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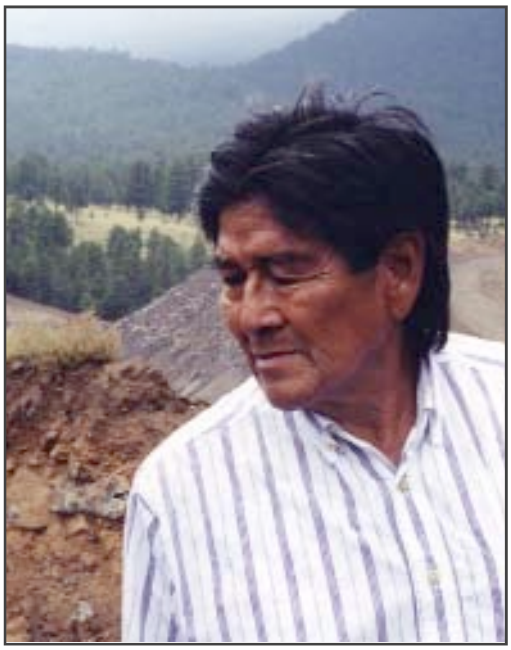

A Tribute to Ferrell Secakuku

by Jessa Fisher[†]

Ferrell Secakuku was an honored guest speaker at last year's Arizona Botanists Meeting. He belongs to the Hopi tribe, and is a native of Sipaulovi Village on 2nd Mesa. Ferrell was recently diagnosed with terminal stomach cancer. An event in honor of his life was held at the Hopi Veterans Center in Kykotsmovi on July 16, 2007. We will miss interacting with Ferrell and hope that his transition to the next world is painless and swift.[1]

Ferrell led an accomplished and active life. From 1994-1997, Ferrell was the Hopi Tribal Chairman. During his tenure, he secured money for a new Hopi healthcare center. Perhaps his greatest political achievement was negotiating the Navajo-Hopi Land Settlement agreement, allowing for both tribes to live in peace on their lands.

As Tribal Chairman, he was instrumental in seeking protection for the N-aquifer, which sits under the Hopi and Navajo reservations. Ferrell continued to care about water his whole life, lecturing on its importance to various audiences. He also participated in many long-distance traditional Hopi runs, dedicating those events to the water cycle. Ferrell was a spiritual leader on those runs, reminding the runners to think about the reason why they were running. In his simple words, he would tell the team when they got to a natural spring to take a bath and invite the clouds to join them.

Ferrell was a lifelong student and teacher. He was the first person from his village of Sipaulovi to go to college, attending Arizona State College (now Northern Arizona University, NAU). In the 1990s and early 2000s, Ferrell helped with many anthropology projects on Hopi involving revitalizations of springs and traditional farming methods. He then decided he wanted to return to school for his Masters Degree in Anthropology. The title of his thesis is *Hopi and*

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Special thanks from the editors to all who contributed time and efforts to this issue.

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President's Note

by Barbara G. Phillips **bgphillips@fs.fed.us**
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We wish to express our sadness at the passing of two colleagues and friends, Ferrell Secakuku and Bob Zahner. Just last February Ferrell spoke on Hopi plants at the Arizona Botanists meeting, tying in with the theme of that meeting and this issue of *The Plant Press*, "Ethnobotany & Inherited Landscapes." Jessa's heartfelt tribute relates Ferrell's many contributions and interactions with society and individuals throughout his lifetime. Bob Zahner will be greatly missed by all who had the pleasure to know him, especially in southern Arizona where he and his wife spent many active years contributing to AZNPS. We are very thankful for each person's unique contribution to knowledge about and preservation of Arizona native plants.

My personal awareness of the landscape effects of humans on the distribution of native plants on Arizona's landscape started about 1989 when I studied effects of recent fires on Tonto National Monument and effects of changes in flood dynamics on Walnut Canyon National Monument. In addition to the studies at hand, as I hiked around these monuments the patterns of plants like agaves and cacti below ruins and combinations of moisture-loving species near seeps struck me as probably more than coincidental. However, research into this possibility by anthropologists and botanists was just in its infancy then (see the review of Amadeo Rea's book, *At the Desert's Green Edge*, p. 16).

I hope each of you finds enjoyment in learning new perspectives about familiar plants and familiar places as you peruse these pages. What an exciting time to explore current research in relation to Native American and recent settlers' influences on the natural distribution of plants throughout Arizona and adjacent Mexico, just as we are in danger of impacting the landscapes in ways that could prevent us from learning about all of this forever. The work of the Arizona Native Plant Society, as ably described by the Regular Features, is more vital than ever before.

Many thanks to Greta Anderson and Wendy Hodgson for stepping up with enthusiasm for conservation efforts throughout the state and the new Parabotanist Program sponsored by AZNPS. These programs stretch AZNPS' mission to promote knowledge, appreciation, conservation, and restoration of Arizona native plants and their habitats with new goals for achievement. PLEASE STEP FORWARD to be part of the future of Arizona Native Plant Society and its outreach into the world of native plants in all the landscapes of Arizona!

Ferrell Secakuku *continued*

Quetzalcoatl—What is the Connection? Ferrell feels with assurance that the Aztec temples of the Sun and the Moon outside of Mexico City is the birthplace of his clan, the snake clan. These temples, painted red when first constructed, Ferrell says is "palatquapi", the Hopi place of origin. He went on his own migration to visit the temples with some of his anthropology professors from NAU. As a pilgrimage, he placed seven "paho" or prayer feathers at the snake god temple of Quetzalcoatl, representing the 7 clans of Sipaulovi. In 2006, Ferrell was the oldest person to graduate with a masters degree from NAU.

During his masters degree and after, Ferrell worked with his partner Anita Poleahla, on Mesa Media, a program to develop the Hopi language. He also continued to be connected to NAU as an Applied Indigenous Studies Elder. It was here where I had my most interaction with Ferrell. He taught several lectures that were open to anyone interested. His talks always focused on migration, farming, water, plants, and living in the "Hopi Way", close to the earth, with respect and love.

At the Arizona Botanists Meeting, Ferrell spoke of some traditional uses of Hopi plants. He mentioned two herbs used to make blood cleansing teas, Hopi tea greenthread (*Thelesperma megapotamicum*; hohosi in Hopi) and ephedra (*Ephedra viridis*; masiisvi in Hopi). Edible plants he discussed included wild onion (*Allium* spp.; siiwi in Hopi), desert plume (*Stanleya pinnata*; kwiivi in Hopi) and springparsely (*Cymopterus newberryi*; daanguna in Hopi). One plant he seemed particularly fond of was Hopi sunflower (*Helianthus annuus*; aqawu' or aqawsi in Hopi), which has many uses- seeds for dye; fibers for basketry; juice for eye-drops; and the petals are picked, dried, and mixed with corn pollen as a facial paint for young women in ceremony.

Ferrell is one of the kindest, gentlest, and most sincere people I know. He has a strong desire to pass on Hopi teachings, which continues today as anthropologists are sitting by his bedside recording his last messages to his people and the world. I am honored to know Ferrell and hope that his enthusiasm for traditional farming and plant harvesting came across to the Arizona Botanists Meeting audience, in one of his last lectures for the public. Thank you Ferrell for passing on your message of appreciation and respect for plants and all living creatures.

[1]**Editor's Note**: Ferrell died July 25, 2007. He had a peaceful passing, resisting chemotherapy or other attempts to extend his life. He was at peace with himself, his life, and fully embraced his transition to the next world. He will be missed by all who knew him.

Central Arizona Agaves: A Window into the Past

by Kathleen C. Parker[†] Photos courtesy the author.

Today the Tonto Basin is only sparsely inhabited by humans, but close to 1000 years ago the basin was bustling with human activity. During the early Classic period (from about A.D. 1150-1325), small settlements and larger towns dotted the landscape in the basin. In the lowlands, farmers used irrigation canals to deliver water from the Salt River to their fields, where they grew crops like corn that needed consistent moisture. On the massive fluvial terraces perched high above the floodplain, farmers manipulated rainwater with rock piles, stone alignments, and check dams to encourage native plants like agave, which provided a dependable food source at times of the year when other crops were not productive.

Several species of agave had a long history of cultivation in the area that is now central Arizona (Hodgson, 2006). Some of these, such as *Agave chrysantha* Peebles and *A. parryi* Engelm., are relatively widespread and likely occurred prehistorically in both wild and cultivated populations. Others, like *A. murpheyi* Gibson and *A. delamateri* Hodgson and Slauson, are only found today in association with pre-Columbian ruins or other archaeological artifacts (Hodgson and Slauson, 1995; Hodgson, 2001). Because of the longevity of the cultivated agave species and their tendency to reproduce primarily asexually, the few scattered populations that remain in the modern landscape are genetic relicts of a much earlier time. They provide us with a small window into the past so that we can piece together some of the early prehistoric agricultural practices of residents of the Tonto and Phoenix Basins, including their management of phenotypic variation (and underlying genetic diversity).

For the past five years, several of my colleagues at the University of Georgia (Jim Hamrick, Dorset Trapnell, Al Parker, and Bob Kuzoff) and I have worked with Wendy Hodgson at the Desert Botanical Garden to map relict populations of *A. murpheyi* and *A. delamateri*, collect plant tissue samples, and use standard molecular markers (allozymes and microsatellites) to estimate the levels of genetic diversity that traditional pre-Columbian farmers maintained in their agave fields (Parker et al., 2007). We have also compared geographic patterns of genetic variation with archaeological information to gain a more complete understanding of human movement and trade.

Since conclusive documentation of widespread agave cultivation was first made in the Tucson Basin more than two decades ago (Miksicek, 1984; Fish et al. 1985), well over 500 agave cultivation sites have been described in central Arizona. Most of these date from the Classic period of the Hohokam culture (Fish, 2000),

above *Agave murpheyi* inflorescence with bulbils, found in the Mazatzal Mountains

but some sites likely involved Salado, and possibly Sinagua, farmers as well. Our work has concentrated on the Tonto Basin, Phoenix Basin, and Verde Valley, primarily because most of the *A. murpheyi* and *A. delamateri* populations that still exist are found in these areas.

Although we initially expected to find very little genetic variation within each cultivated agave species, based on preliminary work done by others (Nabhan, 1992), such was not the case. Not surprisingly, both *A. murpheyi* and *A. delamateri* are less diverse genetically than most wild agave species, thanks to the process of domestication. When farmers choose plants from the wild to cultivate in their fields, they select only plants with certain preferred traits, leaving behind other plants with less desirable characteristics. They further narrow the diversity of their cultivated agaves through additional fine-tuning as they tend their fields, maintaining preferred traits by propagating their stock vegetatively. This human selection, practiced by both modern and ancient farmers around the world, tends to reduce the morphological and genetic diversity of cultivated plants compared to their wild relatives.

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left Pre-Columbian agave field in Tonto Basin. **right** Fluvial terraces in Tonto Basin.

Central Arizona Agaves

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What we did not expect to find, however, was the appreciable genetic variation that was evident both within individual fields of agave and between different agave populations. Modern traditional farmers tend to manage their fields in a way that maintains a diversity of traits, whether growing landraces of potatoes in steep mountainside fields in the Andes, or varieties of cassava on hillsides in Costa Rica. In some cases, they are hedging their bets against variable weather from year to year, in the hopes that at least one of the landraces they plant will be well suited to the vagaries of the weather in a given year. In other cases, the different landraces have slightly different uses, perhaps subtly different tastes that are best for beverages vs. food, or even different traits for use as food vs. fiber. Our results show that pre-Columbian farmers managed their fields in much the same way as modern traditional farmers, maintaining a good bit of diversity within the agave stock that they planted.

Several different factors contribute to the genetic variation evident in pre-Columbian agave fields. Both *A. murpheyi* and *A. delamateri* were likely derived from wild agave species that occurs farther south in Mexico. Our preliminary analyses suggest that *A. murpheyi* was derived from *A. angustifolia* Haw., the known progenitor of several other cultivated species, but further work is necessary to confirm that. Gentry (1982) described the occurrence of *A. applanata* Koch ex Jacobi, a likely ancient cultivated species, along a pre-Columbian trade route extending from southern Mexico northward. Pre-Columbian farmers may have initially selected a diversity of traits in the *A. murpheyi* and *A. delamateri* stock that they transported northward in a similar way. The tendency of both species to form basal offsets, or clones of the parent, before flowering would have made it relatively easy to carry a diversity of planting stock for trade or for personal use after northward migration. *A. murpheyi* also produces bulbils instead of fertile fruits along the inflorescence. These miniature plants that are genetic replicates of the parent would also have been easily transported northward to central Arizona.

Pre-Columbian farmers likely maintained the diversity of their fields through continuing selection for plants with favored traits, often trading with farmers from nearby villages, or even more distant locations. We were curious to see whether the three different regions within central Arizona that we studied would contrast markedly in their patterns of genetic diversity. Interestingly, within each species, there was not a strong regional signature in genetic variation. Many of our *A. murpheyi* populations in the Phoenix Basin bore a greater genetic resemblance to distant populations in the Tonto Basin, than to nearby populations in the Phoenix Basin. *A. delamateri* similarly failed to show a strong regional distinction between the Tonto Basin and Verde Valley.

By the late Classic period, the Tonto Basin had already experienced a rich and complex history of human occupation. The eastern Tonto Basin was settled by Hohokam immigrants from the Phoenix Basin ca. A.D. 750-950 (Clark, 2001). *A. murpheyi* and *A. delamateri* stock may have been transported regionally at this time as well. A few centuries later, the Tonto Basin, Verde Valley, and Phoenix Basin all experienced significant immigration from the puebloan region to the east and north (Clark, 2001), with original inhabitants and immigrants living side by side within communities in many cases. The coexistence within the three regions of diverse cultures, perhaps each with their own preferences and uses for agave, likely accounts for the absence of a strong regional contrast in patterns of genetic diversity in the agave populations we studied.

These rare denizens of the northern Sonoran Desert only occur in central Arizona in small scattered populations. Populations of both species have already been lost to urban expansion and other types of development. From a botanical perspective, they are a fascinating component of the desert vegetation. Perhaps even more significant, they constitute a unique cultural element of the landscape, with a rich story to tell of the complex cultural history that this area has experienced over the last millennium. Their

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In the Eye of the Desert *by Richard Felger*[†]

Stand on the left bank badlands of the Río Colorado delta and you see dried cracked mud from Sonora to Baja California. Look to the sea, where tidal bores once sank ships, and 10-meter tides support uncharted mass meadows of the endemic nipa, the saltgrass *Distichlis palmeri*—potentially one of the most important grain crops for the world.

This story is from the Eye of the Desert and assumes more than one reality to see through the fabric of history. I am going to tell you about the animals and plants and places and People in the Sonoran Desert in the 1540s and 1550s. That was when the pale foreigners first entered the Colorado River drainage in what you now call Arizona and Sonora. The river that even then we called the Red River. It happened there, it happened then.

As you know, the climate was about like it is today, except for a bit more rainfall and the heat not so extreme—it was during the Little Ice Age. The critical thing was that the summer rains were more predictable. It was long after the big townhouse developments collapsed, like Casa Grande southeast of Phoenix. The Great Drought of the late 1200s did in the big-town people because their populations grew too big for anything close to the fairy tale of a sustainable economy.

There were a whole lot less people than nowadays, so there wasn't much government bureaucracy and warfare wasn't so lethal. You would see quite a few babies die and too many women not making it through childbirth, although they have medicinal herbs to prevent or end unwanted pregnancy. But people who make it through those mortality bottlenecks are lean and healthy and strong in body and spirit.

Everyone knows how to prepare medicinal plants. Someone is sure to have dried tooth-root, dock or cañaigre, and bundled creosotebush, desert lavender, and gummy aromatic composites such as desert broom, and powdered antibiotics to prevent infections like the desert mushroom called "land's foreskin." Everyone knows where to get *hierba del manso* and lots of people grow it. Each village has dozens and dozens of medicinal plants plus the special ones traded from afar. Across this land—the place now called the Sonoran Desert Region—there are 1000 species of medicinal plants.

The roads, like the ones the foreign trespassers were guided along to come north into the San Pedro Valley, and over to the Red River itself, run along the rivers. We walk along in the shade and go swimming just about anywhere—dry off in speckle-shaded hard-packed smooth wet ground in pungent summer river smells of seep willow and rotting cottonwood leaves. Places with no spines or stickers. Beavers, muskrats, otters, ducks, great blue herons, cranes and egrets, lots of little turtles, and big fish—all those good things to eat. Most of us live along the rivers where the farming and living is easy, except for the northern marauders. We eat lots of fish. The river between your Tucson and Phoenix and on to Yuma and the delta has a lot of tasty fish. One favorite is that three- to six-foot-long minnow—the Colorado pikeminnow. Like the living dead, you have taken our

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[†]*©Richard Felger, University of Arizona Herbarium, Tucson, AZ 85721*

Central Arizona Agaves *continued*

protection is crucial to the preservation of the biological and cultural heritage of this region.

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upper Plants can be many-branched (pictured) or they can be vine-like, draping across tree branches. NPS photo, 2002. **lower** *Peniocereus striatus* stems arise from multiple tubers. Carbohydrates and water stored in the tubers provide the resources the plant needs to re-grow after a killing frost or herbivory. NPS photo ORPI-153, circa 1945. *Photos courtesy Sue Rutman.*

The Effect of Land Management Practices on the Distribution of *Peniocereus striatus* (Brandegee) Buxbaum on Organ Pipe Cactus National Monument, Arizona

by Sue Rutman[1] and Greta Anderson[2]

Southern Arizona hosts quite a few species that reach their northern range limit in the United States. Many of these species are limited by cold temperatures that occur to the north. Ecologists are increasingly interested in these species because range expansion of cold-intolerant plants will be one result of a warming trend in our climate. *Peniocereus striatus* is one species that might expand its range in Arizona if winter warming continues.

Most southern Arizonans have never seen *Peniocereus striatus*, but many are familiar with the more common *Peniocereus greggii*. The species is uncommon in the U.S., although it is not uncommon in the Sonoran Desert in Mexico. One of the few known U.S. populations occurs on Organ Pipe Cactus National Monument (OPCNM), in an area very close to the U.S./Mexico border. To understand the ecology of this species and determine if it might expand due to warming or other reasons, we conducted a thorough survey for the plant, collected plant and habitat information, and evaluated past and present population censuses with the area's land use history.

P. striatus is a cryptic plant, with slender brownish stems, usually found under nurse plants. Plants usually have a few stems that rise from a collection of smallish tubers (right). Plants growing in the open or within the canopies of shrubs or subshrubs are usually bushy, with stiff and short branching stems. Plants growing under the canopy of trees are vine-like, the long stems following the branches and draping over them. *P. striatus* flowers are even more beautiful than the more common *Peniocereus greggii* flowers, and open in response to rains. The spectacular blooms fill the desert night with an intoxicating scent. After each rain, a fraction of flowers on a plant or in a population will bloom on any given night. Flower buds will abort if no rain stimulates their development.

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A.A. Nichol discovered the OPCNM population in 1939. Since then, several surveyors have reported that *P. striatus* occurred only on rocky hillslopes and not on the loamy flats surrounding the hills. These reports conflicted with observations that *P. striatus* in Mexico occurs on a variety of habitats, including coastal plains, desert plains, bajadas and rocky slopes (Felger 2000), showing a preference for flats. A quick reconnaissance in the vicinity of the OPCNM population found *P. striatus* growing on the flats. The observations raised many questions. Was the population expanding? If so, why?

above This gully system cut back 25 feet with each flash flood in 1952, destroying the habitat of *Peniocereus striatus.* NPS-ORPI photo, accession 1629.

To answer these questions, we started documenting the population size and extent of *P. striatus.* During the winter and spring of 2002, we carefully surveyed more than 170 acres and found 145 plants. We surveyed outward from known plants so we could document the outer extent of the population. Each plant was individually numbered and tagged. Plant height, width, reproductive status, evidence of topkill (due to freezing), nurse plant identity (if any) and other features were recorded. The geographic location of each plant was determined using GPS. To evaluate whether or not historic land management practices affected the current distribution of *P. striatus*, we used ArcView and ArcMap (GIS software) and the OPCNM archives.

The survey confirmed that the population had increased and expanded since previous surveys, and in complex ways. Much of the newly colonized area was on the fine sandy loams of the flats, where temperatures are generally much colder than on the warmer, elevated slopes. If *P. striatus* was limited by freezing temperatures, why would it be expanding into colder habitat?

The answer could be our increasingly warm winters. Since the 1980s, freezing temperatures have become less common in OPCNM (Rowlands 2000). *P. striatus* might be colonizing habitat that was previously too cold.

Other reasons had to explain the puzzling expansion pattern. Formerly thought to occur only on rocky slopes, the population had expanded onto the flats, but only in some areas. Why was *P. striatus* able to colonize some areas and not others? We started looking at past management practices for answers.

P. striatus occurs in an area of OPCNM profoundly degraded by past land use and land management practices (Rutman 1996). Farming, livestock grazing and wood harvesting were among the land use activities associated with the Gray Ranch headquarters, located within *P. striatus* habitat. Photographs and reports from the 1940s through the 1970s show a nearly denuded landscape in the ranch vicinity. Tree cutting for domestic purposes and ranch infrastructure removed nurse plants for *P. striatus.* Loss of plant cover and livestock trails triggered accelerated erosion, expressed as deeply entrenched channels and headcuts that moved upstream as much as 25 feet per rainstorm in 1952 (above).

The loss of several inches to several feet of soil undoubtedly had consequences for the local *P. striatus* population. The tuberous roots would have been exposed and then swept away if not eaten by wildlife or livestock first. Two isolated *P. striatus* plants were found growing adjacent to a deep gully system, suggesting that the gullied area was formerly suitable habitat for the species. Its absence from the severe erosion area seems to be a symptom of habitat degradation rather than unsuitability.

Equally disruptive to *P. striatus* were the many structures built to control the runoff of surface water and control accelerated erosion. Small diversion dams and retention dikes diverted flood flows onto the Gray family farm field. In the early 1950s and 1960s the National Park Service (NPS) and Soil Conservation Service (SCS) constructed a wide variety of structures intended to stop accelerated erosion. Road graders and other equipment used to build the structures undoubtedly resulted in the direct loss of *P. striatus* plants. More than 50 years after their construction, the structures continue to alter sheet flow patterns in the area.

Of the many erosion control structures, a few types have persisted and remain the most influential. Several dikes and diversion dams—some as long as 0.7 mile— re-directed or stopped surface runoff. Habitat below the structures is drier than normal. Water spreaders, consisting of furrows and shallow berms that followed the contour of the terrain, were constructed 50 feet apart over more than 700 acres in the Dos Lomitas area. Habitat between the structures is drier than normal. In some cases, erosion control structures supplement surface flows. Collectively, erosion control structures continue to affect the ecohydrology of several hundred acres of suitable habitat for *P. striatus.*

If these historic land use and land management practices affected the distribution of *P. striatus* plants, we expected to find more plants on undisturbed flats or rocky slopes than on altered lands.

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top Flowering and fruiting occurs during the summer rainy season. This developing fruit will turn bright red when ripe, an irresistible temptation for birds and other herbivores. NPS photo 2002.
right Sonoran Queen of the Night Cereus in multiple-bud stages *courtesy Greta Anderson.*

Peniocereus striatus *continued*

To test this hypothesis, we used GIS to map the erosion control structures as well as the areas that would have been de-watered due to diversion dams or other erosion control structures. The farm field and its retention dams were mapped, too.

P. striatus plants was expanding onto unaltered habitat, but was not found on altered habitats. [To protect the species, we have not provided the maps that confirm these results.] We concluded that the removal of stressors (e.g. cattle grazing, woodcutting), combined with warming winter temperatures might explain the population expansion, but that land use history explained the pattern of expansion.

The distribution of rare plants is often puzzling. Sometimes research can explain the reasons why a species is rare and sometimes the reasons remain elusive. Field work helped us understand the biology of *P. striatus* and its distribution. Only when this information was combined with land use history did we learn the reasons for its distribution on the landscape. It is a sobering lesson on the long-term impact of disruptive land management practices.

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In the Eye of the Desert *continued*

fishes and the rivers themselves to the brink of extinction. Funny thing, you seem to be used to rivers without water.

Everyone can identify the local plants and animals by name, more than a 1000 species of insects, worms, spiders and all the other creepy-crawlies, fishes, snakes, turtles, lizards, toads, big mammals, small mammals, bird of all sorts, and the various bats, trees, shrubs, grasses, wildflowers, summer greens, winter greens, cactuses, agaves and yuccas, and in fact, all the different kinds of Living Things. How many ethnotaxa do you know?

Even though stories circulated for some time before the foreigners actually arrived, The People were amazed to encounter men stuck on top of huge, snorting deer-like captive animals. We joked about unnatural mating systems and strange anatomy. We stopped laughing when we learned how efficient they were at killing and suffered the deadly diseases they brought. The most amazing stories came from The People of the Red River delta, where the foreigners were first seen in gigantic boats. It was 1539 by your calendar. The Delta People first thought the boats were Living Things because they could "see their wings move." Those water monsters roared and killed like lightning.

But the foreigners did bring some good things, like metal tools and plows, and seeds of a wonderful new grain called wheat. Some say the seeds came up from the south along the great trade roads even before the Yoemem (Yaquis) invited the Jesuits into their lands (but that was half a century later). The Red River People call this new grain nipa, the same name they use for their most important grain, the endemic salt grass Distichlis palmeri, which they harvest in late spring from intertidal flats at the delta. The Coastal People call wheat “Spaniards' eelgrass,” because it reminds them of the eelgrass grain they harvest each spring as it washes up from the sea. Everybody transfers the name of their most important native grain to this wondrous new grain. In New England the Pilgrims transferred the name "corn," their English-Germanic term for wheat, to New World maize.

Wheat is a spring crop here. Plant it in fall or early winter, when the ground cools off, and it is ready for harvest in late spring as the weather starts to get hot again. Before we had wheat and barley and chickpeas and other foreign winter-spring-rainfall-regime crops, we simply didn't have winter-time crops. Our big food crops are the hot-weather holy trinity of corn (maize), beans, and squash. All in all we grow four or five species of beans: lima beans, scarlet runners, jack beans, and teparies. Our lima beans are rainbow-

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In the Eye of the Desert *continued*

speckled and taste like the rainbow itself, not like those mushy mealy pasty white limas you buy in the supermarket. But the beans we most often grow are teparies, of just about any color and domesticated right here. The bigger common bean came in from the south at about the time of the foreigners, about the same time we got big chilies from the south. We have other summer food crops too, like grain amaranths and native millets, bottle gourds, and sunflowers. Our summer crops, frost-sensitive and mostly C4 plants, can't be grown over the winter. So can you imagine what it's like to get wheat? Something as useful as maize that thrives through the freezing winter nights—another grain for flour for tortillas and atole. No more bug-infested leftover cornmeal and mesquite in the lean time of the foresummer.

The Old Ones tell of bighorn sheep on every mountain (you see them in pictograph-graffiti), plenty of deer, pronghorn across the whole desert, all the tasty desert tortoises you ever wanted, and as I said before, huge fish in the rivers. Live rivers veining across the desert, rivers lined with great gallery forests of cottonwoods and willows flanked by vast mesquite bosques. Green lagoons and hundred-mile forests across the Red River delta. Surging tidal bores writhing with sea turtles and enormous fish and the little vaquita porpoise. Marshes full of reeds and birds, and migrating flocks that really do darken the sky. Deafening clapper rails. Jaguar paw prints in the morning. Plenty of places to grow corn, beans and squash--and the air always clean like just after a desert rain. I asked some of the Old Ones if they would like to go back to the Old Ways and they said, "Hell no, it was hard."

[I thank Tom Bowen, Linda Brewer, and Ben Wilder for suggestions and encouragement.]

Succulents and Bighorn of Isla Tiburón

by Benjamin T. Wilder[1], Richard S. Felger[2], and Humberto Romero[3].
Photos courtesy the authors.

Isla Tiburón, the largest and most floristically diverse island in the Gulf of California supports a magnificent and largely undisturbed representation of the Sonoran Desert. A true highlight of the island's flora are the many succulent species that exhibit adaptations to an arid environment. The island is the historic homeland of the Comcáac (Seri Indians), and remains under their direct control. The twentieth and beginning of the twenty-first centuries has been a time of significant changes to the Comcáac culture as they transitioned from an existence based upon the products of the desert and sea (Felger and Moser 1985), to the more globally practiced economic model. No story better exemplifies the crossroads of economics and biological conservation in the Comcáac region than that of the introduced bighorn sheep and the diverse succulent plant community of Isla Tiburón.

The island is located within the Central Gulf Coast subdivision of the Sonoran Desert, which has been termed a "sarcocaulescent desert" due to the prevalence of succulent and semi-succulent trees and shrubs with exaggerated stem (trunk and limb) diameters (Shreve 1951). On Tiburón 51 species fall within three categories of succulence: xerophytic (20), semi (22), and halophytic (9) (Wilder et al. 2007). The vast majority of xeropytic succulents are cacti, many of which do not extend much farther north and only a few are familiar to those with an Arizona knowledge of the Sonoran Desert. One such species is the sprawling columnar cactus, pitaya agria (*Stenocereus gummosus*), which is widespread on the Baja California Peninsula but has a very narrow occurrence on the Sonoran mainland. Its distribution has lead to the hypothesis that this species migrated via the Midriff islands from Baja California to the Sonoran mainland (Cody et al. 1983), an hypothesis which is in part supported by

continued next page

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[2]University of Arizona Herbarium (ARIZ); [3]Tribu Seri, Punta Chueca, Sonora

Succulents and Bighorn

continued

right *E. scopulorum*

molecular evidence (Clark-Tapia and Molina-Freaner 2003). Yet the role of humans in dispersing organisms, especially those with such delicious fruit as pitaya agria, should not be ignored (Yetman and Burquez 1996, Nabhan 2000).

One of the major factors contributing to the botanical diversity of Tiburón is the Sierra Kunkaak, a rugged and massive mountain on the east side of the island. The topographical complexity and sheltered environments associated with the Sierra support a diverse composition of desertscrub and tropically-inclined species. In fact, the upper elevations of the Sierra [peak elevation of ca. 4,000 ft (1,200 m)] support largely un-investigated thornscrub vegetation, separated from its occurrence further south on the Sonoran mainland by more than 100 miles of intervening desert. Succulent species are particularly prevalent in the Sierra, none more so than *Agave chrysoglossa*, which is common above 1148 ft (350 m). Also scattered throughout is the semisucculent genus *Bursera*, here represented by four species. Tiburón is the only locality in the entire Gulf of California with such a diversity of *Bursera*, corresponding to the high niche diversity found on the island. Another fascinating succulent record is the Tiburón barrel cactus (*Ferocactus tiburonensis*) that is found only on the island and the nearby mainland coast. It is differentiated from the ubiquitous *F. wislizeni* by straight and firm radial spines and a distinctive seed coat. These are but a few of the botanical treasures housed in the extensive Sierra.

In 1975, twelve years after Isla Tiburón was the first island in the Gulf of California to receive official status as a protected area, a novel conservation initiative was initiated. Twenty desert bighorn sheep (*Ovis canadensis mexicana*) were introduced into the Sierra Kunkaak of Tiburón with the primary goal of creating a breeding ground for this threatened and iconic desert mammal that could then support failing populations on the mainland via re-introductions. There is no historic record of bighorn sheep occurring on Tiburón prior to this introduction, although a sizable population occurs on the similar adjacent Sierra Seri on the Sonoran mainland. Due to the absence of a top predator on the island and a favorable habitat, the bighorn population grew dramatically, reaching about 650 animals in the late 1990's (Hedrick et al. 2001). At this point in time it was decided that permits for the hunting of bighorn sheep on Tiburón were to be sold on the international market to provide a revenue stream to the Comcáac community as well as to decrease the sheep population. The initial permit in 1998 garnered a six figure winning bid and subsequent permits bring comparable amounts.

How are the bighorn and the associated hunting activities affecting the island's native flora? No quantitative studies have yet addressed this question; however, there are a number of obvious and significant impacts. The bighorn diet is based on a wide variety of plants. Over 30 species have been observed to be a part of the sheep's diet, the most apparent component being succulent species. Vast numbers of the Tiburón barrel cactus (*F. tiburonensis*), amole (*Agave chrysoglossa*), saguaro (*Carnegia gigantea*), and other succulents are seen bashed open or otherwise damaged throughout the Sierra. Most concerning is that no baseline knowledge exists for the disjunct thornscrub vegetation at the upper elevations of the Sierra, the primary habitat of the bighorn. In addition to physical damage caused by the bighorn, a minor network of roads has been expanded by the Comcáac to aid the movement of hunters around the island. The disturbance caused by these roads and their associated vehicular traffic is a significant concern in terms of the increase in suitable habitat for the establishment of non-native invasive plant species.

It is widely thought that the use of Tiburón as a breeding ground for desert bighorn is a general success (Ezcurra et al. 2002). From the perspective of bighorn sheep conservation, the contribution made to mainland populations through reintroduction efforts is significant. But what about their impact on the island? Tiburón has been maintained as one of the most undisturbed places in the Sonoran Desert in part because of the bighorn sheep. The revenue for the Comcáac community generated through the sale of high-priced hunting permits is a driving force in their economy. The economic incentive for the Comcáac community to maintain Tiburón in an undisturbed state for bighorn conservation is a primary factor that has kept the island well preserved in a time of external developmental pressure as well as widespread habitat destruction on the Sonoran mainland. This does not mean the bighorn-hunting program is a long-term conservation solution. There is evidence for a dangerously low level of genetic diversity within the population (Hedrick et al. 2001). The creation and use of roads will only expand over time, contributing to habitat degradation, and the continued bighorn impact upon the vegetation is a serious concern. Yet, the desert bighorn conservation and hunting program on Tiburón is a valuable example of the tradeoffs inherent in large-scale conservation. It has been successful in aiding the Comcáac's transition into the 21st century and providing an economic incentive for the preservation of Isla Tiburón.

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ETHNOBOTANY: PEOPLE USING PLANTS

Why you should care about Ethnobotany

by Jessa Fisher **nightbloomingcactus@yahoo.com** *Flagstaff Chapter President*

One of the most important relationships on this planet right now is the one between people and plants. The name that defines this interaction is ethnobotany- the study of how people throughout time use and have used plants. Often in our modern, technological world we lose sight of the fact that without plants we would not be able to even breathe or eat! And while non-renewable resources like oil, plastics, metals, and synthesized materials are often used in their place, throughout history and still in much of the world today plants are used and depended upon for fuel, shelter, clothing and medicine. Other ways that people use plants include as dyes, tools, currency, instruments, in artistry and craftwork, in cosmetics and jewelry, and as mind-altering substances. Plants are integral to not just human society, but human life on earth, and need to be honored as such.

The first printed study that could be defined as an ethnobotanical work goes back in time to AD 77 when Dioscorides, a Greek surgeon, wrote "De Materia Medica" a discussion of the uses of more than 600 Mediterranean plants (Wikipedia). Still today listings of plants in herbal works are referred to as the "materia medica."

Ethnobotany as a field of study has been recognized since the early 20th century when the Harvard Professor Richard Evan Shultes popularized the field with his studies of plants used by shamans in the Amazon rain forest. One famous ethnobotanist from Arizona was Alfred Whiting, who worked in the mid-20th century with the Hopi tribe. Many other ethnobotanical studies have been conducted throughout time, mostly with indigenous tribes worldwide. Cultural sensitivity has not always been valued, but now is strictly encouraged and employed by anglo researchers who venture into the intimate lives of native peoples. It is now widely recognized that important plant- and earth-based knowledge is slowly slipping away, as elders pass on, languages die out, plant species become threatened, and cultures become assimilated. Writing, recording, photographing, teaching, and documenting this valuable knowledge in any way possible is important before this storehouse of information on planetary survival is lost for good.

Ethnobotany can be a part of your world everyday. Think about how many plants you used today, in how many different ways. What plant-based ingredients can you find in your cosmetics? What regions of the world are the plants coming from that you eat? Can you name five native plants growing in your area that you could use as a food or medicine resource? How do you personally relate to plants: your houseplants, garden plants, plants in your neighborhood?

If you would like to learn more about ethnobotany, here are some great texts and web references that can get you involved in the fascinating, adventurous, and important world of people-plant interactions:

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Thanks to Thomas Bowen, Cathy Moser Marlett, and Richard Felger for assistance in editing.

CONSERVATION COMMITTEE UPDATE

An active and vital part of meeting our mission

by Greta Anderson, Conservation Chair **conservation@aznps.org**, *and Barbara Phillips, President*

The AZNPS mission is to "promote knowledge, appreciation, conservation, and restoration of Arizona native plants and their habitats," is taken to heart by the hard-working members of the conservation committee. We are working hard in southern Arizona to do outreach, active restoration, and raise community awareness of the importance of native species in a healthy landscape.

Southern Arizona Conservation Updates

Global Warming Spreads Invasive Species:
The conservation committee has been carrying this message to the masses wherever it's appropriate. This year, on April 14, we participated in "Step It Up 2007" by pulling buffelgrass at Tucson Mountain Park and getting media attention for our efforts. We also tabled at the "Rock the Earth" event in Tucson, an international day of awareness about global warming. Teaching people about the impacts of climate change and how disturbance facilitates weed infestations is a great way to spread the word about how important native plant species are.

Native Plant–Desert Tortoise Demonstration Garden: Our efforts to plant native forage species for the desert tortoise enclosure at the Arizona Game and Fish Department paid off: at last look, four desert tortoises were happily munching on their new home! The completed garden includes a variety of plants, an irrigation system, a plaque explaining the effort and thanking contributors, and soon, a brochure that tortoise adopters can take with them to learn about the vegetation requirements of this species.

Grow Native: Don't Plant A Pest: Our brochures have been wildly popular! We've about run through our original printing of 45,000 English copies and we've begun the fundraising quest to print some more. These brochures are providing an important service by raising appreciation for native species and awareness about the threats non-natives pose in our desert ecosystems. We're constantly getting requests from other parts of Arizona and beyond for new bioregionally-relevant pamphlets, which we're hoping another chapter or organization will take on soon. If you are interested in developing this for your area, want to contribute to the second printing, or want some brochures yourself, please contact **conservation@aznps.org**.

One Thousand Trees Please!: One of the latest projects of the conservation committee is teaming up with the City of Tucson to support a wide-scale planting of native trees on the streets of downtown. AZNPS member Diana Rhoades thought up this great campaign and we're happy to help. The plan is to get gorgeous native and xeric trees planted downtown to help shade walkways and buildings, bring beauty into the urban area, and, ultimately, spawn a Blossom Festival by the time the Centennial rolls around in 2012. We know it's ambitious, but why not? By incorporating water harvesting, green spaces, and native vegetation in the heart of the city, we hope to transform Tucson to a model of sustainable design. The first round of planting is planned for October 22.

Native Plant Vouchers: The conservation committee developed and distributed vouchers that help people who remove buffelgrass from their yards replant with some native grasses instead. In partnership with Desert Survivors Nursery, we've provided gift certificates for native plants to neighborhood associations active in removing buffelgrass. It's a win-win situation: people make the effort to eradicate this flammable and invasive grass and get rewarded with beautiful native replacements. We get to promote native-centric nurseries and offer incentives to residents who are doing the right thing. It would be great to get other nurseries and neighborhoods on board with this fun project- please let us know if you have any ideas

Native Garden Tours: A subcommittee has taken up the task of planning a garden tour for spring 2008. This tour will invite participants into native plant gardens that are geared towards providing wildlife habitat: butterflies, birds, and even lizards! The tour will be in Tucson on April 12th next year — stay tuned for more details.

Aravaipa Canyon: Persistence pays off. One of our members, Diana Turner, has been worried about tamarisk establishing in Aravaipa Canyon for quite some time, but couldn't get other people to pay much attention. This year, she led a small crew from the conservation committee into the canyon to being mapping it and what they found was sufficient to finally raise some alarms. With cooperation from land owners and the Bureau of Land Management, an eradication effort is underway. The conservation committee will adopt three sections of the canyon and yank out this non-native shrub in October.

Northern Arizona Conservation Updates

Northern Arizona Native Seed Alliance (NANSA): This highly enthusiastic group meets monthly to collaborate and share information regarding the development of native plant materials for grant opportunities, upcoming workshops and recent research. It also will provide education and information to others about the need for native plant materials in Northern Arizona for restoration projects. Funding has been received

continued next page

Remembering Bob Zahner

The Arizona Native Plant Society lost a long-time member and supporter when, on September 1, Bob Zahner died in his sleep in Highlands, North Carolina, in the house he built himself 50 years earlier. He was 83, just one month shy of his 84th birthday. He is survived by his wife of 45 years, Glenda (also a native plant enthusiast and AZNPS member), 4 sons, 2 daughters, 1 sister, 8 grandchildren and 1 great-grandchild.

Bob served in the Army Air Corps in WWII, returning to complete his undergraduate education at Duke University. He went on to receive his doctorate at Harvard, becoming a professor of forestry and natural resources at the University of Michigan, and later joining the faculty at Clemson University.

The Zahners' Arizona ties began in the 1973 when Bob, with Glenda, came out for a sabbatical. They quickly grew to love the deserts and sky islands of the southern part of the state, and Bob began to do research for the U of A, with Tucson becoming their second home.

Bob's contributions to the Arizona Native Plant Society were numerous. Bob and Glenda led many field trips for the Tucson Chapter of the Native Plant Society, were co-presidents of the Chapter for several years and served on the State Board of Directors. They were amongst the pioneer "weedwackers" working with crews to eliminate invasive grasses in the Tucson Mountains. Bob also served as the state coordinator for the Arizona Register of Big Trees, a position which brought him great pleasure and satisfaction.

Bob and Glenda were very active in the Tucson chapter of AZNPS over the past 15 years or so, right up until they left this spring for their annual return to the Zahner family home in the mountains of western North Carolina. Bob's health had been failing over the last 3 or 4 years, and it was with some degree of apprehension that their Arizona friends bade them farewell for what would be the last time. Glenda will return, as always, in October to their home on the edge of Tucson Mountain Park, where she and Bob spent many happy "cool" seasons in the company of a constantly revolving cast of family and friends.

Bob will be greatly missed by all who had the pleasure to know him. His gentle manner, keen wit (accompanied by twinkle of eye), professorial demeanor (He seemed to revel in explaining the diversity between the oaks in southern Arizona, or locating an unusual or rare plant in the Tucson Mountains.) and fierce love for nature were sources of inspiration for, and admiration by, those of us who are proud to proclaim him as our friend.

For those so inclined, donations can be made to the Highlands Biological Foundation which supports Bob's work toward conservation. The lecture series at their Nature Center was named for Bob — Highlands Biological Foundation, P.O. Box 580, 265 Sixth Street, Highlands, NC 28741

CONSERVATION COMMITTEE UPDATE *continued*

from the Coconino Natural Resource Conservation District for a Coordinator, Janet Lynn, **Janet.Lynn@nau.edu**. Under funding received from the USDA Forest Service, a Northern Arizona Native Plant Materials Program coordinated project is being developed among the Arboretum at Flagstaff, The Museum of Northern Arizona, The Nature Conservancy, Arizona Game & Fish Department and local volunteers, including AZNPS members. For information about how to be involved with this project, please contact Sheila Murray at **Sheila.Murray@nau.edu**.

San Francisco Peaks Weed Management Area (SFPWMA): Under new Coordinator Scott Harger, **cannonbone@msn.com**, this active cooperative group brings together agency, non-profit organizations, and the public to discuss and coordinate resources and educate about invasive and noxious weeds. SFPWMA is currently expanding from the greater Flagstaff area to include the Williams and Tusayan areas. Recent activities include mapping of all invasives and yellow starthistle and scotch thistle removal along the Rio de Flag in Picture Canyon area and Audubon's recently nominated Important Bird Areas.

Native Plant and Xeriscape Garden Contest and Tours: The Flagstaff Chapter joined with the City of Flagstaff and Coconino County to highlight the appropriateness and feasibility of planting native and drought-tolerant plants in a challenging environment like the Colorado Plateau. Participation from the community was excellent and over a hundred people enjoyed visiting the various types of gardens and talking with the homeowners about how they achieved their goals for native xeriscape landscaping.

These are just a few of our ongoing and upcoming activities, and the list doesn't cover the advocacy letters AZNPS Conservation Committee sends or the regularly scheduled weedwacking efforts we support. We meet on the fourth Wednesday of each month in the Tucson area. If you want to join in or just get on the list to be kept apprised of the Tucson Chapter activities, please contact **anderson_greta@yahoo.com**. Please contact Jessa Fisher **nightbloomingcactus@yahoo.com** for information about the Northern Arizona AZNPS Conservation activities.

left to right *Psorothamnus thompsoniae* var. *whitingii* and *Poliomintha incana*.

The Arizona Ethnobotanical Research Association Little Colorado River Field Institute

by Phyllis Hogan[†]. Photos courtesy the author.

The Arizona Ethnobotanical Research Association (AERA) is a 501 (c) (3) bioregional, educational and conservation organization that combines the wisdom of traditional native teaching with contemporary scientific methods. AERA was formed in response to requests by indigenous herbalists and healers to assist them in investigating and documenting the use of traditionally utilized plants of the Southwest. Based in Flagstaff, we have been working in and around the natural areas and Native reservations of Northern Arizona since 1983.

A recent project we undertook was The Little Colorado River (LCR) Field Institute. This school was designed to train indigenous students to conduct culturally sensitive ethnobotanical research, plant and landscape conservation and environmental management. We interspersed indoor teaching with field excursions to sacred sites and traditional medicine gathering areas in the LCR Basin and the greater region of the Colorado Plateau. Involved were two instructors, six Native students, eight Native elders, and numerous scientific and professional consultants. This project was made possible by a generous grant from The Christensen Fund.

The stunning setting for the LCR Field Institute was the Painted Desert. The Painted Desert is a brilliantly colored plateau region extending 200 miles along the Little Colorado River in north-central Arizona. It is a fantastic land of mesas, buttes, and valleys formed by the ages of wind and water. The Little Colorado River (LCR) begins its course on Mt. Baldy near the town of Greer, Arizona, and flows 350 miles through six vegetative zones before it reaches its final destination in the Grand Canyon, flowing into the Colorado River. The Little Colorado River watershed is the second largest watershed in Arizona encompassing 27,000 square miles in Arizona and New Mexico. Almost half (48%) of the LCR basin belongs to Native American Nations.

At the 2007 Arizona Botanists Meeting, one of the students from the LCR Field Institute, Jonah Hill, and I presented on some of the plants we studied for this project. Jonah is Hopi, and explained some of the Native names and uses for these plants. Many of the plants we studied are still utilized. *Poliomintha incana* (rosemary mint; me'z'ngto'shuve in Hopi and atsa'azee in Navajo) is a culinary spice, and is used as a wash for eagle feathers. The leaves of *Cleome serrulata* (Rocky Mountain beeweed; tu'mi in Hopi) are eaten much like spinach. *Nicotiana obtusifolia* (desert tobacco; pi:'va in Hopi) is a smoke plant, and when used externally as a liniment is analgesic (pain-relieving).

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EDUCATION & OUTREACH COMMITTEE UPDATE

New Parabotanist Program has taken root!

by Wendy Hodgson, Education & Outreach Committee Chair

The Arizona Native Plant Society (AZNPS) has initiated this exciting program to better document the floristic diversity of Arizona through the collection of plant specimens. Tailored after the very successful San Diego Natural History Museum's San Diego Plant Atlas (www.sdnhm.org), the Arizona Plant Atlas Project (APAP) will provide an Internet accessible, databased plant atlas for Arizona, based on vouchered herbarium specimens. Arizona is a region well known for its diversity, ranked fourth in the country in number of total species. The program will train volunteers how to properly collect plant specimens and record appropriate field data. By developing a parabotanist program, we can 1) identify what areas of the state have the greatest floristic diversity, 2) determine if there are new plant species yet to be discovered, 3) determine what areas need to be conserved, and 4) provide decision-makers (land management agencies, academia, politicians) with sound, scientifically based information and verifiable herbarium specimens. The main products of APAP will be 1) a training program, which involves the public while increasing awareness and respect for natural and cultural resources, 2) specimen collections that supports scientific research, teaching, consulting and land management, and 3) an online searchable database for use by biologists, students, teachers, consultants, land managers, landowners, conservationists, garden clubs, etc.

The state Board of AZNPS and local chapters will have certain responsibilities for the successful development and implementation of the program. For example, the state Board of AZNPS will be responsible for securing the necessary insurance, training program and workshops (including manuals and collecting techniques), outreach programs (development of PowerPoint presentations), and overall co-ordination of information input, photos, website and SEINet database. The local chapters will be responsible for a number of tasks such as designating a leader or committee to oversee the local projects; identify areas that are excellent candidates for plant inventory work based on selected factors; schedule and set up training programs; develop educational opportunities (presentations, field trips); recruit and maintain volunteer group (including volunteer recognition opportunities), submit plant information and photos to website; and maintaining a current list of collections from a particular site. Factors to be assessed in selecting an area of study include, but are not limited to: 1) ecological significance (edaphic, interfacing of ecozones, pollination corridor, elevation, water, sensitive or rare plants), 2) cultural significance, 3) intact areas, 4) level of threat, and 5) accessibility and appeal to volunteers.

Tasks required in the immediate future include the state Board of AZNPS to: 1) obtain commitments to APAP from all of the chapters; 2) develop a PowerPoint presentation for promoting this program; and 3) co-ordinate the implementation of workshops with local chapters. The state chapters each need to identify a focal area, recruit and train volunteers, provide supplies to volunteers and obtain necessary permits for selected areas. It was suggested that Verde Valley be selected as our first area for plant inventory work, although chapters may select other areas as well.

This program requires a great deal of work, coordination and commitment from all chapters to make it work. We are confident APAP will be successful!

Little Colorado River Field Institute *continued*

Other plants we researched are rare and/or endemic to this region, including *Amsonia pebblesii* (Peebles' bluestar), *Psorothamnus thompsoniae* var. *whitingii* (Whiting's dalea), *Polygala subspinosa* (spiny milkwort), and *Errazurizia rotundata* (roundleaf dunebroom). (See the Fall 2006 *The Plant Press* for an article on AERA's work with spiny milkwort). I was honored to facilitate this important project, reuniting Native youth with the wisdom of their elders and the special plants growing in their traditional lands.

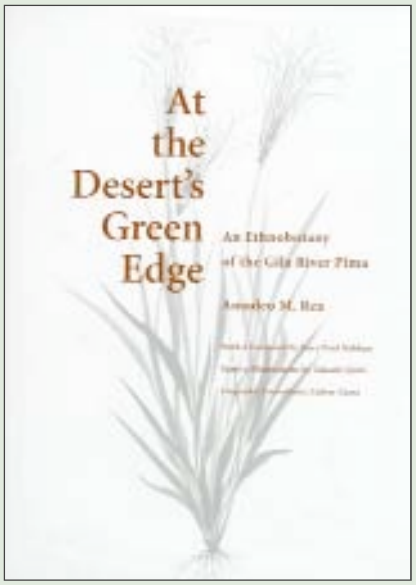
left to right The author, T.Homewytewa, and J.Dedera.

BOOK REVIEW

by Wendy C. Hodgson, AZNPS Board of Directors

At the Desert's Green Edge:
An Ethnobotany of the Gila River Pima

By Dr. Amadeo Rea, University of Arizona Press. 1997. $65, 430 pp.



I have known Dr. Amadeo Rea for nearly 30 years. When I met him, he was already an accomplished author, having what would become a classic in the field of ecological studies, the 1983 *Once a River: Bird Life and Habitat Changes on the Middle Gila*. During the past three decades, he's been busy finishing books, all stemming from his studies of and collaboration with the Pima Indians of Arizona and Sonora, Mexico. *At the Desert's Green Edge* is his *magnum opus*, a testament to his enduring commitment to understand and share the Gila River Pima's story.

The Gila River Pima Indians, or Gileno as the Gila River people refer to themselves, are among the northernmost members of a loosely affiliated network of Tepiman-speaking cultures know as the northwestern Mexican rancheria cultural group. In addition to the Gileno, this group includes the Yaqui, Tarahumara and Opata, among other tribes. According to Dr. Rea, their expansion from northern Mexico into former Hohokam territory is relatively recent. Historically, the Gila River Pima settled along the Gila River from near Casa Grande westward to Gila Bend and beyond. Today, they live on a reservation that is flanked by the Sierra Estrella to the west and South Mountain to the north. *At the Desert's Green Edge* is a chronicle of change that has greatly affected the Pima's traditional way of life, including rapid, serious habitat degradation. The book is arranged in two parts. Part One discusses in wonderful detail the people and their homeland, including descriptions of the region's historic habitat. For example, it may come as some surprise to many readers to learn that sand dunes some 10-15 feet tall once extended along the Gila River throughout most of the reservation. According to ethnohistorical accounts, such dunes also existed in the area between Laveen and the reservation. Sadly, these natural features today have been paved over by development.

Part Two is a catalogue of the plants that are recognized by the Pima people. But instead of using the standard organizational format found in most botanical studies, Dr. Rea arranges the plant entries according to Pima life-form categories such as trees, bushed, cactus-like plants and plants growing in water. Each entry is given the English vernacular, scientific name and Pima name. For help in deciphering Pima names and meanings, Dr. Rea consulted Culver Cassa, a self-taught linguist and foremost expert in the field of Pima mythology and language.

Although bursting with ethnographic and botanical information, the text is highly readable and written with the layperson in mind. (The text also is beautifully illustrated by Takashi Ijichi's Japanese brush-style botanical paintings.) Most plant entries are filled with stories and oral histories recollected by Dr. Rea's native consultants and fiends or with personal anecdotes, reflecting Dr. Rea's long personal and professional involvement with the Pimas. From the text, for example, we learn that the Gila River Pima regard many things in their environment as sacred. Everything, they believe, is on earth for a purpose, although humans my not always know what that is. Even plants that have no apparent utility, Dr. Rea discovered, have a purpose—-some plants exist, as his Pima sources emphasized time and again, "just to beautify the desert."

This focus on presenting the Gila River Pima's view of plants and their environment, along with memories of their own history and culture, is in marked contrast to the vast majority of ethnographic publications that provide excellent information about a group's material culture but fall far short of presenting this information from their subjects' point of view. Letting the Gila River Pima speak for themselves demonstrates how much we can learn from these gentle, caring and good-natured people.

At the Desert's Green Edge is a rare work that sets the bar quite high for similar studies in the future.

Wendy C. Hodgson, a long-time AZNPS member, and current Board member, is curator of the plant collection at the Desert Botanical Garden and author of the award-winning book, Food Plants of the Sonoran Desert.

Ethnobotany: Whose Perspective?

by Amadeo M. Rea

"I know you believe you understand what you think I said, but I am not sure you realize that what you heard is not what I meant." — Richard M. Nixon

This convoluted sentence might be a truism of much of human communication (or maybe miscommunication). It is the problem of anyone attempting translation. Most especially it might be addressed by any indigenous person, coming from a different culture and speaking a different language, to a Western-trained biologist doing "ethno"biology.

Let's look at the typical scenario. A botanist is trained in binomial or Linnaean taxonomy. He or she grabs a branch, twig, vine, usually with leaves, flowers or fruit, flashes it to indigenous person X and asks, "What do you call this?" The indigenous person's answer is then scribbled on a newspaper, the specimen is thrust into the plant press, and the botanist goes on to the next species he or she recognizes and the process is repeated. The end result is a series of answers to the botanist's query of "What do you call this?" Publish results.

What's wrong with this? After all, ethnobotany started out this way. It has been a tradition. The fathers and the mothers of ethnobotany functioned this way. Let's reread the quote again, putting it into the mouth of our indigenous consultant X. The questions our hypothetical biologist asked do not get at how the *consultant* thinks about and organizes his or her world. The goal of ethnography is to try to understand how *others* cognize their world. The question is not how do I fit your categories into *my* way of thinking. Rather it is, how can I use my categories to try to understand *how you perceive, label, and talk about your world.*

Two concepts need to be plugged into our formula for trying to understand someone else's cognized environment: *rank* and *domain*. A whole course could be taught around these two (and sometimes is). Let's be minimalist for a moment. *Rank* means the position in a hierarchy where any folk taxon fits. That should come as no surprise to any Western trained biologist. We just need to ask.

Domain can have two meanings, biological and linguistic. The *biological domain* means that the investigator must know the local biota in order to ask questions. The questions should exhaust the species in the biological domain. The *linguistic* or *conceptual domain* means we must find out how many local species are included in or excluded from any folk taxon. Again, it means asking. Look at the quote again from the native consultant's perspective.

It is time for editors to *impeach* any biologist who submits a paper that merely offers one-to-one correspondences with his or her own Western taxonomic structure. It may be good biology, but it isn't ethnology. And ethnobiology (and ethnobotany) must be both!

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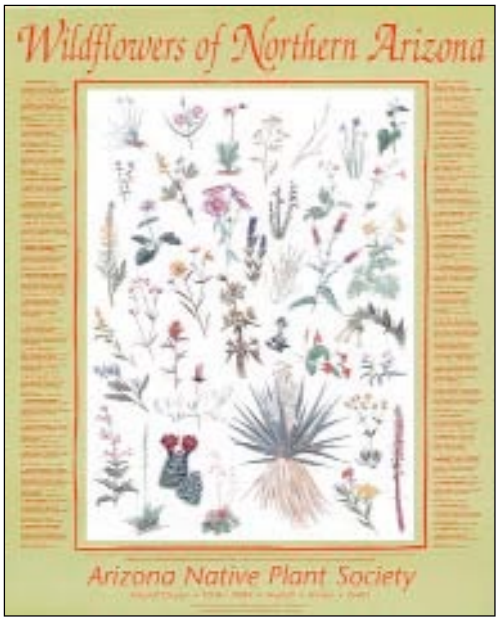

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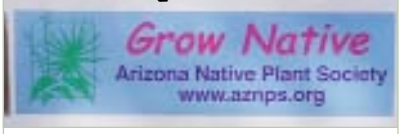

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