The Longspur Prairie Fund
Research Summary 2013-14
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 2014. 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. 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 Scott Opatril

D. Bryan Bishop and undergraduates Jon Tetlie, Jens Hulden, and Scott Opatril, sampled Longspur Prairie (-96.328, 47.076) three times during the summer of 2014. A prior sampling had been conducted in the summer of 2013. This sampling was part of a larger three year project sampling at two restored prairies, the other being Concordia College's Long Lake Field Station. We sampled Longspur's Ulen site three times, once each during the months of June, July, and early August. Sampling methods were standardized using bee bowls (2 oz. Solo Cups©), painted yellow, white, or blue with florescent paint. These were placed on the ground 5 meters apart on two transects in an X shape in each of two, 1-ha plots. Bowls were filled with water and a small amount of detergent, and placed in the field before 10:00 AM. We collected bowls between 3-5:00 PM that same day. While bee bowls were in the field, two people net collected bees, 30 minutes each for a total collecting time of one hour, in the morning and in the afternoon. All collected bees were placed in Whirl-Paks® with alcohol (net collected bees were pinned in the field) and brought back to a lab on campus. Bees were washed, blow dried, pinned, and identified to species, when possible. In 2013 and 2014, we collected and identified a total of 719 and 179 bees during each year, respectively. In both years, the majority of bees were collected during the early-mid June

collections, 91% for 2013 and 67% for 2014. The majority of bees in these collections belong in the genus Lasioglossum (Figures 1 and 2). While the decrease in bees caught was steep, this pattern was seen at our other collecting sites and was reported by others monitoring bees in Minnesota.

FIGURE 1. Bee Survey, Longspur Prairie, Site 1, Ulen – Early June 2013

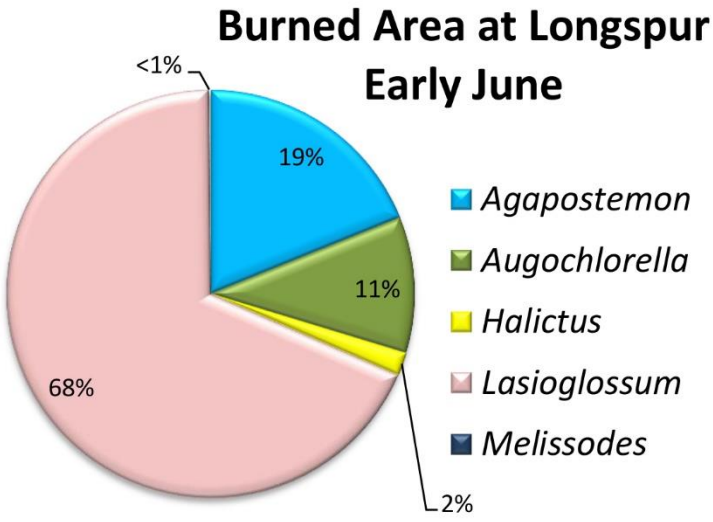
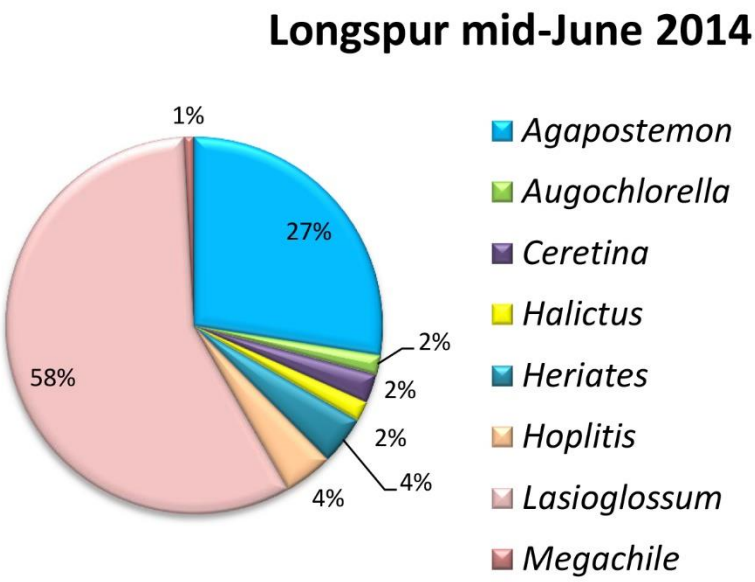


FIGURE 2. Bee Survey, Longspur Prairie, Site 1, Ulen – Mid-June 2014



While the total number caught in June 2014 (120) was lower than the 2013 bee catch (657), the diversity was greater with eight genera in 2014 versus five genera in 2013. This increase in diversity may partly be due to the

burn that occurred at Longspur in 2013. Since a number of bee genera, such as Ceretina, are stem nesters, the burning of the prairie would kill all bees that overwintered in stems. This pattern was also observed at Long Lake, a restored prairie one year younger than the Longspur, Ulen site. Unlike the Ulen site, it is divided into five separate fields. Two of these fields were burned in 2013 and the remaining three burned in 2014. For the 2013 burn year, the number of bees caught in 2013 was greater in 2014, but richness was higher in 2014. Studies conducted at sites like Longspur provide information that better informs our decisions in managing restored pollinator habitats, as well as provide opportunities to better understand the behaviors of native bees.

Dr. Joseph C. Whittaker
Department of Biology, Concordia College, Moorhead, MN
"Small Mammal Abundance and Diversity in Response to Prairie Management Practices."
Student Co-Inquirers: Peter Bergquist, Hannah Fordahl, Jessica Watson, and 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 and they require active management. The impact of prairie restoration and management practices used to maintain prairie on small mammal communities is not well known. Through this continuing project we intend to examine small mammal communities at both Longspur sites, 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 effects of plains pocket gopher mound building 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. We are 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 us monitor their populations in case similar ecological replacement was to happen here in Minnesota. 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.

<u>Ulen Site</u>

We trapped Longspur Prairie's Ulen site, Clay Co., MN, on 29 July through 2 August 2013 and 12 May through 16 May 2014 (Table 1). We captured a total of six species of small mammals over the past two years. The most common mammals captured in 2013 were mice of the genus *Peromyscus* (34 individuals). Additional captures included 25 thirteen-lined ground squirrels (*Ictidomys tridecemlineatus*), 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*). In 2014, there were no *Peromyscus* captures and the most common mammals were thirteen-lined ground squirrels (28 individuals). Interestingly, 11 were recaptures from the previous year. We captured a total of seven Franklin's ground squirrels, one meadow vole, four meadow jumping mice (*Zapus hudsonius*) and another female plains pocket mouse.

Since the project was initiated in 2012 through 2014, and in spite of considerable trapping effort, we have only captured three plains pocket mice. Two of which were captured at the Ulen site of Longspur Prairie. Our only additional capture was at Bluestem Prairie, managed by The Nature Conservancy. It is certainly intriguing that this rare species (and one of conservation concern) is using both well established and a relatively newly restored prairie. We hope continued study of these sites will enable us to better understand the habitat requirements and distribution of this species. We are also interested in the fluctuation observed in the *Peromyscus* population. This species went from the most commonly observed species to being absent. We hope to continue looking into the population of this species to see if they are trapped again in 2015. Franklin's ground squirrels are of special interest as well because they are believed to be in decline in Minnesota. We are seeing limited, but relatively consistent numbers of them between 2013 and 2104. The Ulen site might represent a stable refuge for this potentially declining species.

Mahnomen Site

We trapped Longspur Prairie's Mahnomen site, Mahnomen Co., MN, on 7 through 11 July 2014. Trapping was conducted prior to any prairie planting activities; the site thus represented an abandoned agricultural field at that time. On this site we caught a total of 19 small mammals. The dominant species was *Peromyscus*, with 16 total individuals. In addition to these mice, we caught two thirteen-lined ground squirrels and one meadow vole. This early data from the Mahnomen site will serve as a valuable baseline for comparison as the prairie community recovers and we potentially see changes in the mammals present. Additionally, this data will be useful when comparing to older restored sites (such as the Ulen site) and remnant prairies throughout the region.

TABLE 1. Small mammal individuals caught at Longspur Prairie's Ulen Site, Clay, Co., MN, in in 2013 and 2014.

Species	Ulen 2013	Ulen 2014
Ictidomys tridecemlineatus	25	28
Peromyscus spp.	34	0
Poliocitellus franklinii	5	7
Microtus pennsylvanicus	2	1
Zapus hudsonius	0	4
Perognathus flavescens	1	1
Totals:	67	41

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

While Dr. Aldrich-Wolfe's crew didn't work on NW Minnesota stuff last summer, planning for further work continued. Ongoing work will continue to compare soil fungal communities, including arbuscular mycorrhizal fungi, between restored prairie, native prairie, and representative agricultural sites. We are particularly interested in screening for beneficial fungal species that may be present in native prairie and absent from restored sites -- these fungi may be key to the successful colonization of restored sites by rare or difficult to reestablish plant species -- and in documenting fungal species that may be prevalent in restored sites and absent from native prairie -- these fungi have been implicated as facilitators of invasions by non-native plants but further work to understand their role is needed. Our current experiment at a former agricultural site in collaboration with colleagues at the University of Minnesota suggests that crop plants, natives, and invasive weeds produce divergent belowground fungal and bacterial communities on different hosts, but that the diversity of these communities depends on the particular host rather than host type (native, crop, invasive). For example, while most non-native plant species are colonized by relatively few fungi, corn appears to be colonized by as many species on average as some of our most diversely colonized native plants. Consequently, the particular agricultural legacy of a site may have implications for the quality of its restoration to prairie. We have developed a technique for extracting DNA from plant roots and soils and using fungal-specific primers to simultaneously amplify and identify thousands of fungal species. This technique allows us to quickly characterize the belowground fungal community of a site, a task that would have once been nearly impossible to complete in a lifetime.