

Night-blooming Cereus  
Arizona Queen of the Night  
(*Peniocereus greggii*)



Cora Estelle Mosher

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Queen of the Night; Night Blooming Cereus (*Peniocereus greggii*), Tohono Chul Gardens, Tucson.

## Botanical Gardens and Arboreta of Arizona

by Ries Lindley, Arizona Native Plant Society, Tucson Chapter

If you love nature, then Arizona is a great place to live. Its diversity is broad and deep. Where the Colorado River leaves Arizona and flows into Mexico, the elevation is about 70 feet, and the top of Humphrey's Peak north of Flagstaff is 12,637 above sea level. Annual rainfall in the state ranges from less than 3 inches, near Yuma, to the record 58.92 inches at Hawley Lake in 1978. The topography can be flat or mountainous, and the geology is a very busy scramble. These contrasts in elevation, precipitation, terrain, and substrate result in a great deal of contrast in ecological zones. That contrast leads to a lot of different plant species — 4,260 according to the Arizona checklist on the website for the Southwest Environmental Information Network (SEINet).

It would be wonderful to be able visit all the state's plants in a few short trips, but Arizona's diversity is due, in part, to its size, which is 340 miles wide by 390 miles longitudinally. We can't always schedule a week's vacation every time we head outdoors, but sometimes, we just need a little dose of nature to recharge our batteries. There is an answer for that. The state is dotted with some wonderful destinations that offer us a chance to experience, learn about, and enjoy our flora in doses that are satisfying and convenient. This issue brings you information about some of these jewels.

We hope you enjoy reading about the intriguing choices of gardens, museums, and arboreta that are included here. These gardens are scattered around Arizona and include one in New Mexico. They range from that small public garden in Silver City to large multi-purpose facilities like the Desert Botanical Garden and the Arizona Sonora Desert Museum. They all have common bonds. Each one offers visitors a chance to spend time with many species of plants in a single visit, and all the gardens are dedicated, each in its own way, to educating the public about native plants, plants of the world, or the broader aspects of our natural world.



# President's Note by Douglas Ripley jdougripley@gmail.com

Hello and greetings to all Arizona Native Plant Society members. I hope that many of you were able to enjoy the spectacular botanical results of the exceptional rains we enjoyed last winter. That most welcome moisture had a dramatic effect on local floras throughout the southwestern United States. Although I was not able to travel to see the “super blooms” in Southern California, this spring my wife and I enjoyed several wonderful wildflower trips in Southern Arizona. For many years one of our favorite “spring wildflower venues” has been the lands of the San Carlos Apache Indian Reservation (Gila and Graham Counties), particularly on the Peridot Mesa and surrounding the San Carlos Lake formed by the Coolidge Dam on the Gila River. This spring these areas did not disappoint! Another welcome benefit from the winter rains was the most impressive display of saguaro cactus flowering in years.

I'm pleased to report that the Society is in good health financially, continues to grow with 10 to 15 new members joining each month on average, and our ten chapters continuing to offer interesting monthly meetings or other activities such as field trips. Thanks to the conscientious contributions by many of our board members, several vital committees such as Membership, Editorial, Education and Outreach, Website, and Conservation, many improvements have been made to Society operations.

An important recent development was the recruitment of Tucson Chapter President Jack Dash to assist Ries Lindley and me with the editing of *Plant Press Arizona*, a development that Ries and I appreciate greatly. Another important development for *Plant Press Arizona* was the decision by the Board to

contract with an index professional to prepare a detailed index of all past issues. The index will be completed by the end of summer and will significantly improve the usefulness of the journal. Our other official publication, the quarterly newsletter *Happenings*, continues to keep members informed of the Society's activities thanks to the conscientious efforts of editor Shelley Silva.

We are hoping that we will be able to recruit additional members to serve in leadership positions in the Society, particularly to serve on the Board of Directors. At our last Board meeting I was directed to establish a nominating committee to find members willing to run for election to the Board. The nominating committee will be working this summer with the hope of finding some members willing to stand for election at the next Board meeting in the fall.

For a variety of reasons, we decided at the last Board meeting to forgo the annual Botany Conference this year. Rather, we will focus on making the Botany 2024 conference very special. Thanks to Andrew Salywon and Wendy Hodgson, we will hold the conference in Dorrance Hall on April 27, 2024, at the spectacular Desert Botanical Garden in Phoenix.

Late this summer we will be holding our annual Chiricahua Mountains weekend field trip to the Southwestern Research Station in Portal on 16-18 September. More details on this event will be forthcoming soon.

All best wishes for a wonderful summer during which we hope you will be able to participate in some of the AZ Native Plant Society activities.



Clockwise from left: Peridot Mesa, San Carlos Apache Reservation. Mexican Poppy (*Eschscholzia mexicana*) and Desert Chicory (*Rafinesquia neomexicana*). Smooth Desert Dandelion (*Malacothrix glabrata*); and Goldfields (*Lathenia californica*). Photo credits: Doug Ripley





Horse sculpture. Photo courtesy Tohono Chul Gardens

## Tohono Chul Gardens

by Jamie Maslyn Larson, Executive Director

Founded as a nonprofit in 1985 by Richard and Jean Wilson, Tohono Chul was established by the Wilsons to protect a parcel of land from commercial development and instead create an accessible urban oasis. They envisioned a place where people could admire and find comfort in the natural beauty of the Sonoran Desert, achieve a greater understanding of desert conservation, and obtain an appreciation of the people native to the area.

Today, Tohono Chul has blossomed into a 49-acre nature preserve with a botanic garden, art galleries, museum shops, a retail greenhouse, and a Garden Bistro with over 50,000 visitors annually. The gardens are celebrated by Tucson as one of its “best-kept secrets” and deemed “One of the World’s Ten Best Botanical Gardens” by *Travel + Leisure Magazine*. Tohono Chul’s mission is to enrich people’s lives by connecting them with the wonders of nature, art, and culture in the Sonoran Desert region and inspiring wise stewardship of the natural world.

In our main Collection Garden, we have an eclectic mix of species. Many, such as ocotillo, saguaro, night-blooming cereus (*Peniocereus greggii*), penstemon, cholla, mesquite, and palo verde trees, are native to the Sonoran Desert. But we also

Front cover: Queen of the Night Cactus (*Peniocereus greggii*). Every June, the gardens remain open in the evening to allow visitors to observe the remarkable displays of the Queen of the Night cactus which blooms for one night only. Tohono Chul has one of the largest known populations of this remarkable species. Photo courtesy Doug Ripley

have plants — including succulents and trees from South Africa and Australia — that grow in similar climatic conditions, as well as non-native plants, like citrus trees, that thrive here as well.

The focus at Tohono Chul is to show that a remarkable diversity of plants can adapt and survive in this desert climate. The Sonoran Desert is the wettest desert in the world. We have seasons and cycles of plant activity. Yet even in the hottest, most harsh times of year, the desert is alive and thriving.

In our 38-year history, we have never done a comprehensive assessment or inventory of our plant collection. We do have older plant lists, but these haven’t been updated for 20 years. And while we understand what we have in a broad, general sense, we don’t really know our collection at a detailed, granular level. That will all change in 2023 as we embark on a much-needed plant inventory, not just so that we can determine what’s in our collection, but also to help us better comprehend its value and importance. We know that climate change will impact us, and we need to plan for the future. It is also critically important to document and understand the relationships and inter-dependence between plants. For instance, the palo verde tree often serves as a nurse plant for other species, so if a palo verde dies, there can be major consequences for the entire ecosystem. Of course, we know that anecdotally but having accurate data matters.

Another important aspect of having a comprehensive inventory is to highlight the uniqueness of our collection. For

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# Tohono Chul Gardens *continued*

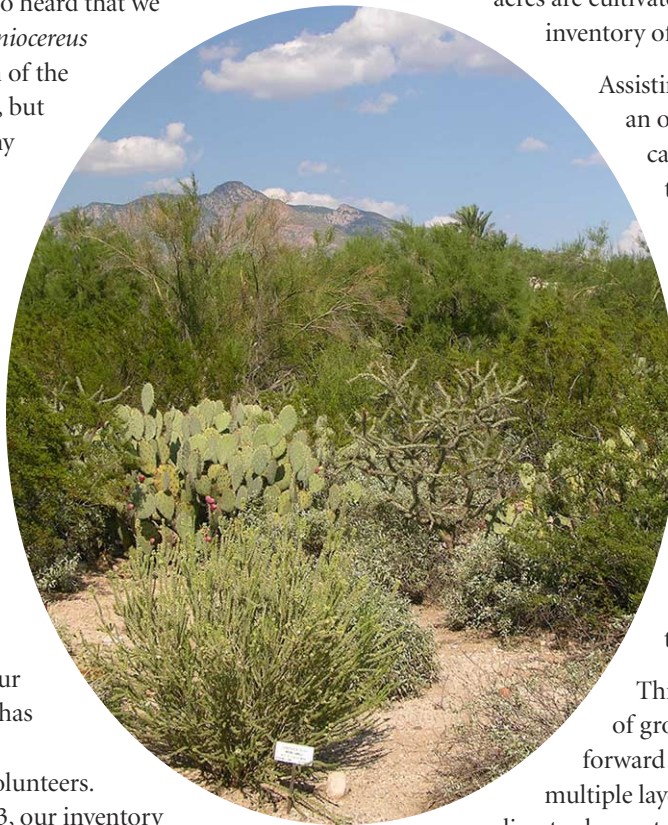
instance, we think we have specimens of every ocotillo species on the planet, but without knowing exactly what we have, we can't really be sure. We've also heard that we have the largest collection of *Peniocereus greggii*, also known as the queen of the night or night-blooming cereus, but we don't know exactly how many we have and where they are located in our garden. Having that knowledge is incredibly important because every summer, hundreds of visitors come to Tohono Chul hoping to see this remarkable plant on the one night of the year that it blooms. Having accurate count and location data will now give us the chance to showcase one of our signature attractions.

We are at the earliest stages of our plant inventory, but the project has generated palpable energy and excitement with our staff and volunteers. Launched in mid-February 2023, our inventory project involves more than 40 volunteers working with five staff members and two interns from the University of

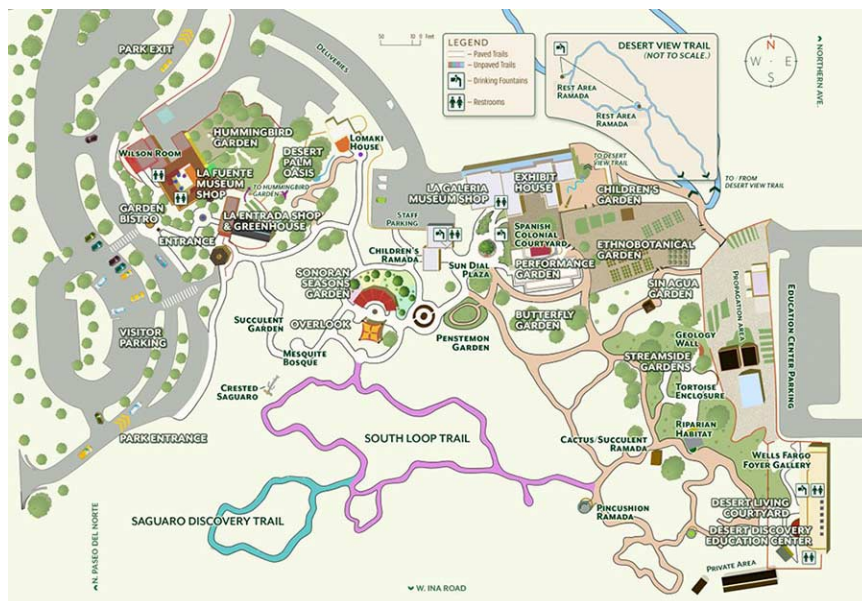
Arizona's School of Plant Sciences. About 30 acres of our garden consists of native undisturbed desert, while seven acres are cultivated landscape. Our focus is on an inventory of the cultivated areas.

Assisting us with all of this work will be an online, cloud-based platform called Hortis, which has helped us to quickly implement the plant inventory project and to engage people of all levels and knowledge. Each team needs only one tablet and one platform to do everything. No plug-ins, no need to import GPS coordinates. Everything is integrated and with a bit of training, volunteers of all ages and abilities have become competent and confident using the technology.

This work sets the stage for decades of growth at Tohono Chul. Going forward we'll be able to understand multiple layers of our collection, from climate change to location to plant condition, health, and age. This will allow us to create better displays and more vibrant experiences and education for our visitors. Knowledge is power and knowing the number of species, where they are located, and their condition will allow us to chart our future even more successfully!



Inset: One of the Garden's many beautiful views of the Santa Catalina Mountains. *Photo courtesy Doug Ripley*



## More Information and Visits

Admission for Members is Free; \$13 for senior (62+) and Military/Students (with ID); \$15 for adults; \$6 for children ages 5–12; and free for children under 5. Tohono Chul Gardens grounds are open 7am–5pm daily; Museum Shops, Greenhouse, and Galleries are open 9am–5pm daily; Garden Bistro is open 8am–3pm daily. Closed New Year's Day, Fourth of July, Thanksgiving, and Christmas





## Discover More at the Desert Botanical Garden

by Doug Ripley, Arizona Native Plant Society, Cochise Chapter *Photos courtesy Desert Botanical Garden*

### History and General Background

Tucked away near the red sandstone hillsides of Papago Park and hidden from the busy city life, the 140-acre Desert Botanical Garden is a sprawling attraction that boasts 50,000 plants, memorable vistas, one of the nation's largest agave collections, and centuries-old cactus that have the height to prove it. The garden traces its origin to 1939 when a small group of passionate local citizens saw the need to conserve the beautiful desert environment. One was Swedish botanist Gustaf Stark, who found like-minded residents by posting a sign that read "Save the Desert." With the support of social influencers of the time such as Gertrude Divine Webster, the Garden's presence grew. Nearly eight decades later, thanks to leadership and investments from many individuals, the Desert Botanical Garden has blossomed from a dream into a living museum.

The Garden's commitment to the community is to advance excellence in education, research, exhibition, and conservation of desert plants of the world with emphasis on the Sonoran Desert. They will ensure that the Garden is always a

compelling attraction that brings to life the many wonders of the desert.

### Research and Conservation of Desert Plants

The Desert Botanical Garden has long served as a global leader in the research and conservation of desert plants and their habitats. Today, Research and Conservation staff at the Garden collaborate with academic, research, and conservation groups across six countries and four continents. The work being done is leading to the discoveries of new plant species, conservation of threatened and endangered species, and identifying emerging threats such as climate change to invasive species to the desert habitats throughout the world.

The Desert Botanical Garden's Research and Conservation staff are tackling the most critical issues affecting desert health and sustainability. The Garden's team brings decades of experience and passion to a core vision of protecting the Earth's deserts through science, conservation, and education. This important research takes place in the following research laboratories:

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## Desert Botanical Garden *continued*

**Hazel Hare Center for Plant Science:** The 85,000-square-foot Center is where Garden staff, researchers, and volunteers are at work growing, studying, and taking care of a world-class collection of desert plants. Many of these species are rare and endangered.

**Desert Botanical Garden Seed Bank:** Housed in the Ahearn Desert Conservation Laboratory, this facility contains more than 4,000 seed accessions representing some of the rarest plants in the world. The collection is primarily focused on the conservation of desert plants, particularly those of the cactus and agave families. In addition to these families, the Garden also works in collaboration with the Smithsonian Institution and the North American Orchid Conservation Center to conserve seeds from the numerous orchid species of the Southwest — some of which are extremely rare. Although seed banking is no substitute for protecting the habitat of these plants, the preservation of their seeds acts as an insurance policy to prevent extinction.

**Dryland Plant Ecophysiology Laboratory:** Here plant ecophysiology traits that underlie adaptation to heat waves, drought, and other stressors are studied. They use the most up-to-date approaches to study plant-water relations, photosynthesis, and growth to better understand how plants respond to stressful environmental conditions. In so doing they identify solutions for restoring and conserving dryland forests, plant communities, and sensitive species threatened by global environmental change.

**Laboratory of Evolutionary and Conservation Genetics:** This molecular lab facility is equipped with eight individual workstations and is available for students, technicians, and other researchers. Research topics explored in the lab range from phylogenetics of major plant groups such as the Agavoideae (the Agaves) to population genetics of individual rare plant species.

### Exploring the Gardens

Most of the Garden's plant collections can be easily observed and enjoyed by walking along the Garden's five loop trails.

**Sonoran Desert Nature Loop Trail:** Take this trail to the top for sweeping mountain views, telescopes, and an organ pipe cactus forest. Then look closer to gain insight into the resilience and survival strategies of Sonoran Desert plants and animals.

**Center for Desert Living Trail:** Fragrant herbs, vegetable beds, and shady spots to relax make this trail a delight for the



senses. Come see what's growing this season and discover tips for creating a robust, water-wise home garden.

**Desert Discovery Loop Trail:** Explore the Garden's main trail and discover the many ways desert plants from around the world have adapted to the environment. Featuring a diverse array of cactus and succulents as well as historic plant collections, this central route connects visitors to the beauty of the desert.

**Harriet K. Maxwell Desert Wildflower Loop Trail:** Stroll along this meandering trail where you'll encounter brightly colored blooms as well as the pollinators they attract, like bees, butterflies, and hummingbirds. Find out how flowers, insects, and birds play an essential role in thriving desert ecosystems.

**Plants and People of the Sonoran Desert Loop Trail:** Wander through five diverse desert habitats and discover the variety of ways indigenous people have used native plants for food, fiber, and shelter.

### Notable Collections

**Cactaceae Collections:** Designated as The National Collection of Cactaceae by the Plant Collections Network of the American Public Gardens Association (June 2010), the Gardens contain more than 15,476 accessioned plants, comprising over two-thirds of the total number of species in the cactus family. Eighty percent of the species in the collection are represented by at least one individual of wild origin, greatly increasing the value of the collection for scientific research, as well as for display and education.

**Agavaceae Collections:** Designated as The National Collection of Agavaceae by the Plant Collections Network of

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## Desert Botanical Garden *continued*

the American Public Gardens Association (June 2010). The Garden displays 171 of the 286 known species and varieties in the genus *Agave*, making this the most prominent agave collection in the United States and perhaps in the world. Seventy-one percent of the total taxa in the agave family make up the collection. More than half of the plants in the collection have known wild provenance and nearly 80 percent of the seeds in the collection are of wild origin, greatly increasing the value of the collection for scientific research, as well as for display and education. Other significant collections within the Agave Family include the genera *Yucca*, *Furcraea*, *Hesperaloe*, *Manfreda*, and *Hesperoyucca*.

### Other Activities

Beyond the natural landscapes, the silhouettes of saguaros, and the sunny weather year-round, visitors will find there's more to discover at the Garden this fall with a series of exhibits and events for all ages.

**Fernando Botero Exhibit:** The latest art exhibition opening later this year will fill the Garden's *Dorrance* Hall with paintings and sculpture from world-renowned Colombian artist Fernando Botero who is widely recognized for his unique and signature style "Boterismo," incorporating rotund, whimsical figures and objects in his works.

**Día de Muertos Observance:** This event will transport visitors to Mexico with vibrant displays and features throughout the Garden, including an expansive community altar designed by Mexican artists. Thousands of Southwestern butterflies will throng the butterfly pavilion for an immersive and educational experience about these fragile pollinators.

**Majestic Mariposas:** This exhibit returns with thousands of free-flying Southwestern butterflies, including monarchs. From September 23 through November 12, the living exhibit showcases each stage of the butterfly's life cycle, and guests also will learn about conservation efforts to protect these winged beauties.

**Guelaguetza Holiday Celebration:** This will add some spirit and color throughout the Garden's trails from October 7–8. The Mexican indigenous holiday celebrates the state of Oaxaca's eight regions, bringing a flare of their customs, cuisine, dance, and gifts.

**Music in the Garden:** Enjoy a stunning Garden backdrop and a talented group of local artists at Music in the Garden. The Friday-night concert series runs October 6 through November 17.

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# Desert Botanical Garden *continued*

**Fall Plant Sale, October 19–22:** Find the perfect desert plant or houseplant this fall. The plant sale will include aromatic herbs, vegetables, flowering perennials, as well as a wide selection of cactus, succulents, and agaves. Garden horticulture staff will be available to offer expert advice. Reservations are required.

**Celebration of Día de Muertos:** Occurring October 27 through November 5, this celebration will feature an immersive experience that includes a mega community altar centered on the mythology of the elegant skull, or *La Catrina*, a golden entryway arch and a two-day procession festival.

**Las Noches de las Luminarias:** For 18 nights, the Garden's trails will glow with 8,000 hand-lit luminarias and thousands of twinkling lights. Plus, on select nights, a chorus of handbell performers will return this year!

**La Posada Holiday Celebration:** The Mexican holiday tradition of La Posada returns on December 17. Guests can

expect singing processions, traditional Mexican food and beverage, as well as a piñata-breaking experience for little kids.



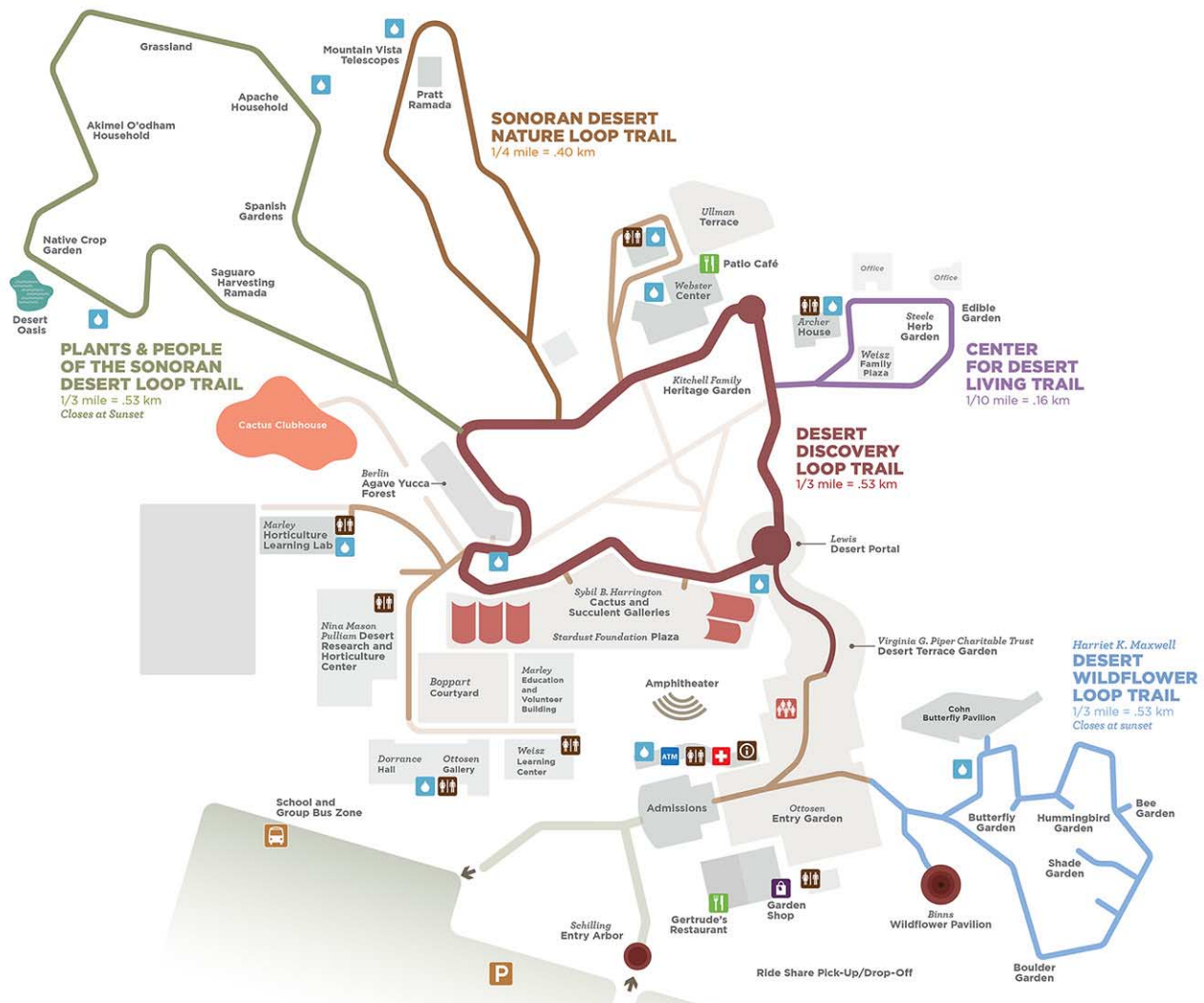
## More Information and Visits

The Desert Botanical Garden is located at 1201 N. Galvin Parkway, Phoenix, AZ 85008. Telephone: 480.941.1225. Email: [Contact@DBG.ORG](mailto:Contact@DBG.ORG).

From June 1 through September 4, admissions for all guests will be \$16.95.

Tickets for *Las Noches de las Luminarias* go on sale October 2 for Garden members, and October 16 for the general public.

Members have free admission. General Admission is \$16.95–29.95; \$14.95–\$16.95 for youth ages 3–17; and free for children under 2 and Active Military Personnel with valid government ID.







Jesús García, Dena Cowan, and Katya Peterson with agaves being prepared for roasting. Photo courtesy Roger Pfeuffer

## Mission Garden: Backwards to the Future

by Kendall Kroesen, Mission Garden Outreach Coordinator

### Back in Time

In geological time, the Santa Cruz River's gentle flow meandered across a mile-wide floodplain in the area that was to become Tucson. The Tanque Verde, Pantano, and Rillito drainages were also rich in riparian resources.

When humans entered the area at least 13,000 years ago, the river's wide riparian area must have been rich with native plant resources and game. Later, during 4,000-plus years of agricultural settlement, water in the river and from upstream wetlands was increasingly captured in canals for irrigation of crops — first corn, and then beans, squash, and cotton.

Many successive cultural layers were added over millennia, each introducing new crops. Some of them flourished in the summer heat and others in our mild winters.

It was only in the early 20th century that regular flows ceased, due to groundwater withdrawals, and agriculture was gradually replaced by commercial and residential development. Today, people think of the Santa Cruz River as

the eroded ditch that carries precious stormwater down to the next county during our summer rainy season. That erosion only started in 1890 — relatively recently in the long history here.

The real heritage of our region is not in that ditch but in the sacred nature of the floodplain for the O'odham, the rich archaeological resources below our feet, and the still-rich floodplain soil under homes, businesses, and streets. It's also in local heritage crops, which have been growing here for centuries or millennia, demonstrating their adaptation to local conditions. Learning about this past opens paths to the future, including the future of local food production. That's where Mission Garden comes in.

### Today at Mission Garden

Mission Garden has taken four rare acres of undeveloped historic floodplain and has begun to recreate, in many separate plots, the agriculture of all those cultural layers. The site, at the base of "A" Mountain (or Sentinel Peak as it is also

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## Mission Garden *continued*

known), was the site of the 18<sup>th</sup> century, four-acre, walled garden associated with Spanish Colonial Mission San Agustín. In turn, that occupation was on the site of the O'odham village of Ts-iuk-shan, from which Tucson got its name. The non-profit that runs Mission Garden — Friends of Tucson's Birthplace — is aptly named.

The garden's native plant area is called Z's Garden, after long-time AZNPS stalwart Nancy Zierenberg. Developed with help from the Tucson chapter of AZNPS, it stretches along the garden's west wall. It features foothills palo verde, ironwood, mesquite, jojoba, wolfberry, whitethorn acacia, creosote, and many varieties of cacti. Z's Garden demonstrates just a little bit of the abundant, wild food resources documented in Wendy Hodgson's book *Food Plants of the Sonoran Desert*. From time to time, workshops teach about the harvest and use of these resources.

The arrival of corn, which some archaeologists now say might go back as much as 5,000 years, is documented in Mission Garden's Early Agriculture Garden. A relatively ancient corn, called chapalote corn, stands in as the closest extant variety to the small-eared corn of the Early Agriculture Period. Experimentally, this garden also grows some wild ancestral crops like chiltepin, teosinte, wild teparies, and little barley.

Next to the Early Agriculture Garden is a garden that grows beans, squash, and cotton alongside corn. Named the Hohokam Garden, it documents not only the Hohokam Period (AD 450–1450) but also the introduction of these new crops around AD 50, in what archaeologists call the Early Ceramic Period. A neighboring plantation of agaves, however, is all Hohokam. The hybrid agaves here, called Hohokam agaves, were an important part of the diet and a fiber source in the latter part of the Hohokam Period.

Continuing through the garden's timeline, one arrives at the Pre-contact O'odham Garden. This area represents O'odham farming along the Santa Cruz River post-Hohokam but before the arrival of Europeans. O'odham crop varieties are well documented for this period. Summer crops include a squash variety called *ha:l*, a fast-maturing corn called *huñ*, and tepary beans, *baba:wi*. Monsoon season additions include devil's claw, gourds, and wild greens such as amaranth.

The local introduction of crops from southern Europe started even before the arrival of the first Europeans. When Father Eusebio Kino and a small Spanish military detachment arrived in the 1690s, Captain Manje noted in his diary the presence of cantaloupe and watermelon. These crops, originally from Africa, were introduced into what is now Mexico after the conquest of the Aztecs. Then they were



Harvest of luffas from the Chinese Garden. Photo courtesy Roger Pfeuffer

traded up into our area preceding the actual arrival of Europeans! It is likely that cowpeas were another early arrival. O'odham farmers eventually grew many other introduced crops, including wheat, garlic, onions, root crops, and leafy greens.

This period of crop exchange between the Americas and Africa, Asia, and Europe — the *Columbian Exchange* — is a theme of the Post-contact O'odham Garden and all the successive plots in Mission Garden's timeline. The expansive Spanish Colonial portion of the garden documents many more Old-World introductions, including orchard trees that are the cloned descendants (from rooted cuttings) of the first fruit trees brought here. They include fig, quince, pomegranate, plums, peaches, apricots, loquats, and several varieties of citrus. These Kino Heritage Fruit Trees, as they are known, make the orchard very authentic. The garden's motto, "Tasting History," is demonstrated by heritage varieties of these trees, which often taste different from varieties available today in our supermarkets.

The Spanish Colonial Vegetable and Herb Garden grows year-round due to the introduction of root crops, leafy vegetables, fava beans, garbanzo beans, and wheat, which all grow well in the Sonoran Desert winter. An annual field of White Sonora Wheat is harvested annually in May in a recreation of the annual San Ysidro harvest festival. This is just one of many of the garden's harvest festivals.

A Mexican Garden represents the period of 1821 to 1854 when our region was a part of Mexico. This beautiful garden incorporates fruit trees, grapes, seasonal vegetables, culinary and medicinal herbs, and ornamental flowers like marigolds and roses. Additions not seen in earlier timeline gardens include nopal, jamaica, and epazote. Cultivated chiles, rare or

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Children's garden with scarecrow. *Photo courtesy Dena Cowan*

## Mission Garden *continued*

absent here before the arrival of Europeans, abound in the Mexican Garden. Many backyard gardens with these characteristics still exist in residents' yards, so the Mexican Garden really represents a style that extends from 1821 to today.

With help drawn from community stakeholders, Mission Garden has created an Africa in the Americas Garden. People of African descent have been involved in local agriculture from the arrival of the very first Europeans. Moorish North Africans, who dominated the Iberian Peninsula for 700 years, stayed there after the Christian reconquest, converted to Christianity, and came to the Americas with the first explorers, missionaries, and soldiers. This garden combines crops that originated in Africa (okra, sorghum, cowpeas, and more) with others representing the culinary preferences of later-arriving African Americans (collards, Cherokee purple tomatoes, etc.) to create an immersive garden experience probably unprecedented in Tucson.

Many of our gardens have been developed with community stakeholder participation. Participation by members of the Tucson Chinese Cultural Center has been key to creating Mission Garden's Chinese Garden. Chinese farmers leased land in the late 1800s and early 1900s, growing cash crops for market. In their own gardens they grew bok choy, daikon, long beans, winter melons, jujube trees, and much more. By 1900, there were already Chinese restaurants, perhaps foreshadowing Tucson's recognition by UNESCO in 2015 as a

City of Gastronomy. Our Chinese Garden keeps this tradition alive.

A dedicated group of Yaquis from the reservation and local Yaqui communities is helping us recreate their gardening traditions in the Yoeme Garden. This includes varieties of corn, basil, wheat, leafy greens, and gourds that are made into ceremonial instruments. Mission Garden is privileged to have the participation of stakeholders such as these.

New garden plots are planned to explore other agricultural traditions in the Territorial and Statehood periods. For example, twentieth century cash crops, especially cotton and citrus, will be grown in the Statehood Garden.

### **Backwards to the Future**

Mission Garden staff and volunteers are starting to plan our final plot, to be called Tomorrow's Garden. We want to take lessons learned during the recreation of thousands of years of past agriculture and mix them with new techniques and technologies to create a garden design that will sustainably produce food under future conditions.

Future food production here will have to contend with higher average temperatures, more extreme weather events, and the need to grow more food with less water and land. Predictions of future climate conditions range from hotter hot spells to colder cold snaps, less rain overall, and potentially more

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## Mission Garden *continued*

intense summer microbursts.

We don't know exactly how Tomorrow's Garden will turn out — that's both the challenge and the fun of exploring design options. There are many possible directions. One is a very low-maintenance, low-irrigation, collection of natives and drought-tolerant cultivars. Picture nopal cactus and Hohokam agave growing with tepary beans, a velvet mesquite, a foothills palo verde, wild wolfberries, an African moringa tree, and — for flavor — wild chiltepin!

Another vision is a more constructed, technology-heavy garden that might include a greenhouse to extend the growing seasons and to house hydroponics. It might also involve growing crops under solar panels, or *agrivoltaics*, all mixed with our traditional, relatively drought-tolerant, heritage crops.

Another way of thinking about Tomorrow's Garden is that because of the relative drought-tolerance of our traditional crops and our current sustainability efforts, the entire Mission Garden represents the future of agriculture here. We've gone backwards to the future.

### Final Message

The mission of Friends of Tucson's Birthplace at Mission Garden is to demonstrate Tucson's long food-production history and to teach about how we can continue to find food here — sustainably — in the desert, in our backyards, in community gardens, and small local farms. But some unexpected lessons have been learned along the way.

The first lesson is how quickly the historic floodplain of the Santa Cruz River can be brought back into production. At the beginning of 2012 nothing was growing inside the rebuilt garden walls. Planting began in February of 2012. In plot after plot, soil was prepared, drip irrigation was installed, and seeds were planted. In those days, heavy summer rains left enormous puddles on the soil, which had been compacted by decades of non-agricultural uses. But after only 11½ years (as of this writing) heavy rainfall is quickly absorbed by the

regenerated soils, trees tower above us, thick crops cover many garden areas, and native species thrive.

Another lesson is that we've also recreated — in a small way — an agrarian ecosystem that used to cover the entire floodplain. Arthropods, mammals, reptiles, and birds that were probably once commonplace across the floodplain are again living and reproducing in the garden. The Santa Cruz River floodplain has a storied ornithological past, from U.S. Army Major Charles E. Bendire in the 1870s, who introduced new species to Western science, to ornithologists who — pardon the pun — flocked to the floodplain and the Great Mesquite Forest in the first half of the 1900s. They might be pleased to see some familiar birds returning to the garden in numbers.

We can do all this sustainably. Waste products (e.g., produce we can't use) are fed to chickens. Their waste goes — along with chipped and shredded cuttings — into our compost operation and then back into the soil. (And their eggs are sold in our shop!)

Rainwater stays in garden plots that are sunk below the level of access paths.

Downspouts from buildings go to plants.

Thick mulching helps to keep soil cool and moist, reviving life and limiting evaporation from our efficient drip irrigation system.



### More Information and Visits

Visit [www.missiongarden.org](http://www.missiongarden.org), click the “Learn” menu, and go to “Virtual Tour.” Even better, visit the garden in person Wednesday through Saturday, 8am–noon (open till 2pm October through March), at 946 W Mission Lane, Tucson.

Mission Garden is largely supported by generous gifts from people throughout Arizona and the unflagging help from hundreds of volunteers. Visit our website to learn how you can get involved. We would like to thank everyone who has helped make this backwards trip to the future of gardening possible!



Inset: Mission Garden volunteer harvests quince fruit. *Photo courtesy Dena Cowan*





From left: Blooming *Datura wrightii* in the garden. A closeup of *Tetraloniella*, a native bee, on *Ericameria nauseosa* in the garden, September, 2021.

## Silva Creek Botanical Garden, Silver City, NM

by Marty Eberhardt and Wendy Graves Photos courtesy Elroy Limmer

In a quiet Silver City neighborhood, you can find the Silva Creek Botanical Garden (SCBG); a project of the Gila Native Plant Society. Located on a previously unloved 1.1-acre piece of land owned by the Town of Silver City, it is named for Silva Creek, an intermittent stream that forms a natural boundary on the garden's east side. The property where SCBG is now located was reportedly once used by the National Guard as an exercise and parade ground, and their horses were stabled on a nearby property. The history is a bit murky, but a large wooden water tank was built on the property and then converted into a tank for road-oil storage when the town began to use the property as a supply yard for the City Roads Department. When the city roads supply yard moved, the property sat uninhabited for a few years.

Around 2008, a Gila Native Plant Society member, Charles Holmes, in partnership with a small group of garden enthusiasts, began to develop a garden on the vacant lot. This group obtained frequent help from the Aldo Leopold Charter School students who were involved in various maintenance and development projects on the property. In about 2013, GNPS member Elroy Limmer, a retired city arborist and city parks manager for the town of Peoria, Illinois, took over management of the garden.

The Gila Native Plant Society is now about 10 years into this project and we have found our stride. The small garden was developed with a series of wide, crushed rock paths and various planting mounds. Cared for and maintained almost exclusively by a small army of dedicated volunteers, the

garden now contains at least one-hundred species of plants native to the Gila Region and is one of the best-kept secrets in Silver City. The small garden has almost limitless potential for more plants, more wildlife habitat, and more educational opportunities. Partly in response to Elroy's desire to retire from day-to-day care for such a large responsibility, and partly in response to the need to set up policies and procedures around what can and should be done in the garden and how planning should proceed, the Gila Native Plant Society Board set up a steering committee for the garden back in July, 2020. Call it our pandemic project — everyone needed one at that time!

The Silva Creek Botanical Garden Steering Committee was set up to process and complete the projects that were considered 'grandfathered in' or were already underway, and there were a fair number of these. By January of 2021, we were ready to slowly move forward with some discussions on new projects, such as rainwater harvesting. The Steering Committee also began looking for a landscape architect or garden design professional to help make a cohesive design for the property. We can say for a fact that both turned out to be difficult tasks. As always in the west, water use is a difficult thing to discuss, and without the proper connections, finding a professional to help design a garden is very difficult as well.

Luckily, in the summer of 2021, we brought Marty Eberhardt onto the steering committee, and she was instrumental in both helping the steering committee get relief from the day-

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From left: Volunteers preparing the way for a path. A view of the historical water tank in the garden, through mature plantings.

## Silva Creek Botanical Garden *continued*

to-day management of the garden and in helping us find the right design professional. Marty had been an early director of the Tucson Botanical Gardens and also a director of the Water Conservation Garden in San Diego, California, so she had lots of experience with the inner workings of gardens and lots of connections. She suggested that we separate the day-to-day garden care and management from the Steering Committee's work. This led to setting up a Garden Management Team, which eventually allowed the Steering Committee to focus more on policy and planning.

With our group's belief that we should be thinking big, we were able to find the perfect rising star for our project. Ashley Pedersen, a student in the Landscape Architect program at Rhode Island School of Design, happened to be looking for a design project to complete for a one-credit independent study during a one-month January term. We got her name from Michelle Conklin, the Director of the Tucson Botanical Gardens. For the cost of flying Ashley out to Silver City for one weekend and housing her, she was able to spend the weekend familiarizing herself with the existing garden, the volunteers who love and care for it, and the community of Silver City.

At the start of her January short-term, the steering committee began what were almost weekly meetings with her by Zoom. These lasted about two hours each, and culminated in mid-February, 2023, with a beautiful design proposal for the garden, along with recommendations for how to integrate our garden themes into our interpretation design.

We wanted to communicate the relationships between native plants, people, wildlife, and climate of the region. To this end, the plan includes twelve new and reworked garden elements.

Many of our existing themed garden areas will be expanded. For instance, the medicinal plants garden will become an Ethnobotany Garden, including food, dye, and fiber uses of plants as well as their traditional medicinal uses. The Children's Butterfly Garden will become a piece of a larger Children's Pollinator Garden; the area where many grasses are planted becomes a Chihuahuan Grasslands Exhibit, including other accent plants and sculptures.

Many stakeholders asked for more seating and fewer bicycles speeding through the garden. All of the garden areas in the plan are linked by meandering paths that provide various seating opportunities, and cyclists will be asked to dismount. They'll be encouraged to do so with rumble strips and a front gate to the garden.

As an all-volunteer organization, we will need to proceed slowly in implementing our plan. Phase one, the Habitat Thicket, is already underway. Phase two will include redoing the Children's Butterfly Garden and the front entrance. Phase three includes the entire pollinator garden and the Front Yard Garden, which will showcase the most stunning landscape plants of our area.

Silva Creek Botanical Garden sits on Town of Silver City property, and we are delighted that the town is partnering with us to help with issues such as curb work to channel water, a bicycle rack, and possibly solar energy for the maintenance area behind the scenes. We look forward to going public with our plan at an event this summer, when we will have detailed plans for the upcoming phases.







Doorway to Barrio Garden.

# Welcome to Tucson Botanical Gardens

by Stacia Williams, Director of Marketing & Communications, and Adam Farrell-Wortman, Director of Horticulture Unless otherwise noted, photos courtesy Tucson Botanical Gardens

Located on the site of the historic Porter property, Tucson Botanical Gardens (TBG) is a five-and-a-half-acre collection of 20 unique, curated gardens, seasonal art exhibits, educational event space, and Edna's Eatery, a café offering breakfast, brunch, and lunch. The Gardens are a true urban oasis in the heart of Tucson, welcoming over 200,000 guests each year. In addition to major exhibits and events, TBG stands out as an attraction with the only live tropical butterfly exhibit in Southern Arizona.

## A Little History

The Tucson Botanical Gardens site was originally the home, gardens, and retail nursery of Bernice and Rutger Porter who moved to Tucson in the 1930s. The Gardens were founded as a non-profit in 1968, and in 1974, the site which the Porters had donated to the City of Tucson was offered to the organization for development and management as a botanical garden. TBG jointly managed the property with the City until 1985 when Tucson deeded the entire acreage to the Gardens for independent operation.

## Twenty Pocket Gardens

The paths of Tucson Botanical Gardens lead one through a plethora of thematic pocket gardens (the size of a small backyard) composed with distinct plant palettes. With over 20 pocket gardens, visitors can meander for hours, getting lost in the sights, sounds, and smells of abundant natural beauty.

The **Cactus and Succulent Garden** is the highlight of the Gardens collection with cacti from all the North American Deserts as well as cacti from across South America.

The **Native Pollinator Garden** has native plants blooming year-round and supports all types of pollinators during multiple life stages.

The **Bird Garden** has plants that provide food, shelter, and nesting materials for our native birds.

The **Tohono O'odham Path** is comprised of plants from the ancestral lands of the O'odham people.

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Butterfly Magic at Tucson Botanical Gardens! Photos courtesy Davis de Dios Media (blue morpho butterfly) and Doug Ripley

## Tucson Botanical Gardens *continued*

The **Native Crops Space** is planted with seed from Native Seeds/SEARCH.

The **Desert Tortoise Habitat** is home to Nora, a 25-year old Sonoran Desert tortoise, and is densely planted with all her favorite native plants to eat.

The **Dry Grassland Garden** has grasses, forbs, and small shrubs from Arizona and the arid plains of North America.

The **Backyard Permaculture Space** includes demonstrations of composting, backyard chicken raising, water harvesting, edible and medicinal native plants, and other design elements associated with permaculture gardening.

The **Barrio Garden** pays homage to the gardens in Tucson's traditional Mexican-American neighborhoods.

The **Modernist Garden** design is inspired by the Brazilian landscape architect Roberto Berle Marx who rewrote the rules of formal garden design in the 20<sup>th</sup> century.

The **Xeriscape Path** features water-wise plants and design limiting the use of water in the landscape.

**Aloe Alley** has a large variety of Aloe species from Africa and Asia.

The **Prehistoric Garden** has examples of the first plant genesis and their evolving forms.

The **Shade Garden** provides gardeners with examples of flowering plants that thrive in Tucson's shade.

The **Porter Patio** is a historic garden of the first Euro-Americans to live on the property and is filled with their original plantings from the 1930s through the 1950s.

The **Herb Garden** is styled in the Mediterranean tradition and presents culinary and medicinal herbs that will grow in Tucson's climate.

The **Ramada Gardens** showcase popular gardening styles including Zen, floral, kitchen, potted succulents, and native woodlands.

The **Children's Garden** provides space and toys to encourage young ones to connect with the natural world.

The **Iris Garden** hosts a wide variety of whimsically named bearded iris.

The **Reception Garden** is a formal event space filled with roses and annual color pots. We host many receptions, weddings, meetings, and events in this lush space.

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Purple butterfly orchid in the Greenhouse.

## Tucson Botanical Gardens *continued*

There are other nooks and crannies to explore within the Gardens, like a **Grapefruit Grove**, **Backyard Trains**, and a **Palm Path**.

### **Butterfly Magic**

The **Cox Butterfly and Orchid Pavilion** is the only live tropical butterfly exhibit in Southern Arizona. This attraction is so popular, there is often a line of Garden friends waiting to enjoy the hundreds of butterflies fluttering around in the tropical greenhouse. The greenhouse features 30–50 different butterfly species every day and around 100 over the course of the whole season. The butterfly species range from Costa Rica, South America, Southeast Asia, and Africa. Just beyond the exit of the greenhouse, our **Chrysalis Exhibit** is on display to watch butterfly chrysalises hatch all season long.

### **Exhibits and Educational Classes**

Tucson Botanical Gardens has been home to many international exhibits and features local artists on a rotating basis. Current exhibits include *All at Once* by local Tucson artist Kyle Johnston, and *Quilts in the Gardens*, an exhibit that helps raise money for Quilts for a Cause and TBG. Just wrapping up this past May, TBG hosted Sean Kenney's *Nature Pop!* made with LEGO bricks. It was a popular exhibit blending nature with 40 never-before-seen sculptures.

Year-round programs serve a diverse audience including people of all ages, backgrounds, and abilities. We educate

visitors and local residents about horticulture, native plant life, the desert environment, and the need to preserve natural resources. Current exhibits and classes can be found on our website at [www.tucsonbotanical.org](http://www.tucsonbotanical.org).

### **LightsUp!**

This past holiday season, Tucson Botanical Gardens showcased its first annual spectacular light show called *LightsUp! A Festival of Illumination* and 24,000 guests visited the light show over 44 nights! The show was presented by NOVA Home Loans and illuminated by The Stonewall Fund at the CFSA. Designed by nationally known public garden landscape architect Tres Fromme, a carefully curated and artfully sequenced series of illuminated experiences transformed the Gardens during the holidays. We can't wait to bring *LightsUp!* back for its second season.

### **Our Team**

Forty-two staff members, a 16-member Board of Directors, hundreds of volunteers, and over five thousand members support the Tucson Botanical Gardens.

### **Volunteers**

Our Gardens thrive because of our volunteers and the many hours of service they provide in different capacities. The Garden volunteers help our horticulture team Monday and Wednesday mornings. Volunteers also assist with staffing our

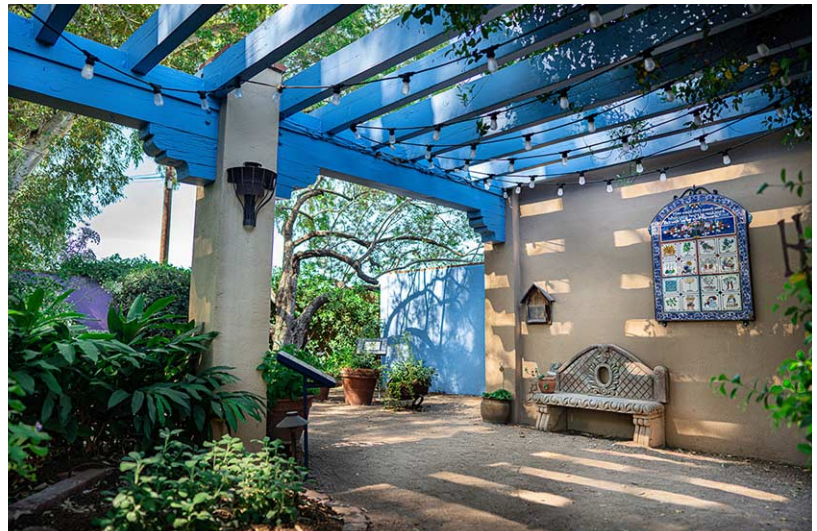
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# Tucson Botanical Gardens

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Butterfly Magic Pavilion 9:30am to 3:00pm daily. We have a volunteer membership mailing team that meets on certain days of the month to assist with membership renewals. One of our largest groups of volunteers are the greeters that welcome people upon entrance to as well as around the Gardens. Our docents are volunteers who have specialized knowledge about TBG, Tucson, and the Sonoran Desert. They help provide a deeper knowledge and understanding of our area. They lead tours around The Gardens and share their knowledge by teaching garden classes. Youth Education department volunteers help staff Youth Ed events such as the Lego Masters competition and other youth-oriented events throughout the year.



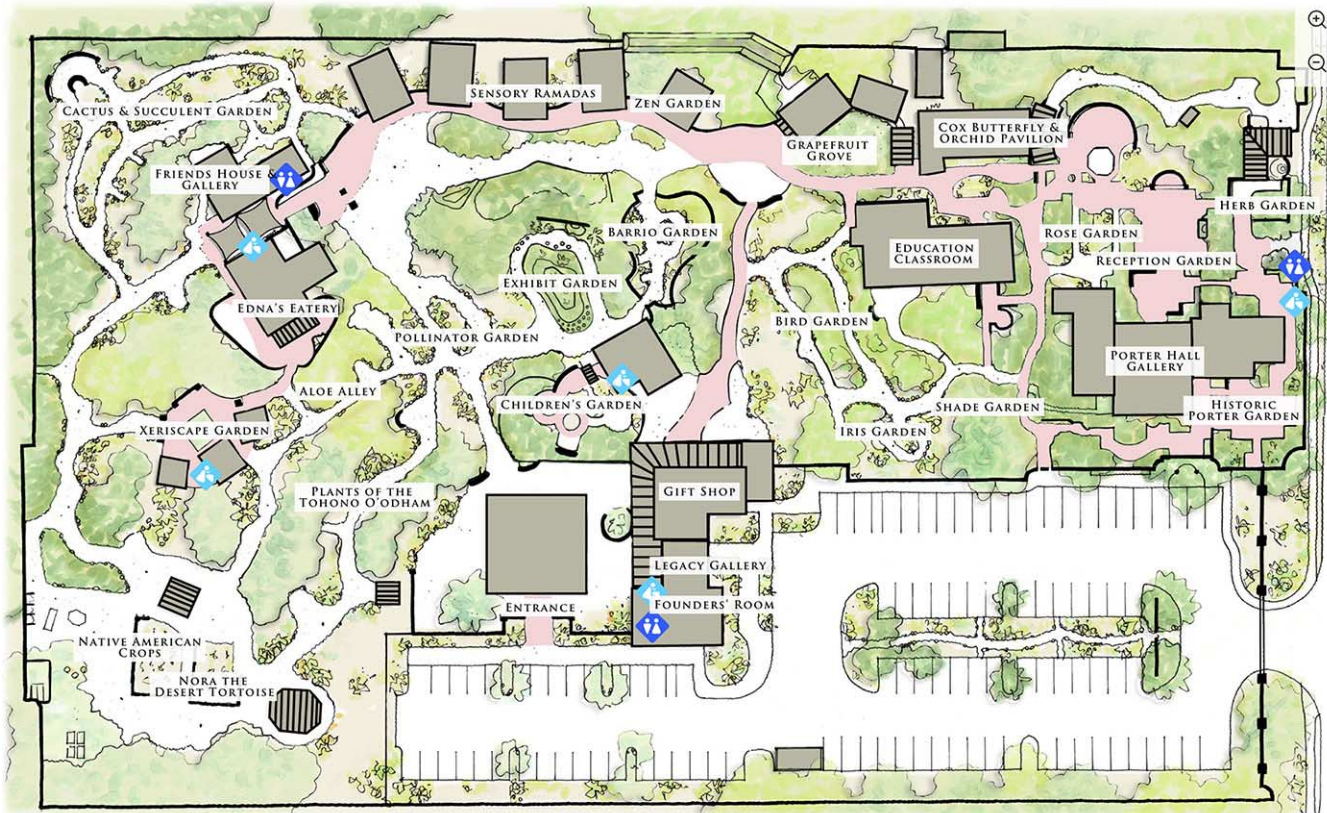
Herb Garden.



## More Information and Visits

Tucson Botanical Gardens are open daily, September through May 8:30am–4:30pm, and 7:30am–3:30pm, June through August. The Butterfly Pavilion is open October through May

9:30am–3:00pm. The Gardens are closed on Thanksgiving, Christmas Eve & Christmas Day, January 1 (New Year's Day), and July 4. Admission is free for members, member children (4–17), and children under age 4; \$15 for adults; \$13 for seniors (62+) and Military; and \$8 for children ages 4–17. Ordering tickets on line is encouraged and can be done via <https://tucsonbotanical.org/visit/>.







The Grassland Garden at the Desert Museum.

## Arizona-Sonora Desert Museum

by Jack Dash, Arizona Native Plant Society, Tucson Chapter *Photos courtesy the author*

Situated in the heart of the Tucson Mountains, in the Arizona Upland subdivision of the Sonoran Desert, the Arizona-Sonora Desert Museum opened in 1952, at a time when notions of xeriscaping and gardening with native plant species were far from the public eye. The Museum was meant to introduce both Arizona locals and visitors from around the world to the unique ecology of the Sonoran Desert, and to foster a greater appreciation for natural history. Seventy-one years later the Museum has continued to pursue this mission of connecting people to the desert around them while encouraging conservation and preservation of natural spaces and species.

Many people know the Museum best for its mammalian, ornithological, and herpetological living collections, but ASDM also features an abundance of gardens showcasing a diverse collection of botanical specimens with a focus on Arizona, Sonora, and the Sonoran Desert. There are four basic types of gardens at ASDM. The first is minimally managed patches of natural desert such as the Desert Loop Trail. The Desert Loop Trail showcases representative plant species of the Arizona Upland subdivision of the Sonoran Desert and provides an accessible but authentic desert experience for guests. The

second garden type is managed-demonstration spaces that explore the possibilities of xeriscaping and wildlife gardening in the Tucson area including the Desert Garden, Hummingbird Garden, and Taylor Plaza. These gardens are perfect for locals who want to learn about the best practices and ideal plant selections to utilize in home plantings, to conserve water, and to attract pollinators. In that sense, these spaces are vital living laboratories of desert horticulture. The Museum also has themed plantings meant to introduce people to the different ecosystems of the region like the Mountain Woodland, Thornscrub, and Desert Grassland gardens. These spaces immerse visitors in some of the main habitat types found in the region and showcase how the sky islands of southern Arizona and northern Sonora contribute to the outstanding species richness of the Southwest. One favorite is the Life Zone Transects which allow a visitor to experience representative species of the dominant habitat types of Arizona from the Lower Colorado subdivision of the Sonoran Desert to the Pine Woodlands found on top of our local mountain ranges. Finally, there are spaces that highlight particular types of desert plants

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# Arizona-Sonora Desert Museum

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such as the Haag Memorial Cactus Garden, and the Agave Garden. These last two are perennially popular with visiting tourists, in large part because people from other parts of the country or world are unlikely to have ever encountered many of these plants before. Gardens like these provide a unique desert experience, and a golden opportunity for selfies to show the folks back home.

One of the most important concepts guiding garden design at ASDM is that the Museum is not only a botanical garden, but a natural history museum. This may seem like a fine distinction, but it impacts planning and management of garden spaces in several ways. To begin with, ASDM is regionally focused, so it is not the goal of the Cactus Garden, for instance, to showcase every species of cactus found in North America or to host mass plantings of nursery hybrids with garish flowers. Rather, the idea is to focus on interpreting species that can be found in the American southwest and northern Mexico, especially the Sonoran Desert. In addition, ASDM is not just interested in showing plants in isolation, but the relationships these plants have with their biotic neighbors. Instead of using chemical herbicides to remove “weeds” in the Agave Garden, native wildflowers such as Parry’s penstemon (*Penstemon parryi*), desert marigold (*Baileya multiradiata*), and golden fleece (*Thymophylla pentacheata*) are allowed, and even encouraged, to grow to support native pollinators. The focus on natural history also influences the hardscaping of these spaces, so most ASDM gardens utilize rock harvested on site, and artificial rock installations are designed to be non-intrusive and blend in with the landscape around them, highlighting the role abiotic factors, such as geology, play in influencing the flora of the Sonoran Desert.

Finally, the role of ASDM as an innovative natural history museum dictates that gardens should be managed for efficient water use. To this end, the majority of the gardens at the Museum are irrigated using drip irrigation systems. These can be controlled from a central irrigation computer to monitor the flow of water, ensure efficiency, and alert gardeners to possible leaks or clogs. Most importantly, the vast majority of water used to irrigate the Museum grounds is reclaimed water from kitchens, restrooms, and cleaning areas at the Museum that is filtered through a series of wetlands before being run through a filter and pumped back onto grounds. This allows the museum to limit its landscape use of potable water, and to store water in case of an interruption in water service.

Gardens at a living natural history museum like ASDM can serve many purposes. For one, they can wow tourists from other places for whom the desert flora is unlike anything they



ASDM staff collecting chiltepin fruits for propagation.

have experienced. These gardens can also inspire locals and encourage responsible desert gardening by showcasing techniques and species that can be utilized in home gardens. But, perhaps most importantly, these gardens can play a pivotal role in ex-situ (out of habitat) and in-situ (in habitat) conservation of plant species. In terms of plants, ex-situ conservation is the cultivation or germplasm storage of a species that faces distinct threats in habitat. Ex-situ collections of rare plants can be used to propagate additional individuals that may be planted out in restoration efforts or in extreme cases, simply grown to ensure that as wild populations are extirpated, their genetic lineages are preserved. ASDM gardens also encourage in-situ conservation by educating visitors about the threats certain species and habitats face, inspiring people to get involved in preservation efforts.

As an example, one species ASDM is working on is chiltepin (*Capsicum annuum* var. *glabriusculum*). Chiltepin is a wild pepper plant that is the progenitor of the vast majority of commonly cultivated chiles including jalapeño, serrano, bell, and anaheim, among others. It is also the only wild pepper found in the United States, and in Arizona it tends to grow in small populations in thickly vegetated drainages and rock outcroppings in mountain ranges along the international boundary. These northern populations are particularly important because they are growing at the margins of the range of the species and so may have developed particular qualities like increased cold-resistance, heat-tolerance, or disease immunities that could make them valuable as breeding stock to help improve hardiness of domesticated chiles that are being impacted by the extreme weather events, and increased pest

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# Arizona-Sonora Desert Museum

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issues wrought by climate change. These populations are also particularly at risk because they tend to be small, and genetically isolated from one another, leaving them vulnerable to extirpation and genetic bottlenecking through habitat loss or over-harvesting for commercial sale. ASDM's conservation efforts for this species include locating and mapping wild populations, collecting germplasm and cultivating these plants on site, and accessioning material from these populations into our herbarium and seed bank. With these efforts, ASDM can protect and preserve wild populations of these chiles, learn about them through cultivation, and encourage local gardeners to grow them by selling them at our annual plant sale. In this way the Museum plays an active role in preserving native species while educating the public about their importance to the larger ecosystems they inhabit.

The Arizona-Sonora Desert Museum is a multifaceted natural history institution with a bioregional focus that uses art, science, and immersive experiences to introduce people to the diverse flora and fauna of the Sonoran Desert region. Institutions like ASDM are hubs of education and conservation, so wherever you live in Arizona, support your local botanical garden or natural history museum, and keep these valuable spaces open to the public.



A bee visiting the state listed rare plant *Buddleja sessiliflora*.

## More Information and Visits

The Arizona-Sonora Desert Museum is open 365 days a year (during inclement weather, please call (520) 883-2702). From October through May, hours are 8:30am– 5:00pm; from June through September, hours are 7:30am–2:00pm. Your ticket purchase directly supports the Desert Museum and our mission. Admission is free for members and children under 3; for ages 13-64, \$29.95; for seniors (ages 65+), \$27.95; for youth (ages 3-12), \$19.95.

**ARIZONA-SONORA DESERT MUSEUM**

## start your day!

This exhibit listing is organized as if one begins at the front entrance and travels counter-clockwise along the main route, branching off onto secondary paths for specific exhibits.

- 1 **Warden Aquarium**  
discover seahorses, pufferfish, eels, trout & more
- 2 **Reptile, Invertebrate & Amphibian Hall**  
rattlesnakes, tarantulas, scorpions, spadefoot toads, San Esteban chuckwalla & more
- 3 **Earth Sciences Center & Cave**  
Arizona gems & minerals
- 4 **Ancient Arizona & Sonorasaurus**  
Investigate prehistoric Arizona and learn about the Sonorasaurus dinosaur.
- 5 **Mountain Woodland**  
mountain lion, black bear, Mexican gray wolves, mule deer
- 6 **Desert Grassland**  
grasshopper mouse, snakes, burrowing owl, great blue heron, prairie dogs
- 7 **Desert Loop Trail**  
Life on the Rocks (multi-species exhibit), coyotes, javelina, lizards
- 8 **Cat Canyon**  
ocelot, bobcat, coati, gray fox
- 9 **Riparian Corridor**  
river otter, beaver, bighorn sheep, fish & aquatic invertebrates
- 10 **Birds of the Sonoran Desert**  
This large free-flight aviary features a variety of species native to the Sonoran Desert region.
- 11 **Life Underground**  
Burrowing animals
- 12 **Hummingbird Aviary**  
Enjoy the antics of multiple hummingbird species!

**BOTANICAL GARDENS**

A Agave B Cactus C People & Pollinators  
D Desert E Pollinators

Help us improve your Museum experience. Scan this QR code to take a quick survey.

Thank you!

The Arizona-Sonora Desert Museum is located on the ancestral lands of the Tohono O'odham (Desert People).

ASSOCIATION OF BOTANICAL GARDENS & AQUARIUMS





## The Arboretum at Flagstaff

by Helena Murray, Educational Programs Director Photos courtesy The Arboretum at Flagstaff

Built in the late 1960s, the Arboretum at Flagstaff was once the year-round home of Frances McAllister, a well-known local philanthropist. Frances loved gardening and dreamed of creating an arboretum since her honeymoon. The Arboretum at Flagstaff was created in 1981 when she donated the land her home resided on and provided an endowment for the project. The Arboretum was created as, and remains, a non-profit organization that receives funding through grants, endowment income, donations, membership, admission, plant sales, and class tuition.

The Arboretum at Flagstaff is the highest elevation research arboretum in the United States at 7,150 feet above sea level. Research staff focuses on native plants, especially rare and endangered species. Our 200-acre botanical garden features more than 750 species of native plants found within high elevation ecosystems of the Southwest. We have been awarded a Level II Accreditation by The ArbNet Arboretum Accreditation Program and The Morton Arboretum, for achieving particular standards of professional practices deemed important for arboreta and botanic gardens. The ArbNet Arboretum Accreditation Program is the only global

initiative to officially recognize arboreta at various levels of development, capacity, and professionalism. The Arboretum at Flagstaff is also now recognized as an accredited arboretum in the Morton Register of Arboreta, a database of the world's arboreta and gardens dedicated to woody plants.

We are in the fortunate position of housing a certified Plant Collections Network (PCN) collection of *Penstemon* of the Colorado Plateau. Our garden is located in the southwestern corner of the Colorado Plateau, which has one of the highest levels of species diversity and endemism for any region of the Colorado Plateau. The Plateau is often considered the epicenter of *Penstemon* diversity, with 116 *Penstemon* of which 60 are found in the Arizona portion of the Plateau. The Colorado Plateau consists of high-elevation deserts and mountains roughly surrounding the Four Corners area of Arizona, Utah, Colorado, and New Mexico. It is home to 6,000 plant species, 34 of which are federally listed as threatened or endangered and many others are considered rare. The Arboretum is one of only two accredited North American gardens higher than 7,000 feet. Ours is the highest garden on

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## The Arboretum at Flagstaff *continued*

the Colorado Plateau. This region is unique because federal agencies manage 55 percent of the land area. The Arboretum has developed strong working relationships with local land managers and scientists to research and restore species found in this unique environment. *Penstemon* display beds already make up a significant portion of our garden area. Participation in the PCN means that we have committed to curating the collection at the highest professional level and to making our collection available for increased distribution and research while promoting public awareness of conservation issues. The Arboretum holds 34 Arizona *Penstemon* taxa, representing over 50% of species found in Arizona. Our curatorial goal is to focus on the *Penstemon* species found in Arizona, and in the future expand our collection to include all species found on the Colorado Plateau. *Penstemon* species are known to hybridize readily, thus it is imperative that wild collected germplasm and properly identified species are obtained.

One of the most valuable associations the Arboretum has is with the Center for Plant Conservation (CPC) — a bank of seeds, cuttings, and other plant material from more than 2,000 of the nation’s most imperiled native plants. Gardens affiliated with the CPC have a particular commitment to the

conservation of rare plant genetic diversity and their ecosystems. The Arboretum has been affiliated with the CPC from the beginning of the CPC organization. We are stewards for 43 species as part of the CPC National Collection.

Botanists in the CPC network around the country gather and catalog these plant materials according to strict standards developed by CPC. The materials are then stored and maintained at the participating institution, preserving our options for restoration. This living collection of endangered plants is a critical conservation resource, serving as an emergency backup in the event a species becomes extinct or no longer reproduces in the wild. National Collection material can be used to study the life cycle and germination requirements of these rare treasures, and plants propagated from the collection are used by botanists and researchers for private, state, and federal plant restoration projects. In our work to secure rare plant species in the national collection of the CPC, we use several strategies. We place seed into long-term storage both here and at the National Laboratory for Genetic Resources Preservation. We conduct germination and cultivation tests to determine growing requirements of the species and we conduct ecological studies to address specific problems related to



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## The Arboretum at Flagstaff *continued*

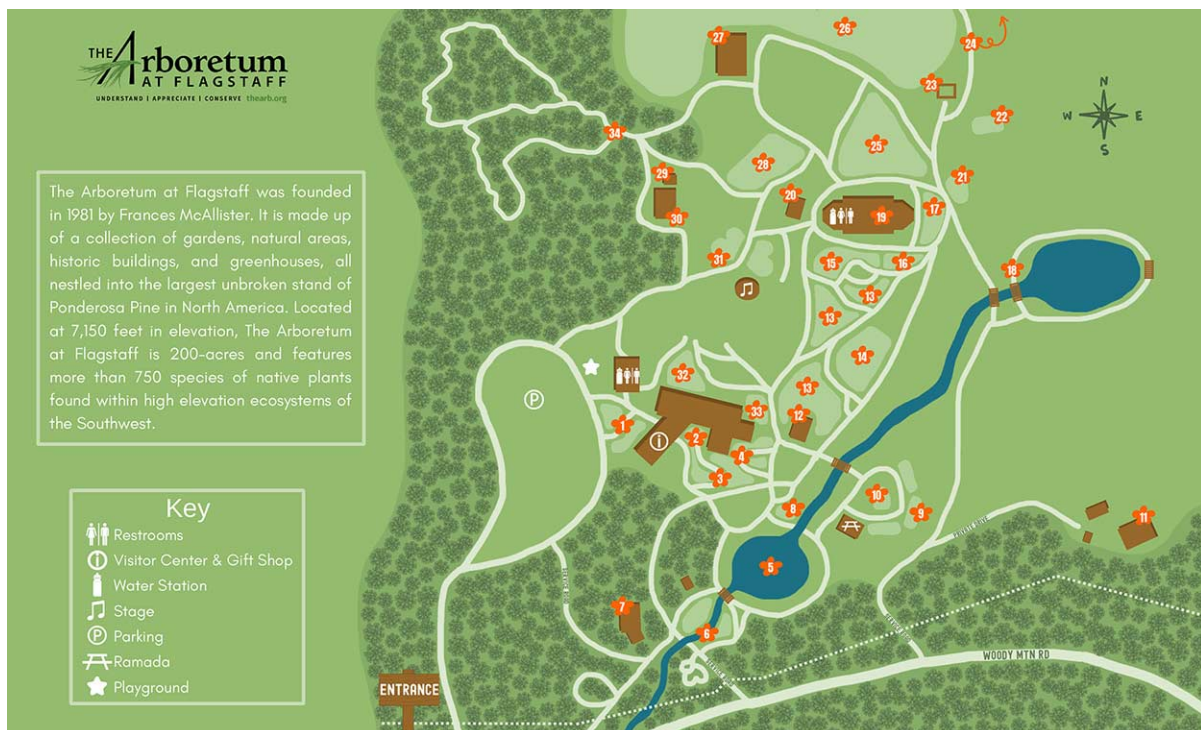
conserving the species in the wild. Just a couple examples of work we have done with CPC include examining seed production and germination requirements of the Sentry Milkvetch (*Astragalus cremnophylax* var. *cremnophylax*) and looking at the long-term history of populations (demography) of Arizona Cliffrose (*Purshia subintegra*).

The work done at the Arboretum at Flagstaff serves to further our mission to increase the understanding, appreciation, and conservation of plants and plant communities native to the Colorado Plateau, to identify, evaluate, display, and introduce plants adaptable to the climatic and soil conditions of the Flagstaff environment; to seek through scientific research innovative solutions to conservation issues of this high-altitude environment; and to develop educational programs that will increase the understanding of the need for wise stewardship of our natural environment.



### More Information and Visits

The Arboretum at Flagstaff is located on Woody Mountain Rd. in Flagstaff, Arizona and is open May 10 – October 31, Wednesday–Sunday from 9:00am–4:00pm with last admission to the grounds at 3:15pm. Admission is free to members. For more information about the Arboretum at Flagstaff, please visit our website at [www.thearb.org](http://www.thearb.org).







Above: Ayer Lake. Inset: Magma Ridge. Photos courtesy Doug Ripley

## A New Era at Boyce Thompson Arboretum

by Lynne Nemeth, Executive Director, and Stephen Fuchs, Plant Collections Manager Photos courtesy the author

Arizona's oldest and largest botanical garden was founded in 1924 by Col. William Boyce Thompson, (1869–1930). He was an American engineer, financier, and philanthropist who created his fortune in the mining industry and was the founder and first president of Inspiration Consolidated Copper Company in Globe-Miami, Arizona, and Magma Copper Company in Superior, Arizona.

His visits to Russia before the Russian Revolution, and again in 1918 just after the Revolution, changed his life. As a member of an American Red Cross relief mission, he witnessed rampant crop failure and starvation and saw firsthand the suffering of the people. The Russian experience convinced him that agriculture, food supply, and social justice are linked.



This conviction, along with his faith in science, helped to shape his philanthropic projects around plants and plant science.

In the early 1920s, Thompson, enamored with the landscape around Superior, built a winter home overlooking Queen Creek, Picket Post House. In 1924, he founded Boyce Thompson Arboretum (Arizona's first non-profit) on 400 acres around his home in Queen Creek Canyon as well as the Boyce Thompson Institute for Plant Research in Yonkers, New York (now at Cornell University in Ithaca).

He wrote, "A plant collection will be assembled which will be of interest not only to the nature lover and the plant student, but which will stress the practical side, as well to

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# Boyce Thompson Arboretum *continued*

see if we cannot make these mesas, hillsides, and canyons far more productive and of more benefit to mankind. We will bring together and study the plants of the desert countries, find out their uses, and make them available to the people. It is a big job, but we will build here the most beautiful, and at the same time the most useful garden of its kind in the world.”

In 2019, after 40 plus years as an Arizona State Park and University of Arizona facility, the Board of Directors of Boyce Thompson Arboretum (BTA) made an audacious decision: to recommit to its founder’s vision. We were again to be a botanical institution, with plant collections at the forefront of our focus and operations.

It hasn’t been easy. Separating from State Parks and the University was amicable, but developing a new culture has been challenging, as has tackling years of deferred maintenance. And the world has changed since Mr. Thompson wrote the above words. Importation from abroad is regulated, invasiveness must be addressed, and conservation and stewardship of native plants is of utmost importance as we face natural habitat loss and climate change.

Boyce Thompson Arboretum currently holds 4,067 taxa (3,013 species) and has acquired close to 20,000 plants on about 105 acres of garden areas. Natural areas encompass an

additional 267 acres. Staff estimates that there are probably 50,000 not yet acquired. (BTA didn’t hire a Plant Collections Manager staff position until 2015.) Our collections include plants from the United States, Mexico, Australia, Madagascar, India, China, Japan, Israel, South America, the Middle East, Africa, the Mediterranean, and the Arabian Peninsula. About 30% are species of conservation concern, meaning that scientists and land managers have concerns about the species’ viability in the wild. Factors that influence species’ viability include inherent rarity, habitat loss, climate change, and ecosystem importance.

We hold three collections nationally accredited by the Plant Collections Network: Southwest oaks, eucalyptus, and desert legumes (a seed collection). Other significant collections include cycads, aloes, cacti and succulents, and flora of the Chihuahuan desert.

## Arizona Native Plants

Among our various collections and many native plants, featured native species include oaks, hedgehog cacti, ephedra, yucca, and prickly pear. Our collection of 147 oaks (*Quercus*) represents 10 of the 14 oak species known to occur in Arizona. (Of the four missing species, three grow exclusively

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Yucca. Photo courtesy Doug Ripley

## Species Native to Arizona at Boyce Thompson Arboretum

Native <i>Quercus</i>	<i>Y. madrensis</i>	<i>E. fasciculatus</i>
<i>Q. ajoensis</i>	<i>Y. schidigera</i>	<i>E. fendleri</i>
<i>Q. arizonica</i>	<i>Y. schottii</i>	<i>E. ledingii</i>
<i>Q. emoryi</i>	<i>Y. treculeana</i>	<i>E. mojavensis</i>
<i>Q. gambelii</i>		<i>E. nicholii</i>
<i>Q. grisea</i>	Native <i>Ephedra</i>	<i>E. polyacanthus</i>
<i>Q. hypoleucoides</i>	<i>E. aspera</i>	<i>E. rigidissimus</i>
<i>Q. oblongifolia</i>	<i>E. californica</i>	
<i>Q. palmeri</i>	<i>E. cutleri</i>	Native <i>Opuntia</i>
<i>Q. pungens</i>	<i>E. funera</i>	<i>O. aurea</i>
<i>Q. rugosa</i>	<i>E. nevadensis</i>	<i>O. basilaris</i>
<i>Q. toumeyii</i>	<i>E. torreyana</i>	<i>O. chlorotica</i>
<i>Q. turbinella</i>	<i>E. trifurca</i>	<i>O. xcurvispina</i>
<i>Q. undulata</i>	<i>E. vidiris</i>	<i>O. engelmannii</i>
<i>Q. welshii</i>		<i>O. fragilis</i>
Native <i>Yucca</i>	Native <i>Echinocereus</i>	<i>O. macrocentra</i>
<i>Y. angustissima</i>	<i>E. arizonicus</i>	<i>O. macrorhiza</i>
<i>Y. baccata</i>	<i>E. bonkeriae</i>	<i>O. martiniana-</i>
<i>Y. baileyi</i>	<i>E. boyce-thompsonii</i>	<i>O. phaeacantha</i>
<i>Y. brevifolia</i>	(aka <i>Echinocereus</i>	<i>O. pinkavae</i>
<i>Y. elata</i>	<i>engelmannii</i>	<i>O. polyacantha</i>
<i>Y. harrimaniae</i>	subsp. <i>fasciculatus</i> )	<i>O. pottsii</i>
	<i>E. coccineus</i>	<i>O. santa-rita</i>
	<i>E. engelmannii</i>	





Display greenhouse. Photo courtesy Doug Ripley

## Boyce Thompson Arboretum *continued*

north of the Mogollon Rim or at high altitude and would be unable to survive at BTA.)

Our collection of 310 *Echinocereus* (hedgehog cacti) specimens contains 27 species and 49 taxa. We have eight of the 11 species known to occur in Arizona, including the *Echinocereus boyce-thompsonii*, a relatively rare variety of hedgehog cactus named after our founder, who discovered it at the Arboretum. The cacti are also called *Echinocereus engelmannii* subsp. *fasciculatus*, although there is lack of clarity on the nomenclature.

Our yucca collection numbers 712 (33 species) and includes nine of the ten species native to Arizona. We expect to acquire the missing species, Schott's yucca or Mountain Yucca (*Yucca schottii*), which grows within the sky islands of southern Arizona and northern Mexico at an elevation of 4,000-5,000 feet.

All eight species of *Ephedra* native to Arizona are represented in our collection of 27 species, in addition to many specimens in the native areas of the Arboretum.

Of our 974 specimens of prickly pear (*Opuntia*) — 58 species and 89 taxa — nine are Arizona natives.

### What's next for BTA

In 2020, BTA Board and staff crafted a new mission statement: to inspire appreciation and stewardship of desert plants, wildlife, and ecosystems through education, research, and conservation. As we enter our centennial year, we intend to place more focus on our native plant species and survey our entire property. We need to develop a plan for species of conservation concern and figure out how to adapt to the coming hotter and drier conditions of climate change. Overall, we seek to transform our collections and collection management strategies and expect to:

1. Assess both the current and potential value of existing collections as a resource for education, research, and conservation.
2. Evaluate the appropriateness of our collections in a warming world and ensure that collections are managed for a changed climate.
3. Include strategies to protect and conserve those plants and plant collections that are most vulnerable to climate change.
4. Define goals for collection development, including BTA's herbarium and seed collection.

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# Boyce Thompson Arboretum *continued*

5. Integrate our collections management with our overarching interpretive theme: "All Life Depends Upon Plants."

While not researching desert plants for food as Mr. Thompson anticipated, BTA has recently entered into a partnership with Arizona State University to make available our native and cultivated areas for botanical and other research programs. Thus far, we have lichen studies, plant-soil ecology, and post-Telegraph Fire restoration projects (with the Arboretum providing control plots), among others.

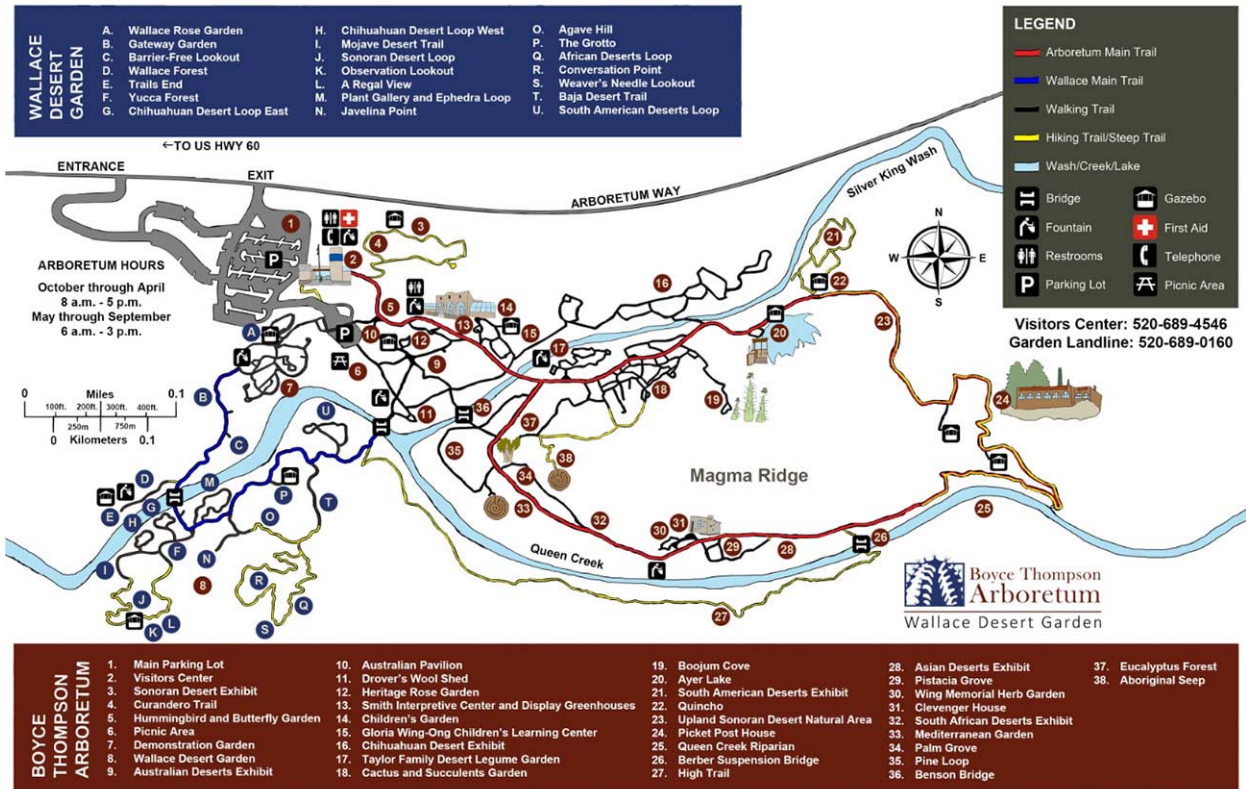


## More Information and Visits

Visiting Hours for the Arboretum are Sunday, Monday, and Wednesday through Friday, 6:00am–3:00pm. Admission for adults is \$19.00; \$9 for children ages 5–12; and free for children under 5. Contact the authors with questions at [Lynne.Nemeth@btarboretum.org](mailto:Lynne.Nemeth@btarboretum.org) and [Stephen.Fuchs@btarboretum.org](mailto:Stephen.Fuchs@btarboretum.org).



Boojum Tree (*Fouquieria columnaris*).  
Photo courtesy Doug Ripley







Walkway around Old Main.

## University of Arizona Campus Arboretum

by Tanya M. Quist, PhD, Associate Professor of Practice, School of Plant Sciences, and Director, University of Arizona Campus Arboretum, and Dorian Dodson, Master Gardener, Arboretum Tour Guide Photos courtesy Gene A. Valdes

What makes a campus arboretum a unique and important place? While most campuses have trees, not every one of them is a campus arboretum. That is a unique designation that indicates a special focus on the trees and plantings on the grounds.

What makes the University of Arizona Campus Arboretum a particularly important example of a campus arboretum? In addition to the beautiful trees enjoyed by students, faculty, staff, the community, and many visitors, it is a center of research, stewardship, preservation, education, and outreach.

### Research, Stewardship and Preservation

The University of Arizona (UA) is the State's oldest and largest land-grant university, a designation following the passage of federal legislation in 1862 and 1890. Prior to that, colleges and universities were primarily geared toward the arts and letters.

There was a growing awareness and recognition that the young nation needed to develop its industry, science, and technology. Land-grant universities were given large tracts of federal land for those purposes.

Almost no industry was considered more important than agriculture. It was — and remains today — a primary focus for all land-grant universities. What agricultural products, or cash crops, are considered important for each university to cultivate depends upon where the university is located.

In Arizona, we are the fortunate beneficiaries of a focus on desert-adapted trees and plants. As noted on the University of Arizona Campus Arboretum website:

*“Most of the roughly 400 acres of The University of Arizona’s main campus are included in the boundaries of the Campus Arboretum. The trees within these boundaries, collected over*

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## University of Arizona Campus Arboretum *continued*

*the University's more than 125-year history, are an historical part of the University's land grant commitment to providing research and education to serve the needs of the state. The campus itself was used as a proving ground and living laboratory in sustainability, evaluating hundreds of new species and cultivars for their adaptation to this urban and arid region."*

Beginning in the 1890s, many different species of trees were planted on the campus. One of these was the European Olive (*Olea europaea*). Many of those same trees are alive today, and they still produce a robust crop of olives every year. Citrus, eucalyptus, palms, and many other species followed. And while some of them became viable agricultural crops — citrus trees and date palms, for example — others found their niche in the desert as urban landscape trees.

Another major landmark in the UA's role as a land-grant university came in the 1970s when Dr. Warren Jones, Professor of Landscape Architecture, brought trees and seeds from all over the world back to the campus. The goal was to determine whether these trees could survive the harsh desert climate and could do so with less water than the trees found in the east and other milder, wetter areas of the United States. Urban horticulture became as important to the University as identifying and cultivating cash crops.

Most of the desert-friendly trees that one sees in cities and towns throughout Arizona and the southwest are the direct result of this research and testing. Some of them are native and have been cultivated to be more suitable and decorative in the urban landscape. Others are adapted from various regions of the world with similar climates. However, all these trees owe their popularity in our region to the research conducted on the UA campus. When you visit the Campus Arboretum, look for some of the different cultivars of natives such as the desert willow (*Chilopsis linearis*), which was originally found along washes and streams of the southwest. One particularly lovely cultivar is named Warren Jones, in honor of his work.

There are several species of the Palo Verde (*Parkinsonia aculeata*), a decorative drought-deciduous tree with green bark that continues photosynthesis even when all the leaves have been shed. This is now a widely available and popular tree that turns Arizona towns and cities bright yellow in the spring with its blossoms. The often-overlooked Mesquite tree (*Prosopis*) that grows in southwestern deserts as a large shrub has become a long-lived, landscaping-staple tree, often very large and providing much needed shade in the hotter months. The Ironwood (*Olneya tesota*) is a flowering evergreen tree



Date palm on the grounds of Old Main.

that is one of the most drought-hardy trees in the Sonoran Desert.

You will also see the Chinese pistache (*Pistacia chinensis*), a large and beautiful shade tree native to China, Taiwan, and the Philippines which thrives in our area. Look for the Texas mountain laurel (*Dermatophyllum secundiflorum*) that can be grown as a shrub or a smaller tree. It has fragrant purple flowers in the spring and keeps its glossy green leaves year-round. When they are in bloom on the campus, no one can walk by without stopping to admire them and inhale the perfume of their stunning blossoms.

As a result of the exploration of trees from around the world, the Campus Arboretum is home to other interesting and unique specimen trees that add beauty and interest to the grounds. The UA's research showed that these trees could survive and even thrive in urban micro-climates, which provide a more protected climate than the general desert landscape. Look for these as well: the cork oak (*Quercus suber*) and yes, its bark is where the cork for wine bottles comes from, the silk floss tree (*Ceiba speciosa*), and the Assyrian plum (*Cordia myxa*) — these are all examples of trees growing happily in their campus microclimates.

Since the 1970s, the general awareness of the need for water conservation has increased dramatically. Changes in watering

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# University of Arizona Campus Arboretum *continued*

practices, water catchment, and plant selection and placement for optimal water savings followed. UA helps to lead this effort, and there are many examples of successful desert-wise landscaping, and active and passive water catchment systems on the campus.

In September 2002, the UA Campus Arboretum was officially dedicated and accepted as a member of the American Public Garden Association with the charge to preserve and enhance this significant collection, and to promote stewardship and conservation of urban trees.

The UA Campus Arboretum, with its roots as a land-grant university, is a leader in the preservation of trees at a time when the need for, and importance of trees, has never been more critical. Its rigorous guidelines for the care and protection of its own collection set the standard for tree-centered thinking. The applied research and practice have resulted in many comprehensive UA publications on tree selection, planting, pruning, and irrigation. They are widely available and, although based on science and best practice, they provide practical and useful information for homeowners, urban planners, landscape professionals and nursery people alike.

## Education and Outreach

The research conducted on the UA Campus Arboretum is translated into education at all levels. Undergraduate and graduate students from the College of Agriculture and Life Sciences benefit from the “living laboratory” of the Arboretum. Other colleges on campus find lessons in culture and history — interwoven with the trees in every society — that enrich their curricula.

But, in addition to academic instruction, the UA Campus Arboretum is a place for all of us to be educated. The history of the campus, and its evolving path to the present understanding of the importance of trees and their preservation, provides us with invaluable information. Here are just a few lessons we learn when we attend a lecture or special presentation given by the Arboretum Faculty or take a Campus Arboretum Tour:

Plants are “green infrastructure.” They provide goods and services that benefit people and the planet. They filter the air, produce oxygen, trap carbon dioxide, improve water quality, reduce soil erosion, and provide food and medicine.



Olive tree on the grounds of Old Main.

Of all the plants we can cultivate, trees provide the greatest return on our investment. They are woody, and as a result they excel at trapping carbon dioxide in their wood, which reduces greenhouse gasses in the atmosphere. They are long-lived, so their benefit continues for decades or even centuries. They are large, so they have greater capacity for generating many benefits such as shade and reduced cooling costs.

As in any locale, native plants are well suited to the natural conditions of our southwest desert. Not only do they have better chances of survival with less care, but they also co-evolved with pollinators and other local organisms that also benefit all desert dwellers.

However, because of the somewhat unnatural conditions of a heavily built environment — think cities and towns — we need to look at other plants that can also survive in these conditions. We should strive for biodiversity and the best use of micro-climates. And, thanks to the global travels of some of the most prominent horticulturists at UA, we can enjoy a worldwide palette of suitable trees and plants.

Except for watching the trees filter air, produce oxygen, and trap carbon dioxide, every one of these important lessons is visible and showcased while walking around the UA Campus Arboretum. We can enjoy the beauty of the trees and plants while we learn exactly how they enrich our lives. We can also

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From left: Cristate Saguaro cactus on the grounds of Old Main. The Joseph Wood Krutch Garden, born at The University of Arizona almost as soon as the doors opened, has grown and developed with the University for 120 years. It stands as an insight into the past and a living laboratory testing sustainability into the future.

## University of Arizona Campus Arboretum *continued*

learn how to recreate the landscaping on a scale suitable for our homes and neighborhoods. We can learn how rainwater catchment systems can be effective and enhance the look of our gardens. We can use all these examples to help shape our communities and governmental policies.

One of the most historic points of interest on the UA Campus is the Joseph Wood Krutch Garden, named in honor of the esteemed American author, critic, and naturalist who wrote nature books on the American Southwest. Located on the mall, it is a collection of many Sonoran native plants and trees, and it is an excellent example of a striking, low-water desert landscape in a contained area.

In addition to the Garden itself, the Arboretum has worked with scientific illustrators and artists to create the Krutch Garden Florilegium. Scientific illustrations of all 65 species in the garden are nearing completion. These illustrations capture all features of the plant under magnification, allowing a close and detailed look at the structures that make each species unique. They also depict the structures present from the beginning to the end of the life cycle.



### **More Information and Visits**

The UA Campus Arboretum is open 24 hours a day, seven days a week. Free tours are conducted every Sunday morning from mid-September to mid-May, and special tours are provided on request. The different tours highlight different aspects of the Arboretum's collection: **Sonoran Natives** featuring the Krutch Garden, **Trees Around the World**, and **Edible Plants and Trees** are just a few of the tours offered every year. Visit the Arboretum website (<https://arboretum.arizona.edu/>) to learn more about the trees, the programs, and resources available. You can also sign up for a tour on this site. Study the Krutch Garden florilegium for a collection of drawings of native plants that combines horticultural education and stunning art at <https://arboretum.arizona.edu/research/joseph-wood-krutch-florilegium-project>. Find a helpful publication on all aspects of tree and plant care, including selection, planting, pruning, fertilizing, maintenance, and disease management at <https://extension.arizona.edu/pubs>.





*Berberis haematocarpa*. From left: Creating a shady hedge. A bee mimic fly visiting its flowers. Fruit.

## SPOTLIGHT ON A NATIVE PLANT

by Jack Dash, President, Tucson Chapter, Arizona Native Plant Society

# Red Barberry, *Algerita* (*Berberis haematocarpa* Wooton, syn. *Mahonia haematocarpa*) Family: Berberidaceae

While cool mornings still leave frost on windshields, barberry (*Berberis haematocarpa*) explodes in a profusion of yellow flowers that garland the spiky blue-green foliage. The “red” in its name refers to its purplish red berries. Barberry is an evergreen shrub found in mid-elevation chapparal, grassland, and oak-juniper woodland plant communities in the southwestern United States and northern Sonora, Mexico.

Look for barberry in the form of individual plants or thick hedges growing amongst mesquite (*Prosopis velutina*), Oak (*Quercus* species), and juniper (*Juniperus* species), or scattered in with grasses and subshrubs. The dense foliage consists of paired leaflets with sharp marginal spines growing on petioles tipped with a single terminal leaflet that is typically longer than the rest. These leaves come tightly packed on the plant, making this shrub virtually impossible to walk through. Shooting out from the same nodes as the leaves come small clusters of lemon-yellow flowers on thin stems that light up the plant, appearing as early as February in lower elevations and brightening dormant winter landscapes. The blooms consist of a halo of yellow sepals around a central petal cup that holds the flower’s reproductive parts. These blossoms attract diverse pollinators, including bees, butterflies, and bee-mimicking fly species. Time spent watching a flowering barberry will prove fruitful for any entomologist.

There are a total of six *Berberis* species in Arizona including creeping barberry (*Berberis repens*), a low growing plant

found in cool mountain woodlands and moist canyon edges at high elevations, and Fremont’s barberry (*Berberis fremontii*) that largely replaces red barberry north of the Mogollon Rim.

In landscaping, red barberry’s dense, evergreen foliage suggests it as a living hedge or screen. The flowers and their many pollinators will be a delight for butterfly or bee enthusiasts, and the tart red berries will reward birders with sightings of thrashers, flycatchers, jays, and other fruit-loving avifauna. The leaves of this plant are a confirmed larval food source for several species of moth caterpillars but are also known to host *Puccinia graminis*, a rust fungus much abhorred by grain farmers. This may be a consideration for those living in or near farming communities but will not be a significant issue for the majority of urban or rural dwellers in Arizona.

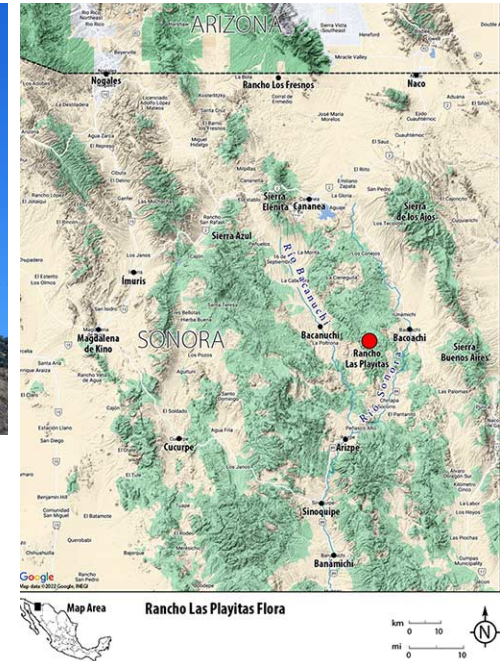
Do some research into which barberry species are local to your area and ask around at local nurseries to see if they have them in stock. Creeping barberry is somewhat common in nurseries in temperate areas, but other native species, including red barberry, are harder to find. Increased demand for these plants will ensure that more nurseries devote space and time to producing them, which will be a win for gardeners and the wildlife we love.







Above: Figure 1. The Picacho de Bacoachi towers over Rancho Las Playitas.  
Photo by Ana L. Reina-G.



Right: Figure 2. Map of the El Picacho de Bacoachi-Rancho Las Playitas flora area.

# Preliminary Flora of El Picacho de Bacoachi-Rancho Las Playitas, Sonora, Mexico

by Thomas R. Van Devender<sup>1</sup>, Ana Lilia Reina-Guerrero<sup>1</sup>, Stephen F. Hale<sup>2</sup>, Susan D. Carnahan<sup>3</sup>, Guillermo Molina-Padilla<sup>4</sup>, and Jose Abel Salazar-Martínez<sup>5</sup>

## Abstract

A preliminary flora is presented for the El Picacho de Bacoachi-Rancho Las Playitas area between Bacoachi and Bacanuchi, Sonora, Mexico, based on historical collections and collections and observations made on three Madrean Discovery Expeditions and related field trips from July 2019 to August 2022. The known flora contains 429 species plus three additional varieties in 80 families and 274 genera, with Asteraceae (61 species), Poaceae (55 taxa), Fabaceae (33 species), Euphorbiaceae (18 species), Malvaceae (19 species), Solanaceae (17 species), Cactaceae (14 species), Apocynaceae, Boraginaceae, and Pteridaceae (10 species each) the most diverse families. Only 25 of 429 taxa are non-natives (5.8%), including eight species of Poaceae.

## Introduction

The northern limits of the New World tropics are in Sonora with tropical deciduous forest (TDF) as far north as the Sierra San Javier (26°N) and foothills thornscrub (FTS) as far north

as the Arizpe-Sinoquique area (30.4°N, Van Devender and Reina-G. 2021). Decreasing winter temperatures control the transition from FTS to desert grassland at the same elevations and rainfall regimes about 70–120 km south of the Arizona border — the transition from the tropics into the Northern Temperate zone.

Van Devender et al. (2010) summarized the flora of the state of Sonora with 3,477 species (92.9% native) plus 147 additional varieties and subspecies and 30 interspecific hybrids in 88 families and 1,103 genera. Only 77 taxa (67 species, 8 subspecies, and 2 varieties in 24 families) were endemic to mainland Sonora. Van Devender et al. (2020) updated the total for Sonora to 3,842 vouchered taxa and 266 (6.9%) non-natives.

The plant diversity in Sonora is greatest in TDF in southern Sonora (Van Devender et al. 2000) and the pine-oak forest in the Sierra Madre Occidental (SMO) in eastern Sonora (Van Devender and Reina-G. 2016). Other areas that significantly add to the plant diversity in the state are the Sky Island mountain ranges and temperate grasslands in the Madrean Archipelago (MA) in the northeast (Van Devender et al. 2018) and the Sonoran Desert to the west (Turner et al. 1995).

Here we report the local flora of the El Picacho de Bacoachi-Rancho Las Playitas area, Municipios de Arizpe and Bacoachi, to further document the floristic diversity of Sonora.

<sup>1</sup>Greater Good Charities, 236 S. Scott Ave., Suite 140, Tucson, Arizona 85701; [yecora4@comcast.net](mailto:yecora4@comcast.net). <sup>2</sup>EcoPlan Associates Inc., 3610 N Prince Village Place, Suite 140, Tucson, AZ 85719. <sup>3</sup>University of Arizona Herbarium, 1140 E. South Campus Dr., Tucson, AZ 85721. <sup>4</sup>Av. Juárez No. 14, Cananea, Sonora, México, CP 84620. <sup>5</sup>Calle 5 de Mayo s/n, Bacoachi, Sonora, México.





Figure 3. A. Foothills thornscrub-desert grassland transition vegetation. B. *Phrynosoma ditmarsii*. Photos by Charles Hedgcock and Guillermo Molina-P.

## Preliminary flora of El Picacho de Bacoachi-Rancho Las Playitas *continued*

### Study Area

Rancho Las Playitas has been in the Salazar family for four generations. It is located between Bacoachi and Bacanuchi (center: 30.598°N 110.094°W), 33 km north-northeast of Arizpe (30.4°N), 50 km south-southeast of Cananea (31.0°N), and 86 km south of the Arizona border. The ranch drains into the Río Sonora on the east and the Río Bacanuchi on the west (Figure 2). The ranch includes 3,230 hectares, with portions in both the municipalities of Arizpe and Bacoachi. It ranges from 1,060 to 1,590 m elevation and is adjacent to the dramatic 1,650-m Cerro El Picacho (Figure 1). Barranco Basaitequi, Rancho El Peñascal, and Arroyos Los Chorros and Las Padercitas are important collecting areas on Rancho Las Playitas.

### Methods

A few incidental plants were collected in the Rancho Las Playitas study area by Ira L. Wiggins in 1948, Rigoberto López-Estudillo in 1991, Marc A. Baker in 1997, and Van Devender in 2001.

The preliminary flora of the Sierra Buenos Aires east of Bacoachi totaled 408 taxa in 82 families and 257 genera, with Asteraceae (52 taxa), Fabaceae (47 taxa), and Poaceae (46 taxa) the most diverse families (Ferguson et al. 2018). The vegetation is desert grassland and oak woodland. The preliminary flora of the Sierra Elenita north of Cananea totaled 320 taxa in 65 families, with Asteraceae (55 taxa),

Poaceae (41 taxa), and Fabaceae (36 taxa) the most diverse families (Carnahan et al. 2018). The vegetation is oak woodland and pine-oak forest.

The Madrean Discovery Expeditions (MDE) program was first associated with Rancho Las Playitas when Molina-Padilla and Salazar-Martínez installed and maintained a network of wildlife cameras to document the mammal fauna, including ocelot (*Leopardus pardalis*) and American black bear (*Ursus americanus*). Many plants were photographed as part of the field work. Plants were inventoried extensively on MDE Expeditions to Rancho Las Playitas on July 5–7, 2019, September 27 – October 5, 2021, and April 18–23, 2022. Additional collections were made on October 2–3, 2022. The second and third MDE Expeditions were focused on studying *Phrynosoma ditmarsii* (Rock Horned Lizard; Turner et al. 2022; Figure 3B), a species endemic to Sonora. Additional plants were collected on bi-weekly trips to monitor horned lizards fitted with radio transmitters from October 16, 2021, to August 13, 2022. All observations, records, and images are publicly available in the MDE database ([madreandiscovery.org](http://madreandiscovery.org)).

### Results

The flora of the greater Rancho Las Playitas area currently has 429 species plus three additional varieties in 80 families and 274 genera (Checklist). The most numerous families are Asteraceae (61 species), Poaceae (55 taxa), Fabaceae (33

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Figure 4. A. *Forestiera angustifolia*. B. *Fraxinus gooddingii*. Photos by R. Wayne Van Devender and Ana L. Reina-G.

## Preliminary flora of El Picacho de Bacoachi-Rancho Las Playitas continued

species), Euphorbiaceae (18 species), Malvaceae (19 species), Solanaceae (17 species), Cactaceae (14 species), Apocynaceae, Boraginaceae, and Pteridaceae (10 species each). The most numerous genera are *Bouteloua* (12 taxa), *Muhlenbergia* (9 species), *Euphorbia* and *Opuntia* (7 species each), and *Quercus* and *Solanum* (6 species each). Only 25 of 429 taxa are non-natives (5.8%), including eight species of Poaceae. None of them are invasive.

### Discussion

The flora of the El Picacho de Bacoachi-Rancho Las Playitas area is an important contribution to the flora of Sonora. The floristic affinities of the species are interesting. Tropical

species that extend from TDF northward into FTS and adjacent vegetation types include *Croton ciliatoglandulifer*, *Gronovia scandens*, *Havardia mexicana*, *Henrya insularis*, *Manihot rubicaulis* *Milleria quinqueflora*, *Opuntia* aff. *duranguensis*, *O.* aff. *wilcoxii*, *Senegalia occidentalis*, and *Thymophylla anomala*. The distributions of *Cylindropuntia thurberi*, *Erythrina flabelliformis*, *Eysenhardtia orthocarpa*, *Lagascea decipiens* (Figure 5B), and *Lysiloma watsonii* reach Arizona.

Northern oak woodland and desert grassland species present on Rancho Las Playitas include *Agave schottii*, *Dasyliirion wheeleri*, *Forestiera angustifolia* (Figure 4A), *Fraxinus*

*continued next page*



Figure 5. A. *Opuntia gosseliniana*. B. *Lagascea decipiens*. Photos by Guillermo Molina-P.





Figure 6. A. *Plumbago zeylanica*. B. *Jacquemontia pringlei*. Photos by Ana L. Reina-G.

## Preliminary flora of El Picacho de Bacoachi-Rancho Las Playitas *continued*

*gooddingii* (Figure 4B), *Juniperus arizonica*, *Mariosousa millefolia*, *Nolina macrocarpa*, *Opuntia chlorotica*, *O. santarita*, *Rhus aromatica*, *Rhus virens* subsp. *choriophylla*, and *Senecio flaccidus*. *Aralia humilis*, *Quercus arizonica*, *Q. oblongifolia*, *Q. toumeyi*, *Q. viminea*, and *Yucca madrensis* are widespread in the oak woodland from the Yécora area in the SMO north through the MA into Arizona, while *Q. emoryi* is primarily a MA species and *Q. chihuahuensis* does not reach Arizona.

Between Bacoachi and Rancho Las Playitas, there is a drier area where the vegetation is more like Sonoran desertscrub with *Bursera fagaroides*, *B. laxiflora*, *Cylindropuntia fulgida*, *Fouquieria splendens*, *Opuntia gosseliniana* (Figure 5A), *Prosopis velutina*, and *Stenocereus thurberi*.

A few species are noteworthy. *Erythranthe diminuens* was previously only known from the Sierra Bacadéhuachi, a southeasternmost Sky Island, and near Mesa Tres Río in the SMO (Nesom 2017). This is a range extension of 138 kilometers to the northwest. *Phacelia sonoitensis* was described from Santa Cruz County, Arizona (McLaughlin 2007), 166 kilometers north-northwest of Rancho las Playitas. This collection (Carnahan 3851) plus Carnahan 2436 from El Cajón Bonito, Rancho Los Ojos, Municipality of Agua Prieta (31.2738°N 109.0073°W, 173 m elevation) are the first records for the state of Sonora and the country of Mexico. *Adolphia infesta* near Arroyo las Padercitas is a very spiny shrub in the Rhamnaceae that is widespread in Mexico, but only reaches the United States in western Texas and in the Guadalupe Canyon area in Cochise County, Arizona. *Senna wislizeni* is a handsome shrub with dark green leaves and large yellow

flowers that is widespread in eastern Mexico, especially in the Chihuahuan Desert, reaching the United States in western Texas and southeastern Arizona as far north as the Santa Catalina Mountains above Tucson, Arizona. There are populations in Chihuahuan desertscrub near Agua Prieta in northeastern Sonora and in Sonoran desertscrub near Benjamín Hill in central Sonora. Rancho Las Playitas is in FTS in between these two areas.

Van Devender et al. (2022) summarized the flora and vegetation at six Rock Horned Lizard sites at Barranco Basaitequi and near Arroyo Padercitas on Rancho Las Playitas. A total of 137 plant species in 38 families were observed with Poaceae (22 species), Asteraceae (21 species), Fabaceae (15 species), Malvaceae (9 species), Euphorbiaceae (8 species), and Cactaceae (6 species) the most numerous families. The vegetation of Rancho Las Playitas is a transition between tropical FTS and temperate desert grassland. On rocky slopes, a shrubby overstory is dominated by shrubs such as *Lysiloma watsonii*, *Prosopis velutina*, *Mimosa dysocarpa*, and *Fouquieria splendens*, as well as *Celtis pallida*, *Eysenhardtia orthocarpa*, *Forestiera angustifolia*, and *Fraxinus gooddingii*. In areas with gentler slopes, perennial grasses are dominant, including *Bouteloua chondrosioides* (Figure 7A), *B. curtipendula*, *B. repens*, and *Bothriochloa barbinodis*. The diversity of 53 species of grasses reflects the desert grassland influence.

Mesic canyons in the Rancho Las Playitas support riparian vegetation with occasional *Populus fremontii*. In Arroyo Las Padercitas, *Celtis reticulata*, *Buddleja sessiliflora*, *Graptopetalum rusbyi*, *Fraxinus velutina*, *Juglans major*, *Lobelia*

*continued next page*





Figure 7. A. *Bouteloua chondrosioides*. B. *Najas guadalupensis*. Photos by Ana L. Reina-G.

## Preliminary flora of El Picacho de Bacoachi-Rancho Las Playitas *continued*

*laxiflora*, *Morus microphylla*, *Populus monticola*, *Salix gooddingii*, *Tillandsia recurvata*, and *Zeltnera arizonica* are present in a rocky stream canyon. *Populus monticola* is an aspen-like tree found in the Cape Region of Baja California and in central Sonora. *Adiantum capillus-veneris*, *Aquilegia chrysantha*, *Erythranthe diminuens*, and *Sambucus nigra* subsp. *cerulea* were only found in Aguaje el Palmillito on Rancho Peñascal. In Fremont cottonwood-willow riparian forest along the Ríos Bacanuchi and Sonora, *Phoradendron leucarpum* subsp. *macrophyllum*, *Platanus wrightii*, and *Salix bonplandiana* are also present. Aquatic plants include *Najas guadalupensis* (Figure 7B) in Arroyo Las Padercitas, *Heteranthera limosa* in Arroyo Los Chorros, and the non-native *Nasturtium officinale* in several areas.

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# CHECKLIST: Picacho de Bacoachi–Rancho Las Playitas Area page 1 of 4

An asterisk (\*) denotes non-native status.

## Pteridophytes

### PTERIDACEAE

*Adiantum capillus-veneris* L.

*Argyrochosma incana* (K. Presl) Windham

*Argyrochosma limitanea* (Maxon) Windham

*Astrolepis sinuata* (Lag. ex Sw.) Benham & Windham

*Bommeria hispida* (Mett. ex Kuhn) Underw.

*Myriopteris aurea* (Poir.) Grusz & Windham

*Myriopteris lindheimeri* (Hook.) J. Sm.

*Myriopteris wrightii* (Hook.) Grusz & Windham

*Notholaena grayi* Davenp.

*Pellaea wrightiana* Hook.

### SELAGINELLACEAE

*Selaginella rupincola* Underw.

## Gymnosperms

### CUPRESSACEAE

*Juniperus arizonica* (R.P. Adams) R.P. Adams

## Eudicots

### ACANTHACEAE

*Anisacanthus thurberi* (Torr.) A. Gray

*Carlowrightia arizonica* A. Gray

*Elytraria imbricata* (Vahl) Pers.

*Henrya insularis* Nees ex Benth.

*Justicia candicans* (Nees) L.D. Benson

*Ruellia ciliatiflora* Hook.

*Tetramerium nervosum* Nees

### AMARANTHACEAE

*Alternanthera caracasana* Kunth

*Amaranthus palmeri* S. Watson

\**Chenopodium murale* (L.) S. Fuentes-B, Uotila & Borsch

*Chenopodium neomexicanum* Standl.

*Froelichia interrupta* (L.) Moq.

*Gomphrena nitida* Rothr.

*Gomphrena sonora* Torr.

*Guilleminea densa* (Humb. & Bonpl. ex Willd.) Moq.

*Iresine latifolia* Moq.

\**Salsola tragus* L.

### ANACARDIACEAE

*Rhus aromatica* Aiton

*Rhus virens* Lindh. ex A. Gray var. *choriophylla* (Wooton & Standl.) L.D. Benson

*Toxicodendron radicans* (L.) Kuntze

### APIACEAE

\**Bowlesia incana* Ruiz & Pav.

*Daucus pusillus* Michx.

*Spermolepis lateriflora* G.L. Nesom

### APOCYNACEAE

*Asclepias asperula* (Decne.) Woodson

*Asclepias elata* Benth.

*Asclepias linaria* Cav.

*Asclepias nummularia* Torr.

*Asclepias nyctaginifolia* A. Gray

*Cynanchum ligulatum* (Benth.) Woodson

*Funastrum heterophyllum* (Engelm. ex Torr.) Standl.

*Haplophyton cimidum* A. DC.

*Mandevilla brachysiphon* (Torr.) Pichon

*Polystemma* sp. nov.

### ARALIACEAE

*Aralia humilis* Cav.

### ASTERACEAE

*Acourtia thurberi* (A. Gray) Reveal & R.M. King

*Acourtia wrightii* (A. Gray) Reveal & R.M. King

*Adenophyllum porophyllum* (Cav.) Hemsl.

*Ageratina paupercula* (A. Gray) King & H.E. Robins.

*Ambrosia ambrosioides* (Cav.) W.W. Payne

*Ambrosia confertiflora* DC.

*Ambrosia cordifolia* (A. Gray) W.W. Payne

*Artemisia ludoviciana* Nutt.

*Baccharis salicifolia* (Ruiz & Pav.) Pers.

*Baccharis sarothroides* A. Gray

*Baccharis thesioides* Kunth

*Bebbia juncea* (Benth.) Greene

*Bidens heterosperma* A. Gray

*Brickellia amplexicaulis* B.L. Robins.

*Brickellia californica* (Torr. & A. Gray) A. Gray

*Brickellia coulteri* A. Gray

*Brickellia floribunda* A. Gray

*Brickellia venosa* (Wooton & Standl.) B.L. Robins.

*Carminatia tenuiflora* DC.

*Cirsium neomexicanum* A. Gray

*Coreocarpus arizonicus* (A. Gray) Blake

*Diaperia verna* (Raf.) Morefield

*Encelia farinosa* A. Gray ex Torr.

*Erigeron arisolius* G.L. Nesom

*Erigeron divergens* Torr. & A. Gray

*Erigeron lobatus* A. Nels.

*Erigeron velutipes* Hook. & Arn.

*Guardiola platyphylla* A. Gray

*Gymnosperma glutinosum* (Spreng.) Less.

*Helenium thurberi* A. Gray

*Heliomeris longifolia* (Robins. & Greenm.)

Cockerell var. *annua* (M.E. Jones) Yates

*Heterosperma pinnatum* Cav.

*Hymenoclea monogyra* Torr. & A. Gray ex A. Gray

*Hymenothrix wrightii* A. Gray

*Koanophyllum palmeri* (Gray) R.M. King & H. Rob.

*Lagascea decipiens* Hemsl.

*Machaeranthera tagetina* Greene

*Malacothrix fendleri* A. Gray

*Melampodium appendiculatum* B.L. Robins.

*Melampodium leucanthum* Torr. & A. Gray

*Melampodium longicorne* A. Gray

*Milleria quinqueflora* L.

*Parthenice mollis* A. Gray

*Pectis cylindrica* (Fern.) Rydb.

*Pectis filipes* Harvey & A. Gray

*Pectis prostrata* Cav.

*Perityle microglossa* Benth.

*Porophyllum gracile* Benth.

*Porophyllum macrocephalum* DC.

*Senecio flaccidus* Less.

\**Sonchus oleraceus* L.

*Stephanomeria pauciflora* (Torr.) A. Nels.

*Thymophylla anomala* Rydb.

*Tithonia thurberi* A. Gray

*Trixis californica* Kellogg

*Uropappus lindleyi* (DC.) Nutt.

*Viguiera dentata* (Cav.) Spreng.

*Xanthisma gracile* (Nutt.) D.R. Morgan & R.L. Hartm.

*Xanthium strumarium* L.

*Zinnia peruviana* (L.) L.

*Zinnia zinnioides* (Kunth) Olorode & A.M. Torres

### BIGNONIACEAE

*Tecoma stans* (L.) Kunth var. *angustata* Rehd.

### BIXACEAE

*Amoreuxia palmatifida* Moc. & Sessé ex DC.

### BORAGINACEAE

*Cryptantha barbiger* (A. Gray) Greene

*Cryptantha crassisepala* (Torr. & A. Gray) Greene



## CHECKLIST: Picacho de Bacoachi–Rancho Las Playitas Area page 2 of 4

*Cryptantha pterocarya* (Torr.) Greene  
*Eucrypta micrantha* (Torr.) Heller  
*Johnstonella angustifolia* (Torr.) Hasenstab & M.G. Simpson  
*Nama hispida* A. Gray  
*Phacelia affinis* A. Gray  
*Phacelia arizonica* A. Gray  
*Phacelia distans* Benth.  
*Phacelia sonoitensis* S.P. McLaughlin

### BRASSICACEAE

\**Chorispota tenella* (Pall.) DC.  
*Descurainia pinnata* (Walter) Britton  
*Dryopetalon runcinatum* A. Gray  
*Hesperidanthus linearifolius* (A. Gray) Rydb.  
*Lepidium lasiocarpum* Nutt.  
*Lepidium thurberi* Wooton  
\**Nasturtium officinale* R. Br.  
\**Sinapis arvensis* L.  
\**Sisymbrium irio* L.

### BURSERACEAE

*Bursera fagaroides* (Kunth) Engl. var. *elongata* McVaugh & Rzed.  
*Bursera laxiflora* S. Watson

### CACTACEAE

*Cylindropuntia fulgida* (Engelm.) Knuth  
*Cylindropuntia thurberi* (Engelm.) F.M. Knuth in Backeb. & F.M. Knuth  
*Echinocereus arizonicus* subsp. *nigrihorridispinus* W. Blum & Rutow  
*Echinocereus fendleri* (Engelm.) Sencke ex J.N. Haage  
*Echinocereus rigidissimus* (Engelm.) Haage f.  
*Mammillaria grahamii* Engelm. & Bigelow subsp. *grahamii*  
*Opuntia* aff. *durangensis* Britton & Rose  
*Opuntia* aff. *wilcoxii* Britton & Rose  
*Opuntia chlorotica* Engelm. & Bigelow  
*Opuntia engelmannii* Salm-Dyck  
*Opuntia gosseliniana* A. Weber  
*Opuntia gosseliniana* A. Weber X *O. santa-rita* (Griffiths & Hare) Rose  
*Opuntia phaeacantha* Engelm.  
*Opuntia santa-rita* (Griffiths & Hare) Rose  
*Stenocereus thurberi* (Engelm.) F. Buxb.

### CANNABACEAE

*Celtis pallida* Torr.  
*Celtis reticulata* Torr.

### CONVOLVULACEAE

*Cuscuta umbellata* Kunth

*Evolvulus alsinoides* L. var. *angustifolia* Torr.  
*Ipomoea costellata* Torr.  
*Ipomoea cristulata* Hallier f.  
*Ipomoea hederacea* Jacq.  
*Ipomoea longifolia* Benth.  
*Ipomoea muricata* (L.) Jacq.  
*Ipomoea ternifolia* Cav. var. *leptotoma* (Torr.) J.A. McDonald  
*Ipomoea thurberi* A. Gray

### CRASSULACEAE

*Graptopetalum rusbyi* (Greene) Rose

### CROSSOSOMATACEAE

*Crossosoma bigelovii* S. Watson

### CUCURBITACEAE

*Cucurbita digitata* A. Gray  
*Cucurbita foetidissima* Kunth  
*Cyclanthera dissecta* (Torr. & A. Gray) Arn.  
*Echinopepon wrightii* (A. Gray) S. Watson  
\**Lagenaria siceraria* (Molina) Standl.

### EUPHORBIACEAE

*Acalypha neomexicana* Muell.-Arg.  
*Acalypha ostryifolia* Riddell ex J. M. Coult.  
*Acalypha papillosa* Rose  
*Cnidoscolus angustidens* Torr.  
*Croton ciliatoglandulifer* Ortega  
*Euphorbia gracillima* S. Watson  
*Euphorbia heterophylla* L.  
*Euphorbia hirta* L.  
*Euphorbia hyssopifolia* L.  
*Euphorbia indivisa* (Engelm.) Tidestrom  
*Euphorbia polycarpa* Benth.  
*Euphorbia serpens* Kunth  
*Euphorbia setiloba* Engelm. ex Torr.  
*Jatropha cardiophylla* (Torr.) Muell.-Arg.  
*Jatropha cordata* Müll.-Arg.  
*Manihot angustiloba* (Torr.) Muell.-Arg.  
*Manihot rubricaulis* I.M. Johnst.  
*Tragia nepetifolia* Cav. var. *dissecta* Muell.-Arg.

### FABACEAE

*Acaciella angustissima* (Mill.) Britton & Rose  
*Aeschynomene villosa* Poir.  
*Astragalus nuttallianus* DC.  
*Calliandra eriophylla* Benth.  
*Calliandra humilis* Benth.  
*Chamaecrista nictitans* (L.) Moench  
*Coursetia caribaea* (Jacq.) Lavin var. *caribaea*

*Crotalaria pumila* Ortega  
*Dalea pogonathera* A. Gray  
*Dalea pringlei* A. Gray  
*Dalea pulchra* Gentry  
*Desmanthus bicornutus* S. Watson  
*Desmodium cinerascens* A. Gray  
*Desmodium procumbens* (Mill.) A.S. Hitchc.  
*Erythrina flabelliformis* Kearney  
*Eysenhardtia orthocarpa* (A. Gray) S. Watson  
*Galactia wrightii* A. Gray  
*Havardia mexicana* Britton & Rose  
*Lysiloma watsonii* Rose  
*Marina calycosa* (A. Gray) Barneby  
*Mariosousa millefolia* (S. Watson) Seigler & Ebinger  
\**Melilotus indica* (L.) All.  
*Mimosa biuncifera* Benth.  
*Mimosa dysocarpa* Benth.  
*Nissolia schottii* (Torr.) A. Gray  
*Parkinsonia aculeata* L.  
*Prosopis velutina* Wooton  
*Rhynchosia minima* (L.) DC.  
*Rhynchosia senna* Gillies ex Hook.  
*Senegalia occidentalis* (Rose) Britton & Rose  
*Senna hirsuta* (L.) H.S. Irwin & Barneby  
*Senna wislizeni* (A. Gray) H.S. Irwin & Barneby  
*Sphinctospermum constrictum* (S. Watson) Rose  
*Vachellia farnesiana* (L.) Wight & Arn.

### FAGACEAE

*Quercus arizonica* Sarg.  
*Quercus chihuahuensis* Trel.  
*Quercus emoryi* Torr.  
*Quercus oblongifolia* Torr.  
*Quercus toumeyii* Sarg.  
*Quercus viminea* Trel.

### FOUQUIERIACEAE

*Fouquieria splendens* Engelm.

### GARRYACEAE

*Garrya wrightii* Torr.

### GENTIANACEAE

*Zeltnera arizonica* (A. Gray) G. Mans.

### JUGLANDACEAE

*Juglans major* (Torr.) A. Heller

### KRAMERIACEAE

*Krameria erecta* Willd. ex Schult.



## CHECKLIST: Picacho de Bacoachi–Rancho Las Playitas Area page 3 of 4

### LAMIACEAE

*Hyptis albida* Kunth  
\**Marrubium vulgare* L.  
*Salvia misella* Kunth  
*Salvia parryi* A. Gray  
*Salvia setosa* Fernald  
*Salvia subincisa* Benth.  
*Salvia tiliifolia* Vahl  
*Stachys coccinea* Ortega

### LOASACEAE

*Gronovia scandens* L.  
*Mentzelia albicaulis* (Dougl.) Dougl. ex Torr. & A. Gray  
*Mentzelia isolata* Gentry  
*Mentzelia longiloba* J. Darl. var. *longiloba*

### LOBELIACEAE

*Lobelia laxiflora* Kunth

### LYTHRACEAE

*Cuphea leptopoda* Hemsl.  
*Cuphea wrightii* A. Gray  
\**Punica granatum* L.

### MALPIGHIACEAE

*Cottsia californica* (Benth.) W.R. Anderson & C. Davis

### MALVACEAE

*Abutilon abutiloides* (Jacq.) Garcke ex Britton & Wilson  
*Abutilon incanum* (Link) Sweet  
*Abutilon mollicomum* (Willd.) Sweet  
*Abutilon reventum* S. Watson  
*Anoda abutiloides* A. Gray  
*Anoda crenatiflora* Ortega  
*Anoda cristata* (L.) Schltld.  
*Ayenia filiformis* S. Watson  
*Corchorus hirtus* L.  
*Gossypium thurberi* Todaro  
*Herissantia crispa* (L.) Brizicky  
*Hibiscus acicularis* Standl.  
*Hibiscus biseptus* S. Watson  
\**Malva parviflora* L.  
*Malvastrum bicuspidatum* (S. Watson) Rose  
*Malvastrum coromandelianum* (L.) Garcke  
*Rhynchosida physocalyx* (A. Gray) Fryxell  
*Sida abutilifolia* Mill.  
*Waltheria indica* L.  
**MARTYNIACEAE**  
*Proboscidea altheifolia* (Benth.) Decne.

*Proboscidea parviflora* (Wooton) Wooton & Standl.

### MELIACEAE

\**Melia azedarach* L.

### MENISPERMACEAE

*Cocculus diversifolius* DC.

### MOLLUGINACEAE

*Glinus radiatus* (Ruiz & Pav.) Rohrb.  
*Mollugo verticillata* L.

### MONTIACEAE

*Phemeranthus aurantiacus* (Engelm.) Kiger

### MORACEAE

*Morus microphylla* Buckley

### NYCTAGINACEAE

*Allionia incarnata* L.  
*Boerhavia coccinea* P. Mill.  
*Boerhavia erecta* L.  
*Boerhavia purpurascens* A. Gray  
*Commicarpus scandens* (L.) Standl.  
*Mirabilis longiflora* L.

### OLEACEAE

*Forestiera angustifolia* Torr.  
*Forestiera phillyreoides* (Benth.) Torr.  
*Fraxinus gooddingii* Little  
*Fraxinus velutina* Torr.

### ONAGRACEAE

*Oenothera caespitosa* Nutt.  
*Oenothera primiveris* A. Gray  
*Oenothera tetraptera* Cav.

### OXALIDACEAE

*Oxalis albicans* Kunth  
*Oxalis latifolia* Kunth

### PAPAVERACEAE

*Argemone gracilentia* Greene  
*Argemone ochroleuca* Sweet  
*Argemone pleiakantha* Greene  
*Corydalis aurea* Willd.  
*Eschscholzia californica* Cham. subsp. *mexicana* (Greene) C. Clark

### PASSIFLORACEAE

*Passiflora arizonica* (Killip) D.H. Goldman  
*Passiflora bryonioides* Kunth

### PETIVERIACEAE

*Rivina humilis* L.

### PHRYMACEAE

*Erythranthe diminuens* G.L. Nesom

*Erythranthe floribunda* (Douglas ex Lindl.) G.L. Nesom

*Erythranthe guttata* (Fisch. ex DC.) G.L. Nesom

### PLANTAGINACEAE

*Maurandella antirrhiniflora* (Humb. & Bonpl. ex Willd.) Rothm.

*Mecardonia procumbens* (P. Mill.) Small  
*Penstemon parryi* (A. Gray) A. Gray  
\**Plantago major* L.

*Schistophragma intermedium* (A. Gray) Pennell

*Stemodia durantifolia* (L.) Sw.

### PLATANACEAE

*Platanus wrightii* S. Watson

### PLUMBAGINACEAE

*Plumbago zeylanica* L.

### POLEMONIACEAE

*Eriastrum diffusum* (A. Gray) Mason  
*Gilia mexicana* A. & V. Grant  
*Gilia sinuata* Douglas ex Benth.  
*Loeselia glandulosa* (Cav.) G. Don

### POLYGALACEAE

*Hebecarpa obscura* (Benth.) J.R. Abbott

### POLYGONACEAE

*Eriogonum abertianum* Torr.

### PORTULACACEAE

*Portulaca oleracea* L.  
*Portulaca suffrutescens* Engelm.  
*Portulaca umbraticola* Kunth

### PRIMULACEAE

*Androsace occidentalis* Pursh

### RANUNCULACEAE

*Aquilegia chrysantha* A. Gray  
*Clematis ligusticifolia* Nutt.  
\**Consolida ajacis* (L.) Schur  
*Thalictrum fendleri* Engelm. ex A. Gray

### RHAMNACEAE

*Adolphia infesta* (Kunth) Meisn.  
*Condalia correllii* M.C. Johnston  
*Sageretia wrightii* S. Watson  
*Sarcomphalus obtusifolius* (Hook. ex Torr. & A. Gray) Hauenschield

### RUBIACEAE

*Bouvardia ternifolia* (Cav.) Schltld.  
*Galium microphyllum* A. Gray  
*Mitracarpus hirtus* (L.) DC.  
*Randia sonorensis* Wiggins



## CHECKLIST: Picacho de Bacoachi–Rancho Las Playitas Area page 4 of 4

### SALICACEAE

*Populus fremontii* S. Watson  
*Populus monticola* Brandegee  
*Salix bonplandiana* Kunth  
*Salix gooddingii* C.R. Ball

### SANTALACEAE

*Phoradendron californicum* Nutt.  
*Phoradendron leucarpum* (Raf.) Reveal & M.C. Johnst. subsp. *macrophyllum* (Engelm.) J.R. Abbott & R.L. Thompson

### SAPINDACEAE

*Dodonaea viscosa* Jacq. var. *angustifolia* (L. f.) Benth.  
*Sapindus drummondii* Hook. & Arn.

### SAPOTACEAE

*Sideroxylon lanuginosum* Michx.

### SAXIFRAGACEAE

*Heuchera sanguinea* Engelm.

### SCROPHULARIACEAE

*Buddleja sessiliflora* Kunth

### SOLANACEAE

*Calibrachoa parviflora* (Juss.) D'Arcy  
*Capsicum annuum* L.  
*Datura discolor* Benth.  
*Datura quercifolia* Kunth  
*Lycium andersonii* A. Gray  
*Lycium berlandieri* Dunal  
*Lycium exsertum* A. Gray  
*Lycium fremontii* A. Gray  
\**Nicotiana glauca* Graham  
*Nicotiana obtusifolia* M. Martens & Galeotti  
*Physalis acutifolia* (Miers) Sandw.  
*Solanum americanum* Mill.  
*Solanum elaeagnifolium* Cav.  
*Solanum houstonii* Martyn  
*Solanum lumholtzianum* Bartlett  
*Solanum nigrescens* M. Martens & Galeotti  
*Solanum rostratum* Dunal

### TALINACEAE

*Talinum paniculatum* (Jacq.) Gaertn.

### VERBENACEAE

*Aloysia gratissima* (Gillies & Hook.) Troncoso  
*Bouchea dissecta* S. Watson

### VIBURNACEAE

*Sambucus nigra* L. subsp. *cerulea* (Raf.) R. Bolli

### VIOLACEAE

*Hybanthus attenuatus* (Humb. & Bonpl. ex Roem. & Schult.) Schulze-Menz

### VITACEAE

*Vitis arizonica* Engelm.

### ZYGOPHYLLACEAE

*Kallstroemia grandiflora* Torr. ex A. Gray

## Monocots

### ARACEAE

*Lemna minuta* Kunth

### ASPARAGACEAE

*Agave palmeri* Engelm.  
*Agave schottii* Engelm.  
*Dasyllirion wheeleri* S. Watson  
*Nolina microcarpa* S. Watson  
*Yucca madrensis* Gentry

### COMMELINACEAE

*Commelina erecta* L.

### CYPERACEAE

*Cyperus esculentus* L.  
*Cyperus squarrosus* L.  
*Eleocharis montevidensis* Kunth

### HYDROCHARITACEAE

*Najas guadalupensis* (Spreng.) Magnus

### POACEAE

*Aristida adscensionis* L.  
*Aristida ternipes* Cav. var. *ternipes*  
*Bothriochloa barbinodis* (Lag.) Herter  
*Bouteloua aristidoides* (Kunth) Griseb.  
*Bouteloua barbata* Lag. var. *barbata*  
*Bouteloua barbata* Lag. var. *rothrockii* (Vasey) Gould  
*Bouteloua barbata* Lag. var. *sonorae* (Griffiths) Gould  
*Bouteloua chondrosioides* (Kunth) Benth. ex S. Watson  
*Bouteloua curtipendula* (Michx.) Torr.  
*Bouteloua diversispicula* Columbus  
*Bouteloua eludens* Griffiths  
*Bouteloua hirsuta* Lag.  
*Bouteloua parryi* (E. Fourn.) Griffiths  
*Bouteloua radicata* (E. Fourn.) Griffiths  
*Bouteloua repens* (Kunth) Scribn. & Merr.  
\**Cenchrus myosuroides* Kunth  
*Chloris virgata* Sw.  
\**Cynodon dactylon* (L.) Pers.  
*Digitaria ciliaris* (Retz.) Koeler

*Digitaria insularis* (L.) Mez ex Ekman

*Dinebra panicea* (Retz.) P.M. Peterson & N. Snow subsp. *brachiata* (Steud.) P.M. Peterson & N. Snow

*Dinebra viscida* (Scribn.) P.M. Peterson & N. Snow

*Diplachne fusca* P. Beauv. ex Roem. & Schult. subsp. *fascicularis* (Lam.) P.M. Peterson & N. Snow

*Disakisperma dubium* (Kunth) P.M. Peterson & N. Snow

\**Echinochloa colona* (L.) Link var. *colona*

\**Echinochloa crus-galli* (L.) P. Beauv. var. *zelayensis* (Kunth) A.S. Hitchc.

*Enneapogon desvauxii* P. Beauv.

*Eragrostis cilianensis* (All.) Vignolo ex Janch.

*Eragrostis pectinacea* (Michx.) Nees var. *miserrima* (E. Fourn.) J. Reeder

*Eragrostis pectinacea* (Michx.) Nees var. *pectinacea*

*Eriochloa aristata* Vasey

*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.

*Hilaria belangeri* (Steud.) Nash

*Hopia obtusa* (Kunth) Zuloaga & Morrone

\**Melinis repens* (Willd.) Zizka

*Muhlenbergia alopecuroides* (Griseb.) P.M. Peterson & Columbus

*Muhlenbergia arizonica* Scribn.

*Muhlenbergia dumosa* Scribn. ex Vasey

*Muhlenbergia emersleyi* Vasey

*Muhlenbergia fragilis* Swallen

*Muhlenbergia microsperma* (DC.) Trin.

*Muhlenbergia minutissima* (Steud.) Swallen

*Muhlenbergia rigens* (Benth.) A.S. Hitchc.

*Muhlenbergia tenuifolia* (Kunth) Trin.

*Panicum alatum* Zuloaga & Morrone

*Panicum hillmanii* Chase

*Panicum hirticaule* J. Presl var. *hirticaule*

\**Pennisetum ciliare* (L.) Link

\**Polypogon monspeliensis* (L.) Desf.

*Setaria grisebachii* E. Fourn.

*Setaria liebmannii* E. Fourn.

*Setaria macrostachya* Kunth

\**Sorghum halepense* (L.) Pers.

*Tetrapogon chlorideus* (J. Presl) P.M. Peterson

*Zuloagaea bulbosa* (Kunth) E. Bess

### PONTERIACEAE

*Heteranthera limosa* (Sw.) Willd.



BOOK REVIEW *Douglas Ripley, Arizona Native Plant Society, Cochise Chapter*

## Recognizing Plant Families of the West

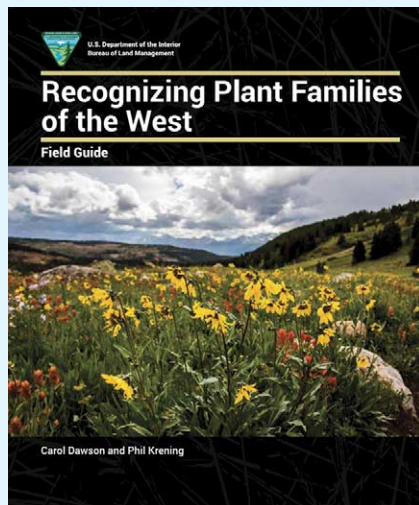
by Carol Dawson and Phil Krening

2022. 215 pages. U.S. Department of the Interior. Bureau of Land Management. National Operations Center. Printed Materials Distribution Services. Available online at: [https://www.blm.gov/sites/default/files/docs/2022-01/BLMCO.Plant\\_ID\\_Guide\\_2021\\_508.pdf](https://www.blm.gov/sites/default/files/docs/2022-01/BLMCO.Plant_ID_Guide_2021_508.pdf).

As most plant enthusiasts know, the family is the level of classification that is most important to recognize in identifying an unknown plant. Consequently, the better one knows the characteristics of the flowering plant families, the easier it is for them to master the taxonomy of the individual genera and species of a given flora. It is also for this reason that most beginning plant taxonomy classes focus on explaining the unique characteristics that distinguish individual families.

For anyone interested in starting to learn plant family characteristics, or just looking for a source of such information for refresher purposes, this book is a wonderful guide. The authors, Carol Dawson who is the Bureau of Land Management's Colorado State Botanist, and Phil Krening, a Plant Conservation Specialist with BLM Colorado, have prepared a book that is not only beautiful but is extremely easy to use, and informative. Using over one thousand carefully selected images, the authors discuss the identifying characteristics of 54 of the most common plant families in the western United States. Each family discussed includes a succinct discussion of general information, a summary of identifying characteristics, and beautiful images of some of the common genera.

Admirably, the U.S. Bureau of Land Management has made this very useful and informative guidebook available gratis. One can simply download the book as a pdf file using the URL listed above



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