2023 Florida Rare Plant Conference
ABSTRACTS

April 27, 2023

KEYNOTE ADDRESS

Wesley M Knapp, Chief Botanist, NatureServe. "The Race Against Plant Extinction: The current state of knowledge and Florida's unique position." wesley_knapp@natureserve.org

Extinction rates are expected to increase as we move through the Anthropocene, our current geologic era where humanity is the dominant influence on the climate and environment, yet we have a poor understanding of what plants have already gone extinct and the reasons for these extinctions. Every extinction is a conservation failure and identifying the reasons for past extinction events may help us prevent future extinctions. Of the 65 plant taxa (51 species, 14 infraspecies) believed extinct from the continental United States and Canada, 4 were endemic to Florida, with 2 being global single-site endemics. Each of these Florida extinctions will be discussed in detail. Single-site endemics represent 64% of all known plant extinctions in the USA and Canada. Currently, no method exists to identify single-site endemics, despite the disproportionate impact on biodiversity conservation. I will present preliminary data on plants of one known occurrence (OKO), which includes single-site endemics. These OKO plants need immediate *in situ* and *ex situ* conservation attention to prevent extinctions. These species are often so rare that there are few herbarium vouchers. This creates challenges for understating the taxonomic merit of these OKO species and the accurate identification of new populations.

ORAL PRESENTATIONS – alphabetical by first author

Patti J. Anderson, FDACS-Division of Plant Industry "Listing Plant Species as Endangered: The Process and the Role of EPAC (Endangered Plant Advisory Council)" patti.anderson@fdacs.gov

You might have wondered how so many plants have been listed as **endangered** (1: *Acacia angustissima* – prairie acacia through 447: *Ziziphus celata* – scrub ziziphus) or **threatened** (1: *Acanthocereus pentagonus* – barbed-wire cactus through 118: *Zephyranthes treatiae* – Treat's zephyr-lily) in Florida. You might even be concerned about a species of you think should be protected as an endangered species. I'll discuss several ecological factors that increase the likelihood of finding plants in danger within the state and review the process and the paperwork for listing a species as endangered or threatened. This discussion includes EPAC, the council responsible for reviewing protected plant species. In addition, I can answer questions about the rules for obtaining permits to collect endangered and commercially exploited plants.

Federico López-Borghesi, University of Central Florida, and **I. Jack Stout**, University of Central Florida, "Demographic dynamics of the federally listed *Lupinus aridorum* using monthly examinations." flopezborghesi@Knights.ucf.edu

We compare demographic dynamics of *Lupinus aridorum* (scrub lupine) in two locations: Fenton Street Conservation Area in the Mount Dora Ridge and Lake McLeod National Wildlife Refuge in the Winter Heaven Ridge. This perennial shrub is endemic to Orange and Polk counties in central Florida, USA. Rapid habitat conversion over the last 20 years has reduced the range to small, isolated sites. The species is listed as endangered under the Endangered Species Act, and stable populations are limited to single sites in each county. Using monthly data collected between 2012 and 2019, we explore the use of shorter sampling intervals to better account for variations in vital rates, particularly for cryptic life stages. Performing annual surveys would have resulted in missing 25% to 60% of germinants, leading to miscalculations of seed mortality and dormancy and underestimation of seedling mortality. The effects are more extreme in the Fenton Street population, which shows greater germination rates but lower seedling survival. Plants within our plots showed similar growth patterns in both populations, experiencing seasonal senescence. Probability of survival was similar as well for plants up to 150 cm in diameter, after that, however, plants in the Lake McLeod population showed greater mortality rates. On the other hand, plants in Lake McLeod became reproductive at smaller sizes and showed greater fecundity at equivalent sizes. The population dynamics of *L. aridorum* show great variability from year to year. A deeper understanding of seed bank dynamics is necessary for the effective management of this species.

Hanna Bowen[1], Cheryl Peterson[2], Eric Menges[1], Aaron David[1]
[1] Plant Ecology Program, Archbold Biological Station, Venus, FL 33960, U.S.A
[2] Rare Plant Conservation Program, Bok Tower Gardens, Lake Wales, FL 33853, U. S.A
"Long-term success of Chrysopsis floridana introductions depends on continued fire management." hbowen@archbold-station.org

Population introductions are a critical tool for the conservation of endangered and endemic plant species. However, establishing new populations is likely not enough to rescue species from the brink of extinction, and requires proper land management. Populations of many Florida scrub plant species, including endangered and endemic herbaceous plants, are fire-dependent and require prescribed burns to remain viable. Here, we investigate the role of management in maintaining introduced populations of the federally endangered Florida goldenaster Chrysopsis floridana. Chrysopsis floridana is limited to only 5 counties in west-central Florida, and following efforts to introduce new populations, is being considered for de-listing. From 2008-2013, 8 introduced populations were established, and detailed demographic data were collected from 2017-2022 at 5 of these sites which we report on here. Prescribed burning was infrequent at most introduction sites. Time-since-fire was negatively associated with average annual survival. Our results demonstrate the importance of ongoing, multi-year species specific management plans that include controlled burns for the long-term success of endangered plant introductions in the Florida scrub.

Daniela Champney, Fairchild Tropical Botanic Garden. "Fairchild's Connect to Protect Network: Recent efforts to promote native plants to South Florida residents, with a focus on state-listed species." ConnectToProtect@fairchildgarden.org

Fairchild's Connect to Protect Network is a citizen science program that enlists South Florida residents to plant native plants in order to connect the few remaining isolated fragments of globally imperiled pine rockland. Since its inception in 2007, CTPN has connected residents, up close and personal, with threatened and endangered plant species that they may otherwise never have encountered. With funding from the Daniels Lab at the Florida Museum of Natural History, we made 2021 our Year of the Locustberry. Our newsletter and social media extolled the many wildlife virtues of this Florida threatened species. A call for seed from our membership resulted in an influx of hundreds of ripe fruit from which we are propagating plants for years to come. Our efforts to educate the public about the rare Florida duskywing butterfly resulted in our documenting the species in four of our members' yards—a new find for this butterfly. This presentation will also focus on past efforts to promote the pineland croton (*Croton linearis*) as well as other Florida listed species.

Raelene Crandall[1], Jimi Sadle[2], Ben Baiser[1], and Owen Schneider[1]

[1]University of Florida, Gainesville, FL, [2]Everglades National Park, Homestead, FL,

"*Digitaria pauciflora* "falls" for a complex hydrologic regime in marl prairies of Everglades National Park" raecrandall@ufl.edu

Marl prairies, such as those in Everglades National Park, experience a flooding regime strongly linked to seasonal precipitation. The extent and duration of flooding in Everglades National Park is generally greater during the wet season but varies spatially along topographic and soil gradients and affects plant community dynamics. We tested the response of *Digitaria pauciflora*, a federally endangered grass, to different flooding regimes over three years. We established demography plots at both ends of *D. pauciflora*'s elevation range in areas with different burn histories. We measured vital rates, including growth, survival, and reproduction, annually for three years (2020-2022). Results showed that *D. pauciflora* has a patchy distribution across the landscape, with individuals occurring in spatially-separated aggregates. This is likely owing to its mode of vegetative reproduction via plantlets. Towards the ends of culms, often directly beneath the inflorescence, *D. pauciflora* produces plantlets at the nodes. We observed up to 6 plantlets on a single culm and an average of 1.2 plantlets per culm. The plantlets typically remain on the plant and continue to grow until they become so heavy that the parent culm falls to the ground, placing the plantlets in direct contact with the ground. The plantlets can then begin rooting, provided they land in suitable microsites and are not inundated. We found that *D. pauciflora* had increasing population growth in lower elevation areas, but only when seasonal flooding ended before plantlets fell to the ground. In these instances, *D. pauciflora* had both higher survival and establishment. During extended flooding events, the establishment of new plants was rare, and thus there was a net decrease in population size (i.e., greater mortality than establishment). We posit that *D. pauciflora* may have a "boom or bust" population demography. Its population growth rate might decline during unfavorable or bust years when water levels are high for an extended period. During boom years, survival and recruitment from plantlets might be particularly high, resulting in high population growth rates. Over the long term, this cycle should

maintain populations of *D. pauciflora* provided there are not an excessive number of bust years without boom years during which the population can recover. Hydrologic regimes and their effects on ecosystem function are likely robust determinants of plant population dynamics on long timescales in seasonal environments. Thus, aspects of the hydrologic regime, such as frequency, duration, and magnitude, should be considered in management, especially for populations of rare and endangered species.

Alan R. Franck, University of Florida Herbarium, Florida Museum of Natural History, Gainesville, Florida **George D. Gann**, The Institute for Regional Conservation, Delray Beach, Florida. "What is *Guilandina major* and where is it in Florida?" francka@ufl.edu

Guilandina (Fabaceae) has a pantropical distribution with ca. 20 species of typically prickly scrambling shrubs and lianas. The genus was often included in a widely delimited *Caesalpinia*. *Guilandina* is poorly understood and 10 names have been attributed to the Caribbean region, most as endemic to the region. Two species are given a pantropical distribution and applied to native plants in Florida: *G. bonduc* and *G. major*. Confusingly, *G. bonduc* was once known incorrectly as *Caesalpinia crista* (=*Ticanto crista*) and *G. major* was once known incorrectly as *G. bonduc*. Further confusing the issue, some plants of the introduced *Ticanto crista* on the mainland have been previously misidentified as *G. major*. The presence of *G. major* (as currently circumscribed, state-endangered) in the Florida Keys has been documented with fertile specimens, and we compare its morphology with *G. bonduc*. Sterile collections attributed to *G. major* are also known from the southeast coast, some of which had been historically identified as *G. ovalifolia*.

Elizabeth Gandy, Bruce Holst, and **Shawn McCourt,** Marie Selby Botanical Gardens. **Erik Patel,** Lemur Conservation Foundation. "How Lemur Conservation Has Led to Habitat and Rare Plant Conservation in Florida" egandy@selby.org

As conservationists are aware, partnerships provide the best chance of long-term success when it comes to saving land and the species that depend on that land. Sometimes we find our partnerships are unconventional or not what we might expect. In 2017, Marie Selby Botanical Gardens (MSBG), was approached by the Lemur Conservation Foundation (LCF) in nearby Manatee County to provide a vascular plant inventory of the 120 acre-LCF property, including the free-roaming enclosures where lemurs are allowed to engage in natural behaviors. The botanical inventory found some very healthy natural plant communities, including scrub and wet flatwoods and identified 365 plant species, including 14 that are endemic or listed as threatened or endangered. While conservation of native species is incidental to the mission of LCF, the botanical work made clear how important this site is for conservation of native habitats. LCF staff have been very responsive to important management actions like removal of invasive species and prescribed burning. The partnership between LCF and MSBG has continued with additional study projects and recommendations about best management practices. Future collaboration between our institutions will help to ensure the conservation and documentation of native species at the LCF Reserve.

Sterling A. Herron, Archbold Biological Station, **Haley Dole**, University of Nevada, Reno, **Stephanie M. Koontz**, Georgia Department of Natural Resources, **Eric S. Menges**, Archbold Biological Station, **Stacy A. Smith**, University of Florida, **Carl W. Weekley**, Archbold Biological Station, **Aaron S. David**, Archbold Biological Station, "Population trends and prospects for endangered Florida ziziphus (*Pseudoziziphus celata*) on the Lake Wales Ridge." sherron@archbold-station.org

Florida ziziphus (*Pseudoziziphus celata*) is one of the most rare and restricted endemics of the Lake Wales Ridge, known from 13 extant wild populations across Highlands and Polk Counties, with only 41 known wild genotypes. Here we present an update on vital rates for each population (both wild and introduced), based on 27 years of data, as well as plans for further conservation of the species. Annual survival rates remain high for wild populations (generally >90%), but population size is often quite low (<30 individuals in most populations), plants are on unprotected, private land, and the overall trend is decline. Genotypes from each wild population are preserved in the National Collections at Bok Tower Gardens as well as in new introductions on protected lands. Previous introductions and augmentations (N=17) conducted between 1998-2020 remain stable (generally >80% annual survival), though few have yielded reproductive individuals yet. Several new translocations have been added in recent years, including seed augmentations, and a new National Collections site is being established at The Knoll (a restored sandhill) located at Bok Tower Gardens. Through identification of new genotypes, informed translocations to appropriate habitat, and tissue culture innovations, there is hope for the preservation of this unique scrub endemic.

Cliff G. Martin and **Zachary Brym** (both Dept. of Agronomy, UF/IFAS, TREC)
"Rare plants at UF/IFAS Tropical Research and Education Center (TREC): 47 species and counting!" brymz@ufl.edu

The University of Florida Tropical Research and Education Center (TREC), Homestead, FL, showcases diverse ornamental, vegetable, fruit crop, and native plant species. It has 160 acres including 8 acres of pine rockland and hammock habitats and 3 acres disturbed by agricultural activities, then scraped to expose the oolitic bedrock allowing natural regeneration of vegetation. TREC is home to 789 plant species, including at least 276 native species. TREC native plants include 45 rare species based on Wunderlin & Hansen (2011) and 22 "rare or imperiled" species based on the Florida Natural Areas Inventory Element Tracking Summary list. Of the 45 rare native plants, 34 occur within their native habitats in pine rockland and rockland hammock, 10 are growing as cultivated landscape plants, five are endemic, and one was re-introduced into its native habitat. TREC also has at least 475 non-native plant species including 265 established and 210 only found in cultivation. Of the latter group, two palms are extremely rare and endangered in their native Haiti. We hope to document plant diversity at TREC, develop outreach programs for public education, provide an exchange program for rare plant seeds and other propagules with Fairchild Botanic Gardens and other interested parties, and improve the rockland habitat for rare and imperiled plants by their management, augmentation, and re-introduction.

Andrea M. Naccarato, Archbold Biological Station, **Stacy A. Smith**, University of Florida, **Eric S. Menges**, Archbold Biological Station, and **Aaron S. David**, Archbold Biological Station, "Experimental Introduction of *Crotalaria avonensis*, a Narrow Endemic of the Florida Scrub." anaccarato@archbold-station.org

Avon Park Harebells (*Crotalaria avonensis*) is an endangered perennial legume that is narrowly endemic to Florida scrub habitats in Highlands and Polk Counties. Ten years ago, this rare plant species was known from only three locations. In an effort to increase the number of protected populations, *C. avonensis* seeds (N = 400) and transplants (N = 84) propagated using stem cuttings and tissue culturing were introduced in 2012 to the Lake Wales Ridge Wildlife and Environmental Area (Silver Lake Tract). Survival and population demography were monitored for the following 10 years. By 2022, 47.5% of seeds had germinated, with most seeds germinating within the first three years, and cumulative survival of germinated seeds was 12%. Total germination was significantly higher in scrubby flatwoods than rosemary scrub, although there were no significant differences between seed scarification treatments (scarified vs. non-scarified) or scarification x habitat interaction. For the transplants, 43 plants survived their first year and 27 plants (32%) survived through 2022. Survival was not affected by propagation type (stem cuttings vs. tissue culture stem cuttings vs. tissue culture plants). Clonal (19.5 offshoots observed per year on average) and seedling (3.0/yr) recruitment have been observed surrounding transplants. Together, both the seed and transplant introductions have resulted in a new protected population of *C. avonensis*.

Andre A. Naranjo (Florida International University), **Ryan A. Folk** (Mississippi State University), **Matthew A. Gitzendanner** (University of Florida), **Douglas E. Soltis** (University of Florida), **Pamela S. Soltis** (Florida Museum of Natural History). "Florida mints radiated as peninsula sank and resurfaced during ice ages." anaranjo@fiu.edu

The North American Coastal Plain is recognized as a global biodiversity hotspot. However, the mechanisms driving high levels of species richness in a region with relatively low topographic relief and homogeneous climate are unclear. We investigated the evolutionary processes driving ancestral area evolution and diversification in a biodiversity hotspot from both a systematic and biogeographical context using a clade endemic to the hotspot called the Scrub Mint clade (SMC) (*Dicerandra, Conradina, Piloblephis, Stachydeoma* and four species of *Clinopodium* (Mentheae; Lamiaceae). We generated a dated phylogeny using a target enrichment/capture dataset and then calculated ancestral area using biogeographical models. We uncovered neo- and paleo-endemism hotspots and inferred ancestral potential ranges at each node based on ancestral niche reconstructions and paleoclimatic data to understand the geographical range evolution of subclades. Ancestral area for the SMC was inferred to be the Florida Panhandle/Apalachicola River basin. A diversification event likely happened around the mid-Pleistocene Transition. Endemism hotspots were recovered in NE Florida, the Atlantic Coastal Ridge, and along the Lake Wales Ridge. Reconstructions of potential ranges support biogeographical findings, with the ancestor of the SMC likely located in the vicinity of the northeastern Gulf Coast during interglacial and glacial periods. The timing of diversification events and colonization of new areas by ancestors of the SMC are consistent with the timing of major geological events in the

region. The presence of multiple types of endemism highlights the complexity of evolutionary and ecological processes that foster the large number of endemic taxa found in this region.

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[2] Bok Tower Gardens, Lake Wales, Florida
"Brooksville bellflower habitat restoration through cow grazing pressure: an update."
oghenekome.onokpise@famu.edu

A rare Florida plant species, The Brooksville Bellflower (*Campanula robinsiae*), is reportedly under extinction pressures with most of the existing plant population found within the Burns Prairie on the property of the Brooksville Agricultural and Environmental Research Station, Florida A&M University (FAMU-BAERS). Surveys conducted in 2018 and 2019, indicated that only 300 out of 8,000 plants remain on this site after more than 20 years study by the Bok Tower Gardens (BTG) scientists. The Brooksville Bellflower "seems to love cows". Thus, a formal study to evaluate the impact of cattle grazing on the known Brooksville Bellflower habitat restoration area was initiated in March 2022 during which cows averaging 250 kg (550 lb) were grazed for one month (March 22, 2022 – April 22, 2022) prior to plant survey on April 30, 2022. This study was continued in 2023 with a new set of weaned cows averaging 250 kg to 300 kg (550 lb – 660 lb). Cows were allowed to graze for a much longer period January 10 – March 28, 2023, prior to plant survey in April 13 - 14, 2023. Hypothetically, disturbing the habitat muck enhances *C. robinsiae* seed bank for the germination of embedded seeds and growth of the bellflower plants. Results of this second - year study will be presented and discussed in relation to the ecological restoration and germplasm preservation of the Brooksville Bellflower, a Florida rare plant species.

Hanna Rosner-Katz, Florida Natural Areas Inventory and **Katie Heineman**, Center for Plant Conservation. "Florida Plant Rescue: Where We Are Now!" hrosnerkatz@fnai.fsu.edu

Beginning in 2021 and continuing strong, Florida Plant Rescue (FLPR) is an initiative coordinated through the Center for Plant Conservation (CPC) to safeguard all of the state's imperiled plant species by means of seed collection and banking. With the myriad threats facing Florida's rare native flora, ex-situ preservation in off-site collections is of the upmost importance to the conservation of these species. At last year's Rare Plant Conference, the FLPR project was introduced to participants by the project's coordinator to increase awareness, participation, and support for our ambitious goals. Now, this year's presentation will summarize updates to the project, goals achieved thus far, and future directions for the coming years. CPC participating institutions including Fairchild Tropical Botanic Garden, Atlanta Botanic Garden, Bok Tower Gardens, Naples Botanical Garden, Florida Native Plant Society, and Marie Selby Botanical Garden have already contributed greatly to the initiative in their collecting efforts and exceptional species projects for some of the state's rarest plant species. Additionally, work from this project has also helped to increase our understanding of the life history and ecology of these species via field observations, germination testing, and propagation, thus allowing for the

potential to inform comprehensive strategies for plant conservation and recovery. Furthermore, the knowledge and data sharing resulting from this project has been an invaluable tool for Florida Natural Areas Inventory (FNAI) to update species' distribution and population status information, and thus their conservation statuses.

Ashlyn Smith, Gulf Coast Coordinator and **Emily E.D. Coffey, PhD,** VP of Conservation and Research, Southeastern Center for Conservation, Atlanta Botanical Garden. "Demographic response of Chapman's rhododendron to prescribed fire; preliminary results of a three year study." asmith@atlantabg.org

Chapman's rhododendron (*Rhododendron chapmanii)* is a Federally Endangered, Florida endemic shrub and the only evergreen rhododendron native to the state. Reports indicate that it has been rare since the 1860s, but over-collection by the horticulture industry and habitat destruction have reduced the number of individuals by half in some areas. The Atlanta Botanical Garden's Southeastern Center for Conservation, with funding and guidance from the US Fish & Wildlife Service, and partnership with Florida Natural Areas Inventory, is applying meaningful conservation actions to protect this species from further decline. Demographic field studies provide powerful tools for understanding the basic ecology and population dynamics of species. They identify factors that limit population size and are helpful in guiding appropriate management actions, including the frequency or seasonality of prescribed fire. Six demography plots were established within the St. Joseph Bay State Buffer Preserve to closely monitor changes in stem characteristics and recruitment as well as rates of seed germination. This talk will focus on how Chapman's rhododendron responds to prescribed fire. Preliminary results from two years of demographic monitoring show that the mean number of reproductive structures (buds / flowers / fruits) per stem peaks around 1.7 years (606 days) after prescribed fire. While burning between the two data collection events increased stem counts, it dramatically reduced flower counts by up to 98%. Reduced flowering may interfere with sexual reproduction. A third year of data collection will allow for development of a matrix population model that can quantify population growth rates and further refine our understanding of how fire affects this species.

April 28, 2023

POSTER PRESENTATIONS – alphabetical by first author

Luc Alfred, South Florida State College, **Sarah Arnan**, South Florida State College, **Emily Boyette**, South Florida State College, **Toby Ellison**, South Florida State College, **Jenna Gutierrez**, South Florida State College, **Stephanie Hicks**, South Florida State College, **Nylla Wilder**, South Florida State College, **Kate Calvin** PhD, Honors Research Mentor, South Florida State College, "GC-MS Analysis of Bioactive Compounds in *Ziziphus celata."*
kate.calvin@southflorida.edu

Ziziphus celata, or Florida jujube, is a spiny flowering shrub native to Florida and found only on the Lake Wales Ridge in Highlands and Polk Counties. There are just a few wild populations left and it is officially listed as "endangered." In contrast, *Ziziphus jujuba* is a very popular crop plant in its native China. It has been analyzed extensively and has been shown to contain several interesting compounds with medicinal value such as anti-oxidants and anti-cancer agents. Many other species of *Ziziphus* have been similarly analyzed. Bok Tower Gardens (Lake Wales, Florida) has generously provided samples for our project to identify bioactive compounds in Ziziphus celata. In previous work using gas chromatography-mass spectrometry (GC-MS), we established methods and successfully identified several compounds present in *Ziziphus celata* fruit. Current studies focus on refining sample preparation and data acquisition methods in order to identify more compounds and quantify their relative abundance. In addition to fruit, we are now targeting the analysis of stem and leaf. Our latest results are presented here.

Elizabeth Gandy, Marie Selby Botanical Gardens, **Bruce Holst**, Marie Selby Botanical Gardens, **Shawn McCourt**, Marie Selby Botanical Gardens, **Erik Patel**, Lemur Conservation Foundation, "How Lemur Conservation Has Led to Habitat and Rare Plant Conservation in Florida" egandy@selby.org

As conservationists are aware, partnerships provide the best chance of long-term success when it comes to saving land and the species that depend on that land. Sometimes we find our partnerships are unconventional or not what we might expect. In 2017, Marie Selby Botanical Gardens (MSBG), was approached by the Lemur Conservation Foundation (LCF) in nearby Manatee County to provide a vascular plant inventory of the 120 acre-LCF property, including the free-roaming enclosures where lemurs are allowed to engage in natural behaviors. The botanical inventory found some very healthy natural plant communities, including scrub and wet flatwoods and identified 365 plant species, including 14 that are endemic or listed as threatened or endangered. While conservation of native species is incidental to the mission of LCF, the botanical work made clear how important this site is for conservation of native habitats. LCF staff have been very responsive to important management actions like removal of invasive species and prescribed burning. The partnership between LCF and MSBG has continued with additional study projects and recommendations about best management practices. Future collaboration between our institutions will help to ensure the conservation and documentation of native species at the LCF Reserve.

Helen Pennington, Pranay Lingareddy, and **Erin N. Bodine**, E.C. Ellett Professor of Mathematics, Rhodes College. "Modeling the Population Dynamics of Imperiled *Guzmania monostachia* Populations." bodinee@rhodes.edu

Guzmania monostachia are large, long-lived bromeliads whose leaves grow in a rosette pattern and are native to the Americas, but endangered in Florida due to damage caused by the invasive weevil *Metamasius callizona*. Each *G. monostachia* rosette can reproduce sexually via flowers or asexually by producing clonal offshoot rosettes. We model the population dynamics and demographic structure of a *G. monostachia* population using a Lefkovitch matrix model where each state represents a demographic class of rosettes. Model analysis over a range of uncertain

parameters show the conditions under which a *G. monostachia* population is viable in the absence and presence of *M. callizona*, and the expected demographic structure under those conditions.

Michael Penton, BioTECH @Richmond High School, Miami, and **Sabine Wintergerst**, Fairchild Tropical Botanic Garden swintergerst@fairchildgarden.org. "Effect of soil salinity on germination of Fragrant pricklyapples (*Harrisia fragrans*) seeds collected from three populations across its range."

The endangered fragrant pricklyapples (*Harrisia fragrans*) is a columnar cactus growing along the east coast of Florida in two distinct geographic regions: one subset is found north of Palm Beach County and the other occurs in the Cape Sable region and throughout the Florida Keys from Key Largo to Sugarloaf Key (these southern plants were previously called *Harrisia simpsonii*). Earlier research indicates that fragrant pricklyapples populations form persistent soil seed banks. These underground seed repositories are critical for the long-term survival of a species by providing a source of new propagules after disturbances or during periods of low seed set of the existing population. Because the species occurs at low elevations close to the coast, the soil seed bank of fragrant pricklyapples is in danger of being impacted by the consequences of climate change. Sea level rise can lead to slow increases in soil salinity in coastal areas and more frequent and intense storm surges increase the risk of populations being inundated in saltwater for short periods of time. To test how well seeds of fragrant pricklyapples can withstand an increase of soil salinity, we performed germination trials with increasing salt concentrations using seeds from three populations across the species range. Additional germination trials were performed with seeds that were subject to the highest salt concentration for several weeks to test if seeds can recover after short term exposures to high salinity during storm surges.

Lindsey A. Riibe and **Jennifer E. Possley**, Fairchild Tropical Botanic Garden. "Florida's list of endangered and threatened plants overlooks dozens of fern species." riibe.lindsey@gmail.com

We propose nominating dozens of fern species to the rank of *Endangered* or *Threatened* in Florida following the Florida Department of Agriculture and Consumer Services Division of Plant Industry (FDACS) ranking system for plant species of potential special concern. Despite their rarity (or presumed extirpation from the state) to our knowledge none of these ferns have been ranked yet. Utilizing the online database, Atlas of Florida Plants (florida.plantatlas.usf.edu), we downloaded a filtered list of all the ferns native to Florida without state listed status. We then created a subset which included those species described as rare or uncommon in the Flora of Florida (Wunderlin and Hansen, 2000); this resulted in a list of 42 fern species. We then searched NatureServe Explorer (explorer.natureserve.org) to check for rank status not yet updated in the Atlas. To estimate the number of populations and range of the species in Florida, we collated all available online occurrence records from the SouthEast Regional Network of Expertise and Collections (SERNEC, sernecportal.org), the Global Biodiversity Information Facility (GBIF, gbif.org), and iNaturalist (inaturalist.org). Here we present a brief overview of our results and the ferns we propose to nominate, with the intention of soliciting input on these nominations from the Florida Rare Plant Conference attendees.

Brian J. Sidoti, Fairchild Tropical Botanic Garden, **Erin N. Bodine**, Rhodes College, **Eduardo Cordoves**, BioTECH at Richmond Heights High School, **Nataly Irias**, BioTECH at Richmond Heights High School, **Isabella Mendizabal**, BioTECH at Richmond Heights High School, **Jean Moreno-Gongora**, BioTECH at Richmond Heights High School, **Sabine Wintergerst**, Fairchild Tropical Botanic Garden, **Brad Oberle**, New College of Florida, **Jolynne Woodmansee**, BioTECH at Richmond Heights High School, **Jamie Anderson**, Fairchild Tropical Botanic Garden, and **Rachel S. Jabaily**, Colorado College. "Vegetative vs. Reproductive Mass Comparisons of Two Florida Native Bromeliads."
bsidoti@fairchildgarden.org

Tradeoffs between reproduction and survival predict contrasting reproductive strategies for plants and animals. Florida's native bromeliads are an ideal model system for studying two different reproductive approaches. *Tillandsia utriculata* (Giant air plant) has a semelparous reproductive strategy, meaning there is one single, fatal reproductive episode that produces abundant quantities of seeds; whereas, *T. fasciculata* (Cardinal air plant) is iteroparous, meaning that the genet can sexually reproduce many times in its lifetime, but in smaller numbers. While both species are classified as state endangered due to the effects of *Metamasius callizona* (an invasive weevil introduced to our state in the year 1989), *T. utriculata* is more vulnerable given its semelparous reproductive strategy. Previous research at Colorado College (CC) showed multi-ramet iteroparous bromeliads have similar reproductive effort (the percentage of total biomass devoted to reproductive tissue) ranges, regardless of morphology. The goal of our study was to better understand the life history of bromeliads using wild collected native bromeliads at Fairchild Tropical Botanic Garden. We measured the vegetative and reproductive mass of *T. utriculata* and *T. fasciculata* and compare our findings to greenhouse plants at CC. This study allows us to hypothesize that semelparity in bromeliads evolves repeatedly via the reproductive effort model.

Brian J. Sidoti, Fairchild Tropical Botanic Garden, **Rachel S. Jabaily**, Colorado College, **Andy Diaz**, BioTECH at Richmond Heights High School, **Brandon Easler**, BioTECH at Richmond Heights High School, **Emiliana Nunez Montas**, BioTECH at Richmond Heights High School, **Mia Rodriguez**, BioTECH at Richmond Heights High School, **Sofia Purchon-Cantel**, BioTECH at Richmond Heights High School, **Amanda Torrecilla**, BioTECH at Richmond Heights High School, **Sabine Wintergerst**, Fairchild Tropical Botanic Garden, **Brad Oberle**, New College of Florida, **Jolynne Woodmansee**, BioTECH at Richmond Heights High School, **Jamie Anderson**, Fairchild Tropical Botanic Garden, and **Erin N. Bodine**, Rhodes College. "Comparison of Seed Counts of Two Native Bromeliads: Strategies and Recommendations"
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While the relationship of seed count as a proxy for fitness remains controversial, it is one of the easiest ways to collect data. Fairchild Tropical Botanic Garden (Fairchild) has several state-threatened bromeliads growing naturally on its campus. Through the BioTECH high school program at Fairchild, we examined different approaches to counting seeds per fruit and the number of seeds per plant of *Tillandsia utriculata* (Giant air plant) and *T. fasciculata* (Cardinal

air plant). The goal of our research is to better predict the number of seeds per fruit and fruits per plant using various methodological strategies. We compare our results with previously published work and those of past BioTECH students. Preliminary results from last year showed an estimated approach similar to the actual seed count per plant. *T. fasciculata* seed count data, not previously collected by BioTECH students, will be presented. Finally, we provide an update on germination and survivorship rates of large, long lived epiphytic bromeliads. Our research supports fundamental baseline data needed by researchers at Rhodes College who are modeling the long-term viability of these state-endangered plants threatened by *Metamasius callizona*.

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"Technical summary of the reintroduction of *Jacquemontia reclinata* (Beach clustervine) and the importance of Coastal Strands in Palm Beach and Miami-Dade counties".
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Since 2019, The Institute for Regional Conservation (IRC) and Fairchild Tropical Botanic Garden (FTBG) have collaborated to recover the federally endangered *Jacquemontia reclinata* (Beach clustervine)-- a perennial vine with white to light pink flowers which represents both the beauty and fragility of our coastal ecosystems. It only occurs in coastal strand, a habitat that lies between beach dunes and maritime hammocks along Florida's coast. For decades, the coastal strand habitat was subject to development, fragmentation, and degradation, and therefore Beach clustervine's available habitat has become smaller and smaller. IRC and FTBG are determined to keep this species as part of the flora of Florida's southeastern coast. In Palm Beach County, we implemented restoration activities, reintroduced Beach clustervine, and monitored its populations at multiple sites (Delray Municipal Beach, Atlantic Dunes Park, Red Reef Park, South Beach Park, and Spanish River Park). In Miami-Dade County, we collaborated on restoration activities at Virginia Key North Point and Crandon Park. Restoration activities include the removal of non-native invasive plants such as *Scaevola taccada* (Beach naupaka) and large-flower Mexican clover (*Richardia grandiflora*) as well as the reduction of encroaching native plant species, including *Coccoloba uvifera* (Seagrape), *Dalbergia ecastaphyllum* (Coinvine), and *Caesalpinia bonduc* (Gray nicker-bean). IRC, FTBG, and others are developing and testing the best ecological restoration methodologies to reestablish coastal strand ecosystems and repopulate this important habitat to benefit a wide array of species like the Beach clustervine.

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Special Publication 59, "Florida Geomorphology Atlas," is a digital publication of the Florida Geological Survey. It is the first comprehensive discussion of landforms in Florida that relates feature origin to underlying geology. It employs LiDAR digital elevation models, aerial and satellite imagery, and geologic data in a geographic information systems environment. The

interactive WebApp map defines discrete geomorphic boundaries, and accompanying text discusses landforms with respect to the geology and the key geologic processes common to environments in Florida: coastal, fluvial, and karst. Florida is divided into 10 regional districts which are subdivided into a total of 71 provinces. Classification is based upon landform similarities, relationships to surrounding features, and geologic processes. The spatial polygon data are available for download, and while not intended for site specific use, the associated text provides descriptions helpful for one learning about the geology and landforms of regions in Florida. These polygons can also be useful for recognizing areas where ancient coastal environments have impacted the landforms or where coastal, aeolian, fluvial, and karst processes are actively impacting the land surface. While not defined and written primarily for ecological reasons, there will be certain overlap between districts and provinces and particular communities, more likely at the subregional province level than at the district level due to broader variation of the geology and geological processes in play over the larger districts. Discussion within the texts also includes places to access and experience landscapes and landforms in the districts and provinces.