Abstracts 2016 Florida Rare Plant Task Force Meeting

ORAL PRESENTATIONS

Patti Anderson, Florida Department of Agriculture and Consumer Services, Division of Plant Industry, "Regulatory Challenges for Florida's Rare Plants: Political Science meets Natural Science." Patti.Anderson@FreshFromFlorida.com

The State of Florida protects endangered, threatened, and commercially exploited plant species by listing them in Rule 5B-40. This rule provides the authority to regulate harvesting, movement and nursery propagation and sale of listed species. The challenges to plant protection under our state laws include the facts that rule does not prohibit owners from destroying listed plants on their own property and does not provide for setting aside critical habitats. How can we attempt to deal the challenges?

-Understand the process of listing and reviewing plant status by the Endangered Species Advisory Council (EPAC)
-Give information to EPAC about currently listed plants and those that should be added
-Try to convince state legislators that more protection, funding and enforcement are needed

Perhaps each of us could convince our local state legislators to adopt a rare plant or at least meet one face to face.

Danielle L Green, Naples Zoo at Caribbean Gardens & Association of Zoological Horticulture "AZH Plant Conservation Grant Program and opportunities to support Florida's rare plants" Danielle@napleszoo.org

AZH is an organization of professional horticulturists that work in the specialized field of zoo horticulture. AZH works to highlight the importance of plants within zoos and aquariums, and seeks to support the horticulturists who work in a zoological setting. Zoo horticulture involves more than enhancing the landscape for its resident animal populations as evidenced by the thousands of dollars used to protect and conserve the natural environment within our zoos and around the world.
One of the core values of the Association of Zoological Horticulture is conservation of rare plants and plant diversity. The commitment of AZH toward these efforts is evidenced by the AZH plant conservation grant program. This grant program began in 1992 and has since awarded close to $300,000 in funding to projects that span the country and the globe.
Grant projects range from in-situ/ex-situ plant conservation projects to invasive plant eradication and habitat restoration. The intent of the grants is to support and promote AZH members participation in plant conservation within their institution and surrounding communities.
AZH has actively participated in projects with the Georgia Plant Conservation Alliance on *Rhus michauxii* and prescribed burning for habitat restoration and will be supporting conservation efforts for Florida's most endangered epiphytic plants in the Fakahatchee Strand Preserve State Park, a proposal submitted by Atlanta Botanical Garden for 2016.

Héctor E. Pérez and **Michael E. Kane**, University of Florida Department of Environmental Horticulture, Plant Restoration & Conservation Horticulture Research Consortium, "Desiccation and cryo-freezing tolerance in seeds of two geographically distant *Uniola paniculata* (Poaceae) populations" heperez@ufl.edu

Seed provenance is an important consideration for germplasm conservation management that has been shown to influence desiccation and freezing tolerance. Here, we

focus on potential population effects with respect to desiccation and cryo-freezing tolerance of an important coastal dune grass in need of conservation. We collected seeds from wild populations of *Uniola paniculata* (Poaceae) separated by 465 km. Seeds from both populations maintained relatively high initial germination (DWP = 83%, LTI 48%) following post-harvest storage for 3 months within a non-climate controlled shed (ca. 9-28°C; 59-93% RH). Seeds of DWP and LTI displayed initial moisture contents of 0.14 and 0.16 g g^{-1} which corresponded to water potentials of –94 and –60 MPa, respectively. Seeds of both populations exhibited water sorption isotherms similar to those of desiccation tolerant seeds. Germination was nearly complete (> 84%) and relatively rapid (t_{50} range 2-4 d) for DWP seeds equilibrated to low water potentials (–12.9 to –797.5 MPa). The germination response of LTI seeds equilibrated to the same water potentials was comparatively lower (63-85%) and delayed (t_{50} range 5-14d). Germination was not considerably reduced for seeds of DWP (78-93% germination, t_{50} 2-4 d) or LTI (59-80%, t_{50} 4-20 d) following exposure to any combination of desiccation or cryo-freezing (1, 60, or 1,440 minutes) stress. We conclude that seeds of both *U. paniculata* populations are desiccation and cryo-freezing tolerant. Therefore, genebank storage seems feasible for seeds of this species.

Brittany Harris, Florida International University. "Pesticides and pollinators of imperiled plants of the Lower Florida Keys." Bharr063@fiu.edu

Conservation management strategies for imperiled plants should consider plant-pollinator interactions in recovery planning. Pollinators promote genetic diversity via sexual reproduction and outcrossing, thereby improving plant fitness, a goal for stabilizing rare populations. National Key Deer Refuge, in the Lower Florida Keys, is a heterogeneous landscape that contains many endemic flowering plants. The refuge is intermittently dispersed between urban developments that spray insecticides year-round for mosquito control. Extensive studies show that broad spectrum insecticides negatively affect non-target invertebrates, including pollinators; however, indirect effects on plant reproduction have not been documented in conservation areas.

We chose three imperiled species of native plants throughout three islands in the Lower Florida Keys to investigate direct and indirect effects of mosquito insecticide on flower visitor activity and plant reproduction (fruit set). Our hypothesis: flowers open following an insecticide application would have lower visitation rates and fruit set than flowers open at unsprayed sites. As expected, open flowers at treatments sites had a decreased visitor rate, but only obligately entomophilous species had significantly reduced fruit set. Automatic self-pollination is a common fail-safe mechanism in short-lived herbaceous plants when efficient pollinators are sparse, and this mechanism is apparently operating in one species, *Linum arenicola*. For rare plants, however, reliance on selfing can constrain genetic diversity, and this mechanism may mask ecological instability, such that populations may be apparently viable but declining. Conservation management for rare flowering plants should therefore consider habitat quality for pollinators by including buffer zones from drift and restricting spray routes to dense residential neighborhoods.

James J. Lange Fairchild Tropical Botanic Garden, "Addressing Challenges in the Conservation of the Key Tree Cactus (*Pilosocereus robinii*)." jlange@fairchildgarden.org

The Key Tree Cactus (*Pilosocereus robinii*) is a federally-endangered columnar cactus endemic to the Florida Keys that is typically found growing on exposed limestone less than 1m in elevation within the transition zone from mangrove to tropical hardwood hammock. Since 1994, there has been an over 90% decline throughout its range, with the largest declines taking place on Big Pine Key. We have been monitoring wild populations on protected land since 2007, and most populations are in decline. Habitat loss to development surely was the primary factor

limiting the species to so few populations, but even on protected land the challenges to existing populations continue to mount. Storm surges from Hurricane Wilma are thought to be the cause for the major die-off on Big Pine Key, and the imminent threat of sea-level rise (SLR) makes more die-offs likely in the near future. Observed rates of wild recruitment and dispersal offer little hope for the survival of this species without intervention. FTBG currently maintains a living *ex-situ* collection in addition to stored seed, and has conducted experimental reintroductions at two sites addressing multiple concerns. We are interested to see if cacti can establish at higher elevations, safeguarding them at least temporarily from SLR, and how much influence the surrounding canopy has on survival, growth, and reproduction. We are also looking for underlying effects of lineage on growth and survival.

Kristie S. Wendelberger, **Daniel Gann**, and **Jennifer H. Richards,**Florida International University. "The effects of sea level rise and anthropogenic change on coastal rare plant communities" kwendelberger@yahoo.com

In combination with sea level rise (SLR), the Everglades ecosystem has undergone large-scale drainage and restoration, changing coastal vegetation throughout south Florida. Upland coastal communities in Everglades National Park (ENP) maintain 21 rare plant species that are threatened by SLR, including the federally endangered plant *Chromolaena frustrata*. Has the spatial extent and distribution of coastal plant communities harboring rare plant species diminished over time? We utilized remote-sensing techniques to create a map of coastal plant communities in 2011 and compared it to one made from 1978, aerial imagery, 33 years prior. We found that lowland plant communities moved up the coastal elevation gradient into lands once covered by upland communities. White mangrove forest decreased 16% and black and red mangrove forests increased 27 and 11%, respectively, suggesting the area became saltier and wetter. Additionally, tropical hardwood hammock and buttonwood forest, the two highest-elevation communities harboring the most coastal rare plants, decreased by 4 and 6%, respectively. Our map shows that in 2011, the ENP coastal communities were still quite diverse, maintaining a complex matrix of black and red mangrove forests, halophyte prairie, two buttonwood communities (glycophyte and halophyte), white mangrove forest, and tropical hardwood hammock. However, if the losses in upland communities continue, there will be a decrease in species and community diversity along the ENP coast, increasing threats to rare plant species found there. If we want to preserve biodiversity and ecosystem integrity, the effects of SLR and Everglades drying on coastal south Florida should be addressed immediately.

Melissa Tolbert and **David Witmer,** Palm Beach County Department of Environmental Resources Management, “Survey, Monitoring and Demographics of *Asimina tetramera* on the Juno Dunes Natural Area (Year 1 – South Parcels).” mtolbert@pbcgov.org

The federally endangered four-petal pawpaw, *Asimina tetramera* Small, is a perennial shrub, limited to scrub habitats in three disjunct areas of Martin and Palm Beach Counties on the Atlantic Coastal Ridge in southeast Florida. Detection of population trends is needed to determine *Asimina tetramera* status and very little demographic data are available. Population trends may be based on estimates of age structure. Continuous studies over a long time period are needed to accurately determine the age class structure and the long term viability of this species. The Juno Dunes Natural Area (569 acres) is the largest tract of Atlantic Coast Ridge scrub left in Palm Beach County and critical habitat for the four-petal pawpaw. During the summer of 2015, the southern parcels of the Juno Dunes Natural Area were surveyed by implementing the monitoring protocol developed by Anne Cox and Marjorie Shropshire to determine age class structure (6 categories from seedlings to senescent adults) and noting any

observations of plant stress. The majority of the population can be categorized as reproductive adults. The recruitment rate and number of senescent adults is very low. The study also compared the reproductive status and plant condition by management unit which will be used to prioritize management actions.

Angela Ricono, Bok Tower Gardens and Florida Institute of Technology, "Population Genetic Analysis of a Rare and Endangered Legume; *Lupinus aridorum*, and Two Close Congeners." aricono2011@my.fit.edu

Lupinus aridorum (*L. aridorum*), a federally listed legume, has experienced a drastic decline from 45 populations to nine, six of which are wild. With low survivorship of introduced populations as well as amongst individuals in greenhouse settings, understanding imperative genetic parameters is paramount to successful proliferation and proper conservation management practices for an increasingly rare and endangered species such as *L. aridorum*. We used a population genetics approach to examine the genetic diversity and connectivity among populations of *L. aridorum* and between *L. aridorum* and two close congeners (*L. westianus* and *L. diffusus*) to aid in conservation efforts. We found low levels of genetic diversity for all *L. aridorum* populations, in comparisons with the abundant *L. diffusus*, with at least one population showing moderate to high selfing rates. Genetic diversity was found to be positively correlated with increasing habitat size, thus suggesting that further fragmentation and compression of current habitats will continue to decrease their already low genetic diversity. This is especially problematic for this species as present habitats lie directly within two of the nation's top 50 fastest growing counties. Further, *L. aridorum* is currently described by the IUCN as a variant of *L. westianus*; however, after running several data analyses to characterize the population structure of both organisms as well as the level of gene flow between them, our findings show that they are currently not connected and should be managed as separate species, including a separate IUCN listing for *L. aridorum*.

Stephanie M. Koontz and **Eric S. Menges**, Archbold Biological Station, "Demography of *Chrysopsis highlandsensis*: 16 years of data, trends, experiments, and discoveries." skoontz@archbold-station.org

Chrysopsis highlandsensis (Highlands Golden Aster) is a Lake Wales Ridge endemic and state-listed herb occurring only in Highlands and southern Polk counties. Described in 2002, it is known to occur on four protected sites, private land and roadsides. Rangewide surveys have shown populations vary from a few individuals (<10 plants) to thousands and that population trends are strongly linked to location. Demographic data has been collected quarterly at three protected sites since 1999. Seedlings have recruited year-round with peak recruitment occurring in March (mean 3 seedlings per 10 m^2), but vary quarterly (<1 to 12 seedlings per 10 m^2). Seedling survival was low (43% mortality <1 year) and 84% of plants never reached reproductive maturity (3 years or older). Of plants that did reach reproductive maturity, 88% flowered once, 10% flowered twice and 2% flowered three or more times, indicating *C. highlandsensis* is not strictly semelparous. Seed ecology experiments have shown that, although most seeds that germinate do so quickly, *C. highlandsensis* is capable of forming a persistent seed bank for up to two years. Germination in the lab (20-30%) has been more successful than in the field (<1% - 9%). Manipulative experiments suggest germination is stimulated by smoke and the ideal seedling microsite includes partial shading. Unlike other scrub endemics, the post-fire environment does not favor *C. highlandsensis* with few plants resprouting and low seedling recruitment. Typically, *C. highlandsensis* occurs in areas with current or past anthropogenic disturbance, but fire may keep sites open enough for populations to persist.

Eric S. Menges, Archbold Biological Station, **B. Pace-Aldana**, The Nature Conservancy, **Sarah H. Crate**, Archbold Biological Station, and **Stacy A. Smith**, Archbold Biological Station,
"Ecology and Conservation of the Endangered Legume *Crotalaria avonensis* in Florida Scrub."
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We analyze the ecology of the highly endangered Florida scrub plant *Crotalaria avonensis* (Avon Park harebells) based on data collected from 1998-2014. This perennial herbaceous legume occurs at 3 sites and prefers microsites with less vegetation cover and more bare sand. At an unprotected site, populations have declined in size, but dynamics have been more stable at the 2 protected sites. Marked plants have shown high survival, slow and inconsistent growth, and occasional plant dormancy (usually 1-2 years). *C. avonensis* is reproductively challenged, with very low rates of fruit set and infrequent visitation by required pollinators. The hard seeded fruits germinated at 13-56%, with scarification increasing germination rate. Unscarified seeds formed a persistent seed bank for at least 3 years. Seedlings recruited rarely, had moderate survival, began flowering at 4 years of age or later, and reached the size of median adult plants in 6-8 years. Herbivores affected 7-53% of plants in a given year, but plants showed rapid compensatory resprouting. Caging plants reduced herbivory and increased survival, growth and flowering. Plants resprouted after fire and mechanical disturbance with higher survival and growth, but repeated disturbances by vehicles caused increased mortality. *C. avonensis* remains extremely endangered due to its limited range, small population sizes and miniscule seedling recruitment. We recommend fire management, protection from herbivory, and introductions and augmentations to help this species recover.

Houston Snead, Horticulture Technician II, Jacksonville Zoo and Gardens, "United We Stand, Divided We Fall." sneadh@jacksonvillezoo.org

There are many different organizations and individuals in Florida working to safeguard plant species and manage populations both in situ and ex situ. However, Florida is lacking a cohesive plant conservation network. Neighboring states have started banding together to work towards the goal of no local extirpations. The Georgia Plant Conservation Alliance was started 20 years ago with just a handful of member organizations and no more than 10 target species to safeguard. Now they are close to 100 species in safeguard and 49 of those have been reintroduced from ex situ collections to in situ management areas. The GPCA has collected a wide variety of members, some of which include utility companies, universities, zoos, government agencies, and private land owners. A Florida alliance can be an effective tool in ensuring that no priority species fall through the cracks and no projects are being duplicated. The ability to network under one umbrella will provide partners with the opportunity to share information, provide funding, and greater access to volunteer support. For those that want to be involved in plant conservation but lack the personal or institutional resources, a Florida plant conservation alliance would be a place they can get involved at their current level of expertise or funding and contribute to conservation in a way they wouldn't be able to on their own. The goal of this talk is to recognize a need, and ask the group what we are going to do about uniting plant conservation in Florida.

Marc C. Minno, Eco-Cognizant, Inc., 600 NW 35th Terrace, Gainesville, FL 32607, **Steve Mortellaro**, US Fish and Wildlife Service, 1339 20th Street, Vero Beach, FL 32960 **Lori Miller**, USFWS and **Maria Minno,** Eco-Cognizant

John Bartram and his son William Bartram journeyed to Florida together in 1765-1766, Harper (1942) published John Bartram's diary, which included a brief mention of a gourd (Okeechobee gourd) growing along the St. Johns River. Years after the Bartrams' first trip, William Bartram returned to Florida. Again he observed Okeechobee gourd growing in swamps along the middle St. Johns River. William gave the name *Cucurbita peregrina* to this gourd (Bartram 1791), but did not designate and voucher a type specimen. Thus, that name is not scientifically valid (Andres and Nabhan 1988). It wasn't until the early 1900's that the gourd was seen again. John K. Small found the gourd much further south, along the southern shore of Lake Okeechobee (Small 1914, 1918). The Okeechobee gourd was formally described by Small in 1930 as *Pepo okeechobeensis*. That same year, Liberty H. Bailey transferred the gourd into the genus *Cucurbita*. One of the main characteristics distinguishing the Okeechobee gourd is the pale, cream colored flowers. Other gourds usually have deeper orange-yellow flowers. The Okeechobee gourd was listed by the U.S. Fish and Wildlife Service (Service) as endangered on July 12, 1993. At that time, it was only known to survive in a few places in southern Florida. However, the following year Marc Minno, Palmer Kinser, and Gregory Dambek rediscovered the Okeechobee gourd along the St. Johns River some 200 years after the Bartrams' discovery (Ward and Minno 2002). Little scientific information is known concerning the reproduction, growth and survival of the Okeechobee gourd. We are investigating methods of establishing experimental populations of the Okeechobee gourd at the Loxahatchee Impoundment Landscape Assessment (LILA) wetland research facility, a part of the Arthur R. Marshall Loxahatchee National Wildlife Refuge west of Boynton Beach, Florida.

Eric von Wettberg Florida International University, , Department of Biological Sciences and International Center for Tropical Botany, Miami, FL, USA. **Tonya Fotinos** FIU and Panola College, **Emily Warschefsky** FIU and Fairchild Tropical Botanic Garden, **Nora Oleas** Centro de Investigación en Biodiversidad y Cambio Climático (BioCamb), Ingeniería en Biodiversidad y Recursos Genéticos, Facultad de Ciencias de Medio Ambiente, Universidad Tecnológica Indoamérica, Avenida Machala s/n y Sabanilla, Quito, Ecuador EC170103, **Cheryl Peterson** Bok Tower Gardens, and **Vivian Negron-Ortiz** USFWS. "Genomic approaches to Florida Conservation Genetics" ebishopv@fiu.edu

Molecular genetic information has become increasingly useful for conservation planning. Various DNA polymorphisms can be used to delineate management units and species boundaries, assess levels of inbreeding and clonality, and estimate the extent of population bottlenecks. Emerging DNA sequencing approaches such as restriction site associated DNA sequencing (RAD-seq) are rapidly facilitating the development of large (≥1000) marker datasets for any organism of interest. We will outline different approaches to developing molecular markers, and then give applied examples from several endangered Florida species including the Keys Tree Cactus, *Pilosocereus robinii*; the Miccosukee Gooseberry, *Ribes echinellum*; Harper's Beauty, *Harperocallis flava*; Ocala's Vetch, *Vicia ocalensis*; and narrowleaf hoarypea, *Tephrosia angustissima*. We will compare benefits of different marker systems from data richness, ease of development and analysis, and cost. Overall we advocate for the widespread use of emerging marker approaches, due to greater data depth and better platforms for maintaining data in open-source repositories after the completion of projects.

Dennis Giardina, Everglades Region Biologist, Florida Fish and Wildlife Conservation Commission, **Mike Owen**, Park Biologist, Fakahatchee Strand Preserve State Park, **Jennifer Cruse-Sanders**, Vice President of Science & Conservation, Atlanta Botanical Garden, **Matt Richards**, Conservation Coordinator, Atlanta Botanical Garden, **Hong Liu**, Associate Professor,

Florida International University. “The Experimental Restoration of Extirpated Orchids in the Everglades and Big Cypress Basin.” Dennis.Giardina@MyFWC.com

In the autumn of 2012, Florida biologists Mike Owen and Dennis Giardina attended an orchid conservation conference organized by the University of Pinar del Rio and held at Orquideario de Soroa Botanical Garden in Artemisa Province, Cuba. There they presented a paper on their efforts to experimentally increase the populations of *Cyrtopodium punctatum* and *Prosthechea boothiana*, two rare orchid species at Fakahatchee Strand Preserve State Park in collaboration with Dr. Jenny Cruse-Sanders and Matt Richards of Atlanta Botanical Garden and Dr. Hong Liu of Florida International University. During the conference, they initiated a collaborative effort with Cuban botanists Dr. Rolando Pérez and Leyaní Caballero-Tihert to experimentally re-introduce two of Fakahatchee Strand’s extirpated orchid species, *Bulbophyllum pachyrachis* and *Epidendrum acunae* and two of the Eastern Everglades extirpated orchid species, *Brassia caudata* and *Macradenia lutescens*, using seeds collected from the nearest extant populations of these four species in Western Cuba. This presentation will recount the odyssey to find Florida’s “lost orchids” and bring them back.

POSTERS

Andre Naranjo & Pamela Soltis, Florida Museum of Natural History, “Dicerandra: Understanding Past Distributions” aanaranjo@ufl.edu

Dicerandra (Lamiaceae) comprises nine species (*Dicerandra christmanii, Dicerandra cornutissima, Dicerandra densiflora, Dicerandra frutescens, Dicerandra fumella, Dicerandra immaculata,Dicerandra linearifolia, Dicerandra modesta, Dicerandra thinicola, Dicerandra radfordiana*) endemic to the southeastern United States. Species of *Dicerandra* are threatened or endangered and restricted to sand hill vegetation and a mosaic of scrub habitats, with some species (*D. cornutissima*, *D. thinicola*, *D. immaculata*, *D. frutescens*, *D. christmanii*, and *D. radfordiana*) being restricted to one or two sites in peninsular Florida and Georgia. Using locality and specimen data from iDigBio and other sources, we have applied ecological niche modeling to investigate shifts in abiotic niche space among species. Such shifts may have served as isolating mechanisms associated with speciation. These results will be used to reconstruct ancestral niche spaces when sea levels and climate were markedly different. We will make inferences on the possible ecological shifts and niche diversifications associated with speciation that have occurred during the evolution of the genus.

Eric von Wettenberg, Florida International University, “Conservation Genetics of *Vicia ocalensis*” eric.vonwettenberg@fiu.edu

Effects of Soil Mixture and Planter Type on *Pinus Ellioti Var. Densa* Plantlets
Vanessa Jean Francois, Jose Calera, Carlos Vazquez, and Dora Pilar Maul. School of Science, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054

Contrasting Effects of Vermiculture-based Fertilizers on Development of *Eruca sativa*
Luis Alfredo Cendan, Vanessa Jean Francois, and Dora Pilar Maul
School of Science, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054

***In vitro* citrus micropropagation as a potential system for the study of Huanglongbing disease (HLB).** Jose Calera (1), Dora Pilar Maul (1), T. Greg McCollum (2). (1) St. Thomas

University, 16401 NW 37th Ave, Miami Gardens, FL 3354, (2) USDA-ARS-US Horticultural Research Laboratory, 2001 S. Rock Rd., Fort Pierce FL 34945.

Evan Craine, Archbold Biological Station, “Adapt or Die: Response of an Invasive Forb to Harsh Conditions” evan.craine@gmail.com

Olivia Karas, Archbold Biological Station, “Flame or Fortune: A Tale of Wiregrass Under Fire-Supression” Olivia.karas@gmail.com

Jennifer Cruse-Sanders, Atlanta Botanic Garden, “Rare Plant Conservation and Restoration of Pitcher Plant Bogs Across the Southeastern Region of the United States” jsanders@atlantabg.org

Dave Bender, USFWS, “Florida Semaphore Cactus and the Keys” david_bender@fws.gov