BENEFITS OF GRASSLANDS FOR BIOENERGY PRODUCTION

IN AN AGRICULTURAL LANDSCAPE

SCHOOL OF NATURAL RESOURCES

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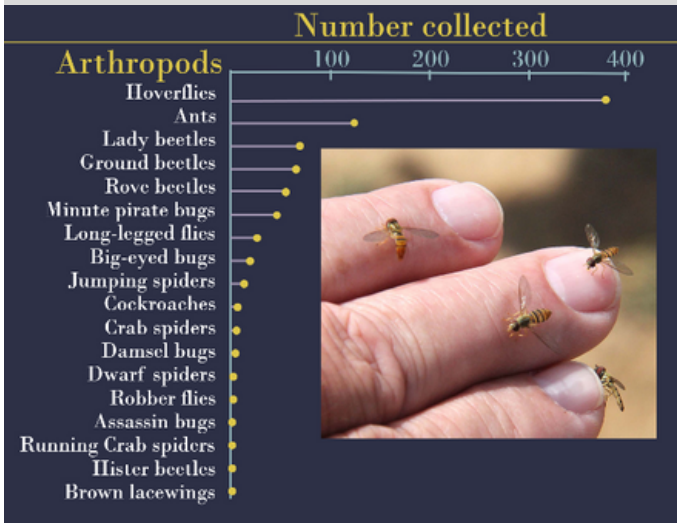
Agriculture intensification is expected to increase with the human population and its nutritional needs. Producers everywhere are facing challenges to meet food and energy production, sustain agriculture systems, and deal with economic uncertainties. A solution to these issues is utilizing perennial grass for bioenergy crop production. Perennial grass is an alternative bioenergy source that is renewable, produced domestically, has the power to diversify rural economies, and consumes less resources. Grasslands, in addition to their lower overall water usage, management requirements, and planting and harvesting costs, are also havens for many desirable animals and arthropods. These can benefit Nebraskans directly through bigger gamebird populations for hunting, more pollination and predation, and more generally through increasing the value of ecosystem services to the surrounding agriculture communities.

There is a critical need to improve our knowledge on how perennial grassland cropping systems influence biodiversity and ecosystem services. This Department of Energy funded project aims at identifying solutions to maximize agricultural production while reducing the negative impacts on natural resources. With our extensive research experience and our expertise in landscape ecology, wildlife spatial ecology, bioacoustics, entomology, and habitat management, our team is excited to lead the way on this revolutionary project.

NEBRASKA INSECT COMMUNITIES IN GRASS AND CROPLAND

Insects were collected from paired crop fields and their next-door Conservation Reserve Program (CRP) properties using various techniques. We collected from the center of both the crop fields and the CRP, and at the boundary near the edge of both fields. Pollination data was collected using visual surveys, where plant and insect species were collected when insects were observed landing on flowers. Ground dwelling insects were collected using pitfall traps and flying insects were collected using sticky cards in each of the five months between May and September. Our goal is to identify the species of beneficial insects present within and between the two land use types, and to understand how the landscape and season may change the benefits they provide.

PREDATOR INSECTS FOUND



INITIAL FINDINGS

- More insect pollinators were found in CRP properties than in crop fields with the highest number found in CRP centers.
- Grassland sites supported the highest diversity of pollinator species and our most common pollinator was sweat bees, followed by rose chafer beetles and soldier beetles.
- The most common predatory arthropods caught on sticky cards were hover flies, followed by ants, lady beetles, ground beetles, and rove beetles.
- Pitfall traps collected the highest number of ants, though ground beetles, and spiders were also well represented.
- We found more predators in crop fields than CRP for hover flies, lady beetles, ground beetles and rove beetles, however ants were found in greater numbers on CRP properties.

Predators in general seem to be spending more time in crop fields and we hope to continue exploring this trend in the coming summer. More complicated patterns of land use seem to occur closer to the border between fields and our samples this year will also aim toward understanding what is causing these effects.

GRASSLAND BIRD COMMUNITIES

Avian population estimates were conducted by completing point counts at various Conservation Reserve Program (CRP) properties, soybean fields, and corn fields. Point counts are a method that is used to estimate the total number of bird species at a given point. It consists of a trained technician standing at a predetermined point and counting all the birds seen or heard for a set period of time. The goal of this research is to improve our knowledge of grassland bird community response to various bioenergy crops.

6 ROW CROP FIELDS SAMPLED

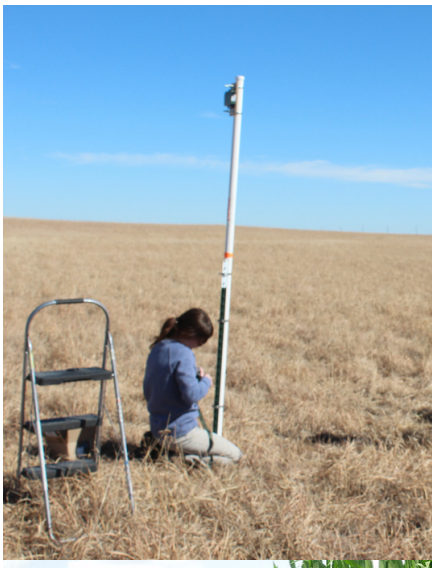
CRP PROPERTIES SAMPLED **15**

INITIAL FINDINGS

- The most common bird species found across all the sites were Dickcissel (15.4%), Grasshopper Sparrow (11.3%), Pheasant (9.4%), Western Meadowlark (22.4%), Red-winged Blackbird (8.1%).
- The least common bird species found across all the sites were Burrowing Owl (0.1%), Common Yellow throat (0.1%), Cedar Waxwing (0.1%), and LeConte Sparrow (0.1%).
- Fifty-four species of bird were sighted across all sites.
- All bird species had a higher population in CRP fields except for Kill Deer (66%) and Horned Larks (28%).

96 POINT COUNT SURVEYS COMPLETED

PROPERTIES GRANTED ACCESS **21**



UNDERSTANDING WILDLIFE USING TRAIL CAMERAS AND ACOUSTIC MONITORS

Trail Cameras and Acoustic Monitors were set up at six Conservation Reserve properties and six row crop fields. Acoustic Monitors and Trail Cameras are a non-invasive and cost-effective way to calculate biodiversity. Incorporating visual surveys and bioacoustics surveys can improve the detection of species that are more difficult to see or hear. During the 2022 field season, twelve Wildlife Acoustic Song Meter Mini recorders were attached to a 6-foot PVC pipe that is secured to a steel metal stake. The recorders were programmed to record for 2 hours in the morning and 2 hours in the evening. The Trail Cameras were positioned one meter off the ground and attached to the metal stake. To understand the wildlife that utilize different bioenergy crops, the photos from these cameras and recordings from Acoustic Monitors will be analyzed by Argonne National Laboratory.

INITIAL FINDINGS

- Argonne National Laboratory found that acoustic monitors in grassland sites had a higher number of total daily detections of grassland bird calls than row-crop sites.

As you can find in this report, we successfully completed another field season in 2022 and collected data on the birds, insects, and other wildlife inhabiting the CRP grasslands and row crop fields in Hayes County. We are looking forward to continuing this work in the 2023 and 2024 seasons, as well as answer any questions you may have!

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