Cemamagĭ Du'ag

A Field Guide to Tumamoc Hill

Written and edited by Juliet Cassone Saxton
Designed and illustrated by Aubrey Behrens



Cemamagĭ Du'ag, known as Tumamoc Hill, leads you along a much-walked, much-studied, much-loved path. Every day, around a thousand hikers climb the hill's steep path as it winds its way through the desert.

This field guide is meant to explore Cemamagĭ's history— the guide is paired with "field notes" which include quotes from researchers, workers, poets, and hikers to let the hill's history speak for itself. The guide is about the hill itself, the desert laboratory that has occupied the land for over one hundred years, and the trail that thousands of walkers now use.

As poet Mary Oliver marveled, "If you notice anything it leads you to notice more and more,"

So take a moment to notice this place you might walk every week - and by noticing, see it more deeply than before.

Then, begin the walk again.



JIAWUL
(CANDY BARREL CACTUS)

Cemamagĭ Du'ag

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KAKAICU
(GAMBEL'S QUAIL)

Part I: The Hill

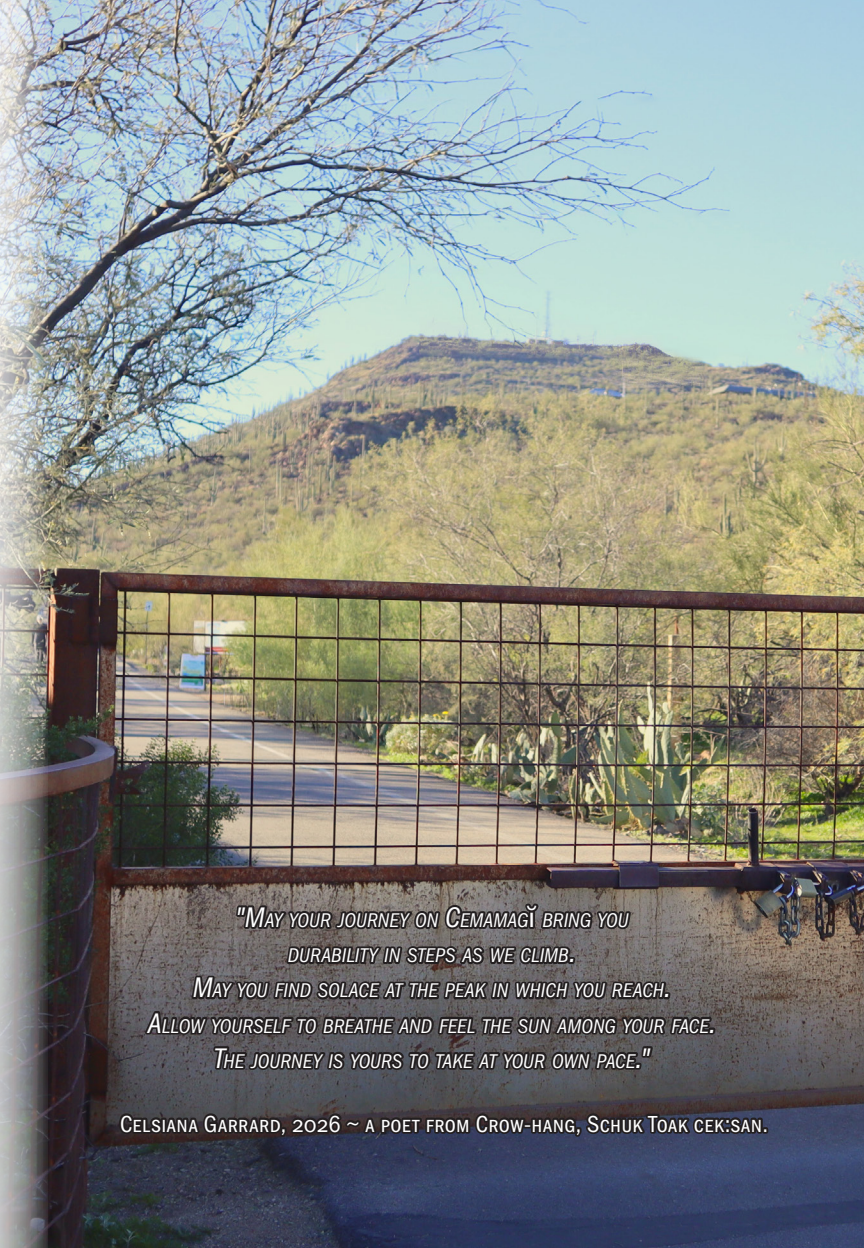
"ONE DAY IN EARLY SUMMER I WALKED ON TUMAMOC BEFORE THE SUN TOOK COMMAND. IF TUCSON HAS AN ACROPOLIS, THIS IS IT, THE HILL OF THE HORNED TOAD."

LAWRENCE POWELL, *FROM THE HEARTLAND*, 1976



People hiking Tumamoc Hill is nothing new. Cemamagĭ itself has lived many lives, as varied as the people who walked its path, studied its plants, or made a life on the hill.

The Sonoran Desert itself has a history of resilience and adaptation, as does Tumamoc Hill. But the hill also tells stories of collective labor and abundance. From the Indigenous people who maintained a village that required carrying wood and water up to the hilltop, to the current researchers maintaining the Desert Laboratory, the hill has been a place of work, learning, and story.



"May your journey on Cemamagĭ bring you
durability in steps as we climb.
May you find solace at the peak in which you reach.
Allow yourself to breathe and feel the sun among your face.
The journey is yours to take at your own pace."

Celsiana Garrard, 2026 ~ a poet from Crow-hang, Schuk Toak cek:san.

Tumamoc derives its name from the O'odham word, "Cemamagĭ" which means horned lizard. The hill itself is near the Santa Cruz River and "A" Mountain, known as "Cuk Ṣon" in O'odham, which means "the base of black hill." Cuk Ṣon would become the basis of the name "Tucson," which represents one of the longest continually inhabited and farmed areas in the United States.



Cemamagĭ Du'ag is pronounced Chu-mah-mahgih Du-ahg. Cuk Ṣon is pronounced Chu-k Shon.

"The base of black hill" is quite on the nose; both hills, in fact, have "black bases" formed of layers of lava and sediment spanning back 30 million years. These rocks, appearing dark in color, can be found on the hill and throughout Tucson, because quarrying led to the use of these volcanic stones in the construction of the University of Arizona, the buildings on the Desert Laboratory's grounds, and the St. Mary Hospital at the base of the Hill.

"CUK ṢON IS A STORY. TUCSON IS A LINGUISTIC ALTERNATIVE.
THE STORY IS IN THE MANY LANGUAGES STILL HEARD IN THIS PLACE OF BLACK MOUNTAINS.

THEY ARE IN THE ECHO OF LOST, FORGOTTEN LANGUAGES
HEARD HERE EVEN BEFORE THE PEOPLE ARRIVED.

ROCKS, SEDIMENT OLDER THAN LIFE ITSELF SERVE AS REMINDERS."

Ofelia Zepeda, "Proclamation," 2008 ~ a
Tohono O'odham poet and linguist.

Thirty to fifteen million years ago, mountains pushed up by volcanic activity blocked off moisture from the Pacific Ocean and Gulf of Mexico, which made the area dryer and hotter. 1.8 million years ago, the glacial periods led to a surge in coolness, which led to the encroachment of woodland plants. As temperatures warmed across the planet, the Sonoran Desert we know today formed around 9,000 years ago. By this point, Arizona's megafauna, like mammoths, giant anteaters, and giant sloths, had gone extinct.

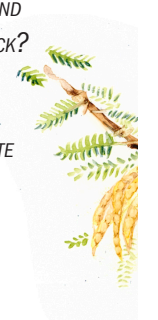




"In the shadows along the trail I keep an eye for ghosts, the beasts of the ice age. What is the purpose of the thorns on the mesquites in my backyard in Tucson? Why do they and honey locusts have sugary pods so attractive to livestock? Whose foot is devil's claw intended to intercept?

Such musings add magic to a walk and may help liberate us from tunnel vision, the hubris of the present, the misleading notion that nature is self-evident"

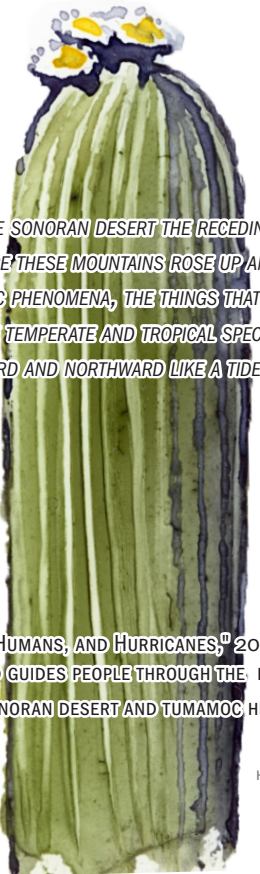




Paul Martin, "The Last Entire Earth," 1992/3 ~ martin researched paleoecology and natural history with the Desert Laboratory from 1957-2008, best known for his work with megafauna, pollen dating, and packrat middens.

The desert evolved from this alternating temperate-tropical state, becoming extremely biodiverse and unique, highlighting plants and animals with drastic adaptations. Over millions of years, succulents became desert-adapted into cactus. Lush leaves became spines.





"I like to call the Sonoran Desert the receding hairline of the tropics... since these mountains rose up and created all these atmospheric phenomena, the things that were around before that were temperate and tropical species... kind of receded southward and northward like a tide or hairline."

ROBERT VILLA, "HERPS, HUMANS, AND HURRICANES," 2025 ~ VILLA EXPLORES, STUDIES, AND GUIDES PEOPLE THROUGH THE HISTORY AND ECOLOGY OF THE SONORAN DESERT AND TUMAMOC HILL.

HA:ṢAÑ (SAGUARO)

People came through this area around 11,000 years ago, but it was about 4,000 years ago that people continuously lived and farmed in the Tucson basin, moving up Cemamagĭ Du'ag 2,300 years ago.



KU'I (MESQUITE)

Indigenous peoples farmed along the Santa Cruz watershed, made a trail up to the hilltop, and used the summit village for grinding food, storing resources, harvesting saguaro fruit (bahidaj) and Palo Verde beans (muñ). This hilltop village is also one of the earliest publicly known sites of coordinated communal labor in Arizona. With fine soil, proximity to the river, and flat hilltop with a view, it was a prime spot to live.



TOHAWES
(BRITTLEBUSH)

"Every plant on the mountain ought to be regarded as if (it) has been placed there for some special purpose and should not be destroyed without good cause."

From a letter Daniel T. MacDougal sent to
William A. Cannon, September 25, 1903.



Cemamagĭ's hilltop is covered with "*cerros de trincheras*," which are massive walls and terraces made of rock, first built around 2,000 years ago. There are also remnants of pit houses, bedrock mortars and cupules, extensive rock art, and a trail system. About 150 ancient houses have been found on top of Tumamoc.

Researchers have asked: Why live on a hill? What were these walls for? Were they for defense or for something else?

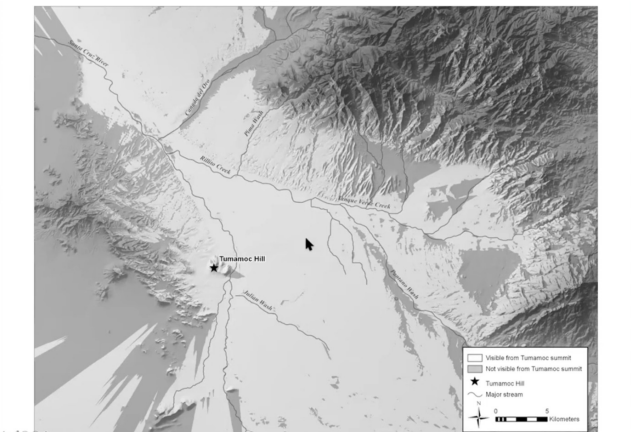
The hilltop was a prime location for crop storage, gathering, terrace farming, and ceremonies. The walls could also have been built to keep intruders from trying to come up the hill. But it's also possible that, since the walls are low to the ground and close to gardens and houses, the walls could have been for gathering rich soil for terrace gardening.

Archaeologists still debate this even now!



Some of the extensive rock art and petroglyphs found on Cemamagĭ are solar markers. On the summer solstice, the longest day of sunshine all year, when the sun comes over the horizon, a shadow moves across a stone petroglyph like a pointed edge.

The hilltop offered a place to monitor the weather using a 360-degree view to notice changes in clouds and changing sun placement. The summer solstice, for instance, indicates the agricultural season, with upcoming abundant rains essential for desert growing seasons. Weather reports could be delivered right from hilltop to river basin—Indigenous people gathered and shared knowledge long before the Desert Laboratory or the University of Arizona existed.



Viewshed Analysis for Tumamoc Hill



The archaeology of Cemamagĭ can tell us a lot about the past. The pottery shards found on the hill show that the pottery came from all over the Tucson Basin, meaning that people came from different parts of Tucson or that pottery was being imported into the community through trade. This can show extensive social connections throughout the Tucson area. Meanwhile, the presence of roasting pits, rock knives, and rock terraces show that there was also agave farming on the hillsides.

Around 1,500 years ago, the Hohokam people grew agave on rockpile fields at the base of Cemamagĭ, though not living on the hilltop themselves. After maturing the agave (between 10 and 30 years), they were harvested, stripped with rock blades, and baked in roasting pits, turning into a sugary but important food source. The fibers were also utilized for various non-dietary needs.



"THE HEART IS A VERY SWEET AND NUTRITIOUS FOOD AFTER IT'S ROASTED. THEY COULD JUST TAKE PIECES AND CHEW IT UP AND SPIT OUT THE FIBERS (QUIDS). IN PRE-HISPANIC TIMES THERE WEREN'T A LOT OF SWEET THINGS AND IT WAS PARTICULARLY PRIZED FOR THAT."

SUZY FISH, "AGAVE RETURNS," 2018. DRS. SUZANNE K. FISH AND PAUL FISH RESEARCHED HOHOKAM ANTHROPOLOGY IN SOUTHERN ARIZONA, OFTEN DOING RESEARCH ON CEMAMAGĬ DU'AG.



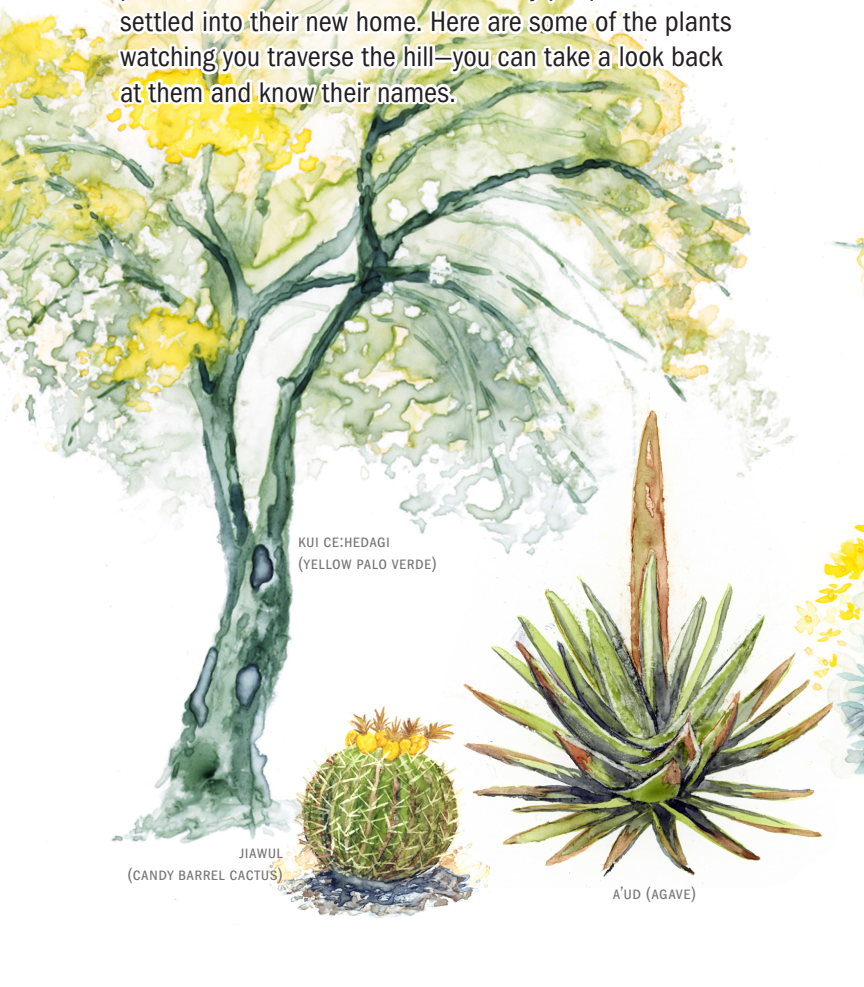
Long after there were villages on the hilltop, and after the Hohokam archaeological era, the Tohono O'odham and Sobaipuri O'odham continued to live, farm, hunt, and forage in Southern Arizona as they had before, including along the Santa Cruz River at the base of the black hill, Cuk Ṣon (A-Mountain).

The Spanish had consistent contact with this area from the seventeenth century and on. They had built a mission along the Santa Cruz River at Cuk Ṣon to take advantage of the river's water and the pre-existing Indigenous population for labor and religious conversion. This presence led to the creation of the city of "Tucson" in 1775.

When the United States acquired Arizona in the Gadsden Purchase of 1854, American settlers moved into Tucson, with the U.S. government forming the San Xavier Reservation in 1874. Over time, these colonial contacts displaced Indigenous people at Cemamagî Du'ag. On the Wa:k (San Xavier) District, just around ten miles south of Cemamagî, the O'odham still live and farm along the Santa Cruz River, reclaiming exploited water resources to continue the cultivation, recovery, and regeneration of their bio-cultural heritage.

PHOTO OF THE SANTA CRUZ RIVER TAKEN 1910.

All these millions of years of history end in the ecosystem you see on the hill now. Every time you walk the hill, you move through the homes of 346 species of plants, 49 of which were introduced by people and have settled into their new home. Here are some of the plants watching you traverse the hill—you can take a look back at them and know their names.



"THE LIFE OF A DESERT PLANT IS AN INCESSANT STRUGGLE AGAINST ADVERSITY FROM THE VERY START. OF THE MANY SEEDLINGS WHICH APPEAR IN THE RAINY SEASONS NOT MORE THAN ONE IN A THOUSAND SURVIVES TO THE NEXT RAINY PERIOD, AND FEW INDEED ARE THE ONES THAT LIVE TO REACH FULL SIZE. THE SCARCITY OF WATER, THE DESICCATING EFFECTS OF THE BRILLIANT SUNSHINE, THE DRY AIR, AND THE ALMOST CONSTANT WIND, TOGETHER WITH THE RAVAGES OF HUNGRY RABBITS, MICE, BIRDS, AND INSECTS, ALL MAKE LIFE PRECARIOUS EVEN FOR THE MOST HARDY PLANTS."



"IT HAS OFTEN BEEN REMARKED THAT THE FINEST BITS OF DESERT IN THE TUCSON REGION SEEM LIKE SOME INTENSE BOTANICAL GARDEN. THE IMPRESSION COMES FROM THE WIDELY DISSIMILAR PLANTS THAT MAY BE FOUND GROWING TOGETHER. THE GIANT SAHUARO, THE GREEN-BARKED PALO VERDE, THE THORNY OCOTILLO, THE GRACEFUL CREOSOTE BUSH, THE SHINING CHOLLA, THE ACACIA, THE BARREL CACTUS, A DOZEN OF OTHER TYPES, ARE MINGLED WITH EACH OTHER IN MATCHLESS LANDSCAPE EFFECTS."

FORREST SHREVE, *THE DESERT AND ITS LIFE*, 1934 AND "THE DESERT LABORATORY OF THE CARNEGIE INSTITUTION OF WASHINGTON".

Cemamagĭ Du'ag lies along an annual migration route for birds, which also makes it a perfect place for birders. Birds chase seasons while walkers and researchers chase birds.



Vermilion Flycatcher

Mammal life also teems on the hill, scurrying by to gather food, hiding from the sun, and stopping for water where it collects with animals ranging in size from the mule deer to the tiny but mighty pocket mouse.

"...to me that speaks volumes about how important it is for people to stop and realize where they live in the world and what non-human beings and non-human teachers are – how there's so much potential to heal ourselves and heal each other based on taking the time to understand those beings and the ability to relate in some way. Learn from saguaros, from snakes, and Gila monsters and coyotes and javelinas and the mountains."

Robert villa

The hill of the horned lizard is also the site of many reptiles and amphibians, moving under shrubs and rocks. There has even been a sighting of a desert iguana, the eastern-most sighting in the United States!



CEADAGI
(GILA MONSTER)

Fun Fact about the Gila Monster!

"...so Gila Monsters, because they only eat maybe once a year, their body has to prepare for that. Because they also eat a lot of food all at once. so I have people imagine eating your entire Thanksgiving meal in one sitting and sleeping it off for the rest of the year. So Gila Monsters have to be able to produce large quantities of insulin and they have very specific metabolic adaptations for being able to process all of that..."

Robert Villa explaining how scientists found out how to make the compound for the drug Ozempic from Gila Monsters. "How We're All Roommates," Turek Books Podcast, 2025.

Part II: The Lab

As you cross the mid-point up the hill, you will see buildings made of volcanic stone jutting out of the side and see the sign, “Desert Laboratory.”



But in fact, these buildings are not the laboratory.
The whole hill is.
All 860 acres.

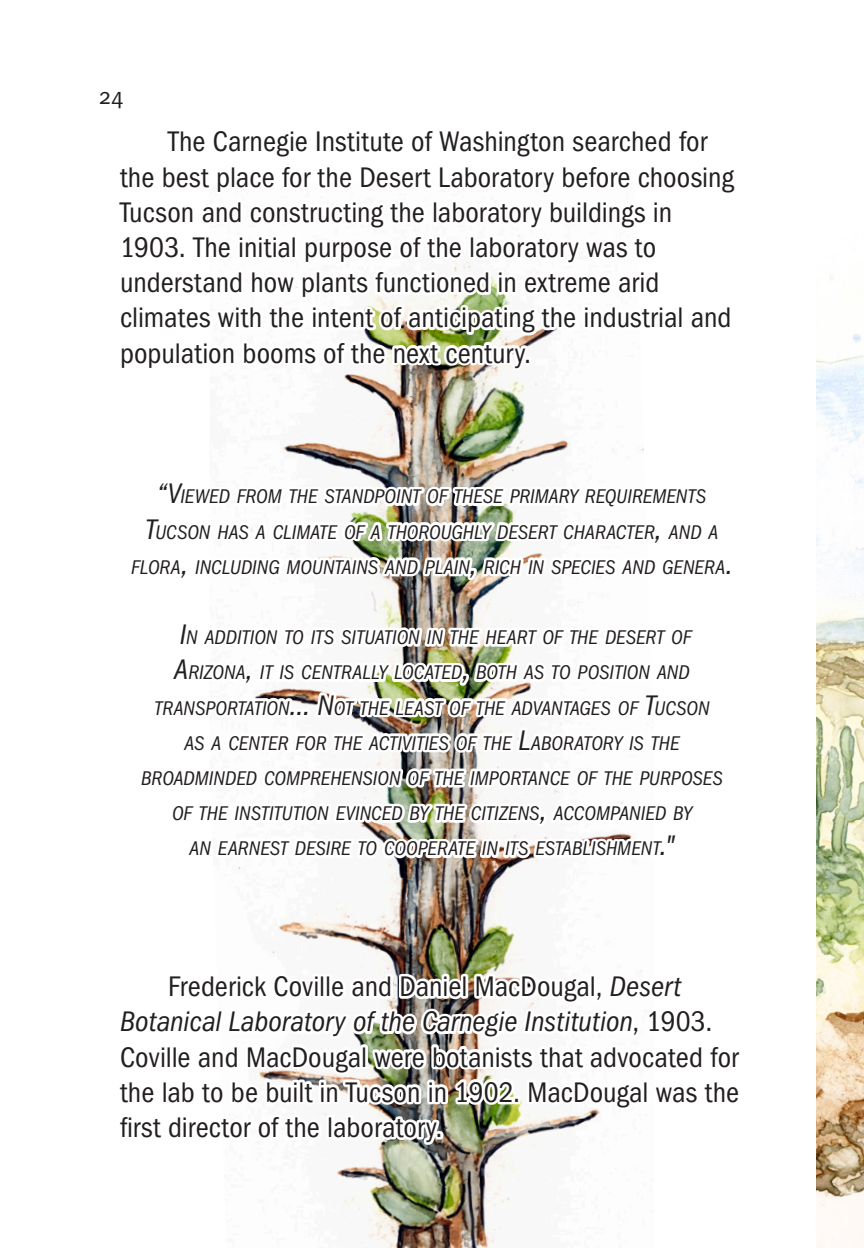
This is a living lab.



"It won't be many moons now before we shall have a laboratory here that will do your eyes good to see."

From a letter William A. Cannon sent to Daniel T. MacDougal in October 17, 1903 ~ Cannon was the first resident researcher of the Desert Laboratory, and he worked in the emerging field of ecology of desert plants and the study of root systems.

The Carnegie Institute of Washington searched for the best place for the Desert Laboratory before choosing Tucson and constructing the laboratory buildings in 1903. The initial purpose of the laboratory was to understand how plants functioned in extreme arid climates with the intent of anticipating the industrial and population booms of the next century.



"Viewed from the standpoint of these primary requirements Tucson has a climate of a thoroughly desert character, and a flora, including mountains and plain, rich in species and genera.

In addition to its situation in the heart of the desert of Arizona, it is centrally located, both as to position and transportation... Not the least of the advantages of Tucson as a center for the activities of the Laboratory is the broadminded comprehension of the importance of the purposes of the institution evinced by the citizens, accompanied by an earnest desire to cooperate in its establishment."

Frederick Coville and Daniel MacDougal, *Desert Botanical Laboratory of the Carnegie Institution*, 1903. Coville and MacDougal were botanists that advocated for the lab to be built in Tucson in 1902. MacDougal was the first director of the laboratory.

The Desert Laboratory land was fenced in 1906 to prevent damage to vegetation from cattle and goats and to prevent vandalism of the plots, petroglyphs, and other artifacts. The Desert Laboratory was established as an ecological reserve—the Laboratory would continue to be fenced through the twentieth century making it the longest monitored desert ecological site.



"AS WE APPROACHED THE FOOT OF THE BOTANICAL MOUNTAIN, I FRAMED UP A FOOLISH QUESTION. I WAS ABOUT TO SAY, "WHY ARE YOUR FENCE POSTS SO TALL, AND SO IRREGULAR?"

BUT FOR ONCE I WISELY HELD MY PEACE; AND PRESENTLY IT WAS CLEAR THAT ALL THOSE SEEMING TALL STRAIGHT POSTS RUNNING UP THE MOUNTAIN ON THE SOUTHERN SKY- LINE WERE GIANT CACTI, WITHOUT SIDEARMS.

THEY STOOD ALL OVER THE PLAIN, AND CLIMBED UP ALL SIDES OF THE MOUNTAIN."

WILLIAM HORNADAY, *CAMPFIRES ON DESERT AND LAVA*, 1908.

The Desert Laboratory researchers work in biology, hydrology, climatology, geology, anthropology, etc. in deserts across the world—and in many ecologies that are nearer to the hill itself like the Santa Catalina Mountains, the Santa Rita Experimental Range, the Colorado River Delta, Baja California, and the Salton Sea.



ȘEGAI (CREOSOTE)

But more than anything, the Desert Laboratory began with a focus on ecology. In the early 1900s, ecology was still an emerging field in the U.S., but the Desert Lab was helping lead its development through producing the academic journal *Ecology* (originally called *Plant World*), training the first generation of ecologists, and publishing some of the first ecological studies, with Effie Spalding publishing the first article to come from the Desert Laboratory, “Mechanical adjustment of the sahuaro to varying quantities of stored water.”

Eventually, the Carnegie Institute, with limited funding, turned its eyes to new research sites, and it seemed like time had run out for the Desert Laboratory. In 1937, the Carnegie Institute transferred ownership of their deeded and leased lands to the United States Forest Service for $1, and the lab entered an era of decreased interest and funding. But in 1956, the University of Arizona acquired the lab, and the Desert Laboratory came back to life.

This also started the trickle effect of Tumamoc Hill and the Desert Laboratory being designated a National Historic Landmark in 1965, a National Environmental Study Area in 1976 by the U.S. Department of the Interior, and a State Scientific and Educational Natural Area in 1981.

The Desert Laboratory transforms with each phase and director, reflecting emerging science and researchers' interests. The Carnegie Institute valued understanding the desert to adapt arid lands for usability, in order to "tame" the desert. Forrest Shreve came to the Desert Laboratory as a botanist in 1908 and directed the Desert Laboratory from 1910 until his death in 1950. Under his leadership, the Laboratory took a turn towards appreciating the desert in its own right. However, this new phase in 1956 brought the University of Arizona's Department of Geochronology into a close relationship with the Lab.

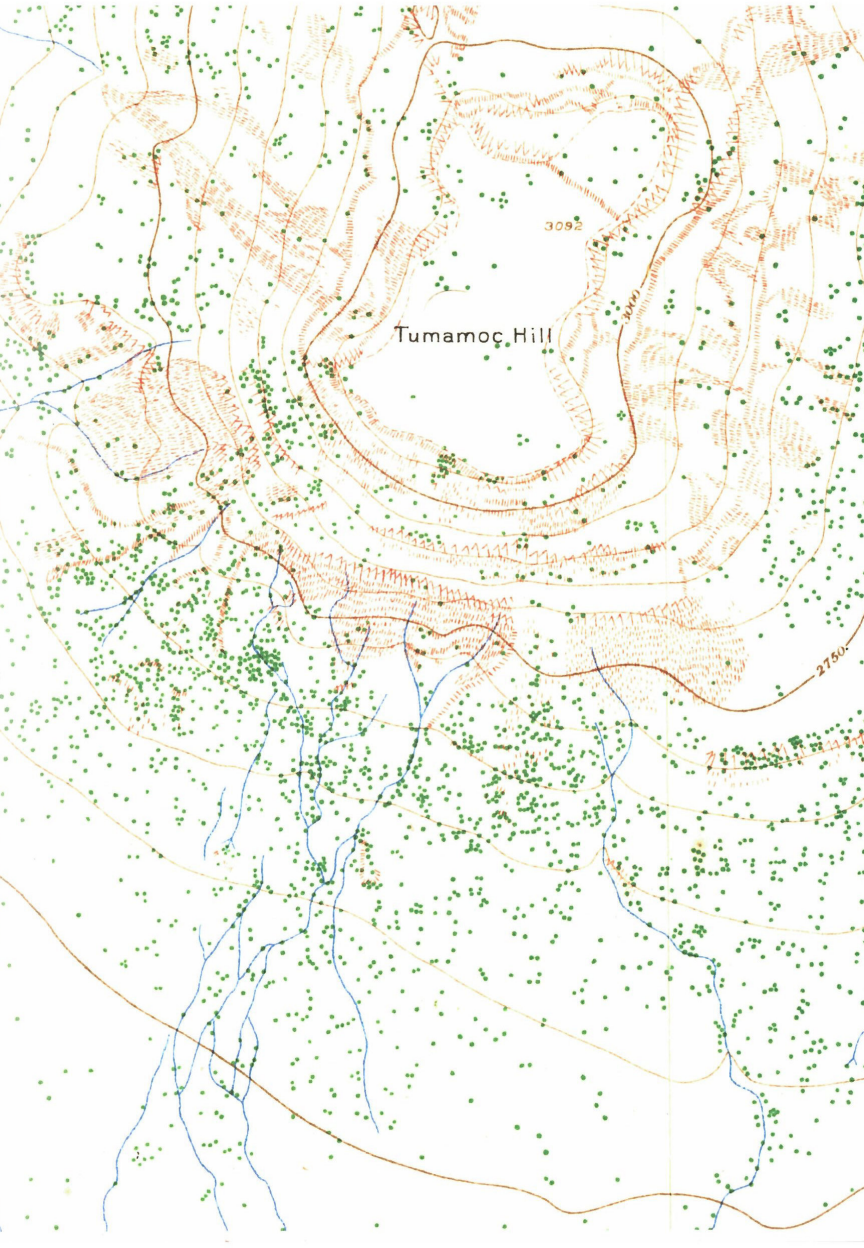
Geochronology refers to the study of time through earth science. Using data from rocks, fossils, and sediments, scientists can determine the age and history of events on Earth.

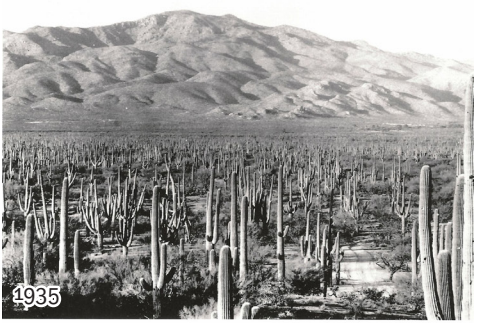
Despite changing priorities, the research that came from the Desert Laboratory has always been unique in how sustained and repeatable it is. The research included permanent plots of monitored plant sites and repeat photography, both types of research that can be duplicated over stretches of time to monitor change over time. This is some of the longest-term data we have in ecology, because it began so early.

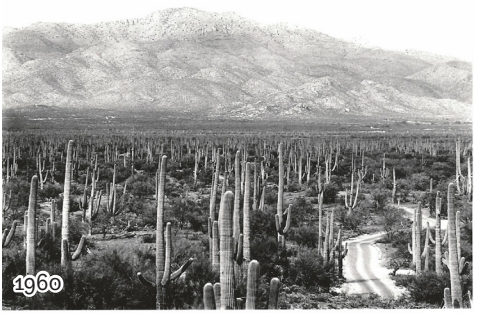
To start, Volney Spalding set up nineteen permanent plant plots to examine long-term changes in desert plant life. Nine of these plots have survived. Over the years, in addition to adding new plots, researchers re-mapped and re-measured the original plots to continue observing changes.

"ONE OF MY HEROES AMONG THESE EARLY SCIENTISTS WAS VOLNEY SPALDING. THIS IS THE MAP HE MADE OF EVERY SAGUARO ON TUMAMOC AND A-MOUNTAIN, OVER 10,000 OF THEM. THE TASK IS ALMOST MYTHOLOGICAL, BUT SHOWS THE ENERGY AND ENTHUSIASM OF THESE RESEARCHERS IN WANTING TO UNDERSTAND THE LANDSCAPE, AND THE RELATIONS OF PLANTS TO THEIR ENVIRONMENT."

PAUL MIROCHA, "POG TALK, PART 2," 2012. VOLNEY SPALDING WAS THE FIRST VISITING INVESTIGATOR AT THE DESERT LABORATORY AND A PROFESSOR OF BOTANY.


3092
Tumamoç Hill
2750


1935


1960

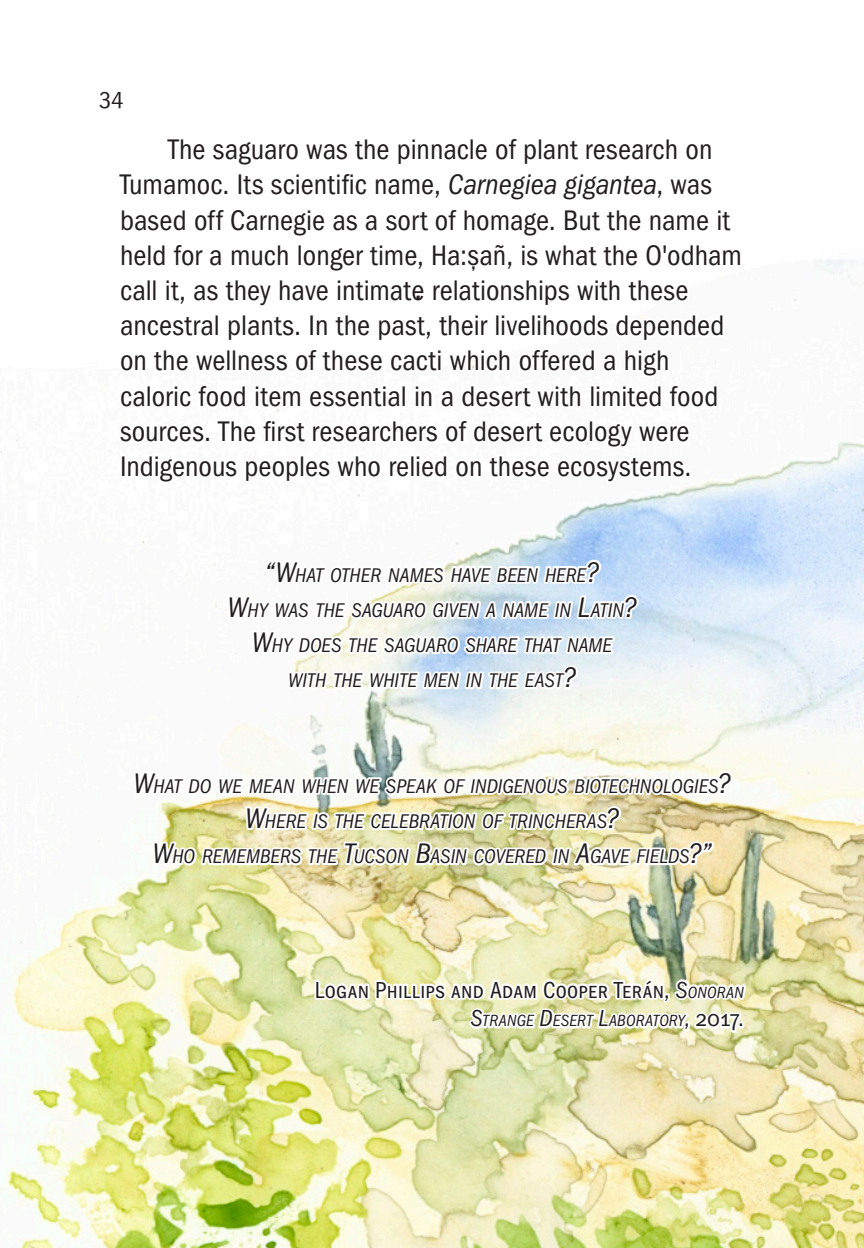

1998

One of the Desert Laboratory's largest contributions is the long-term repeat photography that has occurred and been replicated since its founding.

"In its simplest form, repeat photography involves finding the camera station of a previous photographer, aiming a camera, and taking a photograph...Repeat photography is a valuable tool for evaluating long-term ecological and/or geological change in landscapes. Its practitioners conduct repeat photography projects by acquiring historical and current images, matching those images, and then cataloging and archiving the imagery for long-term changes."

Ray Turner, Bob Webb, and Diane Boyer, *Repeat Photography*, 2010. Turner was an ecologist, a leader in modern repeat photography, and a former director of the Desert Laboratory. Webb worked at Tumamoc Hill stationed by USGS and his research focused on hydrology and the study of landscapes.

The saguaro was the pinnacle of plant research on Tumamoc. Its scientific name, *Carnegiea gigantea*, was based off Carnegie as a sort of homage. But the name it held for a much longer time, Ha:ṣañ, is what the O'odham call it, as they have intimate relationships with these ancestral plants. In the past, their livelihoods depended on the wellness of these cacti which offered a high caloric food item essential in a desert with limited food sources. The first researchers of desert ecology were Indigenous peoples who relied on these ecosystems.



"What other names have been here?
Why was the saguaro given a name in Latin?
Why does the saguaro share that name
with the white men in the east?

What do we mean when we speak of indigenous biotechnologies?
Where is the celebration of trincheras?
Who remembers the Tucson Basin covered in Agave fields?"

Logan Phillips and Adam Cooper Terán, *Sonoran Strange Desert Laboratory*, 2017.

Saguaros have been mapped and measured across Tumamoc since 1908, and now, researchers conduct repeat surveys of the ~4,000 saguaros at the plots, collecting all sorts of data: height of the main stem, number of arms, condition, associated vegetation, as well as chronicling new and dead saguaros.

"Asked this morning what the purpose of our saguaro measurements yesterday was. Tony joked, 'because they were there.'

'Actually,' Ray said, "we intend to repeat these measurements at each of our far-flung plots..."

"...while Tony was clipping spines off a saguaro today, I said, 'we certainly develop some peculiar skills.'

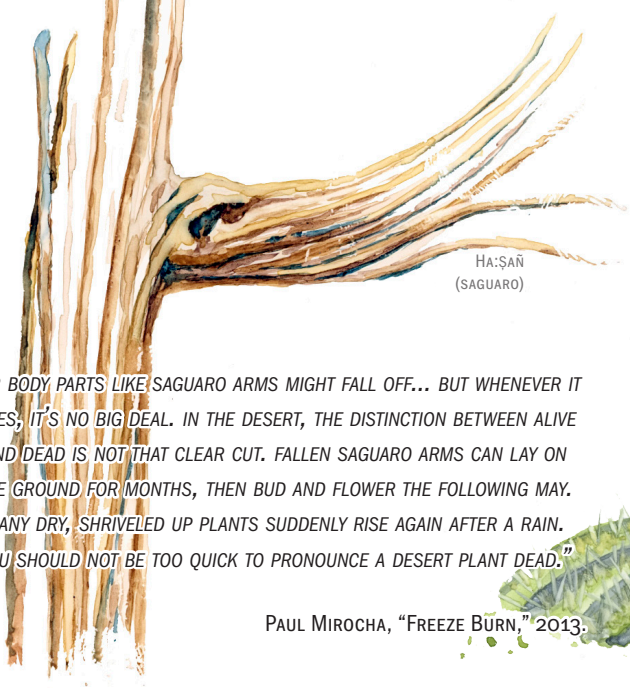
'What do you mean by that?' Tony asked.

'That you've become a good saguaro spine snipper,' Ray suggested.

'The best,' I said, but Tony was unimpressed."

From Janice Bowers' *Field Notebook*, written April 25 & 26, 1985 describing Janice, Ray Turner, and Tony Burgess conducting research. Janice Bowers was a botanist stationed at the Desert Laboratory in 1982.

This long-term research shows us the boom-and-bust cycles of the saguaro's existence on the hill. Through this research, we can see that the population decreased prior to the early 1900s, then began to increase, and then entered a period of decline since the 1970s. Any one of these trends taken in a smaller portion of time could have led to a misleading understanding of what was next for the saguaro, which is why long-term data is so important. We still have not studied saguaros for as long as a single saguaro lifetime (about 250 years)!



Ha:ṣañ
(saguaro)

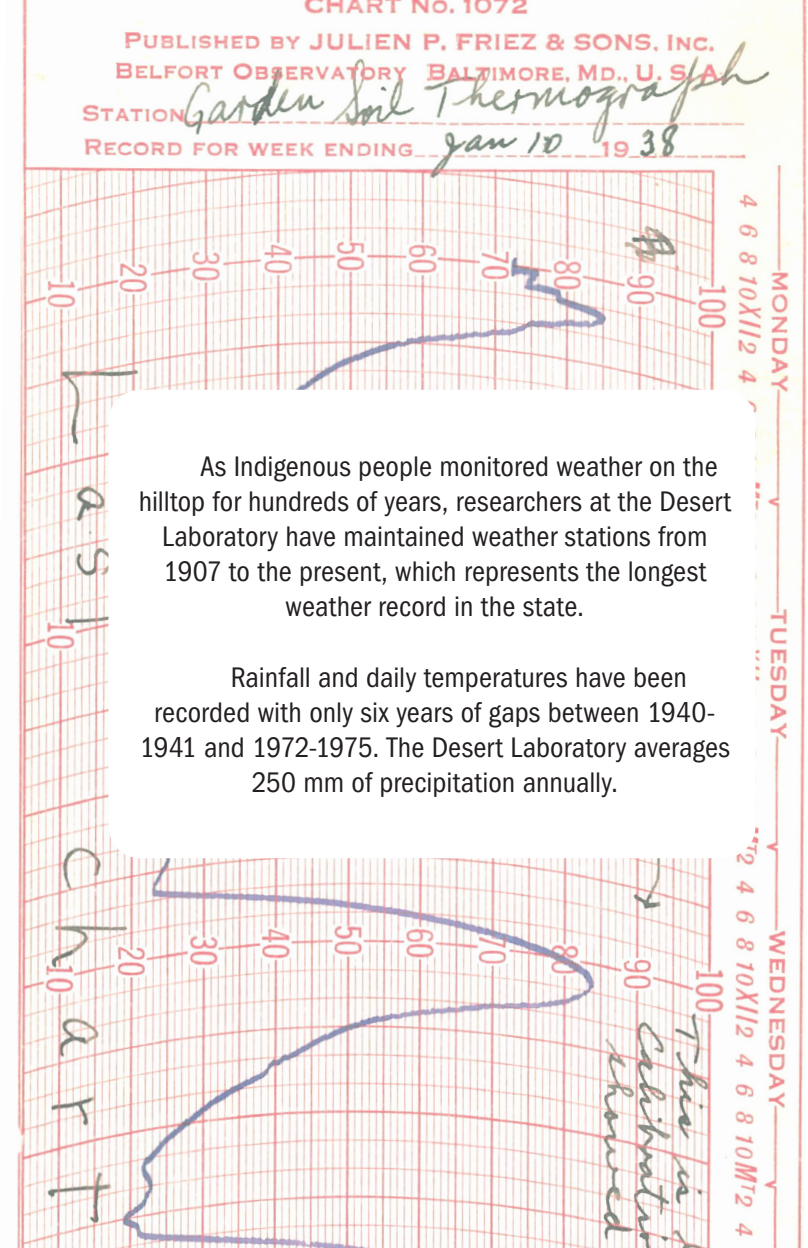
"Or body parts like saguaro arms might fall off... but whenever it does, it's no big deal. In the desert, the distinction between alive and dead is not that clear cut. Fallen saguaro arms can lay on the ground for months, then bud and flower the following May. Many dry, shriveled up plants suddenly rise again after a rain. You should not be too quick to pronounce a desert plant dead."

Paul Mirocha, "Freeze Burn," 2013.

Saguaros can also help us understand relationships in the broader ecosystem: how the Palo Verde nurses it from birth, how the Gila Woodpecker makes it a home, and how other birds like Elf Owls use that home, how beetles use the roots as a habitat, and how birds and bats feast on their flowers' nectar.



NANAKMEL
(BAT, LESSER LONG NOSED BAT)



As Indigenous people monitored weather on the hilltop for hundreds of years, researchers at the Desert Laboratory have maintained weather stations from 1907 to the present, which represents the longest weather record in the state.

Rainfall and daily temperatures have been recorded with only six years of gaps between 1940-1941 and 1972-1975. The Desert Laboratory averages 250 mm of precipitation annually.

Through the Desert Lab's Laboratory of Paleontology collection, work was done with tree ring data, fossil pollen, radiocarbon dating, packrat middens (nests of dung and debris), and all kinds of prehistoric remains that include giant sloths, dinosaurs, and mammoths. The collection holds over 23,730 numbered specimens and more than 2,000 packrat middens.

"UNWITTINGLY WE WERE LOOKING AT THE DUNG DEPOSITS OF EXTINCT ANIMALS ALONG WITH PLANT FOSSILS OF THE LAST ICE AGE...

THE OLD DESERT LAB SEEMED TO BE SPINNING THROUGH A TIME WARP. I WAS ENCHANTED."

Paul Martin, "Rediscovering the Desert Lab," 1995.



KOSON (PACKRAT)



So many wild stories animate the long-dead creatures on Cemamagĭ. The knee of a dinosaur found in Tucson, all kinds of mammoth and mastodon teeth, and a giant fish head hide away their long-forgotten stories in containers. Packrat middens, nests of compacted rat poop sometimes several feet high, spanning back 40,000 years, lay crumpled to be carefully stored for future research. In the halls of the Desert Laboratory, you can see pictures of former director Paul Martin overshadowed by the size of these dung nests. Rumors whisper through the old stone buildings of a dead elephant from a circus being brought up the hill to provide a sample comparison for mammoth bodies.

"BEFORE I FORGET, I ENTER MY COYOTE SIGHTING IN THE WILDLIFE LOG, A SPIRAL BOUND NOTEBOOK IN THE MAIN OFFICE. MOST OF THE ENTRIES ARE BRIEF -- WILDLIFE GLIMPSED ON THE RUN AS WE GO ABOUT OUR DAILY BUSINESS. IN THE LOG'S PAGES, COYOTES CHEW ON MESQUITE LEAVES, A ROADRUNNER KILLS AND EATS A SMALL RATTLESNAKE, TWO COLLARED PECCARIES COPULATE, SEVEN BABY QUAIL SWIM IN THE WATER HOLE, A HARRIS HAWK ATTACKS BUT MISSES AN ADULT QUAIL.



BAN (COYOTE)

THESE UNSYSTEMATIC OBSERVATIONS HAVE LITTLE SCIENTIFIC VALUE, YET IF THE LOG DISAPPEARED, I AM CERTAIN THAT SOMEONE WOULD START ONE AGAIN. AND AGAIN, AND AGAIN, AS A NECESSARY THING."

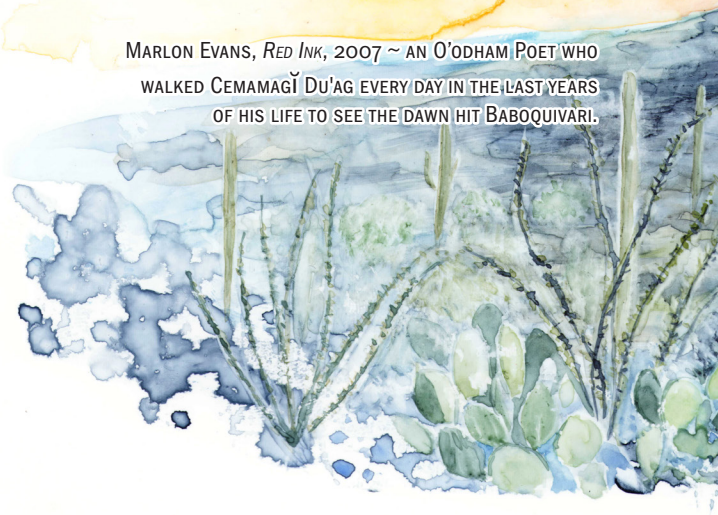
Janice Bowers, "The Gate Swings Wide (Tumamoc Hill, Tucson Mountains)," 1997.

Part III. The Trail

Nowadays, Tumamoc Hill is known as Tucson's favorite hiking trail - as Indigenous communities used rock paths to walk to the top of Cemamagĭ Du'ag and overlook the river basin, now hikers from all over the world walk the paved access road to overlook the city.

"THE TUMAMOC HILL HIKING EXPERIENCE AT 4 A.M. IN THE MORNING HAS INTRODUCED ME TO ANOTHER WORLD, A WORLD OF SACRED ANCESTRAL GROUNDS, NOCTURNAL ANIMALS, SNAKES, JAVELINA, SHOOTING STARS, A LUNAR ECLIPSE, AND AN OBELISK BIRDCAGE. ALL OF THE AFOREMENTIONED HAVE PROVIDED AN INSPIRATION: TO THE EAST, THE WARM CITY LIGHTS OF TUCSON, TO THE WEST, THE OVERWHELMING O'ODHAM DARKNESS."

MARLON EVANS, *RED INK*, 2007 ~ AN O'ODHAM POET WHO WALKED CEMAMAGĬ DU'AG EVERY DAY IN THE LAST YEARS OF HIS LIFE TO SEE THE DAWN HIT BABOQUIVARI.

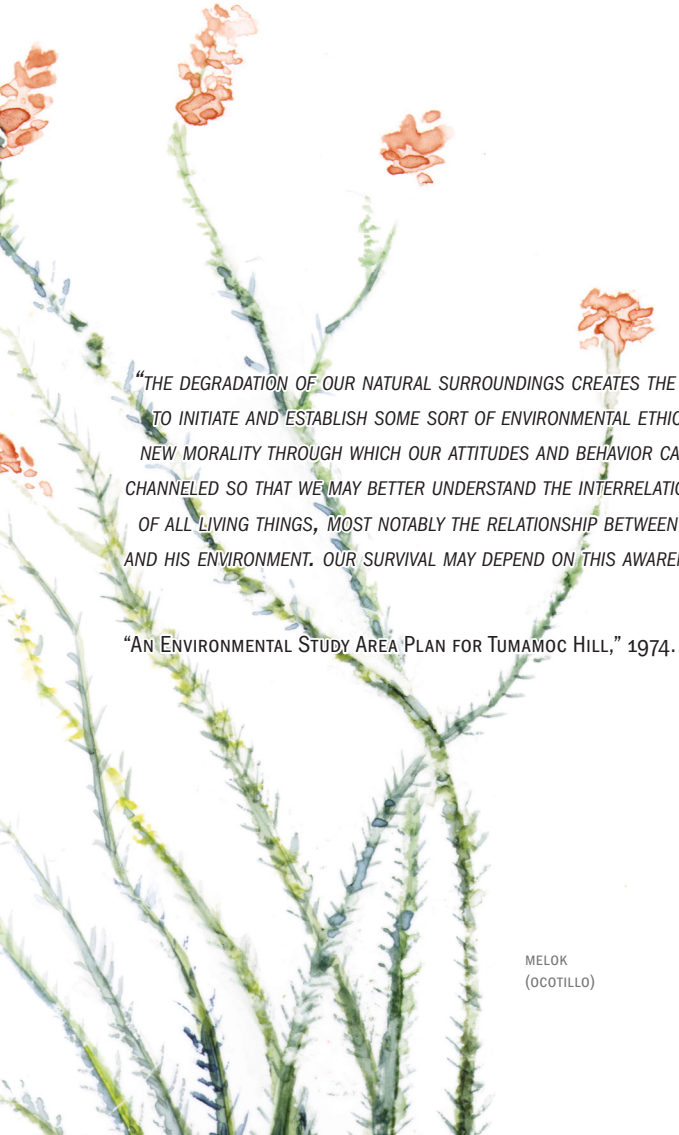




Tumamoc's openness to the public has not come without risks. While the fencing kept out cattle, it didn't just allow wildlife to cross, people could also cross. For a time, vandalism occurred across the hill: domestic dogs would run loose, people would leave the paved path and vandalize the buildings, drivers of four-wheel vehicles would see the steep slopes, locked gates, and fences as challenges. But really, even walking on soil damages it. All of this put the natural ecosystem, habitats, and the study plots at risk.

"We've thought about putting up a ***chain link fence*** *around it to prevent encroachment and unscheduled use and to keep out dogs. But the negative aspect is that it will then turn Tumamoc into a natural zoo where the wildlife are contained. You won't have natural passage as you do now. There are some real trade-offs and we'll have to come to grips with that sometime in the future."*

Paul Martin, "Tucson's last wild area: 'Keepers of the hill' are worried," 1979.



"THE DEGRADATION OF OUR NATURAL SURROUNDINGS CREATES THE NEED TO INITIATE AND ESTABLISH SOME SORT OF ENVIRONMENTAL ETHIC, A NEW MORALITY THROUGH WHICH OUR ATTITUDES AND BEHAVIOR CAN BE CHANNELED SO THAT WE MAY BETTER UNDERSTAND THE INTERRELATIONSHIP OF ALL LIVING THINGS, MOST NOTABLY THE RELATIONSHIP BETWEEN MAN AND HIS ENVIRONMENT. OUR SURVIVAL MAY DEPEND ON THIS AWARENESS."

"An Environmental Study Area Plan for Tumamoc Hill," 1974.

MELOK
(OCOTILLO)

Researchers still come from all over the world to work at the Desert Laboratory. They continue this long line of research, trotting old paths to re-map and re-count for the next generation of data, and walking new paths, introducing new topics of research.

HEAT EXHAUSTION

"IN THE JUNE AND JULY
AND HOT AUGUST SUN
CREW MEMBERS MUMBLE
THIS AIN'T MUCH FUN
TWO HOURS TO GET HERE,
AND THREE TO GET BACK
I DRANK ALL MY WATER
I LOST MY DANG HAT
YOU EXPECT ME TO CRAWL
ON THE HOT DESERT GOUND
SO YOU CAN PUBLISH YOUR REPORTS
WHEN I'M NO LONGER AROUND
WELL TAKE YOUR DANG POT SHERDS
AND TAKE YOUR DANG STONE!
I'M DREAMING OF WINTER
JUST LEAVE ME ALONE"

J.H. Madsen, Picacho, AZ, August 1986, 2PM, 109 degrees.

This work has evolved to include restoration and reconciliation to combat climate change, loss of biodiversity, and harmful changes in the environment, such as the spread of buffelgrass. Though, Cemamagĭ Du'ag's restoration really began in 1906 with the fencing of the hill which kept out cattle, allowing the desert plants to recover from grazing.

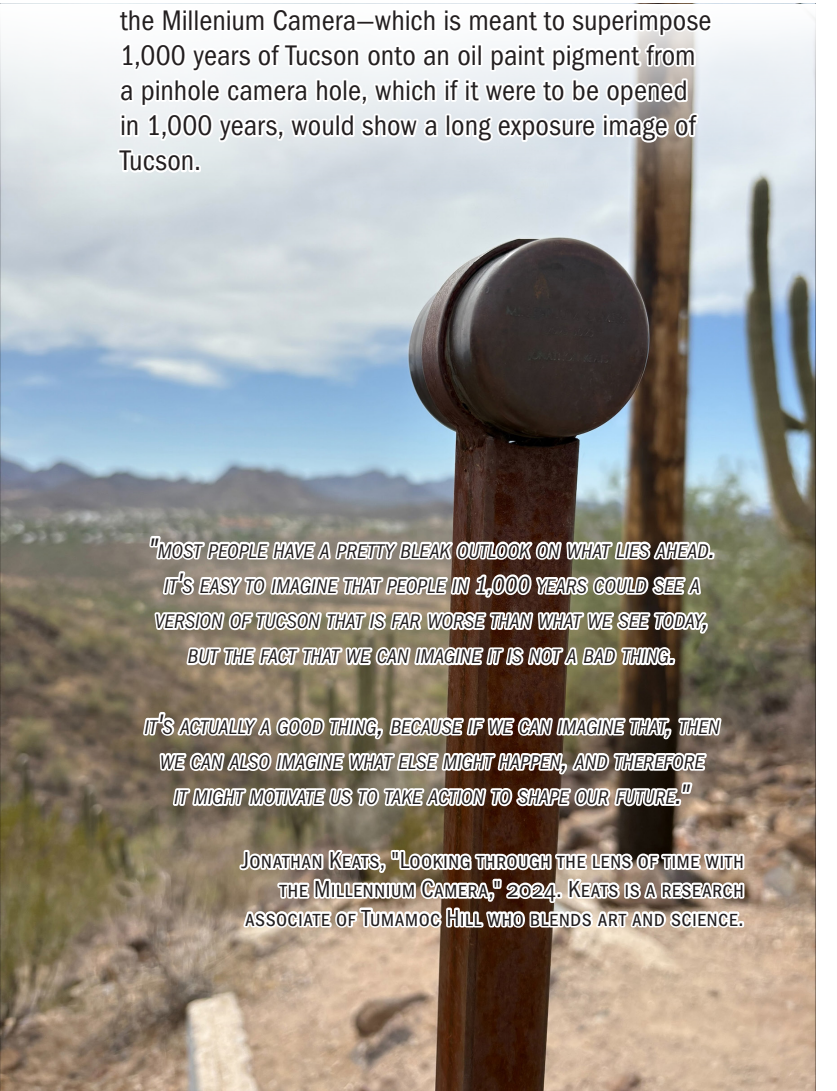
After 24 years of fencing, Forrest Shreve wrote in 1930:

"The long period without disturbance has brought the plant life back to virgin desert conditions such as one can find only in the most remote and ungrazed parts of Arizona."

From his booklet, "The Desert Laboratory of the Carnegie Institution of Washington."

This long process of repair now has a term, ecological restoration, which the Desert Laboratory continues to advance and innovate in the desert.

Art and science blend on the hill with projects like the Millenium Camera—which is meant to superimpose 1,000 years of Tucson onto an oil paint pigment from a pinhole camera hole, which if it were to be opened in 1,000 years, would show a long exposure image of Tucson.



"Most people have a pretty bleak outlook on what lies ahead. It's easy to imagine that people in 1,000 years could see a version of Tucson that is far worse than what we see today, but the fact that we can imagine it is not a bad thing.

It's actually a good thing, because if we can imagine that, then we can also imagine what else might happen, and therefore it might motivate us to take action to shape our future."

Jonathan Keats, "Looking through the lens of time with the Millennium Camera," 2024. Keats is a research associate of Tumamoc Hill who blends art and science.

Another project, Future Climate Proverbs, brought the community in to write weather proverbs that anticipate changing climate into the future. Rather than traditional proverbs we know, like "Red sky at night, sailor's delight; red sky in morning, sailor's warning," these explore futures in the Sonoran Desert:

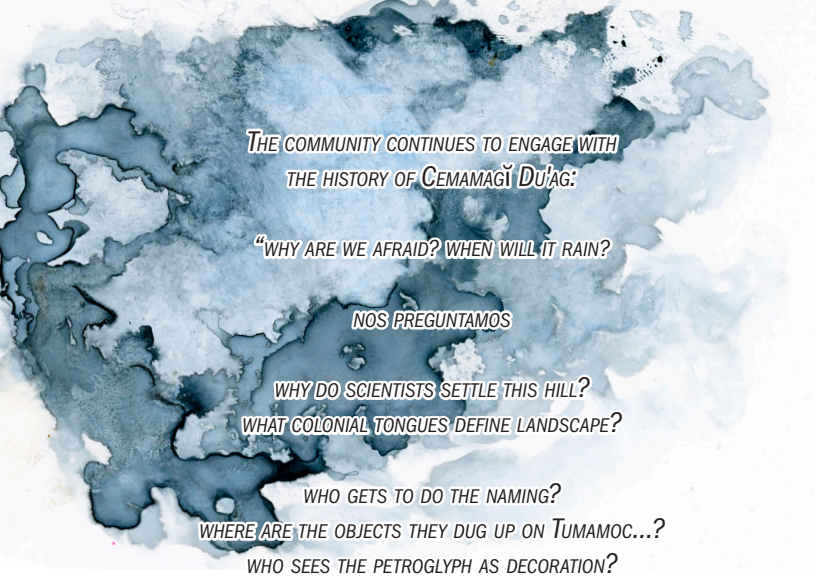
"The climate gets dryer, watch out for fire"

"Flowers on the arms of saguaros, means a hotter uncertain tomorrow"

"Somewhere inside a cave in the mountains amid the desert, sleeping survival a black bear hides, a dream to come and awake to fear, warmer winter shallower streams snow storms alter, no more black bear dreams."



JUDUM
(BEAR, BLACK BEAR)



The community continues to engage with
the history of Cemamagĭ Du'ag:

"why are we afraid? when will it rain?

nos preguntamos

why do scientists settle this hill?
what colonial tongues define landscape?

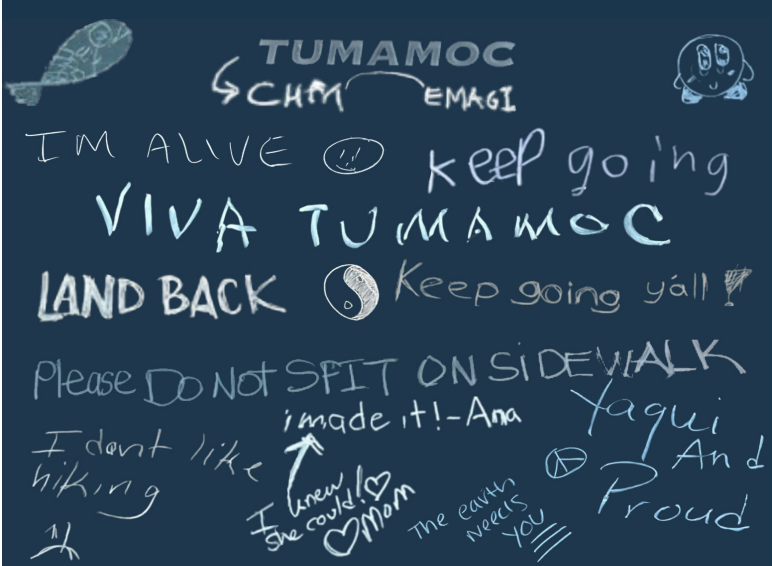
who gets to do the naming?
where are the objects they dug up on Tumamoc...?
who sees the petroglyph as decoration?
who claims the artifacts of another time?

where are the signs?
what is the white gaze?
what scars?
what white gauze, where...?

tucson. place of water at the bottom of black hill,
this hill, less black still after volcanic rocks
used to build the laboratory and university

a remixing of elements, verdad..."

segment from Logan Phillips and
Adam Cooper Terán's poem on Tumamoc Hill, 2017.



The “Future Climate’s Proverb” project also invited the community of hikers and walkers to write and weigh in on the hill. Using chalk provided, walkers were encouraged to respond to poetic prompts inscribed on monumental slates, but mostly people left their thoughts as they hike.

Right now, the hill is teeming with activities like events for children to learn more about ecology and restoration. There are also all kinds of talks and walks to learn with scientists and naturalists.

You can also find survey markers by the Laboratory buildings, in front of a creosote and cactus, that are connected to a global program—and to Biosphere 2—connecting the Desert Lab to the world.

But still, to most, it's a hike with a good view.



"TO KNOW THE CACTUS INVOLVES KNOWING THE DESERT, WHICH IT HAS ADOPTED AS ITS HOME.

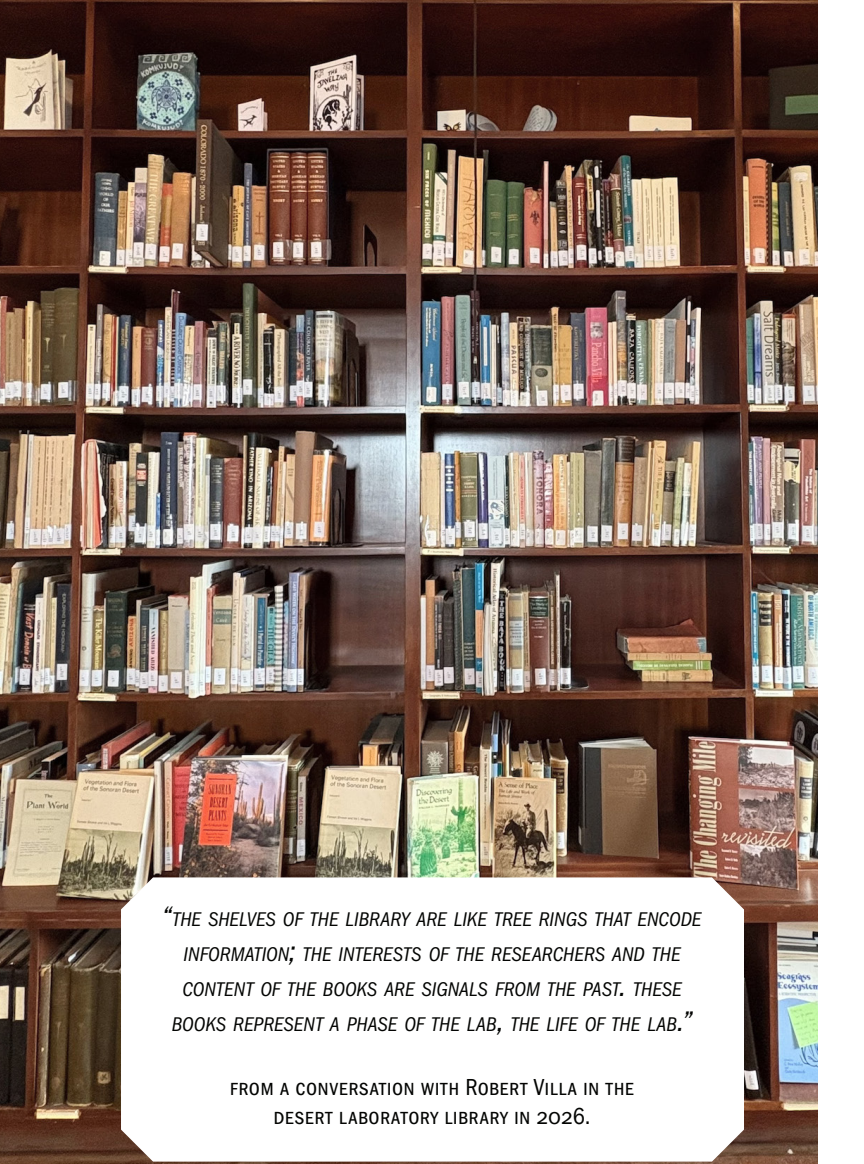
TO KNOW THE DESERT INVOLVES AN ACQUAINTANCE WITH ALL OF ITS ASPECTS AND ALL OF ITS PHYSICAL FEATURES, AS WELL AS ALL OF THE ANIMALS AND PLANTS THAT HAVE LEARNED HOW TO FIND IN IT A CONGENIAL PLACE TO LIVE.



KO:JI (JAVELINA)

THE MOST SIGNIFICANT LESSON THAT THE DESERT DWELLER CAN LEARN FROM A FAMILIARITY WITH ITS PLANT AND ANIMAL LIFE IS TO REGARD HIMSELF NOT AS AN EXILE FROM SOME BETTER PLACE BUT AS A MAN AT HOME IN AN ENVIRONMENT TO WHICH HIS LIFE CAN BE ADJUSTED WITHOUT PHYSICAL OR INTELLECTUAL LOSS."

FORREST SHREVE, *THE CACTUS AND ITS HOME*, 1931.



"THE SHELVES OF THE LIBRARY ARE LIKE TREE RINGS THAT ENCODE INFORMATION; THE INTERESTS OF THE RESEARCHERS AND THE CONTENT OF THE BOOKS ARE SIGNALS FROM THE PAST. THESE BOOKS REPRESENT A PHASE OF THE LAB, THE LIFE OF THE LAB."

FROM A CONVERSATION WITH ROBERT VILLA IN THE DESERT LABORATORY LIBRARY IN 2026.

Learn more:

desertlaboratory.arizona.edu

TumamocSketchbook.com

This Piece of Earth: Images and Words from Tumamoc Hill, written in 2013 by Tumamoc: People & Habitats

Discovering the Desert: The Legacy of the Carnegie Desert Botanical Laboratory, written in 1981 by William G. McGinnies

A Sense of Place: The Life and Work of Forrest Shreve, written in 1988 by Janice Bowers

The Changing Mile Revisited, originally published in 1965, reprinted in 2003, by Raymond M. Turner, Robert H. Webb, Janice Emily Bowers, and James Rodney Hastings

For more information on the sources used to create this guide, see: desertlaboratory.arizona.edu



"LATE SUMMER RAINS HAVE GENERATED A SURGE OF ACTIVITY AT TUMAMOC HILL. RED-TAILED HAWK FAMILIES ARE SOARING TOGETHER, QUAIL FAMILIES ARE RAISING THEIR SECOND CLUTCH OF YOUNG, RED VELVETY "MIGHT MITES" HAVE COME AND GONE DURING THEIR SHORT—AND YET UNSTUDIED—LIFE CYCLE. YELLOW MENODORA, DAINTY JANUSIA VINES, AND FLAME RED FEROCACTUS ARE COLORFULLY FLAGGING DOWN POLLINATORS. MESQUITE AND EVEN A FEW TOKEN SAGUAROS ARE GOING FOR A SECOND FLOWERING. THE RARE TUMAMOCA, TUMAMOC GLOBEBERRY, IS LEAFED OUT AND GROWING. A LATE AUGUST STORM CELL TOOK ITS TOLL IN LIGHTNING-STRUCK SAGUAROS AND BLEW OUT A 4' PANE OF GLASS IN THE EAST 1920 BUILDING. INSIDE THE DESERT DAB, RESEARCHERS AND GRAD STUDENTS ARE BACK AFTER A BUSY FIELD SEASON."



MIGHTY MITE

Martha Burgess, "Tumamoc," newsletter edited in 1993. Martha Burgess teaches desert ethnobotany, environment, and cultural sustainable practices.