

# ARIDUS

The Bulletin of The Desert Legume Program of The Boyce Thompson Southwestern Arboretum and The University of Arizona

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## Twenty Years Later – DELEP at Two Decades

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This summer, DELEP celebrates its 20<sup>th</sup> anniversary. It is difficult to believe that it has been so long ago, in June 1988, when the first seed collections were made from cultivated legumes on the University of Arizona campus. The past twenty years have seen many changes and much progress.

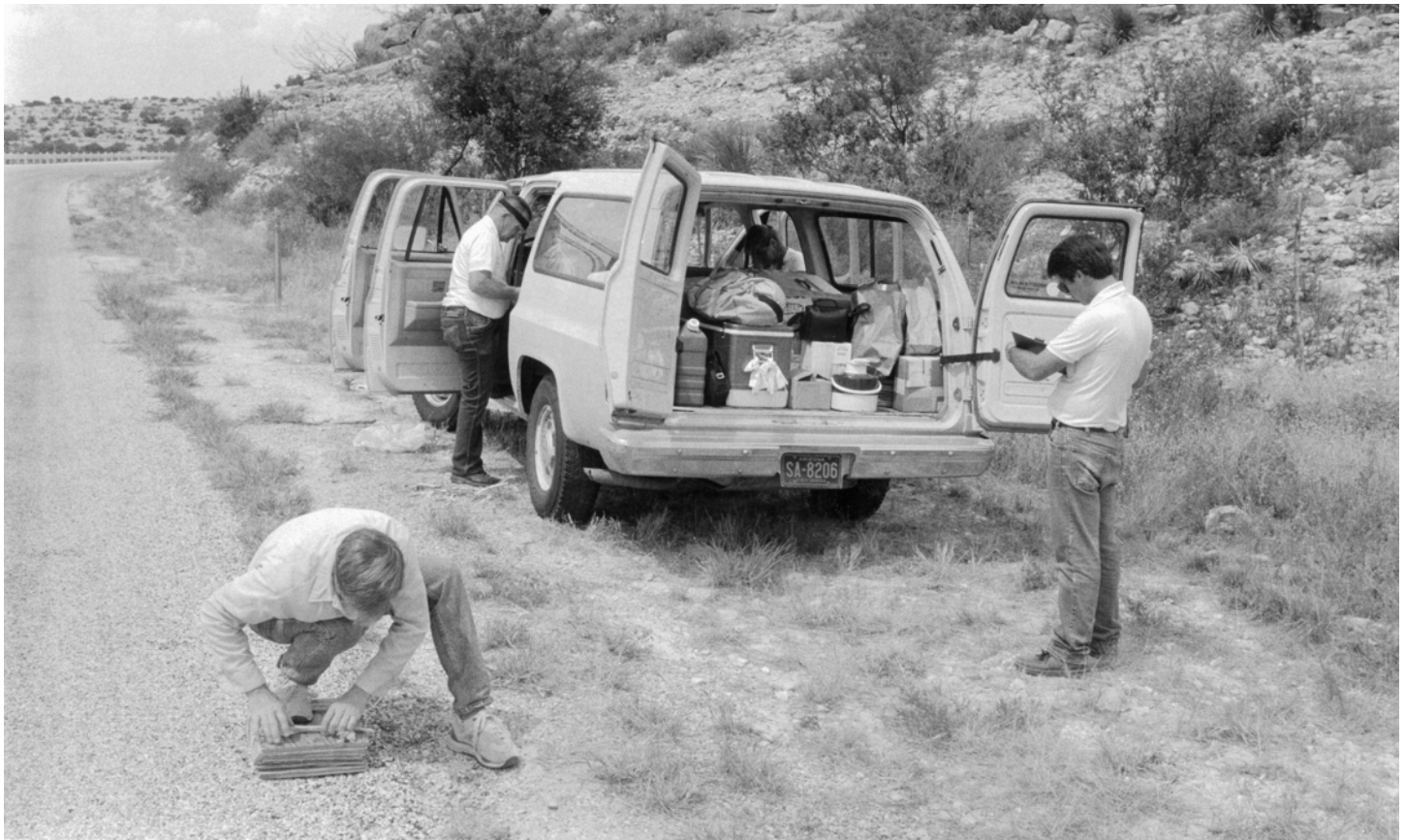
At the heart of DELEP is our seed bank. From humble beginnings, it has grown to a collection of 3480 accessions representing 1350 identified species with a total of 1434 taxa in 219 genera. These seeds have originated from 57 countries on six continents. The seeds are stored in a walk-in freezer and two smaller chest-type freezers. Storing the seeds at 0° F (-18° C) extends viability and eliminates potential pest problems such as seed weevils.

For each accession with a minimum of 200 seeds, a portion is sent to the USDA Agricultural Research Service's National Center for Genetic Resources Preservation (NCGRP), in Fort Collins, Colorado for secure backup storage. This ensures that those accessions will not be lost should something happen to the seeds stored at DELEP's facilities. It would be very difficult and expensive, if not impossible to recreate the DELEP seed collection given the realities of the world today. We are grateful to the USDA for the encouragement and assistance that they have provided over many years. DELEP's Index Seminum is a list of seeds in the seed bank that are available for distribution. It is available through the DELEP website <http://cals.arizona.edu/desertlegumeprogram/> and includes specific information on requesting seeds. The ARS also includes DELEP's seed bank holdings on its Genetic Resources Information Network (GRIN) site and we receive numerous requests each year through GRIN. DELEP has provided seeds to hundreds of recipients around the world. In many cases, we are able to supply seeds that are otherwise unavailable. Some of the many uses for which seeds have been supplied include food

crop research, forage research, seeds to grow plants for fodder for exotic animals, wildlife habitat improvement, soil improvement research, research on salinity tolerance, dryland forestry, research into legumes that can be used as cover crops to provide weed control, research in plant taxonomy, anatomy, morphology, molecular biology, genetics, DNA barcoding, pharmacological research, research to identify phytotoxins, viral indicators studies, starch extraction from seed pods, seeds to grow plants for funerary rites, seed increase for seed banking, weed seed reference collection, archeological seed reference collection, teaching material for university courses, seeds for collections and educational exhibits at botanical gardens and zoological parks, and seeds for commercial nurseries and private horticulturists.

Each seed collection that DELEP obtains is assigned a unique accession number, which is used to track any seeds or plants from that collection. A database contains detailed information on each accession in the seed bank. Accession records include the name of the plant, the collection date, information on the location where it was collected, the name(s) of the collector(s), and other details such as whether a herbarium voucher specimen was made, the quantity of seeds, and storage location. Copies of accession records are provided with any seeds that are sent out from the seed bank. Volunteer Roy Williams has been working on an improved version of our database that will allow greater versatility in generating reports as well as storing digital images and video footage. This represents a major step forward in managing the collection.

Collecting trips in support of the seed bank and other projects have been an integral part of DELEP's activities since the program was established. During the early years of the program, the emphasis was on obtaining seeds of as many taxa as possible. Extensive collections were made from both wild and cultivated legumes. In recent years, we have focused on obtaining collections from multiple populations of species in an effort to sample a significant portion of the genetic diversity present across their ranges. Where possible, seeds are collected from a



DELEP collection trip in Texas, 1990. (SVS)

minimum of 30 individual plants within each population. Collection trips for the Legumes of Arizona project (an effort to produce a publication of the same name) will greatly facilitate our efforts to improve the quality of collections in the seed bank as well as add new taxa. In the past, DELEP has contracted with collectors in other parts of the world to collect seeds. Additional materials have been obtained through exchange with other botanical institutions, donations from private individuals, and purchase from commercial sources. In the past 20 years, DELEP has hosted botanists from the Royal Botanical Gardens, Kew and the USDA, assisting them on trips to collect seeds.

Beginning in 1989, DELEP has maintained field plots where various legumes have been grown. There are currently two fields at the Campus Agricultural Center and an additional field at the West Campus Agricultural Center, in Tucson, and a site at the Yuma Mesa Agricultural Center. Since 1989, nearly 600 taxa of legumes have been planted in these fields to evaluate their performance and adaptability. Numerous plants have failed to survive for various reasons including freezing temperatures, soil conditions, herbivore damage, or senescence, and were replaced with other plants awaiting evaluation. There are currently over 250 taxa of perennial legumes growing in the fields. Data on the performance of these plants has been collected since 1989. A summary of the field evaluations is available on DELEP's website. In addition to evaluating the

performance of legumes in our fields, the plants serve as an important source of seeds for the seed bank. Especially in cases where an original collection has only a small number of seeds, we grow plants to flowering size to increase the number of seeds for distribution and research.

Another important purpose that these plants serve is for biomass collection for various research projects. Hundreds of samples have been collected for biomedical screening and the search for potentially useful industrial compounds. In the early 1990's, DELEP participated in a project that was looking at the aromatic resin from the calyx glands of the desert smoke tree, *Psoralea argophylla*, for possible use as a fragrance in cosmetics and household cleaning products. DELEP collected hundreds of plant samples over a ten year period for Sankyo Company in Japan, for a biomedical screening project. Collections for another pharmaceutical screening project yielded compounds that were extracted from the seed pods of an *Acacia* and are currently being evaluated for possible use in cancer treatment.

DELEP's field plantings serve additional uses. We are now in the fourth year of collecting data on the flowering and fruiting times of all of the legumes growing in our Tucson fields. We will continue to collect this phenology data in coming years. Research carried out by a University of Arizona graduate student examined the roots of mesquite (*Prosopis* species) growing in the fields for

nodulation by *Rhizobium* bacteria. Plants in the fields are evaluated for their landscape potential. DELEP has worked closely with the Arizona landscape nursery industry to introduce attractive trees and shrubs that are adapted to the local climate and have low water requirements. A dozen species have made their way onto the landscape palette in Arizona, either as new introductions by DELEP or little known plants that were promoted following favorable field evaluations. Interest in low water-use legumes hasn't been limited to Arizona. We have provided material for landscape evaluation in other parts of the Southwest and more distant states including Georgia, Florida, and North Carolina where there is an interest in reducing landscape water use. Seeds have also been sent to Africa, Asia, Europe, the Middle East, and Latin America for horticultural and landscape purposes.

DELEP is diligent regarding species that could potentially become ecosystem weeds. The fields are closely monitored for any legumes that may be volunteering from seeds since these irrigated fields are particularly favorable sites for the germination and establishment of plants. Non-native species that show an eagerness to reseed in the fields are not released for landscape evaluation; the volunteer seedlings and in some cases the parent plants are destroyed.

Other projects that DELEP has been involved in included propagating and establishing plants of *Acacia angustissima* for the U.S. Fish and Wildlife Service on

the Buenos Aires National Wildlife Refuge, in southern Arizona. These acacias gradually drop their seeds during the winter months. The refuge was working on reintroducing the endangered Masked Bobwhite Quail, and it was thought that the seeds might provide a food source at a time of the year when insects and other food was scarce.

DELEP has worked with Wallace Desert Gardens since 1989. The Wallace Gardens are an ideal site to plant legumes for further evaluation of their performance in a landscape setting. Mr. and Mrs. H. B. Wallace had a keen interest in legumes and their importance. Support provided by the Wallace Research Foundation has been instrumental in the progress that DELEP has achieved to date. DELEP hosted Fulbright Scholar Dr. Alejandra Vilela, from Argentina, who carried out experiments on germination of North and South American *Prosopis* species.

DELEP has been closely involved with the Boyce Thompson Arboretum, of which it is a part, since the early days of the program. An early project involved growing legumes for the BTA plant sales. Since then, DELEP has grown over 2000 individual plants for the living collections at BTA. Many species were new to the BTA collections. While the majority of the plants were legumes, many other woody plants and succulents have been grown, and we continue to propagate plants for the collections at the Arboretum. DELEP has been instrumental in helping to bring several exhibits to fruition. In the case of the South American exhibit, essentially all of the woody plants except for some of the commercially available species of *Prosopis* were grown by DELEP. The other species were not available from other sources. Matt Johnson has actively participated in collections development through the BTA Collections Committee since the early 1990's, and Matt and Margie Norem serve on the Arboretum's Research Committee.

Four years ago we began a photo-archiving project to record digital images of the plants growing in our fields. Ken Coppola has spearheaded this effort. We extend our sincere appreciation to volunteer Dan Sims who provided a dedicated computer for this project. Dan was our Greenhouse Coordinator for many years. The Legumes of Arizona project came out of the Strategic Planning process initiated by Dr. Mark Bierner. Begun in 2006, this project will produce a major publication entitled *Legumes of Arizona – an Illustrated Reference*, which will include all of the native, naturalized, and commercially grown legumes found in Arizona with descriptions, botanical keys, information on habitat and distribution, and uses and potential uses of these plants. The book will also include distribution maps, illustrations and photographs. This will be a major milestone for DELEP.

DELEP's bulletin, *Aridus*, was initiated by volunteer Dr. Edmund Weber. Ed served as editor for the first three volumes. Volunteers Dr. Steve Stephens and



Dr. Phil Upchurch and Dr. Bill Feldman, 1994. (MBJ)

Phyllis Stephens assumed editorship for three issues of Volume 4. Editorship passed to Matt Johnson who served in this capacity for five years. Dr. Margie Norem assumed the mantle of editor with the last issue of Volume 9, and continues to edit and produce the bulletin now in its 20<sup>th</sup> year. Beginning with Volume 16, *Aridus* may be found online, by going to DELEP's website. An advantage of the online version is that images are in color. Additionally, the website contains information on the program, the Index Seminar, and the field evaluation summary.

DELEP is as much about people as it is about plants, as evidenced in the paragraphs above. Many individuals have been involved with the program over the past 20 years. More than 110 people have volunteered for DELEP since the first volunteer session in January, 1989. Among this distinguished group, five volunteers who were present at the first volunteer session are still active with the program: Clyde Adams, Bill Bearly, Karl May, Dan Sims, and Dr. Edmund Weber. The volunteer program is a great asset to DELEP and brings together people from many walks of life who contribute their time and talents to the program. Monthly seed cleaning sessions at DELEP's headquarters are a great way to get involved. Some volunteers have contributed expertise with computer help, the literature collection, donor relations, plant propagation and care, and field work. Volunteers have participated in seed collecting trips locally and around the Southwest.

The Desert Legume Advisory Board was established in 1994 by then director Dr. R.P. Upchurch. Board members have generously donated their time to provide advice and assistance with activities and efforts to strengthen the program. A total of 40 University of Arizona students have been employed by DELEP on a part-time basis over the years, gaining new experiences and providing much needed help. We are grateful to all of these people for their efforts.

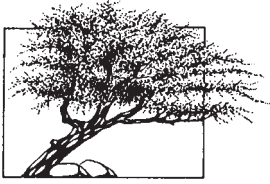
DELEP has been ably led by three outstanding directors. Our founding director, Dr. Robert Phillip Upchurch (1988-1994) turned DELEP from a vision into reality and established the program's direction and primary activities. Dr. William R. Feldman (1994-2005) continued to move DELEP forward, making many improvements and strengthening the ties with the Boyce Thompson Arboretum. Dr. Mark W. Bierner (2005-present) further strengthened ties with BTA and introduced strategic planning to DELEP. Through Dr. Bierner's leadership, we have a series of specific objectives and a timeline for implementing them, with the goal of achieving excellence at the international level and ensuring the long-term continuity of the program.

DELEP's first curator was June Sullivan (1988-1989). June was instrumental in beginning the seed bank and propagation program. Matt Johnson worked with DELEP in 1988 while completing graduate school,

conducting library searches and leading seed collecting trips. He assumed the duties of curator in 1989 and was given the added responsibilities of program manager in 1992. Ken Coppola, DELEP's horticulturist, field and greenhouse manager, and volunteer coordinator, has been with the program since 1989. He performs the essential functions that keep the program operating smoothly. Dr. Margie Norem began working for DELEP in 1990. Her time is divided between editing the journal *Desert Plants* for BTA, and working with DELEP. In addition to *Aridus*, Margie has been the lead person in projects involving the genus *Lupinus* as well as participating in a project with Dr. Ursula Schuch that investigated the phenology of several woody legumes in DELEP's fields over a two year period. Our newest staff member, Kirsten Lake, joined the program in 2007 as managing editor for the Legumes of Arizona project. She has made considerable progress in a short time on this important effort.

We have had several part-time groundskeepers who have provided invaluable help with plant care in our fields and propagation facilities. Theresa Contos, Wayne McGowan, Jena Peterson, Adam Ryan, Rick Spriggs, Jamie Wahl, and Steve Wilcox have all braved summer heat and spiny plants in service to DELEP. Jena and Jamie were previously student employees who continued to work with DELEP for a time following graduation. Administrative support has been provided by Dee Dillhoff, Valerie Hales, Charlotte Brooke, Carol Knowles, Jane Rua, Gina Vance, and Bruce Klewer. Tim Clark, Monica Delisa, Kathy Brewer, and Leandra Lewis have assisted with development activities through BTA and the Friends of the Arboretum office.

The future offers many challenges as well as opportunities. Future funding is a major concern. The DELEP endowment provides some yearly operating expenses and will increase over time. We are grateful for support provided by the UA College of Agriculture and Life Sciences, as well as many individuals and organizations that have provided support over the past 20 years. We are currently seeking new funding opportunities. As we move into our third decade, we reflect on how far DELEP has come from its humble beginnings and remember the many people who have participated with us in various capacities. Perhaps the most important aspects of DELEP's work are the services that we have been able to provide to the world community in preserving and sharing seeds and other plant material of this vitally important group of plants. It is with this foremost in mind, that we look forward to the coming years with the commitment that this is a worthwhile undertaking. Working together, we can achieve a level of excellence for DELEP that will fulfill Dr. Upchurch's original vision for the program and continue to provide valuable service for years to come.



We are in the twentieth year of the Desert Legume Program's existence, continuing a significant period of warm associations amongst our faculty, staff, volunteers, and administrators. We continue our seed collection efforts; preserving, propagating, and sharing the resources we have created with your support, interest, and inspiration. Seeds were first collected by volunteers, with faculty and staff guidance regarding species for inclusion. The composition of our volunteer group and mechanisms for accomplishing our goals have changed as required during these years, but DELEP remains true to the objectives of our Mission Statement [see ARIDUS volume 17, April 2005].

Matt and I have worked together at the core of the program's botanical, horticultural, and technical function since 1989. Dr. Norem began providing key elements to our field and laboratory research during the following year and became the editor of ARIDUS in early 1998. Most recently she has worked to create DELEP's website which includes our Index Seminum and the past five years of ARIDUS. In most years, she and I work together against unknown odds, in effort to increase our *Lupinus* species' seed numbers through field and potted nursery propagation. Thanks to your support, DELEP has been able to grow important legume species for the gardens at Boyce Thompson Arboretum, helping to create greater interest in their potential uses. I hope you will consider visiting Boyce Thompson Arboretum for a first or return visit, especially if you have not been there in a few years! The BTA website will help you plan your

## Staff and Volunteers in Action

day or your event on the BTA grounds ([WWW.arboretum,ag.arizona.edu](http://WWW.arboretum.ag.arizona.edu)). Desert Legume Program links are also accessible from the BTA website.

As these years have passed, our volunteer group has grown and changed. In twenty years, there have been more than 200 volunteer work sessions! A staff of students and groundskeepers has provided a mighty force, especially during the first ten years of DELEP's existence. There are 14 currently active volunteers who were working with us in 1998. Five of those fourteen are "original" volunteers from the 1988 group! These wonderful folks are still active at monthly sessions and in other support aspects. Collectively and solo we continue varied seed collection efforts for preservation, propagation, and eventually sharing the resource we have created with an ever growing environmentally-minded kinship. We have traveled hundreds of miles

around Arizona to maintain our fields and volunteers have been with us on many occasions. Our field specimens have grown from seedlings in "six-paks" through many pot sizes, reaching their current sizes in our four Arizona fields. There, many have attained amazing heights, with some taller than 55 feet, in the Yuma fields. These living nurseries are dually for evaluations and seed production. It is gratifying to be able to provide this variety of seeds and plant material to the scientific community, ensuring the long-term sustainability of desert legumes as an entity as envisioned by R. Philip Upchurch more than twenty years ago. We continue to achieve what we had intended to do, as DELEP changed from a program "concept" to a viable and thriving entity. Your continued interest will allow us to continue this zealous effort. We thank you!



DELEP volunteer session, 1994. (MBJ)

Tentative dates for Fall volunteer sessions are: September 10, October 8, November 12, and December 10. Please send me an email, [kcoppola@ag.arizona.edu](mailto:kcoppola@ag.arizona.edu), or call (520) 318-7047 to learn more. **KC**

Currently active volunteers who have volunteered since DELEP's beginning include:

Clyde Adams  
 Bill Bearly  
 Karl May  
 Dan Sims  
 Ed Weber

The rest of our current volunteer group are:

Bob and Joan Briggs  
 Carol and Maury Clapp  
 Kay and Mike Fagan  
 Jean and George Girard  
 Janet and Charlie Gray  
 Laura Hollander,  
 Bill Kendall,  
 Cesar and Hazel Lee,  
 Carmen and Mat Matsuda  
 Susie May  
 Shari and Ed Montgomery  
 Pia Reynolds  
 Patricia Rorabaugh  
 Marv Smoot  
 Jack and Iola Stroehlein

Past and present volunteers in our Yuma group include:

Gail Culver,  
 Pamela Honaker  
 Glen Branham  
 Terence Donovan  
 Joe Principi

We are saddened at the recent passing of volunteer and former UA College of Agriculture professor T. Curt Tucker. Our condolences to his family and friends.

## **DELEP Personnel**

Mark Bierner, Ph. D.  
 Director

Matthew B. Johnson  
 Botanical Specialist

Ken Coppola  
 Horticulturist

Margaret Norem, Ph.D.  
 Editor Aridus

Kirsten Lake  
 Floristics Coordinator

Bruce Klewer  
 Administrative Assistant

## **Volunteer Coordinators**

Yuma Fields  
 Pamela Honaker

## **Advisory Board**

Michael Chamberland

Elizabeth Davison

David Ellis, Ph.D.

Stephanie Greene, Ph.D.

Leslie Gunatilaka, Ph.D.

Ryan Huxtable, Ph.D.

Michelle McMahon, Ph.D.

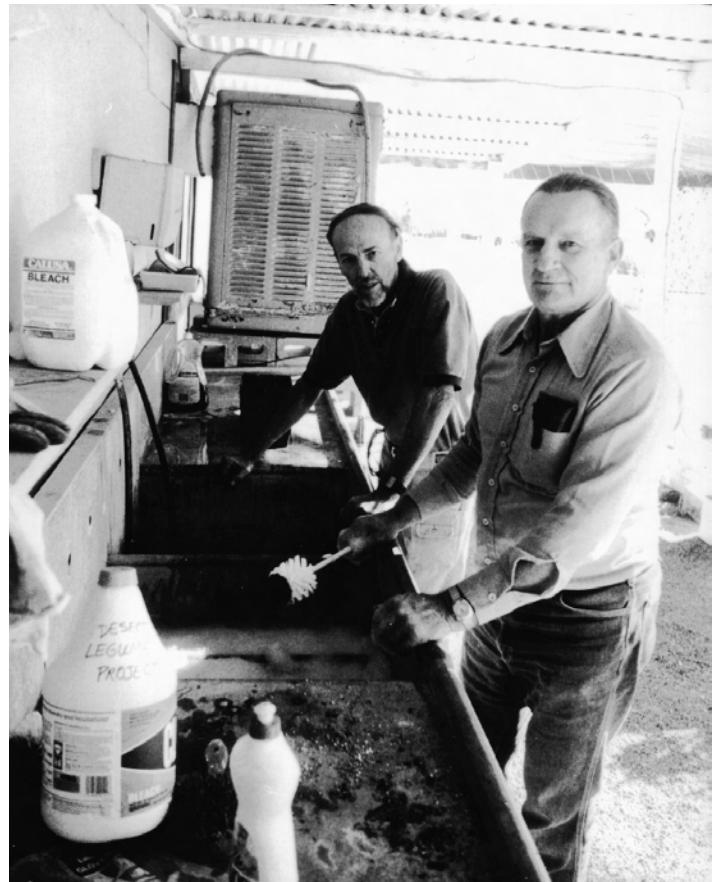
Ken Morrow

Pamela Slate

Raymond Turner, Ph. D.



Keith Taylor and Ken Coppola planting in 1989.



Dan Sims and Bill Bearly volunteering in the greenhouse in 1989.



## Opportunities for Participation

DELEP's bulletin *Aridus*, is published three times annually to stimulate interest in desert legumes, inform our readers of DELEP's activities, and encourage support of DELEP's programs. Manuscripts related to legumes are welcome and should be mailed to the editor for review. Subscriptions are complimentary and are available by contacting the DELEP office. *Aridus* is published by The University of Arizona for The Desert Legume Program.

Financial support for DELEP is provided by private industries, government agencies and individuals through contracts, grants and contributions. Dedicated volunteer work is an integral component of DELEP. Our volunteers have many different backgrounds and work on various projects including wild seed collecting, seed processing, special events and office tasks. Delep volunteers meet once a month.

### To Volunteer:

Call (520) 318-7046

Email: [kcoppola@ag.arizona.edu](mailto:kcoppola@ag.arizona.edu)

### To Contribute:

Call to discuss a pledge, restricted gift or estate planning

Make a check payable to  
DELEP/U of A Foundation

Mail to Desert Legume Program  
2120 E. Allen Road  
Tucson, AZ 85719



DELEP'S board of directors, 1996: Keith Taylor, Warren Jones, Bob Kneebone, Ray Clark, Cindy Salo, Phil Upchurch, Bill Feldman, Allan Dunstan, Ed Weeber, Ryan Huxtable.

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