

The Plant Press

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MYCORRHIZAL ASSOCIATIONS IN SOUTHWESTERN NORTH AMERICA: SOME PRELIMINARY FINDINGS

by Dr. Jean Stutz

Most people are unaware of the fact that plants do not have roots that grow in the soil but really have 'fungus-roots'. 'Fungus-roots' were discovered in the 1880's by the distinguished German plant pathologist, A.B. Frank, when he undertook a study to find out how the fungal delicacies, truffles, were formed. Frank coined the term 'mycorrhiza' from the Greek words for fungus and roots to describe the association he found to occur between truffles and tree roots. Mycorrhiza were viewed as an oddity until their presence was found to be required for the establishment of plants transplanted into new or degraded habitats such as exotic forests in Australia, shelterbelts in grasslands in the mid-western U.S. and mining spoils. Since the early 1960's, interest in use of these fungi in agriculture, forestry and revegetation has resulted in research into their structure, function, physiology and ecology.

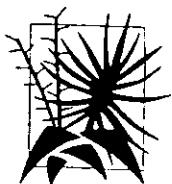
Mycorrhiza are a mutualistic symbiosis in that both the plant and the fungal partners derive benefit from the association. The fungal partner is dependent on the plant for sugars and other organic substances. But despite this flow of organic components from the plant to the

fungus, the growth of mycorrhizal plants is usually enhanced in comparison to their nonmycorrhizal counterparts. This is because the fungus lives both inside the plant root and extends outside the root into the surrounding soil. It absorbs mineral nutrients such as phosphorus from the soil and transports them into the plant. Mycorrhizal plants have also been shown to be more resistant to certain plant diseases and more tolerant to stresses such as drought.

Mycorrhizal associations are widespread among plants and are found in a wide range of habitats. It is estimated that 95% of all land plants have some type of mycorrhizal association. There are several different types of mycorrhizal associations which can be differentiated based on morphological features and on the plants and fungi involved in the symbiosis. For example, many common edible and poisonous mushrooms form mycorrhizal associations with forest trees such as pine, spruce and aspen. Plants in the *Ericaceae* form special types of associations in sand dunes, heaths and chaparral.

(Mycorrhiza - continued on Page 6)

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NOTES FROM THE PRESIDENT

Greetings and best wishes for a great 1995 to all personally and to the Arizona Native Plant Society! May the coming year be one of health, happiness, prosperity and achievement for each of us and for the ANPS as a whole.

Thanks to the inspired creativity and very hard work over a number of years of our Urban Landscape Committee, a sizable amount of money (just over \$60,000) has been amassed from the sale of our stellar series of plant information pamphlets. At the November 3, 1994 meeting of the ANPS Board of Directors, an ANPS Publications Policy was adopted governing the care and use of this valuable resource. The policy follows.

Publications Policy of the Arizona Native Plant Society -

The dollar amount of the Arizona Native Plant Society (ANPS) Urban Landscape Committee (ULC) will be henceforth designated as a Publication Fund for the ANPS. The fund principal shall consist of the bank account balance of the ULC as of August 15, 1994, plus any proceeds from the sale of the existing inventory of publications produced by the ULC. Allowable expenditures from the Publication Fund are of three types:

Operational Expenses - Those expenses involved with managing the fund principal, including bank fees, postage for distribution of existing inventory, etc.

Grants - The fund principal shall be invested in an appropriate instrument(s) and annual income

generated will be made available as grants on a competitive basis for approved projects, with an emphasis on publications.

Projects - Funding for new projects or reprinting of existing publications may be made from the fund principal, up to a maximum of 20% of the fund principal. These shall be limited to approved income generating projects of ANPS chapters or committees, with the stipulation that all funds generated by projects be returned to the Publication Fund, all such actions being subject to approval by the full State Board.

The Publication Fund shall be administered by the Publications Committee of the ANPS State Board. The Publications Committee shall have five members to include an *ex officio* President and Treasurer of the State Board and three ANPS members, to be selected by the full Board of the ANPS. The term of Publication Committee membership is for two years with two possible consecutive terms.

The Publications Committee, appointed for two year terms at the November 3, 1994 meeting, is comprised of the following persons: Bill Feldman (Pres., ANPS), Horace Miller (Treas., ANPS), Jane Evans (Tucson), Mark Dimmitt (Tucson) and Sue Rutman (Phoenix). The committee will be meeting in the near future to plan for implementation of the Publications Policy to include the drafting of competitive grant proposal guidelines as provided for in the policy. More to follow.

- Bill Feldman

1996 ANNUAL MEETING TO BE HELD IN SAFFORD

The 1996 ANPS Annual Meeting is scheduled to be held in Safford on Sept. 29 - Oct. 1. The focus of this year's meeting will be the riparian area of the Gila River Watershed and the sky island plant communities of nearby Mt. Graham. Organizers are currently seeking speakers and field trip leaders. If you are interested in participating in either of these capacities, please contact Julia Fonseca (792-2690) or Scott Wilkins (820-2730). Registration materials will be mailed out this summer. Nancy Stallcup (378-1169) will be handling registration once again. Please contact her if you have any questions regarding registration.

EDITOR'S COMMENTS

A happy 1995 to all of you!

The response to our Reader Survey (Fall, '94 issue) was quite underwhelming. A grand total of 6 responses were received! Many thanks to those (few) who took the time to complete the survey and provide some helpful comments and suggestions. If you wish, you may still fill out a survey form and return it. We appreciate the input.

If you've ever wondered why some of our commercially-grown natives never quite take hold as well when transplanted into the landscape, our feature article, "Mycorrhizal Associations in Southwestern North America: Some Preliminary Findings," may have some answers. Mycorrhiza refers to the beneficial association of certain fungi with root cells of plants. Examples of cultivated plants that have this symbiotic relationship include cotton, corn, apples and citrus. Dr. Jean Stutz of ASU's Department of Botany, initiated a study several years ago of mycorrhiza among desert plants and how they might affect plant growth and development. Her work reveals an abundance of species of mycorrhizal fungi in southwestern North America which play a critical role in our arid ecosystems.

"Is Mesquite Native to Southeast Arizona?" When Julia Fonseca submitted this piece, I confess to having one of those "Is the Pope....?" reactions. But there is a genuine movement afoot that questions the origin of our "native" mesquites, and Fonseca is there to challenge it. Read up.

- Balbir



Members attending the annual meeting enjoy the flora near Phelps Cabin in the White Mountains.

SPRING CALENDAR

Mar. 24-26 (Fri.- Sun.): DESERT BOTANICAL GARDEN Spring Plant Sale, Papago Park, Phoenix. Members-only sale, Fri., 3 to 6 pm.; sale for general public, Sat. & Sun., 9 am to 5 pm.

Mar. 25-26 (Sat. & Sun.): TUCSON BOTANICAL GARDENS Spring Plant Sale at TBG, 2150 N. Alvernon Way, Tucson. Open to general public 10 am to 4 pm both days.

Mar. 31- Apr. 9 (Fri.- Sun.): BOYCE THOMPSON SOUTHWESTERN ARBORETUM Spring Plant Sale (8 am to 5 pm all days).

Apr. 1-2 (Sat. & Sun.): DESERT SURVIVORS Plant Sale at 1022 W. 22nd St., Tucson.

Apr. 8 (Sat.): ARIZONA SONORA DESERT MUSEUM'S Third Annual Plant Promotion, showcasing new varieties of desert-adapted plants. 9 am to 3 pm.

Year round (Mon-Sat.) Plant Sales: TOHONO CHUL PARK, 7366 Paseo del Norte, Tucson. Hours from Oct. 1-May 1 are 10 am to 2 pm; May 1-Oct. 1, 9 am to 1pm.



TRIO OF RECIPIENTS RECEIVE ANPS ANNUAL APPRECIATION AWARD

The 1995 ANPS Annual Appreciation Award was given to three members: Kent Newland of the Phoenix chapter, and Dr. Paul Martin and Barbara Tellman both from the Tucson chapter. The awards were presented at the ANPS Annual Meeting in Show Low on Oct. 1. Barbara Tellman was the only recipient who attended the meeting, however.

All three recipients reflect diverse efforts to protect our native flora and educate others about it. Their outstanding contributions serve as an example to the rest of us about what can be achieved through such dedication and hard work.

Kent Newland was awarded for his work in education, conservation, native plant landscaping and propagation.

Kent currently works as head of the xeriscape program for the City of Phoenix Water Conservation Office. In this capacity, he has made numerous contributions to encouraging the use of native plant materials in landscapes in Phoenix. This includes playing a major role in the preparation of several brochures which provide information about the use of native and low water use plants in the home landscape.

He is involved in several programs, either through the City of Phoenix or educational agencies, in which he makes presentations concerning the use of water-wise landscaping plants. He has also taken the lead in developing the SmartScape program which is a training series for landscape professionals.

He has worked to encourage an increase in the availability of native plants in commercial nurseries - both number of species and the varieties available. He has also promoted the introduction of non-natives that are suited to the Sonoran Desert environment.

He has served as the President of the Phoenix ANPS Chapter for several years and initiated the lecture series on deserts of the world.

Dr. Paul Martin is an Emeritus Professor of Geosciences at the University of Arizona.

His nominator remarked, "To my knowledge he has never turned away an inquiring mind from the pursuit of an understanding of the natural world; instead, he made classes and field trips and meetings accessible to all students, whether registered at a university or not." His many contributions in education and scientific research include:

- studies of ancient botanical remains which have contributed to understanding Arizona's changing biota;

- teaching environmental education classes which have influenced many;

- encouragement of interdisciplinary programs, including Tumamoc Hill's "Menudo Society;"

- current work updating Howard Scott Gentry's Rio Mayo flora;

- recent efforts to bring together astronomers and biologists to study Mt. Graham's mountaintop ecosystem.

Anyone who knows **Barbara Tellman** has likely discovered her passion for saving the environment. Lucky for us, this has included her tireless efforts to preserve native plants and their habitats. Her list of committee memberships and contributions may be too numerous to mention here. But if there is an "above and beyond" category, it certainly goes to her.

Tellman is currently a research assistant with the Water Resources Research Center at the University of Arizona. She only recently resigned from the ANPS State Board of Directors. In the past, she served as chairperson of the Conservation Committee, spearheading many of our Society's efforts to protect desert and riparian areas. The Sky Islands Alliance exists today thanks to her foresight. She is also the editor of the Arizona Riparian Council newsletter.

The State Board of Directors unanimously approved Tellman's award for her service on behalf of ANPS and its goals.

IS MESQUITE NATIVE TO SOUTHEAST ARIZONA?

by Julia Fonseca

This is a question some Arizonans are posing. Mesquite was introduced to southeastern Arizona during the late 1800's, they state (in an effort, perhaps, to thwart conservation of mesquite habitats). The facts, however, state otherwise.

During the last 150 years, the density and occurrence of mesquite (*Prosopis*) in southeastern Arizona has shifted dramatically. The increase of mesquite in upland areas, coupled with replacement of some riparian plant associations by mesquite, has led to some confusion about the origins of this plant.

Although mesquite has historically expanded into grassland and riparian areas, it was present at low densities in the uplands, and as "bosques" or closed canopy woodlands along the Santa Cruz, Gila and lower San Pedro Rivers well before the introduction of livestock. According to Tom Van Devender, professor of paleoecology at the University of Arizona, mesquite appears in packrat middens near Tucson from over 11,000 years ago, predating the appearance of saguaros in our region. It has also been documented (in archaeological, historical and linguistic studies) that mesquite was a mainstay of diet among indigenous people such as the Pima, Tohono O'odham and Apache prior to the arrival of Anglos.

The "invasion" of grasslands in southeastern Arizona by both velvet (*P. velutina*) and western honey mesquite (*P. glandulosa* var. *torreyana*) since the late 1800's is well-documented by scientists (see *The Changing Mile* by Hastings and Turner, for example). The increase in mesquite, coupled with overgrazing, has reduced the carrying capacity of semidesert grasslands in Pima, Cochise, Santa Cruz and Graham Counties for livestock.

At the same time, large floods in the region in the late 1800's and early 1900's resulted in deeply incised arroyos. These arroyos drained the riverine marshes and wet meadows which had characterized many watercourses in southeastern Arizona.

The desiccation of these marshlands allowed dense thickets of mesquite to form in river

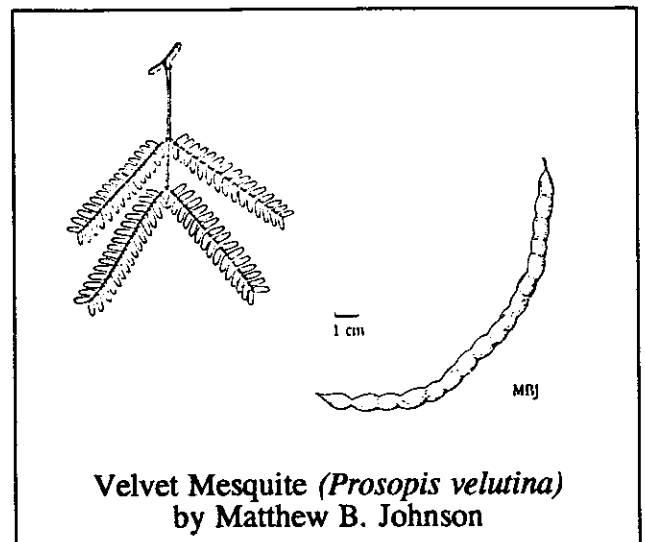
bottoms that had been dominated by sacaton, sedges and deciduous trees like willow. This process also reduced grazing capacity. Small wonder, then, that the question of whether mesquite is truly native has arisen, and some seek its eradication.

Current trends indicate that the shrubby form of mesquite will persist and possibly even continue to increase in the grasslands of southeastern Arizona. In contrast, mesquite bosques are declining due to the demands of an increasing human population, as well as replacement by tamarisk (*Tamarix* sp.).

Furthermore, according to Dr. Roy Johnson of the University of Arizona, of the 83 species of birds dependent on mesquite habitats, 36 species have declined. Populations of at least one mammal, Merriam's mouse (*Peromyscus merriami*), have been severely reduced over the last century due to the destruction of mesquite habitat.

Control of groundwater pumping is essential to prevent the loss of mesquite bosques, which begin to die when the water table drops below 50 feet or so. Incentives for protection are needed to reduce the economic conversion of mesquite bosques to other uses.

Julia Fonseca is a hydrologist with the Pima County Flood Control District and a member of the Board of Directors of the ANPS.



By far the most common type of mycorrhizal association is between a wide range of herbaceous and woody plants and arbuscular mycorrhizal fungi. These fungi are named for the branched structure called an arbuscule which they form inside cortex cells of plant roots. Arbuscules are the site of exchange of mineral nutrients such as phosphorus which flow from the fungus to the plant and organic compounds such as sugars which flow from the plant to the fungus. Plant roots can be heavily colonized with arbuscular mycorrhizal fungi and look no different than roots which are not colonized. The only way to tell if roots are colonized with these fungi is to stain the roots and look for the presence of arbuscules. Arbuscular mycorrhizae are the most common type of association in arid desert ecosystems and semiarid grasslands, and my research group has concentrated its efforts on the study of this type of mycorrhizal association.

Our interest in arbuscular mycorrhizae started with some practical research into the possibility of inoculating desert trees with mycorrhizal fungi prior to planting in landscapes and revegetation projects. We were interested in finding out if inoculating trees with 'desert' mycorrhizae at the nursery stage resulted in trees which transplanted better into desert landscapes and revegetation sites when compared to inoculating with mycorrhizae from more temperate regions.

Most commercially available mycorrhizal inoculum originates from temperate regions, and scientists have recently found that mycorrhizal fungi are adapted to the soil conditions such as pH and climatic conditions such as temperature from the region in which they originated. One problem that we encountered immediately was the lack of mycorrhizal inoculum from arid and semiarid areas in Arizona.

Because arbuscular mycorrhizal fungi are obligate symbionts, the fungus has to be grown on a living plant host. Inoculum normally consists of a pot culture which is the roots of a host plant (sudan grass, *Sorghum sudanense*, is commonly used) and the growing media which contains the spores of the fungus.

Dr. Earl Bloss of the Department of Plant Pathology at the University of Arizona had done some pioneering work identifying and culturing arbuscular mycorrhizal fungi from the Sonoran Desert surrounding Tucson and

the Santa Catalina Mountains in the early 1980's. But after his retirement most of his pot cultures were no longer in existence. So our first task was to identify and culture some of the arbuscular mycorrhizal fungi associated with trees in arid and semiarid regions in southwestern North America.

In the early 1990's we started to collect soil and roots from mesquite (*Prosopis velutina*) and palo verde (*Cercidium floridum*) trees from several sites in the Sonoran Desert surrounding the Phoenix area. We used the soil and roots collected to set up trap cultures of arbuscular mycorrhizal fungi in greenhouses at Arizona State University.

Trap cultures are living cultures of arbuscular mycorrhizal fungi which use sudan grass as a host. They allow a scientist to produce spores of arbuscular mycorrhizal fungi. Since these fungi are identified based on characteristics of their spores, the production of spores is necessary in order to discover what species of fungi are present in an area.

Trap cultures also produce viable spores which can be used to establish cultures of arbuscular mycorrhizal species for future research. This technique had first been used to identify and culture fungi from more temperate, mesic regions, and we soon found that we had to adapt the technique for use with soil collected from more xeric sites. In trap cultures using soil from mesic areas, an indication of the diversity of the arbuscular mycorrhizal fungi present can be obtained by sampling and extracting spores from the initial trap cultures.

In contrast, we found that we had to reculture our trap cultures for two or three generations in order to determine the full extent of species diversity present at our xeric locations. Because it takes 3 to 4 months for each trap culture generation to form spores, it normally takes over a year using this technique to determine which arbuscular mycorrhizal fungal species are present at each site.

Using the successive generation trap culture technique, we found that our sampling sites in the Sonoran Desert had a greater number of arbuscular mycorrhizal fungi than had previously been reported by other scientists. Previously, researchers who had surveyed arbuscular mycorrhizal fungi in the Sonoran Desert using one generation of trap cultures or spores extracted directly from the soil

postulated that very few mycorrhizal fungi could survive and function in xeric environments because they recovered only 1 to 4 mycorrhizal species at each sampling location.

In contrast, we found a range of 6 to 12 different mycorrhizal species at each sampling site, thus expanding the number of mycorrhizal fungi present at each location. By using this new successive generation trap culture technique in arid and semiarid ecosystems, we will be better able to assess the biodiversity of arbuscular mycorrhizal fungi at these types of locations.

Since our initial work in the Sonoran Desert surrounding Phoenix, we have expanded the numbers of sites we have sampled for arbuscular mycorrhizal fungi. We set up trap cultures from a range of arid and semi arid biomes in Arizona, New Mexico, Texas and in Sonora, Mexico. These sampling sites range from locations in the Plains of Sonora Subdivision in the Sonoran Desert near Hermosillo to semiarid grasslands in the San Raphael Valley in Arizona to mesquite hummocks in southern New Mexico.

In more recent years we have become interested in sampling from saline sites and have set up trap cultures from the Rio Grande Valley near El Paso, Texas, the Quitobaquito Springs area in Organ Pipe National Monument and from Anzo-Borrega State Park in the western Sonoran Desert in California. Because of the range of sites sampled, we have collected some interesting information about the biogeography of arbuscular mycorrhizal fungi in southwestern North America. Over 21 different species of mycorrhizal fungi were identified from the different sites. Four of these species occurred at almost all the sites we sampled, but over a third of the species collected occurred at only one or two sites. We had isolated six putative new arbuscular mycorrhizal species which still have to be described.

It is of interest that one of the more widely occurring of these new species in southwestern North America has since been found to occur in the Namibia Desert in Africa. Paleobiological evidence suggests that arbuscular mycorrhizal fungi evolved before the breakup of the supercontinent Gondwanaland. Hence, it is interesting to

speculate how this particular arbuscular mycorrhizal species evolved.

Recently we have finally been able to produce enough inoculum to inoculate plants with these unique arbuscular mycorrhizal fungi and find out how they affect plant growth. Much of this work has been done in collaboration with Dr. Chris Martin of the Department of Botany at Arizona State University. In an initial experiment we compared the growth, photosynthesis and transpiration of lemon trees inoculated with arbuscular mycorrhizal fungi collected from the San Raphael Valley with those inoculated with fungi collected from outside Wickenburg in the Lower Colorado Subdivision of the Sonoran Desert. Plants were exposed to two temperature regimes, one in the near-optimum range with a high temperature around 80° F and the other in the supra-optimum range with a high temperature around 105° F. All plants were well watered.

Growth promotion was greater in plants inoculated with the fungi from the San Raphael Valley, but the physiological responses of the plants differed especially at high temperatures. At these high temperatures, plants inoculated with the fungi from the Sonoran Desert quickly shut their stomates in the afternoon and had decreased rates of photosynthesis. In contrast, plants inoculated with fungi from the San Raphael Valley continued to photosynthesize throughout the afternoon and were observed to be visibly wilting.

We believe that this may be evidence that arbuscular mycorrhizal fungi from the Sonoran Desert aid plants in their adaptations to the extreme heat present in this area. We hope to start an investigation of the mechanisms behind this differential response to heat stress. We are currently conducting experiments on the effect of drought stress on plants inoculated with arbuscular mycorrhizal fungi isolated from xeric and mesic environments and hope to soon be able to conduct experiments on the effect of salt stress on plants inoculated with arbuscular mycorrhizal fungi isolated from saline environments. We have yet to perform the practical experiment of inoculating transplants with 'desert' mycorrhizae which started this research, but hope in the future to have inoculum which may be beneficial for use in revegetation projects and in xeriscapes.

Dr. Jean Stutz, Ph.D, is a professor of plant pathology in the Department of Botany at Arizona State University.

ANNOUNCEMENTS

HIGH ON THE DESERT

HIGH DESERT GARDENING & LANDSCAPING CONFERENCE

February 16 & 17, 1995

The second annual High Desert Gardening and Landscaping Conference will be held Thursday and Friday, February 16 & 17, 1995 at the Ramada Inn in Sierra Vista, Arizona. Optional tours are scheduled for Saturday, February 18. The conference is sponsored by the Master Gardeners from the Cochise County Cooperative Extension office of the University of Arizona.

Everyone with a love of the high desert and the gardening and landscaping problems it presents is encouraged to attend.

For more information or registration form call the University of Arizona Cooperative Extension office, (602) 458-1104, Ext. 141 or write ATTN: Rob Call, 1140 N. Colombo, Sierra Vista, AZ 85635.



"LIFE IN AN ASPEN GROVE"

The Colorado Native Plant Society has announced the availability of "Life in an Aspen Grove", an educational program that explores the varied environment of aspen groves.

Anyone who has ever made the fall trek to the Colorado mountains in search of "aspen gold" knows that this is an aspen rich state.

But how many people know that an aspen grove is richer in species than the meadows it borders? Or that an aspen grove is more varied than the dense, dark spruce forest that may eventually replace it?

This introductory-level program takes a close look at aspen trees, the rich and varied habitat they create, and some of the many species that call the aspen woodlands home for all or part of the yearly cycle. The program includes 80 slides depicting the varied plant and animal life in an aspen grove. A cassette tape (with audible advance signals) contains the spoken narrative. The program is also available as a 27 minute videotape. Accompanying either version is a printed booklet that includes the narrative, an extended text containing additional details and a glossary of terms used in the program.

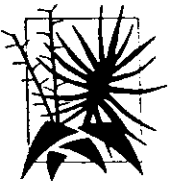
Further information can be obtained from Dr. Miriam Denham, Chair of the Colorado Native Plant Society's Education Committee, at (303) 442-1020.

HYDROPONICS IN THE FUTURE

"Hydroponics in the Future" is the focus of the 16th Annual Hydroponic Society of America conference and trade show. This year's conference will be held at the Holiday Inn Downtown in Tucson on March 23-26.

Workshops will be targeted at both the amateur and professional with "how to's" for the commercial grower, the supplier, the educator, and the home grower. A number of nationally known speakers will discuss current hydroponic technology, including research projects, growing methods, and approaches to product distribution. In addition there will be special taste tests and field trips to hydroponic greenhouses in Wilcox and Biosphere II in Oracle.

For more information contact the Hydroponic Society of America, 2819 Crow Canyon Road, Suite 218, San Ramon, CA 94583, or call Patty Bates (510) 743-9605.



CONSERVATION PAGE

SCS GOES "NATIVE"

The U.S. Soil Conservation Service (SCS) has recently updated its "Plant Materials Long Range Plan (1994-2000)" for vegetative resources in the Sonoran, Mojave and Chihuahuan Deserts. ANPS members should be pleased to know that the plan reflects a greater commitment toward selection and release of native plants, particularly grasses, rather than exotics. This new direction is consistent with both ANPS' revegetation policy and a recently signed Memorandum of Understanding (MOU) concerning native plants adopted by all of the U.S. land management agencies.

The plan calls for development of cultivars using *Atriplex polycarpa*, *Aristida purpurea*, *Bothriochloa ishaemum* and *Hilaria rigida* as cover crops to prevent erosion. *Sporobolus contractus*, *Tridens muticus*, *Sporobolus flexuosus*, *Digitaria californica*, *Bothriochloa barbinodes* and *Setaria leucopila* would be promoted for range seeding projects.

The Tucson Plant Materials Center also plans to publish documents promoting plants for clayey, saline and sodic soils and for idle farmland rehabilitation.

Copies of the long range plan and the inter-agency MOU should be available through your local SCS office or from Bruce Munda at the Tucson Plant Materials Center.

WILD BULB COLLECTION

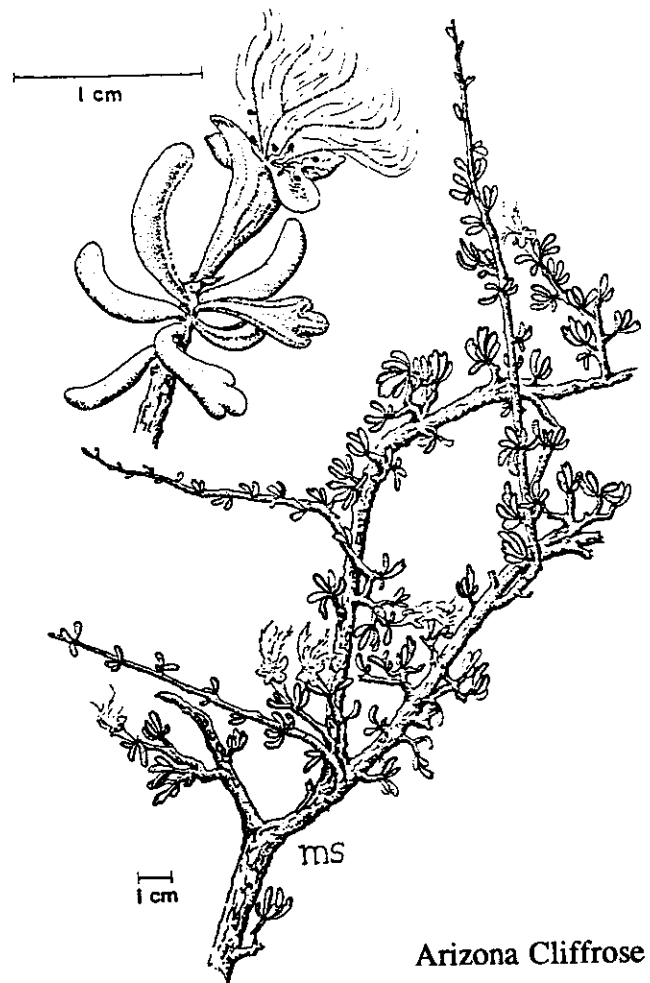
The import into the U.S. of bulbs collected in the wild continues unabated. Despite a treaty protecting three genera - *Cyclamen*, snowdrops (*Galanthus*) and *Sternbergia* - 26% of the imported bulbs (or over 2,000,000 snowdrops, 550,075 *Cyclamen* and 87,215 *Sternbergia*) from 1990-1993 were found to be of wild origin.

Thus far, efforts by the Natural Resources Defense Council and the Garden Club of America to educate the American public about this problem have not been effective.

This is clearly due to the Federal Trade Commission's (FTC) lack of appropriate labelling requirements for dealers in the U.S. A customer who tries to avoid buying wild-dug bulbs doesn't know what he or she is getting because of the lack of information on labels. Labels from some dealers may simply read that the bulbs were grown in the Netherlands.

Until this matter is resolved, it is urged that you avoid buying these bulbs at all as they may well have been collected in the wild.

- Julia Fonseca



Arizona Cliffrose

CHAPTER NEWS & EVENTS

PHOENIX CHAPTER:

Regular meetings are held the 2nd. Monday of each month at 7:30 pm September through May in the Webster Auditorium at the Desert Botanical Garden.

February Events: Meeting -- John Alcock will be the guest speaker. Field Trip -- To Tohono Chul Park, Cactus Growers, and Arizona Sonora Desert Museum in Tucson. Date to be announced.

March Events: Meeting -- Great Deserts of the World Lecture - "The Atacama of Chile", Ted Anderson. Field Trip -- Desert Wildflowers. Date to be announced.

April Events: Meeting -- "New Low Water Use Plant Introductions", Janet Rademacher. Field Trip -- Mountain States Nursery. April 15 from 10:00 am to 2:00 pm.

May Events: Spring Potluck and Field Trip to Rackensack Canyon. Memorial Day Field Trip to be announced.

For more information contact Kent Newland at 8376 Cave Creek Stage, Cave Creek, Az. 85331, (602) 585-3630(H), or Marcia Francis at (602) 992-5435 (H/Ans. Machine).

TUCSON CHAPTER:

Meetings are held on the second Wednesday of the month at 7:30 pm at the Tucson Botanical Gardens.

February Events: Meeting -- "Applied Biologist" Dr. Peter Marshall will offer thought provoking perspectives on ecosystem restoration, based on research and development projects in the United States and Africa.

March Events: Meeting -- Marks Briggs of the Rincon Institute will speak on "Riparian Habitat Restoration in Arizona, Insights, Limitations and Opportunities."

April Events: Meeting -- Ed Glenn, Environmental Research Laboratory, will speak on "Halophytes" (salt-tolerant plants).

May Events: Meeting -- Greg Starr, Starr Nursery, will discuss "Hunting Agaves in Mexico."

SOUTHEAST SUB-CHAPTER:

These meetings are held at 6:30 pm at the Sierra Vista campus of Cochise College, Building P4 (Administration Bldg).

February Events: Meeting -- "Jojoba and Other New Oil Seeds for Arid Regions" will be discussed by Dr. David Palzkill, University of Arizona.

March Events: Meeting -- "Arizona's Big Trees" will be presented by Robert Zahner, State Coordinator for the National Register of Big Trees.

April Events: Meeting -- "Land Condition Trend Analysis Program at Fort Huachuca" will be discussed by the new program coordinator.

May Events: Meeting -- Bob Handy will discuss his local operation under development to grow native and low water use plants for use in the southeast Arizona highlands.

FIELD TRIPS for Tucson & Southeast Sub-chapter:

Feb. 18, 19, 20 - Cabeza Prieta National Wildlife Refuge. Call Nancy or Larry Stallcup at 378-1169 for details. Feb. 25 - Hike into Agua Caliente Canyon with Brenda & Fred Houser. Call John Wiens at 579-0472 for more info.

March 4 - Join Scotty McCarthy for a trip up Javalina Wash in the Saguaro National Park, West. Call Scott at 743-7939 for details. March 10, 11, 12 - Visit the Organ Pipe National Monument with Sue Rutman. Contact Nancy or Larry Stallcup at 378-1169. March 25 - John Wiens will take a "hardy" group into the Picacho Mountains north of Tucson. Call John at 579-0472.

April 8 - Visit Brown Canyon on the Buenos Aires National Wildlife Refuge. Contact Nancy or Larry Stallcup at 378-1169. April 14, 15, 16 - Car-camp in the Sierra Ancha Mountains north of Globe. Nancy or Larry Stallcup have the details at 378-1169.

(More field trips - Page 11)

WELCOME TO NEW MEMBERS

ANPS welcomes the following individuals and organizations as new members. Thank you for becoming a member and, more importantly, thank you for your interest in native plants.

Arizona Gardens (Hereford)
Josette G. Arvey
Joanne Basta
Margaret Baxter
Martha Blue
Jacqueline A. Bogard & Douglas James Bell, Jr.
Patsy L. Borman
Lucy Bradley
Jeanne Brave
Bill V. Brannan
Jim P. Brock
Howard Brownstein
Dennis Caldwell
Mary Caldwell
Michael Chamberland
Mary Jo & Bob Cox
Debra L. Crisp
Cado Daily
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More Field Trips

April 22 - Learn about Boojums from Bob Perrill, owner of Boojums, Unlimited. Bob will provide a tour of his nursery and talk about the natural history of the Boojum. Call Bob at 682-7441 to register and get directions. April 29 - Join Matt Johnson for an all day outing to Happy Valley on the east side of the Rincon Mountains. Call Matt at 749-2547 to register and for carpool information.

May 7 - Gene Joseph will lead an all day trip on the Ruby Road in Santa Cruz County. Call Gene at 628-8773 for more information and to register. May 18-21 - Bill Kendall will be taking people on a long weekend into Hualapai Canyon to the community of Supai. Call Bill at 297-3569 or John Wiens at 579-0472 for all the details. If interested, register as soon as possible because entry to the canyon is limited.

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