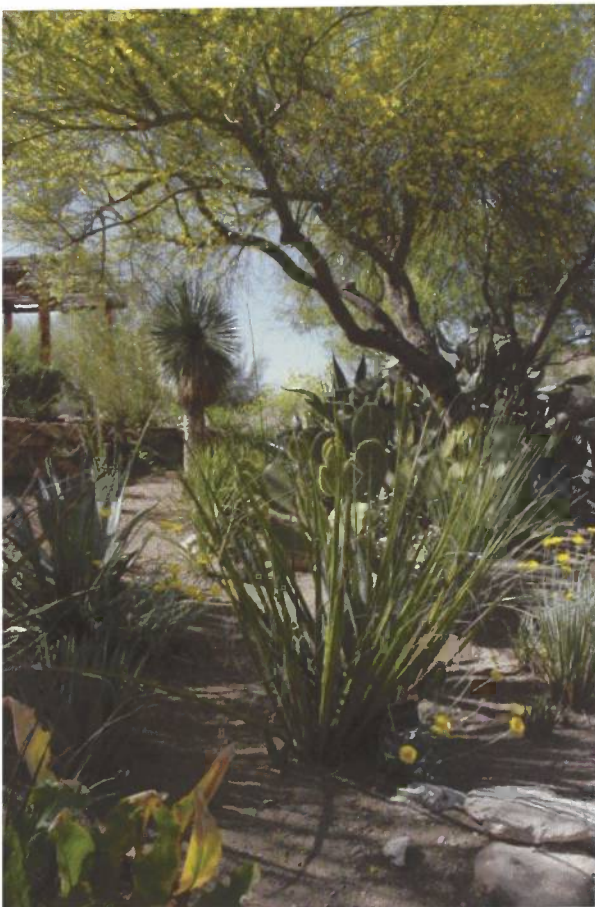


Boyce Thompson Arboretum and the Global Strategy for Plant Conservation

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What would you do if you found out that maybe a third of plant species would be extinct in your lifetime? Assuming your first step might be finding out what plant experts were doing, the following article will bring you up to date and give you some background on current efforts to prevent this from happening. (As well as explain the alphabet soup that is frequently employed when discussing this topic).

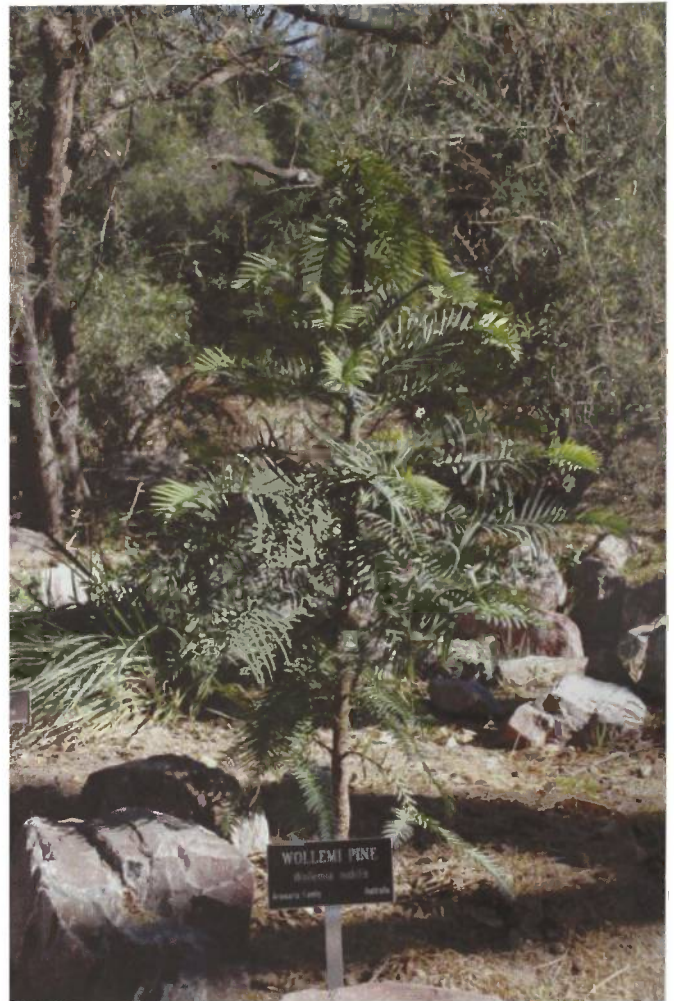


Which plants would you be willing to sacrifice? (M. Siegwarth)

What is Plant Conservation

Simply put, the ultimate aim of plant conservation is to maintain viable growing plant communities in the wild in sufficient numbers to protect the genetic diversity of a species and to allow it to survive. This is often referred to as *in situ* conservation or on site conservation. *Ex situ* conservation or off site conservation has become popular as native habitat disappears. This loss of habitat

frequently changes the number of plants listed as rare, threatened or endangered. As the number of viable communities in the wild decreases, so do the odds of the species surviving. In addition, the loss of native plant communities represents a loss of some genetic diversity as each community, although of the same species, may contain some genetic differences.



Arboreta may soon have more than the 100 Wollemi Pines existing in the wild. (M. Siegwarth)

Many arboreta and botanical gardens have embraced *ex situ* conservation as they are uniquely suited for it. Already, some species currently exist only at these institutions and no longer grow in the wild. *Ex situ* conservation bears with it a heavy responsibility. Seeds must be maintained not only as a backup for the institutions current collection but also to share with other institutions. A grow out plan is required as seeds, even in optimum storage conditions, have a finite life. In other words, as seeds begin to lose their viability, they need to be propagated so that these new plants will yield fresh, viable seeds of their own. For research purposes and documentation, live plants and plant specimens stored in herbariums are also critical to research efforts. Even with a large supply of seed, if propagation, growth information, and data on seed origin is lost, the seeds become essentially useless.

Plant conservation at arboreta and botanical gardens aims to practice *ex situ* conservation until the time is ripe for the restoration of a species through *in situ* conservation.

Why is Plant Conservation Important

I was somewhat hoping that stating “losing up to a third of plant species in our lifetime” is in and of itself, sufficient rationale to embrace plant conservation efforts. However, when people responded that a few less flower varieties is not necessarily cataclysmic, I decided to beef up this section of the article.

Plants supply us with food, shelter, medicines and clothing and it is hard for me to imagine a world without them. However, this does not address the need for diversity nor the fact that “virtually all human food comes directly or indirectly from plants, with just 103 species supplying over 90 percent of the calories we consume” (Raven 1999). This assumes we are willing to embrace a more monotonous diet over time. I personally could not forgo the joys of heirloom tomatoes or the pleasure of comparing the various scents of heritage roses. As history has taught us, the over reliance on just a few species carries great risk. The Irish potato famine in the 1800s is probably the most famous example but the spread of soybean rust in 2004 is probably a better example of why plant conservation is so important. Scientists screened more than 20,000 varieties of soybeans and their relatives looking for genetic resistance to rust that could be bred into this important crop (Scientific Collections 1999). Sadly, as with many things, we will not know what we have lost until it is gone.



The Heritage Rose Garden at Boyce Thompson Arboretum.
(M. Siegwarth)

The Arboretum on its own

Since its founding, Boyce Thompson Arboretum (BTA) has always had a global outlook. At its dedication in 1929, University of Arizona President Dr. Homer Shantz marveled at the opportunity before him. Whereas most horticultural efforts were focused on the mere 12.5 percent of the earth’s surface that was deciduous, BTA would draw on the neglected 50 percent of the earth’s surface that was arid or semi-arid. In fact, he noted that with supplemental irrigation, BTA’s reach would extend beyond 50 percent. Immediately, plants from around the world were gathered at this unique place that could provide a hospitable climate for them to grow and be studied (Desert Plants 2009).

At the time, the mission of BTA was primarily research and education. Recreation, although not explicit in the mission, was a natural part of any visit to the Arboretum. Conservation and the green movement were not yet prominent in the psyche of the 1920s. However, restoring and making land productive after the demise of the mining and timber industries was certainly in the Colonel’s thoughts.

The 1940s reinforced the research focus of the Arboretum as the nation dealt with shortages and disruption of supplies of needed plant material from around the world. The partnership with the University of Arizona in the 1960s further reinforced the research and education focus of the Arboretum. The partnership with Arizona State Parks in the 1970s made explicit the recreational aspect of the Arboretum’s mission.

In 1979, the Master Plan was changed to move the focus of our exhibits from either a type, i.e. cactus garden or use, i.e. economic trees to a geographic, i.e. Chihuahuan Desert. By creating a geographic focus, this allowed BTA to create plantings in a natural setting and in effect, create a natural biotic community where the interplay of plants could function. This change not only reinforced our research and educational opportunities but the recreational aspect of the Arboretum as well. It has become one of the defining characteristics of the Arboretum.

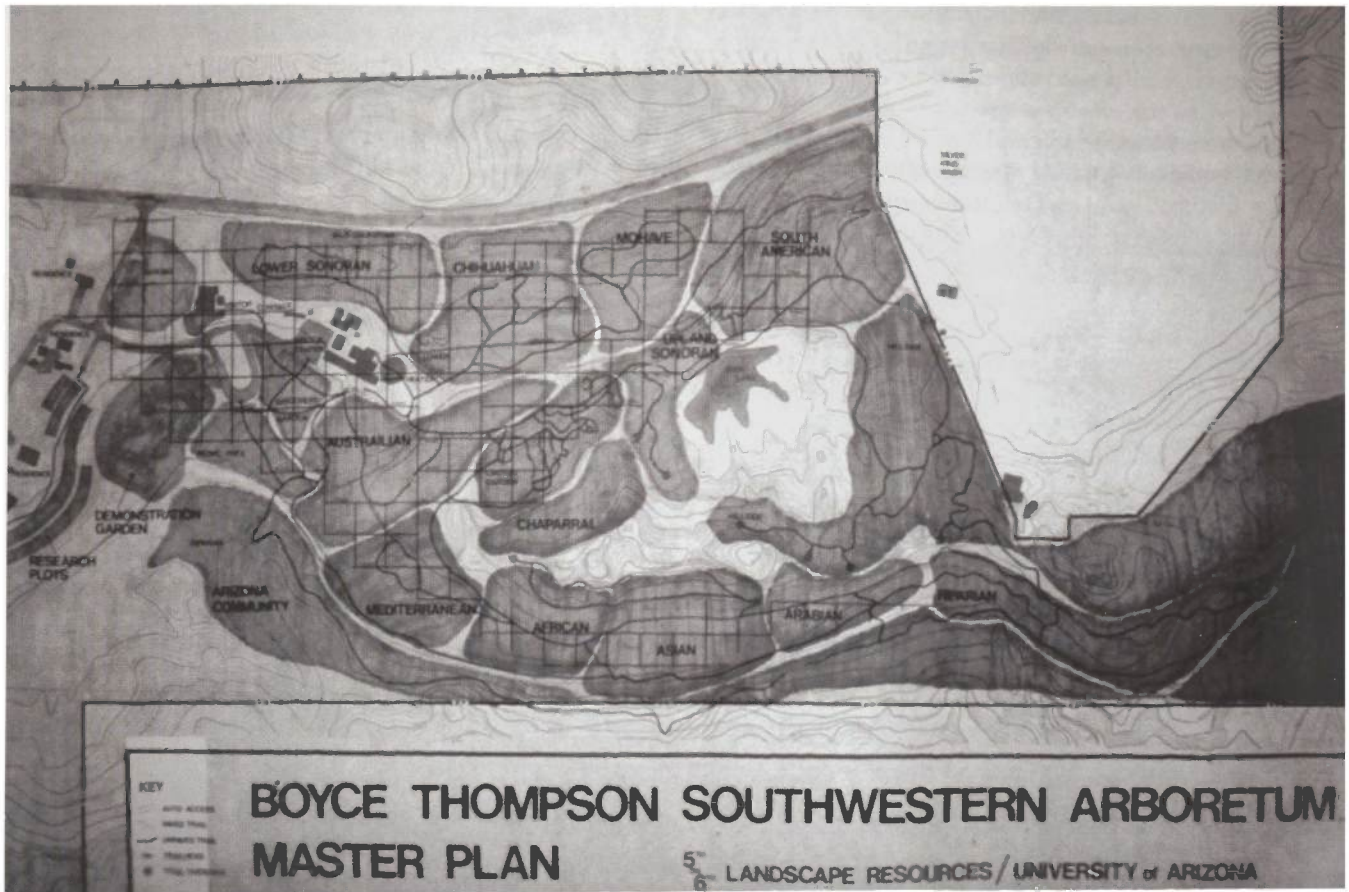


Australian shrubby woodland plant community at Boyce Thompson Arboretum. (M. Siegwarth)

In the late 1990s, the Board added three words to the mission statement. The mission statement became “The purpose of the Boyce Thompson Arboretum is to instill in people an appreciation of plants through the fostering of educational, recreational, research and **conservation** opportunities associated with **the world’s** arid land plants”. These changes made explicit our global focus and the importance of conservation to our mission. In looking at the national and global efforts in this area, we were right there in the forefront.

Beginning of the Global Effort

In 1999, at the XVI International Botanical Congress, in St. Louis, Missouri, Dr. Peter Raven, Director of the Missouri Botanical Garden made a call for action for Plant Conservation. His concern



Boyce Thompson Arboretum master plan (M. Siegwarth)

was as many as 100,000 of the estimated total 300,000 species may be gone or on the way to extinction by the middle of the next century.

The first of the 7 steps he recommended was:

“(1) Establish a new coordinating body, presumably sponsored by the United Nations directly, possibly managed by one of its constituent organizations, to monitor the status of plants throughout the world, detect those in most danger, and take steps to conserve them in nature, in botanical gardens, or in seed banks or preferably a combination of these strategies.”

This was followed up by another call to action by the Gran Canaria Declaration in April 2000. The Gran Canaria Group is an *ad hoc* group drawn from national and international organizations, institutions and other bodies involved in biodiversity conservation. The first meeting of this group ultimately led to the development and adoption of the Global Strategy for Plant Conservation.

In 2002, the Global Strategy for Plant Conservation (GSPC) was unanimously agreed to by all parties to the United Nations Convention on Biological Diversity at the Hague. The GSPC listed 16 targets to be achieved by 2010 in order to significantly reduce the loss of plant biodiversity. Grouped into five categories, some of these 16 targets are beyond the reach of Boyce Thompson Arboretum and would lead to an advocacy role in areas that many might find uncomfortable. The following broad categories currently fit squarely in the mission of BTA:

- (1) Understanding and documenting plant diversity
- (2) Conserving plant diversity
- (3) Using plant diversity sustainably
- (4) Promoting education and awareness about plant diversity
- (5) Building capacity for the conservation of plant diversity

Within these categories is Target 8. The goal of Target 8 is to have 60 percent of threatened plant species in accessible *ex situ* collections, preferably in the country of origin, and 10 percent of the plant species included in recovery and restoration programs.

In 2010, it was realized that even though arboreta and botanical gardens in North America were making significant strides individually, there was no data collectively on the progress in meeting Target 8. Botanic Gardens Conservation International (BGCI) is a facilitating agency for the Global Implementation of Target 8. BGCI – USA, The United States Botanical Garden and the Arnold Arboretum at Harvard University conducted the first ever assessments of which threatened North American species were actually held *ex situ*. Boyce Thompson Arboretum and its Desert Legume Program participated in this assessment, listing both their living and germplasm (or seed) collections.

Also, in 2010, at the 10th Conference of the Parties to the Convention on Biological Diversity in Japan, it was agreed to revise the GSPC and its targets for work through 2020. Specifically Target 8 was increased to 75 percent of the worlds threatened species would be in *ex situ* collection. The above documents are available at <http://www.bgci.org/ourwork/policytools/>.

The Efforts of the United States within this framework

Even though the United State is not a party to the Center for Biological Diversity, many U.S organizations still work within its convention, especially if they are working with the global community. Although there are many conservation based groups in the United States, the Plant Conservation Alliance (PCA), the North American Plant Conservation Consortium (NAPCC) and the Center for Plant Conservation (CPC) are worth singling out in relationship to BTA.

The PCA, founded in 1994 as the Native Plant Conservation Initiative, is a consortium of ten federal government Member agencies and over 270 non-federal Cooperators representing various disciplines within the conservation field. PCA Members and Cooperators work collectively to solve the problems of native plant extinction and native habitat restoration, ensuring the preservation of our ecosystem.

PCA embodies the axiom "think globally, act locally." Federal plant conservation resources are pooled at the national level to provide a focused, strategic approach to plant conservation at the local level on public and private lands, eliminating duplication of effort and increasing the effectiveness of these programs. Each year, PCA awards thousands of dollars for on-the-ground conservation and restoration projects through a matching funds grant program administered by the National Fish and Wildlife Foundation.

The PCS came up with a national framework for plant conservation in 1995, which is similar in many ways to the GSPC. To read this framework, go to <http://www.nps.gov/plants/strategy.htm>.

In the early 1990s, the American Public Gardens established the North American Plant Collections Consortium (NAPCC). The NAPCC is a network of botanical gardens and arboreta working to coordinate a continent-wide approach to plant germplasm preservation, and to promote high standards of plant collections management. NAPCC Collections may serve as reference collections for plant identification and cultivar registration. Collection holders make germplasm available for taxonomic studies, evaluation, breeding, and other research. Participating institutions compare holdings with others to identify duplications and gaps. This makes efficient use of available resources, strengthening collections through combined collaborative activities. (<http://www.publicgardens.org/>) The NAPCC collections can be either single site, one institution or multi-site, several institutions joining together to conserve a particular genus.

Another U.S. organization is the Center for Plant Conservation (CPC). The CPC is dedicated solely to preventing the extinction of U.S. native plants. The Center was one of the first organizations created to meet this need. The Center is a network of 36 leading botanic institutions. Founded in 1984, the Center operates the only coordinated national program of off-site (*ex situ*) conservation of rare plant material. This conservation collection ensures that material is available for restoration and recovery efforts for these species. CPC also works in research, restoration, technical assistance, education and advocacy through the efforts of the network and the national office.

The cooperative CPC network maintains the National Collection of Endangered Plants. Believed to be the largest living collection of rare plants in the world, the collection contains more than 700 of

America's most imperiled native plants. Live plant material is collected from nature under controlled conditions and then carefully maintained as seed, rooted cuttings or mature plants. Network institutions conduct horticultural research and carefully monitor these materials so that imperiled plants can be grown and returned to natural habitats. Several CPC institutions are also involved in restoration projects in the field (*in situ*). Scientists are stabilizing current populations of imperiled plants and reintroducing new populations in appropriate habitats. (CPC website <http://www.centerforplantconservation.org/About/Mission/Mission.asp>)

Boyce Thompson Arboretum Current Efforts

With over 3,200 species at the Arboretum and another 1,356 maintained by the Desert Legume Program, BTA continues to be part of the global conservation effort. Not only are DELEP seed backed up at the National Center for Plant Genetic Resources in Fort Collins and the Global Seed Vault in Svalbard Norway, its holdings are also listed on the national Germplasm Resources Information Network (GRIN) and the BGC Plant Database, so that researchers worldwide can have access to their holdings. In the last two years, DELEP has honored over 100 seeds requests to 21 states and 21 foreign countries. With our new listings in the BGC database and resultant publicity on our program, we expect these numbers to grow.



Svalbard Global Seed Vault (M. Norem)

Simply put, maintaining a seed bank, which includes growing them out occasionally to replenish the seed, maintaining a live plant collection for researchers and others, providing specimens for herbaria and maintaining detailed records on the plants and techniques of propagation is already quite an effort that few visitors ever see. Add to that, recovery and restoration projects, and you can see why the staff at BTA and DELEP are already pretty busy. However, there is so much more to do.

Even though this is a global effort and BTA has much to offer globally, there is much to be done right here in our backyard. BTA has been working with the Arizona Department of Transportation and the U.S. Forest Service on recovering and studying the propagation and transplant of the endangered *Echinocereus triglochidiatus* var. *arizonacus* or Arizona Hedgehog Cactus. With this partnership, BTA also hopes to be involved in several restoration projects as well.

Although DELEP's collection is considered a treasure, DELEP still needs 188 species to complete its collection of the approximately 370 legumes species in Arizona. The USDA's plant database lists 22 legumes for Arizona in their threatened and endangered list, of which four have federal threatened or endangered status. DELEP has some holdings of threatened/endangered species but not all. DELEP is hoping to acquire 90 new Arizona species over the next year if sufficient funding becomes available to conduct seed gathering efforts. If successful, working with BTA to maintain a live plant collection and a seed grow out plan will be required.



Arizona hedgehog cactus (M. Siegwarth)

BTA is considering applying for membership in the NAPCC both as a single site for Fabaceae (legumes) and as part of the multi-site *Quercus* (oak) group. DELEP already has a unique collection and may be appropriate for entry. The multi-site *Quercus* group has 13 members but none in the Southwest. BTA has been busy expanding its oak collection with plants that have been grown from wild seed and has the requisite collection data.

BTA will be joining the PCA so that it may apply for grants related to our efforts to conserve and restore native plants to the wild. With the help of the CPC, BTA will improve its handling of the rare, threatened and endangered species it has or may acquire over the next few years.

Conclusion and Next Steps

I hope I have established that there is much going on at the state, national and global level and that BTA is part of that. There is also a great deal that still needs to be done. If BTA is to continue to be part of the solution, collaboration with the PCA, NAPCC and CPC will be critical. Just as critical is our ability to perform such work.

Other institutions have offered us seed because of our unique location and mission. But the acceptance of this seed comes with great responsibility, as I stated at the beginning of this article. BTA needs to upgrade its seed storage, propagation and greenhouse facilities, as well as its collection data management tools. I hope you can help us meet these needs through our annual Research, Collection and Education appeal, as well as a future capital campaign to meet the challenges ahead.

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Jeff Payne gathering seed for the Desert Legume Program. (M. Johnson)



Which plants would you be willing to sacrifice? (M. Siegwarth)