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Society

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### Peirson's Milkvetch: A species at the interface of biology, politics, and litigation

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Just slightly off the Arizona road in southeastern California is one of the most spectacular sand dune areas in the Southwest. The Algodones Dunes, sometimes called the Imperial Sand Dunes, lie about 20 miles west of Yuma along Interstate 8 and stretch for about 40 miles toward the northwest. The dunes are home to a number of plant and animal species uniquely adapted to withstand extreme summer temperatures, subfreezing winter nights, severe and prolonged droughts, and the abrading effects of blowing sand. It is indeed a land of environmental extremes, and the plants that survive there are tough, having evolved to survive conditions that other species could never withstand. Oh yes, I almost forgot to mention, the Algodones Dunes are the most popular dune area for off-road vehicles in the Southwest, drawing thousands of recreationists each weekend from October to April.



Of the 15 or so plants present (and mostly endemic) in the dunes, only one has been listed by the U.S. Fish and Wildlife Service under the Endangered Species Act. Peirson's milkvetch (*Astragalus magdalenae* var. *peirsonii*) was listed as Threatened in 1998, citing ORV issues as the main threat. An administrative closure of 30% of the dunes was imposed in 2000 by a Federal court judge over BLM's management of the dunes to protect the plant, sparking legal battles between recreationists and environmental groups over the closures that remain unresolved. A wilderness area encompassing about 20% of the dunes has been closed to motorized travel since 1971. More than \$3 million has been spent by Federal agencies alone on monitoring and litigation in the past six years, and there is no end to the dispute in sight. How many "millions" have agencies made available to study or monitor YOUR favorite species?

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# President's Note

by Barbara G. Phillips [bgphillips@fs.fed.us](mailto:bgphillips@fs.fed.us)  
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This issue of the *Plant Press* is devoted to some of the rarest plants in the Southwest and the diligent research being done on their behalf by Arizona Botanists. From the Algodones Dunes near Yuma, to the subalpine meadows on the Kaibab Plateau just north of the Grand Canyon, to the ancient Native American pathways of the Verde Valley, this issue brings you a fresh perspective about the diversity of species and habitats that we AZNPS members all love and enjoy.

The time perspective of the influence of man on rare plants is greatly extended with discussion of pre-Columbian agave cultivars from about 800 A.D. to the current impacts of dune buggies and invasive weeds, and restoration efforts in the Yuma wetlands. In terms of research, some species have had many decades of study and monitoring, while for others these reports represent only a second assessment after a gap of many years.

I hope the studies in this issue of the *Plant Press* will provide incentive for each of you to consider ways that you might assist these authors, or other botanists, in their attempts to learn about and document the fascinating life and habitats of the rare Southwestern plants.

What else can AZNPS members do on behalf of Arizona plants? The National Forests of Arizona are gearing up for Forest Plan Revision since it has been about 20 years since the Forest Plans were completed. Due to changes in regulations, rare and invasive taxa will be addressed under "Species of Concern" and "Species of Interest," rather than "Sensitive Species" lists so there will be plenty of opportunities for input in the plants' arena. Please look at the website ([fsweb.r3.fs.fed.us/eap/nfma/index.shtml](http://fsweb.r3.fs.fed.us/eap/nfma/index.shtml)) to find those individual forests which you want to assist. The Southwest Vegetation Management Association ([www.swvma.org](http://www.swvma.org)) will be having its annual meeting November 1-3 in Casa Grande, with presentations by some AZNPS members. Some talks that might be of interest are aquatic plant identification, biological soil crusts, and mycorrhizae, in addition to invasives, herbicides and control methods.

Many thanks to Carianne Funicelli for resuming the Chair of the Conservation Committee after a very brief hiatus. Thanks also to Tina Ayers, *Happenings* editor, who is now on sabbatical and has been ably replaced by Jessa Fisher. Jessa has also volunteered to be Recording Secretary for the Board. Wendy Hodgson enthusiastically agreed (with a little arm-twisting) to be Education and Outreach Chair when it was pointed out to her that she was already doing the job! And welcome to new Board members, Karen Reichhardt, Dave Bertelsen, and Mark Bierner. We look forward to your new ideas and assistance on the Board.



## Peirson's milkvetch

*continued from page one*

I began working on the biology, demography, and status of Peirson's milkvetch in the spring of 2001. With six seasons now completed, we are learning much about this fascinating plant. The BLM El Centro area office has monitored the plant annually since 2003, and sporadically before that back to 1998.

Our first task was to survey the open areas of the dunes and find as many places where Peirson's milkvetch grew as possible. At each site we located, we counted the plants, determined their age (first-year or older), noted reproductive condition, and mapped the outline of the site with a GPS. We found 126 places, of which 60 were large enough to circumscribe with a GPS, and counted nearly 73,000 plants. About 45% were reproductive, and less than 1% showed evidence of damage by ORVs. Nearly all appeared to be first-year plants, and a check of nearby weather stations confirmed that there had been a major storm in late October 2000. We concluded that the vast majority of plants had germinated as a result of that storm.

Although we were unable to obtain permission from BLM to enter the administrative closures, we were able to obtain the services of a helicopter and fly over the entire dunes area, noting occurrences of Peirson's milkvetch from the air and mapping them with the GPS. When we combined our ground surveys with the aerial points to map distribution, a pattern began to emerge: the plants grow along a narrow corridor that parallels the axis of the dunes, in the western third of the system, where well-developed dunes occur but outside the area of the highest, most active dunes. Moreover, the milkvetch consistently grows with the other plants in the dunes, forming pockets of vegetation on the lee sides of slipfaces and bowls where sand movement is less than elsewhere in the system. We were finding a pattern in the distribution of the plants, and their occurrences were predictable. We



were also finding that the ORVers preferred the high, unvegetated dunes to the shrubby gentle slopes where vegetation is concentrated, and they largely avoid such places when possible.

The following season, 2001-02, was very dry, and few seedlings germinated. However, timely rains during the summer allowed 21% of the plants we had enumerated in the spring to survive. Milkvetch seedlings quickly grow very long taproots after germination, and their roots may be 5-6 feet long by the end of their first season. This allows them to tap moisture deep in the sand, and makes it possible for robust plants to survive the terrific desiccating heat of summer — temperatures in the dunes regularly reach 115 to 120° at weather stations, and must be considerably higher at the sand surface.

Even without fall and winter precipitation in 2001-02, the surviving plants grew robustly and reached basketball to beachball size by late fall. Flowering began by December, and for a second season these survivors successfully reproduced. The previous uncertainty about whether Peirson's milkvetch is an annual or a perennial was resolved: it is both! We found that some robust plants can have as many as 800 pods; at ten seeds each, perennial individuals can be quite prolific.

The following season, 2002-03, lacked fall rain but a storm in mid-February resulted in a germination event that rivaled that of 2000-01. We waited to see if these seedlings would flower, but they didn't! Another twist in the reproductive strategy of the milkvetch had been revealed: plants that germinate in the fall can reproduce their first year, but those that germinate in late winter must survive a summer before flowering the next season. There simply would not be enough time for them to flower and produce seed before the onset of summer dormancy. The summer of 2003 was very dry, and more than 99% of the February seedlings died. This is a small return for a big investment, made feasible by the prolific seed production of second-year plants.

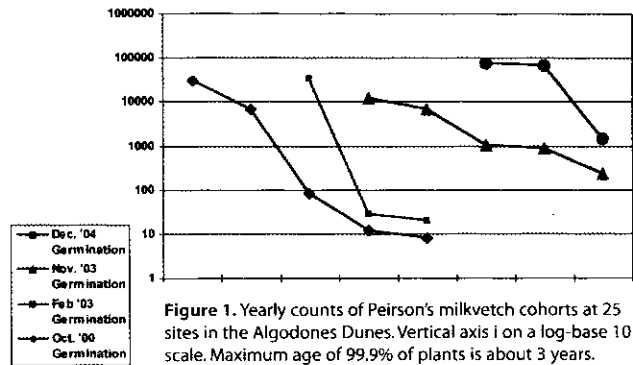


Figure 1. Yearly counts of Peirson's milkvetch cohorts at 25 sites in the Algodones Dunes. Vertical axis is on a log-base 10 scale. Maximum age of 99.9% of plants is about 3 years.

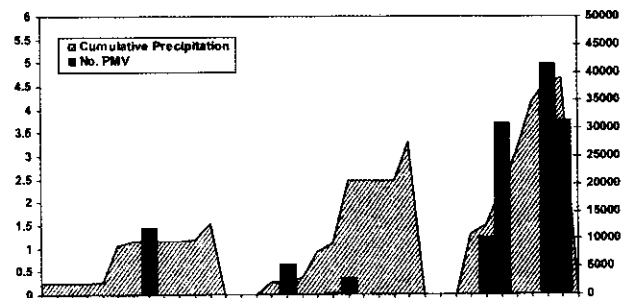


Figure 2. Relationship between precipitation and Peirson's milkvetch germination. Precipitation graphs are cumulative for the year, reset on October 1. Steep slopes indicate precipitation events, while plateaus are dry periods.

How long do the plants live? As figure 1 shows, between 80% and 99% fail to survive beyond their initial growing season, making them annuals. By the third season, 99.9% of the plants in a given cohort have died. Thus only a few plants survive to become short-lived perennials.

The 2004-05 season began with heavy rainfall in late October that continued at regular intervals through the winter. Germination began within days and continued unabated for weeks. By March there were twice as many plants as in 2001. Nearly two-thirds of these first-year plants flowered. In addition, the 1200 survivors from previous years produced copious amounts of seeds. It was a banner year for Peirson's milkvetch.

By comparing rainfall events with germination, we can easily see how storms influence germination. We find that summer rains may enhance survival, but there is no germination during the hot time of year. This is a good survival strategy, as seedlings adapted for cool season growth would never make it in summer. By mid-October the weather is usually cool enough for successful germination. In spring, rains occurring after mid-April do not result in any germination. Figure 2 shows the relationship between rainfall and germination between 2002 and 2005.

Obviously, dormant seeds must be available in the sand to germinate quickly when conditions are right. We conducted studies of the seed bank in 2001-02 and 2005-06. By pushing

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## Peirson's milkvetch

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frames into the sand, scooping it out, and running it through a soil sieve we were able to capture and count the seeds in a known volume of sand. We extrapolated these counts to determine the number of seeds at a site and in all of our sites. Both times, the numbers came out between 2.3 and 3 million seeds and were statistically identical. The seed bank appears to be a much more constant measure of size and status of the population than living plants.

There is an important lesson here for those who study the status of rare short-lived plants in arid climates: you must study the seed bank to determine the true health of the species. The vagaries of weather events result in tremendous variation in the number of living plants from year to year, while the seed bank provides a more consistent and accurate measure of the status of the species.

Peirson's milkvetch provides an excellent opportunity to gain insight into the interface among biology, management, politics, and litigation. All play a role in the ongoing saga of this species, and all are likely to be invoked in the decision-making process in any situation where controversy or conflicting interests arise in the management of rare plants and their habitat.

### Photos courtesy the author:

- page 1 Close-up of Peirson's milkvetch flowers
- page 2 Perennial Peirson's milkvetch in flower
- page 3 Algodones Dunes
- page 4 Annual and perennial Peirson's milkvetch in typical habitat

## ETHNOBOTANY: PEOPLE USING PLANTS

# *Polygala subspinosa:* A Culturally Significant Find

by Jessa Fisher [nightbloomingcactus@yahoo.com](mailto:nightbloomingcactus@yahoo.com)  
Flagstaff Chapter President

The plant family Polygalaceae, or the Milkwort Family, is only represented by a few genera in Arizona. One genus, where the family gets its namesake, is *Polygala*. In Greek this means "much milk" in reference to it being a galactagogue, or herb that stimulates mother's milk production.



This genus contains herbs or small shrubs with entire leaves and flowers with 3 petals, the lower one clawed, which are situated in narrow, terminal racemes. Our local Colorado Plateau species is *Polygala subspinosa*, spiny milkwort. The common name comes from its spinescent branches, that is, branches that end in a spine. It can have puberulent (softly hairy) or glabrescent (smooth, without hairs) stems and leaves. It is suffrutescent, meaning it is woody only towards the base. The lower clawed petal is yellow, while the other 2 petals are purple. It blooms in June and July and in Arizona is found only in northern Navajo and Mohave counties at 5000 to 6500 feet in elevation. It lives under other shrubs, and is rather unnoticeable unless flowering.

The Arizona Ethnobotanical Research Association (AERA: [www.azethnobotany.org](http://www.azethnobotany.org)) is a non-profit organization headquartered in Flagstaff, Arizona, founded and run by Phyllis Hogan. Last year, the AERA hosted the Little Colorado River Basin (LCRB) Field Institute, a forum to train Indigenous students in all aspects of ethnobotany. One mission of the group was to search for rare and sensitive species. In April of 2005, the LCRB Field Institute went to Crack-In-Rock at Wupatki National Monument, just one of their many field sites, along with National Park Service employees Paul Whitefield and Mark Brehl. Perhaps because of the great (normal!) precipitation last year, the team was able to locate and document a population of this plant. Phyllis Hogan and Kristin Husinga first found the plant in the Wupatki area in 1999, noting a new county and NPS Monument record for the shy little plant. The 2005 sighting confirmed that spiny milkwort is hanging on to its little niche.

The uses of *Polygala subspinosa* might have been lost through time due to its small distribution and 20<sup>th</sup> century cultural shifts. Diné (Navajo) uses are not documented. Alfred Whiting, the famous Hopi ethnobotanist, only noted that the plant was "an extremely rare species that seems to be very important to the Hopi, but just why and how it's important, I just don't know." Other species of *Polygala* throughout the US and the world are used medicinally, for a broad range of things including for snakebites, coughs, and milk production. The existence and persistence of spiny milkwort reminds us that every plant, even the seemingly most insignificant, has its place in nature and its own relationship to humans, as well.

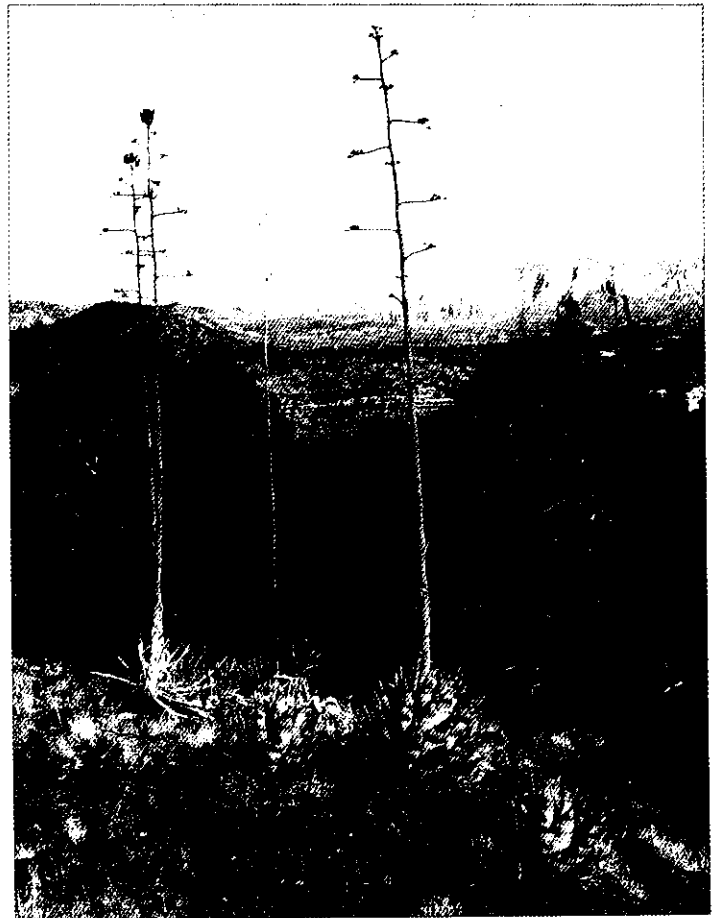
# Verde Valley — A “hotspot” for rare pre-Columbian agave cultivars

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As one descends down Interstate 17, slicing through the magnificently rich, fertile Middle Verde Valley from either direction, one cannot help but think that this was a favored area for pre-Columbian habitation. Yet, surprisingly, relatively few archaeological reports and surveys have been produced for this area, compared to the heavily surveyed areas of Tonto, Phoenix and Tucson Basins to the southeast and south, respectively. After spending considerable time searching and studying extant pre-Columbian agaves in these latter basins, I fortuitously shifted my interest to surveying for these plants in the Verde Valley. During a short period of time, our knowledge (and of course, ensuing questions) of pre-Columbian agaves and their roles in subsistence patterns of Salado, Sinagua and Hohokam, and Hohokam-influenced peoples have increased greatly. In addition, collaboration with staff of different agencies including the National Forest, National Park Service and Tribal groups has also increased significantly.

In 1998, Coconino National Forest archaeologist Peter Pilles (1998) wrote an article on traditional agave roasts and noted how botanists needed to be involved in helping archaeologists study the distribution of agaves around archaeological sites to learn about cultural landscapes and the interaction of humans and the ecosystem of which they were a part. Eight years later, I am pleased to say that botanists are indeed very much a part of these studies and am excited at the prospects of working with our new collaborators and developing programs.

By the turn of the new millennia, *Agave murpheyi* Gibson and *A. delamateri* Hodgson and Slauson (1995) were relatively well-known pre-Columbian agave cultivars from the Phoenix and Tonto Basins, having survived hundreds of years following successful selection and cultivation by Salado and Hohokam peoples through vegetative reproduction. In other words, these plants represent clones of plants farmed extensively from ca 800 A.D. (or possibly earlier) to ca 1350 A.D. Considerable work in the Tucson Basin by Fish et al. (1985, 1992) suggested that there occurred extensive agave cultivation of probably *A. murpheyi*, although no living plants have been found. This was all very exciting news in

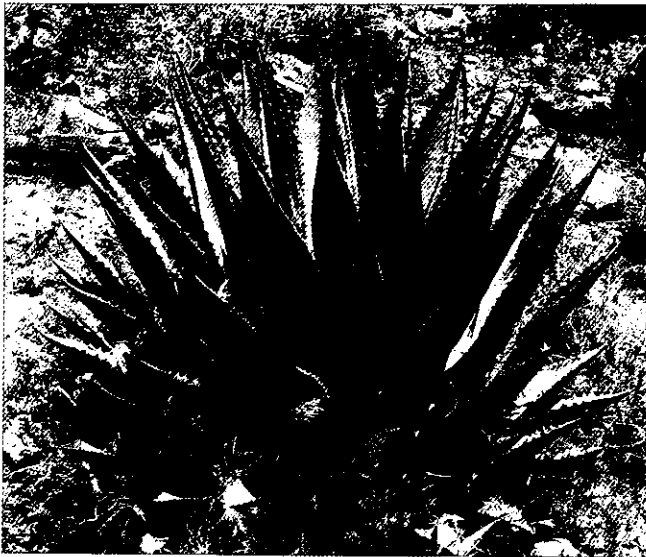


the archaeological and botanical fields. We soon learned that this was only the beginning.

*Agave phillipsiana* Hodgson is a recently described new entity from Grand Canyon National Park (Hodgson 2001), first located by Rose Collom in the 1930s when she was Park botanist (Hodgson 2004). Like *A. murpheyi* and *A. delamateri* it is a member of Gentry's Ditepalae group, showing strong affinities with *A. shrevei* Gentry, *A. delamateri* and *A. palmeri* Engelm. but is easily differentiated from the indigenous and rarely cloning, spicate, tough-leaved Kaibab agave, *A. utahensis* Engelm. ssp. *kaibabensis* (McKelvey) Gentry. In 2002, *A. phillipsiana* was only known from three sites within the Grand Canyon, all near archaeological features (habitation and agricultural). Since then, it was located in the Middle Verde Valley near Tuzigoot, Page Springs, Sedona (near Pulatki ruin and Enchanted Resort), and along the Hassayampa River south of Prescott, near archaeological features including habitation sites and agave processing tools, at elevations between 730 and 1430 meters.

Two additional types of agave believed to be preColumbian cultivars have been recently found in the Middle Verde Valley (Hodgson 2004; Hodgson in edit). The rare “Page Springs agave” is found near its namesake, Page Springs, Yavapai County. Plants grow on the dry, exposed ridges overlooking Oak Creek, Verde River, West Clear Creek and Dry Beaver

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## Verde Valley

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Creek, usually in agriculturally favorable basalt soils with or near archaeological features between 900 and 1200 meters in elevation. Plants are noticeably small, the rosettes being less than half a meter in height, and possess easily cut leaves that are dark gray-green, linear and with mostly deflexed teeth. Plants appear to be closely related to *A. chrysantha* and may have its origins involving introgression with *A. chrysantha* and another cultivated agave within the Ditepalae.

The Sacred Mountain agave is another recently discovered rare pre-Columbian cultivar that is known from Montezuma Castle/Well, Clear Creek, Sacred Mountain, Page Springs and Camp Verde areas, Yavapai County (Hodgson 2004; Hodgson in edit). Clones occur near major archaeological sites/features atop ridges, usually on basalt soils, overlooking permanent water between 1050 and 1350 m in elevation. Plants are freely cloning, less than half a meter tall and show little variability in morphological characters. Mature rosettes and leaves resemble small *A. delamateri* plants; flower color suggests introgression involving *A. chrysantha* with *A. delamateri*-type plants. *Agave chrysantha* (and *A. parryi*) is infrequently found in lower elevations of the Verde Valley but become more frequent on the higher slopes.

Montezuma Castle, Montezuma Well, Sacred Mountain, Pulatki, Honanki and Tuzigoot are major low land settlements developed and occupied from 1130 - 1400 A.D. (Pilles 1981). People extensively farmed and traded with groups to the north (Flagstaff and Winslow-Hopi Mesa areas) and southwest (Prescott area) during peak development of these sites from 1300-1400 A.D. Sacred Mountain is one of a series of sites along Beaver Creek (Pilles 1981) that contained an unusually high frequency of agricultural features compared to other areas of Verde Valley (Fish and Fish 1984). The cobbly or stony loam soils that are especially abundant in the Sacred Mountain area are good for agriculture and

excellent for construction of agricultural features (such as channels, waffle gardens). By maximizing their use, abundant crops, such as corn and cotton, could be produced for local use and exchange (Fish and Fish 1984).

Archaeological evidence suggested extensive use of agave in the upland area of Beaver Creek watershed (Pilles 1981). With the recent discovery of the Page Springs and Sacred Mountain agaves, *A. phillipsiana*, *A. delamateri* and possibly *A. chrysantha* as likely cultivars, we now have strong evidence for extensive farming and use of agave in the lowland areas as well. Neither the Page Springs or Sacred Mountain agave occurs in Tonto Basin, where there exists numerous clones or populations of *A. delamateri* and *A. chrysantha*. Perhaps Page Springs and Sacred Mountain agaves represented signature plants (*sensu* Gasser and Kwiatkowsky 1991) of the Verde Valley region (Hodgson in edit). Villages within this area likely specialized in food production and the exchange of goods, including agricultural products, between upland and lowland people, which continued in the Tuzigoot Phase (Pilles 1981). Why they selected and grew these small agaves is unknown. Perhaps this was a result of decreased fuel wood for fires (small agaves required less time to bake), which may have been related to the beginning of a significant drought period.

Archaeological evidence in the Tucson and Phoenix basins suggested that more than one agave was cultivated (Bohrer 1991). We now have living evidence that more than one agave was grown in the Tonto and Middle Verde Valley areas, having found numerous sites where the Page Springs agave, *A. delamateri*, *A. parryi*, *A. phillipsiana*, and/or the Sacred Mountain agave grow together (Hodgson 2004; Hodgson in edit). One of the more remarkable sites overlooks Oak Creek where hundreds of *A. delamateri* are growing with the Sacred Mountain agave and *A. phillipsiana*, only a few kilometers from extensive populations of the Page Springs agave. Farmers increased the genetic diversity of plants that had a multitude of purposes through selection of mainly vegetative and highly plastic characteristics developed via hybridization of other agaves, while also maintaining favorable characteristics - a progressive and challenging task to say the least.

Despite the recent advances in understanding the role of agaves in the southwestern U.S. and northern Mexico, there remain many questions. To answer these, it is necessary to involve other disciplines including molecular genetics, cytology, archaeology, ecology, ethnobotany and population biology (Hodgson 2004; Hodgson in edit). It is also critical that contemporary people (Yavapai, Apache, O'odham), whose history includes agaves as an important resource, be involved. Last March, members of the Yavapai-Apache Nation participated in the harvesting and roasting of a number of different kinds of agaves, including *A. murpheyi*, *A. delamateri*, *A. chrysantha*, Sacred Mountain and Page Springs

agaves. This event was part of the V-Bar-V archaeology fair, in collaboration with the Nation's Culture Center and the Coconino National Forest. Desert Botanical Garden staff assisted in finding, harvesting and processing the agaves. It became apparent that the interest in agaves was still high amongst tribal members who reminisced of days past when they and their ancestors harvested the plants. Taste tests and preliminary nutritional analyses were performed with these samples; more nutritional analyses, including the kinds and characteristics of agave fructans, are planned from baked agaves processed at the next archaeology fair in 2007.

With the help of molecular analysis by Dr. Kathy Parker and others at the University of Georgia, we hope to answer a number of questions (Parker et al. 2002). Preliminary molecular analysis indicates that although there are low levels of genetic diversity within *A. murpheyi* and *A. delamateri* relative to other clonal, wild species, there exists variation both within and among populations. This suggests that the evolutionary history of these agaves is far more complex than that of a single introduction followed by minimal artificial selection.

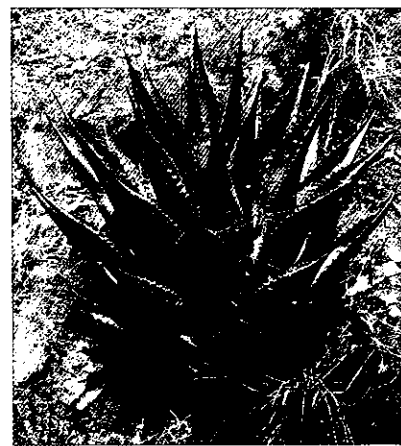
These plants are rare. Only six of a total of approximately 17 *A. phillipsiana* clones, less than 16 Sacred Mountain and 10 Page Springs clones, and less than 10 of a total of approximately 60 *A. delamateri* clones are known from the Verde Valley. One of the questions that needs to be addressed is how we can protect these rare cultural and natural resources given the fact that possible hybrids or plants whose existence depended on people are not protected by the Endangered Species Act. Other avenues of protection must be sought for the protection of these plants within their cultural context.

Without question, these recent studies are painting a picture of agave cultivation at an extraordinary level in Arizona, putting the multi-purpose agaves in their proper place amongst different groups as an extremely valuable resource at one time or another (Hodgson in edit). Everywhere agaves could grow, farmers selected or encouraged plants with certain attributes for their particular climate, topography, soils and needs, involving indigenous agaves (*A. chrysantha* and *A. parryi*), hybridization of local species with cultivated agaves (Sacred Mountain and Page Springs agave) or plants that originated elsewhere, received through trade or migration activities (*A. murpheyi*, *A. delamateri* and *A. phillipsiana*).

#### Photos courtesy the author:

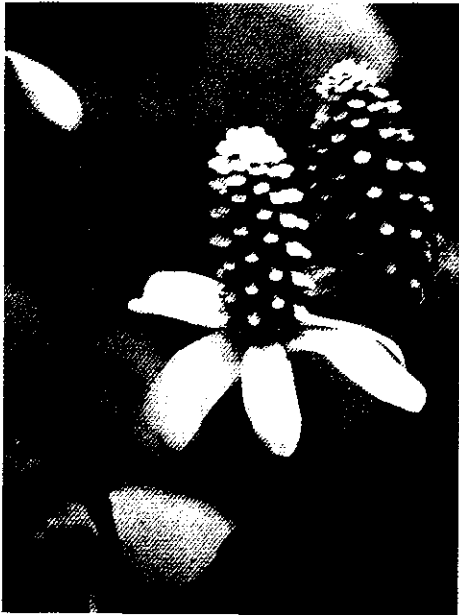
- page 5 *A. delamateri* in Tonto Basin overlooking the valley where three cultivars are found
- page 6 Page Springs agave
- page 7 This Sacred Mountain agave, found near Camp Verde, grows alongside *A. delamateri*

Although we are seeing remnants of plants once grown on a large scale (and many other types were probably developed but have since disappeared), we are seeing the results of years of selection, hybridization and introgression as a result of human-manipulation of agaves (native or not) and the habitat, and subsequent "natural" genetic exchanges amongst plants brought into association with the descendants of these manipulated plants (Hodgson in edit). Scientists must look at landscapes from a cultural perspective and evaluate "normal" wild species more critically within their cultural and "natural" landscape (Hodgson 2004).



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# Annie Has Found a New Home

by Karen Reichhardt karen\_reichhardt@blm.gov  
Yuma Field Office, Bureau of Land Management

Whether you are interested in natives for landscaping, medicinal use or simply their intrinsic value, *Anemopsis californica*, or Yerba Mansa, is a good plant to learn. Although not technically rare, the wetland herb is difficult to find in Arizona. It is rated as G5 or “globally secure” according to NatureServe, the national online database that tracks rare plants and animals. A query on the Southwest Environmental Information Network (SEINET) shows at least 50 collections deposited in Arizona herbaria. In Arizona, its distribution is limited to saline wetland areas which have historically declined due hydrologic change. Its distribution could increase following a recent trend to plant it in native gardens and wetland restoration areas in the Southwest.

*Anemopsis californica* is described by Felger (2000) as “herbaceous perennials with thick creeping aromatic rootstocks and long above-ground stolons. Leaves are mostly basal; petioles are 3-80 cm long, with the blade ovate, 5-15 (30) x 3.0-7.5 (14) cm (much smaller when drought stressed), and the margins are entire. The inflorescence is a spike simulating a single flower (*Anemopsis* is Greek for ‘anemone-like’). Spikes are many-flowered, compact, thick and conical, mostly 3-0-3.8 cm, subtended by petal-like bracts. These bracts are (2.0) 2.5-4.0 cm long, white, aging to green and the flowers are fragrant. There are 1 to several spikes on mostly erect stems that are 12–110 cm tall, with a few reduced leaves. The ovaries are sunken in rachis of the spike. Mass flowering occurs in late spring and summer. Plants are winter dormant; the leaves are freeze killed.”

Yerba Mansa is found in wetlands throughout the southwestern United

States from Oregon to Texas, and from Oklahoma to northwestern Mexico from nearly sea level to 5,000 feet. NatureServe reports that its overall populations within the United States are relatively stable. However, it is becoming increasingly popular to collect from the wild as a medicinal. It is substituted for goldenseal, which is heavily traded commercially and has similar herbal properties. It is also used as a traditional southwestern herb.

In all the years botanizing southwestern Arizona, I have seen *Anemopsis californica* growing in the wild at three locations. It grows along the roadside of the highway in open areas on the Big Sandy River south of Kingman, on the Bill Williams River in moist soil under a dense cottonwood and willow thicket, and in soggy wetlands of the Hassayampa River in Wickenburg. It was probably much more widespread before white men dewatered the Gila and Colorado Rivers for irrigation and domestic use starting in the 1800s. According to numerous accounts, it was highly revered by the O’odham peoples who collected it from broad marshy meadows on the Gila River in the Sacaton area. Amadeo Rea (1997) described how it disappeared from the Gila River by the 1940s and was brought back to the area from California to be planted in Pima gardens in the 1970s.

In the 1980s, when the Desert Botanical Garden exhibit Plants and People of the Southwest was being designed, Wendy Hodgson and Gary Nabhan chose *Anemopsis californica* as an important medicinal display plant to be grown out by the pond. They collected it in Mexico and brought live roots and stolons for the exhibit. It is

## Photos

TOP: Courtesy of SEINET database

**Scientific Name:** *Anemopsis californica*

**Photographer:** Liz Makings

**Locality:** My backyard pond in north Scottsdale

**Image Owner:** ASU Vascular Herbarium

**Notes:** Plant purchased from Desert Botanical Garden

BOTTOM: Courtesy of SEINET database

**Scientific Name:** *Anemopsis californica*

**Photographer:** Liz Makings

**Locality:** San Pedro Riparian National Conservation Area, St. David Cienega

**Image Owner:** ASU Vascular Herbarium

still on living display there. The plant is so easy to grow that inventive horticulturists at the garden have more recently planted the showy leaves at the base of a water fountain in the residential landscaping exhibit.

Wetland plant communities extend for miles of the Lower Colorado River at Imperial and Cibola Wildlife Refuges and at Mittry Lake, but I have not found it growing there. Felger reported *Anemopsis californica* farther south in several places in Mexico along the Lower Colorado River (2000). According to Michael Moore (1989) *Anemopsis californica* can improve wetland soil conditions. Given all the wetland restoration projects on the Lower Colorado River, *Anemopsis californica* may have an opportunity for reintroduction in the region.

The perfect reintroduction locality is in the City of Yuma at two different wetlands restoration projects. At Yuma West Wetlands the planting crew under the guidance of Certified Arborist Tina McKeand started growing out one-gallon pots I brought them from Tohono Chul Park in Tucson. Tina's assistants named it "Annie" for convenience. They plan to increase the plant by setting the stolons into pots where the nodes form new plants. When they have over 100 new plants from the four they started with, they will plant them among cottonwood, willow, and seep willow at a reconstructed beaver pond overlooking the banks of the Lower Colorado. The park is at the site of a former city dump.

The second project, Yuma East Wetlands, is a gigantic restoration project where Landscape Architect Fred Phillips designed a backwater that can be controlled to raise and lower water tables to mimic natural river conditions. Fred is using a natural plant palette to replace 15-foot drifts of decadent giant reed and impenetrable "black forest" thickets of saltcedar. Once the salt cedar was removed with bulldozers and root knives, native species such as sea purslane and salt heliotrope started introducing themselves. When Fred learned about *Anemopsis californica* last fall, he bought over a hundred plants from Tohono Chul Park in Tucson. He planted the *Anemopsis* where ground cover is needed along the fluctuating water edge. The plants are sometimes inundated for several days along with *Distichlis spicata*. Both species are thriving, forming thick patches in the heavy saline river bottom. Fred says his hired help was familiar with the plant and started using it for its medicinal qualities as soon as it started growing at the park.

The herbal qualities of Yerba Mansa are well known throughout indigenous peoples of the Southwest. In Richard Felger's book (2000), Mexicans living on the Lower Colorado River used to collect the long aromatic rootstocks and stack it on burros to be carried to market. Margarita Kay (1996), who studied medicinal herbs of the southwestern U.S. at the University of Arizona, stated that people she interviewed

mentioned Yerba Mansa more than any other herb. Its name "mansa" means gentle, and the name refers to its soothing effects. All of the plant parts can be used in the form of powders, teas, or even as "chew". Among its myriad uses, it is for coughs, colds, sore limbs, and as a topical ointment for skin disorders. It is particularly mentioned as an aid to women's health. Michael Moore's vivid descriptions (1989) of how to use the plant for herbal medicine are the most helpful.

If you happen to come to Yuma, please stop by our wetland restoration areas. You'll be pleased to find "Annie" thriving where she once lived. We are happy she is back – and hopefully she will no longer be as hard to find. And if you happen upon her growing in the wild you'll agree she's a plant you gotta love.

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## *Triteliopsis palmeri* — Blue Sand Lily, an Elusive Plant of the Sand Dunes

by Karen Reichhardt [karen\\_reichhardt@blm.gov](mailto:karen_reichhardt@blm.gov)  
Yuma Field Office, Bureau of Land Management

Seeking perennial drought-adapted plants in southwestern Arizona can be an enigma if the plant's adaptation to avoid drought is to hide underground. Drought is the standard climatic condition. Prior to 2005, there was virtually no rain in the Yuma area for two years. Creosotebushes began to die off, and other desert plants looked long gone. The chance that any small herb such as a perennial lily would survive in the parched soil seemed hopeless. Then came the flowering season of 2005: it was one of those years when plant enthusiasts, tourists, snowbirds and city dwellers alike reveled in the wildflowers. Among the many elusive desert herbs to appear was *Triteliopsis palmeri*, or blue sand lily. Many of us made expeditions to the outskirts of Yuma to the single Arizona locality listed by Kearney and Peebles (first published in 1951).

In *Arizona Flora*, Kearney and Peebles state that *Triteliopsis palmeri* is found... "at the base of the Gila Mountains, Yuma County, 250 feet. Known otherwise only from Baja California." That locality places the blue sand lily in the vicinity of a modern day subdivision named Mesa del Sol, or the "foothills". Members of the Arizona Native Plant Society first spotted the suspected plant in January, 2005 next to the subdivision. It looked like spaghetti-like strands of leaves sprawled over the

sand. In a few weeks deep blue inflorescences atop stout stems up to 18 inches tall were visible everywhere. One could observe the showy umbels of 30-100 flowers until the end of April.

Many sand dune endemics are deeply rooted as an adaptation to avoid high soil surface temperatures and to tolerate shifting sand. *Triteliopsis palmeri* reproduces from tiny bulblets which form a corm found deep in the sand. The bulblets remain dormant during drought. As a testimony to the plant's drought tolerance, Dr. Art Phillips once discovered that the blue sand lily had sprouted out of a plant press where he had placed it to dry as a herbarium specimen.

The Yuma population is the northernmost limit of its range. It is most prevalent in patches around creosotebushes among off highway vehicle tracks, trash dumps, and the invasive species Sahara mustard (*Brassica tournefortii*). A population in the Pinta Sands of Cabeza Prieta National Wildlife Refuge is also threatened by Sahara mustard.

Even though the blue sand lily occurs in other localities - the Arizona Rare Plant Field Guide shows five localities in Yuma County - local Yuma nature enthusiasts are determined to protect the foothills habitat. Land ownership of the habitat is a mixture of State, private and Federal land. Yuma County Parks and Recreation has approached the Yuma Field Office, Bureau of Land Management, to create an environmental education and nature preserve on a portion of the habitat. Arizona Western College and a number of nearby schools as well as the public could benefit from setting aside this parcel of land.

In the fall of 2005, Ed Grossenheider of Yuma County Parks and Recreation organized a trash cleanup of the site for National Public Lands Day. At least 20 participants helped beautify the landscape. Two roll-off boxes were filled with tires, residential appliances and refuse, and even a medium sized boat. The event included a short interpretive talk, describing the blue sand lily and other wildflowers that inhabit the area during rainy seasons.

Arizona Bureau of Land Management considers *Triteliopsis palmeri* to be a "sensitive" species because of its limited distribution on public land. The plant is "salvage restricted" according to the Arizona Native Plant Law because it is in the Lily family. It is abundant in Baja California during wet years, and therefore is not listed as threatened or endangered by the U.S. Fish and Wildlife Service. More research is needed to understand its distribution, threats and reproductive biology. Reports are unclear whether it germinates from seed. Dr. Richard

**Photos** ABOVE AND NEXT PAGE: *Triteliopsis palmeri* courtesy the author.



Felger found the Seri Indians use the plant for food and are known to plant it.

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## SPOTLIGHT ON A NATIVE PLANT

# *Coryphantha robbinsorum* (W. Earle) A.D. Zimmerman

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Organ Pipe National Park, National Park Service

*Coryphantha robbinsorum* (Cochise pincushion cactus) is a small cactus that lives in a small area in the extreme southeastern corner of Cochise County, Arizona, and nearby northern Sonora, Mexico. Most mature (reproductive) plants are single, unbranched stems 5-11 cm wide. Plants start to produce flowers when they are 15 – 20 millimeters wide. Year-old seedlings are just a few millimeters wide and look like snowflakes. The central and radial spines are bright white and covered at the base with white wool. The parchment-colored flowers bloom in April and May and the fruit ripens in June to August.

*Coryphantha robbinsorum* is rare because its habitat is rare. It grows only on certain deposits of grey limestone imbedded with small fossils. Another rare plant, *Vauquelinia californica* subspecies *pauciflora* (few-flowered Arizona rosewood) [Rosaceae], also grows on the same type of limestone. *Mortonia scabrella* (sandpaper bush) [Celastraceae], a plant common on many types of limestone throughout Cochise County and neighboring Sonora, is almost absent in *Coryphantha robbinsorum* habitat.

With the cooperation of the local ranchers, we have been monitoring this cactus since 1988 to document population changes. Nearly every year in April a few of us would visit the plots to find and measure all the permanently tagged plants. Seedlings that had established since the last visit were tagged. We recorded the width of each plant and how many flowers and developing fruits each had.

No big changes happened in the monitoring plots between 1988 and 1993. Then, in 1994 an insect infestation killed a substantial proportion of plants. Larvae ate the flesh of the plants and left behind bright orange frass (excrement) and an empty shell of spines. The number of plants has declined steadily since the mid-1990s. From a high of 165 plants in 1991, the number of monitored plants has declined to 69. In one plot, only 8 plants remain.

The insect attack will probably have long-lasting effects because the larvae primarily killed plants in their reproductive prime. With fewer seeds being produced, there are fewer seedlings. Compounding the problem is the extended drought, which has decreased the likelihood that seedlings and juveniles will survive. Another developing, localized threat is the illegal migrant and smuggling traffic passing through the habitat.

Time will tell if we are monitoring the demise of this species. I am hopeful, though. These little plants are remarkably tough. During our 2006 visit, we found that some of the tagged plants that had been severely damaged by insects or had died back to below ground level were able to re-sprout. Perhaps these survivors will be the founding parents of the next generation.



## Beath's Milk-vetch: New insights on the distribution and abundance of a rare endemic plant

by Daniela Roth [navajoplants@hotmail.com](mailto:navajoplants@hotmail.com) Navajo Natural Heritage Program, Window Rock  
Photos courtesy the author.

The Beath's milk-vetch (*Astragalus beathii* Porter) was originally reported to be restricted to Moenkopi Shale outcrops between Gray Mountain and Marble Canyon in Coconino County, AZ. It was first collected in 1939 and described by C.L. Porter in 1941. It was named after the original discoverer of the species, Orville Andrew Beath, a research chemist at the University of Wyoming, noted for his work on selenium occurring in plants.

*A. beathii* was listed as a Candidate Species, Category Two, in 1980 (Fed. Reg. 45 (242)). A status report by Brian and Phillips (1982) did not recommend this species for listing because of the abundance of habitat and the difficulty in determining the population sizes. No further survey work has been done since this time. However, casual observations in the habitat of Beath's milkvetch and the evident misidentification of specimens in local herbaria have let us to

question the status of this species. *Astragalus beathii* is a weak perennial or annual which responds strongly to rainfall. It was reported to be abundant in wet years and rare during less favorable Springs. Although there are large areas of Moenkopi Shale exposed between Gray Mountain and Marble Canyon, existing information indicated that the same populations along the roadside were sampled repeatedly and there was little evidence of its existence away from major highways. A study was proposed to get a better understanding of the abundance and distribution of *Astragalus beathii* over a 2 year period, documenting populations through different spring rainfall events.

Eleven populations were on record with the Navajo Natural Heritage Program (NNHP), including a new record from the 2003/2004 surveys. All known sites were re-located to the extent possible in March and April of 2003 and 2004.

**Photos** ABOVE: Mature perennial *Astragalus beathii* plant. RIGHT: Close-up of *Astragalus beathii* flowers.

Surveys at six known locations were negative, three of which were determined to be incorrect identifications. Two locations were too vague for resurveys. A total of three 3 populations were located during the surveys, one of which was new.

Surveys during the wet spring of 2003 and herbarium research have found that populations reported from the Navajo Bridge/Marble Canyon area were misidentified *Astragalus preussii*. Only *A. preussii* was found in the Marble Canyon area and three Museum of Northern AZ herbarium specimens from Marble Canyon were annotated to *A. preussii*. Two other reported and vouchered sites were determined to have been misidentified from herbarium specimens (NAVA, ASC). Both were located north of Cameron. Several attempts to relocate a properly identified and mapped population northwest of Cameron have failed. There appears to be only three currently extant populations, one of which was newly recorded in 2003.

Observations during the two survey years indicate that although the species is locally much more abundant during wet springs, many of the seedlings do not reach the reproductive stage and do not survive into the following year. Estimated change in plant numbers from 2003 to 2004 was 70 – 90% fewer individuals in 2004 over 2003 at all three sites. Out of 450 plants recorded in five monitoring plots established by a collaborative effort between the Arboretum

at Flagstaff and the NNHP in 2005 none survived into 2006. No seedlings were found during the dry spring of 2006.

This survey has resulted in substantially shrinking the known range for *Astragalus beathii*. Previously reported populations from Marble Canyon turned out to be misidentifications. No populations were found north of Cameron. Repeated efforts in trying to relocate a population north of the Little Colorado River failed despite excellent location and habitat information and the presence of a properly identified specimen.

Even though individual plants can number in the thousands during a wet year, only 3 populations of *A. beathii* were found during the 2 survey years. Plant numbers varied widely within the three populations from one year to the other. *A. beathii* appears to be highly restricted to shallow washes and benches composed of red Moenkopi Shale. It is unclear what happened to the 3 vouchered locations that could not be relocated. Two were along roads and could have been impacted by roadside herbicide spraying. One of the populations was reported to have succumbed to a fungus. One population north of the Little Colorado River was located in a low impact, remote site. Perhaps some of these were founder populations that came in during wetter years but failed to establish new populations. The NNHP is working with the Arboretum at Flagstaff to learn more about the long term population trends of this species. Funding for the 2 year status survey was provided by a grant from the U.S. Fish & Wildlife Service.



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# Status of two rare endemic plants on the north Kaibab Plateau, North-Central Arizona

by John R. Spence [john\\_spence@nps.gov](mailto:john_spence@nps.gov)  
Glenn Canyon National Recreation Area, National Park Service

In 2005 Dr. Barbara Phillips and I were awarded a U.S. Fish & Wildlife Section 6 grant to study the current status of several rare plants found on the North Kaibab Plateau, north of Grand Canyon National Park. The selected species included the local endemics *Astragalus cremnophylax* var. *myriorrhaphis* (Cliff milkvetch), *Castilleja kaibabensis* (Kaibab paintbrush) and *Lesquerella kaibabensis* (Kaibab bladderpod), as well as the more widespread *Fremogone* (*Arenaria*) *aberrans* (Mt. Dellenbaugh sandwort). There was some urgency in taking a new look at these species as few surveys had been conducted since 1992, and there were concerns about the potential impacts of the drought that started in 1999. In this article, I will discuss the two species I have concentrated on this last field season, the Kaibab paintbrush and Kaibab bladderpod.

The study area consists of the unique high elevation meadows on the North Kaibab Plateau. There are several large meadow complexes, sometimes called “parks”, at elevations between 8000-9000 feet, including De Motte Park, Dry Park, Little Park, Pleasant Valley and Surprise Valley. The vegetation is a mix of grasslands, wet swales, and subalpine-like “fellfields”. The meadows are underlain by porous Kaibab Limestone, and thus no surface streams occur. However, small sinkholes that have gradually filled in with fine sediment support small permanent lakes, including Crane, Deer, Indian and VT. The parks are remarkably diverse, with more than 70 forb species known, as well as numerous grasses, sedges and rushes. Five species are endemic or near-endemic to these meadows. The Kaibab paintbrush and Kaibab bladderpod are true endemics, found only in the study area. A third species, *Dieteria* (*Machaeranthera*) *mucronata* is also endemic to the North Kaibab Ranger District. Two other species are found that are disjunct between the North Kaibab meadows and the high elevations of the Markagunt Plateau around Cedar Breaks National Monument in southern Utah, *Hymenoxys subintegra* (bitterweed) and *Penstemon pseudoputus*. With continued exploration, additional unusual and rare species may be discovered. I had four goals in mind in studying these two species: 1) to locate and map populations; 2) to study their pollination ecology; 3) to establish permanent transects to



**Figure 1.** A typical adult plant of Kaibab bladderpod in frost-heaved rocky soil in Pleasant Valley. Note the prostrate inflorescences.

follow the fate of individuals; and 4) to examine relationships with related species growing in the general vicinity.

The Kaibab bladderpod is a small, semi-prostrate mustard that was not described until 1982 (Figure 1). The type locality is in Pleasant Valley, in open rocky fellfield vegetation near Highway 67, where it grows among and between clumps of *Eriogonum arcuatum* (Baker's wild buckwheat) and *Phlox austromontana* (desert mountain phlox). The last extensive surveys were conducted in the late 1980's as part of the improvement of Highway 67 from Jacob Lake to the North Rim. Surveys conducted this season failed to locate the species at several of its historical sites, including at least one population that apparently was destroyed during road construction. The Kaibab bladderpod appears to be common only in the main part of Pleasant Valley, with small outlying populations near Crane Lake, VT Lake, and in De Motte Park. I established 10 meter belt transects to monitor individuals in three locations, the type locality (Figure 2), Crane Lake, and a small population located northeast of Deer Lake in De Motte Park. The species was abundant at the type locality, with an estimated 60 plants per square meter. At this location, there are tens of thousands of plants. Many of the individuals were small and non-flowering, suggesting recent recruitment.

At the other two locations the species was much less common, with an estimated 10 to 12 plants per square meter. The Crane Lake site appears to be a mixture of Kaibab bladderpod and *Lupinus kingii* (King's bladderpod), a common species in open Ponderosa Pine forests on the North



**Figure 2.** The subalpine "fellfield" community at the type locality of Kaibab bladderpod in Pleasant Valley, with *Phlox austromontana* (desert mountain phlox) in flower.



**Figure 3.** Plants of Kaibab paintbrush in a grassy meadow west of Deer Lake, De Motte Park.

Kaibab. I noted with interest that the fruits of many plants were infested with a small green beetle larva which had burrowed into the seeds and destroyed them. Initial estimates are that between 10-15% of the seeds were destroyed. I never saw any adult beetles in the vicinity of plants, but suspect a bruchid beetle of some kind to be the culprit. Morphologically, the Kaibab bladderpod is very similar to the King's bladderpod, and the two are easily confused when not in flower. King's Bladderpod has upright inflorescences with yellow flowers, while the Kaibab Bladderpod has inflorescences that are prostrate with upcurving tips and pale cream-colored flowers. This coming winter I will examine other traits to see if I can find additional differences between the two species.

The Kaibab paintbrush is a small beautiful species that is widespread and relatively common in De Motte Park (Figure 3). Its closest relative is *Castilleja miniata* (greater red Indian paintbrush), a larger species with orange-red bracts that is widespread in the high elevations forests of the North Kaibab. In all populations of *C. kaibabensis*, a bewildering array of bract colors can be found, from pale yellow, yellow-salmon, salmon, and orange through to the typical orange-red of *C. miniata*. I devised an 11-point color scheme to use in distinguishing plants, with 0 being pure white and 10 a deep scarlet-red. Most Kaibab bladderpods have colors from 2-6, while *C. miniata* is almost exclusively red-orange (8-9). To make matters more confusing, two other red-bracted species occur on the North Kaibab. The southern species *C. integra* (whole-leaf Indian Paintbrush) reaches its northernmost limits in Arizona in the study area, where it is abundant in Pleasant Valley. The widespread common *C. linariifolia* (Wyoming Indian paintbrush), is also found, although it typically occurs in drier and more open forests below 8,000 feet. My pollination observations suggest that the Kaibab paintbrush is exclusively visited by hummingbirds, primarily

the Broad-tailed. Individuals began foraging in the meadows as soon as it becomes light enough, and I often observed them flying back and forth from the meadows into the forests. There is an intriguing possibility that the birds are transferring pollen between *C. kaibabensis* and *C. miniata*. This suggests the possibility of hybridization, and that the two species may not be reproductively isolated, perhaps explaining the variety of bract colors. Future work on the genetics of the Kaibab bladderpod should be done to determine if it is a good species, or simply a dwarfed pale-colored form of *C. miniata* that grows in the meadows. The species is only common in De Motte Park and the northernmost part of Little Park, and to date I have not found it in any other areas on the North Kaibab. Previous reports from other areas appear to represent *C. miniata*. I established three 50 meter transects, two near Deer Lake, and the third about 1 mile north of the Grand Canyon NP north entrance station. Abundance of the species at these locations was about one plant per square meter. Since De Motte Park alone is an estimated 10-12 square miles in extent, the total number of plants is probably in the hundreds of thousands.

Based on my field work this season, it appears that both species are still common. The long-term monitoring transects should be able to provide details on any changes in abundance over time. However, both species have extremely limited ranges on the North Kaibab, and thus remain vulnerable to climate changes, such as global warming impacts. As we learn more about the ecology of these two unique plants and the meadows they inhabit, we will be better able to determine how they will respond to future changes.

# Book Reviews

## *River and Desert Plants of the Grand Canyon*



After 5 long years of research and editing, the long awaited field guide, *River and Desert Plants of the Grand Canyon*, is available! This book is the most comprehensive guide devoted to lower elevation riparian and desert plants of the Grand Canyon. Bursting with beautiful color photographs and line drawings of over 250 ferns, grasses, trees and flowering plants, this book will satisfy

experienced plant enthusiasts as well as the novice to wildflower identification. Plants are organized by life form and common family name. Thumbnail photographs, arranged by flower shape and color offer a key for easy identification. Each narrative plant description is full of fascinating information on natural history, medicinal uses, pollinator relationships and stories of Latin name origins.

This book also includes essays by regional experts that explore numerous aspects of plants that find their way into political, social, economic and environmental realms. This compilation combines published facts with the yet unrecorded knowledge of over 50 contributors, who are all connected through their love of the Grand Canyon. This field guide will be the perfect companion for Colorado River travelers, backcountry hikers and visitors to the Grand Canyon and to the surrounding desert regions of the Southwest.

Many thanks to the Arizona Native Plant Society Horace Miller Publication Grant for providing much needed support, and all of you plant lovers out there who contributed time, expertise and enthusiasm to the project.

Books are for sale on Amazon.com and soon will be available in local bookstores.

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## *Museum of Northern Arizona Rio de Flag Nature Trail Guide*

Reviewed by Barbara Phillips [bgphillips@fs.fed.us](mailto:bgphillips@fs.fed.us)

Sometime wonderful things come in surprisingly small packages. That was the feeling I had when I was given this guide to the Rio de Flag Nature Trail at the Museum of Northern Arizona, Flagstaff. The trail was installed many years ago when I worked at the Museum and I have visited it frequently enough over the years that when I glanced at the guide I thought, "yes, this is the way it is: a homey little trail that each person feels he/she is almost the first to explore." This guide feels very simple and homespun, too, entirely in character for the place, yet the amount of accurate information presented within 23 pages in such a seemingly casual manner is amazing!

My friend Teresa Prendusi, Forest Service Region 4 Botanist, and I took an hour or so to negotiate the minimally, but adequately, maintained trail and peruse the guide. First a map illustrates the trail location with "steep watch your step" and "poison ivy grows along the creek. Please stay on the trail." warnings. Each of the Northern Arizona plant communities from Ponderosa pine to willow riparian, springs, aspen grove, and meadows is described in turn with explanations of structure and processes such as the geology of the San Francisco Peaks to weathering of rocks by lichens, photosynthesis, decomposition, symbiosis, cloning of aspen, and the importance of fire in the ecosystems.

Over 35 species of trees, shrubs, herbs and grasses are described as they are first encountered, most illustrated with a beautifully executed simple drawing. Species are briefly described in lay terminology and the few more technical terms are defined in the brief glossary at the end of the pamphlet. Uses by Native Americans or early settlers as well as fascinating information on natural history, and medicinal uses add interest. Bird and animal interactions with the various plants and habitats are also presented.

So take the time to visit the wonderful museums, gardens and arboreta throughout Arizona. Ask if there is a guide to a nature trail, and use it. If there is not a guide (or perhaps not even a nature trail!), seize it as an opportunity for you or your Arizona Native Plant Society chapter to develop one to contribute to that institution and public education about the native plants of our spectacularly diverse natural environments.

*\*Conception by Barb Phillips. Text by Roger Clark. Line drawings by Jodi Griffith. Production by Steve Hirst for the Museum of Northern Arizona. 23 pages, pamphlet, \$1.00 donation suggested.*

# What is the Conservation Committee up to?

Notes from Carianne Funicelli, AZNPS Conservation Chair

The Conservation Committee is an active and vital component of AZNPS activities. The committee is collaborating more and more with other local conservation organizations in increase the impact our work and to reach greater audiences. Here are some of our recent, on-going, and upcoming activities:

**National Public Lands Day, September 30th:** This is a day on which conservation organizations across the nation celebrate our public lands through service projects. AZNPS teamed up with the Coronado National Forest and Friends of Sabino Canyon to remove invasive species from Sabino Canyon.

**Native Plant – Desert Tortoise Demonstration Garden:** The conservation committee has designed a garden for the Tucson office of the Arizona Game and Fish Department (AGFD) that will feature native species that are food plants for the Sonoran desert tortoise. This project will be funded and implemented collaboratively by AZNPS, AGFD, the Tucson Herpetological Society, and the Arizona-Sonora Desert Museum. The garden will be installed this fall!

**Teaming with Wildlife:** The conservation committee provided an official endorsement of this AGFD campaign to encourage Congress to provide permanent funding for Arizona's non-game species.



**GROW NATIVE! Don't Plant a Pest**  
The conservation committee is pleased to announce our new education and public outreach tool to address ornamental invasive plants: **Grow Native! don't plant a pest.** This brochure and accompanying website informs the general public about the ecological impacts of invasive non-native plants. While most non-native plants that are introduced through the nursery and horticulture industry stay where they are planted, some do escape and invade natural areas and watercourses. The overarching goal is to southern Arizonans with printed material about invasive species, raise

appreciation for the native vegetation communities, and reduce the demand for invasive non-native ornamentals.

AZNPS utilized the AZ Wildlands Invasive Plant Working Group list, "Invasive Non-Native Plants That Threaten Wildlands in Arizona," to choose species with demonstrated impacts in Arizona wildlands to include in the brochure. Seven commonly used invasive ornamental plants were chosen. Botanists, native plant experts, and nursery industry representatives identified several native plant alternatives that have similar attributes (flower color, life form), characteristics (drought tolerant, evergreen), and/or function (screen for privacy, ground cover) for each invasive non-native plant.

The Conservation Committee raised over \$12,000 to conduct the initial printing of over 60,000 brochures in English and Spanish. Sponsors included state government agencies, local governments, conservation organizations, and local businesses. Check out the accompanying website, designed by SUNY-Fredonia student Damian Salerno [www.aznps.org/html/invasives.html](http://www.aznps.org/html/invasives.html) for additional photos and information.

This initial effort is geared toward southeastern Arizona, but each part of the state has unique invasive challenges. Interested in developing materials for YOUR region of Arizona? Or maybe you know of a good distribution venue? Contact the conservation committee to coordinate! [Conservation@aznps.org](mailto:Conservation@aznps.org)

***This project would not have been possible without the commitment, dedication, and talent of two very special conservation superstars. DANA BACKER headed the subcommittee for 2 years to see it to its fruition and DENNIS CALDWELL provided the beautiful, user-friendly design work. THANK YOU!***

The conservation committee meets monthly in the Tucson area. Please contact Carianne Funicelli [conservation@aznps.org](mailto:conservation@aznps.org) if you would like to get involved!

Lastly, check out the beautiful "Jaguar in Red" cards on page 18 — just in time for holiday greetings! Packages of 10 are available for \$20 and proceeds will fund upcoming conservation committee endeavors.

## Jaguar in Red & Green

This full-color card was donated to AZNPS by Prescott artist, Carolyn Schmitz, and notice that jaguar is decorated in all native attire! We are honored to be able to pass this wonderful card on to you. AZNPS is selling these cards in a packet of 10, with envelopes, for \$20 (includes postage). You will love sending these to your friends and family. All proceeds from card sales benefit the AZNPS Conservation Committee and their work. To view more of Carolyn's art go to [www.desertdada.com](http://www.desertdada.com)



## More New Hems!

### The Arizona Register of BIG TREES

\$5 (includes postage) This is the latest listing of Arizona's champion trees and how they are chosen. Includes some color pictures.

### Canotia, a new journal.

AZNPS is contributing to the printing of this new effort to make available editions of the new updated **Arizona Flora**, as they are published, to libraries. We offer the extra printed editions to you at \$6 per copy (includes postage).

Note that you can also download them from the web at <http://lifesciences.asu.edu/herbarium/canotia.html> — on that page you can elect to receive an email when new editions become available.

Volume I — **Index to Families of the Vascular Plants of Arizona**, by VPA editorial committee; and **Vascular Plants of Arizona: Polemoniaceae**, by Dieter H. Wilken and J. Mark Porte

Volume II, Issue 1 — **Vascular Plants of Arizona: Portulacaceae**, by Allison Bair, Marissa Howe, Daniela Roth, Robin Taylor, Tina Ayers and Robert W. Kiger; and **Vascular Plants of Arizona: Rhamnaceae**, by Kyle Christie, Michael Currie, Laura Smith Davis, Mar-Elise Hill, Suzanne Neal and Tina Ayers.

# AZNPS Merchandise

You can purchase AZNPS t-shirts, booklets and posters from our local chapters or by mail order. In addition, you can find posters at the Arizona-Sonora Desert Museum, Audubon Society, Boyce Thompson Arboretum, Desert Botanical Garden, Organ Pipe National Monument, Saguaro Park (East and West), The Arboretum at Flagstaff and Tohono Chul Park.

Questions? Sending an international order? Please contact Nancy Zierenberg at [anps@aznps.org](mailto:anps@aznps.org)

## AZNPS T-shirts

Sacred Datura, Dark purple or Khaki, Gildan pre-shrunk Ultra 100% cotton.

Specify S M L or XL

Just a few XXL left in Khaki only

Member price: \$16.00

Non-member price: \$18.00

Shipping/handling: \$3.00 plus \$1.00 for each additional t-shirt mailed to the same US address.

## AZNPS Posters

Wildflowers of Northern Arizona  
Sonoran Desert Wildflowers

Member price: \$10.00

Non-member price: \$12.00

Shipping/handling: \$2.50 plus \$0.50 for each additional poster mailed to the same US address.

Wholesale pricing\*:

10-49 \$6.00 each

50+ \$5.00 each

\*Shipping/handling are an additional charge and depend upon the size of order. Please contact Nancy Zierenberg for specifics on shipping costs.

## AZNPS Booklets

Desert Butterfly Gardening

Desert Bird Gardening

Desert Grasses

Desert Ground Covers & Vines

Desert Shrubs

Desert Wildflowers

Desert Accent Plants

Sonoran Desert Trees (new edition)

Price per booklet ordered includes postage for US addresses only:

1-9 \$3.50 each  
(any combination of titles)

10-49 \$2.75 each  
(any combination of titles)

50+ \$2.10 each  
(any combination of titles)

## AZNPS Bumpersticker

Grow Native \$1.00 each  
(price includes postage)

## AZNPS Logo Decal

Two for \$1.00 each  
(price includes postage)

No glue! This is static stick so it can be easily moved. Display it proudly on your window.

For order forms, please visit the AZNPS website at [www.aznps.org](http://www.aznps.org) and send your order to:

Arizona Native Plant Society, PO Box 41206, Tucson AZ 85717

Don't forget people on your gift list.  
And thank you for your order!

# AZNPS Board & Volunteer Profiles

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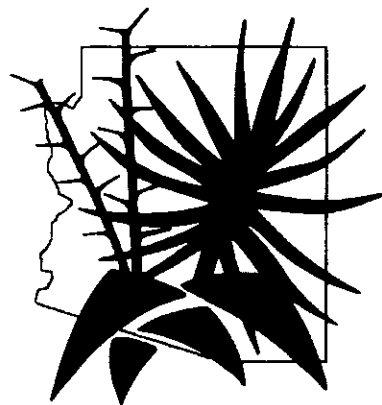
Vice President (*vacant*)

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The Arizona  
Native Plant  
Society

### Upcoming Issue: Pollinators!

Contact *Plant Press* Technical Editor, Barbara Phillips, at [bgphillips@fs.fed.us](mailto:bgphillips@fs.fed.us) for more information on contributing articles, illustrations, photographs or book reviews on this topic.

*The Plant Press* is a benefit of membership in the Arizona Native Plant Society. Suggestions are welcome for book reviews, and articles on plant use, conservation, habitats, and invasive species

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*Special thanks go to Barb Phillips for pulling this all together and to all who contributed time and effort: Jessa Fisher, Carianne Funicelli, Wendy Hodgson, Arthur Phillips, Barbara Phillips, Karen Reichhardt, Daniela Roth, Sue Rutman, John Spence, and Nancy Zierenberg.*

# New Members Welcome!

People interested in native plants are encouraged to become members. People may join chapters in either Phoenix, Flagstaff, Prescott, Tucson, 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 at the address below, visit the AZNPS website at [www.aznps.org](http://www.aznps.org), or contact one of the people below.

Phoenix Chapter: Doug Newton	602.438.9628
Flagstaff Chapter: Jessa Fisher	928.527.8882
Prescott Chapter: Carl Tomoff	928.778.2626
Tucson Chapter: Nancy Zierenberg	520.882.7663
Yuma Chapter: Mar-Elise Hill	mar-elise.hill@azwestern.edu

## Membership Form

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

Phone/Email: \_\_\_\_\_

Chapter preferred:  State only  Flagstaff  Phoenix  Prescott  Tucson  Yuma

Enclosed:  \$15 Senior (65+)  \$75 Sponsor

\$15 Student

\$100 Plant Lover

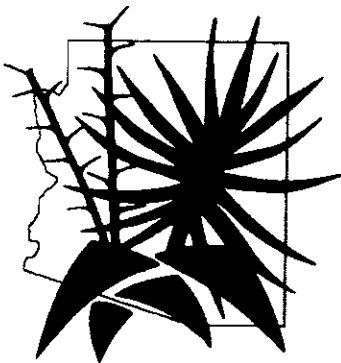
\$25 Family/Individual

\$500 Patron

\$40 Organization  \$1,000 Lifetime

\$60 Commercial

**Mail to: Arizona Native Plant Society, PO Box 41206, Tucson AZ 85717**



**Arizona Native Plant Society**  
**PO Box 41206**  
**Tucson AZ 85717**

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