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The Challenge of Bio-Pollution

by Randy G. Westbrooks and Robert E. Eplee

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In recent years, there has been a new awareness that certain nonindigenous species (NIS) pose a threat not only to agriculture and human environments, but to natural and managed ecosystems as well. In 1993, motivated in large part by the zebra mussel invasion, the Congressional Office of Technology Assessment (OTA) published a study that examined the issue of NIS and the roles of various federal agencies in addressing it. As a result of the OTA report and recent interactions between federal, state and private agencies, there is a new awareness of the ecological and economic significance of the loss of biodiversity due to this human induced problem.

Development of Biogeographical Realms by the Breakup of Pangaea

In the mid-1800s, Alfred Russel Wallace, a British naturalist and codiscoverer of the chief mechanism of evolution with Charles Darwin, defined six major biogeographical realms that correspond with the continents. Each realm has a distinct assemblage of plants and animals. Current theory holds that these species evolved in ecological and genetic isolation over the past

50-180 million years as the supercontinent Pangaea gradually broke up.

Throughout most of this period of time, oceans acted as barriers to the movement of most species beyond their native ranges. As a result, unique species evolved in balanced ecosystems in each biogeographical realm. Over time, as environments changed, species that could not adapt were replaced through natural selection by others that could adapt. Unlike today, when extinction rates have been greatly accelerated by human activities, the historical turnover of species was probably gradual, and new species were able to replace old ones without any serious detrimental effect on the larger ecosystem. The isolated continents can be viewed as "species pumps" that permitted the evolution of many more species than there would have been on a single large land mass like Pangaea.

Dispersal of Species by Humans

As social changes and technological advances expanded and facilitated human movement, humans intentionally relocated numerous plants and animals. Many plants, animals and fish were domesticated for agricultural purposes, while others were moved for sporting or aesthetic reasons. Along with these deliberately introduced species came a host of unintended species. Human activities, such as transoceanic shipping and the construction of canals, also aided the movement of many species by removing

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Notes from the President

In these, the fading days of my ANPS Presidency, I have been embroiled in a struggle to inject some balance into the process by which our Arizona Department of Transportation (ADOT) arrives at decisions to remove native trees from within the highway right-of-ways placed under ADOT stewardship. Just over two weeks ago, I became aware of ADOT's imminent intent to remove 490 mesquites, palo verdes (both foothills and blues), and ironwoods from within the "clear zone"-- a swath 30' from the edge of the traffic lane to either side of U.S. 60, from roughly milepost 202 to 208 in the vicinity of Gold Canyon--about 8 miles east of Apache Junction. The trees tagged for removal are 4" or more in diameter at 1' above the ground, and were all deemed to constitute a hazard to errant motorists running off the highway.

The debate centers on the degree of balance or mitigation that should exist between safety and environmental considerations in the application of the guidelines on both Federal and State-funded projects. Should consideration be given to the age, beauty and value of the roadside tree? Should a mitigating alternative to tree removal such as barrier installation be considered? Should trees located on slopes from which vehicle recovery is unlikely be removed? What about the accident history of the stretch of highway, whether or not the trees have ever been involved in an accident, etc. etc.?

The above are all matters on which reasonable persons can differ, and for which the public review provisions of the National Environmental Policy Act (NEPA) were put in place. ADOT has had its own Roadside Vegetation Management Program in place since 1988. It calls for the involvement of Vegetation Management Program and Roadside Development personnel prior to large scale removal of trees and large shrubs occurring in the "clear zone". The removal of 490 trees and large shrubs--magnificent, late spring-blooming ironwoods among them--in the area of King's Ranch Road would seem to be a situation calling for careful application of both ADOT internal review provisions, as well as the public comment and

environmental impact assessment provisions of NEPA.

Without going into the convoluted details of this sorry situation, I will just say that in the case of U.S. Hwy. 60 between mp 202 and 208 the above procedures do not seem to have been adequately implemented, and in fact seem to have been treated with contempt by "public servants" acting in an arbitrary and capricious manner to the detriment of the overall public good. It may well be that a large percentage of the plants removed--mere "desert vegetation" in the words of top ADOT spokesperson Robert Johnson--needed to come out. But given the manner in which the environmental oversight process was handled it seems certain to me that a significant number of valuable, beautiful and/or harmless native trees and shrubs were butchered without adequate discussion and debate aimed at uncovering possible mitigating circumstances and/or actions. In my view, the activity along U.S. Hwy. 60 constitutes a classic public policy "train wreck"--a "train wreck" that culminated in chain saws and chippers this week.

I take responsibility for failing to show strong enough leadership over the past two weeks, for naively thinking that this matter could be dealt with in a reasonable manner and without causing undo embarrassment to ADOT. But in a real sense, this debacle, this "train wreck" actually took place back in 1995 when ADOT played fast and loose with its own and NEPA planning and oversight provisions in the interest of tunnel-visioned expediency.

To close on a personal note, it is with mixed feelings that I address you for the last time as ANPS President. Mainly, I am grateful for having been given the opportunity to serve ANPS in this capacity over the past six years. But, I am also sad at having to inevitably have reduced contact with fellow Board members whom I have come to value as colleagues and friends over these years. I would like to express my personal thanks to the many members who have served the Society over the term of my Presidency. I especially wish to acknowledge and thank our "grand old man," Horace Miller of

Tucson, for his dedication, hard work and unflinching good humor. Happily, I will be able to continue to see Horace on a regular basis through our mutual association with the Desert Legume Program of Boyce Thompson Arboretum and the U of A College of Agriculture.

Although at present my successor has not yet materialized, I am confident that fresh, dynamic leadership will come forward to lead our Society on to new and greater heights of public service: **in increasing awareness and appreciation of Arizona's native plants; in working towards protection and restoration of native plants and their habitats; and in promoting the use of low water use landscaping, with emphasis on the use of native plants.**

-Bill Feldman

Editor's Comments

In the age of computers and jet travel, the world seems a much smaller place, a global village where we have access (or at least "virtual" access) to the most remote corners of the world. Discussions on the social

consequences of the global village fill countless pages. But what are the ecological consequences? We know we do not tread lightly on this planet. And when we think of species extinction, we point to rain forest destruction and industrial pollution.

In our feature article, "The Challenge of Bio-Pollution" (reprinted from the *Aquatic Nuisance Species Digest*), authors Westbrooks and Eplee present a more insidious cause for concern-- the very mobility on which we pride ourselves, what creates that global village, could have far greater consequences for species survival and diversity. Read and see what you think.

Know somebody who may want to join ANPS? Please pass along the membership form on page 11. Or you might want to consider a gift membership for a friend. It's a great opportunity to meet new people, learn and get involved.

I think I speak for all ANPS members in thanking Bill Feldman for his leadership, hard work and dedication during his years as ANPS President. We're sorry to see you go, Bill, and wish you well.

-Balbir

Fall Calendar -- Plant Sales and Other Events

Oct. 5-6: Tucson Botanical Gardens Annual Fall Plant Sale. Members only presale on Saturday, 8-10 a.m. Open to public Saturday, 10 a.m.-4 p.m.; Sunday, 12 noon to 4 p.m. 2150 N. Alvernon Way, Tucson.

Oct. 12-13: Desert Survivors Native Plant Sale. Saturday, 8 a.m.-4 p.m.; Sunday 10 a.m.-4 p.m. Members only presale Friday, Oct. 11 at 4 p.m. 1020 W. 22nd St., Tucson.

Oct. 18-20: Desert Botanical Garden Fall Landscape Plant Sale. Presale for members only on Friday, 3-6 p.m. and Saturday, 8-9 a.m. Open to general public Saturday and Sunday, 9 a.m.-6 p.m. Free admission to sales area. 1201 N. Galvin Parkway, Phoenix.

Oct 19-20: Fiesta de los Chiles, at the Tucson Botanical Gardens (also sponsored by Native Seed/Search). Saturday and Sunday, 10 a.m.-5 p.m. Shuttle service available between TBG and El Con Shopping Mall.

Dec. 6-7: Boyce Thompson Southwestern Arboretum's Annual Herb and Houseplant Sale. Open to members only on Friday and to general public on Saturday. Further details available from the arboretum at 520-689-2811. Highway 60 near Superior.

Dec. 5-7: Noches de los Luminarias at the Desert Botanical Gardens. Members only on Thursday the 5th; open to general public on Friday and Saturday. All evenings at 5:30 p.m.

Dec. 7-8: Luminaria Nights at the Tucson Botanical Gardens. For details, call the TBG at 520-326-9686.

Gardening with Natives

Two Sharp Agaves

by Greg Starr

Our two featured plants are agave species that can be difficult to find at nurseries. Both of them are very ornamental and offer a variety of uses. They can be used as container plants, in raised planter beds, or planted in the ground in any xeriscape zone. They are not particular about soil type and are very easy to grow and maintain.

Agave ocahui

Description: *Agave ocahui* is a small to medium sized plant that grows to 2-3 feet high and 3 feet wide. Plants do not offset and form a dense ball of 150-200 leaves. Dark green leaves are 1-1.5 feet long and up to 1 inch wide. The margins are toothless and reddish brown; the terminal point is about 1 inch long and sharp, but relatively weak. Flower spikes are 10-15 feet tall, unbranched and densely crowded with yellow flowers.

Ornamental features: The most ornamental feature about this plant is its dense head of leaves that create a ball-like appearance. The flower spike is also impressive, but that only appears once, then the plant dies.

Culture/Maintenance: *Agave ocahui* is easy to grow. Plants develop the best shape when grown in full sun and given very little water. If overwatered, they tend to grow large and have a more open appearance. They will also grow more open and leggy if planted in any shade. They are soil tolerant and will even grow on almost pure rock. If the soil is enriched, be sure to not overwater or plants will lose their distinctive character. Plants should not be watered by sprinklers, especially in winter. Winter watering should be held to a minimum, preferably no more than once a month. The species is hardy to at least 15° and probably to 10° or lower. Plants have a slow to moderate growth rate depending on amount of water applied.

Identification: *Agave ocahui* is quite distinctive and cannot be confused with any

other agave except maybe *A. pelona*. *Agave pelona* is a little smaller with the slightly curved leaves having a larger, white margin.

Landscape Application: *Agave ocahui* is an excellent plant to use in the transition and outer zones of a xeriscape. Plants can be used either singly or massed, and combine well with groupings of large boulders. They work well with plants that will not overshadow them all the time. Some perennial plants that blend well include *Baileyamultiradiata*, *Hibiscus cardiophyllus*, *Penstemon baccharifolius*, *Penstemon barbatus*, *Penstemon eatoni*, *Siphonoglossa pilosella*, *Zephyranthes citrina* and *Zephyranthes grandiflora*. *Agave ocahui* also looks good when planted near the base of larger accents like *Brahea armata*, *Nolina nelsoni* and *Yucca rigida*.

Agave schidigera 'Durango Delight'TM

Description: *Agave schidigera* is a small or medium sized plant that grows to 2-3 feet across and 2 feet tall. The dark green leaves are 1-1.5 feet long and 1 inch wide at their widest point. The are decorated with white markings and thin white marginal fibers. Plants that are five to ten years old consist of 100-150 leaves which radiate uniformly from the center giving the plants a very symmetrical shape. There are no marginal teeth on the leaves; however, the tip is very sharp and can inflict some damage. The flower stalk is 10-12 feet tall and is densely loaded with dark purple flowers.

Ornamental Features: 'Durango Delight'TM is a very symmetrical plant with straight leaves. Some populations of *Agave schidigera* have slightly curved leaves that detract from the symmetry. The small size, very ornamental leaves and toothless nature combine to make this a very desirable plant for landscaping around houses and small patio areas.

Culture/Maintenance: *Agave schidigera* is tolerant of most soils in southern Arizona. The only requirement is that it have good drainage and not be waterlogged. Plants have a moderate growth rate, responding some to supplemental water during the growing season (spring through early fall). Plants may benefit from fertilizing in spring and the monsoon season. I have grown plants from the 'Durango Delight'™ form for 12 years. Plants have been subject to winter lows of 17° without suffering any damage. The only damage I have seen on any plants was from early morning overhead watering in winter. The water froze and resulted in pockmarks on the leaves. Plants should be drip watered when in the ground. Keep winter watering to a minimum, usually about once a month from November through March. These plants do not seem to be favored by the agave beetle that can devastate other *Agave* species. However, it is still a good idea to apply a preventative treatment in spring and summer.

Identification: 'Durango Delight'™ is easily recognized by its very symmetrical shape, the dark green, swordlike leaves with distinctive white markings and the white marginal fibers. The only agave species that this could be confused with is *Agave filifera*. These two are separated by the nonoffsetting nature of *Agave schidigera* compared to *Agave filifera* which does produce offsets.

Landscape Application: *Agave schidigera* is an excellent plant to use in all zones of a xeriscape. Plants can be used either singly or massed, and combine well with groupings of large boulders. Some perennial plants that blend well include *Baileya multiradiata*, *Daletcapitata* 'Sierra Gold'™, *Hibiscus cardiophyllus*, *Penstemon* species, *Siphonoglossa pilosella*, *Zephyranthes citrina* and *Zephyranthes grandiflora*. *Agave schidigera* also looks good when planted near the base of larger accents like *Brahea armata*, *Nolina matapensis* and *Yucca rigida*.

Greg Starr is owner of Starr Nursery in Tucson, specializing in native and arid-adapted plants.

Symposium

"Flora of the Chihuahuan Desert and Its Many Ecosystems"

October 18-20, 1996

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For more information,
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A Field Guide to the Plants of Arizona

by Anne Orth Epple

Photography by Lewis E. Epple

Falcon Press Publishing Co., Helena,
Montana, 347 pp.

Reviewed by Dean Brennan

As an amateur "botanist," I'm always scouring the bookstores looking for publications that I can use as a reference to gain a broader knowledge of the plants native to Arizona. There seems to be no end to the gardening books that describe what plants we should use in our back yards. Although many of these books are excellent resources for the home gardener and provide a lot of information, they typically include more than just Arizona native plants.

With that rather constant limitation, it was with great joy that I picked up a copy of Anne Epple's book, *A Field Guide to the Plants of Arizona*. Not only does she focus exclusively on Arizona's natives, she does it in a way that is easy to use and understand. After four years of traveling around the state with her husband, Epple was able to include 850 of the more than 3,000 species that are native to Arizona. Amazingly, that represents less than one-third of our native species, but in no way does it detract from the value of this book.

The most difficult task with producing this kind of book (other than driving around the state for four years and photographing 850 different species) may be the organization of information so it can be easily accessed. Since the purpose of the book is to serve as a "field guide," photographs (a total of 853 color plates) are arranged so that they can easily be connected with the proper plant description.

The format is straightforward and simple. First, Epple grouped the photographs of ferns, trees, cacti and the agave family-- plants we generally identify by form rather than by floral characteristics. Ferns are grouped by genera, trees by leaf shape, cacti

by form, and agave by species. This makes it easy to find those unusual plants that are so frequently encountered.

Next, she grouped the plants with conspicuous "regular" flowers into eight groups by flower color-- white, cream or yellow, orange, red, pink to reddish pink, blue to purple, green, and brown. In some instances, the color groups are further divided based on a variety of characteristics including petal type, petal segments, and clustered versus unclustered. At the end of each color group are the plants with "irregular" flowers. Since we typically notice plants when they are in bloom, this approach makes a lot of sense. The final group of photographs are of shrubs, shrublike plants and vines without conspicuous flowers.

Besides including the plant name for each photograph, a handy page reference links the photograph and the information about the plant included in the second portion of the book. That information is grouped by family so the reader can then learn something about the characteristics of that particular plant as well as about other members of the same family. Some of these characteristics include family size, description of flowers and leaves, blooming period, elevation, habitat and general comments. In addition, the comment section typically includes the phonetic spelling of the species name for those of us who find it painful getting through Latin pronunciations. The book concludes with an extensive glossary that further enriches the learning experience.

In the introduction, the author writes that she and her husband worked on this book because they could not find a comprehensive field guide to Arizona plants. Their intention was to create a "compact guide for hikers, campers, rangers, and other amateur botanists who are interested in recognizing, as well as learning more about, Arizona's natives". In my opinion as an amateur botanist, they have succeeded. My only criticism-- the title didn't identify this book as "Volume I!"

ANPS' Latest Booklet a Collaborative Effort

Due to increasing interest in butterfly gardening in our region, ANPS and the Sonoran Arthropod Studies Institute (SASI) in Tucson have jointly produced the booklet, *Desert Butterfly Gardening*.

The full-color booklet follows in the tradition of the other fine publications in the series published by the society.

More than 30 species of plants (most of which are natives) for the butterfly garden are discussed along with the butterfly species they attract. Color plates of both plants and butterflies accompany these descriptions. The booklet also contains information on plant selection, design ideas (along with a sample butterfly garden), the life history of the butterfly, and butterfly families of the Southwest. Plant and butterfly tables at the back of the booklet list characteristics for each species.

An interesting note: a successful butterfly garden contains both larval foodplants and nectar plants. *Desert Butterfly Gardening* shows you how to include both and add an immensely enjoyable element to your garden. This and other booklets in this series are available for \$2.00 from:

Arizona Native Plant Society
P.O. Box 41206
Sun Station
Tucson, AZ 85717

[Other booklets in the series: *Desert Trees*, *Desert Shrubs*, *Desert Ground Covers and Vines*, *Desert Wildflowers*, *Desert Accent Plants* and *Desert Grasses*.]



Desert Landscaping CD-ROM Offers Xeriscape Options to Gardeners

With a housing boom still in full swing in Arizona's largest cities and personal computers in many homes, the Water Resources Research Center (WRRC) in the College of Agriculture at the University of Arizona may have come up with the perfect solution for wisely planning (and planting) all those front and back yards. It's called *Desert Landscaping: Plants for a Water-Scarce Environment*, a multimedia CD-ROM that allows users to select from more than 600 low water-use plants adapted to desert conditions.

More than 1,500 full-screen color photos, including wide shots and close-ups of plants, help make planning a landscape a pleasurable task. A most useful feature on the menu is the "Landscape Browser" where users can view attractive, award-winning landscapes to see how plants are combined. If a particular plant strikes your fancy, you can click it on for identification and then go back to the "Plant List" for a description of the plant. Or choose plants based on size and growth rate, soil and sun requirements, the plants' place of origin, etc. using the "Plant Selector." "Landscaping Tips" provides information on irrigation practices, fertilizing, pruning, weed control and other areas. A fun plant trivia section and an illustrated bibliography are also included.

The computer requirements for this CD-ROM are a 486-based or faster PC with 4mb RAM (8mb recommended) and a 2X CD-ROM. (A Mac version is due later in the year.) *Desert Landscaping* is available at nurseries, botanical gardens and gift shops.

Or contact Gary Woodard, Associate Director at WRRC and project manager for the CD-ROM, at 520-792-9591, or email woodard@ccit.arizona.edu.

natural barriers. Humans became the agents of dispersal in a mass migration of species to distant regions of the world. The movement of these plants, fish, animals, and associated or free-living invertebrates beyond their native ranges represents a significant ecological event in the history of life on Earth. The resulting successes of some immigrant species have been disastrous for many indigenous species.

Ecology of Nonindigenous Species

The ecological and agronomic problems that are caused by NIS are a direct result of plants and animals being taken far beyond their native ranges by humans. With new ecological conditions, such as new types of foods, more benign weather, or the lack of predators and parasites, some immigrant species outcompete or even displace native populations. The near extinction of the American chestnut [*Castaneadentata* (Marshall) Borkh.] due to chestnut blight (*Endothiaparasitica*), a disease introduced into New York in the early 1900's with the Chinese chestnut (*Castanea mollissima*), clearly illustrates the effect that exotic species can have on native species. While the Chinese chestnut had evolved resistance to the blight, the American chestnut had no defenses. An appropriate term to describe immigrant species that threaten agricultural productivity and the biodiversity of natural ecosystems is "biological pollution."

Recreation of Pangaea by International Commerce

Frank Butler, an engineer from Pennsylvania, developed an idea that led to a new ecological perspective on biological invasions. By studying bird populations in different areas of the world, Butler found a relationship between the size of an area and the number of species living in that area. In a groundbreaking article in the *Journal of Ecology* in 1960, Butler used statistical linear regression to show that there are about four times as many total bird species on the isolated continents as there would be on a land mass the size of all the continents combined. Based on the number of birds that now exist on each continent, he estimated that

there would be about 2,300 species if the continents were connected. However, there are more than 8,600 total bird species that presently exist worldwide.

Butler's analysis, as well as the work by Darwin, Wallace and others, first led to the idea of the isolated continents as species pumps. However, we now realize that it also sheds a whole new light on the importance of excluding NIS. Due to the removal of natural barriers by fast intercontinental travel, the continents are becoming reconnected and many species now live far beyond their native ranges.

The Breakdown of Wallace's Realms: Implications and Challenges

Using Butler's theory, we have estimated that it would require a single land mass of about 10 billion km² (4 billion miles²) (75 times the area of the combined habitable continents) to support the present number of birds that exist on the isolated continents. Since the habitable continents have a combined area of only 134 million km² (52 million miles²), the isolation of the continents has contributed to greater species diversity than would have been possible on a single large continent.

It is possible to conclude that continued homogenization of the world's flora and fauna will serve to "reconnect" the continents and adversely affect biodiversity as successful immigrant species replace native species. The potential loss of biodiversity provides a strong argument for regulatory exclusion of all harmful NIS and further validates the need for a strict national policy to require screening of new species before they are imported. A national challenge is to maintain the integrity of biogeographical realms by the exclusion of NIS that threaten the sustainability of natural, managed and agricultural ecosystems.

National Biological Security: A New Challenge

No longer is it enough to say that regulatory agencies will protect American agriculture from invasion by NIS. Ultimately, federal and state regulators must protect the total

biological order from recognized destructive species. One thing is certain, if a more intensive effort is not undertaken shortly to reduce the movement of NIS around the world, life as we know it could take a radical turn. The appearance of AIDS and the development of resistance to most antibiotics by some "old" diseases suggests that humans are still subject to the laws of nature and evolution, despite our technological efforts to circumvent them.

Conclusions

Almost 40 years ago British ecologist Charles Elton predicted that eventually the biological world will become less diverse and everything, everywhere will be much the same. In a biologically destabilized world, surviving native species will be under new stresses that will make them more susceptible to disease and less adaptable to environmental changes. Some scientists believe that disturbed biological communities are more vulnerable to invasion. This could mean that following the first wave of disturbance from invasions successive invasions would be more likely. Eventually communities would become dominated by exotic and cosmopolitan species and much of the world diversity would be lost. To avoid further degeneration of our ecosystems, the general integrity of our biogeographical realms must be maintained. Elton's prediction could come true unless proactive measures are taken to prevent the further homogenization of the world's biota.

We also believe that the significance of chemical pollution will ultimately pale in comparison to the effects that biological pollution are likely to have on our ecosystems if we do not tighten our borders and deal effectively with NIS.

Now is the time for congressional leaders, regulators, the scientific community, commercial importers and the public at large to address one of the most serious environmental issues to arise in decades. It is important for everyone to understand the concept of biological pollution and the implications of homogenizing the world's flora and fauna. Communicating this new perspective and garnering funds to meet the new challenges will be a formidable task in a time of fiscal difficulties. However,

considering the consequences of inaction, we must develop and implement effective, efficient and biologically sound policies and strategies to protect the biodiversity of natural ecosystems, the sustainability of agriculture, and the aesthetics of managed ecosystems.

Randy G. Westbrooks and Robert E. Eplee are weed scientists who have worked with the Weed Science Society of America, The Exotic Pest Plant Council, and federal and state regulatory agencies. They have written and spoken extensively on the threat posed by the homogenization of the world's flora and fauna.

Further Reading

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Conservation Update

Pantano Jungle Revegetation Project

by Julia Fonseca

On August 10-11, 1996, fifty-five volunteers planted and watered approximately 670 seedlings of Giant Sacaton (*Sporobolus wrightii*) in an abandoned agricultural field located within the Cienega Creek Natural Preserve. Other activities included planting 50 cholla cuttings and digging out the sole specimen of an exotic grass (*Arundo donax*). Groups represented at the event include the Audobon Explorers Post, Pima County Adult Probation, Southwest Center for Biodiversity and the Arizona Native Plant Society.

The event was part of a larger project by Pima County Flood Control District, Arizona Game and Fish Department, and U.S. Fish and Wildlife Service to revegetate the "Jungle," an area which comprised part of the largest mesquite woodland in the watershed prior to its clearing in 1974. Goals of the project are to restore native plant communities, improve wildlife habitat and to reduce erosion.

Giant Sacaton is a bushy, perennial grass that was once common along Cienega Creek and the San Pedro River. The Pantano Jungle site is the type locality for the species, described by C.G. Pringle in 1882. Only a few sacaton plants have established in the field since it was cleared and planted with bermuda grass in 1974. Bermuda grass is still the dominant perennial plant at the site.

Sacaton seeds were collected in the preserve by the ANPS in October, 1995. At the collecting site, located approximately one-half mile upstream of Interstate 10 along an ephemeral reach of

Cienega Creek, sacaton grows on terraces with Velvet Mesquite (*Prosopis velutina*), Desert Willow (*Chilopsis linearis*) and Bush Muhly (*Muhlenbergia porteri*).

The sacaton seeds were propagated by Coronado Heights Nursery using funding from U.S. Fish and Wildlife Service. The survival and growth of two seedling sizes, from 4-inch versus 14-inch deep containers, are being monitored by Ron Tiller, a doctoral candidate at Arizona State University.

Additional sacaton seeds will be collected by ANPS volunteers on Sunday, November 3. This field trip will also include a visit to the Jungle site. There, participants will be able to view the sacaton plants and survey eight small plots which were seeded with a commercial native grass-herb mix in November, 1995.

If you would like to participate, please call Julia Fonseca at (520) 740-6350 (day).

ANPS now has a page on the Worldwide Web. Included thus far are membership information and a list of ANPS publications and upcoming events. If you have material you would like to contribute to the page, or if you already have a Web site and would like to link up, contact Dave Sewell (his email address is listed on the page). The Web site can be accessed at <http://www.azstarnet.com/~anps>

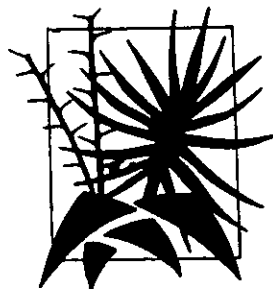
**BECOME A MEMBER OF THE
ARIZONA NATIVE PLANT
SOCIETY**

The Arizona Native Plant Society, a statewide nonprofit organization, was founded in 1976 to foster appreciation for and protection of native plants and their habitats. Learn more about our state's unique flora and become involved in efforts to protect it by becoming a member of ANPS. Or consider giving a membership to a friend.

Membership includes:

- * *The Plant Press*, a newsletter featuring articles about native plants and their habitats, gardening with natives, conservation and more;
- * meetings in communities with local chapters, with stimulating programs and speakers;
- * field trips to places of special interest to members;
- * the opportunity to join in plant and habitat conservation activities;
- * the opportunity to assist in educational projects;
- * annual statewide meeting and workshops (at extra cost).

Membership is open to any interested person, family, business, or group. Annual membership extends from January 1- December 31. New members joining after September 1 of any year will be considered a member through the next calendar year.



**The Arizona
Native Plant
Society**

Membership Application

(Cut out and return this portion with membership dues in the envelope provided.)

Membership classes:

<input type="checkbox"/> Lifetime	\$1,000
<input type="checkbox"/> Patron	\$100
<input type="checkbox"/> Sponsor	\$50
<input type="checkbox"/> Commercial	\$50
<input type="checkbox"/> Institution (includes clubs and societies)	\$25
<input type="checkbox"/> Family and individual	\$15
<input type="checkbox"/> Senior citizen/student	\$10

I am adding a donation of \$____.
(Donations are tax deductible.)

I wish to affiliate with:

- Flagstaff
- Phoenix
- South Central
- Southeastern
- Tucson
- Yuma
- None

Name _____

Address _____

City _____ State _____

Zip _____ Phone _____

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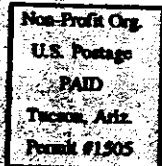
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