Phillippe, Austin
Authors: Phillippe, A. and Kotara, K.
Department of Biology, Trinity University, San Antonio, TX
Contact: aphilli2@trinity.edu

The Consequences of Changes in Grassland Species Composition on Rangeland Forage and Nutrient Cycling

The rate invasive species change decomposition has the potential to affect rates of nutrient cycling and soil nutrient composition over time. These changes can also cause positive feedback loops that perpetuate the invasive species and hinder native species reestablishment. The introduction of non-indigenous, invasive species such as *Bothriochloa ischaemum* (a.k.a. King Ranch bluestem) to Texas grasslands has resulted in widespread decline in native diversity and changes to the way in which these ecosystems function. In this study, we aim to assess differences in rates of decomposition between the non-indigenous, invasive King Ranch bluestem (KR) and the native species *Schizachyrium scoparium* (little bluestem) and *Bouteloua curtipendula* (sideoats rama). We hypothesize that the native species in this system decompose more quickly than KR, slowing nutrient cycling. Because grass culms typically decompose slower than leaves, we employed decomposition bags with culm to leaf ratios that mimicked the species actual ratios. Based on culm:leaf ratio measurements, we constructed 125 litterbags of each species, containing one gram of biomass per bag with 60% culm and 40% leaf material and placed the litterbags at three Hill Country properties along paired transects in either KR or native-species dominated areas. The study is ongoing and will include five collection dates through December 2015. Soils and plant species composition will be analyzed at all sites and the rates of decomposition rates of each species will be assessed. Results to date will be presented.

Addendum

Presentation Abstracts

Adams, Ann
Authors: [1]Adams, A., [1]Bassiri-Gharb, A., [1]Alvarado, C., [1]Lyons, K., and [2]Kwessi, E.
[1]Department of Biology, Trinity University, San Antonio, TX
[2]Department of Mathematics, Trinity University, San Antonio, TX
Contact: aadams@trinity.edu

The Effects of Density in a Three-Species System of Texas C_4 Grasses

Today the dominant grasses in C4-dominated grasslands throughout the southern Great Plains are non-indigenous and invasive. These grasses, such as King Ranch (KR) bluestem (Bothriochloa ischaemum), negatively affect grassland ecosystems by homogenizing and reducing plant species and wildlife diversity. Unfortunately, control of these invasive grasses has proven difficult and post-removal reintroduction of native species is contingent on identifying species that can establish and outcompete KR upon re-invasion.

According to niche theory, species whose niches overlap experience direct competition with one another. In the face of direct competition, species can employ different mechanisms, such as niche shift. Alternatively, the most-fit species could dominate over others. We hypothesize that the best competitor(s) against KR will be a species whose niche overlaps with that of KR, and whose growth is minimally or positively affected despite this.

As such, we conducted a density-controlled competition study between KR and two native C4 grass species that often grow sympatrically with KR, little bluestem (Schizachyrium scoparium) and sideoats grama (Bouteloua curtipendula). Density was included as a factor to study it as a determinant of the mechanisms of competition, as it could affect the probability of a species shifting its niche. Accordingly, our study restricts the area in which a constant number of plants are grown in all possible combinations of the three species.

From this design, we assessed species richness, species composition, and planting-density as determinants of KR fitness (i.e., control). We used principal component analysis (PCA) to determine which plant traits are best-suited for modeling competition in this three-species system. From the PCA, a cluster analysis was performed to assess if species shift the niche space they occupy when grown in different species combinations. This will allow us to design a predictive model of competition for this three-species system with an improved understanding of the species interactions in space and time, in response to the presence of other species.

Best, Chris
U.S. Fish and Wildlife Service, Austin, TX
Contact: chris_best@fws.gov

Early Succession in a Restored Native Grassland in Southwestern Bandera County, Texas

Dr. Ashley McAllen, a private landowner in southwestern Bandera County, Texas, obtained a grant from the U.S. Fish and Wildlife Service Partners for Fish and Wildlife program to restore native grassland on 34 hectares (85 acres) of dryland crop fields. The fields had previously been used for annual hay crops. The landowner's objective was to convert the land to sustainable, low-cost native grass pasture as well as a diverse nectar source for pollinators. We planted a mix of 21 native grass and forb seeds, using a Truax no-till drill, on November 3 – 5, 2012. Competition from introduced invasive winter annuals, primarily Malta star thistle (*Centaurea melitensis*) and burr clover (*Medicago polymorpha*), and poor spring rainfall in 2013 and 2014, led to relatively little native seed germination. Long-time residents of the area were skeptical of the project and the landowner became the target of derision. Nevertheless, barely-noticeable episodes of native plant establishment followed sporadic summer and fall storms. Consistent rainfall from January through June 2015, and a timely shredding of winter annuals in mid-April, stimulated excellent native seed germination. By July 2015, the site was dominated by a diverse stand of native grass and forb species. This experience demonstrates that patience pays in ecological restoration; the landowner believes he will soon win a bet when he is able to cut a bale of hay.

Lyons, Kelly
Authors: [1]Lyons, K., [1]Schultz, K., [1]Adams, A., [1]Tansey, E., [2]Elaydi, S., and [2]Kwessi, E.
[1]Department of Biology, Trinity University, San Antonio, TX
[2]Department of Mathematics, Trinity University, San Antonio, TX
Contact: klyons@trinity.edu

Use of Competitive Dynamics to Inform Species Selection for Restoration

Selection of native species for restoration following invasive species removal is based on criteria such as availability and abundance, successional status, increasing biodiversity, and provisioning for wildlife. In the presence of an invasive species, it is also critical that restored species be competitive. Nonetheless, is often difficult to imagine any residential species having high enough fitness to compete with an invasive species or successfully partitioning resources in its presence. The niche is a useful concept to describe how species might coexist through resource partitioning and has been employed in restoration to assess the role of functional group overlap as biocontrol for invasive species. In this project, we aim to determine if partitioning of niche space allows restored species to coexist with an invasive species. We focused our study on C_4 grasses of Central Texas USA using KR bluestem (*Bothriochloa ischaemum*) as our focal invasive and sideoats grama (*Bouteloua curtipendula*) and little bluestem (*Schizachyrium scoparium*) as our focal restored species. We employ a two-way factorial growth chamber experiment with species composition and light condition as factors. The native species were grown in competition with KR bluestem from seed in 100:0, 50:50 or 0:100 ratios. Once germinated and established, the seedlings were exposed to one of two light conditions (300 or 1000 µmoles), representing shade and sun field conditions. Growth rate data were collected and applied to a modified version of the competition model published by Carroll et al. in 2011. This model defines niche difference and relative fitness difference as a function of sensitivity, or the proportional reduction in growth rate due to interspecific competition. We demonstrate how this model, with some modification, can be used to predict competitive dynamics and assist managers in species selection for restoration.