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# Palmetto



Rare Plant Conservation at Bok Tower Gardens ● Yaupon Redeemed ● The Origin of Florida Scrub Plant Diversity

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# A Collaboration of Passion, Purpose and Science

## Bok Tower Gardens Rare Plant Conservation Program

“Today nearly 30 percent of the native flora in the United States is considered to be of conservation concern. Without human intervention, many of these plants may be gone within our lifetime. Eighty percent of the at-risk species are closely related to plants with economic value somewhere in the world, and more than 50 percent are related to crop species...but it can be saved.”

– Center for Plant Conservation

Ask the average Florida citizen to name at least one endangered native animal in the state and they will likely mention the Florida manatee or the Florida panther. Ask the same person to name one endangered native plant and they give you a blank stare. Those of us working to conserve Florida’s unique plant species know this all too well, and if the job isn’t difficult enough, a lack of funding and support for the conservation of land supporting imperiled plant communities makes it harder.

Bok Tower Gardens Rare Plant Conservation Program is one of 39 botanical institutions throughout the United States that collaborate with the Center for Plant Conservation (CPC) to prevent the extinction of native plants in the United States. Created in 1984, CPC institutions house over 750 living specimens of the nation’s most endangered native plants, the largest living collection of rare plants in the world. According to the CPC, five percent of all native flora is on or qualifies for the federal endangered species list, and Florida is the No. 3 hotspot for critically imperiled plant diversity (CPC, n.d.). Of the 64 rare Central and North Florida plants under curation at the Bok Tower Gardens Rare Plant Conservation Program, 29 are federally-listed and 35 are state-listed as endangered or threatened native flora (Bok Tower Gardens n.d.). Like endangered animals, native plants are threatened by increased development, fire suppression in fire-adapted communities, habitat destruction and invasive

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**Photos:** 1. Bok Tower 2. *Ziziphus celata* 3. *Bonamia grandiflora* 4. Juliet Rynear in the greenhouse 5. Rare Plant Conservation Program National Collection Beds at Bok Tower Garden 6. Monitoring *Warea amplexifolia* 7. Imperiled scrub plant rescue 8. *Clitoria fragrans* 9. *Conradina etonia* 10. *Conradina glabra* 11. *Dicerandra frutescens* 12. *Chrysopsis floridana*. Photos 1, 2, 3, 5, 10, 12 – Donna Bollenbach; 4, 8, 9, 11 – Joel Jackson; 6, 7 – Juliet Rynear.



species. However, more legal protections exist for endangered animals because they are considered public property, whereas plants are considered private property. Except for commercial purposes, private landowners can remove or destroy rare plant populations on their property without a permit. This lack of protection for plants is rooted in British Common Law, which was adopted by the American legal system. Under Common Law, animals belong to the government, but plants belong to the landowner, so private landowners can destroy protected plants with impunity and the government cannot intervene.

CPC institutions, such as Bok Tower Gardens Rare Plant Conservation Program work to overcome this inequity. Native plants, defined by the CPC as those that have been growing in our state before human settlement (CPC n.d.), provide us with food, medicines, fuel, flavor, fragrance, beauty and so much more. They are intrinsic to our survival and our quality of life. Each time we allow a plant to go extinct we are not only destroying a part of our heritage, but a possible cure for a disease or a valuable food source. It is this knowledge and passion for native plants that drives the Rare Plant Conservation Program and countless volunteers to spend hours in the scorching Florida sun rescuing, restoring and monitoring imperiled native plant populations.

To understand the work of the CPC one has to understand the science behind it. The goal of any conservation program is to protect and restore biodiversity. Biodiversity is defined as the variety of life on Earth. On a large scale, biodiversity includes the variety of living organisms within ecosystems, or landscapes, in the world, such as deserts, rainforests, wetlands and scrub, to name only a few. On a smaller scale, biodiversity is measured at the molecular level within the genes of individual plants and plant populations. The greater the genetic diversity within a population, the more likely it will be that the population will survive long into the future.

**Partial List of Plants in the National Collection Monitored by Bok Tower Gardens**

| Scientific Name                                       | Common Name(s)  |
|---|---|
| <i>Asimina tetramera</i>                              | four-petal pawpaw   |
| <i>Bonamia grandiflora</i>                            | scrub morning-glory, large-flowered bonamia, Florida bonamia                |
| <i>Calamintha ashei</i>                               | Ashe's savory   |
| <i>Calamintha dentata</i>                             | toothed savory  |
| <i>Chionanthus pygmaeus</i>                           | pygmy fringe-tree   |
| <i>Chrysopsis floridana</i>                           | Florida goldenaster   |
| <i>Clitoria fragrans</i>                              | scrub pigeon-wing   |
| <i>Conradina canescens</i>                            | short-leaved rosemary   |
| <i>Conradina etonia</i>                               | etonia rosemary   |
| <i>Conradina glabra</i>                               | Apalachicola rosemary   |
| <i>Conradina grandiflora</i>                          | large-flowered rosemary   |
| <i>Crotalaria avonensis</i>                           | Avon Park harebells, Avon Park rabbit-bells                                 |
| <i>Cucurbita okeechobeensis</i>                       | Okeechobee gourd  |
| <i>Cuphea aspera</i>                                  | tropical wax weed   |
| <i>Deeringothamnus rugelii</i> var. <i>pulchellus</i> | white squirrel-banana, beautiful pawpaw                                     |
| <i>Deeringothamnus rugelii</i>                        | Rugel's pawpaw, yellow squirrel-banana                                      |
| <i>Dicerandra christmanii</i>                         | Garrett's mint, Christman's dicerandra                                      |
| <i>Dicerandra cornutissima</i>                        | longspurred balm, longspurred mint  |
| <i>Dicerandra frutescens</i>                          | scrub balm, scrub mint  |
| <i>Dicerandra immaculata</i> var. <i>savannarum</i>   | Lakela's mint   |
| <i>Eryngium cuneifolium</i>                           | snakeroot, wedge-leaved button-snakeroots, wedge-leaved eryngo              |
| <i>Euphorbia telephioides</i>                         | telephus spurge   |
| <i>Harperocallis flava</i>                            | Harper's beauty   |
| <i>Hypericum cumulicola</i>                           | scrub hypericum, highlands scrub St. John's-wort, highlands scrub hypericum |
| <i>Justicia pringlei</i>                              | Cooley's water-willow, Cooley's justicia                                    |
| <i>Liatris ohlingerae</i>                             | Florida gay-feather, scrub blazingstar                                      |
| <i>Liatris provincialis</i>                           | Godfrey's blazing-star  |
| <i>Lupinus westianus</i> var. <i>aridorum</i>         | scrub lupine  |
| <i>Macbridea alba</i>                                 | white birds-in-a-nest   |
| <i>Matelea alabamensis</i>                            | Alabama anglepod, Alabama spiny-pod   |
| <i>Nolina brittoniana</i>                             | Britton's bear-grass  |
| <i>Paronychia chartacea</i>                           | papery whitlow-wort, paper-like whitlow-wort                                |
| <i>Polygala lewtonii</i>                              | Lewton's polygala   |
| <i>Polygonella basiramia</i>                          | wireweed  |
| <i>Polygonella macrophylla</i>                        | large-leaved jointweed  |
| <i>Prunus geniculata</i>                              | scrub plum  |
| <i>Spigelia gentianoides</i>                          | gentian pinkroot  |
| <i>Warea amplexifolia</i>                             | clasping warea, wide-leaf warea   |
| <i>Warea carteri</i>                                  | Carter's mustard, Carter's pinelandcress, Carter's warea                    |
| <i>Ziziphus celata</i>                                | Florida ziziphus, ancient ziziphus  |

Thus, when creating procedures to collect plant material for the propagation and reintroduction of rare plants, CPC institutions partner with scientists, government agencies, private and public landowners, and concerned citizens to develop protocols that are designed to protect and conserve the unique genetic diversity within our native plant populations. To do this, partners need

to consider the natural community of each species, its historical range, the potential for outbreeding or inbreeding depression, hybridization with closely related congeners, and the condition of each introduction site (level of fire suppression and impact of invasive species).

Hybridization is the exchange of genetic material (or interbreeding) of different species or genetically dissimilar

individuals from the same species (Wittler 2014). While biologists agree that some hybridization occurs naturally in the course of evolution, and is sometimes beneficial, rampant hybridization that results from the introduction of invasive species (including the movement of native species outside their historical range) is a threat to biodiversity. These man-made events, which bring two previously isolated species of the same genera into contact, can result in genetic swapping that, more often than not, results in a weaker, less fit plant, or one that is infertile. According to Donald Levin in his article *Hybridization and Extinction*, “Most hybrids are inferior to their parents. Some abort as embryos, others die as juveniles, and others still grow to adulthood, but cannot reproduce.” (Levin, 2002). Such an event, often referred to as “extinction by hybridization,” is especially damaging to rare species coming into contact with more abundant ones. Interbreeding between a rare and prolific species can eventually create a hybrid that displaces the native population.

Extinction by hybridization can also work another way. If one species is defined by features that are homozygous recessive alleles, then hybridization with a closely related species that features dominant alleles for those particular features can quickly mask the characters that define the recessive species.

The threat of undesired hybridization must also be avoided when introducing rare plant populations. The CPC and its institutions, such as Bok Tower Gardens Rare Plant Conservation Program, perform much needed research to develop successful protocols needed to propagate rare plant species, introduce rare plants back into the wild, and to establish new rare plant populations onto protected sites. The institutions follow strict scientific protocols created by the CPC when collecting seeds and cuttings from existing plant populations so as to protect existing wild populations. Living plants are rescued from the wild when development of a site is imminent and assured. The rescued

plants are transplanted into specially prepared beds within the National Collection or hardened-off in the nursery until they can be reintroduced to a protected site. The living specimens within the National Collection are used for research or cloned by root and/or stem cuttings to use for population introductions onto protected sites. Only shoots or cuttings are used to clone some species because their seeds are very prone to hybridizing with similar species in the nearby plant beds or in the wild. The staff keeps meticulous records. Seeds collected from the wild are accessioned and tracked in a database and every plant or clone in the greenhouse has a unique number that associates it with its collection source and collection date. The permanent tags will remain with the plants for many years to allow researchers to continue to track the success of each population introduction by monitoring each plant’s health, growth and reproduction.

The task of finding suitable protected locations to reintroduce rare plant populations into the wild falls on the local institutions in collaboration with the U.S. Fish and Wildlife Service and other federal, state, and local public agencies. In Florida, that task is becoming increasingly difficult as the last remaining parcels of intact, imperiled natural communities are being developed for housing, roads and planned communities. For example, some of the last remaining parcels of scrub habitat on the Mount Dora Ridge occur in small city parks.

According to the CPC, “Tasks like identifying and managing threats, planning or implementing habitat restoration actions, restoring the plant populations themselves, fine tuning land management practices, and planning for future maintenance are actions at the community level that require a good functional understanding of the habitat type” (CPC 2006).

At the start of each project, conservation partners look for suitable habitat (the natural community or communities



Juliet Rynear pointing out recently sprouted seeds taken from refrigeration. Photo by Donna Bollenbach

within which the target species occurs) within the historical range of the species. Florida’s unique biogeography and natural history has given rise to many unique native plant communities that evolved on isolated islands during interglacial periods when sea level was much higher than it is today. This isolation led to a high degree of endemism (plants occurring only in Florida). At the present time, there are 29 federally-listed endemic plant species in the Florida scrub community alone. Further, some species are adapted to specific microhabitats within a plant community (Hartnett and Richardson 1989; Menges et al. 1999; Richardson et al. 2014).

In addition to finding a location that meets the growing requirements of the plant, conservation professionals must consider what other plants are growing in the surrounding areas. If the habitat is in reproductive proximity to a population of either native or non-native plants in the same genera that may hybridize with the introduced populations, they must rule out that habitat. Once a suitable location has been chosen and a population has been successfully introduced, scientists must continue to monitor the population for many years to document long-term viability.

Recovering imperiled native plants in the U.S. is a long process. It may take scientists and researchers decades to develop successful methods for seed banking, germination, propagation, and introduction back into the wild.



*Conradina etonia*. Photo by Joel Jackson.

They must consider the life history of each species (lifespan, breeding system, seed dispersal mechanism, etc.) and the conditions that the plants are exposed to in the wild. Long-term seed storage may allow reintroduction of the species if it disappears in the wild. Most seeds are dried to 15%-20% moisture content and then stored at CPC institutions, such as Bok Tower Gardens, or in cryogenic, long-term storage at the National Center for Genetic Resources Preservation in Fort Collins, Colorado.

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Native plant conservation is important in our state, our country and around the world. Bok Tower Gardens Rare Plant Conservation Program is part of a global network involved in projects with government agencies, universities, research institutes, conservation organizations and private landowners that dedicate their work to ensuring that our treasured native plants will thrive for many generations to benefit from and enjoy.

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#### About the Author

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