



Tohono Chul  
GARDENS • GALLERIES • BISTRO



# The Official Guide

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# Introduction

Welcome to Tohono Chul where nature, art and culture connect! We're in the Sonoran Desert, a highly diverse region with a variety of plants and animals having remarkable survival skills adapted to an often inhospitable climate. In addition, here in our border region a confluence of cultures has interconnected with the natural environment, thus contributing to our distinctive regional character.

*The mission of Tohono Chul Park 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.*

Tohono Chul is located in a sprawling urban environment in one of the fastest growing cities in the United States. Residential housing, strip shopping centers, and non-native plants are quickly replacing the pristine desert. This loss of habitat makes the vulnerability of the desert even more obvious; therefore our mission becomes even more imperative. **Our goal and purpose is to inspire everyone — visitors, community members and, most importantly, children — with the desire to learn how to live with our desert home.** We serve as a model for others to learn to be participant stewards of this fragile environment.

The site itself offers a dramatic setting for our regional focus. Views of the majestic Santa Catalina Mountains form a backdrop

for this natural desert habitat. Its location within existing migratory tracks provides a temporary home for many species of wild, native fauna. Thirty-eight species of birds make their permanent home here while another 57 migrant species visit seasonally. A variety of reptiles and mammals, from gila monsters to gray fox, may be spotted on the Park grounds.

Within these surroundings, Tohono Chul has developed thematic displays using its collections to teach visitors about indigenous plants and animals, conservation, desert ecology and native cultures. We are the only organization in our region whose primary focus is on these natural and cultural connections, giving our visitors a unique perspective on the Sonoran Desert.

Our botanical collections consist primarily of those plants native to our region or adapted to the American Southwest. They include more than 150 species of shrubs and trees; 300 species of cacti and succulents; and 50 species of wildflowers. In addition, we have the largest public collection of native Night-blooming Cereus (*Peniocereus greggii*) in the United States! Moreover, visitors often encounter the serendipitous — a bird feeding its young; a lizard capturing its prey; a rabbit scampering through the desert scrub — an opportunity to connect with the wonders of nature.

Exploring the grounds you will encounter diverse exhibits such as the Ethnobotanical Garden, which displays some of the indigenous plants cultivated by Southwestern native peoples for food, medicine, and other

necessities of life; a re-circulating desert stream, which replicates the natural vegetation of Arizona's riparian communities; the Geology Wall, which illustrates the geologic history of the nearby Santa Catalina Mountains; our Desert Living Courtyard filled with home landscaping ideas, which promote native and arid-adapted plants in a variety of design aesthetics; and, our Saguaro Discovery Trail where visitors can explore the life of the saguaro both through its cultural connections to the Tohono O'odham and its botanical connections to the natural history of the Sonoran Desert.

Tohono Chul's changing indoor arts and cultural exhibitions are strongly community oriented, and feature community groups and artists of all ages.

Our educational philosophy blends the ecological, cultural and artistic, distinguishing us in the community. Our programs are designed to enable our audiences to reach a better understanding of the relationships that shape the land — the complex interplay among the desert and its plants, animals and people. With this understanding comes a richer appreciation for the desert's allure and a heightened sense of the need to preserve its beauty and biodiversity.

## THE SONORAN DESERT

The Sonoran Desert is a **subtropical desert**. It lies in portions of Arizona and southeast California in the United States, and Sonora and Baja California in Mexico. Precipitation ranges from

one to 15 inches annually, most falling in winter and summer. Summer temperatures can reach over 110° and winters are mild with only brief periods of freezing temperatures. The vegetation of much of the Sonoran Desert is more varied than that of the other North American deserts, with many trees and shrubs as well as large cacti and other succulents.

Tucson's characteristic saguaro-palo verde plant communities place it within the **Arizona Upland** subdivision of the Sonoran Desert, one of six fairly distinct regions.

The average annual rainfall at the weather station at Tucson International Airport is 11 inches, though we have seen as little as five inches in a year and as much as 24 inches. Mt. Lemmon in the Santa Catalinas north of the city receives 30 to 35 inches annually.

Our precipitation is bi-seasonal -- in the winter from December through March and in the summer from July through early September. Winter rains come intermittently from cool low-pressure systems moving from the Pacific Ocean. Heavy snows can fall in the higher mountains and Tucson itself has been known to receive a light dusting every several years. The majority of the rain falls during the summer monsoon season. These localized and often violent thunderstorms can drop prodigious amounts of rain in a short time -- up to four inches!



heritage

# Our Past

## PREHISTORIC ORIGINS

The recent history of the site begins in the early 1920s when land that would eventually be part of Tohono Chul's current 49 acres was homesteaded by Tucsonans interested in raising cash crops like citrus and dates. However, centuries before, prehistoric native peoples lived in this place. Situated on the outer edge of the alluvial fan that extends outward from the base of Pusch Ridge in the Santa Catalina Mountains, this section of Arizona Upland was occupied by the Hohokam before the first millennium.

Hohokam is a Pima word meaning "all used up," no doubt a reference to the fact that after almost two thousand years their culture collapsed and by

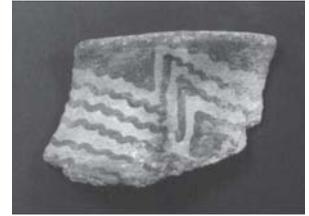


*Rincon polychrome*  
AD 1000-1100

1450 they no longer lived in the Tucson basin. These early farmers occupied the Salt, Gila and Santa Cruz River basins beginning about 300 BC. Sophisticated agriculturists, they built irrigation canals, lived in villages of pithouses surrounding a central plaza, imported from Mesoamerica the tradition of building ballcourts and engaging in team

Hohokam in Tucson Basin  
about 300 BC

sports and traded as far as the Gulf of California for shells and parrot feathers from the rainforests of Central America.



*Rincon red-on-brown*  
AD 925-1000

Archaeological evidence of Hohokam habitation on the Park site includes isolated plainware sherds discovered along the arroyos on the southern edge of the property and a major find uncovered during the construction of what is now the Lomaki House in the late 1960s. Broken pieces of red and buff decorated pottery indicate the site was occupied consecutively through three Hohokam cultural phases — the Rillito and the Early and Middle Rincon — between AD 70 and 1150.

## THE 20TH CENTURY

In the 1920s, the entire northwest section of Tucson — called the "thermal belt" because of the foothills' milder winter climate — was considered ideal for growing frost-sensitive citrus and date palms. Maurice Reid, father of Gene for whom Tucson's Reid Park and Zoo are named, owned property from Orange Grove Road to Ina Road and beyond and planted it with groves of citrus trees. He introduced black date palms and grapefruit to the property that would become Tohono Chul; aerial photos of the 1940s clearly show the rows of trees south of the

Hohokam disappear  
1450

Hohokam living on site  
AD 70-1150

Father Kino arrives  
1692

## FROST POCKETS & THERMAL BELTS

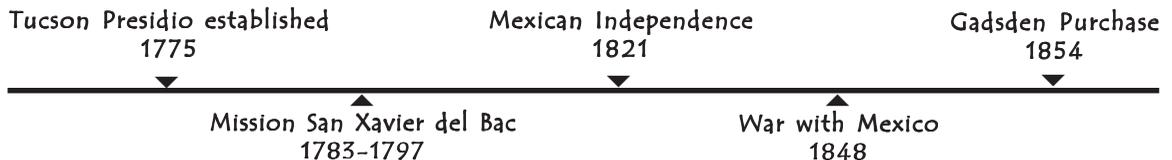
Have you ever noticed the drop in temperature while crossing a desert wash at night? Cold air, being heavier than warm air, tends to flow down mountain canyons and settle in low-lying areas, which results in a temperature inversion. These low-lying areas may be 10° colder at night than surrounding areas and are sometimes called “frost pockets.” The lighter, warm air forms “thermal belts” in areas with good air drainage. These thermal belts may be several degrees warmer than surrounding areas and much warmer than the frost pockets on a relatively still night; strong winds, however, will break up this inversion layer.

Exhibit House. At this time in Tucson’s history, not much thought was given to conserving a limited water supply and wells pumped precious groundwater to irrigate the thirsty trees. For many years a thriving local industry shipped Tucson’s citrus and dates to other parts of the United States. Groves of citrus trees remained even after Samuel W. Seaney subdivided the area in 1931, calling it Catalina Citrus Estates.

Seaney had homesteaded 640 acres in 1930 and daughter Cornelia Seaney Lovitt remembers spending weekends with her mother in a cabin off Magee Road to qualify for the

homestead rights. Seaney also sank a well near Magee and Northern streets and supplied water to several residents in the area. At that time, utility lines did not extend north of the Rillito River, and roads in the area were unpaved.

Maurice Reid, acting as realtor for Seaney, sold the future site of Tohono Chul to John T. deBlois Wack in 1937. Mr. Wack was an avid polo player from Santa Barbara and a friend of the Reverend George Ferguson, pastor of the newly consecrated St. Philip’s in the Foothills Episcopal Church. Following an afternoon spent drinking mint juleps, the Fergusons and young Gene Reid escorted the Wacks around the property. Their obvious powers of persuasion resulted in the sale at a cost of \$200 an acre — \$16,000 for the 80-acre parcel. Later that year, Paul Holton built the Wacks a Santa Fe style house (today’s Exhibit House) at a cost of \$60,000 based on the plans of Santa Barbara architect Chester L. Carjola. During construction, the adobe bricks for the 18” thick outer walls were made on the premises and Ponderosa pine logs were brought down the winding back road from Mt. Lemmon to be used for the living room beams. Adobe was used not just for its aesthetic appeal. In the days before central air conditioning wise desert dwellers knew that adobe walls would keep interiors cool during the heat of the summer, while maintaining warmth during





*view of the pool, looking east toward the Santa Catalinas --  
late 1940s or early 1950s*

the winter. The house was also designed to take advantage of cooling breezes with French doors installed throughout. Finally, a large concrete swimming pool, one of the first private pools in Tucson, was built with an unobstructed view of Pusch Ridge (the area is now the Garden for Children).

Shortly before completion of the house, power lines were strung and Oracle, a two-lane country road, was paved. Many older Tucsonans vividly remember visiting the property — a far distance from town in the 1940s — to swim or to pick some fruit.

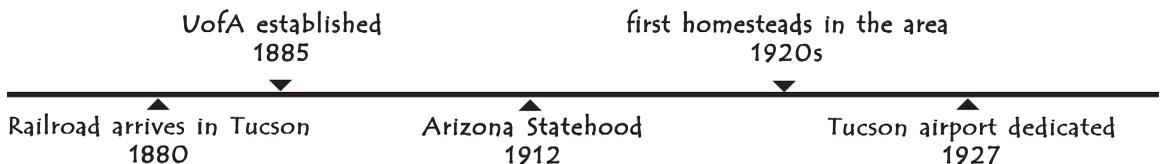
The Wacks actually spent little time in Tucson. Gene Reid and Mr. Wack's

father, Henry Wellington Wack, founder and first editor of *Field and Stream*, acted as house-sitters. By the end of World War II the home had exchanged hands several times, passing to the Pierpont Davises of Boston, and then to the Wilson Campbells of Pittsburgh. The Campbells in turn rented it during their ownership to Clifford Goldsmith, the man responsible for the famous radio series *Henry Aldrich*. His son, Barclay Goldsmith, remembers his father working on scripts in an office in today's Exhibit House Museum Shop and entertaining notables from New York.

Then, in 1948, Colonel Robert Bagnell, an active board member of the Tucson Red



*wooden gate leading to today's Spanish Colonial Courtyard --  
late 1940s or early 1950s*



Cross and his wife Eugenia Sullivan Bagnell, both of St. Louis, bought the Wack's 80-acre parcel. With them came their butler, Levan Bell, who remembers picking grapefruit from the orchard and taking the family's Airedale to the veterinarian in town to have porcupine quills removed. Affectionately called "Las Palmas" during the Bagnell's tenure, the house was graced with a rose garden, a grass lawn and elegant visitors dining by candlelight.

The Bagnells found other uses for the property too. Mrs. Bagnell donated a portion to the Catholic Diocese of Tucson to serve as the site for St. Odilia's Catholic Church, visible today to the north of the Park. In 1963 Mrs. Bagnell's son, John Sullivan, built a home on ten acres on the western edge of the property. Designed by Lewis Hall, a student of noted Tucson architect Josias Joesler, the charming hacienda-style home featured a traditional *zaguan* and fountained courtyard. The heavy arched doorway is modeled after a larger one that once would have admitted a horse and carriage to the privacy of a home's interior courtyard. Mrs. Sullivan remembers summers spent sleeping on the roof of the building to escape the heat of the day. It is now known as the "West House" and is the site of the Tohono Chul Garden Bistro.

Colonel Bagnell passed away in 1965, two years after his wife, and left the remainder of the property to the Sullivan family who then

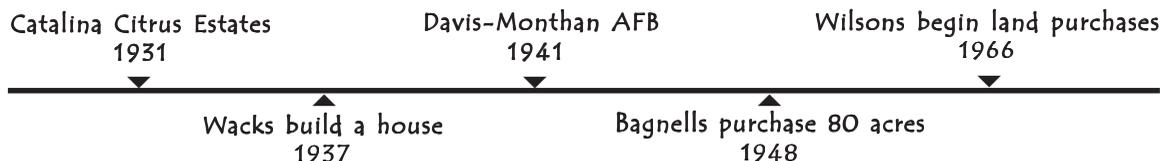
moved into the empty main house (today's Exhibit House).

## THE FOUNDATIONS OF TOHONO CHUL PARK

The story of Tohono Chul begins in 1966 when its benefactors, Richard and Jean

### A FAMILY LEGACY

The concept of preservation and exhibition actually dates back to Richard Wilson's great, great, great-grandfather Charles Willson Peale (1741-1827). Saddler, watchmaker, silversmith, inventor and student of Benjamin West, Peale was the most prominent portraitist of the Federal period and is credited with the earliest-known portrait of George Washington (1772). In 1786 he founded the Peale Museum, an institution housed in Philadelphia's Independence Hall, intended for the study of natural law and the display of natural history and technological objects. Considered to be the first major museum in the United States, its varied collections included Peale's paintings, Native American artifacts and mounted specimens such as the first complete skeleton of an American mastodon. Thus it is appropriate for Richard and Jean Wilson to perpetuate this heritage through Tohono Chul.



Wilson, started piecing together patches of the desert that would form its core — ultimately owning 37 of the Wack's original 80 acres.

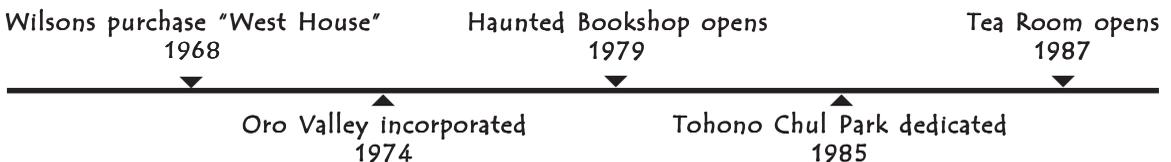
The son of a Texas oilman, Richard Wilson is a geologist, trained at Yale and Stanford. With his wife Jean, he came to Tucson in 1962 to teach at the University of Arizona. His roots in the Southwest go much deeper, however, for there are strong family ties to the region, its land, its peoples and its cultures. Mr. Wilson's uncle, Dr. Harold Colton, founded the Museum of Northern Arizona, Flagstaff, in 1926 as a means of displaying, documenting and preserving the Native American crafts of the region. The Museum's first curator, Dr. Colton's wife and noted painter Mary-Russell Ferrell Colton, encouraged the Hopi and Navajo tribes to continue their traditional arts and to develop new styles through the offer of exhibitions and cash prizes. Mr. Wilson's mother, Suzanne Colton Wilson, was a collector of contemporary Southwest Native American arts. Today, 65 pieces from her collection are part of our permanent cultural collection.

In 1968 the Wilsons purchased the section containing the hacienda-style "West House" and lived there for the next eight years. They never occupied the Wack's home, instead offering it to a succession of non-profit organizations as a halfway house or youth residence. It was during the 1970s that the

couple was approached several times by developers seeking to purchase the land for commercial development. They always refused. Jean Wilson told them, "I don't want to sell the land. I don't want it cemented over. I want to preserve it." In fact, when Pima County condemned a strip along the southern boundary of the property in order to widen Ina Road, Dick Wilson demanded that they move every saguaro and replant it on their adjacent property.

In 1979 Jean Wilson opened the Haunted Bookshop on Northern Avenue along the eastern edge of the site. Once it was up and running, the Wilsons began planning their next project — a park. "At first we just went out and put down some lime to make a path and marked the names of some of the plants and bushes, but then it started to snowball." The path gradually grew into a loop trail, meandering ½ mile into the surrounding desert. In 1980 they received a citation from the Tucson Audubon Society for saving the desert greenspace and opening it to the public.

Motivated by a desire to preserve the Sonoran Desert they loved, they established the non-profit Foundation for the Preservation of Natural Areas in the early 1980s. "We wanted to keep something natural in the middle of all the (surrounding) development so that people could come easily for a few hours and get out of the traffic and learn



something at the same time. It's probably contrary to what most people would do, but we feel it's real important for people to have something like this." The purpose of the organization was to promote the conservation of desert regions and to educate the public about arid lands and responsible water use. Over time, demonstration gardens, a re-circulating stream, a geological re-creation of the Santa Catalina Mountains, ramadas and areas with special plantings of arid-adapted vegetation were developed. The Wacks' original 1937 stuccoed adobe house was carefully renovated in 1984 to provide space for changing art exhibits, a museum shop and administrative offices. Tohono Chul Park was formally dedicated as a 37-acre desert preserve on April 19, 1985. The Wilsons deeded the property to the non-profit foundation, Tohono Chul Park, Inc., in 1988.

In the spring of 1995 development again threatened Tohono Chul. An 11-acre parcel abutting the property on the north was slated for higher density rezoning and offered for sale. With the help of longtime member John Maher, the Park was able to acquire the property, establishing a memorial to John's late wife, Mary.

The most recent addition came when the much-loved Haunted Bookshop closed in 1997. The Wilsons donated the land and building to Tohono Chul, adding the final acre — then there were 49!

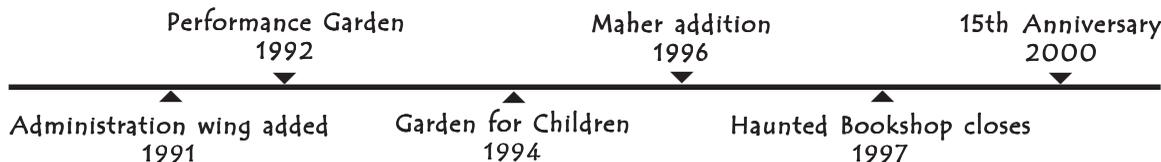
Today, sadly, both Richard and Jean Wilson are gone. But, their commitment to the history and the open spaces of the Southwest lives on — in addition to founding Tohono Chul, it is the Wilsons who delivered the family property at Hart Prairie (Flagstaff) and Muleshoe Ranch (Willcox) into the protective hands of the Nature Conservancy.

At the dedication ceremony in 1985, Richard and Jean Wilson expressed their vision for Tohono Chul:

*"We dedicate this park to those who come here, who, we hope, will not only admire and find comfort in the natural beauty of the area, but will achieve greater appreciation of the ways of conserving all our precious desert region and obtain a greater understanding of the people native to these areas."*

## Our Present

Tohono Chul has evolved into a unique urban desert island devoted to fostering an appreciation of the distinctive character of this region. The Sonoran Desert is the most diverse desert of North America, with thousands of native plants and hundreds of species of animals making their home in this rugged, yet fragile, environment. Seventeen indigenous cultures live in the region, while a confluence of others, including Anglos, Latinos, Chinese and Africans, have adopted this region as their own. The words "Tohono



Chul" mean "desert corner," and are taken from the language of the Tohono O'odham, a desert-dwelling people renowned for their many uses of Sonoran plants and their ability to live in this harsh climate.

Today Tohono Chul is a part of Oro Valley and encompasses a total of 49 acres and retains much of its hacienda-style charm in the face of booming urban sprawl just beyond its boundaries. Sensitive planning and development have allowed for enhancements of the Park's site while preserving its spectacular natural setting and feeling of intimacy. The original three homes on the property have different Southwest regional styles and promote a distinct sense of place. Each has been refurbished and renovated for Park use while retaining its regional character — the Wack's 1937 home (Exhibit House), the Sullivan's 1963 home (Tohono Chul Garden Bistro) and the Wilson's Lomaki guest house, now used for classes, meetings and rentals.

With an emphasis on the natural and cultural aspects of the desert Southwest, the site now includes an extensive botanical collection with nature trails and exhibits; wildlife migration trails; the Desert Living Courtyard

featuring an array of arid-adapted plants and low-water landscaping techniques; the Ethnobotanical Garden with crops grown by both indigenous populations and New World immigrants; the Sonoran Seasons Garden showcasing the five seasons of the Arizona Upland; an Exhibit House featuring changing art and cultural displays appropriate to our mission; and, a new Desert Palm Oasis which links us to the hidden palm canyons of Sonora, Mexico.



*Ina Road/Paseo del Norte corner monument wall*

Tohono Chul's extensive educational programs underscore and complement the gardens and exhibits, while expanding upon them by relating them to the natural history, culture and botany of our region.

Helping people learn to live with their desert home is the overarching purpose of Tohono Chul. The interdisciplinary approach we take to achieve this goal reflects the richness of this region's natural environment and cultures. By teaching people about the interconnections between the natural environment and cultural heritage we hope to increase their appreciation of both, so that they can become stewards of our precious desert region.



arts & culture

# The "Heart" of Tohono Chul

## READING THE MAP

Let this guide enhance your visit to our desert preserve. **The numbers below correspond to the numbers on the map on page 37. To insure a safe and enjoyable visit to our desert:**

- ✓ wear comfortable walking shoes (close-toed are best)
- ✓ bring your hat and a water bottle (drink lots of water when it's hot)
- ✓ wear sunscreen (SPF 15 or higher)

Roving Docents are available on the grounds (look for the distinctive vests with our night-blooming cereus logo on the back) to answer your questions, or you can join one of our regularly scheduled tours.

Daily scheduled tours begin at the **Visitor Overlook** which boasts amazing views of the southern portion of Tohono Chul and an imposing malachite/azurite mineral specimen. Weekday mornings stop and investigate one of our hands-on Eco-stations!

[1] Across from the Overlook, the **Sonoran Seasons Garden** tells the seasonal stories of the Arizona Upland, one of the six subdivisions of the Sonoran Desert and the one in which we find ourselves.

The coldest region of the Sonoran Desert, the Arizona Upland is blessed with bi-annual rainfall — fierce summer thunderstorms and gentler winter rains. We also have five seasons: fall, winter, spring, dry foreshimmer and monsoon summer. The Garden puts the spotlight on the star plants of each of those seasons.

[2] Just beyond the Sonoran Seasons Garden to the west is the latest addition to Tohono Chul, the **Desert Palm Oasis**. Just six hours south of Tucson, along the east coast of the Gulf of California, pockets of native fan palms nestle in isolated mountain canyons. The fact that palm trees grow in the Sonoran Desert is evidence of the region's tropical origins long ago.

Our Desert Palm Oasis recreates the tropical forest of one of these canyons — Cañón de Nacapule — located in the Sierra El Aguaje near the town of San Carlos, Sonora, Mexico. Just  $\frac{3}{4}$  mile long and surrounded by sheer cliffs, Nacapule hosts 285 species of plants, many found in few other places, including three species of fan palms — Hesper Palm (*Brabea brandegeei*), Sonoran Palmetto (*Sabal uresana*) and Mexican Fan Palm (*Washingtonia robusta*).



Nacapule and other palm canyons in the region are delicately balanced ecosystems threatened by human activity, increased groundwater pumping, livestock grazing and the introduction of exotic species.

[3] Continuing along the main pathway through the **Cactus Circle**, on your left you will see a pair of modern petroglyph-covered "newspaper" rocks by local artist John Palacio who used Hohokam-inspired designs.



*Picture Rocks sundancers,  
Tucson Mountains*

**Petroglyphs** are designs chipped into the dark surface of desert boulders by pecking, scraping or grinding. This thin, dark, hard, glossy coating that accumulates on rock surfaces after long exposure to the elements is called **desert varnish**. Designs are pecked into the varnish, revealing the underlying lighter colored rock beneath.

It is believed that petroglyphs are not a language like hieroglyphics, nor are they simply doodles. Anthropomorphic (human-like) figures, depicted dancing or elaborately dressed, may represent ceremonial events; others may be deities, mythical beings or shamans. It is nearly impossible to decipher the exact meanings of any of the etchings.

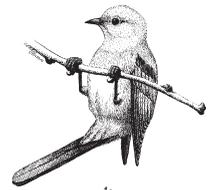
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*heliocronometer by John Carmichael*

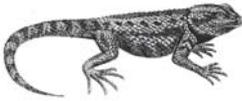
[4] Did you discover the rattlesnake encircling the **Sundial Plaza**? How about checking your watch against our innovative "horizontal heliocronometer?" A sundial tracks the apparent movement of the sun around the earth's celestial pole by casting a shadow onto a surface marked by hour and minute lines. The gnomon (diagonal brass cable) serves as an axis about which the sun appears to rotate. Carved of Coconino sandstone and donated by John L. Carmichael, Jr., our sundial was designed specifically for Tucson's latitude and longitude (Mountain Standard Time). If the appropriate number from the Equation of Time correction graph is added or subtracted from the sundial's reading it is accurate to within a minute.

Shading the Plaza is a canopy of **mesquite** trees (*Prosopis velutina*), which provides food, in the form of naturally sweet seedpods, for people and animals. The trees' spring blossoms are visited by bees and a variety of birds and other insects. Cardinals and verdins can be found nesting in the branches. The dried wood has been used for building materials for centuries. Next time you plan a barbecue and want to impart a distinctive mesquite flavor to your meat, try tossing a handful of dampened seedpods on the coals instead of mesquite wood chips that are not as renewable a resource.



*verdín  
Debbie Jensen, artist*

At the south end of the Plaza you will see two of the five species of the green-barked trees known as **palo verde** (Spanish for "green stick") found growing in the Park. The group



desert spiny lizard  
Paul Miller, artist

## LIZARDS ON THE SIDE

The Plaza is also a great place for lizard-watching. The big ones that take their time moving out of your way are **desert spiny lizards**. You will find them doing “push-ups” to attract mates, to appear even more intimidating, or just to raise themselves off the hot ground. The slender ones with the very long tails are **whiptail lizards** and the shy, delicate ones with the black-and-white striped tails are appropriately called **zebra-tailed lizards**. These little critters will run just ahead of you, perch on a convenient rock and, curling it over their backs, wag their tails like a dog. Why? Well, just in case you’re a predator you might be fooled into grabbing for that detachable tail, allowing the lizard to live another day.

just south of the sundial are blue palo verdes (*Cercidium floridum*) distinguished by their bluish tone and larger leaves. Directly across from them to the east it is the foothill palo verde (*Cercidium microphyllum*) with a yellow-green cast and tiny leaves.

[5] The **Murphey Foundation Children’s Ramada**, gathering site for school field trips, it also houses wheelchair accessible restrooms and drinking fountains.

[6] A portion of the site’s original home now provides space for one of the Park’s two gift shops. **La Galeria** specializes in tradi-

tional Native American crafts, unique folk art of the region and books on the Southwest. Tohono Chul members receive a 10% discount on purchases. Among the plantings directly in front of the Shop is the elusive boojum (*Fouquieria columnaris*), cousin to our local ocotillo (*F. splendens*). Native to north central Baja California, these peculiar trees look something like an upside-down carrot.

[7] The **Exhibit House** (1937) contains two galleries that feature changing displays of traditional and contemporary art — paintings, sculpture and folk arts. Our exhibitions also address environmental concerns affecting the Sonoran Desert and the Southwest.

[8] The **North Patio**, located behind the Exhibit House, is used for special events such as artists receptions. Nearby is a handbuilt rock water feature and a bench for relaxing and watching the local wildlife.

[9] **Administrative Offices** are open Monday through Friday from 8:00am to 5:00pm.

[10] Relax on a bench under the shade of an ironwood tree (*Olneya tesota*) in the **Spanish Colonial Courtyard** and enjoy this mini-oasis. A Xeriscape® landscape incorporates a majority of low water use plants while allowing for lush plantings requiring more water closer to buildings and living spaces. These oases provide cooling environments where people gather, another illustration of wise desert living.

[11] The **Alice Y. Holsclaw Performance Garden**, shaded by a grove of feathery sweet

acacia trees (*Acacia smallii*), is planted with mealy cup sage, butterfly bush and salvias and is a great spot for some impromptu birdwatching. Humingbirds gravitate to the salvias and phainopepla can be found in the mistletoe clumps in the acacia trees. The Garden's stage provides the setting for concerts and special events like our annual Holiday Nights celebration held each winter. The garden may also be rented for weddings or other ceremonies.



*Native American flutist Vince Redhouse performs*

**[12]** Not just for children, the **Bank of America Garden for Children** captures imaginations and provides opportunities for creative learning and discovery. Young and old alike can enjoy the private spaces and hidden surprises — from the playful stream with its fish boats to whimsical birdhouse — and make their own connections with nature. Please, for your health and safety, do not bathe in, stand in or drink from the water in the stream or pools.



*copper saguaro and owl*

## WHAT'S BUGGING YOU?

Be honest, most of us harbor an intense dislike for insects. Consider, however, that they may be pests only from our point of view. We are both just trying to survive, in need of food and shelter. Sometimes we may actually compete with one another for these resources, or become resources ourselves!

No other group of animals is as diverse, as abundant or as successful in almost every habitat on earth. In fact, arthropods (invertebrates with segmented bodies and jointed limbs, including arachnids, crustaceans and insects) account for approximately 99.5% of all animal species and yet only about 1% can really be considered pests!

The vast majority are extremely valuable for insect products (like silk and honey), medical research, biological control, decomposition, food for other species (including man) and pollination.

In fact, it is estimated that 90% of all flowering plants depend on animal pollinators to help them reproduce and that includes about 35% of the world's food crops — consider that one bite in three at the dinner table depends on animal pollinators and pollinator populations around the world are in decline due to pollution, pesticides, disease and worst of all, habitat destruction.



*tarantula*  
*Anne E. Gondor, artist*

[13] Plants are utilized by people in many ways — as food, medicine and materials as well as a source of cultural identity. The study of this relationship between plants and people is known as ethnobotany. The **Ethnobotanical Garden** displays plants used today and in the past by the native peoples of the Southwest. These plants may be wild, cultivated (purposefully grown), domesticated (adapted to be more useful), or introduced (brought to the New World by Spanish or other European settlers). The emphasis in this Garden is on plants cultivated during the late

Spanish Colonial period in southern Arizona and Sonora, Mexico. The Garden serves as an educational display and a grow-out field. Let-

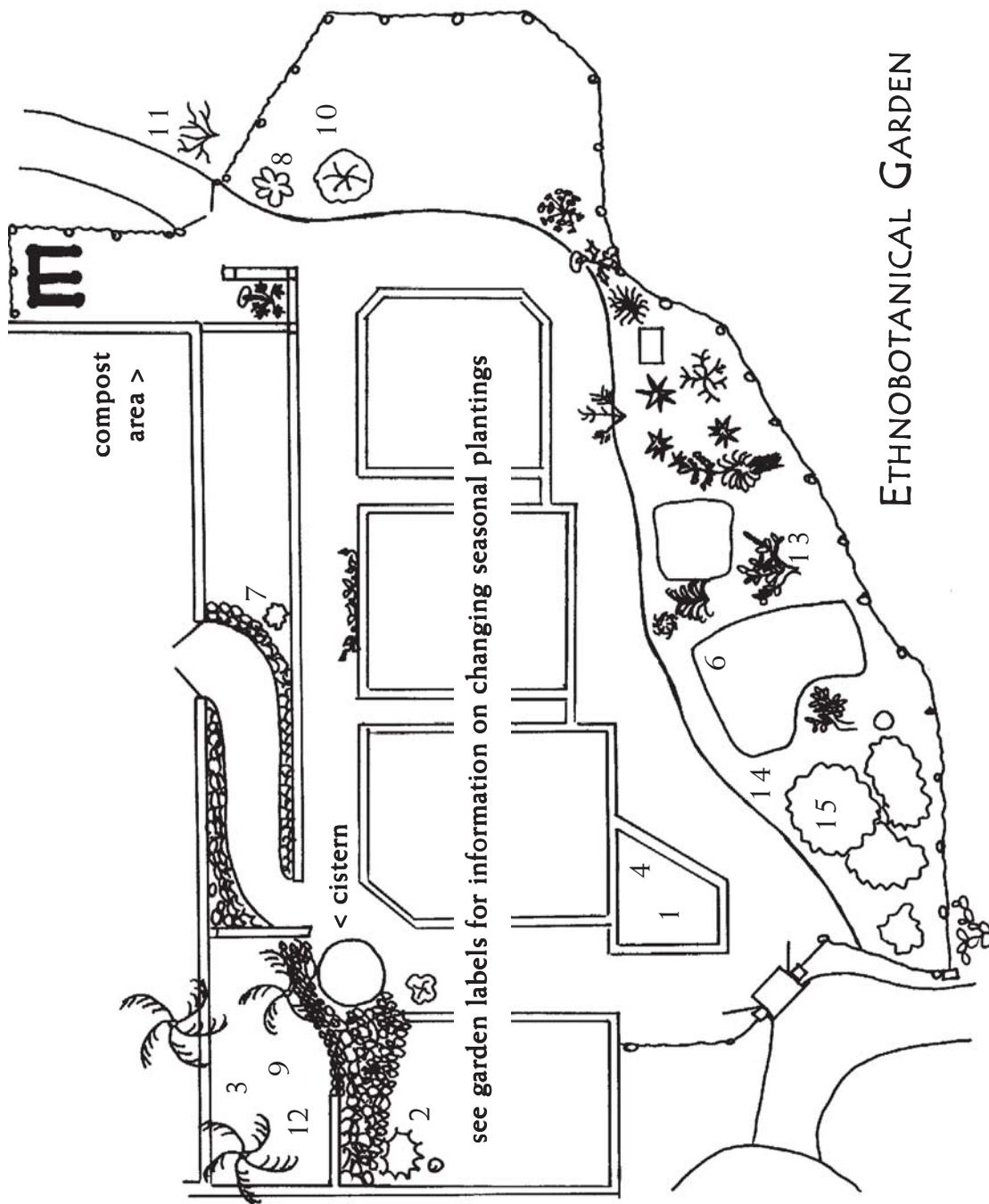


*amaranth, sunflowers, squash and watermelon in the summer garden*

ting our crops go to seed instead of being eaten replenishes and keeps viable supplies of valuable seeds. All the crops are varieties adapted to the special growing conditions of this region — heat, drought and alkaline soil. Because of their special adaptations these ancient crops are a major source of genetic material for new varieties. The garden's plantings are rotated twice a year (summer is the season for mostly native crops and winter, for crops from the Old World). Prior to the introduction of such cool season crops the indigenous Hohokam and O'odham moved into the mountains and foothills during the winter to hunt and collect higher elevation wild foods like acorns and piñones.

## SAVORY SOUTHWESTERN FAVORITES

No doubt some of the permanent plantings in the Garden will be familiar to many gardeners or cooks, while others may seem relatively exotic. These are plants utilized by Native Americans in the area, though not necessarily cultivated by them. (The numbers refer to the map on page 17.) Europeans who relished their sweet, fleshy fruits brought edible **figs** (1) and **date palms** (3) to this area from the Mediterranean. Even in the age of synthetic dyes, **Mayo dye indigo** (2) is still grown by the Mayo of Navajoa, Sonora, for the beautiful blue dye made from its leaves and twigs. Also called wild rhubarb, **cañigre** (4) is typically found growing along watercourses. The stalks of the leaves can be used as a substitute for traditional rhubarb in making pies. The leaves can be baked or roasted for greens and the root contains tannic acid and produces a brown dye. The fiery **chiltepin** (5) is considered the mother of all chiles, the genetic ancestor of all domesticated chiles and bell peppers. The pea-sized red fruit may be HOT but birds relish them. Chiltepins grow naturally in the canyons of southern Arizona and northern Mexico. The plants in the Garden were grown from seed collected in the canyons of the Baboquivari Mountains on the Tohono O'odham Reservation. **Chia** (6) is familiar to many for the ubiquitous "chia pet" craze of a decade or so ago. Actually, the seeds of the chia are high in protein and oil and when toasted and soaked in water they become a thick, high fiber drink popular with the Pimans. The **wolfberry** (7) produces large numbers of small, slightly bitter, juicy berries. A favorite with birds and other desert critters, the





*visitors and volunteers join in a fall harvest*

berries are also collected by humans. The edible berries of the squawbush (8), a native of the Hopi mesas, are used as a color stabilizer in dyeing wool. The twigs are used in basket weaving and are burned as one of the four kiva fuels. **Wild cotton** (9) is nearly fiberless and there is no archaeological evidence that it was ever grown by the Pimans for lint. Yet this wild shrub has been used by plant breeders to improve the lint strength of domesticated short staple cotton, another example of an apparently useless wild plant serving as a valuable resource in plant genetics. **Four-wing saltbush** (10) is also common around Hopi villages. It is another of the kiva fuels, and it is also used in making *paho* (prayer sticks) and for its ashes, which help intensify the blue color of *piki* bread. After a summer rain the desert smells like...? Ask any longtime resident and the answer will be **creosote** (11), the "drugstore of the desert." This fragrant shrub has been used

to treat many ills, from upset stomachs to arthritis to insect bites. Its effectiveness in dissolving kidney stones, as a fungicide, as an analgesic and in controlling cancer cells is currently under study. One of the three major basketry materials (including yucca and devil's claw), **beargrass** (12) is used by the Tohono O'odham and other southwestern tribes to form the inner bundle (warp) of coiled baskets. Its leaves are dried in the sun, then split into narrow strands and secured in successive coils by yucca fibers.

## COMPOSTING

Yard trimmings and kitchen scraps can be transformed into nutrients for your plants and amendments for your soil rather than taking up space in landfills. Compost is decomposed organic material such as plants, leaves, stems and vegetable peelings. With the help of bacteria, fungi, or earth worms gardeners speed up this natural process. Be careful not to include any animal products and leave out weedy plants whose roots and seeds could spread to your garden. To begin, choose a location outdoors for your compost pile. Shred all material into pieces 4" or smaller. Alternate layers in your pile of "wet" (green and moist) and "dry" (brown and dry) material. Make certain you bury food waste to avoid drawing flies. Keep the pile moist and turn it frequently to allow the oxygen to penetrate. Here in the Garden we keep an active compost pile behind the north gate, and over in the Desert Living Courtyard's Utility Garden, we have a rotating bin, perfect for those with small spaces.

With the disappearance of riparian areas during the last century, beargrass and yucca have replaced the traditional, higher quality willow, sumac and cattail formerly used in basketry. Used by indigenous peoples long before early settlers moved west, **Mormon tea** (13) is a medicinal (diuretic) and a sipping tea. It has also been used to control allergies and as a decongestant. The branches produce a rose tan dye. **Brittlebush** (14) is also known as *incienso*, named for the golden sap that oozes from its stems. Burned, the sap produces a fragrant incense, or it can be made into varnish or glue. Tucsonans are most familiar with brittlebush as the bountiful yellow wildflower that graces the hillsides and roadways around the city in the spring. **Jojoba** (15) or goatnut, occurs naturally only in the Sonoran Desert. Everyone has tried jojoba in shampoos or skin lotions but its seeds also produce fine, high quality oil that can replace sperm whale oil in commercial applications.

## WATER HARVESTING

The underground **cistern**, located beneath the date palms, is filled with rainwater collected from the roof of the Exhibit House. The water is used to supplement irrigation needs for the Ethnobotanical Garden. Water harvesting on a large scale was used to grow crops by the indigenous peoples of the Southwest. Washes and arroyos were diverted to irrigate fields in what is called *ak-chin* farming. Today, homeowners can use simple techniques when designing their own landscapes to capture rainwater runoff that would otherwise be lost. Check out the SIN AGUA Garden for ideas!



education

# Living with the Desert

[14] Meant for the slightly more adventuresome, the **Hallowell Desert View Trail** meanders through a beautiful, relatively undisturbed quadrant of Tohono Chul. Approximately 1/2 mile in length, the trail does not meet ADA standards and is therefore not wheelchair accessible but it is a favorite of birders and those looking for the Sonoran Desert in its more natural state. Look for nature- and desert-inspired quotes inscribed on sandstone markers along the trail.

*Love me or hate me, the desert seems to say, this is what I am and this is what I shall remain.*

**Joseph Wood Krutch**

Bobcats, coyotes and javelina traverse the dry washes in this area too, and if you're lucky, you just might see one! Along the trail you will also find two shaded ramadas with drinking fountains.

[15] Close your eyes and you might be able to visualize the citrus trees that once occupied the space now covered by this **Cholla Forest**. Also known as chain fruit cholla, a jumping cholla doesn't really jump. Its stems, loosely attached to the plant, are densely covered with barbed spines. Barely brushing against the plant can detach a whole section — making the hapless human or desert creature jump! However, pack rats find the detached stems perfect protective building blocks for their middens.



cactus wren  
Debbie Jensen, artist

The Cholla Forest is an excellent bird-watching spot. Keep an eye out for cactus wrens and curve-billed thrashers who prefer cholla for their nest sites. The cac-

tus wren, state bird of Arizona, builds an elongated, football-shaped nest with the opening at one end. The thrasher, on the other hand, builds a twiggy, bowl-shaped structure.

[16] *Sim agua* may be Spanish for "without water," but it doesn't really mean that in this case. Instead, it is the efficient and sustainable use of renewable water! The **SIN AGUA Garden** channels and delivers rainwater runoff from the adjacent Education Center parking lot to demonstrate water harvesting and the use of native and adapted plants in a landscape that uses little or no supplemental groundwater.

If you are lucky enough to visit during a rain event, you will see how this garden "works." Individual plots are defined by berms, contoured mounds of earth that contain or direct the flow of surface runoff allowing sediments to settle and water to soak in. Sluice gates in the channel along the northern perimeter are opened manually to direct the water's flow to the driest plots first. The slope of each plot has been calculated to allow for surface water to flow from one to the next. Excess runoff is directed into the surrounding natural desert.

Assuming an annual rainfall of 12" (Tucson's average), the runoff yield is over 37,000

cubic feet of water – equivalent to 40" of rainfall a year! The Garden stores approximately 8,000 cubic feet of water at one time and it takes from 5-6 hours to an entire day for a full plot (8"-9" of water) to empty.

Rainwater harvesting captures rain and uses it close to where it falls, or stores it for future application. The cheapest place to collect rainwater is in your landscape – slowing the flow of runoff to allow it to soak into the ground where plants can make use of it. The use of harvested rainwater reduces erosion and flooding, salt accumulation in the soil, utility bills and our dependence on groundwater.



SIN AGUA on a rainy, winter day

Even the simplest methods of water harvesting, like installing plants under the drip line of a roof or using porous pavement materials, can produce immediate results. Next time it rains, watch which way the water flows across your property. Determine where a berm or channel would slow the flow and spread the water out, allowing it to percolate into the ground; don't forget to allow for extra runoff during a major storm

event with a spillway for overflow. Raised berms can double as pathways and provide additional planting areas for species needing less water.

Keep in mind, any collection system should be large enough to hold the runoff from the heaviest storm you can expect. From a 50' x 50' roof you can expect 18,700 gallons of runoff in a year (assuming 100% runoff). A single monsoon storm that drops 2" of rain on your house could result in 3,000 gallons of water!

[17] Walking through this section of the Park you might notice that the vegetation resembles that of the lower Rio Grande Valley of southern Texas and adjacent Mexico, a semi-arid land averaging about 15-20 inches of rain a year. Termed **Tamaulipan Thornscrub**, the vegetation of this region is characterized by numerous, multi-stemmed, small-leaved, spiny shrubs; small trees; cacti; and yuccas. Compare this planting with native Sonoran Desert vegetation in and around Tucson. Some of the labeled plants, such as desert hackberry (*Celtis pallida*), catclaw acacia (*Acacia greggii*) and desert Christmas cactus (*Opuntia leptocaulis*) are native to this area.

[18] The **Barbara Kennard Present Demonstration Gardens** displays appropriate landscape plants and hardscape materials to provide ideas for homeowners. The soothing sounds of flowing water are everywhere in the Garden; one unique water feature allows cascading water to hopscotch from one strategically placed pot to another down the face of an adobe-plastered wall.

[19] This central planter in the Demonstration Gardens features plants native to **Central Sonora**. Many of the species are frost sensitive and must be protected when temperatures dip below freezing.

[20] On the north side of the Gardens, situated next to a cooling grotto is the **Recognition Ramada**. Handbuilt of lodge pole pine with a saguaro rib roof held in place with carved eucalyptus wood pins, the Ramada shades hand-painted commemorative tiles that honor or memorialize family and friends. A donation to Tohono Chul in someone's name can be used to add to this wall of memories. This peaceful section of the Demonstration Gardens is also available for wedding and other ceremonies.



Recognition Ramada

[21] Unique in all of Tucson, if not the world, is the **Geology Wall** exhibit. The vision of Park founder Richard Wilson, a University of Arizona geology professor, it was inspired by the geologic formation fireplace by Mary Jane Colter in the Bright Angel Lodge at the Grand Canyon, a scale model of the geology of the Canyon from rim to

river. Completed in 1985, the Park's Wall was designed and built by geologist Doug Shakel, with the help of Toby Wright.

The 55-foot semi-circular Wall consists of several hundred rock specimens



collected from more than two dozen geologic formations in the 9,000-foot Santa Catalina Mountains, visible just over the top of the Wall. Shakel and Wright spent three years gathering the specimens and building the Wall to illustrate the geologic story of Southern Arizona.

The Wall in front of you represents a vertical slice of geologic time, cut through Tucson's Santa Catalina Mountains from north to south. As you walk along the Geology Wall from left to right, you are literally strolling through nearly two billion years of earth's history. You would have to hike more than 30 miles through the Catalinas to see the same rock formations.

In general, the rocks of the Santa Catalina Mountains, and the Wall, become younger as you continue walking south. Tucson is built on the youngest rocks, displayed on the far right; they are only 10 to 20 million years old. The oldest rocks, on the far left, are found north of the Catalinas near the town of Oracle; they are about 1.8 billion years old!

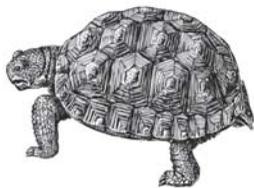
## A CALENDAR FOR THE AGES

To understand the earth's geologic life story, scientists use a chart called a geologic column to represent the various phases of the planet's development. Starting at the bottom, the oldest time period is the Precambrian beginning when the earth coalesced about 4.5 billion years ago and lasting until the Paleozoic Era, 542 million years ago (mya). The Precambrian represents about 87% of the earth's history; using a familiar calendar analogy, it began January 1 and lasted until November 18. The Paleozoic Era, when multi-cellular life began to flourish, lasted from 542 mya until 251 mya or from November 18 to December 12. Next up was the Mesozoic Era, known as the Age of Reptiles. It lasted from 251 mya until about 65 mya or from December 12 to 26. We currently live in the most recent Era, the Cenozoic, which began on December 26. This is the age of "new life" when mammals came into their own; modern humans, on the other hand, have only been around since about 11:48pm on December 31.



[22] The **Propagation Greenhouse** is only open to the public during our twice yearly plant sales (March and October). The rest of the year, staff and volunteers are busy selecting and propagating little known or underutilized native and arid-adapted landscape plants to introduce them to local landscape designers and the general public. By creating a demand for a broader palette of appropriate water conserving plants, more species will become available through commercial nurseries and backyard landscapes will take on an entirely new regional character.

[23] This low-walled **Tortoise Enclosure** is the home of several Sonoran Desert tortoises. The largest native turtle in Arizona, they grow continuously throughout their lifetimes — adults ranging up to 13 inches long and weighing 16 pounds. With a life expectancy of 50 years or more, the reptiles are generally active from April through October. You may have to look carefully to spot them, however, since they seek the shade when it gets too hot and will hibernate when cold weather sets in.



desert tortoise  
Paul Miller, artist

Desert tortoise populations have declined in recent years due to respiratory diseases, illegal collections practices and changes in their habitat brought by development and increased livestock grazing. Tortoises are protected by state law and it is illegal to remove one from the wild.

[24] You are now entering the **Riparian Habitat**, a re-creation of an Arizona riparian community, a diverse association of plants and animals that live on the banks of the state's rivers and streams. Our version displays some of what you might find in Sycamore Canyo, 50 miles south in the Atascosa Mountains at 4,000 ft.

The word riparian (from the Latin *ripa*, meaning shore or bank) was once only familiar to biologists and naturalists but in recent years the public has been made more aware of the extraordinary importance of Southwest ri-



streamside plantings replicate desert riparian habitats

parian communities to native wildlife. It is estimated that roughly half of all breeding birds in the deserts and grasslands of the Southwest nest exclusively in riparian habitats. Similar numbers are emerging with regard to the region's amphibians, reptiles and mammals. Given the number of species dependent on these areas, it is astonishing to note that riparian communities cover much less than one percent of the region's total land mass!

**Arizona ash** (*Fraxinus velutina*) is often called velvet ash because its leaves are covered with fine hairs. In the fall the leaves turn a bril-

liant yellow and light up the canyons across the Southwest. Inconspicuous flowers appear in the spring followed by winged fruits that are scattered by the wind. **Arizona sycamore** (*Platanus wrightii*) is easy to recognize even in winter, when the distinctive sharp-lobed leaves have fallen, because of its beautiful white bark and angular branches. Sycamores are among the hardiest of riparian trees, resprouting readily after losing entire trunks in floods. Their tenacious roots wrap around boulders in rocky streambeds, slowing erosion. **Arizona black walnut** (*Juglans major*) is noted for its edible fruits, and for the fact that its name in Spanish (*nogal[es]*) is the name of a well-known border town to the south.

**Canyon grape** (*Vitis arizonica*) is a true grape and a distant relative of Old World winemaking varieties. Its small, nearly black fruits are edible. Though not strictly a riparian species, **hopbush** (*Dodonaea viscosa*) also grows on rocky canyon slopes. Some cultures around the world use the winged fruits as a substitute for hops in making beer. Other parts of the plant are poisonous, however, and have been used to stun fish in order to catch them.

Living in the stream itself is a population of **Gila Topminnows** (*Poeciliopsis occidentalis*), once the most abundant fish in the Gila River basin of central Arizona and southwestern New Mexico. It is now listed as an endangered species due to competition from a closely related species, the mosquitofish. Loss of habitat as a result of the construction of new dams and the over-utilization of surface waters has also inhibited population growth. The only fish in Arizona to bear

live young, the Topminnow favors pools and slow moving waters where it feeds on aquatic plants and small animals such as mosquito larvae and other small fish. In the fall of 1991 Tohono Chul introduced this population into the



female *Gila topminnow*  
Paul Miller, artist



male *Gila topminnow*  
Paul Miller, artist

stream as part of a cooperative breeding program with Arizona Game and Fish that seeks to preserve species diversity and for reintroduction to the wild.

## RIPARIAN DIVERSITY

From a bird's eye view, southern Arizona's riparian communities appear as ribbons of green meandering through the brown desert. Wherever water collects, whether a perennial stream at the bottom of a canyon or an ephemeral pool in a seasonally flooded dry arroyo, there you will find the kinds of trees and shrubs that need more water than the desert can provide.

There are many reasons for the remarkable diversity of wildlife in riparian habitats. The presence of aboveground drinking water is a magnet, however the water available under the ground may be even more important. It means a greater concentration of vegetation and plant-eating insects. Tall trees such as sycamores, smaller trees such as mesquites, fallen tree limbs, shrubs, grasses and herbs provide a great variety of breeding, feeding and escape situations, accommodat

ing a diversity of animal lifestyles. Riparian communities are also important corridors for the movement of wildlife through the surrounding deserts.

Gallery forests of Arizona willows and Fremont cottonwoods once lined the banks of many valley-bottom rivers and streams, but no longer. Their reproduction is an example of the sensitivity of many riparian species to ecological change. Both trees release cottony seeds in the spring. To sprout, the seeds must fall on moist sandbars recently exposed by receding waters. Man-made dams frequently degrade downstream riparian communities by changing seasonal streamflow patterns.

Urbanization, falling water tables, overgrazing by cattle and a changing climate have all contributed to the degradation and loss of riparian communities throughout Arizona. Today no more than 10% of Arizona's riparian habitats exist in anything resembling their original conditions. Those that remain are among the most precious treasures in Arizona's natural heritage.

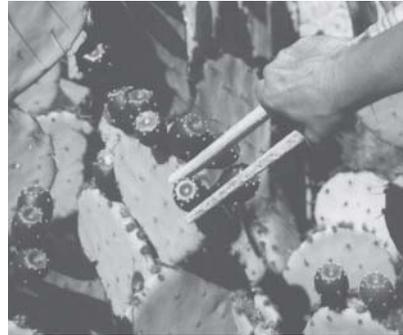
**[25]** The **Demonstration Garden Ramada** offers a soothing escape from the noise and congestion of the surrounding city. The relaxing sounds of running water and birdcalls provide a calming backdrop for a quiet, private moment. The Ramada itself, with its Mexican tile accents and beehive fireplace, is a creative model that visitors can adapt to their own home landscape.



stewardship

## Living in the Desert

**[26]** A number of species of prickly pear cacti are planted along this section of the trail. Members of the genus *Opuntia*, which also includes the cholla cacti, prickly pears are distinguishable from the chollas by their flattened stem sections called pads. For this reason they are also called *Playtopuntias*. *Opuntias* are characterized by the presence of clusters of easily detached, fine, barbed



harvesting prickly pear fruit with wah'o  
(saguaro rib tongs)

spines known as glochids. Some prickly pear cacti such as bunny ears and beaver-tail are exclu-

sively covered with glochids, giving them a soft look. Anyone having had the misfortune to encounter one up close will warn you that appearances can be deceiving!

Peak bloom time is April-May when plants feature lemon yellow to pink to red flowers. The young pads of the cactus, called nopales, can be cooked and eaten as a vegetable. High in calcium and vitamin C, the fleshy fruits, called *tunas*, are very sweet and juicy. Gathered in late summer the reddish-purple fruit is cleaned of its spines and eaten fresh, or

the juice is strained for making jellies, cooling drinks or sorbet. The ripe fruits also produce a soft pink dye. The natural pectin in the fruits has been helpful in controlling diabetes. By the way, that red or purple tinge that may appear on some *opuntias* is a sign of stress due to cold or drought.

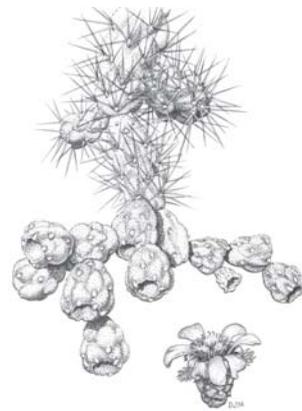
## DESERT CLIMATE

Deserts, and the vast areas of arid grasslands and scrublands that often border them, cover about 30% of the earth's land area. A desert is defined as a region that receives less than 10 inches of rain per year. However, climate, soil, topography and vegetation are all considered when defining a region. Arid climates have at least one thing in common -- the rate at which moisture evaporates (evapotranspiration) exceeds rainfall (precipitation). Evapotranspiration is the total water loss from an area, through evaporation from the soil and through transpiration of water vapor from plants. High temperatures, low humidity and wind increase the rate of evapotranspiration. Many plants that are not adapted to arid environments wilt and die on a hot, dry, windy day, even if growing in good, continuously damp soil.

A number of factors or combination of factors can produce a desert. The world's great deserts occur in the horse latitudes (about 30° north and south of the equator) and are sometimes called trade wind or subtropical deserts. The deserts of Mexico and the Southwest United States are found at this latitude.

**[27] Cholla cacti** (pronounced CHOY-ya), close relatives of the prickly pear, differ by having cylindrical, tubercle-covered stems - *Cylindropuntia*. There are about 45 species of chollas distributed from the Southwest to central Mexico. They are well represented in the Sonoran Desert with six species being native to Tohono Chul. Chollas range in size from low mat-forming types to 15-foot trees. They include such plants as the not-so-cuddly teddy bear and the infamous jumping cholla. Chollas and prickly pears grow easily from detached stems. Cholla spines are covered with papery sheaths, often showy and bright, contributing to the plant's overall coloration. These protective spines are probably the reason these cacti are favorite nesting sites for cactus wrens and curve-billed thrashers.

In March, after a long winter without fresh food, the Tohono O'odham look forward to spring and readily harvest the first available green vegetable, the cholla. Picked before they bloom, the buds of the cholla cactus are rich in calcium — one tablespoonful is



*jumping cholla*  
Debbie Jensen, artist

equivalent to eight ounces of milk! Harvested with tongs made of saguaro ribs (*wab'ó*), the buds are cleaned of their spines and then cooked. They can be eaten as a vegetable, added to salads, soups or stews, or sun dried and stored for future use. The flowers, when they open, range from yellow to green, rust to bronze and orange to magenta. Jumping cholla blooms each year, but seldom sets viable seed. Instead, it develops chains of fruit that eventually fall off and form new plants — thus its other common name, chain fruit cholla.



[28] The **Cargill and Bradley Families Desert Living Courtyard** presents visitors with conscientious alternatives to use when choosing to “garden where we live.” The Courtyard offers homeowners

new and creative ideas for using water-conserving plants in livable landscapes, combining color, texture and function to provide take-home ideas for outdoor living spaces that can be easily reproduced.

Divided into ten distinct garden vignettes, areas of the Courtyard feature different southwest regional themes, from cacti, succulents and annuals in colorful pots, to a “natural” landscape that attracts native wildlife. We also recreated garden styles from other places with similar climates, such as the Moorish gardens of old Spain or the colorful outdoor living spaces of Mexico.

**Barrio Garden** — a small gardener’s garden reflecting a traditional sense of place where family heritage guides the growing of plants that nurture both body and spirit.

**Container Garden** — suits the homeowner and plant lover with limited space, where containers provide alternatives to in-ground plantings.

**Moorish Garden** — reflects the sensual tranquility of a shaded garden where ceramic tiles and wall stenciling reference traditional elements of desert gardens from Spain and overcome the limitations of long dry seasons when plants are not in bloom.



**Xeriscape™ Garden** — demonstrates the classic “zone” principles of oasis, transition, and dry/desert by blending the space into the surrounding landscapes.

**Wildlife Garden** — a riparian habitat in a rocky canyon incorporates a “natural” water feature that is home to a growing population of endangered native fish, and a variety of plant species attractive to a diversity of wildlife.

**Dry Shade Garden** — the most challenging of gardens to design where many native plants actually thrive in full sun.

**Winter/Summer Garden** — plants that bloom in either of Tucson’s most extreme

seasons – the cold of winter or the heat of summer.

**Meditation Garden** — inspired by the simplicity of a Zen garden, demonstrates that even a tiny space can become a peaceful refuge.

**Outdoor Living Garden** — combines architecture and plants to create an informal, comfortable and adaptable sense of place that is inviting for year-round outdoor family living. Creative design decisions can introduce shade, cooling, privacy, and even passive water harvesting to a typical tract home.



Last but not least, the **Utility Garden** — demonstrates gardening basics from tool storage to composting and from low tech water harvesting to a kitchen garden in a cattle tank.

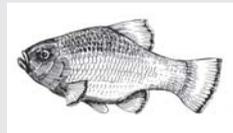
In any given garden, there will be spaces that are less than inviting to plants; these are the spots to consider for utility needs.

[29] In the lobby of the **Desert Discovery Education Center** is the **Wells Fargo Foyer Gallery**, a small gallery space that features longterm exhibits focusing on themes such as edible and useful plants of the desert or Tohono Chul's history. Classes, workshops and volunteer training is held in the Center's classrooms, the largest of which can be rented for private meetings and retreats.

## Desert Pupfish

Thriving in the pond in the Wildlife Garden is another native fish, the Desert Pupfish

(*Cyprinodon macularis*). Native to Arizona, Baja California and Sonora, Mexico, and the Salton

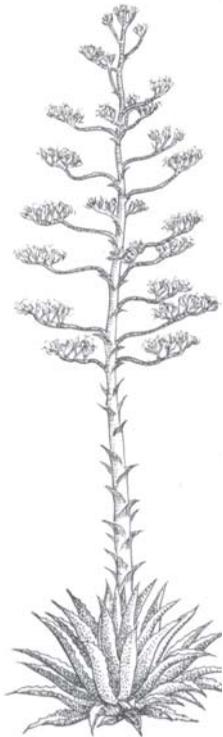


*male pupfish*  
Paul Miller, artist

Sea area of California, the Pupfish is an endangered species. Once common, it has been preyed upon and out-competed by non-native baitfish released into its desert riparian habitats. These fish are also part of a captive breeding program to help save the population of Pupfish indigenous to Quitoboquito Springs in Organ Pipe National Monument.

The Desert Pupfish is capable of withstanding extreme temperature changes, making it perfectly adapted for desert pools. An omnivore, they consume aquatic plant life and tiny marine creatures. In captivity its favorite food is brine shrimp but it will also eat mosquito larvae and other small insects. During the spring and summer you can easily spot the males in the school; they are an iridescent turquoise color. The females and young are a non-descript brown with light bands that camouflage them in the weeds. Females lay their eggs in territories established by the males. Following spawning, the eggs are deposited on the bottom with no further parental care.

[30] **Agaves** can best be described as low-growing rosettes of succulent, evergreen, toothed leaves. Over 130 species occur from the Southwest United States to Mexico, Central America and the Caribbean (12 species



*agave americana*  
Debbie Jensen, artist

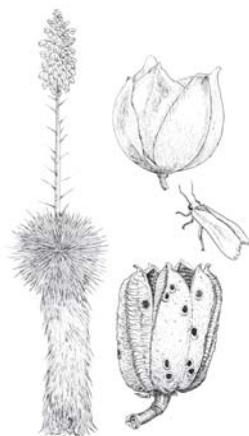
are native to Arizona, more than any other state). Agaves range in size from the six-inch rosettes of *Agave parviflora* to ten-foot high "century plants" that can produce a 25-foot tall flower stalk at the end of its lifetime. The nickname "century plant" comes from the mistaken belief that agaves require 100 years to bloom. Actually, they are multi-annuals requiring seven to 45 years to mature and flower, depending on the species and growing conditions. Resembling an asparagus, the flower stalks of larger agaves can grow as much as one foot per day. Most agaves die after flowering. Besides seed, most species produce offsets or pups and some grow plantlets called bulbils on their flower stalks. This habit of flowering only once is a feature that distinguishes agaves from their relatives: yuccas, beargrass, sotols and hesperaloes. You can see these relatives throughout the grounds. The varied sizes,

forms and blue-green to gray shades of agaves provide many creative opportunities for landscape use.

Agaves have been used extensively for food, fiber and medicines by the indigenous peoples of Mesoamerica for at least 9,000 years. Agave was cultivated by many tribes for its edible heart. Prior to flowering the plant was trimmed of its leaves, much like an artichoke, and the leaf base and stem (called a *cabeza*) was pit roasted and then eaten — a starchy, sweet and nutritious, somewhat fibrous food. Many of us are familiar with agave sap known variously as *aguamiel* (fresh), *pulque* (fermented) and *mescal* or *tequila* (distilled). Traditionally, leaf fiber was used for cordage, nets, basketry, mats, sandals and clothing. Today it is commercially harvested and labeled as sisal. Be careful when handling cut leaves: the sap of the leaves can cause contact dermatitis and other allergic reactions.

[31] Along this loop trail are planted ***Trichocereus***, South American cereoid cacti and some close relatives. These plants are noted for their magnificent, colorful, oversized flowers that frequently appear en masse. Unlike the native night-blooming cereus (*Peniocereus greggii*), they may bloom more than once during a season. The first heavy bloom generally occurs in mid-April and scattered flowering can be enjoyed until the end of warm weather in October. As you walk along the trail you may notice wire cages and shrub branches on top of certain plants. The purpose of the cages is to protect the cacti from hungry wildlife. The branches provide relief from the intense desert sun.

[32] Along this section of the trail you will find various species of **yucca**, close relatives of agaves. Several dozen species of yucca range from the southern United States through Mexico and the West Indies. Yuccas vary in size from small, stemless rosettes to 30-foot high plants such as the famous Joshua Tree of southern California deserts. The beautiful, perfumed white flower masses are striking, especially when whole groves of the plants flower at the same time. The flowers close and droop during the day, opening and turning upward at night for pollination by a variety of nocturnal creatures.



*yucca elata*  
Debbie Jensen  
artist

Yuccas are very useful plants — from the blade-like leaves, fiber can be extracted to make cord. The leaves themselves are used by several tribes in weaving traditional baskets — as green or white stitching fibers and for reddish brown accents (yucca roots). The roots of the soaptree yucca (*Yucca elata*) give the plant its name because when pounded and boiled they create a foamy, cleansing lather used for soap and shampoo. Yuccas are also a source of food. In early spring the

## DESERT SYMBIOSIS

Incapable of self-pollination, a number of yucca species are pollinated by the tiny yucca moth — *pronuba*. This is an example of a plant and an animal linked in a symbiotic relationship. The female moth mates and then begins collecting pollen from several flowers' stamens. She then carries this pollen ball to successive yucca flowers, stopping to lay her eggs deep in the pistil (female portion of the bloom) and then fill its tip with a portion of the pollen that she carries. As the new seeds develop, so do the larvae that feed on a few of the growing seeds. Once mature, they bore through the seedpod and drop by silken threads to the ground. The larvae burrow beneath the soil and spin a cocoon to await the next spring when they will emerge and begin the cycle again.

tender young flower stalk can be baked and eaten, while the white flowers appearing in May can be eaten fresh or cooked. *Yucca baccata* produces fleshy, edible fruits resembling a banana, hence its common name, banana yucca.

[33] The **hedgehog cactus** is a member of the genus *Echinocereus*. There are approximately fifty species of hedgehogs distributed from the southern Plains States and the Southwest to central Mexico. They grow as solitary stems or in clusters of up to 500 stems. A number of hedgehogs are quite hardy to cold. One variety of claret cup hedgehog (*Echinocereus triglochidiatus*) grows at altitudes of up to 10,000 feet. Many hedge-

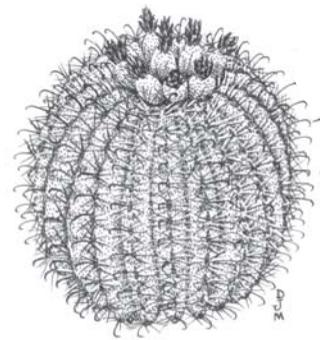
hogs are especially showy when in flower (April) and often a single plant will have dozens of brilliant magenta or red flowers open at the same time. Colors can range from pink to yellow and even green, brown and white. The spines of some species are a display in themselves. The golden hedgehog (*Echinocereus engelmannii* var. *nicholii*) has long yellow spines, while the Arizona rainbow (*E. pectinatus* var. *rigidissimus*) has multi-colored bands of spines ringing the stem. The fruit of many hedgehogs is small but edible.

**[34]** This area of the Park has been planted with specimens indigenous to **Baja California**. They include organ pipe cactus, senita, creeping devil, elephant trees, kidneywood and palo brea.

**[35]** The **Cactus/Succulent Ramada** displays a number of smaller and more delicate cacti and other succulents. This is an opportunity to compare and contrast a few of the thousands of succulents that occur worldwide with the varieties found in the Sonoran Desert. Many of these plants have evolved similar strategies to cope with the common problems of obtaining and storing water in arid environments.

**[36]** **Barrel cacti** generally refer to members of the genera *Ferocactus* and *Echinocactus*, are native from the southwestern United States to Mexico. Barrels range in size from small plants like *Ferocactus fordii* (6" diameter) to massive plants such as *F. diguetii* (14' tall, 3' thick). Most barrel cacti bloom with a showy ring of yellow, orange or red flowers in late summer. *F. recurvus*, just west of the Cactus/Succulent Ramada, has purple flowers in win-

ter and spring. The crown of pineapple-shaped yellow fruits that follow in the fall are edible, with a citrusy taste. Peeled fruits can be made into jellies or marmalades.



fishhook barrel cactus  
Debbie Jensen, artist

The tiny black seeds are high in protein and oil. Fishhook barrel (*F. wislizenii*) has hooked spines that have been used for fishing. Historically, other barrel spines served as needles or awls.

Contrary to popular myth, barrel cacti are not a ready source of water in the desert. You cannot cut off the top and find a pool of clear, cold water ready to drink. The sap of the barrel is an unpalatable, bitter, milky liquid more likely to give you a bellyache. A barrel cactus can make a reasonably effective living compass however. Almost all larger plants will lean toward the southwest. It is noteworthy that similar cacti in the Southern Hemisphere tend to lean to the northwest.

**[37]** As you walk through this area of the Park, take a closer look at the landscape. You are crossing the access road that once led from Ina Road to the main house. In March 1984 we undertook a long-term project to **revegetate** the road and return it to a natural state. The eroded and compacted soil was broken up with a tractor and the surface was then smoothed with a hand roller. Species

of cacti native to the site were planted in natural densities and rocks and gravel were spread on the surface. Seeds of native trees and shrubs were planted. Dead tree limbs and dried brush were scattered about to help reduce erosion, provide protection for germinating seedlings and eventually to form humus for the soil. The road was then thoroughly watered to settle the soil and help establish the cacti. After more than 15 years the road has taken on a more natural appearance though its contours are still visible to those who know to look for them. But without any effort at revegetation it would have remained a permanent scar on the landscape. This is an excellent example of just how fragile desert environments are and yet how they can be restored with care and time.

[38] The shady **Pincushion Ramada** is a welcome respite from the sun on a hot summer day. The rock planter is home to a number of pincushion cacti of the genus *Mammillaria*. At least 150 species and many varieties range from the southwestern United States to Columbia and Venezuela, while the greatest concentrations are found in central Mexico. The fishhook pincushion (*Mammillaria microcarpa*) is common in the desert around Tucson and several other species grow in nearby areas. Most pincushions are favorites of collectors and are prized for their beautifully varied, fascinating forms and the exquisite flowers that ring the tops of their stems with crowns of color. Pincushions range in size from tiny plants barely one inch across, to large clustering masses such as *M. compressa* that can grow to three or four feet across and contain more than 500 stems. Pincushions will usually seek the shelter of a nurse plant, a desert shrub like triangle leaf bursage

or brittlebush that provides protection from predators and the elements. Many of these small cacti would die if exposed to the full intensity of the sun.

[39] The **South Loop Trail** is not wheelchair accessible. It is approximately 1/5 mile in its entirety and is a pleasant walk through washes, up a slight incline and past indigenous vegetation.

[40] The **South Wash** is an example of a desert arroyo. This streambed is normally dry, except immediately after a storm. Rainfall drains off the surrounding higher ground and flows, sometimes quite rapidly, through the channel. This extra water percolates into the adjacent soil and allows trees and shrubs to grow larger than those on upland sites. Desert wildlife is frequently concentrated in wash areas such as this because of greater cover, cooler temperatures and more available food.

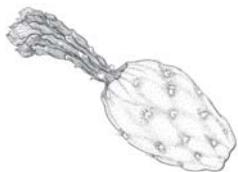


saguaro  
Debbie Jensen, artist

[41] One of Tohono Chul's objectives is to illustrate for visitors the interconnectedness between the plants and people of the Sonoran Desert. In no other instance is this more evident than in the connection between the saguaro cactus (*bahsbani*) and the Tohono O'odham people. The **Pochter Saguaro Discovery Trail** tells the story of the cactus

through its cultural significance to the O'odham and its botanical connections to the natural history of the desert.

One of the "signature" plants of the Sonoran Desert, the saguaro has served as an icon of the Southwest since botanist George Engelmann described it in 1848. Yet many myths and misconceptions persist about its longevity, its appearance and its uses. Interpretive signage along the trail depicts the O'odham origin story of the saguaro, traditional harvesting and preparation methods and the post-harvest wine ceremonies leading to the beginning of the summer monsoon. In addition, there are panels featuring some amazing facts about saguaro adaptations, growth patterns and relationships to other plants and animals in the desert.



*saguaro fruit*  
Debbie Jensen, artist

For example, notice how many juvenile saguaros are clustered below some of the palo verde "nurse" trees. These trees are popular bird roosts and saguaro seeds are dispersed via animal droppings — birds, bats and even javelina and pack rats find saguaro fruit quite tasty. The tree provides the young seedlings protection from the intense sun in summer and reduces frost damage in winter, thus creating an ideal habitat. As the saguaros mature, the tree that protected them in their youth will frequently not survive, the saguaros having absorbed most of the available rainfall.

Now look at the large number of small to medium saguaros around you, fanning out

across the desert. In the Tucson area, the heaviest stands of saguaro occur on warmer south-facing slopes where frost is less injurious and there is a longer growing season. And, don't forget to look for the large, crested (crystate) saguaro at the top of the hill. Transplanted from an expanding sand and gravel operation, the cactus is an example of genetic mutation. No one is quite sure why some specimens develop these odd-looking growth patterns, which may form at the growing tip of the central stem, or from one of the arms.

[42] The **West House** (1963) is a charming hacienda-style home with its traditional *zaguan* and fountained courtyard. The heavy arched doorway is modeled after a larger one that once would have admitted a horse and carriage to the privacy of a home's interior courtyard. Today, the building hosts our **La Fuente Museum Shop** and the **Tohono Chul Garden Bistro**. This Museum Shop features the work of contemporary local artists along with regional cookbooks and spicy Southwest food items. The Bistro is open daily for breakfast, lunch and afternoon tea, serving indoors or in the inviting ambience of the interior courtyard or rear patios. It may



*al fresco dining on the patio*

be rented after hours for special occasions such as weddings, anniversaries and parties.

[43] The **Wilson Room**, located on the northwest corner of the West House, is used for overflow seating from the Bistro and special events. It too may be rented for private functions.



*black-chinned hummingbird*  
Debbie Jensen, artist

[44] Accessible from the back patio of the Garden Bistro, the **Hummingbird Garden** is landscaped with a variety of plants attractive to hummingbirds. These mostly

native species include salvias, penstemons, agaves, honeysuckle, aloes, desert willow, red bird-of-paradise and hummingbird trumpet. The Garden is regularly visited by Anna's and Costa's hummingbirds, by black-chinned in the spring and summer breeding season and by broad-billed and rufous hummingbirds during their migratory passages. The colorful handpainted tiles will help you identify them.

[45] **La Entrada Greenhouse and Garden Shop** has something for every plant enthusiast from the casual weekend gardener to the dedicated do-it-yourself landscaper, and members enjoy a 10% discount! Helpful staff and volunteers are on hand to answer your plant questions. A selection of hardy native and arid-adapted plants are available for sale, along with an assortment of books on gardening and plant identification. Bi-annual plant sales (March and October) are held in the Propagation Greenhouse (22) and fea-

## AN AVIARY WITHOUT WALLS

More than 27 species of birds can be found on the Park grounds or in the skies overhead. There are easily seen residents, like **cactus wrens** and **curve-billed thrashers**; and flashy neotropical migrants like **Wilson's warbler** and **rufous hummingbird**. Birds that breed in the United States and Canada, but winter in Mexico and further south, are termed neotropical migratory birds. The sky islands and riparian corridors of the desert Southwest provide these long-distance travelers with cool, moist rest stops in an otherwise arid landscape.

When walking the grounds, keep an eye out for courting male **roadrunners** with lizard offerings sure to entice potential mates. Do you hear the call of a male **Gambel's quail** — *chi-ca-go-go* — trying to keep his family together?

Do you recognize the so-called black cardinal — **phainopepla**? How about the cardinal look-alike **pyrrhuloxia**? If you are a birder, whether newly fledged or precocial, join one of our regular birding tours for an introduction to our "aviary without walls."

ture an expanded selection of landscape trees, shrubs and specimen cacti and succulents. And in July, local growers and dealers join us for a special Monsoon Madness sale.

[46] THE place for the casual or first time visitor to pick up information about what's happening at Tohono Chul is the **Entry**

**Ramada** and **Admissions** window. In addition to admission to the gardens, you can also purchase tickets to special events and register for upcoming lectures and classes. Admission to the gardens, exhibits and trails is always free for members.

**[47] Lomaki House**, built in the late 1960s as a guesthouse by founders Richard and Jean Wilson, is available for rent by the public for private functions such as meetings, weddings and receptions.



innovation

## Our Future

While the preservation of this 49-acre parcel of Sonoran Desert is an admirable goal, it is not Tohono Chul's sole reason for being. Certainly the site is a place to be cherished — a place where people can come to find peace and inspiration in a place of beauty. However, the Park's site is also a tool, an agent for change, where people can gain knowledge of the natural and cultural heritage of this region. The challenge we face is to find a balance between providing for increasing visitation while protecting the environment our members and visitors have come to enjoy.

In 2001 we implemented a new Master Plan which addressed the needs of our community and constituents. Enhanced visitor services included easier accessibility, ADA upgrades, interpretive signage, lighting, expanded parking areas and public restrooms. Programming services were improved with the additions of the Desert Discovery Education Center (classrooms), Desert Living Courtyard (demonstration landscapes) and a new and expanded retail Greenhouse. The new SIN AGUA Garden and Desert Living Courtyard replaced former parking lots, repurposing bladed and compacted sites with interesting gardens that underscore the benefits of sustainable gardening.

Behind the scenes we renovated/expanded areas for plant propagation and conservation, constructed a new operations shop, built new and upgraded storage for our permanent artifact collections and a conservation/preparation area for the production of our chang-

ing indoor exhibits.

Leading off the South Loop Trail, the Saguaro Discovery Trail was developed in 2004 with sensitive and minimal environmental impact among existing stands of cacti. In 2009 we approached the northern 19 acres of the grounds the same way, with discrete enhancements such shade ramadas and drinking fountains along the improved Desert View Trail. In the "heart" of Tohono Chul, 2010's Sonoran Season Garden, replacing the former main parking lot, tells the seasonal stories of the Arizona Upland.

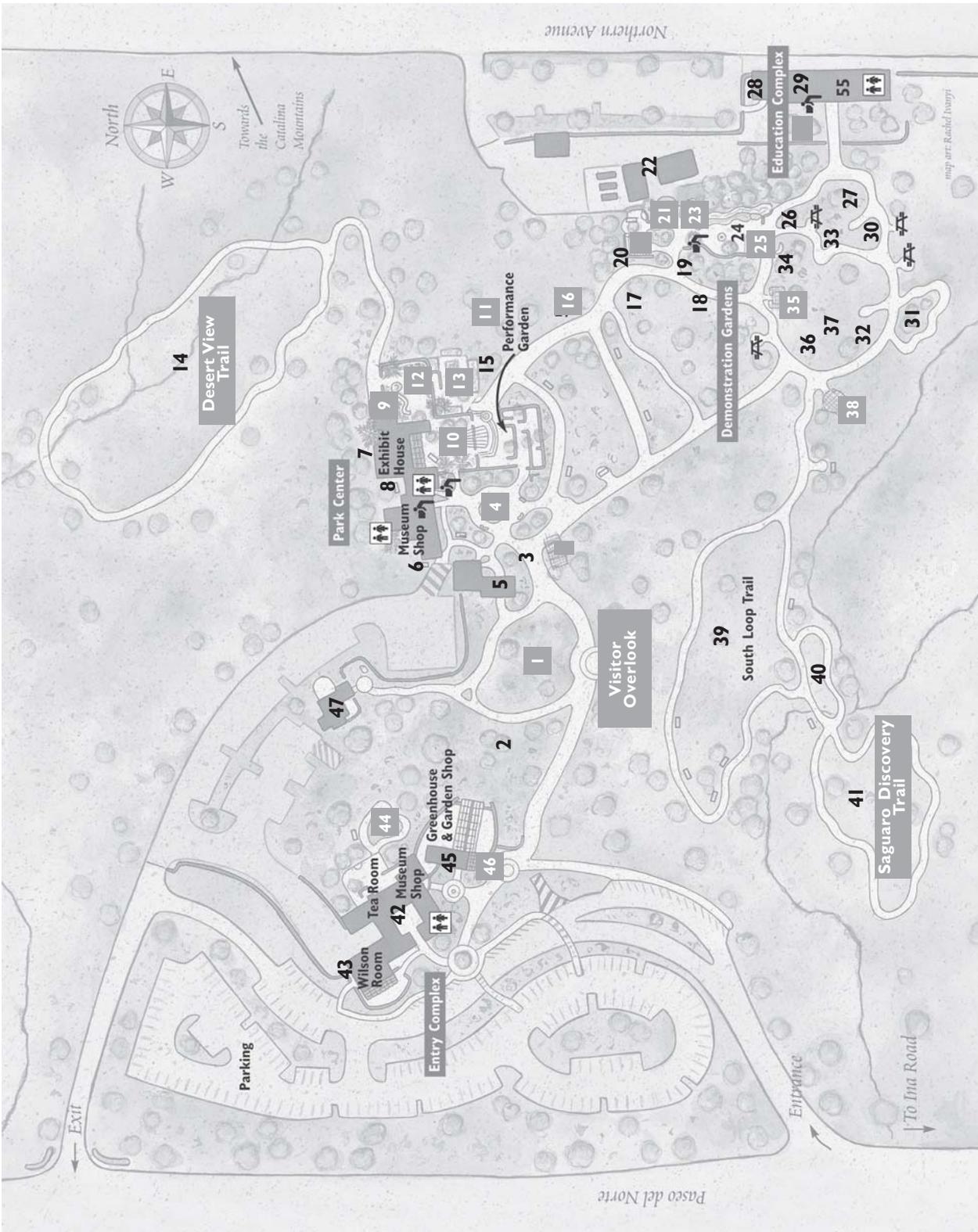
Moving beyond that millennial plan, in 2013 we added the Desert Palm Oasis with its native, but oh, so exotic looking Sonoran palm trees. These new exhibits, along with a new entry path and succulent garden coming in 2014, allow visitors to learn about the natural and cultural heritage of this region and provides them with an enriching experience of the wonders of the Sonoran Desert.

## MEMBERSHIP AND SUPPORT

Thank you for visiting Tohono Chul Park. We are pleased to be able to provide residents and visitors alike with this opportunity to learn about and experience the Sonoran Desert.

If you enjoyed your visit to the Park, and believe as we do that it is a special place, then we ask you to consider becoming a member. Tohono Chul is a private, non-profit organization. It is only through people like you that we are able to continue to protect and preserve this desert oasis for residents and visitors alike.

For information on memberships, contact the Administrative Offices at 742-6455 or [jshults@tohonochul.org](mailto:jshults@tohonochul.org).



Towards  
the  
Catalina  
Mountains

Northern Avenue

map art: Rachel buoyi

Exit

Entrance

To Ina Road

Paseo del Norte

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Desert View  
Trail

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Park Center

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Exhibit  
House

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Museum  
Shop

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Parking

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Wilson  
Room

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Tea Room

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Museum  
Shop

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Greenhouse  
& Garden Shop

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Entry Complex

Visitor  
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South Loop Trail

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Saguaro Discovery  
Trail

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Education Complex

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↑↑

# MAP KEY

- [1] Sonoran Seasons Garden
- [2] Desert Palm Oasis
- [3] "Newspaper" Petroglyph Rocks
- [4] Sundial Plaza
- [5] Murphey Foundation Children's  
Ramada
- [6] La Galeria Museum Shop
- [7] Exhibit House
- [8] North Patio
- [9] Administrative Offices
- [10] Spanish Colonial Courtyard
- [11] Alice Y. Holsclaw Performance  
Garden
- [12] Bank of America Garden for Children
- [13] Ethnobotanical Garden
- [14] Desert View Trail
- [15] Cholla Forest
- [16] SIN AGUA Garden
- [17] Tamaulipan Thornscrub
- [18] Barbara Kennard Present  
Demonstration Garden
- [19] Central Sonora
- [20] Recognition Ramada
- [21] Geology Wall
- [22] Propagation Greenhouse
- [23] Tortoise Enclosure
- [24] Riparian Habitat
- [25] Demonstration Garden Ramada
- [26] Prickly Pear Collection
- [27] Cholla Collection
- [28] Cargill and Bradley Families Desert  
Living Courtyard
- [29] Cargill Desert Discovery Education  
Center and Wells Fargo Foyer  
Gallery
- [30] Agave Collection
- [31] *Trichocereus* Collection
- [32] Yucca Collection
- [33] Hedgehog Collection
- [34] Baja California
- [35] Cactus and Succulent Ramada
- [36] Barrel Cactus Collection
- [37] Revegetated Road
- [38] Pincushion Ramada
- [39] South Loop Trail
- [40] South Wash
- [41] Pochter Saguaro Discovery Trail
- [42] Tohono Chul Park Tea Room and La  
Fuente Museum Shop
- [43] Wilson Room
- [44] Hummingbird Garden
- [45] La Entrada Greenhouse and Garden  
Shop
- [46] Admissions
- [47] Lomaki House