Rare Plant Task Force

April 30, 2020

"The Growth of Rare Plants: from horticulture, to wild recruitment, to tissue culture"

Abstracts

KEYNOTE ADDRESS

Emily Coffey, Atlanta Botanical Garden: Safeguarding imperiled plant species in the southeastern United States and Caribbean. ecoffey@atlantabg.org

Abstract
Atlanta Botanical Garden works to advance the science of conservation through research collaborations and native species recovery programs. ABG's plant conservation collections and field research focus on propagation of under-represented endangered plant groups and the restoration and management of their habitats. In addition to the *in situ* work the conservation horticulture team at ABG specializes in *ex situ* collections management and propagation techniques from field to nursery production of imperiled species. The Garden has more than 30 years of experience in the conservation and recovery of rare and threatened plant species through propagation, collaborative restoration, and habitat management.

ORAL PRESENTATIONS

Patti Anderson, Division of Plant Industry: State Permits Required for Collection of Endangered Plant Species and Any of Their Parts. Patti.Anderson@FDACS.gov

Want to grow endangered plants? Don't even think about it—without checking the requirements for collecting seeds for planting or plant parts for vegetative propagation. The Florida Administrative Code includes a rule to protect the flora of Florida (Rule 5B-40). That rule explains the process required to harvest (collect) one or more plants or parts thereof from private land, not owned by the collector, or any public land. The application form, Request for Permit to Harvest Endangered or Commercially Exploited Plant(s) or Plant Part(s), FDACS-08025, Revised 05/19, includes a space for documenting the permission of the landowner or administrator of public lands. Having a state permit does not allow a collector to enter private property without permission. These and more fascinating details about permit requirements and processing will be offered to assist with your lawful endagered plant collecting.

Nancy Bissett[1], **Shannon McMorrow**[2], and **Joy Ryan**[2], [1]The Natives, Inc., [2]Wood Environment & Infrastructure Solutions, Inc.: Transplanting the endangered Fragrant Prickly-Apple Cactus (*Harrisia fragrans*) from All Aboard Florida North-South Rail Corridor ROW to Savannas Preserve State Park. nbissett@thenatives.org

The Fragrant Prickly-Apple Cactus (*Harrisia fragrans)* now occurs only in St. Lucie County and its only protected site is the Savannas Preserve State Park. When the All Aboard Florida North-South Rail planned to add a new track for the Brightline within its Right of Way (ROW), surveys showed that Harrisia fragrans plants occurred within the ROW. Plans were made with the State Park to move the plants from the adjacent ROW to similar habitat within the State Park that supported an existing population. 170 cacti were transplanted to areas east, north, or west of existing clumps of vegetation. All plants that were dug were replanted, watered, tagged, and located by GPS the same day. The cacti were moved between July 23 and July 26, 2018 to take advantage of the rainy season. Transplants ranged from 2" to 7' tall. Quarterly monitoring events ended in October 2019, by which time 15 plants of the approximately 170 cacti planted in the Park in July exhibited new growth (9%), and approximately 27 plants had one or more fruits present (16%). 26 cacti plant specimens appeared dead, or 15% of the total number. It is possible these "dead" cacti may produce new growth from the root ball at a later date.

Kara Driscoll, Florida Gulf Coast University: Liminal Spaces: The Biogeography of Florida Milkweed (*Asclepias feayi*). kdriscoll6025@eagle.fgcu.edu

The endemic Florida milkweed (*Asclepias feayi*) is an understudied perennial species with an unusual floral morphology and delicate appearance that makes it virtually disappear when not in bloom. Little is known about its preferred habitat despite its seemingly wide distribution in peninsular Florida. Preliminary observations and data suggest that *Asclepias feayi* prefers a specific niche space within mesic flatwoods and scrubby flatwoods, and may require frequent, properly-timed fire for reproductive success and recruitment. I also review the complicated pollination system and reproductive ecology of other members of the genus *Asclepias*, discuss the implications this may have for the conservation and management of Florida milkweed, as well as present avenues for needed future research on this species.

Elizabeth Gandy and **Sean Patton**, Marie Selby Botanical Gardens: Introducing the Ecoflora Project, a growing citizen science initiative. ecoflora@selby.org

Initiated by New York Botanical Garden in 2016, the Ecoflora Project seeks to understand the effects of urbanization on biodiversity, promote plant appreciation and conservation, and increase our knowledge of species' changing distributions and interactions. With funding from the Institute of Museum and Library Services (IMLS), this project has expanded to include five partner gardens across the United States. Over the next three years, Marie Selby Botanical Gardens will combine existing herbarium records and scientific publications with observations of plants and biotic interactions. The first project goal will involve collecting data and photos of vascular plants in the Sarasota-Manatee County region, in both natural and urban settings using the iNaturalist application. Here Selby will reach out to schools, not-for-profits, conservation

groups, and governmental organizations to mobilize "citizen science" observers. The second goal is to collect observations of vascular epiphytes throughout the United States and Canada. This work will produce the first ever map of vascular epiphyte distribution in North America, north of Mexico and serve as the basis of how changes in climate and land use may be altering the distribution of these unique plant species. The iNaturalist observation records from both aims will be combined with existing digital herbarium images and records from on-line aggregators like iDigBio and GBIF on a single digital platform easily accessible by any user. Additional project goals include updating historic herbarium records for the target geographic and taxonomic groups with phenological condition using standardized terminology, adding latitude and longitude using georeferencing, and transcribing label data into digital databases.

Stephanie Koontz[1], Cheryl L. Peterson[2], Valerie C. Pence[3], and **Eric S. Menges[1]**, [1]Archbold Biological Station, [2]Rare Plant Conservation Program—Bok Tower Gardens, [3]Center for Conservation and Research of Endangered Wildlife (CREW)—Cincinnati Zoo and Botanical Garden: Growing populations of endangered plant species through augmentations and introductions in Florida scrub and sandhill. skoontz@archbold-station.org

Translocations are an increasingly utilized tool for rare plant conservation. Urbanization along the Lake Wales Ridge has led to 85% loss of native habitat. The remaining patches hold a plethora of endemics. Our program has translocated several species from unprotected to protected parcels. All translocations are monitored post-outplanting and demographic data used to evaluate success. Here we present case studies for three endangered species and discuss challenges in restoring populations. *Ziziphus celata* has few remnant, mostly unprotected populations. We implemented 10 translocations between 1998 and 2012. Analyses of vital rates through 2016 determined annual survival is high (>90%), but growth of transplants is 1/10th the rate of wild plants. Many wild plants flower annually, yet <3% of transplants have flowered. Setting benchmarks for translocation success is challenging when dealing with slow-growing, reproductively challenged species. *Crotalaria avonensis* occurs at three sites. In 2012, we introduced genetic material from an unprotected site to a protected parcel. Transplants have thrived and expanded through clonal and seedling recruitment. Germination of sown seeds was 47%, with many surviving, flowering and fruiting. The first decade may look successful, but the ultimate test comes in long-term population responses to land management activities and climate change. *Dicerandra christmanii* has <10 sites, only one is protected. We have augmented (2010) and introduction (2012) populations. Both translocations grew exponentially, but were populations demographically viable. Using integral projection models, we determined vital rates were similar between wild and translocated populations. Wild populations provide *a priori* knowledge to inform more successful translocations.

Richard Moyroud, Mesozoic Landscapes, Inc.: Growing Rare Plants: Challenges for a Commercial Native Plant Nursery and the Value of Private Conservation Efforts. moyroud@prodigy.net

For almost 40 years, my native nursery business has grown rare native plants of South Florida, while more common native species are propagated and sold to subsidize the conservation work.

Proper identification of plants can be lax in typical commercial nurseries, but essential in native nurseries. Using the best available published resources, professional contacts, and field work, rare plants were located within the region, propagules collected, and populations established on-site in land that includes managed natural areas as part of the nursery design. Common native plants have only slowly increased in commercial nursery sales, even though they are the best adapted to our region; a few rare species are well-known and planted as seen in the cultivation and sale of *Zamia integrifolia* and rare palms. Rare native orchids, cacti, bromeliads, and ferns are sought by collectors but are rarely available from legitimate sources. Problems encountered include acquiring permission to collect propagules, record keeping, labeling in the nursery, and access to publications when on-line resources require academic, institutional or government affiliation. There is no financial support except that produced by sales of common plants. Early attempts at propagation of Four-petal Pawpaw (*Asimina tetramera*) were successful, but outplantings in raised sand beds failed after several years. Hand Fern (*Ophioglossum palmatum*) was established by spores in existing *Sabal palmetto*, but died out in a drought year. The nursery land now has reproductive populations of native Royal Palm (wild collected *Roystonea regia*), Okeechobee Gourd (*Cucurbita okeechobeensis*), Cuplet Fern (*Dennstaedtia bipinnata*), Hoary Airplant (*Tillandsia pruinosa*), and others. Propagules of these species have been shared with conservation partners in South Florida. Despite some success in nursery propagation, acquisition and management of natural areas remains the most important action for rare species conservation. *Ex situ* work is next, with propagation, reintroduction, and assisted migration.

Valerie Pence, Center for Conservation and Research of Endangered Wildlife (CREW)—Cincinnati Zoo and Botanical Garden: *In vitro* Methods Supporting the Propagation, Preservation, and Restoration of Rare Florida Species. valerie.pence@cincinnatizoo.org

In vitro (plant tissue culture) technologies are an important supporting tool for rare species conservation when conventional methods are not adequate or could benefit from supplementation. For *in vitro* methods to be applied, tissues must be isolated into an aseptic culture, continuous shoot growth must be established, rooting methods must be in place for shoots, and acclimatization protocols must effectively transition plants from tube to soil. In a multi-institutional project to support the conservation of the endangered *Deeringothamnus rugelii* (Rugel's pawpaw), CREW received shoot cuttings from collections made in April 2019 from 54 genotypes from 4 populations. Of the 112 explants surface sterilized and put onto sterile nutrient medium containing the fungicide benlate, 21 (19%) were lost to contamination. Of those that remained clean, 79% were establishing new growth after 4 weeks. The shoots from these cultures were multiplied through several subcultures and are: 1) being rooted on a medium with 1 mg/L of the auxin, IBA, reduced salts, and the ethylene inhibitor silver thiosulfate, and 2) used as a source of shoot tips for cryopreservation and long-term storage in CREW's CryoBioBank, where several other rare species from Florida are banked. Rooted shoots are being sent to Bok Tower Gardens for further acclimatization in preparation for outplanting.

Héctor E. Pérez and **Andres Ochoa**, University of Florida: Germination niche characteristics of *Linum arenicola* (sand flax) a globally imperiled species. heperez@ufl.edu

In 1977 Peter Grubb advanced the plant regeneration niche concept, defined as "an expression of the requirements for a high chance of success in the replacement of one mature individual by a new mature individual of the next generation". Seed germination represents a cornerstone process of regeneration and an understanding of physico-chemical factors that drive germination help define a species' regeneration niche. Today, practitioners utilize information about a species' regeneration niche to strengthen plant conservation activities. However, a considerable knowledge gap occurs between endangered species and factors that drive their germination. Such is the case for the imperiled (G1G2/S1S2) south Florida pine rockland endemic *Linum arenicola* (sand flax), which was federally listed as endangered in 2016. Our goal is to discuss abiotic factors that influence *L. arenicola* germination thereby clarifying its regeneration niche. We found that seeds of *L. arenicola* display an unusual response to temperature whereby seasonally simulated alternating temperatures inhibited but a narrow range of constant temperatures promoted germination. Exposure to 22 °C led to complete (100%) and rapid (median time = 6 d) germination. Germination occurred rapidly and to high levels (> 75%) following exposure to light or darkness. Likewise, desiccation stress (-280 MPa, 13% RH) and burial in the soil for up to 9 months did not hinder germination considerably. However, salinity levels ≥ 6.34 ppth inhibited germination or killed seeds. Practitioners now have more information to enhance *L. arenicola* conservation regardless of whether regeneration is planned for *in* or *ex situ* activities.

Jennifer Possley, Brian Harding, and **Sabine Wintergerst**, Fairchild Tropical Botanic Garden: How experimental propagation and seed germination trials informed the translocation of federally listed Blodgett's silverbush (*Argythamnia blodgettii*) from a road widening project in Miami. jpossley@farchildgarden.org

Protecting and managing plants in situ is always the best option for preserving native biodiversity, especially in the case of rare plants. When in situ preservation is not feasible, it is imperative to secure an experienced rare plant practitioner to not only maximize the amount of genetic material that can be rescued from a source population, but also to best manage the relocation process. This presentation will describe the ups and downs of a multi-agency collaboration to translocate a federally threatened plant species, Blodgett's silverbush (*Argythamnia blodgettii*), from the impact zone of a road widening project. As a result of this endeavor, two new populations of Blodgett's silverbush have now been established (with indications of short-term success) in two additional Miami-Dade County's Environmentally Endangered Lands preserves. Of the 153 plants extracted from the donor site, 57% survived extraction and 39% are established in recipient sites. Perhaps more significant in the long term was the collection of 546 seeds from 37 maternal lines along the preserve's west edge, which includes germplasm from many plants that have since died. As a result of seed collection efforts, 43 seed-grown plants are in Fairchild's nursery, producing seed for further plantings. If experimental trials show that Blodgett's silverbush seed are capable of long-term storage, several hundred seed will be banked in long-term storage. This project serves as an example of how agencies can and should reach across jurisdictional borders to cooperate to reduce biodiversity loss.

Rosalind Rowe[1] and **Philip Gonsiska**[2], [1]Department of Environmental Protection, [2]Rare Plant Conservation Program—Bok Tower Gardens: *Conradina brevifolia*: A Rescue Success Story in Highlands County. Rosalind.Rowe@dep.state.fl.us

At Highlands Hammock State Park, severe erosion from Hurricane Irma was about to eradicate a section of scrub that was home to natural populations of *Chrysopsis floridana*, *Polygonum dentoceras*, and *Polygonum basiramia*. A rescue mission was implemented by a team of staff and volunteers from the Park and from the Conservation team at Bok Tower Gardens (BTG). While individual plants and plant cuttings were being gathered, a small population of *Conradina brevifolia* was discovered for the first time at the Park; eight plants were found, and most were in the most vulnerable section of the erosion. It's possible that this was its southernmost location in the state. We potted four of the plants and made about 200 small cuttings from the other four. BTG took all cuttings and potted plants for further care in their nursery. Eventually, plants and seedlings were returned and reestablished in new areas of the park. The potted plants of the *Conradina*, and 130 of the cuttings were planted over a one-acre section of scrub. At last count, nearly all the *Chrysopsis* and the *Polygonum* were doing well, and 70 of the *Conradina* were thriving in their new home. - Rosalind Rowe is an Environmental Specialist II with the Southwest District (District 4) of the Florida Park Service, where her role leans toward being the Plant Police for the parks. Philip Gonsiska is the Rare Plant Curator for Bok Tower Gardens.

Chad Washburn, Naples Botanical Garden: Conservation Tools: Utilizing Botanic Gardens Conservation International's PlantSearch to prioritize ex-situ conservation efforts. cwashburn@naplesgarden.org

Botanic Gardens Conservation International's PlantSearch database includes records of living plants, seeds, and tissue reported in ex-situ conservation collections from public gardens, zoos, and arboreta around the world. The database, originally developed to gauge progress towards Target 8 of the Global Strategy for Plant Conservation, provides an essential tool for prioritizing plant conservation efforts. Naples Botanical Garden manages 90 acres of natural lands that include nearly 300 species of native plants. We used PlantSearch to analyze the preserve species list in order to identify gaps where species are absent or under-represented in ex-situ collections globally. Of the 300 species found in the Garden's natural areas, we identified nearly 70 species that were reported from zero to one living collection globally. These identified species have become a priority for building the garden's living collections and seed bank. Use of the tool has been expanded to include prioritization for plant collection across the region and opportunities to share plant material with partner gardens to ensure survival for the future.

POSTER PRESENTATIONS

Patti Anderson, Botanist, Division of Plant Industry: Ask me about Florida's native palms: Which Palms Require a Permit for Collecting? Patti.Anderson@FDACS.gov

This poster presentation, based on a new Division of Plant Industry Circular, is intended to help viewers appreciate the variety of our native palms, identify these species and understand the protections the state provides for them. Palms are among the most iconic plants in Florida landscapes. They are essential components of native habitats in Florida as well as being common ornamentals. In addition to environmental and landscape values, many palms are economically important as crops or for other uses. Unfortunately, the popularity of palms native to Florida has led to over exploitation of some species, while loss of habitat has reduced the natural populations of others. Among the 12 native palms in Florida, we find species listed as endangered, threatened, commercially exploited, and sadly, extinct in the wild.

Amber G. Gardner and **Héctor E. Pérez**, University of Florida: *Harperocallis flava* seeds may exhibit intermediate storage physiology, showing signs of freeze sensitivity. apouncey@ufl.edu

In a preliminary trial to assess the seed storage behavior of *Harperocallis flava*, seeds from one population were dried over LiCl (13% RH) and then placed in a freezer at -18 °C for up to 2 years, following standard seed banking protocols. The remaining seeds were stored under ambient laboratory conditions (22-24 °C; 40-50% RH). After 7 months and 1 year, samples of seeds were retrieved from the freezer and germinated at 25 °C. Germination reached 55% after 7-months and 52% after one year. While this level of germination was comparatively lower than seeds from the same lot that were stored at ambient conditions during that time period (95 and 92% respectively), it was considerably higher than that of the fresh seeds (32%). Furthermore, this percentage was similar to the LiCl treatment in a previous desiccation study, where final germination reached 60%. The similar germination percentages suggested that the desiccation treatment was primarily responsible for the reduced germination rather than the freezer. However, after two years at -18 °C, germination only reached 24% compared to 91% for seeds stored at ambient lab conditions, indicating that *H. flava* seeds may be freeze sensitive. These results suggest that *H. flava* seeds may exhibit intermediate storage behavior, where they can tolerate some levels of desiccation and subfreezing temperatures at the expense of longevity. Currently, *H. flava* seeds from three populations are being evaluated for storage potential up to 2 years under various storage conditions: ambient temperatures (22-24 °C), refrigerator (5 °C), and freezer (-18 °C).

Carmen J. Rodriguez and **Fernando M. Rocha**, FAU Pine Jog Environmental Education Center: Restoring the Dancing Lady: Using Lab-propagated *Tolumnia bahamensis* Orchids to Re-establish the Population in Palm Beach County. carmenrodriguez@fau.edu

One of Florida's most critically endangered native orchids is *Tolumnia bahamensis*, Florida's dancing lady. We identified the need to re-establish these orchids in their historical habitat in Palm Beach County. Though once abundant, Florida native orchids, including *Tolumnia*

bahamensis, have been negatively affected by habitat loss, poaching, and urban development. Records show a large population of this species was identified in Martin County in the mid-1960s and targeted for relocation due to the imminent threat of development in the area. In 1966 about 1,000 plants were relocated to Jonathan Dickinson State Park. For the last four years, we have been collecting the seed pods from this population to be propagated in the lab and eventually outplanted to natural areas. We have partnered with Environmental Resources Management (ERM) to re-establish the once-prolific population of these orchids in various scrub sites across Palm Beach County. We have introduced 2,079 plants in six different scrub sites. After one year, each of the populations were surveyed to document their survivability, flowering, and growth. Their survivability rates range from 16% to 72%, and four out of the six sites had at least one flowering plant. With the continued increase of habitat loss and urban development, the need for new plant hosts and habitat locations is evident. Historically these orchids grow under *Ceratiola ericoides* (Florida rosemary). We have been testing various plant hosts that include: cocoplum, scrub oak, saw palmetto, and slash pine. Further research is needed to identify potential new plant hosts for the critically endangered *Tolumnia bahamensis*.