

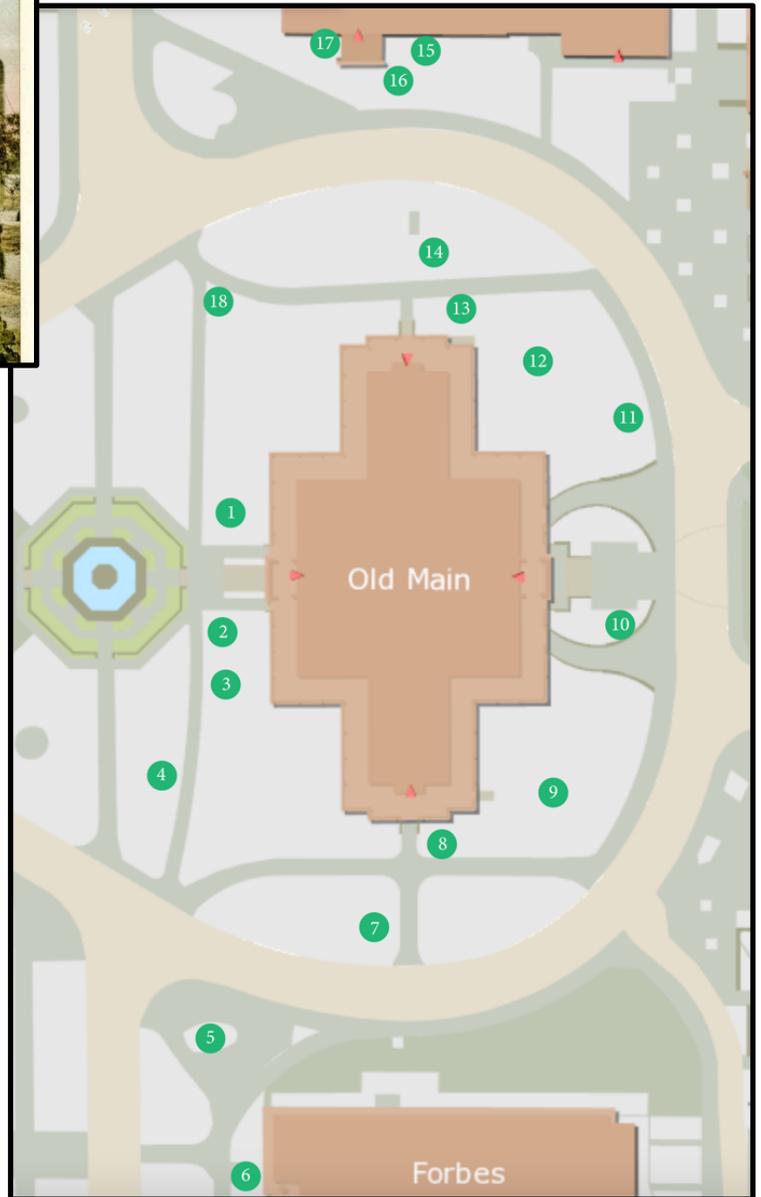
## Self-Guided Tour – Old Main, New Directions



○ Severe, prolonged drought has impacted our urban landscape practices, and significant reductions in our share of water from the Colorado river will shape our landscape choices in the years to come. Selecting appropriate native and desert adapted plants for our urban landscapes is becoming a more critical consideration during landscape planning. However, attractive, appealing, and diverse landscapes are still possible in an urban, desert environment. Understanding irrigation requirements in an era of reduced water use is the key to success. The university is committed to being a leader in landscape options and sustainable water use practices.

This tour serves to highlight desert-adapted plants and the water harvesting initiatives taken on campus to increase sustainability while preserving the beauty and educational value of the campus landscape.

→ *Begin your journey at the Memorial fountain to the west of Old Main.*



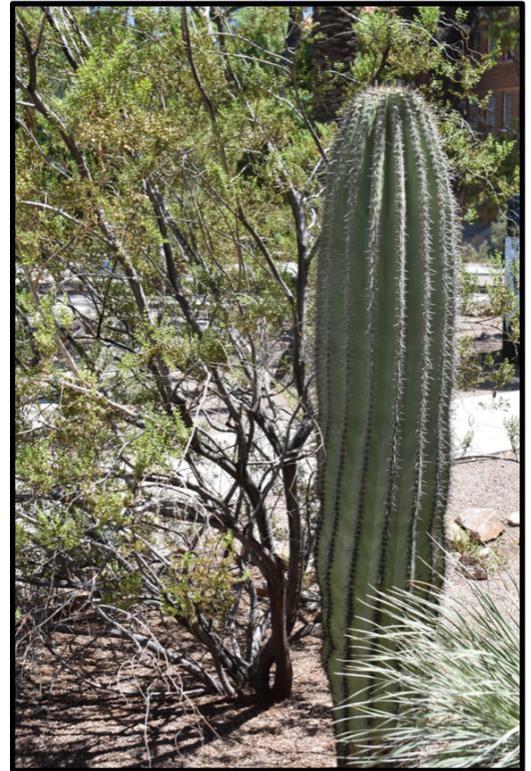
## 1. *Carnegiea Gigantea* – saguaro cactus

**Characteristics:** This icon of the southwest is the only member of the genus *Carnegiea*. It is the largest cactus in the United States. It grows up to 50 feet tall, but grows quite slowly, and it can take many years for them to grow arms. The plant can live for 150 to 200 years. Like many cacti, it stores water in its fleshy, succulent stems.

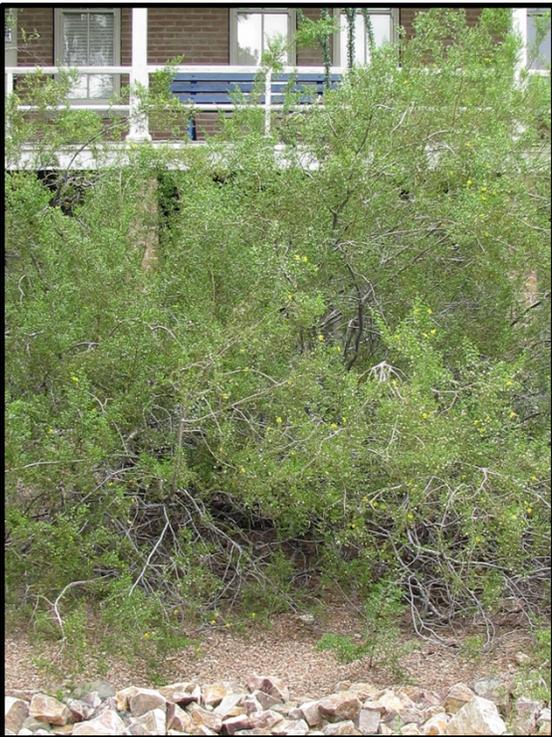
**Ecological Benefits:** Saguaro provide shelter for small birds and owls who may carve burrows in the cactus's fleshy stems. The flower nectar, fruits, and moist fleshy stems serve as a source of food for a wide array of birds, bats, mammals, reptiles, and insects.

**Desert Adaptations:** The saguaros upright structure allows the plant to intercept the least amount of light. The thick waxy coating of a saguaro reduces water lost to the air through transpiration.

**Cultivation:** The saguaro requires very little water usage. Irrigation is only recommended during growing season and not during monsoon season. The saguaro thrives in rocky well-drained soils along washes, foothills, benches, and canyons in the desert.



## 2. *Larrea tridentata* – creosote, greasewood



**Characteristics:** An evergreen, perennial shrub, growing up to 12 feet tall. The bark is gray and knotted, with swollen nodes. During the dry season, the leaves are yellow-green and fold to reduce sun exposure. After rains, the leaves turn a darker green and produce a characteristic aroma. It is known to produce satellite clones, which sprout up in a ring from the root crown. Creosote is capable of surviving for thousands of years and some clones are among the earth's oldest living organisms.

**Ecological Benefits:** provides shelter and food for many animals, including rabbits, foxes, kangaroo rats, lizards, and desert tortoise.

**Desert Adaptations:** The small waxy leaves of the creosote have adapted to conserve water and survive a hot climate. The shrub also only photosynthesizes in the morning to take advantage of a cooler morning sun.

**Cultivation:** The creosote is an excellent option for a xeriscape ornamental due to its full sun exposure and low water usage. *L. tridentata* grows the best in dry rocky soils with low organic matter. The creosote is a popular Sonoran Desert landscape choice that adds shape and color as well as a fragrant aroma each time it rains.

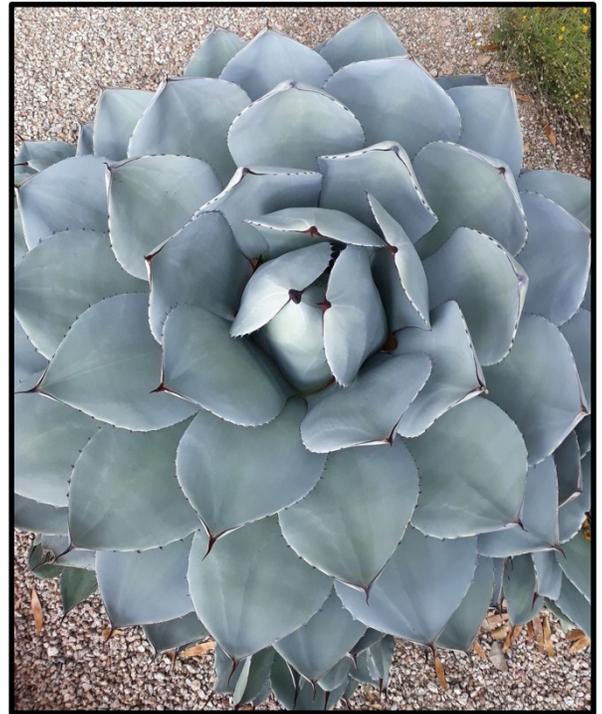
### 3. *Agave parryi* – Parry's agave

**Characteristics:** A compact, medium-sized agave that develops into a symmetrical rosette with blue-green leaves, dark marginal spines, and black terminal spines. It spreads by offsets at the base, forming dense colonies. Plants will bloom only once during maturity before perishing. The flowering stalk can be up to 4m tall and supports a panicle of numerous golden flowers.

**Ecological Benefits:** Many desert pollinators appreciate the sweet nectar produced when agave flower. Visitors include bats, hummingbirds, and bees.

**Desert Adaptation:** The adaptations of *Agave parryi* are to help it survive in areas with water scarcity. The succulent leaves of the agave have a waxy cuticle that prevents water loss as well as stores water for later use. The concave shape and spiral form of leaves of *Agave parryi* allows water to flow directly to the roots.

**Cultivation:** *Agave parryi* requires full sun but is tolerant to minimal shade. Parry's Agave is drought tolerant as well as one of the more cold hardy agave species. The agave grows best in well-drained sandy or fertile loam soils.



### 4. *Chilopsis linearis* – desert willow 'Warren Jones' & Water Harvesting Basins



**Characteristics:** A deciduous tree growing up to 40 feet tall, with a leaning trunk and spreading, open crown. It has linear, green leaves. The bark is thin and dark brown. It produces large, fragrant trumpet shaped flowers from late Spring into Fall.

**Ecological Benefits:** These trees serve as the host plant for the larvae of the rustix sphinx moth. The caterpillars are quite large and resemble tomato hornworms.

**Desert Adaptation:** It grows best in arid landscapes with less than 30 inches of annual rainfall. The desert willow is drought tolerant which means it sheds its leaves in dry conditions and becomes dormant. Water is conserved in the stem and more water loss is prevented when the tree shed its leaves.

**Cultivation:** *Chilopsis linearis* is drought tolerant and will survive with minimal irrigation. The desert willow will grow best in well-drained limestone soils but also tolerates rocky and sandy soils with low organic matter.

*Chilopsis linearis* fast growing nature and drought tolerance makes it an excellent choice for low water usage and xeriscape landscaping.

**Note:** Check out the basins and swales weaving through the plants in this area. These help to divert rainwater for landscape irrigation. A one-inch rainfall on the of Old Main (21,600 sq. ft.) provides 13,500 gallons of water!

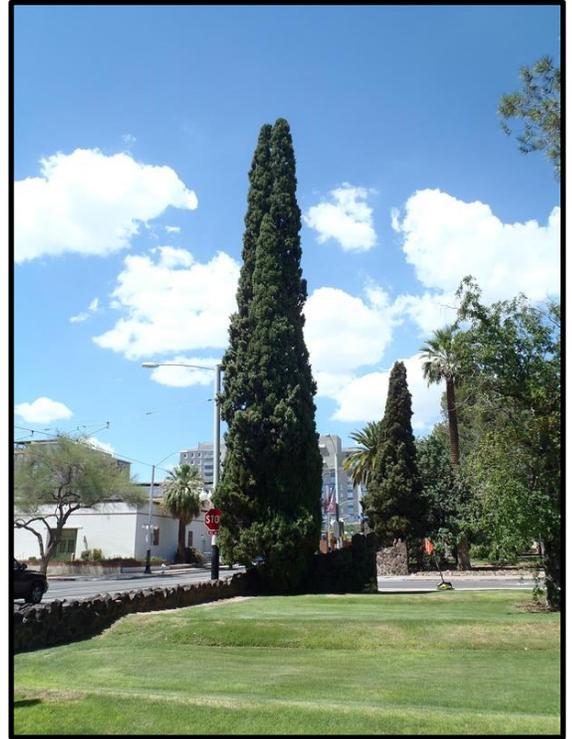
## 5. *Cupressus sempervirens* 'Stricta' – narrow Italian cypress

**Characteristics:** A narrow, evergreen tree growing up to 60 feet. Branches are upright, brown to gray in color, and bear small, scale-like leaves. The fruits are small, oval berries that relatively dry and hard, and brown in color.

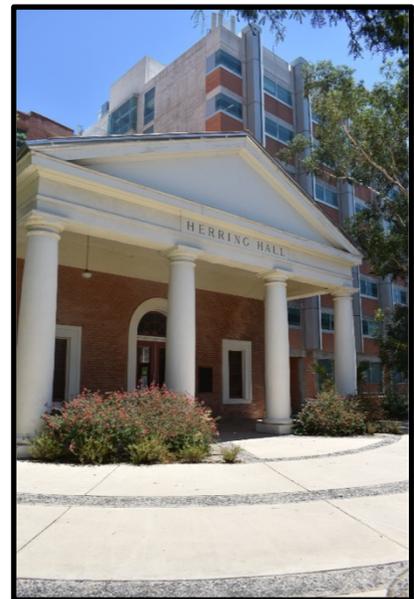
**Ecological Benefits:** Birds utilize the sturdy branches and scale leaves for nest-building materials.

**Desert Adaptation:** The scale-like leaves of *C. sempervirens* are covered in a waxy coating that reduces water loss through transpiration.

**Cultivation:** *C. sempervirens* requires full sun to thrive in an environment. *C. sempervirens* drought tolerance makes it an optimal choice to grow in a dry, hot climate. The tree can survive in a variety of soils including sand, clay, alkaline, and acidic soils.



## 6. Historic Forbes Building and Herring Hall – Mission of Land Grant Universities



The Forbes Building was built in 1915 and serves as the home base for the College of Agriculture and Life Sciences. The words over the front entrance, “Research, Education, and Extension”, represent the 3 components that define the mission of land grant universities. Herring Hall, erected in 1903, is the second oldest building on campus. It once served as a gymnasium and now houses the UA Herbarium, a collection of over 425,000 dried plant specimens, and the Gilbertson Mycological Herbarium, a collection of over 40,000 dried fungal specimens and over 100,000 strains of endophytic fungi.

## 7. *Olneya tesota* – Ironwood

**Characteristics:** A tree in the Fabaceae family that grows to 25 feet tall with bark that is gray to white in color. The branches have small spines that can be curved or upright. Young leaves and stems are covered in fine hairs that help to protect the plant from intense sunlight.

**Ecological Benefits:** Ironwood provides shelter for other plants growing beneath it and is considered a habitat modifying keystone species. Like other legumes, they modify the soil composition, increasing levels of nitrogen and other key nutrients. Birds may nest in their branches and take advantage of the ample nutrients in their fruit and seed.

**Desert Adaptation:** As a drought tolerant tree, *O. tesota* shed its foliage during dry periods to preserve water and energy for regeneration and flowering. Unlike other desert trees, it is uncommon for an ironwood to shed all of its leaves. *O. tesota* is considered a nurse plant for surrounding understory plants. A nurse plant provides a safe area for seed dispersal and protection from the climate.

**Cultivation:** The slow growing Ironwood tree does well in full to partial sun. *O. tesota* has a moderate growth rate and requires low water. Ironwood is a good landscape choice as a screen, shade, or accent plant that will stand out with its height.



## 8. *Calliandra eriophylla* & *Calliandra californica* – pink and red fairy dusters



**Characteristics:** A pair of small, densely branched, shrubs. They grow up to 3 feet tall and have woody, light gray stems. The leaves are bipinnately compound. The flowers are either pink (*C. eriophylla*) or red (*C. californica*) pincushion like clusters of stamens. Both species can be found in this area of old main.

**Ecological Benefits:** The rich nectar and pollen attracts hummingbirds and other pollinators.

**Desert Adaptation:** The small surface area of the leaves of fairy dusters conserve water by preventing more water loss in transpiration. Smaller leaves do not reach as hot of a temperature as bigger leaves which also prevents water loss.

**Cultivation:** Fairy dusters are best planted in their natural environment and thrive on little maintenance. The shrubs should be planted in full sun and need little water once established. Fairy dusters are a great low water use addition to a landscape with its showy flowers and ability to attract pollinators.



## 9. *Prosopis velutina* – velvet mesquite & Water Harvesting Features

**Characteristics:** An iconic southwest tree, growing up to 50 feet tall. The trunk is dark brown with thick bark that peels off in long narrow strips. The branches have a pair of sharp spines at each node. The leaves are green, and bipinnately compound.

**Ecological Benefits:** Like the ironwood, the mesquite performs a variety of ecosystem services, providing shelter and nutrients for birds, mammals, insects, and other plants.

**Desert Adaptation:** The small leaves of the velvet mesquite have a small surface area that reduces the water loss from transpiration. Each leaf is also coated in wax which minimizes transpiration. The thorns of a velvet mesquite deter browsing herbivores. The most notable desert adaptation of a velvet mesquite are the roots. Its roots are able to outcompete other species with its ability to find subsurface water 150 to 200 feet deep.

**Cultivation:** The mesquite tree should be planted in full sun and little water is needed for irrigation except during the first year of growth and during the dry season. *P. velutina* can tolerate a variety of soil types from rocky to fertile. *P. velutina* provides filtered shade in desert landscapes.



Note: Again, take note of the water harvesting basins here.

## 10. Cochineal Scale, Diverse Forms & *Opuntia engelmannii*



**Characteristics:** A large and very common species of prickly pear. It grows up to 12 feet tall and has segmented branches composed of large, fleshy spine-covered pads. In the spring the plants produce showy yellow flowers which are followed in the summer by reddish-purple fruits. The white growths you see on the pads are Cochineal scale insects. When these insects are crushed, a bright red dye (carmine) is produced.

**Ecological Benefits:** The fruit is a rich food source for many animals and insects. Many native bees appreciate the pollen and nectar of its flowers. Some animals, such as javelinas, even eat the spiny pads!

Note: It is possible to create dynamic and interesting landscapes with minimal water input. The gardens surrounding this side of Old Main are home to great diversity of plant forms and growth habits. How many different forms do you see? Many of these plants are easy to care for in warm, dry climates like Tucson's and they use very little water! To see another interesting example of diversity of forms, head directly west of here to the [USS Arizona Memorial and Coral Reef Garden](#).

## 11. *Phoenix dactylifera* – true date palm

**Characteristics:** An evergreen tree that grows up to 75 feet tall. It has large, gray-green, frond-like leaves. The rough trunk has a diamond pattern. It can be multi-stemmed, producing offshoots at the base. The species is dioecious (male and female flowers are on different trees). If you look around, can you find the male plants? (Perhaps by the fountain?). One tree can produce 200 lbs of dates. This particular tree was a gift from Iraqi students to the Dean of the College of Agriculture, Dr. Phillip Eckert, for support in establishing a college of agriculture in Iraq.

**Ecological Benefits:** Dates, the sweet and nutritious fruit of this tree, have been consumed by humans since as early as 4000 B.C. Birds, insects, and other animals enjoy the fruit as well.

**Desert Adaptation:** The thick trunks of true date palms hold and store water for future use.

**Cultivation:** True date palms do well in full sun and require little water. The palm grows best in a well-drained neutral to acidic soil. True date palms are commonly used as a 'street tree' for landscapes because even in limited space it can thrive.



## 12. *Carnegiea gigantea* – crested saguaro



**Characteristics:** The crested saguaro represents an interesting deviation from the usual dome shaped form of this species. The crested, folded top forms by the cells on the growing stem dividing outward instead of upward. The crest assumes a fan-shape with many folds. They are considered rare.

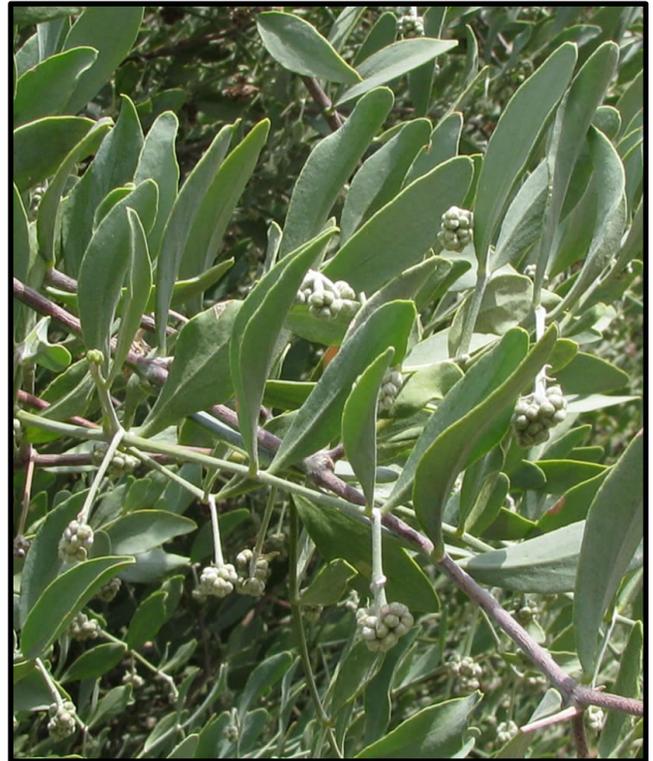
### 13. *Simmondsia chinensis* – Jojoba

**Characteristics:** A woody evergreen shrub growing up to 6 feet tall. It produces a dense covering of leathery, gray-green, narrow, elliptical leaves. The stiff branches give the shrub a rounded form. This species is also dioecious (like the palm from earlier). However, there is a plant here that produces both male and female flowers! Can you find it? The bell-shaped female flowers are pale green and appear singly at leaf nodes. The male flowers are yellow-green and appear in clusters. The fruit produces a resin that is sometimes used in natural skin care products.

**Ecological Benefits:** The foliage is consumed by animals including mule deer, bighorn sheep, and jackrabbits. Ground squirrels, desert chipmunks and other rodents, birds and mammals eat the nuts and seeds of this plant.

**Desert Adaptation:** To minimize the amount of light intercepted by the plant, *S. chinensis* leaves point upward. During the hottest part of the day, when photosynthesis is the least efficient due to high leaf temperatures, the sun will only be shining on the edge of the leaves of *S. chinensis*. The shrub will also shed its leaves during extreme droughts to prevent water loss through transpiration.

**Cultivation:** *S. chinensis* prefers full sun and requires very little water. The shrub thrives in dry sandy or rocky soils.



### 14. *Olea europaea* – European olive



**Characteristics:** A slow growing evergreen that grows to 30 feet tall and can live for hundreds of years. The gnarled, contorted trunk has rough gray bark. The leaves are lanceolate and gray green in color and the flowers are creamy white and appear in clusters. The oil-bearing fruit are oblong, and purple, black, or red in color. Olive trees were first planted on campus by Robert Forbes in 1891. Robert Forbes was the first head of the Agricultural Experiment station here at the University of Arizona.

**Ecological Benefits:** Birds and small rodents enjoy the nutritious fruit of this tree and serve as the primary mode of seed dispersal.

**Desert Adaptation:** Olive trees have developed long root systems that give it access to groundwater in times of drought.

**Cultivation:** Olive trees grow best in full sun to partial shade. Olive trees should be planted in dry soil low in organic matter. Olive trees are better adapted to poorer quality soils than other fruit trees. Little water is needed to irrigate olive trees after they are established.

## 15. *Ceiba insignis* – white floss silk tree

**Characteristics:** A large, fast-growing tree that ascends heights of up to 230 feet. It thorns along its bottle-shaped trunk and branches. The green trunk is photosynthetic. It is native to the tropical forests of South America where it is known as the National Tree of Guatemala. It is winter deciduous and blooms beautiful large white lily-like flowers in the fall that remain on the tree through January unless damaged by frost.

**Ecological Benefits:** The fiber of the bark is used to make clothes, and the “floss” from the seed capsules of this plant are harvested to make pillows, life vests and insulation.

**Desert Adaptation:** The thorns on the silk floss tree are meant to deter predators from scaling the tree. Thorns on the tree are also thought to act as a drip irrigation system, dew catches on the thorns and then condenses into water and drips into the soil below.

**Cultivation:** The silk floss tree prefers full sun and needs little irrigation except during the dry months for better growth. *C. insignis* is tolerant of a variety of soil types. *C. insignis* is an eye-catching ornamental to bring in dispersed shade in a landscape that also has a low water usage.



## 16. *Quercus suber* – cork oak



**Characteristics:** A slow growing evergreen tree with a spreading open crown that reaches a height of up to 60 feet. It has thick trunk and corky bark that provides insulation for the phloem and vascular cells. The cork layer can be removed every 9 to 12 years and is used commercially as cork. These trees can live up to 200 years. The individual located here, just south of the Engineering building, is the oldest one on campus.

**Ecological Benefits:** Quercus spp. are keystone species that provide excellent shelter and food for a variety of animals, birds, insects, and microbes.

**Desert Adaptation:** Cork oak trees have roots that reach deep into the soil to help the trees find water in times of drought. Oak trees have large stomata which allow the plant to cool down with evaporative transpiration.

**Cultivation:** The cork oak tolerates partial shade to full sun. *Q. suber* does well in loamy, clay, or sandy soils. *Q. suber* is drought tolerant and has a low water usage. The cork oak is a stunning accent plant in landscaping that also provides shade.

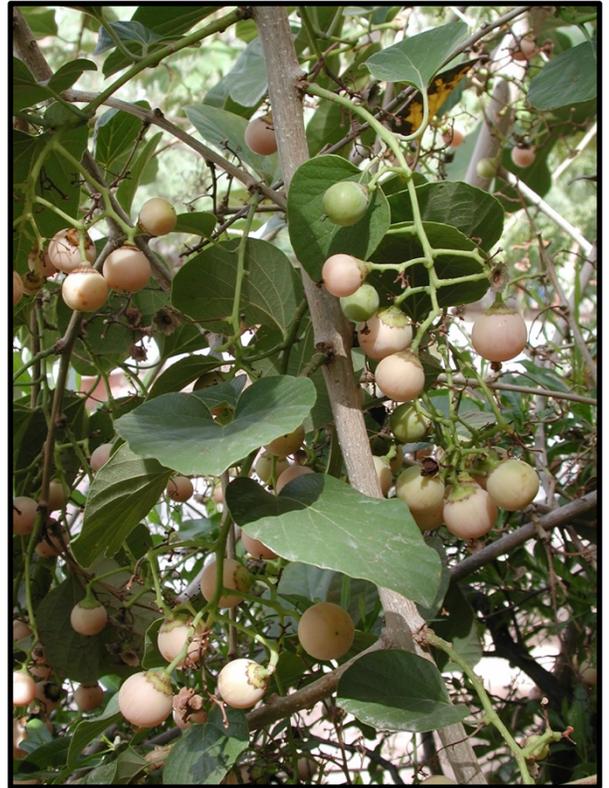
## 17. *Cordia myxa* – Assyrian plum

**Characteristics:** A large evergreen tree with a dense crown that can grow over 30 feet tall. The trunk is straight, with cracked gray bark. The leaves are broad, simple, and green. The small white flowers grow in chain-like clusters. After pollination, the female flowers will develop into clusters of sweet pale pink to brown fruit. The color of the fruit gets darker as the fruit ripens.

**Ecological Benefits:** The fruit is sweet and edible for both humans and wildlife alike. It is also planted to prevent soil erosion.

**Desert Adaptation:** Particularly suited for arid and semi-arid areas, *C. myxa* has wide spreading roots to obtain groundwater in times of drought.

**Cultivation:** *C. myxa* tolerates partial shade to full sun and is drought tolerant. The tree does well in a variety of soil types.



## 18. *Parkinsonia florida* – blue palo verde



**Characteristics:** This Sonoran Desert native is a small to medium-sized, fast-growing tree, with a loose, spreading crown. It grows to 25 feet tall. The trunk and stems are blue green and photosynthetic. The branches have spines. It has small, blue green, bipinnately compound leaves, which are typically absent during the dry season. In spring, it produces flowers of bright golden yellow. The flowers are showy, and typically cover the entire canopy of the tree.

**Ecological Benefits:** Flowers are rich in nectar and attract hummingbirds, bees, and many other insects. The fruit is a source of food for animals, insects, and birds.

**Desert Adaptation:** *P. florida* loses its leaves during dry and hot months to prevent water loss through transpiration. With green bark, they can continue photosynthesis when the foliage drops to continue the supply of nutrients and energy. The roots of *P. florida* spread wide to seek out water sources deep within the ground. The canopy of palo verdes provides shade and protection to young cacti.

**Cultivation:** *P. florida* requires full sun. The tree tolerates medium to dry sandy or loamy well-drained soils. *P. florida* is drought tolerant once established with low water needs. This tree has landscape value as a patio plant due to its shade and beautiful flowers.

## Want more information regarding the plants featured in this tour?

*To learn more about these plants, including cultivation requirements, natural history, and their location on the main University of Arizona campus grounds:*

1. Go to <http://arboretum.arizona.edu/>
2. Click the "Find Trees & Tour" tab.
3. On the drop down menu choose "GIS Map"
4. Once map is open click on magnifying glass and search for whatever tree you are interested in!

## Interested in learning more about Water Harvesting?

Check out the [Dunbar Spring Neighborhood Tour](#), the work of water harvesting expert Brad Lancaster, and the [Dunbar Spring Neighborhood Foresters](#).