Bok Tower Gardens has been a well-known tourist destination in Florida for nearly 60 years. Perhaps less well known is the Garden’s history of conservation commitment and the recent program to bring Florida’s rare and endangered plants into cultivation.

By combining its conservation mission with its horticultural experience, the Gardens has begun to propagate those species most seriously at risk in an effort to save them from extinction.

Edward Bok, who built the Gardens in the 1920s, made his fortune as a writer and publisher of The Ladies Home Journal. A hard-working Dutch immigrant and a man of many interests, Bok saw the beauty of Florida’s natural areas and sought to preserve them.

In his autobiography, Bok tells of his efforts to save the Great Egret, then being shot into extinction for its feathers. Aghast at the fashionable woman’s need to wear the aigrette feather in her hat, Bok began a campaign of public education in his magazine. Even the compelling — if sentimental — argument that birds were being killed in their breeding plumage, leaving their young to die in the nest, could not move the women of America. Abandoning his appeal to the “mother instinct”, Bok fought for legislation to protect the birds by prohibiting the sale of their feathers — one of the first animal conservation issues in this country.

Bok commissioned the firm of Frederick Law Olmsted to design the Gardens on land near his winter home in Mountain Lake. Later he planned the 205-foot marble carillon tower to add music to the beauty of the trees and flowers. President Coolidge dedicated the Bok Tower Gardens in 1929 and presented it to the American people for visitation.

The Gardens was conceived as a sanctuary in the broadest sense of the word — a place where animals and plants would be safe from harm, and where human visitors would gain a spiritual repose in the peace and serenity of the garden setting. Through the years, the Gardens has served as a 130-acre wildlife reserve visited by over 200,000 people a year.

Three years ago, in the tradition of the founder, the Board of Directors of the Bok Tower Gardens Foundation made a long-term commitment to the rare and endangered plants of Florida, beginning an exciting new chapter in Florida’s conservation history.

The Early Origins

The story really begins deep in Florida’s geological past. Because of the state’s unique geography, many plant species have evolved here that grow nowhere else. As sea levels rose and inundated much of the state during the Pleistocene interglacial periods, the ridge down the center of the peninsula remained above water as a series of islands. Isolated populations on the islands evolved, rapidly becoming new localized species. This land form — the Lake Wales Ridge — is clearly evident today as an area of high ground running through Polk and Highlands counties.

Bok Tower Gardens was built atop
the highest point of the ridge, 295 feet above sea level. From the vantage point of the Gardens, one can still see through the tops of relic longleaf pines to the flat plain below, once the floor of an ancient sea. And, fittingly, there are two naturally-occurring rare plant populations in the Pine Ridge Reserve area of the Gardens: the dwarfed and wizened scrub plum, Prunus geniculata, and the delicate, lacy-flowered Warea amplexifolia.

Other groups of rare species have evolved on the high ground of the Brooksville Ridge and along old shore lines of the Atlantic coast. The upper Apalachicola River valley is home to another group of rare temperate species including the Florida torreya (Torreya taxifolia), the Florida yew (Taxus floridana), and the odd monocot with flower parts in fours, Croomia pauciflora. These are thought to be relics of a much cooler climate when glaciers extended far to the south on the American continent.

The Problem Today

Florida is in a botanical transition zone combining both tropical and temperate species. About 10% of the plants here are found only in Florida and nowhere else. This high rate of endemism compares to about 2% for other states in the eastern United States. More than 300 plant species are of conservation concern out of a total flora of about 1200 species. This 25% of the state's flora-at-risk compares to a national average of about 10% (data from the Center for Plant Conservation).

In an undisturbed environment, rare species may survive quite well over long periods of time in relatively low numbers. Now, however, tremendous development pressures threaten to bring the rarest species to the edge of extinction. Fortunately, many areas are being set aside in ongoing land acquisition programs.

But for many of Florida's rarest plants, that strategy won't work. Their natural ranges — never large to begin with — have been reduced to populations on one- or two-acre sites, residential lots in a subdivision, or just a few forlorn individuals along a fence row on the edge of a highway. These sites are expensive to acquire and too small to manage effectively.

Ex situ Preservation

Bok Tower Gardens has undertaken a program of propagating documented collections of these rare species to preserve their unique genes apart from their natural habitats. This ex situ strategy is similar to the work done by zoos to preserve endangered animals. While not an end in itself, ex situ conservation provides a safety net for the species until naturally-occurring populations can be protected or until new populations can be established on secure sites. And by working closely with the plants, researchers can carefully document their sometimes exacting habitat preferences and growing requirements.

Bok Tower Gardens is one of 19 botanical gardens affiliated with the Center for Plant Conservation, a national organization based in Massachusetts. The Center, begun just four years ago, has as its mission the development of a national collection of rare and endangered plants grown in regional botanical gardens throughout the United States. Bok Tower Gardens' mandate covers central and north Florida and the northern Gulf coast. Fairchild Tropical Garden cares for the tropical species of south Florida and Puerto Rico.

Bok Tower Gardens is in a unique position to undertake this work. With its horticultural facilities, Center for Plant Conservation affiliation, and a long-term institutional commitment, the Gardens can sustain the years of research and curation the project will require.

How the program operates

The Center for Plant Conservation provides the participating gardens in each region with a list of the rare plant species considered most seriously at risk. This is a compilation of data from The Nature Conservancy, other conservation groups, and the U.S. Fish & Wildlife Service, and includes the species designated as threatened or endangered on both the federal and Florida lists. Each year, six to ten of these species are selected for addition to the Gardens' collection.

Using information provided by the U.S. Fish & Wildlife Service and the Natural Areas Inventory, the plants are located in the wild, and detailed legal descriptions and ownership information are obtained from the county courthouse. Land owner permission and all necessary state and federal permits are obtained before collecting begins. This paperwork is time-consuming and expensive but it takes only a little experience to understand the necessity of the regulations and the need for all the agencies and individuals involved to cooperate and coordinate their efforts. Population numbers have dropped so low in some cases that collecting pressure must be carefully monitored and legal restrictions scrupulously observed.

The Gardens takes only seeds or cuttings in numbers intended to have as little impact as possible on the natural populations. Whole plants are not dug up — probably an obvious point, but still an important one to emphasize. Most rare plant species in Florida — especially those in sandy soils — cannot be successfully transplanted.

Happily, most of the species in the collection have responded to standard horticultural techniques and can be readily propagated from seeds or cuttings. These vigorous species are threatened most by habitat destruction. A few species require special attention,
and their endangered status is made worse by their naturally low viability and exacting requirements.

When possible, seeds or cuttings are collected from at least 50 wild individuals to obtain a natural range of genetic variation within the population. However, plants of one population are not mixed with plants from another part of that species' range. Each group of cuttings or seeds is assigned a number indicating the date and site of collection, and the clone in the case of cuttings. The accession number documenting its origin stays with each plant throughout its life in the collection.

The 24 species in the collection so far include:

- Asimina tetramera
- Bonamia grandiflora
- Calamintha ashei
- Calamintha dentata
- Chionanthus pygmaeus
- Chrysopsis floridana
- Conradina breviflora
- Conradina glabra
- Conradina grandiflora
- Dicerandra comutissima
- Dicerandra frutescens
- Dicerandra immaculata
- Eryngium cuneifolium
- Hypericum cumulico/a
- Justicia cooleyi
- Liatris chingereae
- Liatris provincialis
- Lupinus aridorum
- Nolina brittoniana
- Polygonella basiramina
- Polygonella macrophylla
- Prunus genculata
- Warea amplexifolia
- Warea cartari.

**ENDANGERED PLANT CONFERENCE**

Recently Bok Tower Gardens hosted a conference of plant conservationists to explore rare plant management techniques and points of view. Several FNPS members were in attendance and addressed the conference, including President Dick Wunderlin and Science Committee Chair Jack Stout. There was a consensus on the critical need to preserve rare plants as a part of Florida's diverse biological heritage.

The following resolutions and recommendations were endorsed by the conference participants:

1. ...that the State of Florida vigorously defend rare plant populations through land acquisition and management, growth management, information gathering, and strengthening and enforcement of plant protection laws.

2. ...that preservation of existing wild populations of rare plants in their natural habitat *in situ* is the first priority.

3. ...that off-site conservation collections be established for rare species, as a complement to *in situ* preservation.

4. ...that the United States Fish & Wildlife Service establish a Florida plant recovery team.

One solution to the long-term preservation of these rare species is the establishment of new populations in the wild on secure sites where they were not known to have grown before. This may be particularly important for those species which are not on protected land. The long-term scientific implications of plant introductions of these rare species. The Gardens' first efforts have been tentative and experimental, mostly successful, with growing techniques evolving with experience.

**Techniques**

The plants are ordinarily grown in a commercial soil-less mix (Metro Mix 500) amended with Perlite for a clean, fast-draining medium. Seeds are sown in trays, then the seedlings are pricked into commercial cell-paks.

Seedlings of dry land species often have large root systems — much larger than the tiny tops would suggest — and require a 4" pot of their own. Cuttings are dipped in Rootone F hormone powder, struck directly in a 4" pot to avoid transplanting later on, and placed under intermittent mist until rooted.

The nutritional needs and natural soil symbionts of scrub plants are not well understood. Under nursery conditions, nutritional problems show up early in young plants, possibly brought on by

- Susan R. Wallace

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**Chionanthus pygmaeus**

Most of these, with the exception of the *Justicia*, are scrub or sandhill species. A few (*Liatris*, *Prunus*, and *Chionanthus*) have close relatives that are grown commercially, but essentially very little work has been done on the life histories or cultural requirements of...
the very high pH irrigation water. Seedlings and rooted cuttings are fertilized sparingly with Peter's 21-7-7 Acid Special.

Phytophthora root rot has been a serious problem with some species when high summer temperatures require frequent watering. The fungus appears to strike quickly—an apparently healthy plant suddenly turns an off color and dies within a day or two. Preventative fungicide treatments have been only moderately successful. This “sudden death syndrome” has been observed in the field although the cause is not known.

The current strategy is to get the young plants in the permanent growing beds as soon as possible so root systems can develop beyond the confines of the pot and the plants can be weaned away from the high irrigation regime of the nursery.

The growing beds, each 10 feet by 25 feet, have been lined out in blocks of 20 with wooden edging and pac-cloth pathways to suppress weeds. An irrigation system provides water to young plants or in times of extreme drought. The beds—140 of them are planned—cover a three and a half acre site away from the public areas devoted entirely to the endangered plant program. Here the rare plants grow to maturity on a protected site under conditions as close to natural as practical. The beds are lightly mulched and carefully hand weeded, giving each plant a chance to grow without competition. The site was originally a yellow sand, longleaf pine/turkey oak sandhill community. Original trees on the site were left standing at random in the beds. The area is appropriately open and sunny and—the volunteers who do the weeding can attest to this—very hot in summer.

Over time, all the plants in the collection will need to be replicated, the short-lived perennial species perhaps as often as every two years. Whenever possible the plants will be propagated vegetatively, by cuttings or division, to preserve the clone and prevent genetic drift. This is particularly important when closely related species—out of their normal ranges—have been planted in close proximity in the collection. For instance, some of the seedlings produced by the three perennial Dicerandra species in the collection are very possibly hybrids, since the bloom times overlapped and the pollinating bees flew from one bed to another. These seedlings, though of some horticultural interest, will be discarded and the parent plants replicated from cuttings. These techniques are intended to keep the rare plant collection as carefully documented and genetically pure as possible.

The endangered plant collection will be made available in the future for research and education and as a reservoir of genetic material for plant introduction projects. Many species may turn out to have landscape value as well. As the cultural requirements become better understood and the plants can be produced commercially, many of the dry land native species will be ideal plant materials when water use is restricted—a day that is surely coming.