The Longspur Prairie Fund
Research Summary 2012-13
Dr. Peter Schultz

The following research projects were conducted by the Concordia College Department of Biology in cooperation with the Longspur Prairie Fund during the summer of 2013. These projects involved both senior researchers and their students. While these projects represent a fraction of current research taking place on restored prairie and wetland sites in Minnesota and North Dakota, they do illustrate the research and management potential of our small organization. These projects also embody LPF's commitment to fostering community collaborations and research partnerships that are based on mutual trust, realistic goals, and concrete deliverables. Scientists and their students are given free and open access to LPF research sites at all times. Researchers pay no fees, dues, or other administrative costs. All state paperwork and permits are managed, collated, and filed by LPF. LPF reporting and accountability standards are simple and clean and allow scholars and their students to focus on science. This is a critical moment for our region's natural legacy and ecological heritage. Expediting rigorous, creative, sustained science in a professional, deliberate, and prompt manner is one important means by which the Longspur Prairie Fund and its partners can continue to impact the communities and ecologies of the High Plains.

Dr. Laura Aldrich-Wolfe
Department of Biology, Concordia College, Moorhead, MN
"A Study of Arbuscular Mycorrhizal Fungi in Native and Restored Prairies."
Student Co-Inquirers: Gaya Shivega, Heather Campbell, Rebecca Asheim, Peter Johnson

Prairie restoration sites are typically compared with native prairie sites and monitored over time for the diversity of prairie species *above* ground. But how do restoration sites differ from native prairies *below* ground, and do those differences have any consequence for the re-establishment of native species diversity? In our work, my students at Concordia and I are focusing on a group of soil organisms, the arbuscular mycorrhizal fungi (AM fungi for short), that are likely to have a profound impact on the diversity of species above ground for restored prairie. AM fungi form a partnership with roots of many plant species and exchange water and mineral nutrients for sugars from their plant hosts. Agricultural activities -- the particular crops cultivated, the length of the fallow, the frequency and intensity of plowing, and the application of agrochemicals -- may have a profound effect of the presence and abundance of different AM fungal species. Those best able to survive and grow in agricultural settings may not be the most important associates of native prairie plants and their suite of micro-organisms. By comparing the AM fungal community of Longspur Prairie's site near UIen to nearby native prairie remnants and other restoration sites, we seek to establish the extent to which this community differs between restoration and native prairie sites, whether any observed differences have long-term consequences for the re-

establishment of some of the rarer prairie species, and if re-establishment of these rarer species can be facilitated by the reintroduction of key AM fungi in our region.

Dr. Joseph C. Whittaker
Department of Biology, Concordia College, Moorhead, MN
"Small Mammal Abundance and Diversity in Response to Prairie Management Practices Presence of Invasive Species, and the Influence of Pocket Gophers."
Student Co-Inquirers: Brian Bickel, Caitlan Hinton, Shannon Leipus, Eric Yu

Prairie habitats in North America have been reduced to 1% of their original area. As a result, many of the large-scale natural processes that maintained prairie habitat and prairie mammal communities no longer function. Prairies now require a great deal of active management to simulate formerly natural processes. The impact of these management practices on small mammals is not well known. Through this project we intend to examine small mammal communities on several wildlife management areas, Nature Conservancy sites, Concordia College's Long Lake restored prairie, and additional private holdings of restored prairie. The project will use live trapping to examine how small mammal communities (abundance and diversity) are affected by restoration practices, prescribed burns, and other prairie management techniques (e.g., grazing and planting). We also intend to look at the effect of invasive species (e.g., reed canarygrass, thistle, etc.) on small mammals.

We also hope to capture mammal species which reach the edge of their range in the prairie habitat of Minnesota, including the plains pocket mouse (*Perognathus flavescens*), prairie vole (*Microtus ochrogaster*) and northern grasshopper mouse (*Onychomys leucogaster*). Previous researchers have stated the importance of documenting and studying these populations of rare species. I was also hoping to document distributions of species such as the deer mouse (*Peromyscus maniculatus*), which has been shown to be declining and is being replaced by white-footed mouse (*P. leucopus*) in other neighboring states (Long 1996). Documenting them now would enable me to monitor their populations in case similar ecological replacement was to happen here in Minnesota.

Additionally, we will be collecting data on habitat variables in order to look for relationships with small mammal diversity and abundance. Specifically we will collect data on vegetation characteristics and litter depth. Another variable that may impact small mammal populations is the presence, density, and amount or area covered by pocket gopher (*Geomys bursarius*) mounds. Pocket gopher mounds have been shown to significantly impact vegetation patterns and we will be searching for a relationship with small mammals. We are also planning to collect soil data on and off the gopher mounds to gain further insight into the role pocket gophers play in altering soil conditions and thus influencing the vegetation present.

Our goal is to collect data that will allow us to better understand how management techniques function in maintaining small mammal diversity and abundance, how invasive species impacts the mammal community, and to examine the role pocket gopher mound formation plays in the community dynamics of other species of small mammals.

We trapped Longspur Prairie's Ulen site on 30 July through 2 August 2013. We captured a total of five species of small mammals (although this total may go to six pending identification through a biochemical analysis). The most common mammal captured (34 individuals) were mice of the genus *Peromyscus* (this genus contains two difficult to identify species and are considered together until biochemical data can be examined). Additionally, we captured 25 thirteen-lined ground squirrels (*Ictidomys tridecemlineatus*) and five Franklin's ground squirrels (*Poliocitellus franklinii*), and two meadow voles (*Microtus pennsylvanicus*). Our most rare capture was of a female plains pocket mouse (*Perognathus flavescens*). This was the only plains pocket mouse captured over the last two summers on a number of prairies sites that were sampled.

Our continuing goal is collect and analyze data in order to better understand how management techniques function in maintaining small mammal diversity and abundance, how invasive species impacts the mammal community, and to examine the role pocket gopher mound formation plays in the community dynamics of other species of small mammals.

Dr. D. Bryan Bishop
Department of Biology, Concordia College, Moorhead, MN
"A Study of Native Bees on Recently Burned Restored Prairies."
Student Co-Inquirers: Jens Hulden, Jon Tetlie, and Ross Thompson

Our research focuses on the species richness and evenness of native bees. We were particularly interested in bee diversity between burned and unburned restored prairies. A site managed by the Longspur Prairie Fund near Ulen was used as a second recently burned site for comparison with another burned site at the Concordia College Field Station at Long Lake. Students collected bees three times during the summer at Longspur Prairie's Ulen site using bee bowls and nets. This site is interesting with the relatively high number of forbs present and the low density of tall grasses which can interfere with pollinators and crowd out forbs. Preliminary results indicate a nice diversity of bees are present at Longspur's Ulen site. This data will be useful as baseline data to document the changes in native bees on restored prairie as climate change progresses through the next fifty years.