SPEAKER ABSTRACTS

THE STORY OF A SURVIVOR: THE WEST TEXAS OAK, *QUERCUS HINCKLEYI* C.H. MULLER

Janet Rizner Backs
University of Illinois – Chicago

Quercus hinckleyi C.H. Muller is listed as a threatened species under the U.S. Endangered Species Act and by the state of Texas and is identified as 'critically threatened' on the IUCN Red List. It has survived over the past 10,000 years in a region in which the climate has become increasingly xeric. Its U.S. range is now limited to a handful of populations in one county in West Texas. Low levels of genetic variability, inbreeding, and limited gene flow are three possible threats to small, isolated plant populations such as *Q. hinckleyi*. The U.S. Fish and Wildlife Service lists small numbers, possible hybridization, human activities, herbivory and insect predation as on-going concerns. Microsatellites were used to genotype ramets collected from three locations in Presidio County, Texas, that represent all known occurrences of *Q. hinckleyi* to determine genetic variability, population structure, clonal growth, and levels of introgression by two potential hybridizing species, *Q. pungens* and *Q. vaseyana*. Genetic diversity for *Q. hinckleyi* was high and no evidence of inbreeding was found. Population structure analyses showed two distinct subpopulations with significant differentiation, unique alleles and genetic clustering. High clonality was discovered at the two smallest sites, with only seven unique genotypes among 58 ramets sampled. Sexual reproduction appears to be present at the other sites, as indicated by less extensive cloning. While there is some hybridization, there was no evidence of genetic swamping. The level of genetic diversity and differentiation among the remaining *Q. hinckleyi* sites warrants protection and preservation of all.

EFFECTS OF SOIL AMENDMENT APPLICATIONS ON RESTORATION OF NATIVE PRAIRIE PLANT COMMUNITIES

Heather Bass
Botanical Research Institute of Texas

In 2011 the Botanical Research Institute of Texas (BRIT) completed construction on a new facility, replacing a former public health building. At this time, BRIT began the process of rehabilitating an area of just less than 3 acres behind the new building. The objective was to establish a functional prairie that could serve as a site for education about and celebration of the native ecosystem of the area. However, the existing soil was of poor quality and compacted from construction. Several options for soil remediation were identified and a research project was developed in order to observe and measure the alternative approaches. Two different substrates were chosen for addition to the existing soil to facilitate soil remediation: biological soil amendments and living prairie soil from a local native prairie remnant. The prairie was divided into four research plots, having one area treated only with biological amendments, one treated only with living soil, one treated with both, and one control with no treatment. Plant

community compositions were examined in each experimental treatment over 3 years to compare the effectiveness of each soil amendment treatment and to track the overall progress of prairie restoration. This talk will discuss the results of this experiment and recommendations for successful native prairie ecosystem restoration and conservation.

DEVELOPING SEED SOURCES OF NATIVE PLANT ECOTYPES FOR MONARCH AND POLLINATOR RESTORATION

Chris Best
U.S. Fish and Wildlife Service

The growing public awareness and recent focus of conservation agencies on pollinators, and specifically monarch butterflies, elevates the conservation of native plant diversity since we cannot otherwise conserve pollinators. In October 2014, Director Dan Ashe tasked USFWS to create Regional monarch conservation teams, develop priorities, and initiate effective monarch conservation as quickly as possible. Logically, the highest priority and greatest cost-benefit is the conservation and appropriate management of extant habitat. We are also supporting projects with Lady Bird Johnson Wildflower Center, NRCS, and South Texas Natives (Texas A&M Kingsville) to develop seed sources of important nectar plants and native milkweed ecotypes; this will make it possible to restore habitats with locally adapted ecotypes. The development of rights-of-way for highways, power lines, pipelines, and seismic surveys, oil and gas exploration, and wind energy development will inevitably continue in Texas. If native grass and forb species are not commercially available in bulk quantities, these swaths of disturbed lands will continue to be revegetated with non-native, often invasive plants, proliferating the foci of their invasions into remaining intact habitats. Habitat restoration is also increasingly important in creating ecological corridors in fragmented habitats. The development of seed sources of native plant ecotypes must be accomplished synchronously with the growth in demand. In Texas and elsewhere, this must also involve extensive, voluntary private landowner participation. These are not quick fixes to the declines of monarchs and pollinators in general, but are components of long-term pollinator conservation, and will require sustained, consistent promotion and appropriate policies of conservation agencies and organizations.

THE FEDERAL POLLINATOR AND MONARCH BUTTERFLY CONSERVATION INITIATIVE

Katie Boyer
U.S. Fish and Wildlife Service

In June of 2014, President Obama released the Presidential Memo for Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators. A decline in the total area occupied by monarchs at their overwintering grounds in Mexico from approximately 18 hectares in 1996-97 to an all-time low of 0.67 hectares in 2013-2014 prompted the development of this Presidential memo. These events initiated what has since blossomed into an international movement to protect monarch butterflies and other pollinators. Since that time, the U.S. Fish and Wildlife Service was petitioned to list the monarch butterfly as a

threatened species under the Endangered Species Act. The Service is now analyzing the status of the monarch butterfly in order to meet the June 2019 deadline for releasing a 12-month finding in the Federal Register. In addition, the White House released the May 2015 Federal Pollinator Health Strategy that outlines specific conservation goals for monarch and pollinator conservation actions. This strategy calls upon all Federal agencies and Americans to work together to achieve three primary goals: (1) reduce winter honey bee colony losses to 15 percent within 10 years; (2) increase the eastern migratory population of monarch butterflies to 225 million individuals; and (3) restore or enhance 7 million acres of pollinator habitat. This historical context, along with increasing engagement from an immense array of conservation partners, has set the stage for conservation delivery, expanded education and outreach, development of unique partnerships, and an increasing focus on scientific research, all focused on pollinators. As a result, grassland/prairie improvement projects and enhanced or diversified plant communities have garnered increased attention as part of the pollinator movement.

ROADSIDE SURVEYS OF MILKWEEDS IN TEXAS

Janis Bush, Tyler Seiboldt, Julian Chavez and Hector Escobar
University of Texas - San Antonio

Milkweed (*Asclepias*) are the sole source of food for monarch butterfly (*Danaus plexipus*) larvae. On the migration north from Mexico to the northern United States and southern Canada, adult monarchs lay eggs on native Texas milkweed. We conducted roadside surveys from north to south Texas, and east to west Texas. Surveys were conducted in the summer and fall of 2015, and spring of 2016. In the summer of 2015 north to south transects, four species of milkweed were found. Antelope horn milkweed (*A. asperula*) was found in the largest abundance (100 stems) in three locations in the Edwards Plateau region in central Texas. In the spring of 2016 north to south transect, we found three species of milkweeds; there were many more than the previous year (over 500 stems) in several locations in central Texas. In the fall 2015 east to west transect, we found two species of milkweed, antelope horn and green milkweed (*A. viridis*). The abundances were very low (< 14 stems). In the spring of 2016 east to west transect, we found three species. Abundance of antelope horn in the Edwards Plateau was in some areas as much as 200 stems and green milkweed was as high as 100 stems in two locations in east Texas. Zizotes milkweed (*A. oenerthoides*) was less than 50 stems in central Texas. An understanding of the distribution and abundance of these native milkweed may help focus restoration efforts and help in understanding if weather patterns may control the abundance and distributions.

CONSERVATION GENETICS OF SHINNERY OAK: BACKGROUND, SAMPLING STRATEGY, AND DNA PROTOCOLS

Charles Cannon, Mackenzie Coden and Drew Duckett
The Morton Arboretum, IL

Quercus havardii (Fagaceae) is unique because it primarily reproduces clonally and hybridizes

readily with related species. Human disturbances in its southwestern American range are causing population declines. We have initiated a project to assess its conservation status, collect samples across its distribution, and gather observations about its basic biology. This oak often persists on very poor, deep sandy soils in arid environments, adapting well to a very harsh habitat. As a first step, we will examine the spatial and taxonomic distribution of genetic variation in the species, work to better understand its genetic delimitation and interaction with other sympatric oak species, and determine the most effective management options to prevent further population loss. As a very very first step, we need to be able to extract cooperative and good quality DNA from these tough leathery leaves. It is difficult to extract DNA from oaks, in general, because they contain compounds that interfere with the extraction process and can bind with the DNA. *Q. havardii* provides additional challenges due to physical properties. This study determines which combination(s) of field preservation techniques, leaf homogenization, and DNA extraction protocols yields the largest amounts of high quality DNA. Mackenzie performed a full-factorial study of these factors on *Q. havardii* and two other white oak species. She found that conditions such as chilling leaf tissue rather than drying the material, and extracting with a classic CTAB protocol rather than an extraction kit yielded higher DNA quantities. Homogenizing material with a machine yielded higher DNA concentrations than hand grinding, but at a lower quality. Further study needs to be performed to assess the purity of the DNA samples before the optimum protocol can be confirmed, but already the results have been applied to field collection and will be applied to future work on *Q. havardii*.

NATIVE WARM SEASON GRASSES FOR WINTER STOCKPILING IN WEST-CENTRAL TEXAS

Brandon Carr
USDA-Natural Resources Conservation Service

Conserving and restoring the landscape of native pastures is a challenge for producers expecting maximum production from their land. For too long, native pastures have been replaced with higher producing introduced species. Understanding the nutritive quality and forage potential of native warm season grasses offers alternatives to these introduced forages used in common pasture plantings. 'Alamo' switchgrass (*Panicum virgatum* L.*),* 'San Marcos' eastern gamagrass [*Tripsacum dactyloides* (L.) L.], 'Lometa' Indiangrass [*Sorghastrum nutans* (L.) Nash], and Oklahoma select little bluestem [*Schizachyrium scoparium* (Michx.) Nash] has been evaluated for use as a standing hay crop. Results suggest these native warm season grasses can provide an alternative to introduced species for winter grazing needs while also preforming other valuable services such as improving wildlife habitat and reducing synthetic fertilization in the environment.

ONE FOR ALL AND ALL FOR HABITAT - WORKING TOGETHER

Russell Castro and Robert Ziehr
USDA-Natural Resources Conservation Service

Commercially available native plant material is critical for economical broad-scale landscape restoration. A strategy must be developed within the scientific, government, and commercial industries to increase the availability of native flowering plants in Texas. Philosophies differ if commercially available plant material reduce genetic integrity and inhibit collaboration between industry, academia and agencies. Currently, supplies of native plant material, particularly forbs and legumes, are severely limited and ultimately impact affected wildlife. All parties involved need to develop a compromising strategy to increase acceptable plant material availability otherwise a cycle of increased threatened and endangered species will perpetuate. This discussion will explain the need for collaboration and cooperation to reach an ultimate goal of improved wildlife habitat.

REGIONAL CONSERVATION STRATEGIES - ADDRESSING BIOLOGICAL AND SOCIOLOGICAL CHALLENGES TO SAVE PLANTS

John R. Clark
Center for Plant Conservation (CPC), CA

Today more than ever, regional conservation strategies are building on local strengths to address region-specific conservation challenges. Conservation needs from state to state and region to region vary based on patterns of endemism, species diversity and ecological factors as they relate to disturbance, development and climate change. Likewise, local identity and values, proportion of private vs. public lands, and numerous socio-economic factors also vary greatly from region to region and affect how conservation is both perceived and can be implemented. Successful conservation strategies address both these challenges – the biological and sociological – to achieve lasting outcomes. Tailoring regionally effective conservation strategies is thus needed to recognize and respond to local values while advancing proven science-based principals in conservation. Drawing on successful examples in the Northeast, Southeast, Hawaii, California and others, John Clark, President and CEO of the Center for Plant Conservation will describe how science-based conservation principals are being implemented in ways that respect local values and culture. The Center for Plant Conservation is responding to this growing understanding in conservation and is more than ever focused on providing support to regional efforts in ways that are replicable, documented and sustainable while also appropriate for local needs and expectations. The goal of the CPC is not to mandate how conservation is done but rather to enhance regional efforts so that our goals in ending plant extinction are achieved on a local, national and international scale.

TEXAS ECOSYSTEMS AND VIRTUAL MAPPING

Laura Clark
Texas Parks & Wildlife Department

Texas Parks and Wildlife's Landscape Ecology Program has developed a Google maps based application, Texas Ecosystem Analytical Mapper (TEAM), to deliver the Ecological Mapping Systems of Texas (EMS) data to Texas citizens. The TEAM application is an interactive mapping tool that will assist users in understanding Texas habitats and integrate vegetation data with land management and resource planning of all types. Wildlife biologists, land managers, naturalists, planners, and conservationists are able to use TEAM to view and print the EMS data in relationship to other natural feature layers such as soils, geology, hydrology and ecoregions. Currently, TEAM allows the user to view and print custom maps and reports of habitat data from uploaded KML and shapefiles, or areas of interest drawn within the application. Other capabilities include: exporting the map and report to a pdf; and calculating the number of acres of each vegetation type within the area of interest. Future updates include improved functionality in addition to a data entry module for crowdsourcing vegetation data and individual profiles for users. TEAM supports land management and conservation approaches incorporating the most current data. It also provides an avenue for community involvement in habitat understanding.

AN ABSOLUTE GAME CHANGER FOR RARE SPECIES CONSERVATION: HOW YOU CAN BE INVOLVED IN A NEW NATIONAL INITIATIVE

Robert Denkhaus and Karly Robinson
Teaming With Wildlife: True To Texas

Teaming With Wildlife: True To Texas is a statewide coalition of conservation-minded organizations and businesses currently representing over 1 million individual Texans. With the introduction of the Recovering America's Wildlife Act (H.R. 550), TWW:TTT is poised to achieve its mission, Creating a Unified Voice in Support of Wildlife Conservation in Texas, by organizing grassroots support for the most important wildlife and rare species legislation since the 1930s. This presentation will outline how organizations and individuals can become actively involved in stimulating financial support for Texas' 1310 SGCN species, including 449 plant species and 19p rare plant communities, at the state and federal levels.

GLOBAL CHANGE AND THE CONSERVATION OF THE CENTRAL PLAINS GRASSLANDS

Philip Fay
USDA Agricultural Research Service, Temple

The Central Plains grasslands of North America once spanned the great middle of the continent from Canada to Mexico, but now are reduced to a fraction of their former range. With increasing pressures from climate change, invasive species, nitrogen deposition and other global changes, how are the remaining grasslands likely to fare in a changing world? Long-term experiments exploring the impacts of extreme rainfall events, warming, rising atmospheric CO2

concentrations, invasive grasses, and chronic nutrient loading reveal that long-term trends in rainfall will play a major role in the structure and function of grasslands; warming will advance prairie growing seasons; rising atmospheric CO2 will vary in its effects across the landscape; nutrient deposition is a threat to biodiversity and may limit the recovery of grassland biodiversity after removal of an invasive grass. A common theme from these experiments is that although global change will have observable impacts, these grasslands are resilient to variability in climate drivers, but less so to changes in nutrient availability. The best way to insure the future of grasslands is to make sure the natural drivers of grassland structure and function are operating, and to restore grasslands across their original range.

AN ABSOLUTE GAME CHANGER FOR RARE SPECIES CONSERVATION: A NEW NATIONAL INITIATIVE THAT YOU NEED TO KNOW ABOUT

Richard Heilbrun
Texas Parks & Wildlife Department

There are more than 1,300 species of concern in Texas and more than 12,000 nationwide. Nearly 500 plant species in Texas alone are identified as a Species of Greatest Conservation Need. Our greatest asset in recovering sensitive populations is the ability to work on them before numbers reach a critically low threshold. The Texas Conservation Action Plan lays out a roadmap for recovering these populations, but there are significant barriers to implementing the TCAP. We as natural resource professionals have limited funding, limited time, and too few people working on these rare species. But that may be about to change. A new national initiative is brewing, and if successful, would be a complete game change for rare species conservation. Over the next 2 years, the conservation community will participate in an all-out blitz to find solutions that that will enable us to address populations of greatest concern and to prevent the need to add additional species to that list. This presentation will address what is being done at the state and national levels, how this effort will benefit conservation, how this effort impacts the issues you care about, and what your organization needs to know about this effort that can only be described as a game changer in the world of conservation.

USDA/NRCS INVOLVEMENT IN PLANT CONSERVATION INITIATIVES AND PROGRAMS TO CONSERVE THE MONARCH

Ricky Linex and Russell Castro
USDA-Natural Resources Conservation Service

Ricky Linex, Russell Castro and Robert Ziehr will combine their two presentations to summarize recent developments in NRCS involvement in plant conservation. See their respective abstracts for detail.

USING USDA/NRCS PLANT MATERIALS CENTERS TO GROW AND EVALUATE POTENTIAL NATIVE FLOWERING PLANTS THAT DIRECTLY BENEFIT MONARCHS AND OTHER POLLINAOTRS

Ricky Linex
USDA Natural Resources Conservation Service

Recognizing the plight of pollinators in general and the Monarch butterfly (*Danaus plexippus*) in particular, the USDA Natural Resources Conservation Service has developed specific technical assistance guidance and new forms of financial assistance available to landowners wanting to restore and enhance habitat for Monarchs. We recognize that efforts toward improving habitat for Monarchs also improves habitat for other pollinators and various wildlife species that depend upon flowering forbs and flowering woody plants. Discussion will highlight the newest conservation programs such as the Monarch Butterfly Habitat Development Project that focuses habitat development in twenty-eight Texas counties located along the migration route of the Monarch. Using a systems approach, NRCS will assist landowners in the conservation of, development or enhancement of diverse native plant communities along with management guidelines to encourage production of species used for brooding and nectaring during migratory periods. Other Farm Bill programs that benefit pollinator habitat or encourage stewardship of the land will be discussed. This is an exciting time for conservation efforts and NRCS is a proud participant in the efforts to reverse the decline in Monarch populations.

DISCOVERING AND PRESERVING TEXAS' BOTANICAL HERITAGE: GOOD FOR SCIENCE, GOOD FOR CONSERVATION

Barney Lipscomb
Botanical Research Institute of Texas

In 1996, Bernard Baum (*Sampling the Green World*) said, “The main sources of knowledge of biodiversity are the study of specimens acquired through exploration and their resulting collections.” Texas is fortunate to have a wealth of information about its plant life, vegetation, and natural history due to many collectors and collections over the last 197 years, since the first scientific collecting began in Texas in 1820. The 19th Century ushered into Texas a wave of zealous naturalists who labored tirelessly in the great age of discovery. Notable Texas expeditions occurred in the Rolling Plains/High Plains (James 1820), the South Texas Plains (Berlandier 1828–1834), Lower Portions of the Post Oak Savannah and Blackland Prairies (Drummond 1833–1834), Edwards Plateau (Lindheimer 1836–1879), Pineywoods, Gulf Prairies & Marshes, lower portions of the Post Oak Savannah, and Trans-Pecos (Wright 1837–1852), and finally the Blackland Prairies and Cross Timbers and Prairies of North Central Texas (Reverchon 1848–1905). These early sojourners gave science a wealth of herbarium specimens which represent an important source of knowledge about Texas’ biodiversity. The 20th Century marshaled in a new era of collecting and botanists who made new observations and discoveries. Collecting habits in Texas ebbed and flowed over the years—slowing down during the Civil War, then increasing afterwards, then decreasing at the turn of the century, and finally peaking in the late 1900s. A current decline of plant collecting continues into the 21st century but at what price? Herbarium specimens are a gold mine of information; deciphering the information is good for science and good for conservation in the 21st century. Collections are leading the way to advances in plant science and conservation (Funk pers. comm. 2016). We

will examine herbarium collections to 1) map under-collected areas in Texas, 2) look at the rate of plant collecting in the 21st century, and 3) identify areas of Texas in need of further exploration and collecting.

EFFECT OF MAGNESIUM ON A THREATENED NATIVE PLANT SPECIES, BRACTED TWISTFLOWER (*Streptanthus bracteatus*) IN GARDEN STUDY

Leah Murray
U. S. Fish and Wildlife Service

Bracted twistflower (*Streptanthus bracteatus*) is a rare winter annual with a narrow and unique range in Central Texas Hill County. Typically, it occurs within a few km along the fault-line where the Glen Rose and Balcones Escarpments meet. The reason for this is unknown; researchers speculate that *S. bracteatus* may be an edaphic endemic meaning it requires something from the soil to survive. Since magnesium ions (mg+) leach out of the dolomitic limestone of the Glen Rose Escarpment, we speculate that *S. bracteatus* may require higher levels of mg+ to survive in the wild. Through a garden study, we are investigating the effect of magnesium on hybrid *S. bracteatus* seeds. We will present the findings and also discuss where conservation efforts for this species currently stand.

VERTEBRATE AND INVERTEBRATE HERBIVORY ON THE FEDERALLY ENDANGERED *SPIRANTHES PARKSII* CORRELL AND SYMPATRIC CONGENER *SPIRANTHES CERNUA*

Deseri Nally
Texas A&M University – College Station

Spiranthes parksii Correll is a federally endangered terrestrial orchid endemic to 13 counties in Central Texas. Currently, there is no knowledge of the difference between vertebrate and invertebrate herbivores influence *on Spiranthes parksii*, and its sympatric congener *Spiranthes cernua. S. parksii* and *S. cernua* have two main vegetative stages accessible to above ground herbivores with an inflorescence present in the fall (September – November), a rosette in the winter and spring (December - June), and a dormant summer phase (June – August). In 2014 and 2015, a 2 x 3 factorial experiment was conducted to determine the difference between Vertebrate and Invertebrate herbivory. Plants were randomly assigned to one of five treatments: Control, Insecticide with no cage (Vertebrate), Cage with no insecticide (Invertebrate), Cage with insecticide, or a Mesh cage. Upon analysis, there was a distinct difference in herbivory between the flower season and rosette season. During the 2014 flower season, herbivores in the Vertebrate treatment removed significantly more reproductive material (45%) than all the caged treatments (3%). However, during a drought in 2015, this dynamic changed with herbivory from Vertebrate (19%) not significantly different from the Mesh treatment (16%), but still significantly different than the Invertebrate and Cage with insecticide treatment. During the 2014 rosette season there was no significant difference between the Vertebrate (16%) and Invertebrate treatments (11%), with plants Caged with insecticide receiving significantly less herbivory (9%). In 2015, a similar trend was detected with

no significant difference between Vertebrate (57%) and Invertebrate (38%). These results indicate that Vertebrate and Invertebrate herbivores could have a significant influence on the fitness and life history of *S. parksii* and *S. cernua*.

HABITAT PREFERENCE FOR COMANCHE PEAK PRAIRIE CLOVER (*DALEA REVERCHONII*, *FABACEAE*) A RARE NORTH CENTRAL TEXAS ENDEMIC

Allan Nelson and Sam Kieschnick
Tarleton State University - Stephenville

Dalea reverchonnii is hypothesized to be a Walnut Limestone glade endemic in North Texas. We compare a population discovered in 2010 on a Walnut Limestone glade in Parker County, Texas to a population found in a peripheral prairie barren. For three years, numbers of *D. reverchoni*i, diameter of plants, number of flowering spikes, as well as richness and coverage associated with plants significantly differed between glade and barren populations. Associated species also were different in the two habitats. Length of the longest spike was not significantly different when comparing *D. reverchonii* in glade and barren populations. These data provide support for the hypothesis that *D. reverchonii* is found mostly in and is best adapted to Walnut Limestone glades.

FORESTS FOR MONARCHS: THE RESTORATION AND PROTECTION OF THE MONARCH BUTTERFLY OVERWINTERING HABITAT

M. Rebeca Quiñonez-Piñón
Forest for Monarchs – Mexico

Forests for Monarchs reforests land within and near the Monarch Butterfly Biosphere Reserve and promotes sustainable forest management in rural communities in the mountains of eastern Michoacán, México. The strategy is to provide alternative sources of forest products that address the underlying needs of poor rural communities, thereby reducing impacts on the remaining natural forests. *Forests for Monarchs* produces and distributes free seedlings of native tree species and ecotypes to rural landowners and provides instruction and technical assistance in the establishment, management, and sustainable harvest of the reforested lands. Participating landowners include members of *ejidos* (agricultural cooperatives), Indigenous Communities, private landowners, academic institutions, religious organizations, and municipal/federal lands. The conversion of non-productive deforested land and degraded cropland on steep slopes to productive forest plantations creates real economic incentives for participants, thus ensuring the long-term sustainability of the project. This change to a more appropriate land use also reduces soil erosion, protects watersheds, conserves biodiversity, sequesters carbon, and benefits both the local and global climate.

TOBUSCH FISHHOOK CACTUS MONITORING AT LOVE CREEK PRESERVE, BANDERA COUNTY

Charlotte Reemts and Jacqueline Ferrato
The Nature Conservancy, Texas Chapter

Tobusch fishhook cactus (*Ancistrocactus tobuschii*) is found in only eight counties in Texas. The Nature Conservancy's Love Creek Preserve (Bandera County) is home to a robust population. Since 2013, Tobusch fishhook cactus have been monitored in six 100 m2 plots on the preserve. We will present basic demographic data gathered during this monitoring and discuss observations of plant responses to herbivory and drought. We will compare the population trajectories of the six plots, which vary in slope, shrub cover, and aspect, and share preliminary results from a preserve-wide survey for the cactus. Finally, we'll discuss an upcoming shrub removal experiment.

EVALUATION AND DEVELOPMENT OF NATIVE SEED SOURCES FOR WEST TEXAS

Colin Shackelford, Forrest Smith, Keith Pawelek
Texas A&M University- Kingsville

Our mission is to develop native ecotypic seed sources and make them available through the commercial seed trade for restoration activities in the Trans Pecos, western Edwards Plateau, the southern Rolling Plains, and the southern High Plains. At present, only one high quality, locally-adapted native seed source appropriate for use in these regions is commercially available. Our goal over the next decade is to develop 20+ regionally-adapted ecotypic seed sources for restoration work in West Texas. Over 900 collections have been made from a target list of 38 grasses and 52 forbs across 37 counties in West Texas. These collections are the foundation for the evaluation and selection of ecotypic native plant materials for commercial scale production. Presently twelve species—one shrub, two forbs and nine grasses—are under evaluation at two different research and evaluation facilities located near Alpine, Texas and Odessa, Texas. Evaluations have been completed and seed increase plantings of four accessions of whiplash pappusgrass and three accessions of silver bluestem were installed summer 2016. Commercial release of these species is expected fall 2017. Seed increase plantings of three grass species in preparation for commercial release as well as new evaluations of three grass species are expected in spring 2017.

PLANT CONSERVATION RESEARCH

Jyotsna Sharma
Texas Tech University - Lubbock

An overview of multiple plant conservation research projects is presented herein. Data are reported for: 1) population genetics of *Sclerocactus brevihamatus* subsp. *tobuschii (Cactaceae)*, which has a parapatric relationship with *Sclerocactus brevihamatus* subsp. brevihamatus; 2) reproduction and mycorrhizal ecology of *Platanthera chapmanii (Orchidaceae*), and 3) discovery and description of a new orchid taxon. By utilizing seven self-developed microsatellite loci for 255 individuals from 10 populations of *Sclerocactus brevihamatus*, we detected: 1)

population differentiation, 2) no spatial autocorrelation, 3) bottlenecks in three populations, and 4) three distinct genetic clusters. Our results suggest that *Sclerocactus brevihamatus* subsp. *tobuschii* is sufficiently differentiated from subsp. brevihamatus to retain its current taxonomic status. Further, we propagated *Platanthera chapmanii* and investigated mycorrhizal fungi of plants growing in the in situ and ex situ environments. Cold-moist stratification of seeds of *P. chapmanii* for 8 or 12 weeks yielded similar (35%) germination whereas germination was lower (25%) in non-stratified seeds. Up to 63% of the resulting seedlings developed into photosynthetically active, root-bearing plants. With respect to mycorrhizal fungi of P. chapmanii, 122 sequences and 18 operational taxonomic units (OTUs) were identified across seven sampling events; 17 of the 18 OTUSs represented the fungal family *Tulasnellaceae* and one belonged to the *Ceratobasidiaceae*. Our data suggest that *P. chapmanii* prefers OTUs within a few narrow clades of *Tulasnellaceae* regardless of its phenological stage or growing environment. Finally, we recently described a new orchid species from the Chihuahuan Desert region in Tamaulipas, Mexico and Texas, U.S.A. By assessing the phylogenetic position of the new species by a cladistic parsimony analysis of nuclear (ITS) and plastid (matK-trnK, trnL-trnF) DNA sequences of 61 species/35 genera of *Spiranthinae* and 15 additional species and genera of *Cranichideae*, a new genus, *Greenwoodiella*, was formed to include the new species (*G. deserticola*) and its closest relatives.

RARE PLANT CONSERVATION COLLABORATION WITH PRIVATE LANDOWNERS IN EASTERN TEXAS

Jason Singhurst
Texas Parks & Wildlife Department

Collaboration with private landowners is essential in order to conserve rare plant populations in Texas. In Eastern Texas, the majority of the Species of Greater Conservation Need (that the Nongame and Rare Species Program track), occur on private land. Timber companies and individual private landowners have given private land access and consent to map rare plant populations, map rare plant communities, inventory the general flora, and suggest management recommendations. Locating rare plant populations involves predictive rare plant community mapping in ArcGIS and ground truthing with assistance of forestry staff and independent landowners. Hancock Forest Management Group owns and manages high quality rare plant community examples of Acids Clay Pine-Hardwood Forests with populations of nodding yucca (*Yucca cernua*) and Catahoula Sandstone Barrens with slender gayfeather (*Liatris tenuis*) and Navasota false foxglove (*Agalinis navasotensis*) populations in the southeastern portion of the Pineywoods Ecoregion. Weyerhaeuser Timber Company owns and manages high quality globally rare Fleming Prairies with populations of Texas ladies' tresses orchid (*Spiranthes brevilabris* ssp. *brevilabris*) also in southeast Texas. Hancock Forest Management Group owns and manages high quality rare plant community examples of Acid-Seep Forests with populations of Texas trillium (*Trillium texanum*) and Bluejack Oak-Sand Post Oak Xeric Sandhills

with populations of Nixon's hawthorn (*Crataegus nananixonii*) in the northeast Texas portion of the Pineywoods.Partnerships with private landowners who own Hillside Bogs ('hanging bogs') in the northern Post Oak Savanna have led to proactive conservation of recently documented populations of dwarf pipewort (*Eriocaulon koernickianum*) and identification of habitat niches for locating future populations. This presentation will focus on the private landowner partnerships that have led to documenting new populations of rare plants and are putting these plants and associated rare plant communities to the conservation forefront.

THE RARE PLANT STUDY CENTER AND ITS RELEVANCE TODAY

Anna Strong
Texas Parks & Wildlife Department

Funded initially by the McAshan Educational and Charitable Trust of Houston (now the Susan Vaughan Foundation, Inc.), the Rare Plant Study Center was based at the University of Texas at Austin and led by Dr. Marshall Johnston, Professor of Botany. Formed ca. 1971, the Center was one of the first organized and funded plant conservation groups in the nation. Some of the Center's work included creating the first list of Rare Plants of Texas, determining propagation methods of wild-collected rare plant seeds and cuttings, and educating others about rare plants and the Center's work. The Center also made recommendations as to which Texas species should be included on the first Endangered and Threatened plant lists in the Endangered Species Act. The Center formed an agreement with Texas Parks and Wildlife Department's (TPWD) newly-established Resource Management Program to focus on rare plant research, specifically to gather and catalogue location information and document propagation techniques. This was the first formalized work on rare plants conducted at TPWD. Not only was the Center innovative, but its work helped guide TPWD's current efforts to conserve rare plants in Texas.

THE VASCULAR FLORA OF ENCHANTED ROCK STATE NATURAL AREA: RARE PLANTS AND CONSERVATION IMPLICATIONS

Kim Norton Taylor and Robert O'Kennon
Botanical Research Institute of Texas

A vascular plant survey of Enchanted Rock State Natural Area, Gillespie and Llano counties, Texas, was conducted from 1984 through 1994 and 2014 through 2015. The property sits near the southern border of the Llano Uplift, a primarily granite region. During the course of the study, 450 additional taxa were documented, bringing the total for the park to 948 taxa. Twenty-eight taxa are considered rare at the state or global level, including 22 state-tracked taxa. The vascular plant diversity of the park will be examined with a focus on the rare and endemic flora. Conservation implications for the park and the region will be also be discussed.

WHERE HAVE ALL THE FLOWERS GONE? FAMILIAR THREATS AND EVIDENCE OF OTHER THREATS TO *LOPHOPHORA* SPP.

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Over the past half century, the conspicuous threats to populations of *Lophophora williamsii* in the U.S. (particularly loss of habitat, excessive harvesting, and improper harvesting) have been gradually recognized as real, but virtually nothing has been done to effect positive changes that would preserve *L. williamsii* as a cornerstone species of the Tamaulipan thornscrub and Chihuahuan Desert floras. Over the past decade, additional threats appear to be emerging, including (1) the installation of wind turbines in the heart of peyote habitat in South Texas, along with the new roads that accompany them; (2) the apparent commercial success of purportedly peyote-containing pomades and oils for topical therapeutic use; (3) the apparent expansion of the use of peyote as a psychoactive plant by non-indigenous elements of the population in Mexico and elsewhere; and (4) interest in and harvesting of species of *Lophophora* other than *L. williamsii* by non-indigenous individuals in Mexico, for purposes that are not yet clear.

PROGRESS FOR SEED BANKING OF ENDANGERED SPECIES AND MANAGEMENT OF TEXAS PRAIRIE DAWN, *HYMENOXYS TEXANA* (ASTERACEAE) AND ASSOCIATED ENDANGERED SPECIES AT A NEW HARRIS COUNTY PRECINCT 4 PRESERVE

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Texas prairie dawn (*Hymenoxys texana*) ranked G2S2 and listed as an endangered species by the U.S. Fish and Wildlife Service in 1986, is a rare annual wildflower endemic to saline prairie habitats in East Texas. Seed banking is a critical component of the recovery plans for endangered plant species, including that of *H. texana*. Mercer Botanic Gardens began *ex-situ* conservation efforts for *H. texana* and rare endemic associates ranked G2S2, Houston camphor daisy (*Rayjacksonia aurea*) and Texas windmill grass (*Chloris texensis*) in 1986. As a participating institution for the Center for Plant Conservation (CPC) since 1989, Mercer Botanic Gardens conserves rare plant species native to east Texas and the Upper Gulf Coast within seed banks and plant collections for the CPC's National Collection of Endangered Plants and assists with restoring these species to the wild. On April 21, 2003, Turner Collie and Braden, Inc. personnel discovered *H. texana* at the site of proposed construction of West Greens Road from SH 249 to Cutten Road in Harris County, Texas. On July 29, 2005, Harris County Precinct 4 Parks Department committed to the long-term protection and management of a 3.6-acre tract within the construction site containing *H. texana*. Current progress towards Mercer Botanic Gardens' restoration of the protected tract, named the Harris County Precinct 4 Prairie Dawn Preserve, and in-situ and ex-situ conservation efforts for rare east Texas and the Upper Gulf Coast species will be discussed.

EDAPHIC DETERMINANTS OF THE DISTRIBUTION OF AN ENDANGERED TERRESTRIAL ORCHID: USING MAXENT AS AN INVESTIGATIVE TOOL FOR RARE PLANT CONSERVATION

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Orchidaceae is the largest and most diverse family of flowering plants, but it is currently facing unprecedented risks of extinction. Orchidaceae consists of over 1000 genera and most of these contain one or more threatened or endangered species. Navasota ladies' tresses (*Spiranthes parksii*) is a state and federally listed endangered orchid, endemic to central Texas, USA. Its distribution is limited to 13 counties and it appears to be restricted to habitats on the edges of upland drainages in small open grass/shrub patches within post oak savanna/woodland communities. We identified potential edaphic factors influencing the distribution of the species, quantified the relative importance of each factor, and determined suitable habitat characteristics. We obtained presence and absence data on Navasota ladies' tresses sampled between 2004 and 2012 from the US Fish and Wildlife Service, Texas Parks and Wildlife Department, Texas Department of Transportation and Texas A&M University researchers. We then analyzed several geo-referenced variables describing soil features and landscape conditions to identify potential factors influencing the likelihood of occurrence of Navasota ladies' tresses using MAXENT. Our results indicated that the probability of presence of Navasota ladies' tresses was most correlated with soil taxonomy, geological formations (percentage of Manning formation), slope, and soil types. Our model should provide a useful quantitative tool that can be used to facilitate future Navasota ladies' tresses surveying, research, and conservation efforts.

RARITY AND ENDANGERMENT IN TEXAS FERNS AND LYCOPHYTES: CAUSES AND SPECIAL CONSIDERATIONS

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Texas is home to about 127 native species of pteridophytes (ferns and lycophytes), more than any other state in the U.S., but currently only three of these species are tracked in the Texas Natural Diversity Database. As noted in the recent comprehensive guide, "The Ferns and Lycophytes of Texas" (Diggs and Lipscomb, 2014, BRIT Press), this almost certainly represents an underestimate of the actual number of taxa of conservation concern in the state. Species rarity in pteridophytes follows patterns similar to those of angiosperms and includes such factors (among others) as: regional endemism, edge of global range, substrate specificity, diminished habitat, and climate destabilization (especially prolonged drought). Also, as in the flowering plants, rarity in Texas and global endangerment are not necessarily the same, as regionally rare or restricted taxa may be at greater or lesser risk of extinction globally. However, an examination of the life histories of these spore-producing plants identifies some special considerations unique to the group. In particular, the roles of polyploidy and apomixis require

careful study in reviewing the conservation status of species in a number of genera. These processes can contribute to cryptic speciation and strongly structured patterns of genetic diversity. Examples will be presented to show the special challenges presented by pteridophytes that complicate evaluation of the conservation status of various species.