



The Plant Press

THE
ARIZONA
NATIVE
PLANT
SOCIETY

Flagstaff
Phoenix
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Yuma

Vol. 12 No. 2 1988

ANPS Publishes Poster

By Stephanie A. Meyer and Greg Starr

Members of the Urban Landscape Plant Committee have finally realized one of their goals. The first poster in a series pertaining to desert landscape plants, it is set for publication June 20, 1988. This poster, entitled "Desert Trees", describes ten trees chosen for their unique qualities which make them suitable landscape plants for southern Arizona. Each species is described in detail with special emphasis on its ornamental features, cold hardiness, water use and maintenance. Special comments and related species are noted. One unique feature is the easy-to-use comparative table. This table lets the reader compare side-by-side the qualities of each species. Each species description is accompanied by an excellent line drawing of one aspect of the tree. Also included are some excellent photographs of each. The poster comes pre-folded in brochure fashion, but unfolds to become both a beautiful and informative poster.

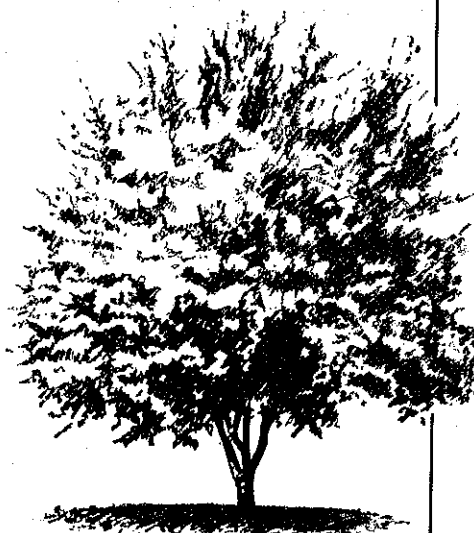
Initially, there will be 30,000 copies printed for distribution in Phoenix and southern Arizona. Several large orders have already been placed by city agencies; we welcome inquiries from any institution or nursery interested in obtaining copies.

Three more posters are scheduled. The second poster will follow the same format and concentrate on desert shrubs. The third poster will address vine and ground covers, the fourth accents and perennials.

This poster could only have been produced with the help of diligent committee workers, headed by Greg McPherson, Ph.D., and including Gene Joseph, Greg Starr, Mark Dimmitt, Ph.D., Rick Larke, Stephanie A. Meyer, and Linda Ryan. We also appreciate the contributions of many other people along the way. We especially are grateful to Lou Martin with Arizona Lithographers, Dave Ingram with Ingram Paper, designer Paul Mirocha, UA

DESERT TREES

for Urban Landscapes



Published by the
Arizona Native Plant Society

Office of Arid Lands Studies, and, last but not least, Carol Shumaker, who will be storing and distributing the posters.

In these days of Arizona's water concerns, we hope this pamphlet will contribute to Arizona's water resource conservation efforts.

Botanical Illegal Aliens

By Horace Miller

The most recent issue of Flora of North America Newsletter (vol. 2, no. 1, 1988) contains a request for help from APHIS-PPQ. I doubt if many of our members will immediately recognize that acronym, so I hasten to explain that it equates to the "USDA Animal and Plant Health Inspection Service-Plant Protection and Quarantine Agency." The request is for aid in detecting foreign noxious weeds which may have slipped through the exclusion process at ports of entry and are now established in the United States.

The article includes a list of 93 noxious weeds found throughout the world which the USDA is interested in eradicating (if here) or keeping out (if not yet here). These 93 "target plants" are those now listed under the Federal Noxious Weed Act of 1974 (see Table 1). We are requested to report populations of these taxa to: Randy G. Westbrooks, APHIS-PPQ, Whiteville Methods Development Center, P.O. Box 279, Whiteville, NC 28472.

In looking over the list, many of you will probably find, as I did, that most of the taxa are unfamiliar -- even on the genus and family level. So I did a little book work and found that they break into the following broad categories:

	No. of taxa	percent
Grasses (Gramineae)	21	22.6%
Pea Family (Leguminosae)	28	30.1
Aster Family (Compositae)	6	6.5
Aquatic Plants (4 families)	11	11.8
All other (24 families)	27	29.0
Totals	93	100.0%

The list poses quite a few interesting questions. Here are a few that come readily to mind:

(1) If we are to maintain an alert and report these plants, how may we recognize them? The USDA assumes that the most likely source for reporting possible domestic populations of these pests will be the herbaria throughout the country. Accordingly, it plans to place standard herbarium sheets with pertinent descriptions of all Federal Noxious Weeds in all major U.S. herbaria -- which presumably will include Arizona's in Tucson, Phoenix and Flagstaff. So we will have somewhere to turn when something exotic and suspicious shows up.

Then too, there already is a text that is of great value in this regard. After passage of the Noxious Weed Act in 1974, the USDA engaged Clyde F. Reed to compile a manual for use by the plant quarantine personnel in detecting the weeds at our ports of entry. Reed's manual was published in 1977 as USDA Handbook

498, Economically Important Foreign Weeds (Potential Problems for the United States). The book describes over 1200 species, all of which are demonstrably serious pests somewhere in the world. Most of the taxa on the present list of 93 taxa are in this book. One drawback, however, should be mentioned. The illustrations are mostly of the plant's seed (or in the case of grasses, spiklets), so identifying your suspected culprit may not be all that easy.

(2) How many have so far been found in the United States, particularly in Arizona? The source article gives us some information on that point: "Forty-one of the species are mentioned in the literature as having limited distribution in the United States. Four occur in Hawaii, but not on the mainland. Thirty-seven occur on the mainland. The USDA has initiated control or eradication programs on seven of the mainland species. These species are: *Striga asiatica* (Scrophulariaceae), *Mimosa pigra* (Leguminosae), *Orobanche ramosa* (Orobanchaceae), *Hydrilla verticillata* (Hydrocharitaceae), *Galega officianalis* (Leguminosae), *Crupina vulgaris* (Compositae) and *Salsola vermiculata* (Chenopodiaceae).

As to Arizona, I know of only three taxa on the list that have been reported here: *Ipomoea triloba* (a Morning Glory) and two mesquites (*Prosopis articulata* and *P. palmeri*). *Ipomoea triloba* is found in the Santa Cruz Valley near Tucson and is listed in Kearney and Peebles Arizona Flora, so it must have been around for

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Tucson chapter celebrates Arbor Day with local grade school children. Participants planted a blue palo verde at Reid Park and the students presented a play.

Illegal Aliens

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some time. As far as I know, it is not regarded (yet) as a serious pest. As to the two mesquites, see question (4) below.

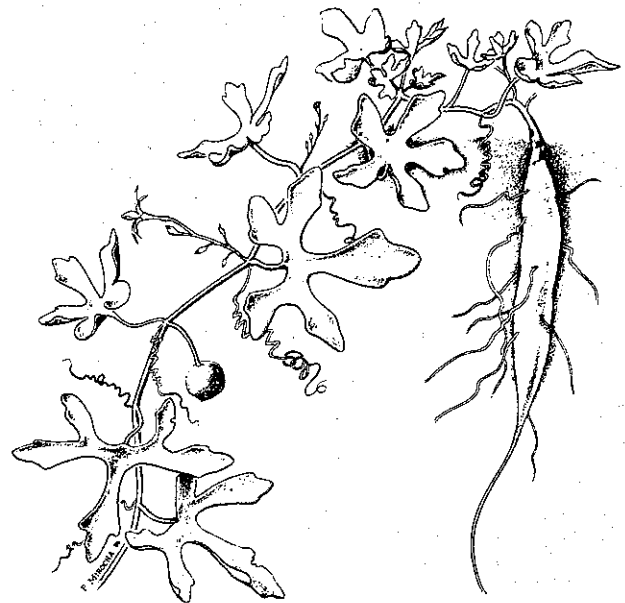
(3) Why 93 taxa? It is clear from reading USDA Handbook 498 that any of the more than 1200 taxa described therein might be candidates for the role of villain in an ecological horror story. So then why are there only 93 on the Federal Noxious Weed list? Part of the answer must be the practical consideration that the plant in the form of seeds (largely) must be routinely detected and excluded at our many ports of entry. It is quite a formidable task to detect accurately 93 taxa (as seed) and probably impractical to do so for over 1200. And consider the mechanics of doing so. These seeds do not arrive in neat packages, but are found in the sweepings from ship holds and as debris of every kind that show up at our ports of entry. Quite a task!

(4) Why so many mesquite on the list? An Arizona question. The genus *Prosopis* (mesquite) accounts for 25 (27%) of the 93 entries on the list. One can only conclude that the menace of mesquite invasion looms large in the minds of USDA people administering this weed effort. If overgrazing by ranchers was not so prevalent, would the mesquite problem be such a severe one? I suspect that we have the raw material for a good debate here.

One of the species on the *Prosopis* black list, by the way, is *P. palmeri*, which was introduced into Arizona for its landscaping possibilities. And even more surprising is the fact that back in 1977, Handbook 489 listed our two landscaping gems, *Prosopis alba* (Argentine Mesquite) and *P. chilensis* (Chilean Mesquite). Fortunately, these were not carried over to the official proscribed list under the Noxious Weed Act. The whole mesquite situation is quite puzzling.

(5) What about the grasses listed? Handbook 489 lists 142 foreign noxious grasses waiting in the wings, ready to leap on stage and do their mischief in the United States. This number was reduced to 21 in the present list. In reading the descriptions and problems of all the 142 taxa, one soon reaches the conclusion that any of them could present serious problems if introduced into the United States. They are all noxious enough that I do not see a friend and foe situation developing with any of them -- as in the case, say, of the controversial Love Grasses, particularly Lehman's Lovegrass. They all look to be as un-lovable as Russian Thistle.

So, in summary, the Noxious Weed List is an interesting one which raises many questions. The issue is a large one -- larger than the 93 taxa list would indicate. I suggest that ANPS may be able to perform some services in this matter.



Tumamoca mcdouglalii, copyright 1988, Paul Mirocha, UA Office of Arid Lands Studies

ANPS Aids Tumamoc Globeberry

By Stephanie A. Meyer

The Bureau of Reclamation has so far invested approximately 1.5 million dollars into the protection of the endangered Cucurbit *Tumamoca mcdouglalii*. As the canal progresses into Pima County it impacts the densest known population of this plant. The Bureau had many plants removed from the site as blading for the canal occurred. Later, adults were transplanted near their original site. Frank Reichenbacher collected seed from these plants. Meg Quinn, horticulturist for Arizona-Sonora Desert Museum, has successfully grown approximately 1000 young plants now ready for transplant.

The conservation committee of ANPS began reintroducing these plants to augment the present population into an area purchased by the Bureau of Reclamation for a Tumamoca preserve on April 30. There will be a planting the first weekend of each month for about four months. The conservation committee will be responsible for monitoring these plants over a five year period.

A planting on July 9 will be followed by a picnic to reward those brave enough to be out in the Avra Valley in July! All are invited to participate in this project. Please contact me (Stephanie Meyer) in Tucson or Dan James in Phoenix (see back page for phone numbers). See Tucson chapter's schedule.

1988 ANPS Chiricahua Workshop

You are cordially invited to join us for an exciting Labor Day Weekend of fresh mountain air and pleasurable learning at our end-of-summer outing, sponsored by the Arizona Native Plant Society.

If you have never attended before, now is a great time to join your fellow plant lovers at the Southwestern Research Station of the American Museum of Natural History. The SWRS is nestled in Cave Creek Valley which drains part of the east slope of the beautiful Chiricahua Mountains. On the map, it is south of San Simon near Portal in the open spaces of southeastern Arizona.

This active outdoor workshop spans most of four days (three nights) from Friday afternoon, September 2, through Monday, September 5, 1988.

We will lodge dormitory style (4-6 beds per room) in nice rustic cabins and eat together family style in the dining room.

From our central location at the Research Station, we will depart on a variety of field trips. With the guidance of superb naturalists, we will be able to identify and enjoy a wide variety of flora, bird life and more! Our explorations will range from low desert to over 9000 feet at the summit of nearby Fly Peak.

Each morning and afternoon there will be several choices offered for activities to fit anyone's mood or energy level, from long distance hikes to short nature rambles. We will have evening programs certain to be of interest to all of us. In addition, you will have plenty of time to swim in the stream-fed pool, explore on your own, or study plants in the well equipped laboratory.

We plan to meet by 6 p.m. at the Research Station for dinner, Friday evening, September 2. If you arrive earlier in the afternoon and get settled, so much the better. The conference ends after lunch Monday, September 5, to allow everyone to return home safely.

As in the past, spaces are again limited this year so be sure to send your registration form early. The Research Station requires us to fill all 40 dormitory spaces prior to granting reservations for a total of 20 camping spaces. We will maintain a list of those interested and will inform you after the dorms spaces are full. Campers must share a separate bathroom/shower facility in the laboratory building and eat in the group dining hall (NO CAMP COOKING). If you wish to be put on the camper waiting list, please check the appropriate spaces on the form.

The fee of \$115.00 per person covers three nights dormitory lodging, nine family-style meals with box lunches for hikers, a staff of expert naturalists, laboratory facilities and a useful learning packet. For children, ages 3 through 18, the fee is \$80.00 per child. Children ages 2 and under are free. For campers, the adult fee will be \$88.00 and for children, the fee will again be \$80.00.

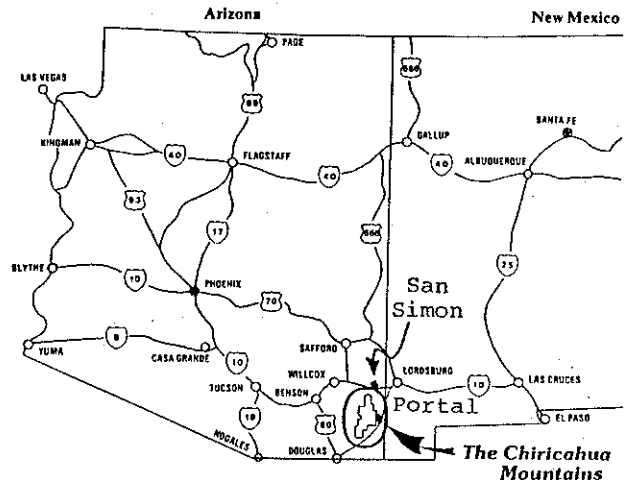
A deposit of \$35.00 per person (for both dorm and camper spaces) will hold your place on a first come-first served basis. The balance of your fee in full will be due by August 10, three weeks before the event. No refunds can be made after August 15, unless a replacement can be found for you. Cancellations must be in writing to the ANPS address (P.O. Box 41206, Sun Station, Tucson, AZ, 85717) or by phone to Mae Criley (622-3234) or Kathy Olmstead (743-7910).

Soon after receipt of your registration form and check we will send you a packet of information concerning weather conditions, suggested clothing and equipment, directions to the Research Station and suggested reading on the natural history of the Chiricahuas.

At that time, you will also be requested to sign and return a Liability Release required by both ANPS and the Southwestern Research Station.

Please feel free to call Chairperson Andy Laurenzi (622-3861 days or 325-8101 nights), Mae Criley (622-3234) or Kathy Olmstead (743-7910) if you have questions, suggestions, etc.

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Chiricahua Workshop

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TO REGISTER, please fill out the form attached and mail with your check or money order made payable to the Arizona Native Plant Society. It may be made out for the full amount or the amount of your deposit. Mail to ANPS, P.O. Box 41206, Sun Station, Tucson, AZ 85717.

WE HOPE TO SEE YOU IN THE CHIRICAHUAS!

-----Registration Form-----

Date of receipt at ANPS _____

NUMBER	AMOUNT ENCLOSED
___ adults @ \$115.00 in full	_____
___ children (3-18) @ \$80.00 in full	_____
___ children (2 & under)	-free-
___ deposits @ \$35.00 per person (Balance due August 10)	_____
TOTAL	_____
Balance due Aug. 10	_____

And please complete the following:

I would like to carpool _____

I request vegetarian meals _____

I would like to CAMP if the option opens. Please inform me when the dorm spaces are full _____

Name(s) _____

Address _____

City, state, zip _____

Phone (day) _____ (night) _____

SPEAKERS BUREAU

The ANPS Board of Directors is trying to compile a list that will be made available to the public of speakers on plant and conservation related topics. Contact Kathryn Michel (address on back page) for sign-up sheets.

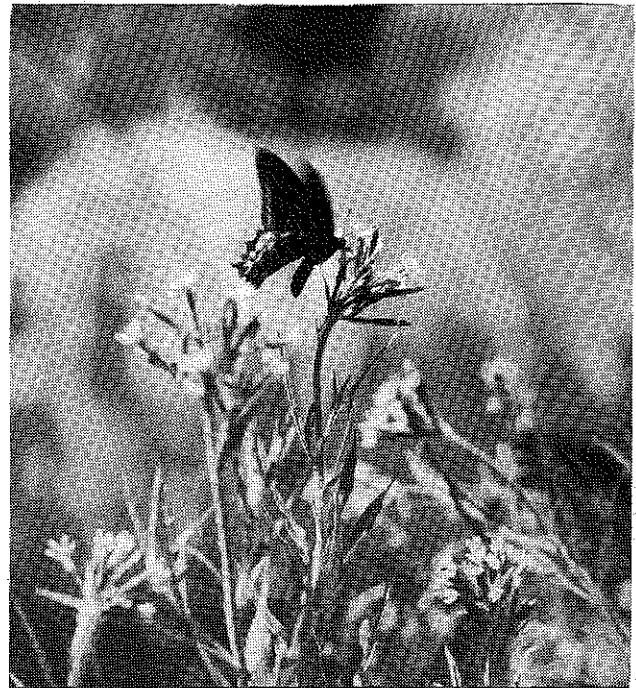


Photo of Kearney's blue stars by Benjie Sanders, The Arizona Daily Star

Saving the Nation's Most Endangered Plant

By Stephanie A. Meyer

A critically endangered plant species, *Amsonia kearneyana*, had a new population introduced to the Baboquivari Mountains over the week of March 28. Under the direction of the U.S. Fish & Wildlife Service, seed from the critically endangered population of eight plants was propagated by Steve McLaughlin, Ph.D., and Meg Quinn, horticulturalist for the Arizona-Sonora Desert Museum. These two-year-old plants were planted by Frank Reichenbacher and Associates, with the help of Meg Quinn and Endangered Species Botanist Peggy Olwell of USF&WS. A canyon that is on private land, protected from cattle, was chosen in the Baboquivaris. This population will be monitored for several years by Frank Reichenbacher and Associates.

Kearney's Blue Star, a small leafy shrub with bluish white flowers, about 18 inches tall, is a member of the Dogbane family (Apocynaceae). The reason for the Blue Star's rareness is not known; the plant may have been slowly declining in numbers throughout this century due to a combination of factors. The plant may be susceptible to destruction by insects.

Recovery efforts such as this one should be commended. Hopefully, this new population will "flourish" in its new canyon home.

Pilostyles, Strange Desert Parasite

By Richard S. Felger, Office of Arid Land Studies, University of Arizona.

The Rafflesiaceae (*Rafflesia* family), a family of bizarre obligate parasites, includes the world's largest single flower, *Rafflesia arnoldii* (or perhaps more correctly *R. tuan-mudae*). Parasitizing large vines in Malaysian jungles, the flowers reach one meter in width. At the opposite end of the scale is *Pilostyles thurberi*, one of the smallest flowering plants in the Sonoran Desert. Like many other carrion-imitating fly-pollinated flowers, those of the Rafflesiaceae are brownish-maroon and foul smelling (fly pollination for most of the species is presumed but not demonstrated). Most of the species are poorly known.

In 1822, the year that the botanical world was astonished by the description of the monstrous *Rafflesia arnoldii*, one European botanist compared this and other parasites to an asylum, calling them insane vegetable productions. Members of this family show extreme adaptations typical of obligate parasitic plants -- ones that depend on a parasitic way of life and cannot survive on their own. In fact, many of these characters are typical of parasitic animals as well. In both kingdoms there is a trend among obligate parasites for reduction in non-reproductive body parts (e.g., vegetative part such as stems, leaves, and roots among plants) and a relative increase in reproductive structures. In the ultimate parasitic organism the reproductive organs dominate all other structures. Members of the *Rafflesia* family are devoid of chlorophyll, and depend instead on food energy from their host.

They are endoparasites, their vegetative parts often like a fungal mycelium inside the host plant tissues. This vegetative tissue is reduced to filaments or plate-like masses of tissue so undifferentiated that it cannot be called either stem or root tissue and is known as the "endophytic system." The endophytic system absorbs water and nutrients from the host and at certain times some of its cells differentiate to form organized bud primordia which develop ultimately into the flowering structures. Only the flower or short flowering stem breaks through the host plant's stem or root to become visible. The flowers are unisexual and the plants mostly dioecious (individual plants produce either all staminate, or male, flowers, or all pistillate, or female, flowers). Leaves are absent except highly modified ones reduced to bracts. These bracts, just below the flowers, function like perianth parts (sepals and petals). The sepals are petal-like and the petals are absent. Stamens are numerous. The seeds are tiny,

very numerous, commonly thousands per fruit among larger plants in the family. Parasitic organisms typically produce large numbers of reproductive structures or offspring, seeds, larvae, etc., in part because of the low probability of contacting a suitable host.

The *Rafflesia* family is not large. It includes seven or eight genera and perhaps about 30 species worldwide, mostly in tropical and subtropical regions and only a few in deserts and temperate regions. The family is most numerous and diverse in the Old World. Probably the largest (in number of species) genus in the family is *Pilostyles*. There are less than 20 species, scattered unevenly in tropical and subtropical regions, mostly in the New World tropics but also in Africa, the Middle East, and Australia. Many of the species are poorly known and difficult to distinguish. Future work will undoubtedly result in reduction, or synonymy, of the number of species now generally recognized. In addition we can expect that there are new species yet to be discovered or recognized. Herbarium material is often scanty, both sexes are not always represented in the same collection, and different stages of the life cycle are seldom represented. Furthermore, the plants are cryptic and not always easy to locate, and very often of highly restricted or localized distribution.

Pilostyles species are parasitic on certain members in the legume family. *Pilostyles* flowers are very small, with a thick central column, expanded at apex into convex disk. Female flowers and fruit are larger than male flowers. Anthers in male flowers are many, situated below the margin of the column disk. This fascinating genus deserves further study. Virtually nothing is known of its pollination biology and the relationships among the species in the different parts of the world remains a mystery.

Pilostyles thurberi, named and described by Asa Gray in 1854, is the only member of the *Rafflesia* family in the Sonoran Desert. It was first collected by George Thurber in 1850 who was the botanist of the Mexican Boundary Survey (1850 to 1854) commanded by Colonel Emory. In the Sonoran Desert it parasitizes Emory's indigo-bush, *Psoralea emoryi* (= *Dalea emoryi*). Buds, flowers, or fruit, dotting the hosts' stems, are purplish brown and somewhat fleshy when fresh, and reddish brown when dry. The dried flowers and fruit remain on the host stems for some time, perhaps a year or so, but eventually fall off leaving a raised crater-like scar. Although tiny, the flowers have intricately sculptured structures. Male and female flowers are

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Desert Parasite

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somewhat similar but the ovary fails to develop in male flowers. The flowers have three nearly identical whorls--the outer whorl of bracts, the inner two of sepals. A ring-like nectary is present in both male and female flowers. The flowers and fruit are only 2.5 to 4.3 mm long (including pedicel, or flower stalk) and 1.5 to 4 mm wide. Flowering occurs at least in April. As with many parasitic plants, the pollination biology remains unknown. I have seen a certain long-legged fly visiting the flowers and perhaps it is the pollinator--or one of them. The fruit is a globose capsule, breaking apart irregularly. The seeds are tiny and numerous for such a small fruit; there are at least 50 seeds per capsule. Each seed is yellowish to light brown, somewhat glistening when fresh, rounded and pointed at the tip and only 0.3 mm long. The mechanism of seed dispersal, germination, and seedling establishment are unknown. Attempts to germinate the seeds have failed so that the morphology of the seedling and mechanism and strategy of parasitic attachment, so important in the study of their evolution, remains unknown. Ants and rodents are conjectured as potential agents of dispersal. Since the host is a perennial and the parasite is present on the host for more than one year, *P. thurberi* is probably perennial.

In the Sonoran Desert this species occurs in the vicinity of Yuma and Welton in Yuma County, southwestern Arizona, southeastern California, northeastern Baja California Norte and northwestern Sonora. It also occurs in the Chihuahuan Desert in western Texas southward to central Mexico. In the Chihuahuan Desert it is parasitic on other legumes, *Dalea formosa* and *D. frutescens*, which are somewhat related to Emory's indigo-bush. It is by no means widespread. The populations tend to be highly localized and widely separated. The way to find *Pilostyles* is look for the purplish-brown scale-like bumps or dots along the lower stems of the host plant. You will not find it by casual inspection and only a tiny fraction of the potential host plants support the parasite, although locally many of the plants may be infected. One of the larger population of *Pilostyles* in the Sonoran Desert occurs along the lower Rio Colorado valley near the river delta in Sonora, within a kilometer or so of the river channel. Other localities include a site on dunes near the coast of Bahia Adair (between Puerto Penasco and the El Golfo) and at least one interdune valley or corridor between the southwest edge of the Pinacate lava shield and Bahia Adair. I know of only one other locality for it in Sonora--on the north side of Cerro Tepopa near El

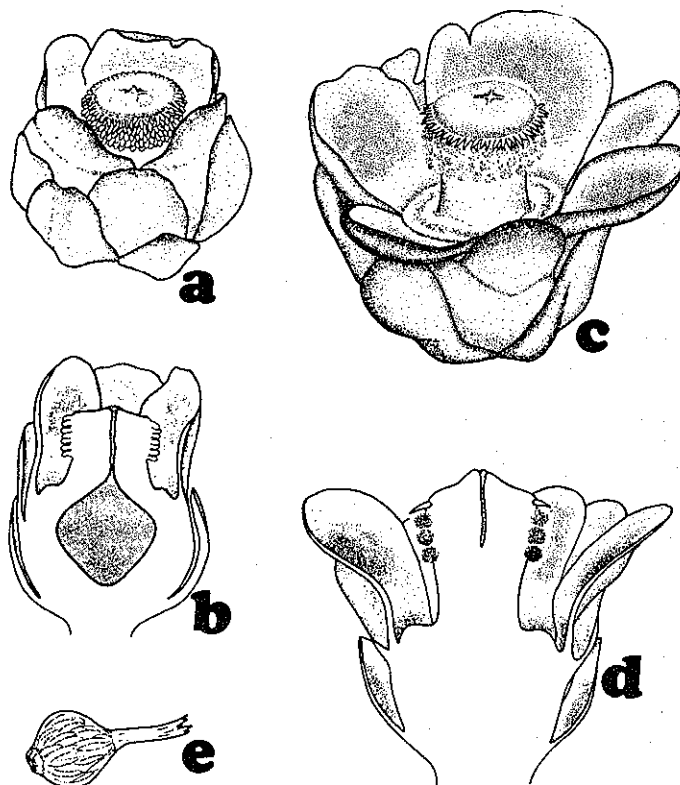


Figure 1. Male and female flowers and seed of *Pilostyles thurberi*. Drawings by Robert James Rutherford, from Aliso, 1970, p. 271. A. Pistillate (female) flower.

B. Longitudinal section of female flower. Note that the ovary (drawn without the ovules) is well-developed and that the anthers on the column are not fully developed (compare with D). C. Staminate (male) flower.

D. Longitudinal section of male flower. Note that the anthers on the column are well-developed but the ovary does not develop. E. Seed.

Desemboque San Ignacio. I have seen localized fog or dew at these places during the cooler times of the year, which may be a factor contributing its sporadic distribution. On cool winter or spring nights the host stems and parasite become wet with condensed dew.

Who will unravel the mysteries of this strange desert parasite?

References:

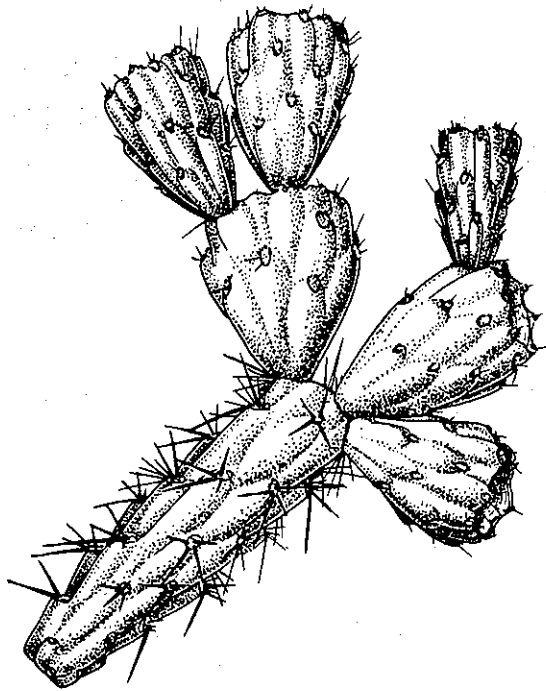
- Felger, R.S. 1980. Flora of the Gran Desierto. *Desert Plants* 2(2):87-114.
 Kuijt, J. 1969. The biology of parasitic plants. University of California Press. Berkeley. 246 p.
 Rutherford, R.J. 1970. The anatomy and cytology of *Pilostyles thurberi* Gray (Rafflesiaceae). *Aliso* 7(2):263-288.

Hybridization Within the Genus *Opuntia*

By Patrick H. Boles

In nature a hybrid between two species is frequently sterile, thus making the hybrid an evolutionary dead-end when only sexual reproduction is a consideration. A problem faced by a taxonomist studying the genus *Opuntia* -- which includes the prickly pears and chollas -- is these species' ability to hybridize and then propagate these sterile hybrids by vegetative reproduction. *Opuntias* have joints and pads that break off easily and are transported by numerous agents such as gravity, water, and animals; in many species the segments are so well-adapted for vegetative reproduction that it hardly matters to the success of the hybrid if its seeds are sterile. This method of vegetative reproduction shown by some *opuntias* is a highly successful way of multiplying new adaptive hybrid types once they have been produced by sexual reproduction.

There are times when the hybrid is better adapted to local conditions than the parents. *Opuntia ficus-indica* (note: Benson's taxonomy is followed in this article) was brought to southern California in 1769 by missionaries who cultivated it for edible fruit and young green pads called *nopales*. Bees transported its pollen to several local species of prickly pears, with the result that hybrids were produced. This area where



Opuntia versicolor, illustration by Lucretia Breazeale Hamilton from The Cacti of Arizona by Lyman Benson.

native species of *opuntias* grew as individual plants was periodically swept by fire in dry summers. However some of the hybrids formed dense thickets that largely excluded the grasses. As a result, fires would kill non-thicket forming species of cacti which grew as scattered individual plants interspersed among the grasses, but only the margins of the thickets would be affected. Thicket-forming hybrids would be left to grow and enlarge their range after each fire. This pattern of selection has nearly eliminated the original native species.

The situation of the native species in California was worsened also by the introduction of *Opuntia megacantha* to the region about 200 years ago. Pieces of this species were originally planted along trails as a food source. These plants soon hybridized with local prickly pears, creating hybrid swarms which made it almost impossible for workers to identify the several natural species occurring from San Diego and San Bernardino to Santa Barbara. These hybrids, caused by the introductions of *O. ficus-indica* and *O. megacantha*, have all but blurred out the natural distributions and characteristics of several species of *Opuntia* native to California.

Opuntia phaeacantha and *O. erinacea* have produced hybrid swarms in southern Utah and northern Arizona. *O. phaeacantha* var. *major* and *O. phaeacantha* var. *laevis* have formed the intermediate referred to as *O. phaeacantha* var. *canada*. *O. nicholii* had a hybrid origin from *O. erinacea* and *O. phaeacantha* var. *major*. It has been suggested that this was followed by natural selection of the hybrid population adapted to the local conditions. In Arizona, New Mexico, and Texas *O. macrorhiza* hybridizes and blends into *O. phaeacantha*. Many of the "species" which plant taxonomists have split off in the past from *O. phaeacantha* may have been based upon individual variants in hybrid swarms. Intergradation with *O. phaeacantha* var. *major* has caused considerable variation in the growth, shape, and size of joints, and arrangement and size of spines of *O. phaeacantha* var. *discata*. *O. phaeacantha* is highly variable and consists of many geographical varieties.

The variation shown by this group of cacti has been evident to taxonomists for quite awhile. In 1896 one author observed that the extreme polymorphism shown by *O. polyacantha* had resulted in a maze of forms impossible to classify. On the plains of Colorado, *O. polyacantha* and *O. rafinesquei* commonly grade into each other, becoming indistinguishable. *O.*

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Opuntia

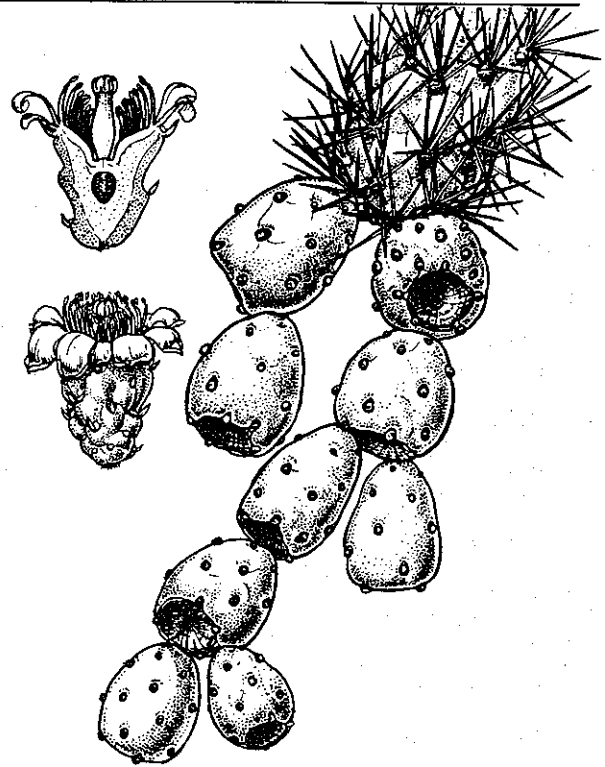
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engelmannii interbreeds with other species to the point where it is difficult to distinguish the true species. *O. bigelovii* produces hybrids with at least two other species. In Mason Valley and Vallecito in San Diego County, California, it hybridized with *O. echinocarpa* to produce a colony known as *O. echinocarpa* x *fosbergii* and in the Chocolate Mountains it hybridized with *O. acanthocarpa* to produce *O. acanthocarpa* x *munzii*.

Along the Gila River in Pinal County, Arizona, *Opuntia spinosior* and *O. fulgida* have crossed and produced an intermediate. Like other hybrids mentioned, these plants reproduce quite effectively from fallen joints. Two of the characteristics of opuntia hybrids, partial or total seed sterility, and dependence on vegetative reproduction, have led some researchers to propose that what is now thought to represent the pure form of *O. fulgida* is itself a hybrid derivative of a pre-existing species. In New Mexico, *O. spinosior* intergrades with *O. imbricata*, producing hybrids with characters intermediate of the two parental species.

A high amount of geographical variation has been attributed to members of this genus, however this variation could be caused by undiscovered hybridizations. In studies of *Opuntia lindheimeri*, researchers have described it as an extremely variable species composed of many races that differ in size and shape of joints and fruits, in shape and number of spines, and in color of flowers. The same researchers found a variety of *O. lindheimeri* which does not develop seeds and relies on distribution of their pads for propagation. Also, it was found that this particular variety grows faster than the parent species which may serve to balance its lack of seed production when in competition with the parents for space and resources. *Opuntia whipplei* is a low mat-forming plant over much of its range while in certain areas it is erect, thus reducing the usefulness of growth form in recognizing the plant. All populations of *Opuntia pulchella* show a great deal of variation in types of spines. Lyman Benson, in his book The Cacti of Arizona, concluded that "no population can be reconciled with the description of *Opuntia occidentalis* appearing in any book or paper, for no two plants are alike and the total variation is extreme."

When studying hybrids, many investigators use vegetative and fruit characteristics to try to determine the hybrids by intermediacy of characters and their parents. The hybrids produced by *Opuntia spinosior* and *O. fulgida* are intermediate in length and color of spines, joint diameter, color of fruit, and in their ability to produce fruit



Opuntia fulgida, illustration by Lucretia Breazeale Hamilton from The Cacti of Arizona by Lyman Benson.

chains like those of *O. fulgida*. Other approaches have been used by some investigators. One study recorded the chromosome numbers and meiotic behavior of twelve taxa of *Opuntia*. Even though that investigation showed the morphology of the chromosomes to be quite uniform, the researchers felt that chromosome studies in the future would be helpful in detecting certain interspecific hybrids and in the understanding of their origin.

Due to their jointed morphology, and the ease with which joints may be removed and transported, some *Opuntia* are well suited to vegetative reproduction. In the words of Verne Grant, in his book Plant Speciation, "*Opuntia* has found a way out of the impasse of complete hybrid sterility."

WILDFLOWER SLIDE SHOW

"Wildflowers of the Southwest" is a 15-minute slide show produced by ANPS members. It is available for showing to any interested groups. For more information, contact Barbara Tellman in Tucson at 792-4515.

Chapter News

CHAPTER MEETINGS

Note: regular meetings may be changed in the summer; check with chapter officials for actual meeting dates.

YUMA CHAPTER

Meetings take place the third Monday of each month at 7:30 p.m. at the University Farm, 6425 W. 8th Street.

PRESCOTT CHAPTER

Meetings are held every second Friday of the month at 7 p.m. at the Yavapai Rehabilitation Center, 436 N. Washington.

PHOENIX CHAPTER

Meetings are held on the second Monday of each month at 7:30 p.m. at the Desert Botanical Garden's Webster Auditorium, located in Papago Park at 1201 N. Galvin Parkway.

TUCSON CHAPTER

Regular meetings are held on the second Wednesday of the month at 7:30 p.m. at the Tucson Botanical Gardens, 2150 N. Alvernon Way.

- June 26 Tumamoca planting, Avra Valley Contact Stephanie Meyer or Meg Quinn (see back cover).
- July 7 Saguaro We Going? Slideshow by Barbara Tellman, Tucson Botanical Gardens, 7 p.m.
- July 9 Tumamoca planting, with picnic to follow.
- July 23 Tour of UA campus vegetation and trees, led by Greg Starr, from 8 to 10 a.m. Meet at Science Library parking lot.
- July 31 Field trip from Sonoita to Lochiel, exploring the San Rafael Valley desert grasslands.
- Aug. 13 Annual trip to cienegas to Mt. & 14 Graham.

Notes from the President

The March Board meeting of ANPS found the board agreeing upon a fiscal year beginning in January through January. The annual meetings will be held in October each year making transition of officers easier. The 1988 annual meeting will be held in Phoenix, with a topic related to urban landscaping. The Bylaws are being reviewed by a committee chaired by Horace Miller.

The Tucson chapter has been active supporting Arbor Day. I encourage all chapters to coordinate with a school in their area to further the education of students about trees in our environment.

Very soon all chapters should receive their sensitive species lists -- by county. Karen Reichhardt is heading up this monitoring program. Please build your field trips around habitats where these plants may be documented. This is an important contribution to our flora of the state. As you all know one person from Game and Fish cannot track all species. We can help!!

USFWS survey for *Agave parviflora* on the Buenos Aires Ranch was very well attended and did contribute data of new populations. Many folks look forward to a weekend on the south rim of the Grand Canyon to look for *Astragalus chremnophylus* over the last weekend in April.

We are in need of a chair for the Education Committee. This entails overseeing the slide shows as produced, production of exhibits for traveling and other related jobs. Please let me know if these are talents you possess. Also a chair for Membership Committee is open. This position encourages new membership, supports the chapters throughout the state, and serves as public relations when possible for the society.

Thank you all for the many hours of work you contribute to the society. I look forward to the summer and working with you all.

Stephanie

Saguaro We Going?

By Kevin Dahl

Saguaro We Going? is the tongue-in-cheek title of a report by the Tucson group of the Sierra Club which has a more descriptive subtitle: Impacts of Population Growth in Eastern Pima County, Arizona. Our own Barbara Tellman, former Plant Press editor, was hired under a grant from the national Sierra Club to oversee the production of this report. Her fine work shines throughout this important document.

It's no secret that desert cities are growing at an incredible rate, and a month doesn't pass without a new controversy between developers and environmentalists. Saguaro We Going? puts together the background information we need to take the debate out of the emotional arena of profits versus not-in-my-backyard concerns. It sets the stage for

continued next page

understanding the true impact of unbridled population growth, and makes a number of recommendations to reduce growth while enhancing the quality of life of residents.

Copies of the full report cost \$7.50 may be obtained by contacting the Sierra Club, Rincon Group, P.O. Box 3506, Tucson 85722, (602) 623-5681. An Executive Summary is also available.

Mt. Graham

By Harry Tate

If a proposed observatory is built on Mt. Graham, one of Arizona's most beautiful sites will be destroyed forever.

Letters are urgently needed to:

The Honorable Mo Udall
Chairman of the Interior Committee
235 Cannon House Office Bldg.
Washington, DC 20515

While the Pinaleno Mountains, including Mt. Graham, contain many rare and fragile native species, three species are especially threatened by the proposed observatory. These are two trees, *Pinus flexilis* (the "limber pine") and *Abies lasiocarpa* (the "Alpine fir"), and also *Eriogonum pringlii*, a scarce "fleabane" or "skeleton weed: known only in central Arizona.

The two trees grow only above 8,000 feet in Arizona and the observatory would destroy their southern-most stand.

E. pringlii is designated Category II by the U.S. Fish and Wildlife Service (an agency in the Department of the Interior). By definition, Category II plants are those about which insufficient data are available to determine whether the species is rare or endangered.

Letters to Congressman Udall (address above) are perhaps the most urgently needed.

Also helpful would be letters opposing the siting to:

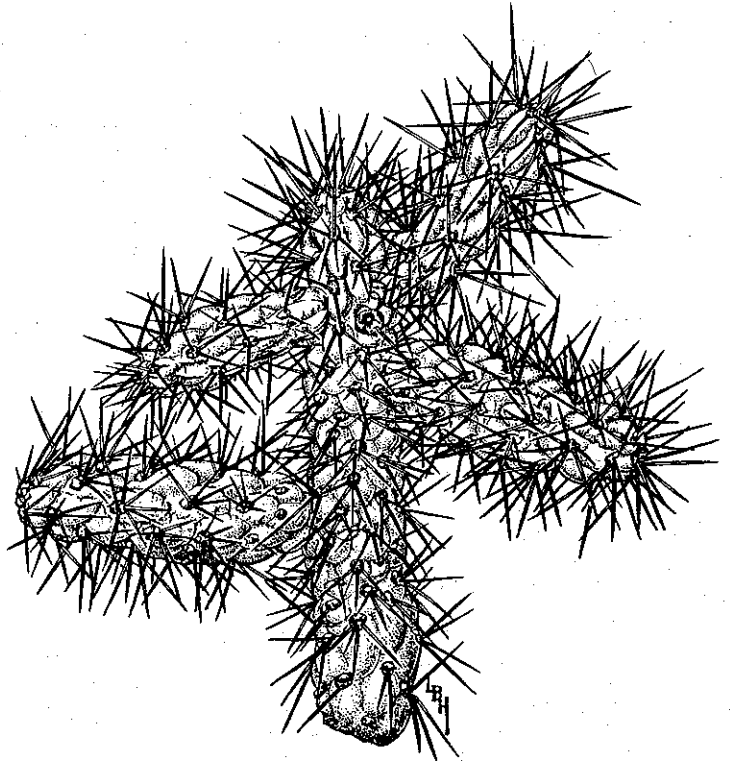
Field Station Superv. Sam Spiller
U.S. Fish & Wildlife, Ecological Services
3616 W. Thomas, Suite 6
Phoenix, AZ 85019

This office will determine whether the land is allotted for the observatory.

Also to:

Office of Endangered Species
U.S. Fish & Wildlife Service
P.O. Box 1306
Albuquerque, NM 87103

It does seem sensible to determine whether a plant is rare or endangered before its sites are obliterated. The so-called "Jeopardy Decision" is aptly named.



Opuntia fulgida, illustration by Lucretia Breazeale Hamilton from The Cacti of Arizona by Lyman Benson.

MEMBERSHIP APPLICATION

Membership classes:

<input type="checkbox"/> Lifetime	\$1000.00
<input type="checkbox"/> Patron	100.00
<input type="checkbox"/> Sponsor	50.00
<input type="checkbox"/> Commercial	50.00
<input type="checkbox"/> Institution (including clubs & societies)	25.00
<input type="checkbox"/> General (including individuals & families)	15.00
<input type="checkbox"/> Senior Citizen & Student	10.00

Chapter affiliation:

<input type="checkbox"/> Flagstaff	<input type="checkbox"/> Phoenix
<input type="checkbox"/> Prescott	<input type="checkbox"/> South Central
<input type="checkbox"/> Tucson	<input type="checkbox"/> Yuma

Name: _____

Address: _____

City, State, Zip: _____

Telephone: _____

Clip and mail this form together with proper remittance to:

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MEMBERSHIP INFORMATION

The Arizona Native Plant Society, incorporated as a non-profit tax-exempt organization in 1976, is recognized throughout Arizona for its leadership in promoting a better appreciation of our native flora, in protecting and preserving these plants and in encouraging their use for landscaping and improving our environment. Membership is open to any interested person, family, or other group. Please use the membership application located elsewhere in this newsletter.

NEWSLETTER CONTRIBUTIONS

Contributions of articles, artwork and letters to the editor are gladly received. Please direct all contributions to the newsletter to:

Kevin Dahl, editor
1609 E. Spring
Tucson, AZ 85719
881-0807

NEXT DEADLINE IS:

August 1, 1988

Please direct all other inquiries regarding the Arizona Native Plant Society to the Secretary at our official address:
P.O. Box 41206 Sun Station
Tucson, AZ 85717

The Arizona Native Plant Society
P.O. Box 41206
Tucson, Arizona 85717



If you move, please send us a change of address. Bulk mail isn't forwarded.
