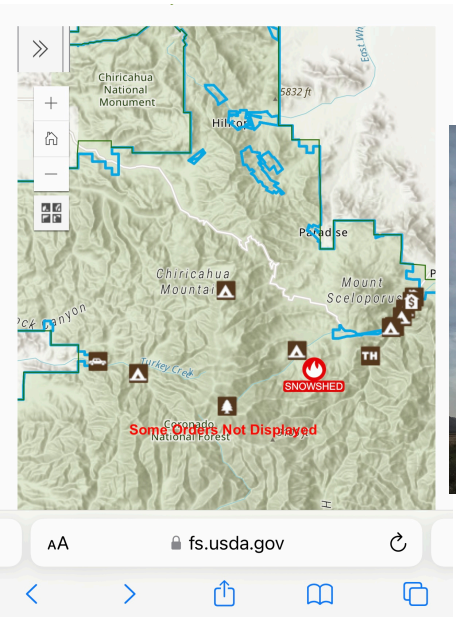
- **Daily Report: A new jaguar to Arizona is named *O: had Ñu:kudam,* (OH-shahd NOO-KOO-dum)**

5. **Wildfire July 6, 2024:** Two days after July 4, when the forests were packed with campers, a wildfire erupted near Snowshed trail in the Coronado National Forest. The location was very near to Herb Martyr Camp area on the east side of the Chiricahuas on a steep slope. Cause? Lightning? Bottle rocket? When we look at the statistics of wildfires, "81% of wildfires are caused by humans." quoted from the National Interagency Fire Center. In this case this wildfire was suspicious and located in an area that was already burned from the Horseshoe II fire in 2011. The area burned in that devastation equated to 80% of the Chiricahua landscape including the National Forest and National Monument. The Snowshed trail begins on the East side of the mountain near Portal, Az. It is a long 16 mile trail that reaches the highest point of the mountains at Chiricahua Peak. The remaining trees that have survived the previous fires are the old growth, the grandmother trees, with the new oak trees enjoying the open canopy now remaining. This new fire in July, began in the grass and low shrubs that were extremely dry. Difficult to get to by hiking in, firefighters from inter-agencies converged and were dropped in by helicopters. It was hot and dry and the steep slopes caused great difficulty in containing the fire. Ready Set Go commands were issued to the nearby Southwestern Research Station, campers and seasonal residents. The entry way to Chiricahua National Monument was the control point for the vehicles, helicopters and crews for several weeks. Highly skilled, trained and brave firefighters, medics, and incident commanders kept the fire from exploding and becoming another widespread wildfire. This difficult fire had no water reservoirs, like a nearby lake, to obtain water from, so it was a very technical process. Out of all of the crew and vehicles and support systems only one laceration injury required a life-flight to nearby Tucson hospital. The firefighter was immediately treated by his EMT medic firefighters, flown to the entry of the park where I further assessed and secured patient for flight out.

- **Daily Report: In Arizona, there are twelve inmate fire crews—eleven male and one female.**

The National Fire Protection (NFPA) statistics on fires state that In the United States, firefighters experience an average of 21,955 non-fatal injuries on the fire ground each year (2018-2022). While these injuries are significant, the vast majority (81%) occur in structure fires. In 2021, 68% of reported injuries happened when assigned to the fire line. Most common injury types include sprains and strains, with injuries caused by slipping, tripping, and falling, as

well as equipment/tools/machinery frequently causing the injuries also. **Statistics from the National Forest Service from 1990 to 2017, state there were 41 incidents in the United States where firefighter burn-over fatalities occurred on wildland fires. Ninety-six fatalities and 78 injuries were reported, with an average of 1.5 incidents and 3.4 fatalities per year.** NPS and other federal agencies train firefighters requiring more than 3,000 hours of training for each person. These are high-risk, intense and on-call positions where crew members are also EMTs, medics, helicopter pilots, and park rangers. Surprisingly for the job skills, years of commitment, and risk, the pay on average is about $20 per hour. The wildfires that have blazed through the Chiricahuas require interagency commitment and often extend into volunteer organizations like Cochise County SAR. With another extremely dry winter and no snow to sink into the forest soils, red-flag season began in February 2025. Everyone is hopeful for monsoon rains to come soon.

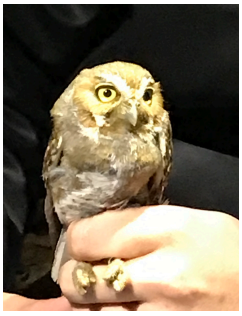


6. The Synchronicity of Trees: In scarcity there is greater adaptation, in plenty there is freedom. One of my observations over time in the forests of the Chiricahuas is how many communities of species create what we might call neighborhoods. As scientists we define through observation and testing the boundaries or range of tolerance each species has. These often relate to temperature and moisture as defined by altitude and elevation, generally. However when one lives over time within these ecosystems there are small details that make themselves present if we watch, listen, smell, and see with our eyes closed sometimes. I have worked for years documenting the large and

unique trees in the Chiricahuas. Lately with an eye for adaptation and recovery especially after the wildfires that have burned the majority of the forests here. Things are growing back, that is the good news. Some species have disappeared, and some only chose one side of the mountain over the other whereas the diversity and populations were more abundant are now a few. With the 2011 Horseshoe II fire, it crossed the Chiricahuas via the crown and canopy taking out the tallest Ponderosa and Apache Pine. In the years following the open spaces left behind, the open areas have become available to the sun loving oaks and pioneer species. Through ecological succession there are now at least 12 species of oaks, with three dominant pines, and many singular species filling in the niches at higher elevations and in the riparian areas. However there is an obvious network of connection between the trees and they do communicate with each other via pheromones known as semiochemicals. As defined, s*emiochemicals are* ***chemical substances released by living organisms that influence the behavior of other organisms****. They are used to communicate and manipulate behaviors, often within or between species*.

In 2024 I watched the first buds bloom in the park in May. As usual the manzanitas were the first to flower. Perhaps their sweet smell across the mountains in the warmth of the sun gently nudge the sleeping bears awake. The black bears in the Chiricahuas seem to know when the flowers appear, as the moms with their new cubs walk out of their dens hungry. Perhaps its the sweet smell, the pheromones that are airborne, that triggers an eye opening and a rumbly tummy. Bears and berries in perfect harmony. So we can say there is a synchronicity in the timing between tree and animal here. Tree to tree I noticed that with the extreme drought of 2024, only one species of oak, the silver leaf, developed acorns. The remaining oaks leafed but didn't produce nuts. And it didn't matter whether the silver leaves were at grassland elevation or at 7,000ft., all of these trees grew their fruit at the same time. And in unison dropped them in synchronicity with a large roar! Humans noticed the crunching under feet and tires everywhere. The Gould's turkeys were especially thrilled as they love the acorns! Every afternoon they would come in for their roost in the trees running down the road scooping up acorns as fast as they ran giving a true name to "fast food." The oaks seemed, through essence, neural networks, smell or some other unknown to be able to communicate timing with each other. They decided who would conserve that year and who would produce. In 2022 it was the white oaks who produced acorns and the year following, the Emorys. Also noted in the previous report from 2022-2023 was the abundance of mushrooms and small orchids that emerged after heavy rains. During the drought of 2024 there were no orchids and only isolated boletes and tree fungi.

Boletes are mycorrhizal, meaning these mushrooms form a symbiotic relationship with specific trees, and these relationships are often favored in areas with sufficient moisture for the trees. The mushroom neighborhoods do favor pine trees and the orchid community is often seen in the fungal network of the old oaks. The most fire resilient and adaptive tree in the Chiricahuas is the Chihuahua pine. They have diverted their need of seed to reproduce from their roots. Chihuahua pines (*Pinus leiophylla var. chihuahuana*) can indeed sprout from the roots or the root crown, which is a type of vegetative reproduction. This method is more common in situations where the tree's crown is damaged, such as by fire or cutting. In Arizona, where Chihuahua pines are found, this behavior is a survival mechanism, especially in fire-prone areas and forests that experience cyclic drought.



- **Daily Report: The Elf Owl, is the smallest owl in the world!**

7. **Different Sides of the Mountain:** Over millions of years arriving in what is now called SE Arizona, volcanoes, oceans, rivers, marshes, mastodons, mammoths and cultures have lived through time here. What exists now in the current timeline are the remnants of volcanic ash with peaks and valleys formed by wind and rain. On the east side of the Chiricahua Mountains is the snowshed side as compared to the western slopes that are drier. On the East side creeks run longer, water is available even when there is none of the West side. Sycamores are grand and line the creek beds as well as cottonwoods and cypress and very old alligator junipers. There are more people living on the East side as there is a town formed at the gates of Cave Creek Canyon that includes a post office, library, cafe and visitor center for the National Forest Service. Established in the 1950s, the Southwestern Research Station sits upon an old homestead from 1878, 5 miles in Cave Creek Canyon from Portal, Az. It is known as a birders paradise with many migrating birds and butterflies. The elf owls are the worlds smallest owls that make their homes in the cavities of the large sycamore trees that line the creeks. The acorn woodpeckers are their allies who make the holes! Also amongst the sycamore and juniper forests are the rare trogons, monarch and swallowtail butterflies and many species of hummingbirds including the blue-throated mountain gem.

The area once had a plentitude of amphibians including the now endangered, maybe extinct Chiricahua Leopard frog. With climate change and wildfires, the wet nature of Cave Creek Canyon is changing. On the West side of the mountains and on the most northern 12,000 acres lies Chiricahua National Monument. The National Monument creeks are fed entirely by rainfall except for a couple of small springs. The protective and rocky hoodoo nature of the monument gives a home to larger wildlife like deer, bear and passing jaguars. In the middle of the West side is the watershed from all of the west sloping rains which funnel down to Turkey Creek and recharges the aquifer in the valley below. This creek is entirely rainfall fed. What we see today is a broad slashing of native mesquite trees and flora replaced with agriculture, ranches and vineyards. There is also mining taking from the aquifer along with everyone wanting their share, with no water regulations. The wildlife has changed, where once there were desert tortoises, frogs, prairie dogs, coyote and predator birds, the loss of habitat has parched the exposed soils and diminished the diversity of life that call this place home.

8. Mesquite, Fertility of the desert

There is a recent rash of clearing the landscape of mesquite trees. People complain of the thorns, the bean pods sticky nature, and they are "just in the way" of grass for grazing, or the planting of yet more corn. Before commercial agriculture arrived in the valley, there were thousands of square miles of mesquite trees to provide shade, food, and fix nitrogen in the soils. Mesquite trees are amongst many other plants like beans, lentils, peas, and clover that are natural fertilizers. These plants capture atmospheric nitrogen which makes up 79% of the air around us, but unusable until fixed by plants to the soil. They have a symbiotic relationship with rhizobium bacteria that live in nodules, in the roots, enabling them to fix nitrogen and add phosphorous. Essentially making nitrogen compounds out of thin air.

Modern agriculture practice buys synthetic and natural nitrogen to pour onto their fields every year creating a false fertility on the surface. The crops in the valley are mostly all corn now building a destructive mono-crop system. They lack the proteins and amino acids that mesquite offer which are building blocks of animals, like us, as we eat them or

feed to birds, cows and other animals that we eat. The mesquite also feed other crops and are vital to the biodiversity of the desert. Another vital threatened resource is water. Mesquite trees are water efficient, they have adapted to change since plants arrived on this landscape. The humans that moved in bringing mining, cattle, agriculture have altered the watershed and aquifer below which holds ancient water. It takes a really long time to recharge, add more water in when there is so much water being pumped out. The result is drier conditions from the inside out. From below the surface, the drying becomes deeper and the soil loses its fertility and becomes blowing dust. Without the mesquite trees to hold moisture, the fields dry up. Because all things are connected, and change is palpable in recent times, those long timers in the valley can tell stories of the before and after of a changing ecosystem, with and without the mesquite. As I travel on the back roads I see piles of mesquite cut and gathered and sitting upon them are the turkey vultures and the ravens who once hunted the small mammals and berries that used to grow under the shade of the living trees, their shiny feathers wet with sweat from the increasing temperatures in the desert.

For a more exhaustive report on **Cultural, Mycology, Wildfires, Storms, Wildlife and more, please see the previous report from 2022-2023 located on www.EarthArXiv.org**

- **Daily Report: 2024 Not a Cicada year! A solo cicada heard here and there but not everywhere.**

The Ancient Fire (*repeated from the previous report due to significance*)

The landscape of the Chiricahuas rests upon a dormant fire forged by the heat of a super volcano which blasted ash more than 50 miles surrounding the caldera and poured out molten lava. "The resulting volcanic plume rose tens of miles high before collapsing into ground-hugging, pyroclastic flows that covered large parts of southeastern Arizona and western New Mexico. It is estimated that more than 120 cubic miles of molten rock was erupted." (Guide to the Volcanic Geology of Chiricahua National Monument and Vicinity, Cochise County, Arizona.) Throughout the millions of years that followed rain and wind with intermittent wildfires shaped what we see today. There is evidence of fires that have ushered in multiple ecological successions. The endemic plants and animals that have survived the fires, that have adapted to the dry and droughts as a result of the loss of forests again were adapting to periodic change in weather and climate, and to species that were taking advantage of the change. Who and what survives shows a resistance leaning toward fire resilient species.

- **Daily Report: The bears have awakened, they are in the sunny patches of the manzanita eating berries**

Through the Laboratory of Tree-ring Research at the University of Arizona, a report from 2020 talks about the Fire History of Chiricahua National Monument. Noted historical fires include one or two major (canyon-wide) fires each century from the 1600s. Those fires tended to follow the canyons entering from the west where human occupation and low valley occupation was situated. Previous to the colonization of the European wave of humans, there were low-intensity cyclic fires in the grasslands frequently. These fires occurred when it was periodically dry and would be replaced with monsoons and rainy years that provide growth for the diverse grasses. These cycles can be seen with the innate cycles of the acorns in the oak trees that bloom every 3-5 years. Each oak species taking its turn to produce the acorns that always ensures there is food every year. In 1905 the United States Forest Service was established and fire suppression was not a practice until the early 1930s. A new policy called the 10am rule was set in motion to protect trees as timber resources. The 10am rule stated that if a fire was sighted it had to be put out by 10 am the next morning. There were large fire crews and equipment in the CNM and National Forest protecting the Chiricahuas from the 1930s until 1978. It was then that the word ecology was acknowledged in the health of forests, and there were allowances with certain fires to burn.

The recent historic fires in the Chiricahuas include the Rattlesnake Fire in June 1994 that quickly burned 28,000 acres in the high-elevation forests of the mountains. Six hundred of these acres burned as a crown fire destroying the largest and oldest Ponderosa pines and Douglas firs. In September just a few months later a landmark conference on the Biodiversity and Management of the Madrean Archipelago: the Sky Islands of the Southwestern United States and Northwestern Mexico was held in Tucson.

- **Daily Report: First helicopter rescue for the season, a firefighter with a hand laceration**

Following cycles of drought in the 1990s, the wildfires increased with intensity leading into the Horseshoe Fire and eventually the Horseshoe2 Fire in 2011 which was the fifth largest fire in Arizona history. This fire consumed entire slopes of the mountains leaving no trees alive, burning fragile soils leaving huge barren swaths. The Horseshoe 2 Fire was not like the low intensity fires of the grasslands to the west, this fire burned through the tops of the largest and oldest Ponderosa and Apache Pines as a crown fire, coming from the south and sweeping over the Monument consuming 80% of the park burning for over a month. Everyone's first thought was about the devastation and loss of trees, birds and animals endemic to the Chiricahuas. The second was when the rains began to arrive would there be flooding occurred bringing soil and burned trees along with it.

More questions asked about species lost, and which species had survived? What would the ecological succession look like? How to prepare for the next fire? How to maintain a healthy ecosystem and did that look like intervention or leaving it to nature to maintain? In the 2022-2023 report there is a section on Trees explaining where I have observed where the new trees are regrowing since the 2011 fire. I also collected data on 400 trees, looking at what the average age of the forests are, what grandmother trees have survived and their importance and some insight as to the latest sightings of what wildlife and plants are still around. (*See 2022-2023 report for graphs and details)*

- ***Daily Report: Red Fox-tail squirrels have a symbiotic relationship with Pines, the squirrels have reappeared***

One important indicator species is the Chiricahua Red Fox-tail squirrel, an endemic adaptation of the Mexican Fox squirrel who prefers to live in the Ponderosa Pine forests. Chiricahua fox squirrels usually make their homes in the thick growth at the bottoms of canyons. They subsist primarily on a diet of seeds, nuts, flowers and fungi which have a symbiotic relationship with the trees. Unlike many other squirrel species, Chiricahua fox squirrels do not store their food. Instead, they will scatter-hoard seeds by hiding them under loose soil or leaves. With the 1994 Rattlesnake Fire, it was first noted that *the Fox squirrel population had diminished by 35% and by 2003 there were only 50 Chiricahua Fox squirrels remaining* (Merrick). The one correlation with the disappearance of the fox squirrels is the loss of pine forest canopy and old growth trees due to fires. Reports since the 2011 Horseshoe II fire, note that there have been no nest sightings or appearance of any Fox squirrels in the Chiricahuas. But this year in 2024, I witnessed Red Fox tail squirrels on both sides of the mountain. Several Fox squirrels on the East side were seen in the creek area of Cave Creek Canyon. On the West side a Red Fox tail squirrel was spotted in the trees and creek in Bonita Canyon. There is great hope with regeneration, proving that resilience also requires time for the inherent nature of the ecosystems species to recover.

Water or Lack of it for 2024

Temperature and moisture are the triggers for the highly adaptive life in the Chiricahuas. With daily observations over the seasons and years, patterns appear in the small details. In 2022, spring was very dry and there was not a lot of food. There was concern for the birds and wildlife that this would be a year with paucity. Temperatures were normal. Surprisingly, heavy monsoon rains began in May, continued into November then changed into snow with more than 90 inches measured at Sugarloaf. That snow pack remained through March of 2023. The total rainfall for the 2023 monsoon season was almost half of 2022 at 15.19" and winter snowfall that followed

totaled only 8.25" that fell between January and April 2024. In June 2024, the first monsoon storm arrived with barely measurable rainfall at 0.01." Monsoon rains totaled only 8.63" for 2024 with only an inch following in November.

The drought continued into 2025 with dry creeks and no snow. Red flag warnings started early in February and the first snowfall stayed at the tops of the peaks on March 15 following a lunar eclipse of a blood moon. Into April the trees had not budded, there were no bird reports in South Fork but a few year round birds like juncos, flycatchers and sparrows in the grassy areas. The owls and hummingbirds were also behind schedule in their migration to the area and likely followed a more westerly path along the San Pedro which still had some water. No turtles arrived this, as they stayed burrowed waiting for rain. Just a few tree mushrooms appeared, but there were no orchids or water species that appear with rainfall. Everything was in conversation mode, deep in the roots. In comparison to the year before the 2023 monsoon season totaled 4.48" and it felt eerily like 2020 that brought only 13 inches for the whole year with no snow and 7 inches of monsoon rain totals. In 2024 the grasses never turned green in the valley between Willcox and the park. The creeks didn't run during monsoon season, except for one freak storm in June that fell at higher elevations and raged red clay waters down Bonita Creek between King of Lead mine Road to the campground inside CNM and disappeared entirely the next day.

- **Daily Report: No mushrooms bloomed and wildflowers were silent for 2024.**

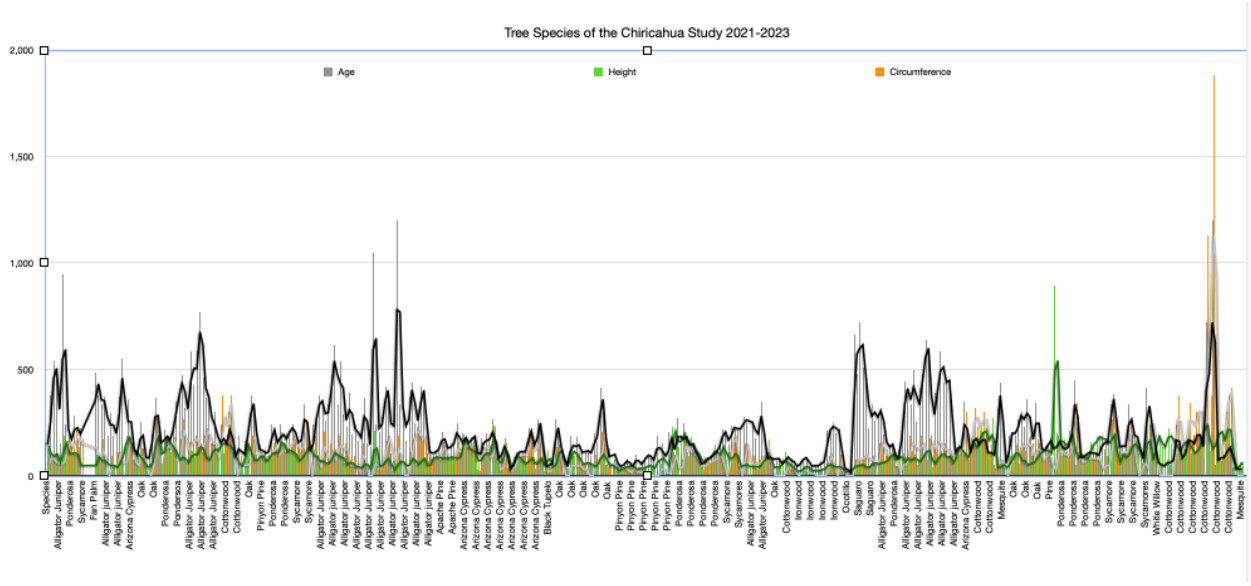
Trees & Forests (*updated from 2022-2023 report*)

The forests of the Chiricahua Mountains are diverse, changeable by temperature and moisture which is defined by elevation. They are however dependent on each other and are part of a contiguous ecosystem that is defined by the mountains but stretches beyond the valleys to other Sky Islands and geographic similar regions. Approaching this study from curiosity as to a long term adaptable ecosystem in a momentary snapshot, the info collected on the trees was as a Citizen Scientist hiking the trails of the Chiricahuas. Hiking through burned sections of the mountain I was curious as to where the new trees were growing back, or if they were at all. I found that there is a deliberate group of allies that are working together to protect the growth of new trees both direct and indirectly. For instance, if a burned juniper no longer has leaves, it cannot produce

new seed, so how does the juniper forest continue on after a fire. Seeds are kept in storage by land mammals and it is they and the birds who transport these seeds that are laying dormant waiting for the right opportunity to sprout. In the Chiricahuas, I asked "who are the players? the allies? working together to regrow the forest?" I searched for the grandmother trees, those older than the average age of the forest, usually the tallest or biggest circumference trees that have long withstood the cyclic climate changes of drought, fire, flooding and severe temperature changes.

- **Daily Report: There are Alligator Junipers in the Chiricahua forest that are more than 1200 years old who are holding the forest together**

Being a field scientist with NASA using the Globe Observer App on my phone I had a handy tool to collect information on the trees without touching them. This is important as coring trees creates and leaves injured places where insects can invade. Trampling near the roots of trees is also sometimes a hazard for both humans and trees. Crypto-biotic soils are important in regenerating burn areas. These living organisms are vital and in fragile environments can take thousands of years to regenerate soil. One footprint kills and so staying on trails is vital. For a detailed list of trees that were collected with the Globe Observe App, you can find all 400+ trees in their global database made and created to be shared with everyone around the planet. All trees are located according to latitude and longitude and noted

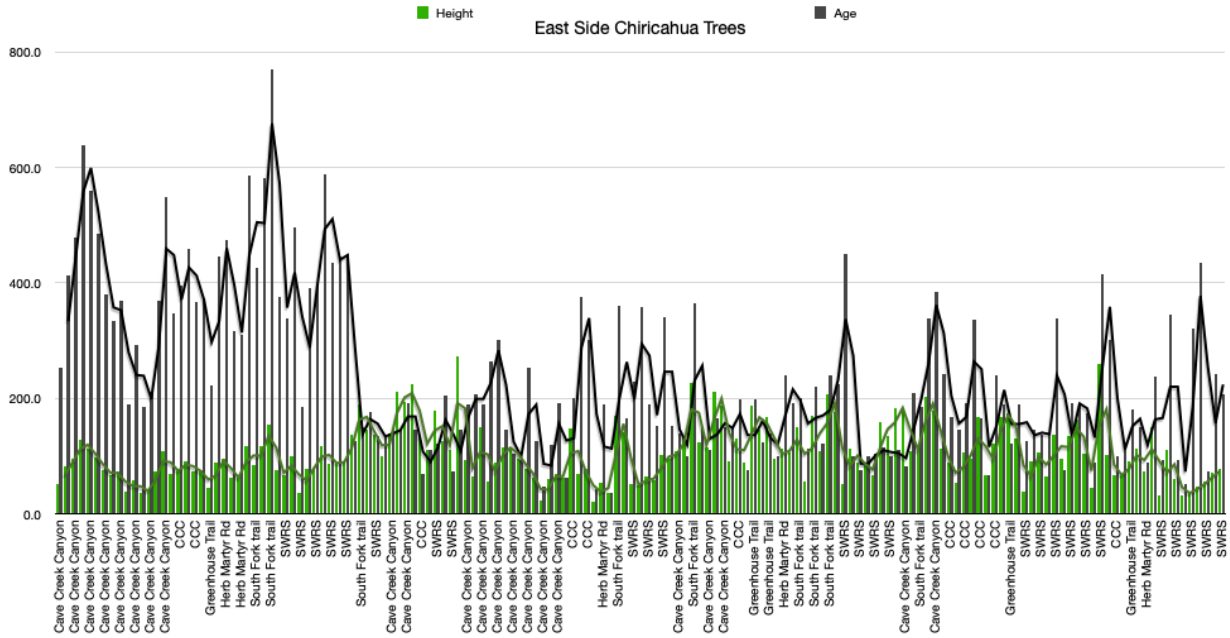


- **Daily Report: Found the new trees growing on Natural Bridge Trail, they are under the snags**

by regional location and by name. Information collected on the trees include Height (estimated by triangulation in the app) calculated by distance of stride and height of collector using the photo option of the phone. Circumference is an option and can be estimated using diameter. Detailed notes were added into each tree information collected and nothing besides observational notes was collected. Leaving No Trace!

- **Daily Report: All the flats, on all the tires, happen to all the visitors that come across Pinery Road**

I will use both the geographic map of the mountain to explain the trees and the ecosystem they live in which is also defined by the biome. Boundaries between biomes are not always sharply defined. For instance, there are transition zones between grassland and forest biomes. Biomes adjust as the climate changes. These transition zones as I spoke earlier are dynamic and change much more often than an old growth ecosystem and short and long-term information needs to be considered.



- **Daily Report: The sycamores are medicine for humans, and home to the elf owls**

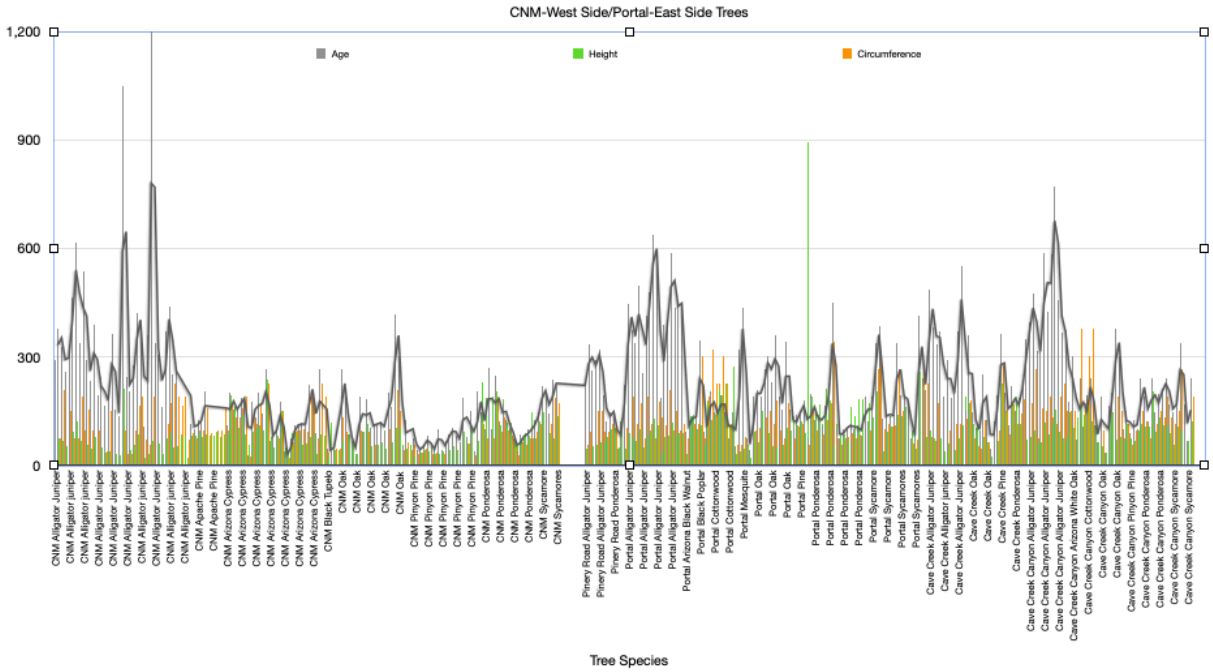
The East Side

Arriving on the East side of the Chiricahuas, one enters Cave Creek Canyon via Portal, Az. The water that arrives down in the creeks here is rainfall fed from the upper peaks winter snow and monsoon rains. This side of the mountain is known as The Yosemite of Arizona where the rock faces are flat, sheer and rise up hundreds of feet. The rock is brittle and flaky rhyolite full of lichen testament to the weathering process as scree piles flow below. The minerals from this old lava rock are fertile and the trees thrive on the nutrients and the water inside the rock. The creek supports a broad forest of very large sycamore trees and cottonwoods. Mixed in are Alligator junipers, oaks, Pinyon and Ponderosa pines, Willows, Black walnuts, and Poplar. Of course the plant and tree list is much more robust than those just listed.

- **Daily Report: Heard a trogon today! Snowshed trail**

The Canyon Road extends from Portal for another 5 more miles as asphalt, then turns to dirt and gravel as you approach the Southwestern Research Station of the American Museum of Natural History. From the SWRS the dirt road called Pinery Road continues its upward winding climb through oak-pine forests for another 18 miles across the high peak conifer forests and then down to the western side of the mountain to the grasslands and entry to Chiricahua National Monument.

- **Daily Report: Madrones and manzanitas are the first to bloom and make berries for the bears that are waking**



Between Portal, Cave Creek Canyon and Pinery Road I collected data on 170 trees including Ponderosa, Sycamores, Alligator Junipers and Oaks. The average circumference 118-123" with average height 120'. The youngest tree in the collection was 36 years old and the oldest 770 years old. The average age of this study is 244 years. In the Chart a running average shows the average age of the forest that is a collective of all of the species of trees that live on the East side and across Pinery Road. On both sides of the Chiricahuas, the oldest trees are the Alligator Junipers.

West Side

Arriving on the West side entry road either from Pinery Road or Highway 186 you are now entering the Chiricahua National Monument (CNM) established in 1924. To the west of the monument, you are amongst old frontier family cattle grazing lands?

- **Daily Report: So many birds, the long list grows!**

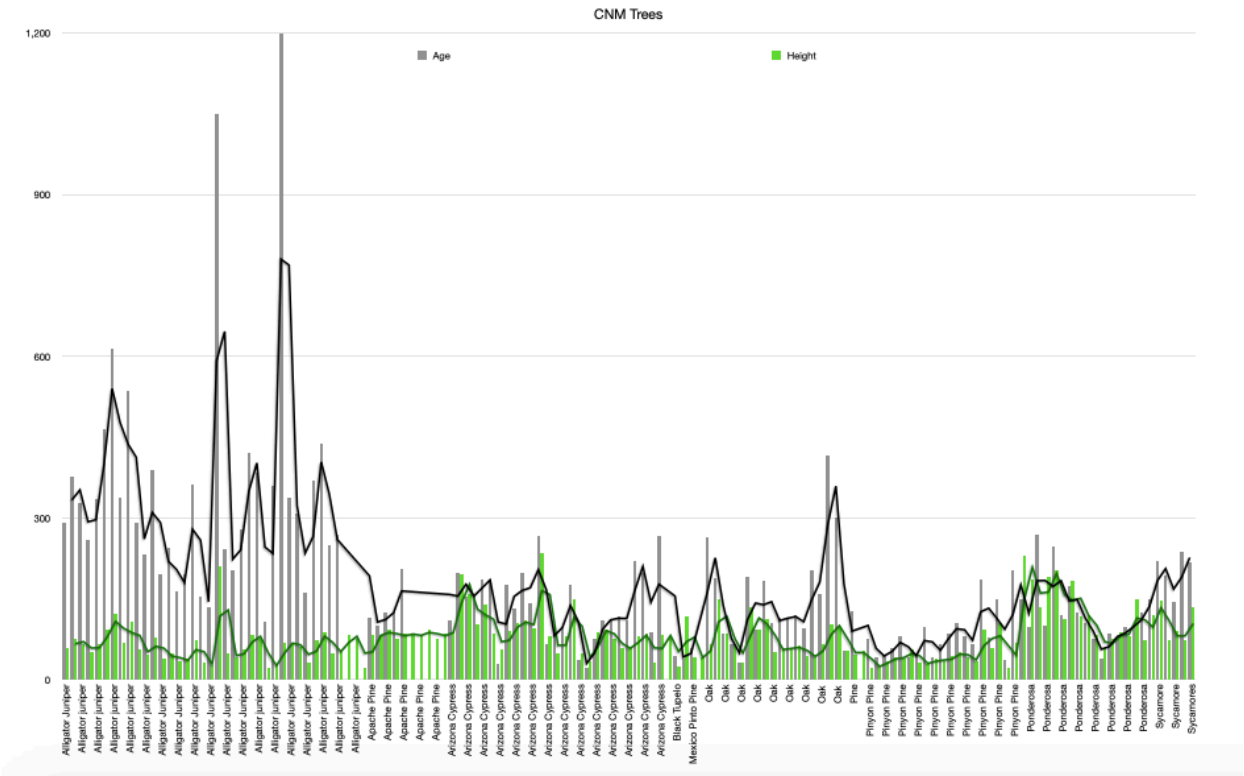
Grasslands abound at the low elevations and within a mile the trees gradually populate a diverse forest of black walnut, alligator juniper, oak and more than 50 species of grasses. As the canyon begins to narrow, one becomes closer to Bonita Creek which is similar to the east side Cave Creek with large Sycamores, Cottonwoods and Arizona Cypress mixed with Chihuahua Pine, Ponderosa and Apache Pine.

The road is one way in and one way out for a total of 8 miles from roughly 4000' in the grasslands to 7000' at Massai Point along Bonita Canyon Road at the Organ Pipe formation the canyon is narrow. Overarching deciduous sycamores and periodic Madrone trees are the magic during season changes with their yellow and orange leaves in autumn and first buds in spring. Climbing in elevation the rock faces are sheer and during rainy seasons are brought to life as water falls from the rock cliffs. Climbing into higher elevation one begins to see Douglas Firs, Pines and Englemann Spruce. Due to exposure at the top of the peaks, winds are fierce, snows are heavy and lightning sometimes strikes trees. Stunted due to the elements, trees are short and carrying the bending of the wind. With more sunshine manzanita and berry bushes abound and are food for the wildlife here.

- **Daily Report: Question of the Day: Where are the coatis? Chiricahua coati are like the wolves of Yellowstone**

Arriving at 7,310 feet at Sugarloaf looking south the highest point is Chiricahua Peak at 9,773ft. Along the visible rim of the ancient Turkey Creek Caldera, one can witness the burned swaths of the recent crown fires of the old growth Ponderosa Pine Forests now replaced by the pioneering Aspens taking root.

- **Daily Report: Very Dry, so dry one can feel the air pulling the moisture out of the pores of your skin**



Between the entry road and along the trails within the National Monument, I collected data on 141 trees including Ponderosa, Sycamores, Alligator Junipers and Oaks. The average circumference 79" with average height 80'. The youngest tree in the collection was 23 years old and the oldest 1200 years old. The average age of trees in this study is 189 years. In the Chart a running average shows the average age of the forest, a collective of diverse tree species living on the west side of the mountain. On both sides of the Chiricahuas, the oldest trees are the Alligator Junipers and for the CNM the oldest Alligator Juniper and Ponderosa/Apache Pine are near to Silver Spur Meadow. Natural Bridge Trail had some of the tallest and oldest Pines and succumbed to the 2011 and previous fires leaving the valley within mostly burned.

- **Daily Report: Red Dirt is an old river bottom that was pushed up to the top of the Chiricahuas, how cool!**

On the monument trails I measured 26 trees with an average circumference of 32" and average height of 36' some as young as 12 years old and the oldest at 720 years old. The average age of the 26 trees is 182 years. All of these trees were randomly chosen for this field report.

The Ponderosa Pine, Alligator Juniper and Sycamore that live near the river had an average circumference of 107" with an average height of 100'. Tree ages range from 130 years to 945 years old with an average age at 310 years old. I look forward to visiting again and exploring more into the primitive forest to find more grandmother trees.

- **Daily Report: Didn't hear coyotes today, but the deafening silence is disturbing**

Stories About Trees

My favorite thing about trees is that they are good teachers. If we watch, if we listen, and if we are patient we will hear the heartbeat of the trees. This last statement is very real, I have used my ear and my stethoscope to listen to the moving rhythm of the life blood of trees-we call it sap. All trees have sap, but not all trees have resin. Only conifers have resin. All trees provide food, all trees breathe, all trees move in the wind, some trees walk, some trees split, some trees osculate (kiss-a term I coined to explain the joining together of Douglas Firs and Big-Leaf Maples in an old growth forest in Oregon). Some trees are monocots, most that we know are dicots. Some trees thrive in fire, some need to be in creeks, others can withstand 130F temperatures. The range of tolerance is how we define the boundaries of life. Humans range of tolerance is very narrow compared to many other species on this planet. We have evolved mostly hairless with very little for self-survival, but with the help of trees for shelter, food, resources and company we do much better. I am always better with trees.

- **Daily Report: The trees seem to walk at night while we sleep**

Culture of Place

Early in the 1990s, I was part of a survey of a large finding of ancient agricultural deposits on the east side. At least 3000 years BP (before present) the nomadic travelers who were crossing in, around and through the Chiricahuas settled and began growing corn, and grasslike wheat, also including squash and beans we know as the three sisters. These early agriculturalists built canals like the Hohokam that lifted and moved water around the valleys and slopes of the Mountains. The things that are left behind to tell the stories are the stone tools, the metates and manos used to grind plants, the rock

foundations of old structures and the daily tools like spear points, sandals and bowls. Water was abundant during this time and flooding of the valley with rainfall was common. As things changed, people then moved on. Perhaps they returned seasonally, or stayed for certain amounts of time, we can only speculate on the context left behind. Under these layers are Clovis points and mammoth bones on the east side of the Chiricahuas too.

- **Daily Report: Nde are the People, those that the colonizers called Apache**

The names that you hear when you visit Chiricahua National Monument are mostly from the earlier European settlers that came to this place. Trail names, House names, even Massai Point were given names. The Land of the Standing Up Rocks are part of an origin story of the Apache people known as the Nde, but other cultures existed long before they arrived here too. These Standing Up Rocks are the spirits of the ancestors. For the *Chokonen*, one of the bands of the Chiricahua Apaches who made a settlement near the Standing Up Rocks, they would come to the interior of the pillars as a sacred moment, to visit, to collect medicine and food, but did not live within as the ancestors spirits already had a home inside the Standing Up Rocks. There was 15 million acres for all of the Apache tribes that expanded into southwestern New Mexico, Chihuahua Mexico and Northern Sonora as in Arizona. The name Chiricahua as written *Chiricagui*, was given by the Spanish. The Coyotero Apache from the White Mountain called the land *Ha'i'aha* which means they are the People from the Rising Sun in the East. The Mescalero who are in New Mexico called the same land *Sha'i'aode*, the People of the Sunset (as they had a view to this place in the West). Everything is relative to the Mountains and directions.

- **Daily Report: Listen, there are voices in the wind, could it be the mountains speaking?**

There is a story about how the Mountains speak to each other. It is said the mountains are the caretakers of the two-legged, and it is the wind that carries the voices of the mountains to all four directions and to each other in order to take care of the two-legged within them. The people that lived in the remnants of the Turkey Creek Caldera we now call Chiricahua called themselves the *Nde*, meaning the People. There were many similar language speaking tribes and bands that came through the mountains, interacted, stayed and moved on. What we call the Chiricahua Apache today pales in understanding the great diversity of the People, the *Nde*, in the Land of the Standing Up Rock.

Observations by Month beginning March 20, 2024

MARCH

Arrived in Portal, Arizona on March 20. It was dry and clear with many white-tail deer crossing the road. On March 25 weather moves in as a snowstorm leaving the top of the peaks white. There are many juncos digging in the leaves and forest duff. The moon is full and clear and a little bird is tapping on the window trying to fly in to the light. March 26 is sunny and skies clear. The creek is running, the snow is melting, bringing water down. There are moss and scaly lichens on the creek rocks, but the frog pond is empty and the leopard frog is no longer in the pool that froths with algae. In the evening more rain and snow with hail and upon waking blue bird skies again. A walk to crystal cave under green forest cover, one finds new bear scat along the dry creek rocks and small "rasta" head Apache pines are regrowing again. The elf owls have not arrived, perhaps they are migrating closer to other water sources. A solo whiskered screech owl echos and a saw-whet is heard a couple nights then gone. The local skunks have been given names of Jefe and Tomas.

APRIL

April Fool's Day opens with leaden skies and snow capped mountains. Rain has reached the ground at the research station and the clouds are sitting heavy just above the ground, so low, so heavy. The creek is running strong on the east side, still nothing on the west. Emory oaks are sprouting acorns and Madrone are flowering. Insects are arriving, many snails in the frog ponds, turkeys abound. Blonde coati are showing up and barberries with their yellow flowers and the crabapple flowers are in full bloom. On April 10 a full moon offers night glow but only a single elf owl calls. A western screech owl is off in the distance. April 13 the snow remains on the mountains. There are alpine cancer-root under the trees, mullein, yucca with flowers forming on the hedgehog and barrel cacti. Finding spearmint plants, horsetail, young cholla and native grasses under the junipers, sycamores, chihuahua and apache pines with band-winged grasshoppers in the fields. April 17 a full moon, with a fiery sunset the next day, snow still on the peaks. A young girl spied a mammal and with a photo tried to identify a dark haired with cotton ball white spots on its body with a thin rat tail and a ground burrowing

head. *Hystricognathi*? By April 21 the oaks are changing colors pushing the old leaves out to bring out the new. There is a bear roaming about, more scat today. Heard a trogon today as I hiked Snowshed trail. There are catkins on the honey mesquite trees, myrmicine ants, red harvesters and honey ants are building things. Carex grass known as a sedge and the common rock rose in brilliant yellow, grow. The turkeys are dancing and the males are calling. The desert penstemon and New Mexico thistle are finding the sun spots. A cougar track on April 27 and what looks like a wolf paw perhaps. Snowshed trail seems to be a corridor of travel for coyote too. Fence lizards and a gopher snake are moving about, with fox calls, bobcat tracks and more bear poop along the way.

MAY

May blooms came before the rains. There were yucca flowers and pods, pinyon cones were just budding, sotol already had huge flowers on the end of their tall stalks, myrtles and thistles, ferns, and Indian paint brush were unfolding and growing, confident rain was coming with the summer sun, but alas it didn't. On May the 4th a Blue-throated Mountain Gem showed up at the Research Station on its first flight in. There were Red Flame Skimmers enjoying the melting snow still left on the peaks. The cholla were producing fruit and there was clover in the shade under the burned trees left over from wildfires. By May 6 it was 80F, Too Hot! The creek is trickling, everything is budding. Catkins on mesquite blooms. On May 9, I arrived at CNM and hiked Cochise Head. The manzanitas were flowering on all of the bushes on the trails, and the oak leaves were yellow, red and orange already. Coatis were doing their climbing thing running up the trees looking for bird eggs and getting chased by the Mexican jays. My favorite hike up to Sugarloaf was full of green and great diversity of plants on the shady sides of the trail. On May 11 there was an Aurora that reached all the way into Arizona, gifting a violet glow in the sky for a quick 10 minutes! On May 15 storm clouds were high in the sky and raining down below in Sulfur Springs Valley. On the Bonita Canyon trail the Doug Fir were sprouting cones, there was Apricot mallow growing and Snow on the Mountain (euphorbia) flowers. Also appearing were fleabane, Dakota mock vervain, Buffalo gourd, Apache plume and southwest prickly poppies. The trees nearby in flower included Blue elder trees, Velvet ash, Mullein, White horehound, Purple plum thistles, Carolina buck thorn and lots of busy harvester and honey ants. Black clouds and rainbows settled in before sunset. The Madrone trees have berries now. By May 17 the last pool of water is gone in the creek and the coati are looking for more. On May 25 it looked like rain, but clouds stayed

high. On the Silver Spur trail the fields were full of white flowers, red brome grass, feather top grass and apache plumes. There were tracks in the wash including bear, turkey and a large cat. Rainbow hedgehogs were flowing and another Red fox-tail squirrel was spotted. Lyrids are active now, watching a meteor fireball and then a great horned owl hoots.

JUNE

June 1, rabbits were about on Mushroom rock trail. There were collared lizards, Silver-leaf acorns, bear scat, False Solomon's seal, seeping Ponderosa tree bark, Pinyon cones were open and more dragonflies. June 6 looked like rain with large swollen clouds, but nothing came down. Bears were walking the trails, finding berries but still no rain. On June 8 the ravens were flying the thermals, a Golden eagle, and dark clouds at Sugarloaf, but no rain. Many Kangaroo mice were around, and I measured the water in the wells. In 2022 the water depth in the well was 32," this year in 2024 less than 1/2" remains. These levels match the groundwater levels which are only recharged by water coming down from the peaks. A few cicada began to buzz and bobcats were about. June 13 a Red flag warning as it reached 92F and climbed to 101F. June 14 sited the yearling black bear on Bonita Canyon Road. The animals were looking for water and resorted to dripping pipes and water fountains. Finally on June 21 rain fell and the next day the entire valley was under deluge of rain storm. June 24 large rain drops led to massive rain caused waterfalls on the road that were pouring off the rock cliffs and causing flooding on the roads. The next day on the 25th there was a lightning storm with more water pooling on the highway. The tortoise and turtles began to emerge. First came upon a large 12" beige shelled Desert tortoise which I helped continue on its way off the road. The next day was a turtle heading the other direction, with a Gopher snake and Turkey vultures sunning themselves. Black Scarab beetles emerged and on Natural Bridge trail saw Red Velvet mites on the ridge, which are often seen after a rain storm. These mites are soil arthropods that decompose woodlands and maintain the structure of the ecosystem. These Trombidiidae are also called rain bugs, are *small arachnids (eight-legged arthropods*). On June 30 rain poured down for a constant 30 minutes. Everyone that awaited the moisture, the lifeblood of the desert, was celebrating.

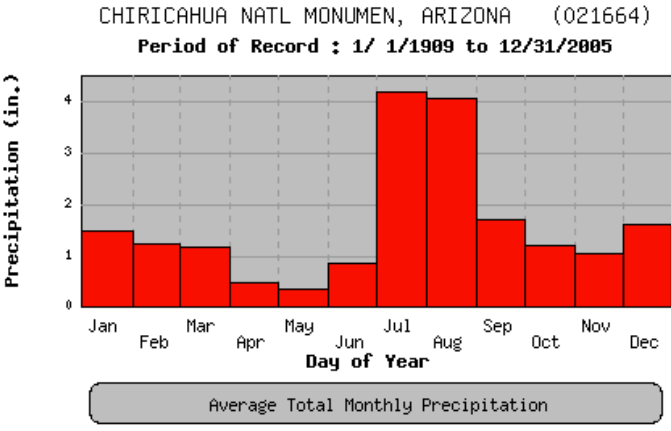
JULY

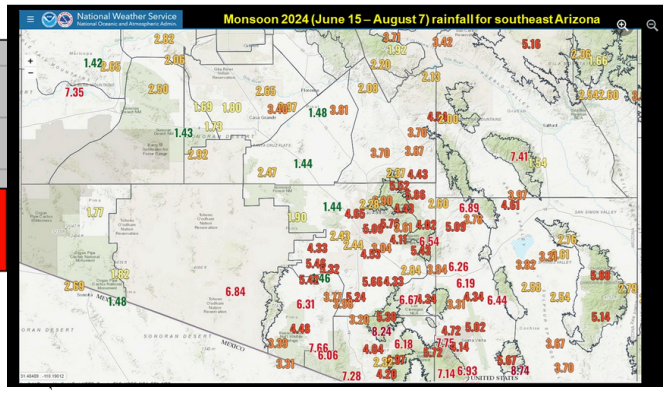
July and July 4 in particular brought out campers and people in abundance to the Chiricahuas. On July 5 however, a fire was reported not far uphill from Herb Martyr campground, on an already burned slope from the 2011 fire. This fire grew rapidly, and was difficult to get to. By July 11 the fires were still burning, haze filled the sky, and baby coatis were born in the ice machine room! The mom every year seemed to choose the maintenance yard to have and protect her babies. By July 12 the field were full of sunflowers, rain clouds were random every day, but settled in spotted sections of the valley below. The blonde coati had white tails and black and brown socks, white noses and Jr. Halo was born! Hollyhocks and Silver-leaf and Emory acorns brought much food for the animals. July 21 black clouds, yucca in full fruit now, pouring rain, red dirt flowing over the road, and a huge waterfall could be heard and seen from afar in Totem Valley. This day only, Bonita Creek flowed from red dirt to Natural Bridge trail then disappeared by the next day. Mushrooms appeared sparsely on Lower Rhyolite trail. A Gopher snake had sneaked in the door, she was looking for the Kangaroo mice!

Comparing July and August Rainfalls over the last 10 years:

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
july	5.4	3.44	2.35	4.88	1.64	1.68	1.61	3.65	5.59	2.12	2.0
Aug	1.39	2.97	3.51	8.17	3.13	1.2	1.45	2.83	6.35	1.64	4.09

Average Annual Rainfall 2022=28", 2023=15.19", 2024=13.46" Still trying to find patterns.





AUGUST

The best stories are in the visuals, the sensory memory we store that triggers place. The call of the jay, the smell of petrichor, the first rains and the lightning that pierces through the dark sky. They mark our hearts like marking a calendar and a change of seasons. August is always full, it is vibrant, dynamic, changing. Everything is in bloom, the rains should have returned if we are lucky and the creeks should be flowing. The coati with their growing babies, yearling bears lumber by and all the migratory birds stick around for the birders. In Chiricahua this August it did not fail even though the creeks did not run, water was scarce, but this place knows about conservation and life continues on. I noted the abundance of Desert mistletoe on the oaks this year. Perhaps the dry hollow nature of these fast growing oaks give the plant a home as most of the mistletoe appears on the oaks. The coati babies are growing and they are getting creative in where to find water, drip pipes, leaky spigots and under the road valve leaks. Driving into the park at night the great horned owls hang out in the grasslands. One should hang out there at night in the open sky as it is a very different spectacular place than within the canyons or on top of the peak. Coyote will pass through the fields hunting rats and mice just as the owls do, but the bobcats and smaller owls move inside the canyon. They have all found a niche to survive here. The coati have found a good home here and this summer their troops seem to be 30-50 in number! Drive slow!

Yarrow's spiny lizards (*Sceloporus jarrovii*), penstemons, and a few mushrooms all find moisture to bloom and thrive in August. Winds are strong with little rain. A siting of Montezuma quail crossing the road. Aug 25 an afternoon rain shower brings out a Mountain King snake, dark skies and lightning. A few cicada exoskeletons are on a few pine trees, but these are just a few solo climbers emerging in comparison to 2022 during the wet monsoon season. Manzanita berries and mesquite bean pods are plentiful and still providing food for the wildlife. Pinyon cones are open, but the seeds are hollow and new cones burst forth. Water is the trigger for whether the seeds have nut flesh or remain hollow.

SEPTEMBER

Praying mantis and spiders abound in September. The yucca stalks are tall and have successfully produced fruit, the turkeys are finding the last acorns, grasshoppers and Montezuma quail are about. The coati babies are big and strong now. The juvenile male White-tail deer have full antlers, some still in velvet. The berries and bean pods have dried up by now but the prickly pear have juicy purple fruit in which the javelina love. Tarantulas are out and crossing the roads looking for mates (it is the males that take that long journey looking for their female). A full moon and partial eclipse and a rescue of three elders stuck overnight at Heart of Rocks. Wildlife highlights: Mexican Grey wolf made a pass through west side of park on September 23, large amounts of bear scat about along with fox scat, and the coati are looking dehydrated, tails are skinny with matted hair. Summer heat with no water takes its tolls. SAR at HOR. (Searching for elder hikers at Heart of Rocks, lost on trail)

OCTOBER

We don't see a-lot of skunks in the Chiricahuas but they are there with their quick flash of tails low to the ground at dusk. Skunks are omnivorous and all of those insects that arrived in September are an important source of food for spotted skunks found in the Chiricahuas, Skunks also eat berries, nuts, roots, grain, and other plants and garbage if left

behind by campers. Acorn Woodpeckers are making quite a mosaic of holes in the trees storing their winter acorns, and early sandhill cranes are flying over and eating the remnants of corn in the surrounding fields. This water is diminishing in the nearby marshes and draws. In October 13, 2024, the comet C/2023 A3 (Tsuchinshan-ATLAS) was visible in the night sky, after sunset in the western sky. It appeared above and to the right of Venus. And the

Aurora Borealis had a presence all the way into Mexico with violet skies for about 10 minutes. Many gorgeous sunsets in October.

In October the Wilderness Risk Management Conference was held in Salt Lake City and I was fortunate to join the amazing wilderness protectors and offered a session entitled TCM Toolkit for Emergency Field Medicine.

NOVEMBER $ DECEMBER

Temperatures calm, things remain dry. Turkeys dancing. A stillness slowly weighs down on the mountain. Colors change, leaves fall, grasses lay down for a winter sleep.

March 2025

Returning to Portal, Az on March 2, there is snow on the peaks, but no rain on the ground. Things are very dry. Rain landed over in Bisbee, 89 miles southwest of the Chiricahuas and it was the first rain since August, a very long drought. March 8 more higher elevation snow on the peaks again. March 13 was a Lunar eclipse of a blood moon, that brought a snowstorm to the west side of the mountains. There is no water in the creek, extremely dry, the ponds at the research station have dried up, making the quest for the leopard frog almost impossible. No birds sited in South Fork as the birders report. Too cold and no water, trees are not budding yet and birds not ready to fly in. There are flycatchers and juncos, sparrows in the grassy field. A solo saw-whet owl is the first owl to be heard. A flammulated owl and a western screech take their turns in the canyon looking for mates. Coos deer and the skunks are about.

Thinking about how and what the Chiricahuas have evolved into, what we have experienced in our short time here, is fascinating. The story line of interpretation has a geologic marker of 27 millions years ago, a huge super-volcano covered the southeast corner of Arizona. There have been oceans, and seas, marshes and large mammals grazing in this plentiful landscape. Further back around 140 million years ago, the world was dominated by conifers, gingkoes and cycads which depended on wind to pollinate and so it was here as well. The conifers have remained longer than any other tree species In this place, and with them animal species became allies with these trees.

Then birds and pollinators in abundance arrived to the wet marshy lakes surrounding the mountain. With the wind and the new pollinators this area became rich, abundant and diverse. What we see today is due to a unique adaptation and ecosystems working together to live abundantly. Our duty now is to ensure the cast of characters remain in order to adapt to the current and future changes.

SAR: Search and Rescue-Safety

In the NPS there are many of us that are trained Wilderness First Responders. Hikers travel into remote places and sometimes need the help of the park rangers to get them out safely. I was fortunate to be that ranger that wanted to hike the trails everyday and help prevent injury and be a trail medic to those in need. Calling 911 in the Chiricahuas sets in motion an interagency rescue including Cochise County Search & Rescue, a volunteer operation in conjunction with the Cochise County Sheriff's Dept. The teams work seamlessly together whether that be a hike in, a litter carry out, or a helicopter long rope haul out. Training and experience are key and there is hope that the NPS sees value in having trail rangers and wilderness first responders as a necessary demand. For me, spending hours with hikers waiting for response teams was the time of storytelling, keeping hikers from going into shock, keeping warm while the sun was setting and cold was creeping in. So many have sent cards and notes saying thank you, highlights of being a park ranger. I hope that every ranger feels the value of taking a wilderness first aid course, and continuing to do so for all of their time within the NPS. So valuable whether it be a bandaid for a fallen child, or bleeding control of an accident, or even like in one of the situations on an icy trail, a horse slipped off and fell 60ft below. Being prepared and experience are keys to happy hikers.

The common theme for most of the assisted rescues and injuries are due to altitude sickness and dehydration. The desert is very dry and visitors are often tired from traveling, not staying hydrated and not eating or sleeping well affects how the body and mind functions. Many people also come from lower elevations not far away and underestimate their abilities at the 7000ft altitude which has decreased oxygen available exacerbating underlying conditions. In the hot sun, dry and dehydrated, people get tired, drag their feet and trip, or cannot finish a trail. These calls are often assisted by park rangers by bringing water and electrolytes and helping to assist their hike back to their vehicles. Some however need extra help when it becomes life threatening.

One rescue during summer 2024 involved three elder hikers from Tucson area who hiked a-lot there. They arrived in the park for a three hour hike (sound vaguely familiar for you that remember Gilligan's Island)? They each brought an 8oz of water, no food, wore Keds sneakers and went by memory instead of bringing a map. They parked at echo canyon parking lot and went down Echo canyon planning and making the 3 mile loop. They took a wrong turn and day turned to night. A 911 call came in the next morning at 630am. Losing their way, missing way signs, running out of water and food, they laid on the bare soil amongst the rocks for shelter. Day temps were into the 80s but nights temperature was 30-40 degrees cooler. They were dressed in shorts. That morning the elder man had hiked to with his phone searching for a signal. He had tried

before but there was no connection and no signal sent to 911. The only thing he knew when he called was that they were lost, out of water and food, had someone that could no longer walk and he had passed a sign named "Duck on a Rock". When the call came dispatch I was already in the park camping in the campground. I put in my pack and waited for Cochise County SAR that were already on their way an hour out. The hikers were staying in place and we knew they were somewhere near Heart of Rocks, a landmark at more than 7,000ft elevation and at least 3 miles uphill from the Visitor Center and more to their vehicle the other direction. A hasty team of 4 including me made our way with medics first to find the lost hikers. Well-prepared hikers had already hit the trails before us and as we neared the HOR, we called and got a response from the hikers. When we found them they were dehydrated, had missed taking medications, exhausted but in great spirits. They had just encountered a couple of hikers who gave them water and snacks. We assessed vitals and called for a litter for the hiker that could no longer walk. Team work and strong wills, we all made it down many hours later. I received a note from the hikers when they returned home with a Thank you, and an appreciative promise that they would not do that again, they had learned their lesson to be prepared. What they learned, like the Gilligan's crew, is to be prepared, survival is imminent depending on some vital key things like water, food, shelter, proper shoes, and a map for starters. In these remote areas where there are no cell phone connections, we must resort to the way things were before our very connected world and be trail smart.

Also in the month of September, more people from the city arrived with a group of 8 hikers. The first flag was the truck with its engine running, locked with dogs inside and the air conditioner flowing. A sign was left on the windshield saying they were kn a trail, not to worry, it was 9am and they would be back by 1pm! So many errors here, first never leave animals in a vehicle, especially in the desert. Never leave a vehicle running and unattended. This finding led to Law Enforcement getting involved and I as trail medic and he made calls to the phone number left on the windshield note. Serendipity on the trail miles away the driver received the message we left and messaged back that he was running back on the trails. He also reported he was with a group of hikers and a couple had split off, he was unsure of their location and were in respiratory distress and out of water. The last location known was echo canyon, although the message came from Inspiration Point and Big Balanced Rock trail miles

away. The LE went for water, I started hiking echo canyon trail to Hailstone trail headed to Inspiration Point. I intercepted 2 hikers of their group who had hiked past the ones in distress. Hikers coming the other direction gave details on crossing paths with a man that was SOB with three others who were hiking slowly about 1.5 miles away. I radioed the location to the LE and asked for his assistance. Finally reaching the distressed hikers we gave water and electrolytes which brought the vitals back up. The hikers were out of water and dehydrated which made the respiratory distress worse. With slow hiking all made it out a few hours later. The man with the running truck and dogs was given a warning instead of citation and all were off for food, hydration and a long couple of hours back to the city.

The Echo Canyon Loop trail is the most popular hike in the park, and also where most of the calls for assistances and rescues happened this year. Trips and falls, an amputee with one leg, elders and pre existing conditions exacerbated with heat and altitude making ailments turn into distress calls. They all have similar things in common, dehydration and altitude sickness. The difference from the 4000 foot valley floor and trails at 7,000ft are significant enough to cause breathing and fatigue. Heat makes everything worse, and running out of water is critical when you overheat. Being in remote locations with constant elevation changes with backcountry, rocky trails exhausts the body more than flat trails and most people coming from flat land areas overestimate mileage and their abilities. One elder woman was one mile away from finishing a trail, had just come 2.5 miles around in exposed sunny and hot temperatures and was exhausted. She was 81, was not a hiker but had joined her family of ten or so on this short 3 .3 mile hike as they thought. The call came in from a concerned hiker that had passed them on the trail who said there was a terrified and mentally distressed elder woman on the trail. Doing a hasty, I arrived to find the large family around the lady who was sitting on a rock crying. She was terrified that she would never get off the trails and die. Her anxiety even though she was surround with many young people that were capable of carrying her out, had stalled her to not moving and terrified of dying. The place where the mind goes during emergencies is phenomenal. It replaces rational decision making with a sort of trail blindness. Short distances turn into barriers, blinded by the available help around them, and trusting that rest, water and food will bring back energy they need. They also had run out of water, all of them. Carrying small disposable bottles of water, they expected a short walk around. When I arrived in uniform, this gave the elder woman a since of relief. With all of those people around her, it was the uniform that gave her hope that she was rescued. And she was, with the help of the young men around helping her walk and carry her over rough areas we arrived at the parking lot.

Telling stories with her along her journey calmed her anxiety and panic, and reviving her dehydrated body also helped her mental mind. Most of our jobs as SAR rescues is about the mind of the injured. Its a place where I have made many friends that stay in touch with a grateful thank you! The best job ever.

- **Daily Report: Pinky swears Rule!**

Citizen Scientists and Jr. Rangers

The absolute highlight and the closing paragraph to this long report, is how important Citizen Science is. Having every visitor and every hiker participate in understanding the value of wild places, the importance of taking care of these valuable bits of nature that provide life for the future. The Jr. Rangers are my favorite. Every pinky swear ever made, every swearing in at the Visitor Center, every badge worn and workbook completed! Is one step closer to those children and ageless visitors that promise to take care of the National Parks. Some grow up to become rangers themselves, or teachers, or leaders working to conserve and take care of the future of these special places. Thank you!

And Thank you for reading this field report and sharing it forward.

Citizen Science Tools:

- iNaturalist & iSeek
- NASA Globe Observer

Further Reading:

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