Texas Chapter of the Society for Ecological Restoration

2012 Conference Schedule

Friday, November 2, 2012

7:00 am	**Breakfast Buffet – Piper Room**
9:00 am –	**Field Trip #1** will gather in the Piper Room
4:00 pm	**Field Trip #2 & #3** will gather in the Hotel Lobby
6:00 pm	**Dinner – Piper Room**
7:30 pm	**Evening Program – Weslaco Professional Building**

Saturday, November 3, 2012

7:00 am	**Breakfast Buffet – Piper Room**
8:00 am	**Welcome and Announcements:** Chris Best
9:00 am	**Keynote speaker:** Jamie Flores
10:00 am	**Break**
	Session moderator: Leslie Dietz
10:20 am	Alex Racelis. Constraints and opportunities for ecological restoration in the Rio Grande Valley, Texas.
10:40 am	Amy Tsay. Defining vegetative characteristics of ocelot (*Leopardus pardalis*) habitat.
11:00 am	Charlotte Reemts. Restoration of endangered star cactus by planting.
11:40 am	Colin Shackelford. Evaluation and development of Texas native seed sources.
12:00 pm	**Lunch and poster session**. Poster presenters will be at their posters at 12:40 pm.
	Session moderator: Colin Shackelford
1:00 pm	Michelle Villafranca. Establishment of the restoration greenhouse and seed collection program at Fort Worth Nature Center & Refuge.
1:20 pm	Kelly Lyons. Applying the diversity-invasion hypothesis to test restoration as biocontrol.
1:40 pm	Claire Afflerbach. The influence of myccorhizal fungi and nitrogen addition on competition between a native and invasive perennial grass.
2:00 pm	Christopher Garza. Projecting climatic suitability for tamarisk beetles and their dispersal into endangered flycatcher habitat in Arizona.
2:20 pm	**Break**
	Session moderator: Kelly Lyons

2:40 pm Virginia Eaton. Conceptual framework to assess the effects of wildland fire on aquatic communities.

3:00 pm David Toledo. Socio-ecological factors influencing the use of prescribed fire to maintain and restore ecosystem health on Texas rangelands.

3:20 pm Angela Rosales. Comparison between Greens Bayou Wetlands Mitigation Bank and Anahauc National Wildlife Refuge using diatom data to show how Ike and the 2011 drought affected these wetlands.

3:40 pm **Break**

Session moderator: Kelly Lyons

4:00 pm Marissa Sipocz. Uncovering the past: buried coastal prairie potholes re-emerge through an innovative restoration process.

4:20 pm Sam Kieschnick. Habitat preference of Comanche peak clover (*Dalea reverchonii*), a rare north central Texas endemic, with notes on an introduction spot at the Fort Worth Nature Center.

4:40 pm Martha Ariza. Integrated in situ and ex situ strategies for the recovery of endangered terrestrial orchids: an example from the Texas endemic *Spiranthes parksii*.

5:00 pm **Break**

6:00 pm **Dinner and awards banquet (Estero Llano Grande Park)**

Sunday, November 4, 2012

7:00 am **Breakfast Buffet – Piper Room**

9:00 am TXSER General Meeting

10:00 am **Board Meeting – Weslaco Professional Building**

Poster titles

Presenter's name is in bold.

Samuel Camarillo, **Alejandro Fierro** and Eric Linder. Are coyotes saviors of Sabal palms?

Gabriel De Jong and Norma Fowler. Landscaping plants as invasive species in central Texas: positive correlations with development, proximity and age, but limited by aridity

Jeremy Edwardson, **Sandra Rideout-Hanzak** and David B. Wester. Litter effects on tanglehead (*Heteropogon contortus*) seedling emergence: implications for prescribed fire and tanglehead

Sandra Rideout-Hanzak and David B. Wester. Slender rushpea (*Hoffmannseggia tenella*): conservation through management—a case study.

PRESENTATION ABSTRACTS

Abstracts are arranged by presentation order.

Constraints and opportunities for ecological restoration in the Rio Grande Valley, Texas.

Alex Racelis, United States Department of Agriculture-Agricultural Research Service, alex.racelis@ars.usda.gov

Few areas in the United States have experienced a more precipitous population growth than the Lower Rio Grande Valley (RGV). This growth has lead to rapid urbanization that has dramatically changed land cover and land use patterns in the area. Only a small fraction of natural vegetation remains, and much of which is under constant ecological pressure from invasive species such as salt cedar (*Tamarix sp*.), giant reed (*Arundo donax*) and other non native grasses. These undeniable trends of growth undoubtedly will continue to have a tremendous impact on native biodiversity and ecosystems, requiring novel attempts to enhance the health of our local environment and conserve the important ecosystem services it provides. In this talk, I present some of the key challenges for conservation and ecological restoration in the RGV and provide examples of promising strategies and directions that may help stem these trends, which include the biological control of invasive species, the enhancement of biodiversity values of urban and agro-ecological areas, and the promotion of opportunities for citizen science and citizen-driven conservation in the Lower Rio Grande Valley.

Defining vegetative characteristics of ocelot (*Leopardus pardalis*) habitat.

Amy Tsay[1], Thomas R. Simpson[2], M. Clay Green[2], John Young.
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2 Texas State University- San Marcos

The ocelot (*Leopardus pardalis*) was placed on the United States federal endangered species list in 1982 because of habitat loss. Previous research has demonstrated that ocelots prefer habitats of dense shrubs with greater than 95% canopy cover. However, little else is known about the total composition of vegetation in their habitat. The objectives of our study were to compile GIS information of vegetation, soil and satellite imagery for seven counties (Willacy, Cameron (Laguna Atascosa National Wildlife Refuge), Starr, Hidalgo, Jim Hogg, Kenedy, and Zapata) in South Texas to enhance prior research and define areas suitable to

support ocelots. Ground-truthing on vegetation transects on public and private land across these counties was performed using densiometer, vegetation profile board (VPB), and daubenmire frame techniques to determine key vegetative parameters that benefit ocelots. Through principal components analysis (PCA), we analyzed VPB measures, percent canopy cover (overstory), percent grass, litter, bare ground, and forbs from Daubenmire frames, woody plant density, woody plant diversity, and average woody plant height per transect. We found the majority of ocelot habitat was characterized by greater plant diversity, greater vertical cover density at ground level, greater canopy cover, smaller shrubs, and more ground litter than habitat not occupied by ocelots. Along an east-west gradient in South Texas, eastern sites were similar to ocelot habitat. Comprehensive vegetation information (i.e. plant density, percent grass, etc.) is lacking on satellite/ land-use images. Therefore, comparing habitat data through PCA analysis would be more effective in delineating ocelot habitat.

Survival of planted star cactus, *Astrophytum asterias*, in south Texas.

Charlotte M. Reemts[1], Patrick Conner, Gena K. Janssen[2], and Kimberly Wahl[3]
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2 Janssen Biological
3 U.S. Fish and Wildlife Service, Lower Rio Grande National Wildlife Refuge

Star cactus, *Astrophytum asterias*, is one of several rare cacti found in the southwestern United States. We planted 308 star cactus individuals on private ranches where existing populations were reduced or destroyed. Overall mortality was 48% with herbivory accounting for 34% of the mortality (50 out of 148). Mortality varied among planting sites, but was not influenced by initial size, even when cacti killed by herbivory were excluded. Mortality was highest during times with low precipitation and/or high temperatures. Surviving cacti on two sites increased in average size. Future reintroduction attempts should investigate the interaction between soil type and mortality, and test the efficacy of supplemental water. Planting of nursery-grown individuals should also be explored for additional cactus species.

Evaluation and Development of Texas Native Seed Sources.

Tony Falk, Forrest Smith, **Colin Shackelford**, and Mia McCraw, Caesar Kleberg Wildlife Research Institute, Texas A&M University Kingsville, Colin.Shackelford@tamuk.edu

The *Texas Native Seeds* program established 6 common garden studies evaluating 60 native seed varieties in south, central, and west Texas. At each site, 30 transplants of each seed variety were established in 3 replications of 10 plants. Under irrigated conditions in 2011 and 2012, we scored each replication for 9 performance characteristics including plant vigor, variety uniformity, seed production, and biomass production. We also measured plant height, canopy cover, biomass production, and seed quality. In addition, we seeded 3 small plots of each species and measured seedling emergence and vigor under rain-fed conditions. Results from year one of the study indicate several plants are capable of performing very well for early restoration needs outside of what was thought to be their range of adaptation. We have also identified several geographic areas where additional native seed source development work should be undertaken in order to provide suitably adapted native plant material. Most notably is our planting near Imperial (west) Texas where just 5 of 60 available native seed varieties survived the first year, even under irrigation. In other areas, a lack of adapted early successional grass species and forbs is apparent. *Texas Native Seeds* is also making field collections of 33 grasses and 13 forbs across 67 counties in central Texas, 35 counties in south Texas, 37 counties in west Texas. These collections will be used by *TNS*, and collaborators from the USDA NRCS Plant Materials Program and Texas AgriLife Research to develop additional native plant materials for commercial production and use in native plant community restoration in Texas.

Establishment of the Restoration Greenhouse and Seed Collection Program at Fort Worth Nature Center & Refuge.

Michelle Villafranca, Fort Worth Nature Center & Refuge, michelle.villafranca@fortworthtexas.gov

Fort Worth Nature Center & Refuge staff has embarked upon a project to develop a plant materials program for the park. Known as the *Restoration Greenhouse & Seed Collection Program*, it has evolved in incremental steps since its inception. The program's primary mission is propagating native plants that are then out-planted at restoration and landscape sites around the park. Planning, collection and propagation protocols, restoration, monitoring, and involvement of volunteers will be

discussed in this presentation as it covers the natural progression from idea to implementation and expansion of a restoration greenhouse program.

Applying the diversity-invasion hypothesis to test restoration as biocontrol

Kelly G. Lyons, Department of Biology, Trinity University, klyons@trinity.edu

Evidence from small-scale experimental investigations suggests that species diversity and introduced species success are negatively correlated and that resident species identity can determine the strength of this interaction. In this study, we assess the applicability of the diversity-invasion hypothesis to restoration. We hypothesize that, following management efforts, richness of restored plots are a determinant of invasive species re-establishment and, furthermore, that some restored species and species combinations will be more effective than others. We employed a two-way factorial experiment in a randomized complete block design where richness and native species composition were manipulated in 1 x 1 m plots. Richness levels include 1, 2, 3, and 4 species with all possible species combinations at richness levels 2 and 3. Each block was replicated four times. Restored species were native, perennial grasses widely used in restoration projects in Central Texas. They included: big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), sideoats grama (Bouteloua curtipendula), and little bluestem (Schizachyrium scoparium). These species were plug planted in January 2010 following removal of the target invasive KR bluestem (*Bothiochloa ischaemum*; hereafter referred to as KR) using a prescribed burn in fall 2009. Restored species established at an overall rate of 60%. Nonetheless, rates of establishment varied greatly among species. Re-establishment of KR was negatively correlated with restored species cover and establishment success as well as the average and total restored species ellipsoid plug area. We also found significant differences among species as determinants of KR re-establishment. We found no significant relationship between assigned or actual richness and KR re-establishment. KR establishment was negatively correlated with plot over-yielding, suggesting that species combinations that perform better than the highest performing species grown in monoculture were effective in invasion control. We aim to utilize this study to inform local land management efforts in restoration regarding the suppressive effects of native species combinations.

The influence of myccorhizal fungi and nitrogen addition on competition between a native and invasive perennial grass species.
Afflerbach, C., Banick, K., Rabat, R., and Lyons, K.G., Department of Biology, Trinity University, San Antonio, TX, afflerb@trinity.edu

The C_4 grass King Ranch Bluestem (*Bothriochloa ischaemum*) was originally planted throughout much of Texas to restore degraded rangeland; however the species has since become an invasive pest. Invasion theory suggests that species coexistence is enhanced through niche partitioning and that species with overlapping use for limiting resources (such as nitrogen) will be in competition. These competitive effects may, however, be mediated by mutualist symbionts, such as mycorrhizal fungi, that increase a species' ability to acquire resources. Here we use niche theory to assess the mechanism of competition between a native and non-indigenous grass at the seedling stage and the potential for restoration of native plant species as biocontrol to reduce KR Bluestem establishment and spread. Using our two focal species, KR Bluestem and Sideoats Grama (*Bouteloua curtipendula*), we employ a three-way factorial greenhouse experiment with species composition (3 levels – 100:0, 50:50, 0:100), nitrogen (5 levels), and mycorrhizal fungi (with and without) as factors. Sideoats Grama is a perennial native Texas grass commonly used in restoration. Small pots (7 x 24.5 cm) were filled with sand and topped with 2 cm of Jiffy Organic Seedling mix to encourage germination of the seeds. Once germinated and established the seedlings were thinned to the assigned species ratios with 16 individuals per pot (8 of each species in the composition pots). Using Hoagland's solution, nitrogen was manipulated to create a nitrogen gradient ranging from 0 to 0.0769 g nitrogen per pot in 0.0192 gram intervals. Beginning 4 weeks post-planting, weekly harvests were conducted over the course of four weeks. We standardized the data to account for the initial concentration differences between the monoculture and competition pots, and used R to run a repeated measures analysis of variance (MANOVA) across the 4 time points. The results suggest that KR is more positively responsive to increases in N and the presence of fungi than SOG, while SOG is more negatively affected by competition than KR. The presence of fungi positively influences height and root length in both species. Root mass ratio in both species is strongly influenced by species composition, suggesting that these two species do in fact niche partition when grown in competition. If KR and SOG aren't sharing the same niche, then theory suggests that the fact that KR outcomes SOG in the field is due to differences in overall fitness, which is supported by KR's greater response to nutrient level increase. In this way, farming practices like

burning and agriculture, which create high-N environments, may be facilitating the invasion of KR.

Projecting climatic suitability for tamarisk beetles and their dispersal into endangered flycatcher habitat in Arizona.

Christopher Garza[1], James Tracy[1], Amanda Dube[2], Ashley Long[2], Alison Orts[3], Robert Coulson[1], and Maria Tchakerian[1]
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2 Department of Wildlife and Fisheries, Texas A&M University
3 Department of Geology and Geophysics, Texas A&M University

Invasive tamarisk (*Tamarix* spp.) has spread throughout the southwestern states and is a dominant shrub in a majority of riparian habitats. Tamarisk has also become a preferred nest tree of the federally endangered southwestern willow flycatcher (*Empidonax traillii extimus*). Three tamarisk beetles (*Diorhabda sublineata*, *D. carinulata*, and *D. elongata*) have successfully established populations after their release as biological control agents in order to reduce tamarisk. The beetle herbivory has been shown to have detrimental effects on flycatchers nesting in Utah although currently, the beetles have not dispersed to the majority of flycatcher nest sites. Using climate data from tamarisk beetle home ranges in Eurasia, suitable areas for the beetles in the North America were determined. Climatic suitability maps showed that, out of the three established tamarisk beetle species, *D. sublineata* is best suited for the Tonto Creek watershed in eastern Arizona. The Tonto Creek watershed is a major nesting site for flycatchers in tamarisk making it susceptible to serious losses from these biological control agents. Beetle dispersal projections show *D. sublineata* moving from west Texas to Tonto Creek in as little as 8 years. Recognizing the amount of time it will take for tamarisk beetles to arrive at the Tonto Creek site is important in developing strategies and performing actions to protect flycatcher habitat.

Conceptual framework to assess the effects of wildland fire on aquatic communities.

Virginia Eaton, Department of Biology/Aquatic Station, Texas State University, ginny.eaton@txstate.edu

A total of 1.3 million acres burned within watersheds of Texas Gulf Slope streams in 2011, including 828,000 acres of mixed use land that border ecologically significant stream segments. Studies assessing the effects of fire on aquatic communities are limited primarily to montane wildlands and might not be applicable to the arid and semi-arid regions of the western gulf slope drainages of Texas. To better understand and manage the land-water interactions within the western gulf slope drainages, we propose a conceptual framework to serve as a basis for testing hypotheses on initial, mid and long-term effects of wildland fires on aquatic communities and for assessing factors that mitigate the effects (i.e., burn intensity, distance from stream reach, resiliency of the aquatic community). Opportunistic sampling of the associated initial community response from two recent fires (Canon Ranch Fire, Independence Creek Drainage, Terrell County; Oasis Ranch Fire, South Llano River drainage, Kimble County) provided an example of how empirical studies populate the framework with replication over time.

Socio-ecological factors influencing the use of prescribed fire to maintain and restore ecosystem health on Texas rangelands.

David Toledo[1], Michael G. Sorice[2], and Urs P. Kreuter[1]
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2 Department of Forestry and Environmental Conservation, Virginia Tech

Fire suppression in grasslands systems adapted to fire is a major factor that has contributed to recruitment of woody species into grasslands worldwide. Even though the ecology of reverting these fire prone systems back to their original state is becoming clearer, the major hurdle to reintroducing historic fire at a landscape scale remains a social issue. We use a structural equation path model to examine how attitudes towards high intensity prescribed burns are affected by degree of brush encroachment, land condition, risk orientation, landowner fire skill, knowledge and access to equipment, and subjective norms. Our results suggest that risk taking orientation and especially perceived support from

others play very important roles in determining attitudes towards high intensity prescribed burns and although not as strong, concerns over lack of skills, knowledge and resources also have a moderately strong effect on attitudes. Our results highlight the importance of targeted communication strategies that address, risk perceptions, subjective norms and landowners concerns if our objective is to provide an effective message with potential landscape scale conservation and restoration benefits.

Comparison between Greens Bayou Wetlands Mitigation Bank and Anahuac National Wildlife Refuge using diatom data to show how Ike and the 2011 drought affected these wetlands.

Brad Hoge[1] (advisor), **Angela Rosales[1]**, Dorothy Ringer-Sumner[2], and Denise Igbineweka[2]
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2 Aldine 9th Grade School (authors)

Diatoms help determine the health and establishment of a wetland community. This research compares Greens Bayou Wetlands Mitigation Bank (GBWMB), a man-made wetland, and Anahuac National Wildlife Refuge (ANWR), a natural wetland, using the total Diatom count and the number of genera present as indicators. In this study, we investigated the progress of how GBWMB has grown similarly or differently than the ANWR. We also studied how Hurricane IKE and the 2011 drought affected these wetlands. The Advisor and Authors of this research project started by visiting both sites and collected the uppermost layer of the mud in the bayou. Samples where then created by the material collected using ASTM standard Sieves. From the data collected, the advisor and authors found that from 2004 to 2012 Greens Bayou has gradually become more stable and similar to Anahuac National Wildlife Refuge through the analysis of the Diatom community at both locations. The Research also indicates that the effects of Hurricane Ike and the drought in 2011 combined introduced new genera in GBWMB and also eliminated genera that were present in GBWMB but absent in ANWR. These results suggest that the complex community at Greens Bayou, with time, has become gradually similar to Anahuac from 2004 to 2012. This result can now guide the Harris County Flood Control District in establishing more mitigation banks around the city therefore aiding in flood control, waste water purification, and organic matter sequestration and degradation.

Uncovering the past: buried coastal prairie potholes re-emerge through an innovative restoration process.

Marissa Sipocz[1], Mary Carol Edwards[1], and Andrew Sipocz[2]
1 Texas Coastal Watershed Program, Texas AgriLife Extension Service/Texas Sea Grant
2 Texas Parks and Wildlife Department

Freshwater palustrine emergent wetlands occupied 25% of the southeast Texas coastal plain prior to settlement. Today this unique matrix of habitat is the rarest of the rare coastal habitat within Texas. Currently, wetland creation in this area largely consists of constructing moist soil impoundments by holding water within existing rice fields or the excavation of relatively small basins without consideration of historic wetland location or basin morphology. Moist soil impoundments provide habitat for wintering waterfowl and shorebirds, but are not suited for supporting the entire suite of native wetland flora and fauna. Pothole excavations in uplands expose subsoil unsuited for plant growth and have proved unsuccessful. A new restoration template developed at Sheldon Lake State Park (Houston, TX) that uses historic and current aerial photographs and soil pits to locate and restore buried and drained wetland basins within agricultural fields has achieved greater than anticipated success. The initial 16-acre restoration included excavation, berm construction and subsequent installation of local native plants (up to 40 different species). The success of the site has spurred the construction of an additional 126 acres of wetland. These wetlands are within a matrix of 172 acres of restored tall-grass prairie. The additional restoration is an 8-fold increase of the amount of restored wetland and is still currently in progress. Results to date demonstrate the similar establishment of wetland features as seen in Phase 1, corroborating the validity of this new freshwater wetland restoration method.

Habitat preference of Comanche Peak prairie clover (*Dalea reverchonii*), a rare North Central Texas Endemic with notes on an introduction spot at the Fort Worth Nature Center.

Samuel R. Kieschnick[1], Allan D. Nelson[2], Suzanne Tuttle[3], Michelle Villafranca[3], Robert J. O'Kennon[1], and Kim N. Taylor[1]
1 Botanical Research Institute of Texas, skieschnick@brit.org
2 Department of Biological Sciences, Tarleton State University
3 Fort Worth Nature Center & Refuge

Dalea reverchonii (Comanche Peak prairie clover) is hypothesized to be a walnut limestone glade endemic occurring in Parker, Hood, and

Somervell counties in North Central Texas. We collected data for three years comparing a population on a walnut limestone glade in Parker County, Texas to a population observed in a peripheral barren. Numbers of *D. reverchonii*, richness, and coverage associated with plants significantly differed between barren and glade populations. Associated plant species also differed between barren and glade habitats. Number of flowering stems, length of flower heads, and diameter of plants of *D. reverchonii* were not significantly different when comparing barren to glade populations. This data supports the hypothesis that *D. reverchonii* is found only in Walnut limestone and is best adapted to glades. Also, a walnut limestone habitat was selected at the Fort Worth Nature Center for introduction of this species raised from seed. Germination techniques, transplanting data, and first year analysis of this introduced population is discussed.

Integrated *in situ* and *ex situ* strategies for the recovery of endangered terrestrial orchids: an example from the Texas endemic *Spiranthes parksii*.

Martha C. Ariza, Fred E. Smeins, and William E. Rogers, Department of Ecosystem Science and Management, Texas A&M University, College Station, TX, mariza@neo.tamu.edu

The Navasota ladies'-tresses orchid, *Spiranthes parksii* Correll, is a federally listed endangered species that is restricted to specific habitats in the post oak savanna of central Texas. The major threat to *Spiranthes parksii* is fragmentation and loss of habitat due to human intervention, such as urban development, agricultural activities, and other disturbances. Although habitat conservation is foremost importance for the maintenance of orchid populations, endangered species often require a combination of *in situ* and *ex situ* efforts to ensure the persistence of populations in changing environments or in cases in which natural expansion is limited by the absence of suitable microsites. This study tested *in situ* and *ex situ* strategies to decrease the risk of extinction associated to habitat loss and fragmentation. We investigated seed germination, seed bank dynamics, microsite limitation, and translocation. Results of *in situ* seed germination and longevity of seed bank showed that the species has a low recruitment potential and exhibit a transient soil seed bank that last less than a year. Seed germination and protocorm development occur rapidly after dispersal and ungerminated seeds degrade within a single growing season. These findings suggest that the short-lived seed bank and restriction of suitable microsites available are major barriers for recruitment of the species, especially under prolonged

drought events. Within site translocation success was highly influenced by the climate conditions and the size of the plant at the time of translocation. In overall, results showed that translocation is a valuable strategy to ensure the maintenance of *S. parksii* populations in areas where habitat loss and fragmentation are unavoidable. These findings have implications for conservation of *S. parksii* and emphasize the need for a combination of *in situ* and *ex situ* recovery practices to ensure the persistence of the species.

POSTER ABSTRACTS

Abstracts are arranged alphabetically by the presenter's last name.

Landscaping plants as invasive species in central Texas: Positive correlations with development proximity and age, but limited by aridity?

Gabriel L. De Jong and Norma L. Fowler, University of Texas at Austin, gabe.l.dejong@gmail.com

We investigated environmental factors that affect the distribution and abundance of non-native plant species in central Texas woodlands. Because many invasive woody species in this region are landscaping plants, we hypothesized that the closer a site was to a developed area and the older the development, the more non-native woody species it would have as a result of ongoing propagule pressure. We also examined the effects of proximity to the city of Austin, distance to the nearest stream and distance to roads on invasive species richness. Finally, we identified the most common invasive species in central Texas woodlands as well as those that may become more common. Species richness and vegetation type were recorded in the field. Other variables were calculated from maps and verified in the field. The most common non-native woody species were all landscaping species: two *Ligustrum* species, *Lonicera japonica*, *Melia azedarach*, and *Nandina domestica*. The number of non-native woody species was greater in plots that were closer to developments, closer to roads, and closer to central Austin. In contrast, relationships between these variables and number of native woody species were much weaker. These results support our initial hypothesis that landscaping is likely an ongoing source of propagules. If so, there may be an 'invasion debt' and we can expect the abundances of these non-native species to increase rapidly in more recently developed areas. The number of non-native woody species per plot was highest in

riparian plots, while native richness was highest in non-riparian woodland plots. Both native and non-native woody species richness was lower in plots further from streams, but the effect on non-natives was greater. These results suggest that at least some of the common non-native invasive species may require a relatively mesic habitat and may not spread to more xeric habitats in the region.

Are coyotes saviors of Sabal palms?
Samuel Camarillo, **Alejandro Fierro**, and Eric Linder, Biological Sciences Department, University of Texas-Brownsville, alejandro.fierro@utb.edu

Historically, sabal palms (*Sabal mexicana*) were common throughout the lower Rio Grande Valley. Today, very few and isolated remnants of the original mixed palm forest are found, mainly around Brownsville. As initial study in view of a long-term restoration project, we are exploring the propagation ecology of Sabal palms. It is known that propagation and dispersal of many plant species benefit from animal interventions, but nothing has been documented yet for Sabal palm. Local botanists suggest seeds passed by coyotes after eating the fruits have a higher germination rate than those that do not. We observed large numbers of seeds containing one and sometimes two larvae of bruchid beetle. The larvae damage the endosperm and the embryo, impeding germination. Preliminary results of a series of germination tests, suggest that germination of seeds collected from coyote scats is promoted possibly due to 1) physical protection from beetles while within the scat; 2) killing of beetle eggs and larvae when seeds pass through the digestive track; 3) chemical/mechanical scarification of pericarp. This enhanced germination adds to the obvious benefit of seed dispersal by coyotes.

Litter effects on tanglehead (*Heteropogon contortus*) seedling emergence: implications for prescribed fire and tanglehead control.
Jeremy Edwardson, **Sandra Rideout-Hanzak**, and David B. Wester, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville

Tanglehead (*Heteropogon contortus*) is a perennial warm-season grass that is native to west and south Texas as well as the southwestern parts of the U.S. and northern Mexico. Tanglehead populations have exploded in the last 15 years in the Coastal Sand Plains ecoregion of Texas. In this area, tanglehead behaves as an aggressive invasive species by excluding native grasses in invaded communities. One consequence of tanglehead invasion is the deposition of considerable residual dry matter on the soil

surface that can accumulate in layers exceeding 5 cm in thickness. Prescribed fire has been used as a restoration tool in tanglehead-invaded areas with limited success. Tanglehead seedlings often emerge in dense stands (exceeding 10,000 seedlings/m^2) following fire. To explore effects of prescribed fire on tanglehead recruitment, we conducted a study of tanglehead emergence under greenhouse settings in pots that were bare or covered with 2 cm of tanglehead litter. We found higher tanglehead emergence in bare pots (12.5% emergence) compared to emergence in pots with litter (3.5% emergence). Heavy litter cover also reduced plant growth: leaf blades on the tallest tanglehead plants averaged 61 cm in bare pots but only 39 cm in litter-cover pots. These results suggest that litter removal by fire likely exacerbates tanglehead invasion in burned areas.

Slender Rush-pea (*Hoffmannseggia tenella*): conservation through management—a case study.

Sandra Rideout-Hanzak and David B. Wester, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Sandra.Rideout-Hanzak@tamuk.edu

Slender rushpea (*Hoffmannseggia tenella*) is an herbaceous legume endemic to Kleberg and Nueces Counties, Texas. Its current conservation classification is Endangered without Critical Habitat. Perhaps the most important factor threatening slender rushpea is habitat disturbance: much of its current range is under cultivation. In the refugia where slender rushpea persists, however, it faces additional threats from invasive grasses, primarily Kleberg bluestem (*Dichanthium annulatum)*. One hypothesis suggests that slender rushpea may be relatively insensitive to shade but that it can be negatively impacted by competition from Kleberg bluestem. Specific mechanisms involved in slender rushpea's interactions with surrounding grasses, however, have not been thoroughly investigated. We have begun a field-scale study of factors affecting growth and survival of slender rushpea that includes experimental manipulation of slender rushpea neighbors. Treatments were imposed in August, 2012. Aboveground biomass of neighbors within 1 m of 33 randomly-selected slender rushpea plants was removed by manual harvest to maintain a local environment free of shade; in this treatment, however, belowground interactions with neighbors continue. Neighbors within 1 m of 34 randomly-selected slender rushpea plants were removed with herbicide application, a treatment that eliminated both aboveground and belowground competition. The neighbors of 33 control plants have not been manipulated. Response variables include various measures of size, growth and survival of slender rushpea. We do

not anticipate measureable slender rushpea response until at least the second full growing season following treatment. We collected several plant morphological features of our study plants prior to treatment, however, that provide valuable baseline data which characterize the variable morphometrics of this species. These data help to better describe natural populations and will be the basis for our assessment of effects of management practices designed to conserve slender rushpea.