

BENEFITS OF GRASSLANDS FOR BIOENERGY PRODUCTION

IN AN AGRICULTURAL LANDSCAPE



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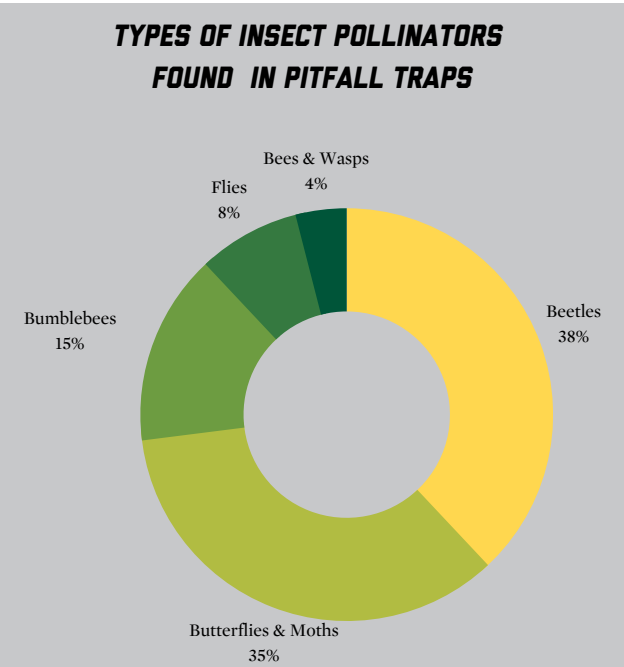
Agriculture intensification is expected to increase with the human population and its nutritional needs. Producers everywhere are facing challenges to meet food and energy production, sustain agriculture systems, and deal with economic uncertainties. A solution to these issues is utilizing perennial 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 local crop fields and adjacent Conservation Reserve Program (CRP) properties using various collecting techniques. Collections were made from the center of the crop fields, at the edge of the crop fields adjacent to the boundary with the CRP, and at the center of the CRP grasslands. Insect pollinator data was collected using visual surveys. Plant and insect species were recorded when insects were observed landing on flowers. Ground dwelling insects were collected using pitfall traps and flying insects were collected using sticky cards. Collections were completed at three points throughout the growing season. Our goal is to identify the species of beneficial insects present within and between the two land use types, and to characterize how the landscape and season may alter the benefits they provide.



INITIAL FINDINGS

- More insect pollinators were found in grassland locations (91%) than in the crop fields adjacent to the CRP (6%) and at the center of the crop fields (3%).
- The grassland sites supported the highest diversity of pollinators with 19 species documented across all sites.
- The rose chafer beetle was found most often (38%), followed by butterflies and moths (35%) and bumblebees (15%).
- The most common predatory arthropods found in pitfall traps were ants (65%), ground beetles (18%) and spiders (15%).
- Sticky card traps collected mostly predators, with about even proportions of lady bugs (27%) and spiders (29%), though lacewings and lightning bugs were also collected.
- The number of predators were highest in the grassland (59%), lowest in the center of the cropland (16%) and intermediate in cropland adjacent to the CRP (24%). The overall number of insect predators decreased over the course of the season.



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.

INITIAL FINDINGS

- The most common grassland bird species found across all sites were Dickcissel (21.8%), Western Meadowlark (16.1%), Pheasants (11.7%), and Grasshopper Sparrows (12.2%).
- The least common grassland bird species found across all sites were Baltimore Oriole (0.1%), Horned Lark (0.1%), and Blue Grosbeak (0.1%).
- Three Pheasant nests, 2 Western Meadowlark nests, and 1 Grasshopper Sparrow nest were found and documented.
- Out of all the birds observed 69% were male, 23% were female, and 8% were unknown.
- Thirty-five species of birds were sighted across all sites.



5 ROW CROP
FIELDS
SAMPLED

CRP
PROPERTIES
SAMPLED **16**



84
POINT COUNT
SURVEYS COMPLETED

PROPERTIES
GRANTED
ACCESS **14**



UNDERSTANDING WILDLIFE USING TRAIL CAMERAS AND ACOUSTIC MONITORS

Trail Cameras and Acoustic Monitors were set up at five Conservation Reserve Reserve properties and five 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 2021 field season, ten 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

- The most common species documented was mule deer.
- Bird species detected by trail cameras include ring-necked pheasants and red-winged blackbirds.



8 TRAIL
CAMERAS
DEPLOYED

ACOUSTIC
MONITORS
INSTALLED **10**



1400+

**AUDIO HOURS FROM
ACOUSTIC MONITORS**



5000+

**IMAGES RECORDED
FROM TRAIL CAMERAS**



As you can find in this report, we were successfully able to start up this project in 2021 and collect 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 2022 and 2023 seasons, as well as answer any questions you may have!

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