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Arizona Botanical Gardens Cooperate for Conservation

By Robert G. Breunig

Arizona is a geographically varied state with habitats ranging from the low deserts in its southwestern corner to the alpine tundra in the San Francisco Peaks. Fortunately the state also has a number of botanical institutions to help represent its botanical diversity. Many of these institutions have conservation traditions and programs to protect rare plants, from *Ammobroma sonorae* (sandfood), found in the dunes near Yuma, to *Senecio franciscanus* (San Francisco Peaks groundsel), endemic to the mountaintops above 10,000 feet.

The various Arizona botanical institutions, two of which are associated with the Center for Plant Conservation, meet together quarterly to share ideas and information on horticultural and conservation practices. And as *ex situ* plant populations grow, they are beginning to share rare plant collections.

The Arboretum at Flagstaff, a CPC Participating Institution located in Flagstaff, Arizona, was founded in 1981 and is the newest of the state's botanical institutions; it has rapidly established a strong commitment to conserving the plants of the Arizona uplands and the Colorado Plateau. The Arboretum is perhaps most noted for its work with varieties of *Pediocactus* (see *Plant Conservation*, Volume 2, Number 1, 1987) and with *Allium goodingii* and *Senecio franciscanus*. The Arboretum also maintains a *Rumex orthoneurus* population, also propagated at the Desert Botanical Garden in Phoenix.

The Desert Botanical Garden, opened in

1939, has had a conservation mandate from its very beginnings. At its dedication ceremonies, the Garden's first president, Gertrude Webster, outlined three major goals for the institution, one of which was to "conserve rare desert plants, not rapidly disappearing." Since the late 1970s, the Desert Botanical Garden has placed strong emphasis on the conservation, research, and propagation of rare plants. Today, the Garden is an active member of the CPC, working on rare plants from the Sonoran and Chihuahuan Deserts.

The Desert Botanical Garden currently is concerned with about 30 rare and endangered desert species, conducting field surveys, monitoring populations, and collecting germplasm when necessary. Sixteen of these are being maintained as part of the Center for Plant Conservation's National Collection of Endangered Plants. Among them are the Arizona agave (*Agave arizonica*), Tumamoc globe-berry (*Tumamoca macdougalii*), sandfood (*Ammobroma sonorae*), and many rare cacti. In addition to maintaining populations of rare plants, the Desert Botanical Garden keeps seeds and pollen of these plants in frozen storage. The Garden also works with federal and state agencies on plant conservation and recovery programs.

The Arizona-Sonora Desert Museum near Tucson has recently participated in salvage and propagation programs for *Tumamoca macdougalii*, a plant whose habitat is near the museum and which lay in the path of the Tucson aqueduct. The museum is also involved in a recovery program for *Amsonia kearneyana*, a plant that is restricted to a single canyon in the Baboquivari Mountains. Germplasm from both of these plants have been shared with the

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Notes from the President

As many of you know, Stephanie Meyer has moved to Alamos, Sonora, Mexico. We will miss her strong leadership and hard work. We have many challenging opportunities to influence the state in the protection and conservation of native plants. I encourage all of you to keep as active as possible for an exciting year. Here's a quick update.

One issue that surfaced at the annual meeting was what value native plants have in the urban desert landscape. This topic deserves more research and debate. Few native plants were even available in nurseries 15 years ago. Two articles in the *Plant Press* are on this topic.

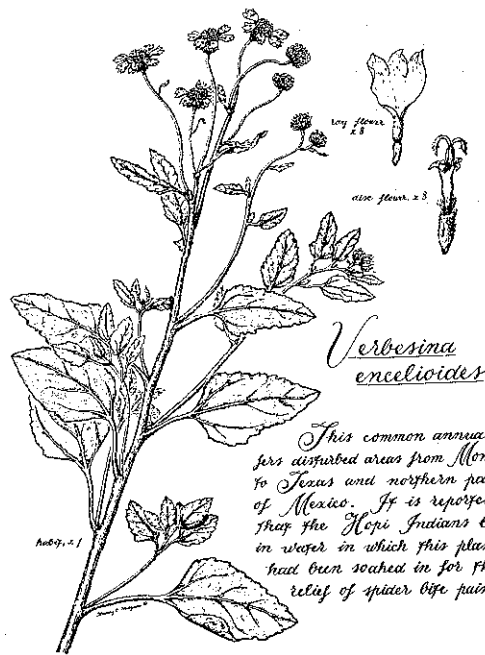
The Conservation Committee has been active in rewriting the Arizona Native Plant Law. The nursery industry has hired a lawyer to rewrite a bill which is acceptable to the private industry, conservation organizations, government agencies and the Agriculture and Horticulture Commission. The intent of these changes is to make the protected native plants easier to be salvaged than destroyed by development. Currently many more plants are lost to the bulldozer than to theft. If the new law is passed there will be a more efficient notice of destruction by landowners so that salvagers can extract the protected plants after applying for permits and tags with the commission. Tagging fees would be lowered for common cacti, making them more economically feasible to be collected. Many common cacti are lost to development because of the current law.

The society has recommended dropping all plant names from the law. Protected plants will be listed in regulation form. We've recommended an advisory board to the commission for updating the list on an annual basis. We are also supporting a provision in the law for the commission to research species affected by the law so that Section 6 monies from the U.S. Fish & Wildlife Service can be used for rare Arizona plants.

The Desert Trees poster is still available. If you know of a good location where it can be distributed, notify Carol Shumaker. A Desert Shrubs brochure is next in line.

The society is in need of a corresponding secretary. If you like to type and would like an opportunity to help with important letters, please notify me. I hope to hear about your ideas and concerns, and look forward to an exciting year.

-Karen



This common annual prefers disturbed areas from Montana to Texas and northern parts of Mexico. It is reported that the Hopi Indians bashed in water in which this plant had been soaked in for the relief of spider bite pain.

All illustrations in this issue were drawn by Wendy C. Hodgson, Desert Botanical Garden. They are copyrighted by her and printed here with permission.

Botanical Gardens, continued

Desert Botanical Garden.

The Boyce Thompson Southwestern Arboretum in Superior, Arizona, the oldest botanical institution in the state, is another institution that was founded with conservation goals in mind. Today, the Arboretum is working with rare *Echinocereus triglochidiatus* var. *arizonicus*, or the Arizona claret-cup cactus.

The Tucson Botanical Garden houses the offices of Native Seeds/SEARCH, an organization devoted to conserving the genetic resources of native crops and their wild relatives. Plants from Native Seeds/SEARCH seeds are now being grown in a major new ethnobotanical exhibit at Desert Botanical Garden and Tohono Chul Garden in Tucson, and are being shared with 25 indigenous tribes to encourage *in situ* conservation.

The level of cooperation and exchange among these Arizona institutions is perhaps unique in the United States and bodes well for the future of plants in the Southwest. By actively sharing ideas, conservation techniques, and germplasm, they are increasing the survival chances for all of the region's rare plants.

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Arizona Native Plant Society Receives Dept. of Interior Award

Stephanie Meyer, President of the Arizona Native Plant Society, accepted a Department of the Interior "Take Pride In America" award from Robert J. Towles, head of the Bureau of Reclamation's Arizona Projects Office. The award was presented in November at the society's annual meeting in Tempe.

The award recognizes the volunteer efforts of the members of the society in assisting the Bureau of Reclamation's \$1 million effort to conserve the Tumamoc Globeberry, an endangered plant species found in the path of the Central Arizona Project canal near Tucson.

In 1986, Reclamation removed about 400 of the plants from the aqueduct alignment onto land purchased, fenced and set aside as a preserve for them. In addition, seeds collected from the plants were given to the Arizona-Sonora Desert Museum in Tucson. The museum produced about 1,00 seedling plants.

This past summer, Stephanie Meyer and other Arizona Native Plant Society members transplanted about 800 of the seedling plants onto the preserve lands. The society will help Reclamation monitor the plants for the next five years to determine their survival rate.

The award also recognizes the society's efforts in helping Reclamation remove Thornber's fishhook cacti from CAP construction sites. About 1,000 of the plants were removed for display and propagation by botanical institutions throughout the United States.

This cactus was proposed for listing as a threatened species in 1984. Subsequent surveys funded by Reclamation resulted in the estimates of the plant's number being revised upward, and the listing proposal was withdrawn in 1987.

The "Take Pride in America" program was initiated by Interior Secretary Don Hodel. The program's goals are to increase awareness of



Stephanie Meyer, president of the Arizona Native Plant Society, accepts award from Robert J. Towles, head of the Bureau of Reclamation's Arizona Projects Office. Photo by Bureau of Reclamation.

the importance of wise use of public lands and natural and cultural resources, encourage an attitude of stewardship and responsibility toward public lands and resources, and promote participation by individuals, organizations and communities in caring for public lands and resources.

"Take Pride in America" awards recognize outstanding volunteer projects that involve the care and maintenance of public lands and resources.

Native Plant Law Revisions

By Karen Reichhardt

The Arizona Native Plant Law is undergoing revisions and will be presented to the Arizona Legislature within the next few weeks. Our society (ANPS) has played an active role in rewriting the old law along with representatives from the Agriculture and Horticulture Commission, private salvage operators, government agencies, conservation organizations and concerned citizens. The objective is to make it easier to salvage plants than to bulldoze them for development. The majority of native plant losses are due to development. Another objective is to provide statutes for greater protection of endangered species and rare plants so that funds from the U.S. Fish and Wildlife Service can be given to the state for research.

As the old law reads, there were several categories of protected plants. Plants protected for scientific or educational purposes were prohibited from collection. Rare plants, such as *Lysiloma thornberi*, appeared on the list - but as botanists agree, the list was not comprehensive. The second category was a protected group of plants meaning they could be collected, transported and sold as long as they had permits and tags. The category included plant families which contain both rare and common plants, genera with both common and rare plants, and several rare shrubs and trees. Trees that were in danger of firewood cutting at the time the law was written were also protected.

To make botanical sense out of the outdated list, we recommended removing all plant names from the law and categorizing plants into protected groups. The plant names will be on definitive lists within the regulations, according to their category of protection, and there will be a scientific advisory board to rearrange this list on a regular basis according to whether the status of the plants change. In the highly safeguarded group will be endangered and threatened plants. Permits and tags are needed from the commission and collection is allowed for scientific concerns only.

The second category of native plants will be salvage restricted. They will require salvage permits, tags and seals. The definitive list will include plants not in the highly safeguarded category but nevertheless subject to a high potential for loss by theft or vandalism.

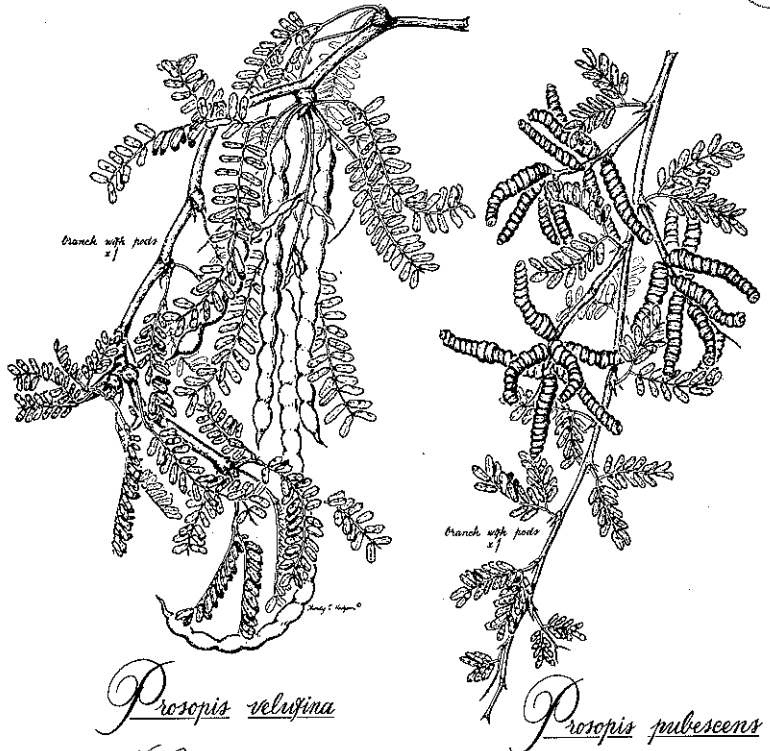
A third list will be plants that are harvest restricted, and will include plants used for wood or fiber, including dead plants or parts of dead plants, and are subject to excessive harvesting or overcutting.

The Arizona Native Plant Society will be involved in creating the definitive list for each of the protected groups of plants. I will be the head of this committee, and the list will be ready for review by botanists and other interested parties within the next few weeks. If you are interested in helping with this list, contact me.

Other aspects of the law which have been changed are fees for tags, exemptions for private land owners to maintain agricultural and ranch property for less than one acre, and the way in which land owners are to give notice of destruction to the commission.

When the bill goes to the state legislature, there will still be need for ANPS involvement. Phone calls and letters may be required in support of the changes we have made. Fortunately, all of the varied interests involved in rewriting the law have thus far arrived at a consensus. This means we will have better success when presenting the bill.

If you are interested in the law, I encourage you to get involved. We have tried to draft it so that there are no loopholes or exemptions that would further weaken it or make it difficult to enforce. The ultimate goal is to provide further protection for native plants.



The mesquites, which may reach a height of 12 meters, are found within the Lower Sonoran Zone. The pods were an important food source for the Indians of the Southwest and its wood is one of the best for use as firewood.

Celebrate February 15: 50th Anniversary of Arizona's Native Plant Law

By Barbara Tellman

A few far-sighted Arizonans recognized back in the '20s, when the state's total population was less than 100,000, that native plants needed preservation. Not only did they recognize the need, but they quickly succeeded in taking the first steps to preserve those plants by passing one of the nation's first native plant preservation laws. The '20s were enlightened years, when people worked for the establishment of the Saguaro National Monument, Tucson Mountain Park, Boyce-Thompson Arboretum and Papago Park.

Franklin Crider, the first director of Boyce Thompson, was the guiding force behind the plant law, which seems to have passed more quickly than would have happened in modern times. The bill was introduced by the Honorable Senator Sutter of Bisbee in late January 1929 and quickly passed the Senate. It ran into tougher going in the House, where amendments were passed, most notably the one excluding:

"disabled soldiers or world war veterans, citizens and residents of the state of Arizona, at the present time domiciled at Tucson, and operating the industry known as "The Hut" at Whipple Barracks, Prescott, Arizona, and elsewhere throughout the state, and utilize in their struggle for self-support a small portion of 'down' cactus for the manufacture of souvenirs."

The Senate modified this to: "Nothing herein shall prevent the use of down or dead cacti for business or other purposes."

There were two dissenting votes. Representative Wisener explained his opposition in flowery poetry:

Ah, dainty little cactus,
Old Arizona's pride,
How often with your spinelets
You've pricked my tough old hide.

And yet while I have suffered pain,
It filled my soul with joy
To gather flowers from off you
Like a happy carefree boy.

But those dainty flowers in future
Will be guarded with much care,
And they will waste their sweetness
Upon the desert air.

For the House in session yesterday
Adopted line by line,
A real Connecticut blue law
That made it quite a crime,
For man, or maid,
Or lad or lass,
To interfere with you
By plucking any of your flowers,
So I must bid adieu.

To all your sweets, and wander far
To Eden's happy bowers,
Where I'll be safe and happy
When I would gather flowers.

The bill became law, with the emergency clause attached, on February 15, taking effect immediately. That first law included a long list of plants, beginning with the ferns and ending with *Opuntia parishii* and "all plants growing within two hundred yards of any highway except noxious weeds." People were prohibited from destroying, mutilating or removing any living plant without a written permit from the owner, except the Agricultural and Horticultural Commission could issue permits for scientific and educational purposes (without the owner's consent?). Exceptions were made for clearing for canals, ditches and roads. Fines ranged from \$50 to \$300.

By 1933, changes were needed. The list was shortened considerably, though it began and ended the same way. The permit system was drastically altered. The Ag-Hort Commission now had to approve the permits granted by the owner. Permit fees and inspection certificates came into being. One change which was later to have serious consequences was to exempt "land being cleared for homes or for agricultural purposes by the owners of said land..." The days were at least 15 years away when "Owners of said land" would include companies owning hundreds of acres of land and using bulldozers to clear that land for thousands of homes.

In 1935 more changes were made. You could now gather the leaves of *Yucca bacatta* or *elata* for obtaining "the fiber therefrom for commercial purposes." The law was amended again in 1967 and 1972 to what we know today. Permits are now issued by Ag-Hort, not the land owners. Fees are up and fines (relative to inflation) are way down. Landowners may still "destroy or mutilate" plants on land they are clearing for homes or agricultural purposes as long as the plants are not transported from the land or sold. But today the

Continued on next page

consequences of this provision are devastating. What was once an innocuous provision to protect individual homeowners, now makes it much more difficult to salvage protected plants than to bulldoze them. The technology of both bulldozing and salvage has advanced to the point that new amendments are needed to bring us into modern times.

the Depression. There he worked for the U.S. Department of Agriculture, experimenting with plants "best suited to soil conservation uses in all parts of the country." It was he who introduced the avocado to this country. After retirement in 1951 he settled in Florida where he cultivated papaya. He died in California in 1961.

(The author would appreciate information about Crider, especially from people who knew him, for further research.)

Franklin Crider

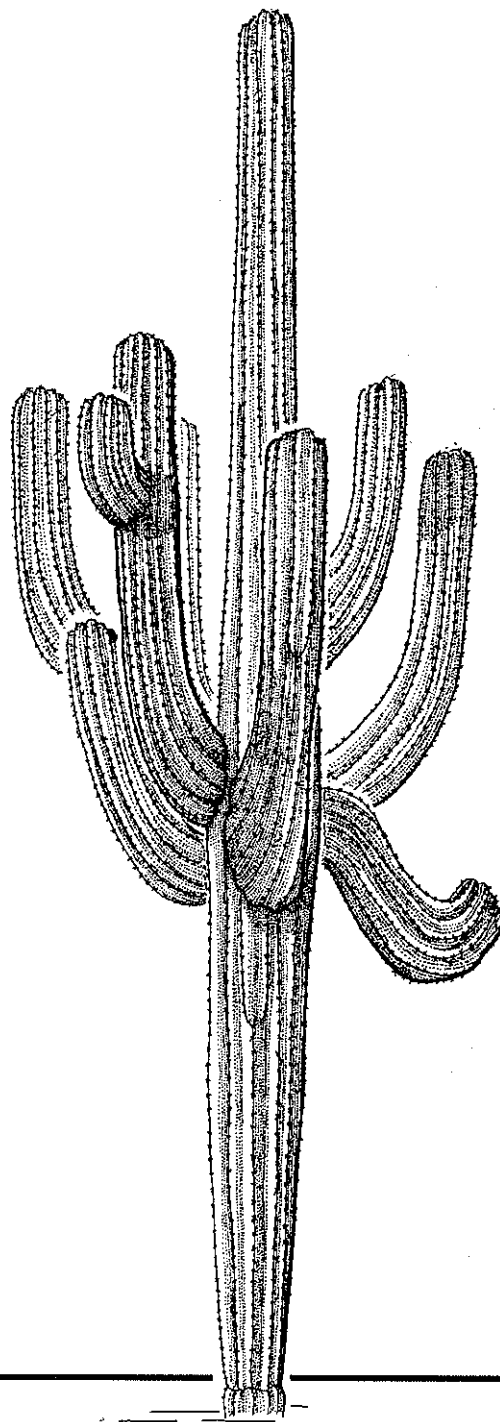
By Barbara Tellman

Franklin Crider was a versatile man whose interests ranged from purely practical publications on cotton planting (he was a horticulturist with the Agricultural Experimental Station, in which capacity he wrote numerous bulletins) to "Appreciation and Utilization of Native Southwestern Plant Life." The news media gave lengthy coverage to his speech on the latter topic, including such quotes as:

"Laymen find difficulty in comprehending the fact revealed by botanists that our own Arizona is one of the richest of all the States in numbers of plant species.... To appreciate this wealth ... one must leave the 'beaten trails' and traverse, preferably in spring or late summer, her flower covered mesas, unsurpassed in beauty, form and color; must linger beside the 'sticky things' of the desert... and see something of their intricate characteristics and how, beneath their protecting branches frailer forms of plant life find shelter from sun and rodent...."

He recommended planting palo verde, jojove (sic), Arizona ash, and plants from other dry climates such as *Pistache atlantica* and carob. (We must also admit that he recommended zenia (sic) and petunia as good flowers for this climate.)

He was a Regent of the University of Arizona which granted him an honorary degree before he moved to Washington, D.C., during



The Use of Regional Native Flora for Desert Landscaping

By Karen Reichhardt and various consultants

I'd like to offer some comments on desert landscaping from a bioregional perspective, as plant ecologists. I've studied the native landscapes of Arizona for more than 10 years, and cultivated a keen interest in the native flora as color, cures, tastes, textures, shades and smells. Home landscaping is for us an attempt to bring into our urban environment a bit of the quality and habitat that remains outside in the desert. Choosing natives as landscape materials simply makes common sense. In research with other biologists I've learned that many desert trees and shrubs provide a niche for birds and animals that would not exist with exotic plants.

Public service organizations and agencies frequently know very little about the values which guide home residents in their choice of landscape materials; in fact it may be that they perpetuate a number of myths about which plants are most useful for arid landscaping. To learn more about homeowner plant materials choices, Judy Mielke and Gary Nabhan designed a survey which they gave to about 100 visitors to the Desert Botanical Garden, to both desert residents and non-resident visitors.

The most surprising finding was that twice as many Arizona desert dwellers have native plants in their home landscape than do non-desert residents. Although it was only 30% of all desert dwellers that did include natives in their yards, this information indicates that there may be more lay interest in plants of local origin here in the Arizona desert than in other regions. Why is this?

Is it because of a decade's worth of propaganda from desert municipalities that urges their citizens to beat the peak, slow the flow, and use drought-hardy plants and landscape designs to conserve water? For 30% of Arizona dwellers water bills are costly enough that they are interested in ways to cut landscape watering costs - only 16.2% of non-desert dwellers felt this to be an issue. More to the point, 45% of the Arizona desert dwellers said that their selection of home landscape plants would be different if they knew which required less irrigation.

But interestingly enough, just as many Arizona desert dwellers said that whether or not a plant is native affects their decision to plant it in their yards. Why would 45% of the desert residents feel that a plant's

status as a native is a critical factor in selection? Like us, they may feel an aesthetic pull toward our own desert plants.

In the past few years brochures on arid landscaping plant materials have promoted exotic trees and shrubs as well as the natives. Even our own desert trees brochure includes several exotic trees. While all of these trees thrive here, only the natives suffice for regionalism.

In the Phoenix area, little native flora remains in core areas which were slowly converted from agriculture to urban cities. What distinguishes this city from Perth, Australia, or Cobble, Iran? Olives, eucalyptus, Italian cypress would grow in any of these locations.

Our native mesquites, palo verdes, acacias, and desert willows help to distinguish us. If we focus only on water saving desert plants, we will open the doors to the widespread use of tamarisk, petite oleander, bermuda grass and bufilgrass.

On the basis of the native plant survey, perhaps "appropriate" means that a plant must reinforce the regional biocultural identity that has evolved in the Sonoran Desert and neighboring deserts over centuries. To improve the desert urban environment it is also desirable that a plant provide habitat for native fauna and not escape to compete with native flora.

We are aware that there will always be an interest in imported plants in the urban landscape. City governments and parks are urged to preserve and increase our biocultural identity through native plants. It is a question of balance: how much effort should we invest in truly native, but underappreciated plants right at our back doorstep?

Cactus Songs

By Richard S. Felger, Felipe A. Molina and
Mary Beck Moser

People of the Sonoran Desert have a rich tradition celebrating their native plants. Here are two songs about cacti.

First is one of the many deer songs of the Yoeme (Yaqui) people (see Evers & Molina, Yaqui Deer Songs/Maso Bwikam: A Native American Poetry. Tucson: Univ. of Arizona Press, 1987). It involves the *maaso* - the white tail deer - and the *aaki* or organ pipe cactus (*Stenocereus thurberi*). This song, translated by Felipe Molina, will be published in the future in a work on the ethnobiology of the Yoeme.

Song of the Organ Pipe Cactus

Akita vampo nachine
husama yoliyoliti awa hiluke

Akita vampo nachine
husama yoliyoliti awa hiluke

Akita vampo nachine
husama yoliyoliti awa hiluke

Akita vampo nachine
husama yoliyoliti awa hiluke

Akita vampo nachine
husama yoliyoliti awa hiluke

Akita vampo nachine
husama yoliyoliti awa hiluke

Ayamansu seyewailo huyata naisukuni
yo vaa bwibwikola weyeka

Senu yo vai vakuliau su yepsaka

Husama yoliyoliti awa hiluke

Akita vampo nachine

Husama yoliyoliti awa hiluke

Near the place of the Organ Pipe Waters,
I am rubbing antlers in an enchanted
brown way.

Near the place of the Organ Pipe Waters,
I am rubbing antlers in an enchanted
brown way.

Near the place of the Organ Pipe Waters,
I am rubbing antlers in an enchanted
brown way.

Near the place of the Organ Pipe Waters,
I am rubbing antlers in an enchanted
brown way.

Near the place of the Organ Pipe Waters,
I am rubbing antlers in an enchanted
brown way.

Near the place of the Organ Pipe Waters,
I am rubbing antlers in an enchanted
brown way.

Over there in the middle of the
flower-covered wilderness.
Walking along side the enchanted water.
Arriving to one enchanted fresh branch.
I am rubbing antlers in an enchanted brown
way.

Near the place of the Organ Pipe Waters.
I am rubbing antlers in an enchanted brown
way.

* * * *

Felger and Moser (People of the Desert and Sea, 1985, Univ. of Arizona Press; p. 173) recorded a Seri Indian song of the *siml*, a common barrel cactus (*Ferocactus wislizeni*). It was sung by Sara Villalobos (1900-1982).

Clouds come from all of the barrel cacti. The spirit power *Icor* causes them to form fog (*xeele*), which makes the clouds from which rain comes and gives life to all plants. "Fog and clouds have life; they are alive. You don't see clouds coming out of *siml* but there is a relationship." Once a *siml* sang a song. A shaman heard the cactus sing and learned the songs from it. Sara Villalobos sang us a song of the *siml*:

hant hipcom siml iti coocapii
Xeele iti mocaaya
Coox imcaamo
Hant ino quiyaaaya
Hant ino quiyaaaya

All of the barrel cactus that grow on this
land
Fog coming from them
They all have life
It is the sound of the land
It is the sound of the land

The third line refers to the fog clouds. The sound of the land, called *hant iinoj* "the roar (hum) of the land," was a low, steady roar or hum caused by the *siml*. This sound was important for the spirits, because they employed it in their use of power. The Seri words are shown as they were sung, with lengthened vowels and extra syllables: *coocapii* = *coocp*, *mocaaya* = *moca*, *imcaamo* = *imcam*, *ino* = *iinoj*, and *quiyaaaya* = *quih yaa*.

Book Review

SEED PROPAGATION OF NATIVE CALIFORNIA PLANTS. Dara E. Emery. Santa Barbara: Santa Barbara Botanic Garden, 1988. \$12.50 paperback. Tax and shipping are included when ordered from the bookstore at Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105; (805) 682-4726.

Reviewed by Jane B. Cole

Information about seasons to grow and landscape plans to develop can be quite different in California and Arizona. Getting a wildflower seed to sprout and grow, however, is not place specific, but applies to both locations. This is an excellent book that gives good coverage of many topics related to getting wildflowers and native plants to grow and thrive.

Growing wildflowers in the desert areas of Arizona means year round pleasure and the joy of developing a self-sustaining almost-wild crop that will continue to reproduce itself for many years. Emery, who is on the staff of Santa Barbara Botanic Garden, has successfully propagated and grown all the species in this 115 page book and here shares his knowledge and that of other researchers in propagating native plants. Although some modern uses of chemical treatments to break seed dormancy are given in this book, in actual use, the only chemical treatment he uses at the Botanic Garden is sulfuric acid.

Gathering a few seeds from wild plants can be a good way to start a wildflower garden. Lupines and gold-poppies are popular in Arizona, but their seeds must be harvested before they are fully ripe and then stored no more than two or three years at room temperature. If planted fresh they need no special treatment, but stored seeds will need scarification or hot water in order to germinate.

Emery's book is also about propagating more difficult species and ways of breaking seed dormancy: treating seeds with scarification, hot water, fire, acid and other chemicals. Not only are the procedures described, but the reader will have a better understanding of why the procedures work and what is really being attempted. The difference between seed coat dormancy and internal dormancy is explained. "After-ripening" is required in some seeds, for instance, and is a physiological condition that may delay germination. Since internal dormancy is often found in desert species, strategies for dealing with it need to be understood by desert gardeners.

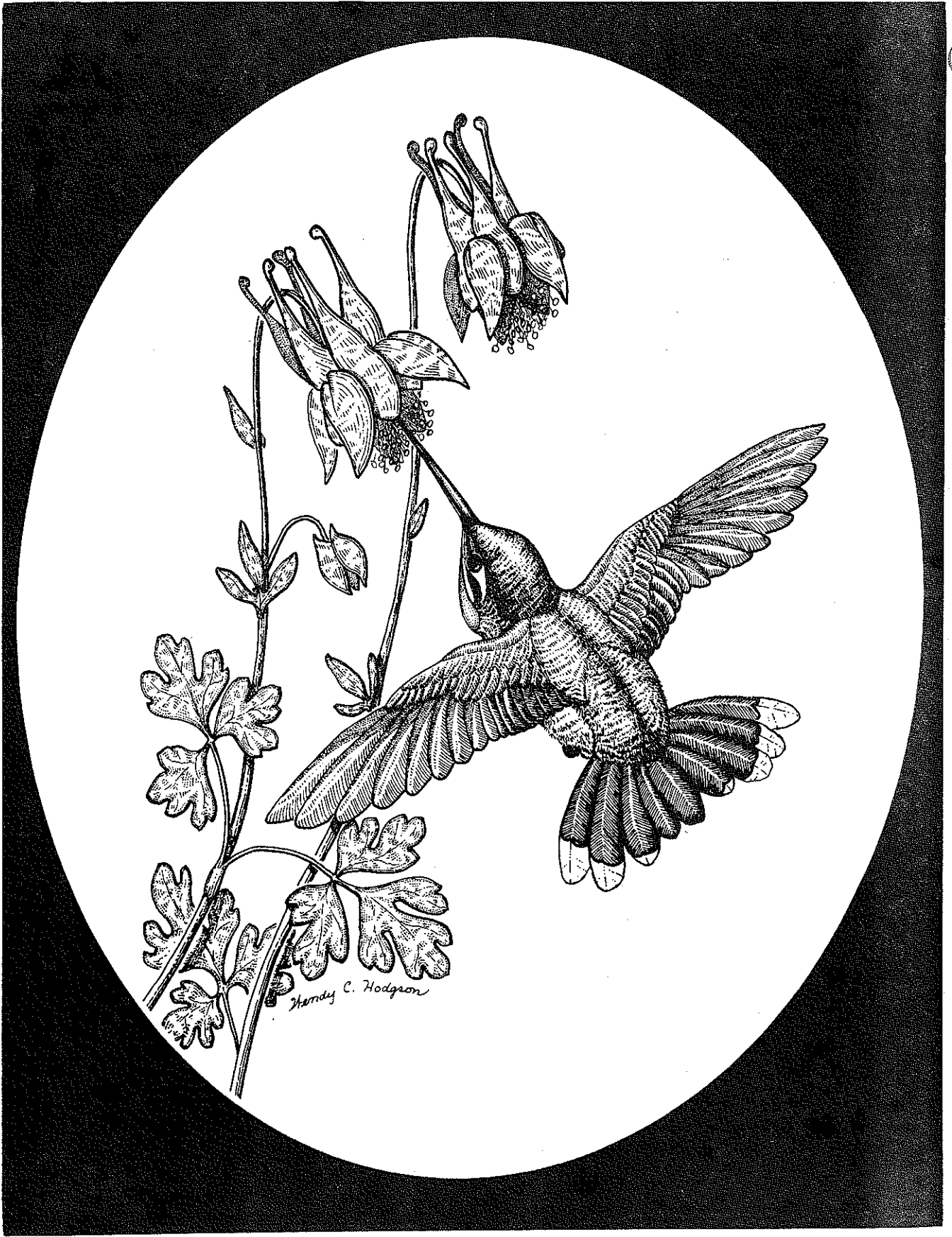
After the introductory chapters, the remainder of the book is a series of charts which show the names of the plant species in alphabetical order with a common name for each and important propagation information. Just in case this is not enough, the book also has four pages of references and an index.

The references given are not really intended to help the home gardener, but are citations to give authority to his information. To have a successful garden in the desert areas of Arizona, Emery is a good start. Additional references for wildflower propagation in desert areas are the planting and growing guide published recently by Arizona Highways titled Desert Wildflowers by the Desert Botanical Garden staff (\$9.95) and How to Grow Native Plants of Texas and the Southwest by Jill Nokes (\$26.95) published by Texas Monthly Press in 1986.

If *Larrea tridentata* (admittedly one of the most difficult to propagate) is attempted, all three of these books give information that is helpful. Emery says that creosote bush seed needs to be soaked in distilled water overnight and will germinate in a dark, hot bed at a steady temperature of 73 degrees. The germination percentage may be low and seedlings are intolerant of water stress. Desert Botanical Garden staff suggest hulling or sanding one end of the seed and soaking for 4-9 hours in deionized water. They suggest sowing out of doors (in the desert). Nokes gives detailed information including the additional statement that "care should be taken not to overwater." She also mentions that the Texas Agricultural Experiment Station at El Paso is developing nursery production methods. So, you may want to buy seedlings instead of trying to grow creosote bush from seed.

All three books also give information on growing cassias, which are much easier to propagate than creosote bushes. Nokes says fresh, untreated seeds of *Cassia wislizenii* planted one-fourth to one-half inch deep will germinate within seven days. The desert species, *Cassia covesii*, according to the Desert Botanical Garden staff needs no special treatment to germinate if planted in the spring, and Emery agrees that neither *Cassia covesii* nor *Cassia armata* is difficult to get started.

Seed Propagation of Native California Plants is a welcome addition to the literature on growing native plants of western America. Whether used as a research tool to propagate native plants or just as a handy reference for a home wildflower grower, it will be used and added to over the years to come.



Southwest Project Cuts Across Cultural, National Boundaries

By Gary P. Nabhan

The Desert Botanical Garden in Phoenix, Arizona, has recently initiated a unique collaboration for plant conservation across international and cultural boundaries. Its focus is on the useful threatened flora in the borderland states of the United States and Mexico. Called the FLORUTIL Conservation Project, it includes botanists from two other cultures: Navajo biologist Donna House of the Native American Botanical Research and Survey in Santa Fe, New Mexico; and ethnobotanist Luis Hernandez, biosphere reserve manager Humberto Suzan, and botanical garden director Guadalupe Malda of the Ecological Association of Tamaulipas in Ciudad Victoria, Mexico.

The arid and semiarid borderlands are rich in cacti, succulents, and herbaceous endemics. Many of these plants are now threatened by commercial overcollection and desertification (human-induced desert expansion). At the same time, 44 million acres of the binational Southwest is inhabited by 73 different cultures living in areas where the floras are little explored by professional botanists but intimately known by native peoples.

To gain perspective on the significance of Indian lands as reservoirs for rare plants, consider this statistic: all the privately owned nature sanctuaries in the United States amount to only 2,500,000 acres — the same land area as the second largest Indian reservation in the Southwest, that of the Tohono O'odham (Papago) of Arizona. A tally of the land areas inhabited by Navajo, Apache, and 28 other tribes from the borderland states in the United States would come to well over 25 million acres! Another 12 million acres of Mexican borderlands is Indian domain.

Until recently, the folk scientific knowledge of these indigenous peoples has not been incorporated into efforts toward plant protection and recovery. Researchers at the Desert Botanical Garden have found that native farmers and gatherers not only know the local distribution of rare species of agaves, sunflowers, and cacti, but that they sometimes protect, propagate, or watchguard these plants as well.

Donna House, in work she initiated while coordinating the Navajo Natural Heritage Program, included both local ethnobotanical information and tribal involvement in helping to formulate a recovery plan for the Navajo

sedge (*Carex specuicola*) — a plan prepared for the U.S. Fish & Wildlife Service. The Navajo sedge is a grass-like plant with pale green leaves reaching a height of about 16 inches. An estimated 700 individual plants occur in clumps in seep-springs in only three locations on the Navajo Indian Reservation in Coconino County in northern Arizona. Navajo Nation community members say that the species was once extensive and that it is used as forage by grazing animals. As part of its conservation program, Desert Botanical Garden will propagate this rare sedge and make it available to the Navajo for future reintroductions.

To facilitate the assembling of information about plants like the Navajo sedge, FLORUTIL participants are using a Spanish/English computer program to record all indigenous uses, management, and perceptions of threatened plants in the borderland states. The FLORUTIL database can provide additional rationales for conserving these plants for their ceremonial, medicinal, or genetic resource value. If a plant is currently used, the conservation project is also comparing the effects of harvesting for local use with those of commercial exploitation and habitat degradation. It is hoped that the information base will encourage *in situ* conservation efforts by U.S. and Mexican governmental agencies as well as by the sovereign tribes of the region.

The project is already adding a new dimension to the Desert Botanical Garden's involvement with the Center for Plant Conservation: the Navajo Sedge, Thornberg's fishhook cactus, Tumamoc globeberry, and sandfood are all species that the Garden conserves in propagation or in seed storage. And, for our Garden visitors, the public displays now include the ethnobotanical uses of these rare plants.

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Grasses in Catalina State Park

By Horace P. Miller

Catalina State Park occupies about 5500 acres northwest of Tucson at the foot of the Santa Catalina Mountains. The park was formally opened on May 25, 1983, and soon became a popular spot for hikers, naturalists and those generally who enjoy the outdoors. The elevation range within the park boundary is from about 2650 feet at the park entrance from the Florence Highway (US 89) to about 4000 feet in the southeast corner. Most of the park, however, is in the 2650 to 3000 feet range. The Romero Canyon trail leading to higher elevations starts within the park.

It is the purpose of this article to present a preliminary list of the grasses that the author has observed growing in the park. During the coming year, it is planned to monitor the grasses with the idea of compiling a more complete list at the end of 1989. In this regard, two ANPS "grass walks" are planned for the spring and fall of 1989.

In looking over the list, the reader will note that some grasses that are quick to invade disturbed sites are already present in the park, including four Lovegrasses (*Eragrostis* sp.), as well as Red Brome (*Bromus rubens*), Bermuda Grass (*Cynodon dactylon*), Crabgrass (*Digitaria sanguinalis*), Wild Barley (*Hordeum glaucum* and *Hordeum leporinum*), Natal Grass (*Rhynchelythrum repens*) and a few others.

However, it will also be noted that some other notorious invaders are not (yet) on the list, including Fountain Grass (*Pennisetum setaceum*), Buffle Grass (*Cenchrus ciliaris*) and Johnson Grass (*Halepense ciliare*). It is of interest to note that these three grasses are now well established in the Sabino Canyon Recreational Area, which has had disturbed areas for a longer period of time. Part of our grass monitoring effort will be to watch for these and other invaders.

The basic text for Arizona grass is: Frank W. Gould (1951) Grasses of Southwestern United States, University of Arizona Press. Because this work is now 37 years old, it is not always up-to-date as far as accepted scientific names are concerned. For that reason, I have included footnotes to the list, giving the old names so that the reader may find the listed species in Gould. Such taxonomic changes for Arizona may be found by referring to: J. Harry Lehr (1978) A Catalogue of the Flora of Arizona, Desert Botanical Garden, Phoenix, and two supplements thereto published by J. Harry Lehr and Donald J. Pinkava in the Journal of the Arizona-Nevada

Academy of Science, vol. 15 (1980) pages 17-32 and vol. 17 (1982) pages 19-26. Finally, the best way to check out a grass for which you have doubts or confusion is to compare it with the mounted specimens in the herbarium of the University of Arizona in room 113 of the Shantz Building.

I should also state that scientific names are given in this article without the complex adornments called for by the taxonomists' Rules of Nomenclature. For example, it is sufficient for our purposes to refer to Fluffgrass as *Erioneuron pulchellum* rather than the more ponderous: *Erioneuron pulchellum* (H.B.K.) Tateoka (*Tridens pulchellus* (H.B.K.) Hitchc.).

So, with that preamble, here are the grasses noted by the author in a series of casual visits to the Catalina State Park. Those preceded by an asterisk are introduced, non-native species.

Footnotes

(In the following, Frank W. Gould's Grasses of Southwestern United States (1951) is referred to as "Gould".)

1. *Aristida adscensionis* is easily confused with *A. parishii*. It is a long lived annual.
2. *Aristida hamulosa* resembles *A. ternipes*, but differs from the latter in having three well developed awns, while *A. ternipes* has only one long awn. In addition to its normal flowering period from August to October, *A. hamulosa* also occasionally flowers during the winter and spring months.
3. *Aristida purpurea*. This species now includes, as varieties, the following species as given in Gould: *A. pupurea*, *A. wrightii*, *A. longiseta*, *A. fendleriana* and *A. glauca*. See Conquest, et al. (1977) Intermountain Flora, vol. 6, p. 455.
4. *Avena*. *Avena fatua* and *A. barbata* probably intergrade.
5. *Bothriochloa barbinodis* is in Gould as *Andropogon barbinodis*.
6. *Bouteloua repens* is in Gould as *B. filiformis*.
7. *Bouteloua rothrockii* and *B. barbata* undoubtedly intergrade.
8. *Digitaria californica* is in Gould as *Trichachne californica*.
9. *Displachne uninervia* is in Gould as *Leptochloa uninervia*.
10. *Eragrostis cilianensis* is in Gould as *E. megastachya*.
11. *Erioneuron pulchellum* is in Gould as *Tridens pulchellus*.
12. *Hordeum glaucum* and *H. leporinum* differ only in small particulars, especially in the length of the joints of the rachis. To key these taxa, use the Intermountain Flora, vol. 6, rather than Gould. Very common in the park in spring.
13. *Rhynchelythrum repens* is in Gould as *R. roseum*.
14. *Schismus barbatus*. A similar species, *S. arabicus*, may also be present. Also they may interbreed.
15. *Sitanion hystrix* is in Gould as *Elymus elemoides*.
16. *Vulpia octoflora* is in Gould as *Festuca octoflora*.

Checklist: Grasses in Catalina State Park

<u>Scientific Name</u>	<u>Common Name</u>	<u>Annual or Perennial</u>	<u>Flowering Period</u>	<u>Foot- notes</u>
<i>Aristida adscensionis</i>	Six Weeks Three-awn	A	Dec.-May	1
" <i>hamulosa</i>		P	Aug.-Oct.	2
" <i>purpurea</i>	Purple Three-awn	P	Spring to Fall	3
" <i>ternipes</i>	Spider Grass	P	Aug.-Nov.	
			Occ. in Spring	2
* <i>Avena barbata</i>	Slender Oat	A	Mostly Mar.-July	4
* " <i>fatua</i>	Wild Oat	A	Mostly Mar.-July	
<i>Bothriochloa barbinodis</i>	Cane Beardgrass	P	Apr.-Oct.	5
<i>Bouteloua aristidoides</i>	Six Weeks Needle-grass	A	Summer & Fall	
" <i>barbata</i>	Six Weeks Grama	A	Throughout Year	
" <i>curtipendula</i>	Side Oats Grama	P	Summer & Fall	
" <i>hirsuta</i>	Hairy Grama	P	Aug.-Oct.	
" <i>repens</i>	Slender Grama	P	Aug.-Oct	6
" <i>rothrockii</i>	Rothrock Grama	P	Throughout Year	
* <i>Bromus rubens</i>	Red Brome; Foxtail Chess	A	Spring	
<i>Chloris virgata</i>	Feather Fingergrass	A	Summer & Fall	
<i>Cottea pappaphoroides</i>	Cotta Grass	P	Late Summer & Fall	
* <i>Cynodon dactylon</i>	Bermuda Grass	P	Spring to Fall	
<i>Digitaria californica</i>	California Cotton-top	P	Mostly Aug.-Nov.	8
* " <i>sanguinalis</i>	Common Crabgrass	A	June-Oct.	
<i>Displachne uninervia</i>	Mexican Spangletop	A	June-Oct.	9
* <i>Eragrostis barrelieri</i>	Mediterranean Lovegrass	A	Aug.-Oct.	
* " <i>cilianensis</i>	Stink Grass	A	May-Oct.	10
* " <i>chloromelas</i>	Boer Lovegrass	P	Spring-Fall	
* " <i>curvula</i>	Weeping Lovegrass	P	Spring-Fall	
" <i>intermedia</i>	Plains Lovegrass	P	June-Oct.	
* " <i>lehmanniana</i>	Lehman's Lovegrass	P	Spring to Fall	
<i>Eriochloa lemmoni</i>	Cupgrass	A	Aug.-Oct.	
<i>Erioneuron pulchellum</i>	Fluffgrass	P	(Spring) Summer-Fall	11
<i>Heteropogon contortus</i>	Tanglehead	P	(Spring) Aug.-Oct.	
* <i>Hordeum glaucum</i>	Wild Barley	A	Spring	12
* " <i>leporinum</i>	Wild Barley	A	Spring	12
" <i>pusillum</i>	Little Barley	A	Spring; early summer	
<i>Muhlenbergia emersleyi</i>	Bullgrass	P	June-Nov.	
" <i>porteri</i>	Bush Muhly	P	Aug.-Nov.	
" <i>rigens</i>	Deer Grass	P	Fall	
<i>Panicum arizonicum</i>	Arizona Panicum	A	(June) Aug.-Oct.	
<i>Poa bigelovii</i>	Bigelow's Bluegrass	A	Early Spring	
* <i>Polypogon monspeliensis</i>	Rabbitfoot Grass	A	Mar.-Oct.	
* <i>Rhynchelythrum repens</i>	Natal Grass	A(P)	July-Nov.	13
* <i>Schismus barbatus</i>	Mediterranean Grass	A	Jan.-May	14
<i>Setaria macrostachya</i>	Plains Bristlegrass	P	May-Oct.	
<i>Sitanion hystrix</i>	Squirrel Tail	P		15
<i>Sporobolus contractus</i>	Spike Dropseed	P	Aug.-Oct.	
" <i>cryptandrus</i>	Sand Dropseed	P	July-Oct.	
<i>Vulpia octoflora</i>	Six-weeks Fescue	A	Spring	16

The U. of A Shuffle

or, "How Tony Got His Ph.D"

(Sung to the tune of "The West Texas Waltz")

When you're ready for talkin',
or just desert walking',
Grab Tony and his four-wheel drive
Go clear to the top of ol' Tumamock
You'll be lucky to get there alive
(You'll be happy if you can survive.)
For the road to the summit's as rough as can be -
But you know that won't keep Tony from his Ph.D.

When he was a young cowpoke,
his Dad said, "How now poke,
You're borderline scholar and borderline fool
'Stead of workin' eight hours,
you're out sniffin' flowers
So I'm packin' you off to school
(I guess they call it botanical school.)"
When he finished he couldn't tell a bush from a tree -
But he knew that wouldn't keep him from his Ph.D.

"Son," said his advisor,
"if you want to get wiser,
Better take this advice while you can:
Stamens need pistils; if you get my gist, you'll
Find you a pretty woman.
(So he went out and found a woman.)
Now her stigma was quite an enigma, but he -
Knew it probably couldn't keep him from his Ph.D.

The day Muff said, "Handsome,
I think there's a chance some-
one else may be moving in here."
His chest was so puffed out, it practically
snuffed out
All hope of research that year
(No, there wasn't much progress that year.)
Of course playing horse beats working, you see -
'Side he knew that wouldn't keep him from his
Ph.D.

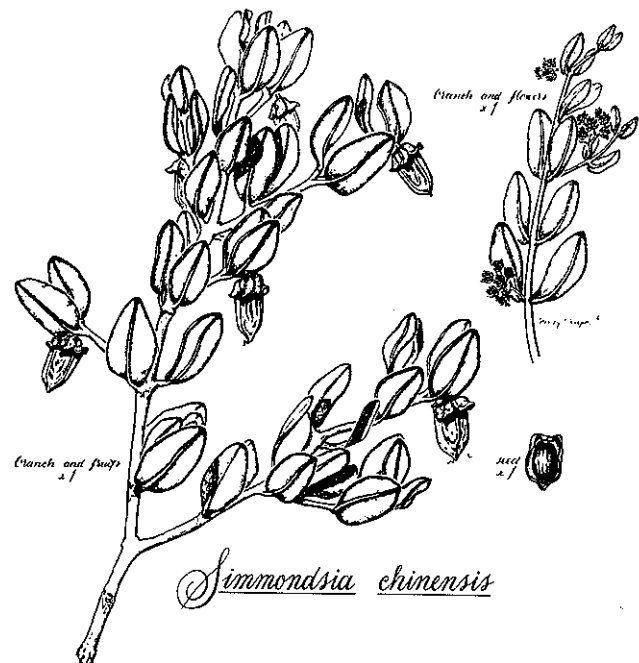
When writing his thesis,
he was bound as Prometheus
To get it completed each day;
But the data kept changing
and he, rearrangin' it,
Hoped to improve it this way.
(Oh, yes, it looks better this way.)
But he was still laughin' by draft one-0-three -
'Cause he knew that wouldn't keep him from his
Ph.D.

Down to Guatemala, Chihuahua and Baja
He wandered with pick axe and glove
He sought the agave throughout the Mojave
And measured the rain from above
(Whenever it rained from above).
Until there was nobody smarter than he -
And he knew they couldn't keep him from his
Ph.D.

So come now you Doctors,
you docents and proctors,
Regardless of how long it's been
Since you sat on the pyre,
your feet to the fire
The heat coming up to your chin
(The sweat dripping off of your chin.)
You remember that day, and (Admit it!) like me
You thought Tony would never get his Ph.D.!!

-Written for Tony Burgess by Mary Ames on the
occasion of celebrating his successful Ph.D
thesis defense, November 26, 1988.

"The Relationship Between Leaf Shape
and Climate in the Agave *cerrulata* complex" is
the title of Tony Burgess' recently completed
thesis in the Ecology and Evolutionary Biology
Dept. at UA. It examines the bioclimatology of
the Vizcaino Desert region of central Baja
California and draws an interesting mosaic of
weather conditions and agave adaptations. It
is available at UA Main Library.



Plant Sales & Events

March 4

Tucson Endangered Species Fair
Reid Park Zoo (Reid Park at 22nd St., just west of Alvernon Way). Many activities for adults and childrens, co-sponsored by ANPS and others. For details, or to help out, call Barbara Tellman, 792-4515.

March 4

Native Seeds/SEARCH seed sale.
Tucson Botanical Gardens, 2150 N. Alvernon.
All items from 1989 catalog for sale. More information: 327-9123.

March 11-12

Plant Sale
Desert Botanical Garden
Write for details: 1201 N. Galvin Parkway,
Phoenix, AZ 85008.

March 18 - 19

Plant Sale
Tucson Botanical Gardens
Saturday, 10 a.m. - 4 p.m.
Sunday, 10 a.m. - 2 p.m.
Write for a listing of tours, wildflower walks and lectures: 2150 N. Alvernon Way, Tucson, AZ 85712.

April 1 - 9

Arid Land Plant Sale
Boyce Thompson Southwestern Arboretum,
Superior
Opening weekend with special displays, demonstrations, talks and tour. 8 a.m. - 5 p.m.
Other events throughout spring; write for details: P.O. Box AB, Superior, AZ 85273; 689-2811.

April 8 - 9

Plant and Mineral Sale
Arizona Sonora-Desert Museum
9 a.m. - 4 p.m.

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 below.

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: _____

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Telephone: _____

Clip and mail this form together with proper remittance to:

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P.O. Box 41206
Tucson, AZ 85717

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

Kevin Dahl, editor
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 881-0807

NEXT DEADLINE IS:

April 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.