



The Arizona  
Native Plant  
Society

## In this Issue:

### Arizona Ethnobotany

- 1 The Obscure Lives of Ancient Crops... and Why They Matter
- 4 Clyde Peshlakai and the Wupatki Herbarium
- 7 Diné Bih Naniseh Bah Haneeh: Navajo Ethnobotanical Teachings
- 11 Plants, Bringing Power and Life to the People: A Decade of the Hualapai Ethnobotany Youth Project
- 14 Madrean Discovery Expedition to the Sierra el Tigre
- 17 Interpreting Ethnobotany at Mission Garden, Tucson, Arizona, Part 1
- 20 Pricklypear Cactus (*Opuntia* ssp.) Near Prehistoric Human Habitations at Walnut Canyon National Monument and Elden Pueblo Archaeological Site, Arizona
- 22 Sierra la Mariquita — A New Sky Island Reserve

### & Our Regular Features

- 2 President's Note
- 6 Spotlight on a Native Plant
- 10 Book Review
- 13 Who's Who at AZNPS

©2015 Arizona Native Plant Society.  
All rights reserved.

# The Plant Press

THE ARIZONA NATIVE PLANT SOCIETY

Volume 38, Number 2

Winter 2015



Devil's Claw (*Proboscidea parviflora*). Photo courtesy Doug Ripley.

## The Obscure Lives of Ancient Crops... and Why They Matter

by Paul Minnis<sup>1</sup>

What comes to mind when we think of the ancient Southwest — picturesque ruins, beautiful pottery, or well-crafted turquoise artifacts? What about little fragments of burned plant remains, microscopic pollen, undistinguished rocks burned in fires lit hundreds of years ago, or an odd plant species surviving in a remote location? The latter groups, too often viewed as ugly and nearly invisible, can provide important clues about the pre-Hispanic Southwest and northern Mexico and may provide useful information for our common future.

One of the major transformations of the human condition was the development of farming — the co-evolution of plants and humans. Upwards of 3,000 species have been cultivated all over the world during the past many millennia. Agriculture is now the foundation of all but a few human societies. It is alarming that humanity is now dependent on what is literally a handful of plant crops such as wheat, maize, soybeans, rice, cassava, potato, yams, plantain, and sorghum. To ensure food security for the future, scholars, agronomists, institutions, and gardeners are gathering and preserving as much crop germplasm as possible, including remote and little-known crops as well as varieties of the more important crops. Native

*continued next page*

<sup>1</sup>Professor Emeritus, University of Oklahoma, Norman, Oklahoma; minnis@ou.edu

# President's Note

by Douglas Ripley [jdougripley@gmail.com](mailto:jdougripley@gmail.com)

To the members of the Arizona Native Plant Society I extend best wishes for the New Year and my thanks for your support, encouragement, and contributions to the Society in 2015. I am also grateful for the invaluable contributions of the members of the Board of Directors and volunteers such as Shelley Silva of the Flagstaff Chapter who recently assumed duties as the *Happenings* editor and Cass Blodgett of the Phoenix Chapter for his contributions as the AZNPS webmaster. Thanks are also due to Pat Sanchez, our new administrative assistant, who has been doing a superb job managing the many administrative details of the Society.

In the past year the AZNPS continued to work diligently to discover Arizona's native flora, promote its appreciation, and conserve its unique natural habitats. We look forward in the New Year to continuing and expanding our programs in support of those goals. Among the activities you can look forward to in 2016 are interesting monthly meetings and field trips sponsored by our six individual chapters, Citizen Science activities through Plant Atlas Project of Arizona (PAPAZ) programs, participation in native plant habitat restoration projects, opportunities to receive research and publication grants from several chapters and, new in 2016, State-sponsored research grants. Other continuing activities will include the annual three day field trip and workshop held in the Chiricahua Mountains (13-15 August, 2016).

Our annual 2016 Arizona Botany Conference will be held in conjunction with the Tri-National Sonoran Desert Symposium on 7-10 March 2016 in Ajo, Arizona. Organizations and individuals from the United States, the Tohono O'odham Nation, and Mexico will be represented at the symposium. I especially hope you will be able to attend this conference, the theme for which is: "Plant Ecology of the Sonoran Desert: Past, Present and Future." In addition to the AZNPS meeting, which will be held on Tuesday, March 8, 2016, attendees will be able to attend concurrent Symposium presentations and poster sessions on a wide array of natural and cultural resources topics. Please consult the AZNPS website for more information on this important symposium. A number of interesting field trips will be offered on the first day of the symposium, Monday, March 7, 2016.

In this issue of *The Plant Press* we feature papers on some of the interesting presentations from the Botany 2015 Conference held in April in Flagstaff. The theme of the conference focused on Arizona ethnobotany so these papers provide various perspectives on human-related native plant subjects. But we have also included two papers by Tom Van Devender and Ana L. Reina-Guerrero that report on their exciting plant exploration expeditions earlier this year to the Sierra el Tigre and the Sierra la Mariquita, two diverse Madrean Archipelago Sky Islands in Sonora, Mexico.



# Obscure Lives of Ancient Crops

*continued*

Seeds/SEARCH ([www.nativeseeds.org](http://www.nativeseeds.org)) is one well-known example in Arizona.

In our concern for collecting and preserving the diversity of all crops, plant explorers have combed the world to outpace the extinction of little-known cultivated plants. An unknown, but probably substantial number of crops, have become extinct in the distant past and were lost to humanity...or have they? The archaeological record, such as those little burned seeds and long-abandoned ancient fields, may contribute to sustaining our future by revealing ancient crops.

Here is where the Southwest United States and Northwestern Mexico (SW/NW) may contribute to uncovering previously unknown crops. Just as the natural environments of the Southwest are diverse and complex, so too the ancient communities living in the region for the past ten millennia or more represent a complex mosaic. Each culture developed its own way of living and I think we can learn from the extensive range of their experiments, efforts, and experiments.

It is true that the Three Sisters—maize, beans, and squash—have been especially important for indigenous farmers, both as food and as essential cultural partners. These plants were first developed farther south in Mesoamerica, so those interested in the origin of crops have not paid as much attention to the SW/NW as major centers of domestication. However, a closer look at the ethnobotany of the SW/NW documents a variety of local crops. Some still exist in small areas but their histories of cultivation are poorly known. These include devil's claw (*Proboscidea parviflora*), panic grass (*Panicum sonorum*), foxtail millet (*Setaria italica*), crowfoot grass (*Dactyloctenium aegyptium*), and curly dock (*Rumex crispus*), while others have become extinct as crops. (Bohrer 1987; Castetter and Bell 1951; Fish 1984; Felger 1979; Ford 1981; Nabhan and De Wet 1986; Yarnell 1977). Two Arizona examples stand out: agave/mescal/century plant (*Agave* spp.) and little barley (*Hordeum pusillum*).

Agave is an important crop in Mexico and native agaves have been an important food in parts of the SW/NW (Fish 2003). A few decades ago, pioneer research in southern and central Arizona documented the substantial cultivation of agave (Fish and Fish 2014). Special tools for processing agave, roasting pits, extensive rock mulch fields, and the actual burned remains of agave paint a picture of the importance of agave to the ancient Hohokam. Furthermore, stands of *Agave murpheyi* and *A. delamateri* have been best interpreted as small relict populations of cultivated agaves hanging on long after

*continued next page*



Crowsfoot grass (*Dactyloctenium aegyptium*). Photo courtesy Forest and Kim Starr

## Obscure Lives of Ancient Crops *continued*

human tending ended. Ongoing research by Wendy Hodgson and collaborators suggests that many more species of ancient cultivated agaves occur in a wide range of Arizona locales (Parker et al. 2010).

The second example is little barley (*Hordeum pusillum*), a native plant in the same genus as cultivated barley (Adams 2014). The discovery of naked grains (seeds not loosely attached to their papery covers and very unusual in native populations but common in cultivated grains), led to the argument that little barley was cultivated. It has been found in a number of sites in the Hohokam area, and one grain has been identified from a site near Paquimé/Casas Grandes in Northwest Chihuahua. Interestingly, naked little barley remains have also been recovered from archaeological sites in Eastern North America.

Agave and little barley are two obvious examples from the SW/NW of ancient domesticated crops known from the archaeological record. There may well be many more waiting to be discovered.

Prehistoric ethnobotanical studies in Eastern North America may provide a model. Despite the common impression that maize was the main crop for the indigenous peoples in Eastern North America since the beginning of time, it was not until late prehistory, around A.D. 900, that it became the primary crop. For thousands of years before that, whole suites of local plants were domesticated and were the focus of Native American farming. This agricultural complex included a hard-shelled squash, a knotweed, sunflower, marshelder, Jerusalem artichoke, and perhaps the giant ragweed. Most of these plants became extinct and were unknown until they were documented by intensive archaeological research. If the

situation in the SW/NW is similar, we may find even more ancient and unknown crops.

The discovery of ancient crops may have value beyond simply understanding and appreciating the SW/NW's fascinating pre-Hispanic past. Could they be re-domesticated? We know they can be domesticated since they once were. Perhaps genes that expressed characteristics useful to the ancient farmers can be used in modern gene manipulations? We don't know, but we do know that discovery of ancient crops expands the world's list of cultivated plants and provides resources we did not know existed. Extinction may not always be forever.



For more information, please permit me a shameless plug for a recent edited volume, *New Lives for Ancient and Extinct Crops*, University of Arizona Press, 2014.

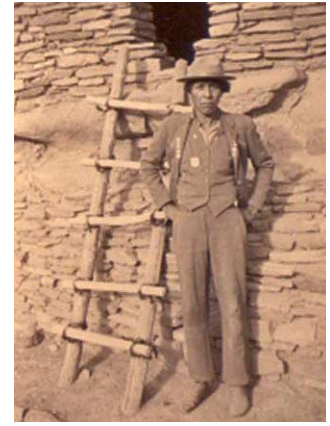
### References Cited

- Adam, Karen R. 2014. Little barley grass (*Hordeum pusillum* Nutt.): A pre-Hispanic New World domesticate lost to history. *In: New lives for ancient and extinct crops*, edited by P. Minnis, pp. 139-179. University of Arizona Press, Tucson.
- Bohrer, Vorsila L. 1987. Recently recognized crops and encouraged plants among the Hohokam. *Kiva* 56:227-235.
- Castetter, Edward F., and Willis M. Bell. 1951. Yuma Indian agriculture: Primitive subsistence in the Lower Colorado and Gila Rivers. University of New Mexico Press, Albuquerque.
- Felger, Richard S. 1979. Ancient crops for the Twenty-First Century. *In: New agricultural crops*, edited by G. Ritchie, pp. 50-59. Westview Press, Boulder.
- Fish, Suzanne K. 2003. Corn, crops, and cultivation in the North American Southwest. *In: People and plants in ancient western North America*, edited by P. Minnis, pp. 115-166. Smithsonian Press, Washington, D.C.
- Fish, Suzanne K., and Paul R. Fish. 2014. Agave (*Agave* spp.): A crop lost and found in the US-Mexico borderlands. *In: New lives for ancient and extinct crops*, edited by P. Minnis, pp. 102-138. University of Arizona Press, Tucson.
- Ford, Richard I. 1981. Gardening and farming before A.D. 1000: Patterns of prehistoric cultivation north of Mexico. *Journal of Ethnobiology* 1:6-27.
- Nabhan, Gary P., and J.M.J. de Wet. 1984. *Panicum sonorum* in Sonoran Desert agriculture. *Economic Botany* 38:65-82.
- Parker, Kathleen C., D.W.W.T. Trapell, J.L. Hamrick, W. Hodgson, and A.J. Parker. 2010. Inferring ancient agave cultivation practices from contemporary genetic patterns. *Molecular Ecology* 19:1622-1637.
- Smith, Bruce D., and C. Wesley Cowan. 2003. Domesticated crop plants and the evolution of food production economies in Eastern North America. *In: People and plants in ancient Eastern North America*, edited by P. Minnis, pp. 126-171. Smithsonian Press, Washington, D.C.
- Yarnell, Richard A. 1977. Native plant husbandry north of Mexico. *In: The origin of agriculture*, edited by C. Reed, pp. 863-875. Moulton, The Hague.



I wander there where my people dwell  
 I wander there at the house of red earth and rocks  
 I wander within the house made of long life  
 I wander within the house made of beauty  
 I wander along the path of long life and happiness  
 I shall go on wandering the trail in beauty

*Navajo Blessing Way Song*



Left Round leaf dune broom (*Errazurizia rotundata*). Photo courtesy Daniela Roth. Above Clyde Peshlakai as acting custodian at Wupatki National Monument, circa 1938.

## Clyde Peshlakai and the Wupatki Herbarium *by Phyllis Hogan<sup>1</sup>*

The Little Colorado River (LCR) begins its journey on Mt. Baldy near the town of Greer, Arizona, flowing 350 miles through six vegetative zones before reaching its final destination in the Grand Canyon. The Sipapu, emergence place of certain ancestral Hopi clans, is located at this confluence of the LCR and the Colorado River.

Over 4,000 archeological sites can be found inside the LCR corridor, along with a network of pre-Columbian trails linking modern day Zuni Pueblo, New Mexico, with the Hopi villages of Black Mesa. Rare and endangered plants, culturally significant to Hopi and western Navajo herbalists, grow in association with these sites. Among these special status plants, Peebles' blue star (*Amsonia peeblesii*) and round leaf dune broom (*Errazurizia rotundata*) have held particular interest for me.

Situated in the LCR corridor and located 35 miles NW of Flagstaff, Wupatki National Monument is notable for a significant archaeological city found within its boundaries. The Monument varies in elevation from 4,000 to 5,700 feet. Part of an ecoregion of dazzling diversity, it contains three major plant communities: pinion-juniper grassland (37%), juniper-grassland (9%), and cold desert shrub (54%) (Hogan and Huisinga 1999).

Archeologists have surveyed 2,668 sites within its 35,254 acres. Built by the Hisatsinom (ancestors of the present day Hopi) in 1100 A.D. and occupied by them for 200 years, Wupatki is well known for spectacular 950-year-old pueblos. However, little is known about the Navajo who lived in the Wupatki basin for nearly 300 years.

Around 1700 A.D., several Navajo families migrated into Wupatki Basin. While in residence, they seasonally hunted and gathered over an immense area between Grey Mountain to the west and Black Mesa, nearly 100 miles to the northeast. In 1864, the United States Army forced thousands of Navajos from their homes in the Four Corners area and marched them hundreds of miles to a reservation near Fort Sumner in eastern New Mexico. One young man, Peshlakai Etsidi, was among the captured Navajos sent on the Long Walk. The Navajos suffered in captivity for four years. Many died from starvation and unsanitary conditions. Finally they were released and allowed to return to the lands they called home. Peshlakai Etsidi and his wife Baa, with meager rations, slowly made their way back to resettle in the LCR valley and the great expansive grasslands of the Wupatki Basin. He and his family began to rebuild their livestock and agricultural fields, having lost all their possessions during the incarceration. By the age of 50, Peshlakai Etsidi was a prominent leader and spokesman for the Wupatki Navajo.

In the decades following the resettlement, events and pressures that the Navajos could not control drastically reduced their presence in Wupatki. By the early 1930s, only four extended Navajo family groups were still living in the Wupatki Basin. All four families were related to Peshlakai Etsidi. When Peshlakai Etsidi died in 1939, his son, Clyde Peshlakai became the spokesman for the Wupatki Navajo. Clyde had an outgoing personality and a moderate command of the English language. He was also the last remaining herbalist of his clan and a legendary Hatalii, a medicine man whose specialty was the Wind Way Chant. Since their healing art includes reciting lengthy song ceremonials, Navajo medicine men are called Hatalii, or singers.

<sup>1</sup>Winter Sun Trading Company, Flagstaff, AZ; wintersn@mindspring.com

*continued next page*

## Clyde Peshlakai *continued*

In Navajo tradition, the Goddess of Vegetation, Asdzaa Nadleh, is the spiritual mother who instructed them to “Walk in Beauty.” All Navajo herbalists accept her teachings as the foundation of their relationship with the plant medicines. As an herbalist, Clyde Peshlakai was considered a liaison between the world of ordinary people and the world of the Diyin Dine’é, the Holy people.

When scientific investigation of Wupatki Pueblo began, Clyde shared his vast knowledge of the natural and cultural features with Park custodians, becoming an integral part of the National Park Service operation. In 1938, he conducted the first ethnobotanical survey of Wupatki, assisting the pioneering Southwest ethnobotanist Alfred Frank Whiting. This plant collection formed the basis of the Wupatki National Monument Herbarium.

As the Wupatki collections were expanded over the years, the Peshlakai plants were shuffled away into obscurity. On a bright and sunny March afternoon in 1992, while curating the Wupatki Herbarium, I discovered the 43-plant Peshlakai ethnobotany collection sequestered within the National Park Service archives (Hogan and Huisinga 2000a).

These 43 voucher specimens are the first and only documentation of the plants Clyde Peshlakai used with the Wupatki Navajo. It is a valuable contribution to the ethnobotanical record, and I feel extremely fortunate to have uncovered the misplaced collection. Although I didn’t find a specimen of round leaf dune broom, I did find Peebles’ blue star. As related to Alfred Whiting by Clyde Peshlakai, the roots of Peebles’ blue star were ground up into a powder and boiled. This concoction was used to alleviate the itch of chicken pox (Hogan and Huisinga 2000b).

A few other plants from Clyde’s repertoire include:

**Sacred Datura** (*Datura wrightii*): Leaves applied topically for external injuries, broken bones, and open wounds.

**Four o’clock** (*Mirabilis multiflora*): Roots boiled and used as an antiseptic wash after castration of sheep. A tea made from the roots was also used for stomach ailments.

**Tetradlea** (*Tetradlea coulteri*): Herb placed in cold water; drunk to cure headaches.



### References Cited

Hogan, P. and K. Huisinga. 1999. An annotated catalog of the native and naturalized flora of Arizona. Arizona Ethnobotanical Research Association, Flagstaff, Arizona.



Peebles’ blue star (*Amsonia peeblesii*). Photo courtesy Daniela Roth.

Hogan, P. and K. Huisinga, 2000a. The Wupatki Herbarium Clyde Peshlakai Ethnobotanical Collection and Sunset Crater Herbarium. Flagstaff Area National Monuments, U.S. National Park Service.

Huisinga, K. and P. Hogan. 2000b. Special status plants of the Flagstaff area and National Monuments. Final Report. Flagstaff Area National Monuments, U.S. National Park Service.



How can I help the Arizona Native Plant Society?

**Donate a car!**

Your donation is tax-deductible and will help us in our mission to promote Arizona native plants and their habitat. Visit our website or call 855.500.RIDE for more information.



Photos courtesy Bob Herrman

## SPOTLIGHT ON A NATIVE PLANT *by Bob Herrmann, Cochise Chapter, Arizona Native Plant Society* **Desert Spoon, Sotol (*Dasyilirion wheeleri*)**

The Sotol or Desert Spoon, recently classified in the Asparagus Family (Asparagaceae), is an iconic native species of southern Arizona, southern New Mexico, west Texas, as well as Chihuahua and Sonora, Mexico, where it occurs at elevations ranging from of 3,000 to 6,000 feet. The plant is dioecious and blooms in the spring and summer. The male flowers are straw colored and the female flowers are red or green. Flowering male plants outnumber the female plants at least four to one. Unlike the agaves, this plant does not die after flowering and will flower again intermittently for years. The single-seeded fruit is an oval, dry capsule approximately one quarter of an inch in diameter.

The plant's gray-green leaves grow up to 40 inches long and form a dense rosette up to 6 feet in diameter. The long narrow leaves have margins with sharp, curved prickles that form a serrated edge and point toward the distal end. The overlapping spoon-shaped leaf bases are the basis for the plant's common English name. After 7 to 10 years' growth, a rapidly growing inflorescence may be produced from the center of the plant and grow to a height of 7 to 15 feet, borne on long woody stalks one to two inches in diameter. Typically only one inflorescence is produced per plant but some plants can produce 2 to 5.

The Desert Spoon has been used by humans for thousands of years. The roasted heart of the plant and the leaf bases were vital food sources for Native Americans. The tough, durable fibers of the leaves were used for

making sandals, mats, baskets, and rope. Early Mexican settlers used the woody inflorescence stalk for construction and fuel. But perhaps the most interesting use of the plant has been in the production of sotol, an alcoholic beverage distilled from the juice of the roasted hearts, which is still produced today in Mexico. It is drought-tolerant and often planted in landscapes as a water-wise plant.



The genus *Dasyilirion* was described in 1838 by the German botanist Joseph Gerhard Zuccarini. The name is derived from the Greek: *dasy-* (thick or dense) and *lirion* (white lily), alluding to the compact arrangement of flowers in the inflorescence. *Dasyilirion wheeleri* was named for Lt. George M. Wheeler (1842-1905), a U.S. Military Academy graduate and member of the U.S. Army's Corps of Topographical Engineers. The origin of *sotol*, the Spanish common name, is obscure but possibly is derived from an ancient Aztec reference to a palm tree.

This year the sotol's bloom in southern Arizona was so spectacular that it excited this plant photographer into a shutter-button frenzy, which caused a digital storage overload. Imagine having hundreds of these tall beautiful blooming plants to photograph with the monsoon clouds and the Dragoon Mountains of Cochise County in the background. It doesn't get much better than that.





From left Golden Mariposa (*Calochortus aureus*). Navajo Tea (*Thelesperma megapotamicum*). Photos courtesy the author.

# Diné Bih Naniseh Bah Haneeh: Navajo Ethnobotanical Teachings *by Arnold Clifford<sup>1</sup>*

## Navajo Culturally Significant Plant Species

Navajo people have lived within the physiographic boundaries of the Colorado Plateau for thousands of years before the arrival of the first European settlers. Their extensive understanding of plants and uses of plants were derived from knowledge passed down through Divine intervention of the Navajo Holy People into the lives of the early predecessors of the Navajo people. As a result of species range expansion, travel during herbal pilgrimages, experimentation, and trial and error, other new plant species were incorporated within the vast knowledge of plants. Various Navajo deities have also instructed the people on uses of native plants and the importance of plants for the well being of the Navajo people.

## Navajo Ethnobotany

Plants are sacred, alive, and dynamic, and Navajos refer to them as “Holy Plant People.” Knowledge of plant use is interwoven with traditional religious contexts, cultural oral tales, and history. Navajos have their own plant classification systems, just as the Europeans have in the sciences of systematic botany and plant taxonomy. Navajo herbalists recognize different individual plant species, including grouping together closely related species by generic Navajo names, similar in some respects to Western botanical scientists’ use of Latinized binomial scientific names for individual plant species. Navajo plant names are very descriptive names that may refer to the morphology of the plant, leaf color, medicinal connotations, ceremonial associations, tobacco types, and animals based on their morphological similarities.

## Navajo Philosophy Relating to Plants

In the process of developing intimate relations with all plants, Navajo have drawn similarities between plants and their own bodies. Teachings include how plants are decorations, garlands, and jewelry of Changing Woman, Mother Earth. Plants also play roles in the human anatomy where our blood, arteries and veins were modeled after the divaricated, branching nature of plant roots. That is how our arteries, and veins began branching out of our hearts, the center of the body. The arteries branching into smaller vessels cover the whole human body, providing warmth, oxygen, and other life-giving minerals and elements to the body. Plant roots function in a similar way as they break down and draw up vital nutrients, minerals, and elements from the soil to distribute into all parts of the plant, to give plants life. The Navajo “Holy Plant People” are treated with respect, holiness, and reverence. When plants are collected for ceremonial use, or for medicinal healing properties, Navajo herbalists talk to the plants they need. Herbalists introduce themselves, stating their reason for collecting each plant, describing the ailment of patients in need of treatment, and calling out sacred plant names. Herbalists offer prayers and make offerings to plants that are gathered for use. This ensures the curative healing powers of the plant will be invoked, as well as extends protection to the herbalist gathering the plants.

## Navajo Classification of Plants

Navajos have several classifications of plants. One simple Navajo classification is based on their intended use in ceremonies, as tobaccos, as food items, or in everyday utilitarian usage. Navajo plant classification is a primitive, systematic approach to better understanding the flora of the

<sup>1</sup>Navajo Nation; aclifford65@gmail.com

*continued next page*



From left Morning Lily (*Oenothera caespitosa* var. *navajoensis*), Broadleaf Cattail (*Typha latifolia*), Clifford's Diné Star (*Aliciella cliffordii*). Photos courtesy the author.

## Diné Bih Naniseh Bah Haneeh *continued*

diversified habitats the Navajo people occupied. Classifying also provided a better understanding of different groups of closely related plant species. Navajo plant classification was partly based on floral morphology or physical similarities of natural families. One basic Navajo botanical classification of plants includes the identification of Life Way, Evil Way, and Beauty Way plant groups. These plants are associated with various ceremonial rites. Most plants have more than one use and can be classified under several different categories. A basic way Navajos classify plants is based on its uses: edible plants, medicinal plants, ceremonial plants, tobacco plants, utilitarian plants, dye plants, and plants for protection and for talismans.

### Edible Plants

Native plant species are utilized for supplemental food, food additives, seasoning, spices, and sweet treats from flower nectars. Hundreds of plants are used as foods, with different plant parts such as roots, stems, leaves, flower petals, flower nectar, assorted berries, tasty fruits, and grass seeds all providing valuable nutrients and sustenance for surviving in the desert wilderness environment.

### Medicinal Plants

Medicinal plants constitute a large group known as the Life Way medicines. These plants are intended to sustain good health and mental wellness and they help to improve the lives of Navajos who reverently partake of them. Life Way plant knowledge was acquired from supernatural events involving the Holy People. The body of Rainboy was dismembered by lightning bolts sent by Big Thunder as punishment for being promiscuous. A restoration rite was held for Rainboy by the Holy People. Before the rite, insects, animals, and other holy deities were instructed to gather Rainboy's dismembered remains. Rainboy's remains were collected with different herbs that grew nearby. The dismembered remains and sacred herbs were brought back together, so a restoration rite could be performed. The holy plants were applied to different body parts of Rainboy, and each body part began to heal and was

restored to health. From that time forward, these plants were considered plants that would heal that particular part of the human anatomy. The healing powers of these holy plants were "life-giving" and therefore, considered Life Way medicinal plants. There are about three hundred Life Way medicines available for Navajos to rely on for curative remedies.

### Ceremonial Plants

Numerous species of trees, shrubs, grasses, and flowering, herbaceous forbs are used for different aspects and rites of Navajo ceremonials and chants. Plants designated for ceremonial use are employed to make ceremonial implements and paraphernalia, such as prayer sticks, prayer wands, cigarettes for offerings to various deities, ceremonial masks, dry paint material, incense for fumigants, and for medicines administered during ceremonial rituals. Plants used in ceremonial rites are considered sacred and are therefore reserved for chanters and medicine people who perform these chants.

### Tobacco Plants

Tobacco plants are utilized reverently. Most tobacco plants are used as offerings for various deities and sacred ceremonial animals. Tobaccos are smoked during ceremonial rites, ritual baths, sweat lodge cleansing rites, as well as during personal meditation and prayer sessions. Tobacco smoke helps to clear the mind and blesses the body and soul. Tobacco smoke also carries a person's prayer to the holy deities. Tobaccos utilized in Navajo society are not for pleasure, relaxation, or for recreational smoking.

### Utilitarian Plants

Many plants are used to make everyday utensils and household objects for domestic use, such as hair brushes for grooming, floor brooms, kitchen utensils, digging tools, farming tools, weaving looms, weaving tools, carding combs and spinning spindles, weaving dowels, bows, and arrows. Trees and larger shrubs are prepared for hogans, shade houses, sheep corrals, sweat lodges, fencing material, and firewood for heating, cooking, and ceremonial fires.

*continued next page*



## Diné Bih Naniseh Bah Haneeh *continued*

### Native Dye Plants

Numerous plants are used by Navajo weavers for dyeing wool. Various plant parts provide natural dyes. The bark of some shrubs and trees yield red, reddish brown, and brown dye hues. The roots of canaigre dock can produce yellow, yellow-orange, and yellow-brown colors. Flowers and seeds of many plant species are also used to create many unique dye hues. Plants are normally boiled in an acidic solution containing a mordant, which helps the dye color to turn a richer hue and also helps the dye to fix to the wool fibers.

### Protection and Talisman Plants

These are specialized plants used to ward off evil influences and also for the protection of individuals. Most of these plants are known by very few people, some are known only by certain clan or family groups. These plants are carried on a person for protection while they are at public functions where many people are in attendance, such as fairs, ceremonial gatherings, rodeos, and other public gatherings.

### The Navajo Gods of Botany: The Humpback Gods

The Navajo Gods of Botany, **Ah Ghaah Dah Hiskid Dih** (Humpback Gods) are fertility gods and are of the utmost importance to the Navajo ceremonial system. Humpback Gods are sacred, powerful deities of native plants and seasonal weather, especially precipitation. They include the god of harvest, of abundance, and the fruits of the fields as well as a polymorphic deity incorporating desert bighorn and Rocky Mountain bighorn sheep, holy people, and humans. They are responsible for revegetation and reseeding the Earth with grasses, flowering plants, shrubs, and trees. In the process of reseeding, they bless each seed with all kinds of precipitation. During the coldest part of winter, when extensive stands of fog cover the desert southwest, the Humpback Gods come out in large numbers, walking amid fog, each burdened and hunched over, carrying bags of seeds and precipitation. The humpbacks utter “Ah Woo” as they walk about in the cold, frosty fog, often stopping to shake their backs to release native plant seeds and precipitation. They do circular dances to poke each seed into the ground with their planting stick-cane. During the spring and early summer, the whole southwest is blessed with new flowering plants, grasses, and shrubs.

The Humpback God wears an inverted Navajo basket with an opening at the top to help secure it to the top of the impersonator's head. The basket is painted black with a white zigzag all the way around the rim. The black represents night time clouds, with the white zigzag depicting lightning strikes between adjacent dark clouds. Standing upright around the rim of the baskets are numerous red flicker or red woodpecker feathers. The feathers represent sunbeams shining through clouds immediately after rain. On top of the basket are two

bluish horns that represent dark clouds before and during rain. The whole head piece is a crown of thunder, lightning, and rain. Along the back is a rainbow with feathers attached along the crest. The feathers indicate sun rays radiating from the eastern horizon, and the rainbow indicates the presence of holy people and the blessings of rain. Under the rainbow is a dark, black sack with white bars. The hump contains mist, dew, frost, female rain, male rain, snow, all aspects of precipitation, and vegetation seeds of all types. Humpback Gods carry and walk with planting-stick canes.



Navajo Humpback God.  
Courtesy Zonnie Gilmore.

### Author Background

These stories of the Navajo Gods of Botany, **Ah Ghaah Dah Hiskid Dih** (Humpback God), the Navajo classification system, the sacred Navajo plant names and its uses were bestowed and blessed upon me from my late maternal grandmother Sarah Charley of Beclahbito, New Mexico. This ancient, sacred, Navajo ethnobotanical knowledge comes from seven or more generations of my family. Sarah was taught by her late mother Irene Bennallie of Beclahbito, New Mexico. Both Sarah and Irene were instructed by Sarah's paternal grandfather, and both collected ceremonial herbs, medicines, and tobaccos for him. Sarah's grandfather was **Tsao Lao Alth Tsoii** (police slender, or slim police), who practiced the Shooting Way, Wind Way, and Beauty Way chants. He also specialized in Navajo herbal and medicinal application. I possess a small portion of this once vast family knowledge, and I feel it is time to pass this knowledge onto other Navajos. This knowledge, I believe, belongs to the collective Navajo people as a whole. It belongs to Navajos willing to learn, willing to keeping an open heart to our traditions, our culture and our religious beliefs. If we horde such sacred knowledge, no one benefits; it all becomes lost. We have already lost over half of our ceremonial systems, including unmatched plant knowledge acquired by our ancestors who never had a chance to pass on their infinite knowledge of all aspects of Navajo teachings.

### Examples of Navajo Plant Uses

Navajos still utilize 1,500 or more native plant species; however, plant knowledge is declining. In the past Navajos had a vault of plant knowledge that included more than 3,000 to 4,000 plant species occurring within the Colorado Plateau. Six different plants are presented here to give an example of the diversity of plants available.

*Aliciella cliffordii* (Clifford's Diné Star, or Clifford's Gilia), a member of Beauty Way tobacco. They are essential plants required in a mixture of several plants that constitute the Beauty Way tobacco mixture. Different species of the genus

*continued next page*

BOOK REVIEW by Jackie Taylor, Arizona Native Plant Society, Tucson Chapter

## Edible and Useful Plants of the Southwest Texas, New Mexico, and Arizona

by Delena Tull

Revised edition 2013. University of Texas Press. 500 pp. 62 color photos, 82 b&w drawings. \$29.95 paperback.

*Edible and Useful Plants of the Southwest* is a comprehensive resource for just about all uses of native plants. Delena Tull's extensive instructions and explanations include: plant dyes, plants in industry, using plant fibers and textiles, making baskets, culinary uses, teas and spices, and much more. This is a wonderfully helpful guide for the reader to learn the many facets of native plants. There is a general reference to mushrooms as well as a large section about poisonous and harmful plants, including houseplants. A section on berries and fleshy fruits is full of recipes as well as useful warnings.

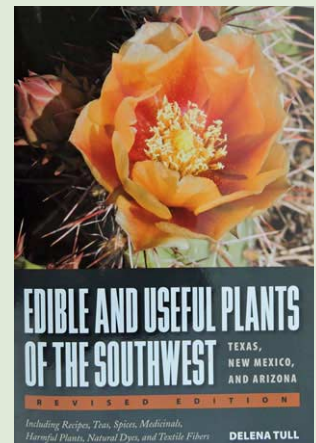
The author includes a helpful short section explaining local seasonal allergies. Allergies are a common and year-round complaint in Tucson, and she states: "Today Tucson has a pollen count three times higher than the national average."

One of my favorites, the plant dye chapter, is inspiring and very educational. There are many enjoyable, interesting, historical, and traditional references throughout the book. There are also many modern scientific references, which could prove useful to any reader wishing to delve deeper into the topic.

The individual plants are listed by family, which isn't the most user-friendly for the non-botanist, but the short explanations of

characteristics and uses are thorough. This is definitely not a field guide, nor is it very useful for any identification purposes. The author makes this clear in the introduction and refers readers to the Arizona Native Plant Society as well as the Texas and New Mexico Native Plant Societies for further lists of publications useful for identification of native plants. Readers will definitely need to know the identity of their plants or have a good source for plant material. Thankfully, the author mentions ethics of wildcrafting (the harvesting of wild plants in their natural habitat).

I would have appreciated more color photos, sketches, and illustrations throughout the book. However, I learned so many creative ways to use and understand plants from this helpful guide that I am delighted to add it to my library of plant publications as I'm sure it will come in handy in the future!



### Diné Bih Naniseh Bah Haneeh *continued*

*Aliciella* are called by the generic Navajo name **Hozho Nah Toh** (beauty tobacco) and are classified as Beauty Way plants. Clifford's Diné Star is a rare plant known only from the north foothills of the Lukachukai Mountains and the foothills of Mexican Cry Mesa, Arizona. Named after Arnold Clifford of Beclahbito, New Mexico.

*Calochortus aureus* (golden mariposa), a showy yellow-flowered member of the Lily family. The white bulbs below the ground are edible when fresh. They taste similar to peanuts. Its Navajo name is **Alth Chiin Daah**, which means children's food. Found south of Sheep Springs to Window Rock regions.

*Oenothera caespitosa* var. *navajoensis* (morning lily), a plant called **Kleeh Yih Ghaih**, meaning night time turning white, or night bloomer. A plant used as a medicine to heal body sores. Found on weathered, grayish white-colored Mancos Shale surrounding the Shiprock region to the Four Corners. The papery, white flowers are very large.

*Rumex hymenosepalus* (canaigre dock), a plant of sandy places. Easily identified by its large wavy leaves and light reddish

flowering stems. Its large, bunched root tubers are about a foot and half or more below the basal leaves. The tuber roots are boiled to produce various colors of orange-brown to brownish dyes. Thick lower stems are used to make Navajo pie fillings. In some species, the seeds are used medicinally. Its Navajo name, **Chaa Ha Tiin Ni**, refers to darkness dweller.

*Thelesperma megapotamicum* (Navajo tea, greenthread), a plant gathered to make Navajo tea, a mild stimulant, served as a beverage during meals or during social greetings. During illness, Navajo tea helps to reduce fevers, helping the body feel better. Boiling the plant produces different shades of a yellowish-orange dye that is used by weavers to dye sheep wool. **Chiil Ah Whee** (plant coffee) is the Navajo name. Found throughout the desert southwest.

*Typha latifolia* (broadleaf cattail), a multi-use plant growing in wetlands. Its fleshy roots are edible. Its long, broad leaves were used to make mats, skirts, and other useful items. Flower stalks provided ceremonial pollen and the fresh green flower stalks are also edible. When the flower stalks matured and were dry, they were collected for stuffing in pillows, pads, kid's toys and other items. The Navajo name, **Ethel Nigh Teel**, means cattail wide. The generic Navajo name is **Ethel**.





From left Elder instructor Malinda Powskey harvesting the Mesquite bean near Hackberry, AZ. Ethnobotany youth Running Wolf Elder instructor Frank Mapatis with ethnobotany youth Phyna Cook harvesting mescal agave in Peach Springs Canyon on the Hualapai Indian Reservation. *Photos courtesy the author.*

## Plants Bringing Power and Life to the People: *A decade of the Hualapai Ethnobotany Youth Project*

by Carrie Calisay Cannon<sup>1</sup>

People say the desert is a harsh, forsaken place. If you've ever driven Highway 93 between Phoenix and Las Vegas, you may have asked yourself how could anyone survive out here? In August of the year 1940, Hualapai Tribal elder Malinda Powskey was born into the scorching heat of the desert. She was raised here in the Big Sandy River Valley near Wikieup, Arizona, where the Mojave and Sonoran desert regions converge. Early Anglo settlers who arrived in the region may have believed one needs a lot of faith to survive the desert, but the truth is people thrived here. To find out how, one must inquire from the elders of the Tribe. They will tell you, "Every plant has a name, a purpose, and a story."

The ethnobotanical story of the Hualapai Tribe (People of the Tall Pines) begins with the plant knowledge the people have inherited from their grandparents and great grandparents who lived entirely off the land. Hualapai grandchildren and great-grandchildren live in an entirely different modern world now — a 21<sup>st</sup> century millennial world congested with cell phones, text messages, and ipods. The Hualapai Ethnobotany Youth Project, an intergenerational program designed to provide elders with an opportunity to share their plant and land-based knowledge with Hualapai youth, is now in its tenth year.

For a few hours a week, the cell phones, TVs, and text messaging are dialed down, and the focus is brought back to the land—to an ancient knowledge, to a tribal technology that served the Hualapai for hundreds of generations, and

which brought power and life to the people. For the Hualapai people, culture and nature are inextricably linked. It has only been approximately 150 years since members of the Hualapai Tribe were living entirely off the land. Ethnobotany Project instructor and Tribal elder Malinda Powskey came from the last family from the Big Sandy River Band still living off the land and maintaining many of the old ways:

"I am a member of the Big Sandy River Band of Hualapai. My family came from the last member of that Band to still live down there. When we teach the plants to the children we also teach them the place names in the Hualapai language: **Wikman**, that is Valentine, Arizona, meaning Falling Rocks; **Ivthi Gatanavkwa** is Kingman and means Surrounded by Creosote; and there is **Hakdagwiva**, the name for Peach Springs, meaning Surrounded by Springs; and **Hak Skela**, which today is the Big Sandy River and means The Open Water. If our children lose the knowledge of place names, they lose part of their history and a knowledge of where they come from. In the teaching of the ethnobotany to the children we had in mind to teach those places to our children too, because the plants are not just separate entities, they are part of the land just like the people."

The Big Sandy River lies within the southernmost reaches of ancestral Hualapai territory, extending into the northern stretch of the Sonoran desert and in the vicinity of present

<sup>1</sup>Hualapai Nation; calisay17@hotmail.com

*continued next page*



From left Ethnobotany youth Running Wolf Havatone and Triston Jackson harvesting Banana Yucca in the Hualapai Mountains outside of Kingman, AZ. Elder instructor Malinda Powskey receiving the Arizona Indian Living Treasures Award for her contributions to the Hualapai community in ethnobotany, tribal language, and culture at the Heard Museum. Elder instructor Drake Havatone helping Lone Wolf Havatone making the Cliffrose Bark vest at the Hualapai Cultural Center. Photos courtesy the author.

## Plants Bringing Power and Life to the People *continued*

day Wikieup, Arizona. Raised in this region, Malinda remembered harvesting the sweet ripe fruit of the saguaro cactus in June. Long wooden poles were lashed together to make an *i:isiquab*, or a Saguaro knocking pole, to tap the fruit down from the tall cacti. The fruit can be eaten fresh, seeds and all, or the juice and seeds can be separated to yield a festive beverage. In the autumn, Malinda helped her family harvest traditional garden crops of corn, beans, and squash from gardens irrigated by the river. In the spring, the mescal agave flower stalks began to emerge and were ready for harvest. As a young girl she learned from her family the way to pry the agave from the ground, and cut off the spiny green leaves to yield the white-colored heart, which was then roasted in an earthen oven. Now as an instructor, she shares with the Ethnobotany Youth Project the precise manner in which to roast the agave. Stones are placed in the four directions of the roasting pit, representing the cardinal directions, and the youngest child present who was born in the summertime is selected to light the fire to ensure the agave burns nice and hot.

Ancestral Hualapai territory encompassed approximately seven million acres of what is present-day northwestern Arizona. The 14 territorial bands comprising the Hualapai Tribe were bounded by the Grand Canyon to the north, the Little Colorado River to the east, the Colorado River to the north and west, and the Bill Williams and Santa Maria Rivers to the south. Altitudes within the ancestral Hualapai territory range between 1,000 and 7,000 feet. This wide gradient of elevations contains diverse landscapes encompassing rivers, springs, canyons, cliffs, flats, valleys,



and both Mojave and Sonoran desert types. As a result of the tremendous diversity in the landscape, a great variety of plants were available throughout the year. The present-day Hualapai Reservation comprises 1 million acres, and the majority of Tribal members live in Peach Springs and have little time in the modern world to travel and harvest the traditional foods. This makes teaching the traditional ways difficult for most families, especially since many of the bands are removed from their ancestral lands.

Today the Tribe relies upon elders like Malinda to share their knowledge to youth through intergenerational classes facilitated by the Hualapai Cultural Resources Department.

Since the Hualapai Ethnobotany Youth project began in 2006, students have been involved in harvesting many plants, including the mescal agave, wild turnip, cholla buds, sumac berries, wild grapes, banana yucca fruit, prickly pear, mesquite beans, and piñon nuts. Twice a month down at the Hualapai Cultural Center, between 15 and 30 tribal youth ranging in age from 7 to 15, meet with the five elder instructors. Activities include a full-day field trip, followed later in the month by a class session at the Cultural Center where students learn how to prepare what they have harvested for consumption or craft. On the field trips, students learn plant identification, growth habits, and harvesting season; medicinal, dietary, or utilitarian uses; and names in Hualapai and English. The plants are harvested when seasonally available and used for demonstrations in

*continued next page*

*Inset* Malinda Powskey at the Hualapai Ethnobotany Youth Project traditional feast. Photo courtesy the author.

## Plants Bringing Power and Life to the People *continued*

food preparation, basket making, cradleboard construction, and making of traditional garb such as the cliffrose bark skirt and shirt.

In 2013, multiple individuals of the mescal agave were collected, as would have been done in ancestral times. Students harvested *Agave utahensis* on the Reservation within Peach Springs Canyon, a side Canyon within the greater Grand Canyon. Then students went on a field trip to Lake Havasu, Arizona to visit an archeological mescal agave pit roasting site as part of a joint effort with the Bureau of Land Management staff. Here they gathered *A. mckelvyana*. Later as the season progressed, *A. parryi* was harvested outside of Seligman, Arizona, and the Native American Club from the local Kingman High School came along to learn from the Hualapai Ethnobotany Youth Project. At the annual Pai Language Immersion Camp held on the reservation, Hualapai Ethnobotany Youth had the chance to roast the three different species and compare and contrast the taste and texture. Hualapai Cultural Resources staff member Marcie Craynon instructed youth participants in pounding out mescal agave into dried cakes to be stored for later consumption, as was done in traditional times.

When we had students fill out a survey to gauge their feelings about what they were learning, several comments indicated the students have taken an increased interest in learning their language. One student commented, "This program is a very cool program. If it wasn't for this I would not even be interested in my language." Another student responded, "I like being in the Ethnobotany class because it helps me learn more Hualapai words." Besides language, students have been grateful for the knowledge they have gained. One student commented on her survey, "I just want to say this project is a very good way to teach youth about our heritage and plants in the Hualapai way."

Down in Phoenix, at the Heard Museum, a lengthy applause develops, echoing through the reception room as Malinda Powskey receives the 2015 "Arizona Indian Living Treasures Award." Malinda received this honor for her lifetime of achievements in promoting tribal language, culture, and ethnobotany. She is one of four recipients from various Tribes throughout the state to accept this prestigious award. The dedicated effort and time elders like Malinda have contributed to the Hualapai Ethnobotany Youth Project is greatly appreciated and has served to pass the Hualapai culture to the present and future generations. She is one of the last remaining links to the past, and her knowledge of the old ways persists because of her contributions.



## Who's Who at AZNPS

### BOARD OF DIRECTORS

#### Cass Blodgett

*Director, Phoenix Chapter Co-President*  
cblodgett2@cox.net

#### Suzanne Cash

*Director, State Secretary*  
roxiep@msn.com

#### Wendy Hodgson

*Director, Education, Outreach and Conservation Committee Chair*  
whodgson@dbg.org

#### Diane Kelly

*State Treasurer*  
kelly@timdarby.net

#### Andy Laurenzi

*Vice President*  
alauren33@gmail.com

#### Ries Lindley

*Director, Tucson Chapter President, Co-Editor, The Plant Press*  
ries.lindley@gmail.com

#### Valerie Morrill

*Director, Yuma Chapter President*  
bebbie@hotmail.com

#### Mike Plagens

*Director at Large, Phoenix Chapter Co-President*  
mjplagens@arizonensis.org

#### Doug Ripley

*President, Co-Editor, The Plant Press*  
jdougripley@gmail.com

#### Andrew Salywom

*Director at Large*  
asalywon@dbg.org

#### Sue Smith

*Director, Prescott Chapter President*  
suejs01@yahoo.com

### AZNPS COLLABORATORS

#### Cass Blodgett

*Web Editor*  
cblodgett2@cox.net

#### Shelley Silva

*Happenings Editor*  
shelley.a.silva@gmail.com

#### Patricia Sanchez

*Administrative Assistant*  
aznpsinfo@yahoo.com

#### Julie St. John

*The Plant Press  
Layout Editor*  
julieStDesign@gmail.com



From left Sierra el Tigre landscape. Photo courtesy Dale Turner. View of Presa Angostura and the Sierra el Tigre. Photo courtesy Ana Lilia Reina-G.

## Madrean Discovery Expedition to the Sierra el Tigre

by Thomas R. Van Devender and Ana L. Reina-Guerrero<sup>1</sup>

The Sierra el Tigre is a massive mountain range, one of about 55 Sky Islands found in the Mexico-United States borderlands between the Sierra Madre Occidental in Sonora and Chihuahua and the Mogollon Rim in central Arizona. These isolated Sky Islands mountain ranges in the Madrean Archipelago were recognized as a global biodiversity hotspot by Conservation International in 2008.

The Sierra el Tigre is the closest Sky Island to the northernmost Sierra Madre Occidental. It is within a great loop of the Río Bavispe, which flows north from Bavispe on the east side to Colonia Morelos and southward on the west, eventually joining the Río Áros to form the Río Yaqui. The Sierra el Tigre rises from 743 m (2437 ft) at the Presa Angostura dam to 2350 m (7709 ft) on Cerro el Tigre, an elevational range of 1607 m (5270 ft). The mountain is 31

km (19 mi) from north to south, and 21 km (13 mi) from east to west.

The lowland vegetation along the Río Bavispe ranges from foothills thornscrub near the Presa Angostura dam, to Sonoran desertscrub on the west side, and then to Chihuahuan desertscrub and desert grassland on the north side. The patch Sonoran desertscrub was mapped as a disjunct eastern part of the Arizona Upland subdivision, but is distinct and worthy of its own designation. At higher elevations, the vegetation changes to oak woodland and pine-oak forest. Many of the trees are typical of the Sierra Madre Occidental (*Arbutus xalapensis*, *Juniperus durangensis*, *Quercus jonesi*, *Q. mcvaughii*, and *Q. viminea*). Other trees and shrubs are southern populations of northern temperate species (*Cercocarpus montanus*, *Pinus discolor*,

<sup>1</sup>GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718

continued next page



From left Un tigre. Photo courtesy Ron Thompson, Primero Conservation, Inc. Stephen White and José Vera-Santos in the Sierra el Tigre in October 1941. Photo courtesy the University of Michigan Herbarium.



From left Sue Carnahan and Frank Reichenbacher pressing giant coral-root. Photo courtesy Caroline Treadway. Giant coral-root (*Hexalectris grandiflora*). Photo courtesy Sue Carnahan. Red columbine (*Aquilegia skinneri*). Photo courtesy Caroline Treadway.

## Sierra El Tigre *continued*

*Pseudotsuga menziesii*, *Robinia neomexicana*, and *Quercus toumeyi*).

The village of San Miguel de Bavispe was founded in 1645 by the Jesuit missionary Cristóbal García. Bavispe is derived from the word “Bavipa” in the Ópata Indian language, which means “place where the river changes direction.” The language is no longer spoken as the Ópatas were assimilated into the *mestizo* culture. On May 2, 1887, a strong earthquake destroyed every home in the village. Cliffs collapsed in Sabino Canyon near Tucson (280 km [175 mi] northwest), windows cracked in Albuquerque (555 km [344 mi] north-northeast), and bells rang in Mexico City (1565 km [970 mi]) southeast). Colonia Morelos was established as a Mormon settlement in 1900, but during the Mexican Revolution in 1912–1914 residents were forced to leave. The Sierra el Tigre was named by American prospector James Taylor in 1900 when *un tigre* — as the jaguar (*Panthera onca*) is called in Mexico — was killed near newly discovered

gold and silver deposits. Jaguars were said to be abundant at that time.

From 1938–1941, Stephen S. White led three botanical expeditions to collect plants in the Río Bavispe region of northeastern Sonora. In 1941, he was assisted by Filipino grass specialist José Vera-Santos. Published in 1948, White’s dissertation reported 1,200 species (currently 995 taxa after revision) and 549 genera in 114 families, many collected from the Sierra el Tigre and along the Río Bavispe.

**GreaterGood.org** is continuing a tradition of expeditions of large groups of biologists to document the animals and plants in the Sonoran Sky Islands of Sonora, Mexico, for conservation, research, and education. The first Madrean Discovery Expedition (MDE) went to the Sierra el Tigre in August 2015. The Expedition was cosponsored by the Ajos-Bavispe National Forest Reserve and Wildlife Refuge, a reserve in the Mexican Comisión de Áreas Naturales Protegidas (CONANP) system. With five large Sky Islands, Ajos-Bavispe is the Sonoran counterpart to the U.S. Coronado National Forest.

*continued next page*



From left Santa Cruz beehive cactus (*Coryphantha recurvata*) in Sonoran Desert east of Presa Angostura. Photo courtesy Tom Van Devender. Matuda claret cup cactus (*Echinocereus arizonicus* var. *matudae*). Photo courtesy Caleb Weaver.



From left Wild begonia (*Begonia gracilis*). Photo courtesy Chris Roll. White phacelia (*Phacelia platycarpa*). Photo courtesy Caroline Treadway. Mexican tiger lily (*Tigridia pavonia*). Photo courtesy Frank Reichenbacher.

## Sierra El Tigre *continued*

MDE participants from Canada (Alberta), United States (Arizona, Colorado, and North Carolina), and Mexico (Sonora, Mexico City) camped the first night in the mining ghost town of Pilares de Nacozari. In the 1890s, the mine was developed by American Meyer Guggenheim and later sold to the Phelps Dodge Company, an important mining company in Arizona. Pilares was a town of 6,800 people when the mine closed in 1931.

On the second day of the expedition, 14 vehicles caravanned over the top of the Sierra Nacozari through the Mina la Caridad, crossed the Río Bavispe on the dam that forms the Presa (reservoir) la Angostura, and traveled north through Sonoran Desert between the Sierra las Iglesias (*little churches*) and east into the Sierra el Tigre.

The MDE Sierra el Tigre Expedition was a huge success. From the base camp at Rancho el Tigre, 51 participants went on hikes or rode in CONANP pickups to study areas. Activities included botanizing, bird-, butterfly- and reptile-watching, photography, and always sharing discoveries.

Botanists Sue Carnahan, George Ferguson, Chris Roll, Frank Reichenbacher, Steve Hale, Reina-Guerrero, and Van Devender observed, collected, and pressed plants — about 400-500 species!! Six species of ground orchids were seen, including giant coral-root (*Hexalectris grandiflora*). The Matuda claret cup cactus (*Echinocereus arizonicus* var. *matudae*) was common. Herbs typical to the Sierra Madre Occidental included a red columbine (*Aquilegia skinneri*), a wild begonia (*Begonia gracilis*), a red honeysuckle (*Lonicera pilosa*), and a white phacelia (*Phacelia platycarpa*). The Mexican tiger lily (*Tigridia pavonia*) was spectacular. Northern herbs included spotted wintergreen (*Chimaphila maculata*), the Huachuca Mountain lupine (*Lupinus huachucanus*), and Thurber skyrocket (*Ipomopsis thurberi*). Processing all of the biological observations will take months of transcribing notes and identifying unknowns. But it is clear that there will be a thousand or more records, hundreds of them with images, documenting the biodiversity of another Sky Island in the Madrean Archipelago. All of these observations and images will be publicly available in the [GreaterGood.org](http://GreaterGood.org) Madrean Discovery Expeditions database that will be online soon.



From left Spotted wintergreen (*Chimaphila maculata*). Photo courtesy Chris Palting. Huachuca Mountain lupine (*Lupinus huachucanus*). Photo courtesy Tom Van Devender. Sunset view of Presa Angostura from the Sierra el Tigre. Photo courtesy Caroline Treadway.





From left The Z-Garden at Mission Garden honors the life work of long-time native plant enthusiast and AZNPS member, Nancy Zierenberg. Photo courtesy Rod Mondt. *Agave murpheyi* bulbils in the Z-Garden; chiltepin plant in fruit. Photos courtesy the author.

# Interpreting Ethnobotany at Mission Garden, Tucson, Arizona, Part 1

## *What AZNPS's wild desert garden teaches us for the future*

by Martha Burgess<sup>1</sup>

The interactive, interdependent dance of *People and Plants* has been swirling around the base of A-Mountain in Tucson, Arizona, for thousands of years. Hidden by horse corrals, pavement, and waste dumps in recent centuries, **Schukshon**, the *black spring* place at the foot of A-Mountain, is coming into its own, greening up and fruiting decoratively and deliciously at Mission Garden. Through the vision and hard labor of the non-profit organization, Friends of Tucson's Birthplace, this very site by the Rio Santa Cruz, home of Desert People who gave Tucson its name, is flourishing anew.

The Arizona Native Plant Society (AZNPS) has been active from the outset, helping to plant the natural desert portion of this unique agro-cultural living-history park. In four short years, the native plants that AZNPS provided in memory of admired activist, past AZNPS Tucson chapter president, and AZNPS Administrative Director, Nancy Zierenberg are burgeoning as the Z-Garden. It is designed as a visual continuum of the desert beyond the adobe wall and a place to interpret wild plants harvested by people who dwelled here over the last approximately 11,000 years.

Our Z-Garden really sets the stage for interpretive tours at Mission Garden. For understanding pre-historic and historic cultures, knowing their ecological setting and their plant communities are paramount. One cannot even begin to

discuss archaeology or past cultures without mentioning plants — as food, medicine, tools, sources of spirituality, ornaments, housing, clothing, fuel, calendrics, you name it.

Our ethnobotanical tour begins interpreting some “whys” of plant communities. The ancient black lava flow that created adjacent A-Mountain extends east under the present floodplain to form a bedrock “dam” which, even into the last century, forced groundwater to the surface as springs or ponds. The ancestral Santa Cruz flowed consistently, supporting a gallery of riparian trees and making happy habitat for humans as well as wildlife. Let's hear it for geologic and hydrologic determinism! Now that Tucson pumps so much groundwater that the subsurface dam no longer serves us, we are forced to use fuel, instead of gravity, to bring water to the Mission Garden site.

The Z-Garden exhibits in microcosm three distinct native plant communities that meet in Tucson: an Arizona upland desert association with ironwood/foothills-paloverde/saguaro/barrel cactus/cholla; a desert bajada with creosotebush/ocotillo/ jojoba; and a floodplain with saltbush/mesquite/soaptree-yucca/sacaton. Here, even the shade ramada (**wahk'toh**) displays how Desert People, the Tohono O'odham, traditionally used velvet mesquite (**kui**, *Prosopis velutina*) as upright posts and crossbeams, and ocotillo branches (**melhog**, *Fouquieria splendens*) for lattice roofing.

<sup>1</sup>Friends of Tucson's Birthplace, Tucson, AZ; marthaab@aol.com

*continued next page*

## Mission Garden *continued*

All three plant communities of the Z-Garden are rich with ethnobotanical lessons. Come on a virtual tour with me through its seasons, the way a desert harvester must view the plant calendar...

As the Desert New Year begins, in the blistering heat of June, the giant saguaro (*ha:šań*, *Carnegiea gigantea*) has bloomed, its flowers have been pollinated by bats and birds, and insects have pollinated its flowers. Its fruit (*bahidaj*) is turning rosy red, ready to harvest with a *kui'pad* pole made of the woody ribs from the same provident cactus. This arid June, mesquite beans (*kui wi:hog*, *Prosopis velutina*) are turning buff-color and rattling on the trees. The pods must be bone-dried in the parching sun to be ground and stored for use before monsoon moisture renders them hazardous with fungal aflatoxins. It is also basket-materials time. Quickly, while the new growth is emerging from the hidden meristem in each soap tree yucca (*takui*, *Yucca elata*), the youthful fibers must be carefully harvested, split to prevent spoilage, and sun-dried to bleach white the fibers for coiled baskets. Mature yucca leaves are cut and prepared under shade to preserve their rich green for the coiled basket. Rain spinach (*Ju'hukia*

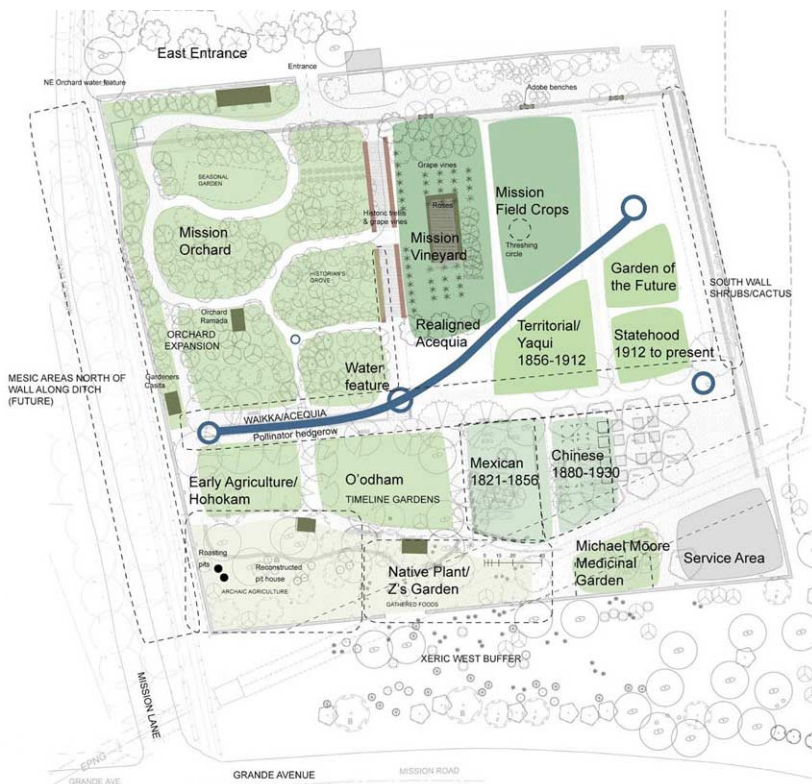


*i:wagi*, *Amaranthus palmeri*), better known as pigweed or careless weed to those who do not appreciate its benefits, are 10 inches high a week after monsoon rains begin, providing tasty greens, then high-protein seed when their spiny tops dry. In July and August, multiple varieties of prickly pear fruit (*i:bhai*, *Opuntia engelmannii* and others) are ripening, some required to be eaten fresh or dried, some storable in sealed clay ollas—all good medicines for blood sugar balancing as well as sweet nutrition. Banana yucca fruits (*howij*, *Yucca baccata*) are plump, ready to roast.

An end-of-summer “weed,” Mexican arnica (*Heterotheca* sp.), can be used to make a salve to soothe sore joints and muscles this winter. As the season cools into October–November, fiery hot little chiltepin peppers (*bahban ko'okol*, *Capsicum annuum*) are turning red and must be picked before birds discover them. Modern chemists, like shamans, are using chile's powerful capsaicin in formulations to ease pain of such ailments as shingles. By cold weather, a desert walk might be momentarily stopped when the sharp hook of a devil's claw grabs your ankle (*i'hug*, *Proboscidea parviflora*). The curled black pod from this summer annual is harvested and split to use for black fiber in coiled baskets. Tasty seeds from its woody pod are a relished snack.

One's store of wild-foods and medicines must last until winter rains have watered new ephemerals and perennials to harvest. Cool season bulbs, such as blue dicks (*ha:d*, *Dichelostemma pulchellum*), will emerge through rocky ground, a guide to sweet food below. Balls of blue-flowered chia (*da:pk*, *Salvia columbariae*) dry as spring warms, providing tiny rich seeds full of edible omega-3s and sustained energy. If winter is dry, one can still rely on the persistent yellow fruits of barrel cacti (*ji'awul*, *Ferocactus* spp.) with their tangy rind and protein-rich seeds as “desperation food” to tide you over to more productive times. April, the month when the desert turns yellow, heralds a season of plenty with the budding of several species of cholla cactus (*chi'olim*, *Cylindropuntia versicolor*, *C. spinosior*; and *wi'panoi*, *C. arbuscula*). Spine removal and prepping their flower buds is laborious, but a group effort is rewarded by good energy food, storable fare, and aids to digestion, cholesterol and hypoglycemia control. Prickly pear flowers of April (*i:bhai he'osik*, *Opuntia* sp.) provide medicine and phytonutrients. New-growth pads of prickly pear (*nowh*) are a nutritious vegetable we now know is especially beneficial to

*continued next page*



Mission Garden Concept Plan, September 2015.  
Courtesy Friends of Tucson's Birthplace.

*Inset* Juanita Ahil opens a ripe saguaro fruit.  
Photo courtesy Peter Kresan, KresanPhotography.com



From left *Cylindropuntia versicolor* in bud and flower. *Ferocactus wislizenii* fruit in February. Photos courtesy the author.

## Mission Garden *continued*

diabetics. By May, creamy white flower petals of soap tree yucca (**takui he'osik**, *Yucca elata*) have been gathered fresh for soup. Flowers of foothills paloverde (**kuk che'hedagi**, *Parkinsonia microphylla*) and ironwood (**hoh'idkam**, *Olneya tesota*) in May will help the bees go wild making honey, and by early June they will have been transformed into fat soft beans in their respective pods, to be eaten fresh off the tree or dried, roasted, and ground for gluten-free, high-protein flours. As mesquite beans and saguaro fruits ripen, the harvest calendar has gone full cycle—and our ethnobotanical tour takes a diversion.

South from the Z-Garden, planned as an extension of it, will be the Michael Moore Memorial Medicinal Garden, to honor the primo herbalist who really “brought back” herbal medicine to the Southwest, making herbalism acceptable and accessible to the modern family. It will be a joy to plant lovers, as they walk through this medicinal garden, to discover “new talents in our old friends” — the plants we already admire for beauty, form, habitat, shade — talents the plants have evolved for their own protection, which can be used for our own health and healing as well.

Walking northward in our tour of the Z-Garden we see a slope with concentrations of rhyolite rocks and on each cobbly mound an agave rosette. This species of century plant, (**ah'ut**, *Agave murpheyi*), is found today only near Hohokam archaeological sites. For exciting info on this, please see articles by plant explorer Wendy Hodgson (Parker et al. 2010) and archaeo-botanists Suzanne and Paul Fish (Fish and Fish 2014). Here is a living demonstration of the way we now know Hohokam People (ca 500–1400 AD) propagated clonal root “pups” and flower-stalk bulbils, planting each with a rock mulch to ward off rodents, create insulation, and prevent capillary water loss. When these pups finally mature over the years, and begin to send up their flower stalks, it's another chance for experiential

learning. We will need a harvest and pit-baking workshop guided by traditional Native People so visitors can taste tradition and savor pre-history, because *A. murpheyi* is truly a living relict of past people's botanical knowledge and horticultural ingenuity.

Our seasons in the Z-Garden bring to light the rich productivity of the Sonoran Desert flora, which every culture has exploited through time here—and which can provide food and medicine for contemporary cultures into the future as climate warms and desertification spreads. We have native plants to share with growing regions of aridity. And this is only the first taste of the living palette of useful plants at Mission Garden!

### Visit the Mission Garden

Mission Garden is open with guided tours by knowledgeable volunteers: Saturdays (8am–noon in summer and noon–4pm in winter). Groups such as AZNPS chapters are invited to visit by prior arrangement via [www.tucsonbirthplace.org](http://www.tucsonbirthplace.org). Volunteer opportunities abound for AZNPS members in this ever-changing place of learning.

The next issue of *The Plant Press* will feature a virtual ethnobotanical tour through stages of domestication, the continuing dance of *People and Plants* in **Schuk-shon** from 4,000 years ago to the present. Watch for Part II: *Pre-historic and Historic Desert Agriculture Reborn in its Place of Origin*.



### References Cited

- Fish, Suzanne K., and Paul R. Fish. 2014. Agave (*Agave* spp.): A crop lost and found in the US-Mexico borderlands. *In*: *New lives for ancient and extinct crops*, edited by P. Minnis, pp. 102-138. University of Arizona Press, Tucson.
- Parker, Kathleen C., D.W.W.T. Trapell, J.L. Hamrick, W. Hodgson, and A.J. Parker. 2010. Inferring ancient agave cultivation practices from contemporary genetic patterns. *Molecular Ecology* 19:1622-1637.



A larger bush-like pricklypear suggestive of *Opuntia engelmannii* from Walnut Canyon N.M. Photo courtesy Susan Holiday.

## Pricklypear Cactus (*Opuntia* spp.) Near Prehistoric Human Habitations at Walnut Canyon National Monument and Elden Pueblo Archaeological Site, Arizona by Susan Holiday<sup>1</sup>

### Background

Pre-contact people of the Southwestern United States cultivated and used various domesticated and wild plants such as corn, cotton, and agave. One plant currently used by various people, but not mentioned extensively in archaeological literature, is the pricklypear cactus (*Opuntia*). *Opuntia* is a genus of cactus that has flattened stems that serve as photosynthetic organs, and small barbed spines called glochids. There are thirteen *Opuntia* species in Arizona recognized in the *Flora North America* (Pinkava 2004) and sixteen species listed in the *Field Guide to Cacti and Other Succulents of Arizona* (Breslin et al. 2015). Six of the pricklypear cacti found in Arizona have fleshy to juicy fruit, which can be eaten.

Pricklypears are a commercially grown crop in Mexico where they are used to make vegetable dishes, candies, and syrups. Cactus propagation and selection by local peoples in Mexico was described by Colunga-Martin et al. (1986). The characteristics selected for among the local peoples were larger cladodes (the pad-like stems of the cactus), more space between areoles, fewer spines, and larger fruit. There is archeological evidence suggesting the use of *Opuntia* by prehistoric people, including seed found at sites and fragments from coprolites. Pre-contact people traded corn, agaves, and other useful plants, so possibly larger, juicier fruited pricklypears were included in what was traded.

I decided to conduct a study to compare the physical characteristics of pricklypear plants growing in two Northern Arizona prehistoric human habitation sites with the physical characteristics of pricklypear plants growing in surrounding areas that were not documented as archaeological sites. Demonstrating the existence of physical differences between these populations would serve as evidence of possible selection for desirable traits by the pre-contact inhabitants.

### Study Sites

Walnut Canyon National Monument is located southeast of Flagstaff, Arizona (lat. 35°10'17.61"N, long. 111°31'33.70"W in pinion-juniper/ponderosa pine mixed forest, at approximately 2,060 meters (6,758 feet) elevation. The ruin settlements include buildings in limestone alcoves above Walnut Creek and pit houses on the flats above. The Sinagua people lived there from about 1000 to 1120 A.D. According to the National Park Service's visitor information, the people farmed suitable land above the creek. Walnut Canyon was designated a National Monument in 1915 to preserve the cliff houses. Within the city limits of Flagstaff is found the Elden Pueblo Archaeological Site (lat. 35°14'25.52"N, long. 111°34'14.94"W), another Sinagua site, dating from 1070 to about 1275 A.D. It is located in a ponderosa pine forest on U.S. Forest Service land, altitude ca. 2,120 meters (6,896 feet). This site, discovered by Harold

*continued next page*

<sup>1</sup>Northern Arizona University, Flagstaff, AZ; naris123@cs.com

# Pricklypear Cactus *continued*

Colton of the Museum of Northern Arizona, is overseen by the U.S. Forest Service and is presently being excavated.

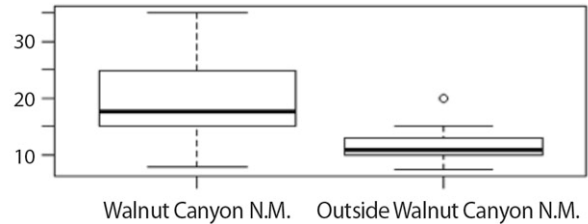
Plants resembling Engelmann's prickly-pear (*Opuntia engelmannii* s.l.) are found near the pueblo ruins of Walnut Canyon National Monument and Elden Pueblo Archaeological Site near Little Elden Spring and spreading along the southern base of the mountain. These pricklypears were measured and found to be larger than the plants generally found near Flagstaff. The pricklypears found at these two sites have larger pads with a greater distance between their cladodes, making the plants easier to handle (Fig. 1). These plants also have larger, juicier fruit (Fig. 2). A nearby source of the larger pricklypears could have been the Sedona-Verde Valley area. Fish et al. (1980) concluded that Flagstaff was a node in prehistoric trading routes between southern and northern Arizona. As pricklypears easily root from cuttings, survival of a pad would have been possible with foot travel from the Verde Valley area to Flagstaff. Wendy Hodgson of the Desert Botanical Garden has studied the trading and cultivation of agave in Verde Valley and has suggested that the occurrence of *Opuntia engelmannii* in the Grand Canyon may have had a human origin. Hodgson suggested that there may be other sites where humans have transported other useful plants that can survive in the environment (personal communication).

## Methods and Results

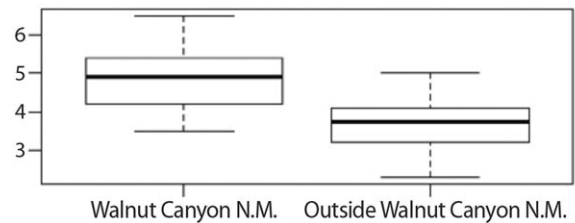
Figure 1 shows a comparison of the pricklypear pads found on the Walnut Canyon Island Trail and Rim Trail compared to those found outside the park on Forest Service land within about a five-mile radius. The pads were measured in centimeters across the largest part of the pad. The thick lines in the middle of the boxes in the plot show the mean width of the pricklypear pads. To have a fair test, I measured all of the pricklypears I could find (28 individuals) on the trails of the Monument no matter which species, as long as it was a juicy-fruited variety. I also measured every pricklypear I found outside the Monument, 24 in all, using the same criteria as I did for in the park. The plot shows that the average width of the prickly pear pads inside the Monument was greater than outside. The plot also shows that there is more variation in the size of the prickly pears in the Monument.

Figure 2 shows that the fruit lengths of the cactus fruit found inside the Monument on average were larger than the fruit found outside the Monument. Because not all of the plants produced fruit, I only had 22 fruit to measure inside the Monument and 22 from outside the Monument. They were measured on the outside of the fruit from attachment to the pad to the top in centimeters using a tape measure. So that it would be a fair comparison, only non-damaged, juicy fruits were measured in both locations. That the fruit were found

## Boxplots Comparing Cladode Widths



## Comparison of Fruit Lengths



From top Figure 1 and Figure 2.

to be larger in the Monument suggests that the prehistoric inhabitants could have chosen and perhaps brought the cactus close to where they lived.

## Conclusion

When studying the locations of plant communities of the Southwest, pre-contact human influences need to be considered. Pricklypear cacti tend to create polyploids and hybridize when different species are grown together. Engelmann's prickly pear is more commonly found at a lower elevation than is found above the Mogollon Rim. However, these plants have persisted in the Flagstaff area near areas of pre-contact human habitation.



## Acknowledgements

I thank Wendy Hodgson for reviewing this paper.

## References Cited

- Breslin, P., R. Romero, G. Starr, and V. Watkins. 2015. Field guide to cacti and other succulents of Arizona. Tucson Cactus and Succulent Society, Tucson, AZ.
- Colunga-Garcia Marin, Patricia, Efraim Hernandez Xolocotzi, and Alberto Castillo Morales. 1986. Variacion morfologica, manejo agricola tradicional y grado de domesticacion de *Opuntia* spp. En El Bajio Guanajuatense. *Sobretiro de Agrobiencia* 65: 7-46.
- Fish, Paul R., P.J. Pilles, and S.K. Fish. 1980. Colonies, traders and traits: The Hohokam in the North. In Davide, David and Fred Plog, Editors. *Current Issues in Hohokam Prehistory: Proceedings of a Symposium*. Arizona State University Anthropological Research Papers 23: 169-172.
- Pinkava, D.J. 2004. *Opuntia*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 19+ vols. New York and Oxford. V4 Page 93, 94, 95, 102, 123, 232, 381.



From left Perilla (*Lopezia gracilis*) flowers. Photo courtesy Jeff Sartain. Monsoon rain storm. Photo courtesy Tom Van Devender.

## Sierra la Mariquita — A New Sky Island Reserve

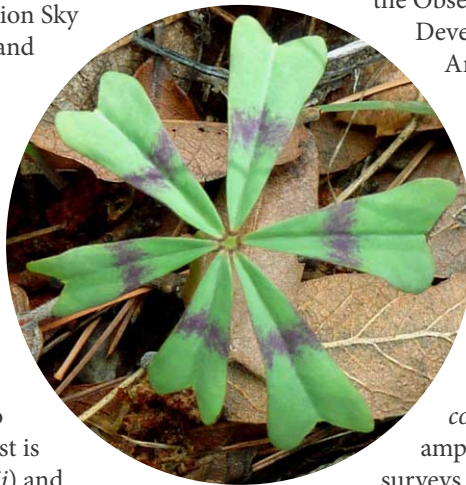
by Thomas R. Van Devender and Ana L. Reina-Guerrero<sup>1</sup>

The Sierra la Mariquita is a Sky Island mountain in northern Sonora owned by the Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), the Mexican national astronomy agency. The Observatorio Astrofísico Guillermo Haro was built on the summit in 1987. It is located northwest of the copper mining town of Cananea, only 26 km south of the Arizona border. The Sierras la Mariquita and Elenita form a high elevation Sky Island complex connected by oak woodland in Puerto Cananea, north and south of Mexico Federal Highway 2. They are sister ranges to the Huachuca Mountains of Arizona.

The Sierra la Mariquita rises from 1230 m elevation at the base of the southwestern bajada to 2498 at the summit, an elevational range of 1268 meters. The vegetation of the Sierra la Mariquita ranges from desert grassland and oak woodland on the lower slopes to pine-oak forest above. The montane forest is dominated by Apache (*Pinus engelmannii*) and southwestern white pine (*piñón*, *P. strobiformis*) pines. The eastern slopes drain into the San Pedro River, which flows north into Arizona, where it is managed as the San Pedro Riparian National Area. The western slopes of the Sierra la Mariquita drain into the Río Bacanuchi, a major tributary of the Río Sonora, which passes through Hermosillo and at one point ran all the way to the Gulf of

California. In 2014, 11 million gallons of a copper sulfate acid solution spilled from a leaching pond at the Buenavista Copper Mine, polluting the Ríos Bacanuchi and Sonora and affecting 25,000 people in seven *municipios* (counties).

In June 2009, September 2010, and August 2013, observations of plants and animals were made on trips to the Observatory area. Plants were recorded by Van Devender, Reina-G., and Chris Roll from Arizona, J. Jesús Sánchez-Escalante, Curator of the Universidad de Sonora Herbarium in Hermosillo, and Guillermo Molina of the Instituto Tecnológico Superior de Cananea. John Palting documented moths, Roll chased butterflies, and Tom collected beetles and scorpions. This Sky Island was named for the *mariquitas* that congregate on the summit — convergent lady beetles (*Hippodamia convergens*). Erik Enderson searched for amphibians and reptiles. Aaron D. Flesch did surveys of breeding birds and tree transects in pine-oak forest in the Sierra la Mariquita.



Several plants in the Sierra la Mariquita are noteworthy. A mustard (*Draba helleriana*) with yellow flowers is a rare plant in Arizona and New Mexico. Pale bastard toadflax (*Comandra umbellata* ssp. *pallida*) is a subshrub with white flowers that is widespread in the western United States. Both

*continued next page*

<sup>1</sup>GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718

Inset Tenleaf woodsorrel (*Oxalis decaphylla*) leaves. Photo courtesy Ana L. Reina-G.



From left View to the north-northwest from Sierra la Mariquita. Convergent lady beetles on southwestern white pine (*Pinus strobiformis*) needles. Photos courtesy Tom Van Devender.

## Sierra la Mariquita *continued*

species were not previously reported for Sonora or Mexico. Other plants with northern distributions that are rare in Sonora are Arizona wheatgrass (*Elymus arizonicus*), quaking aspen (*álamo temblón*, *Populus tremuloides*), cardinal catchfly (*metatera*, *Silene laciniata* ssp. *greggii*), Gambel oak (*Quercus gambelii*), Huachuca agave (*Agave parryi* var. *huachucensis*), mountain mist grass (*Blepharoneuron tricholepis*), New Mexico locust (*Robinia neomexicana*), prairie Junegrass (*Koeleria macrantha*), and sweetclover vetch (*Vicia pulchella*). Perilla (*Lopezia gracilis*) is a white-flowered annual in the Onagraceae commonly found in tropical deciduous forest that has not yet been found in the United States. The Sierra la Mariquita represents a significant northern range extension.

These biological inventories have documented 292 species in the Sierra la Mariquita — 174 plants and 118 animals. These results are mostly of plants, insects and, birds, with a few

casual observations of other animals. Insects, amphibians, reptiles, and mammals are especially poorly known in the fauna. All of these observations and many images are available publicly in the Madrean Archipelago Biodiversity Assessment (MABA) database ([Madrean.org](http://Madrean.org)).

The Comisión de Áreas Naturales Protegidas (CONANP) is the federal agency that manages parks and reserves in Mexico — equivalent of our National Forest Service and National Park Service combined. Major CONANP reserves in Sonora are the Ajos-Bavispe National Forest Reserve and Wildlife Refuge in the northeast, Sierra de Álamos-Río Cuchujaqui Wildlife Refuge in the south, and the El Pinacate and Gran Desierto de Altar Biosphere Reserve in the northwest. In 2011, Rancho el Aribabi in the Sierra Azul was designated as an Área Natural Protegida (ANP), under the category of Voluntary Land Conservation. In 2015, the Sierra la Mariquita became the latest Sonoran ANP with INOAE's participation. The observations by American biologists provided documentation of the biodiversity.



From left Gambel oak (*Quercus gambelii*) leaves and acorn. Sunset. Photos courtesy Tom Van Devender.



# THE ARIZONA NATIVE PLANT SOCIETY

PO Box 41206  
Tucson AZ 85717  
[www.aznativeplantsociety.org](http://www.aznativeplantsociety.org)

Nonprofit Org  
US Postage  
PAID  
Tucson AZ  
Permit #690

*Address Service  
Requested*

## New Members Welcome!

People interested in native plants are encouraged to become members. People may join chapters in Flagstaff, Phoenix, Prescott, Cochise County (Sierra Vista), Tucson, or Yuma, or may choose not to be active at a chapter level and simply support the statewide organization.

For more information, please write to AZNPS (see return address above), visit [www.aznativeplantsociety.org](http://www.aznativeplantsociety.org), or contact one of the people below:

Cochise: Doug Ripley,  
[jdougripley@gmail.com](mailto:jdougripley@gmail.com)

Flagstaff: Dorothy Lamm, 928.779.7296

Phoenix: Cass Blodgett, 480.460.0725, and  
Michael Plagens, 602.459.5224

Prescott: Sue Smith, 408.507.7706

Tucson: Ries Lindley,  
[ries.lindley@gmail.com](mailto:ries.lindley@gmail.com)

Yuma: Valerie Morrill, [bebbia@hotmail.com](mailto:bebbia@hotmail.com)

## Membership Form

Name:

---

Address:

---

City/State/Zip:

---

Phone/Email:

---

Chapter preferred:  State only  Cochise County  Flagstaff  
 Phoenix  Prescott  Tucson  Yuma

Enclosed:  \$15 Student  \$75 Commercial  
 \$30 Individual  \$100 Plant Lover  
 \$35 Family  \$500 Patron  
 \$50 Organization  \$1,000 Lifetime

### Mail to:

Arizona Native Plant Society  
PO Box 41206, Tucson AZ 85717