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Differential Foraging Patterns of Rodents and Birds in a Restored Prairie

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The Assignment: Students conducted an ecological study in restored prairie at the College of DuPage and wrote scientific papers on this investigation following the format of the peer-reviewed journal *Ecology*.

ABSTRACT

A presentation of an attempt to describe foraging behavior of rodents and birds based on giving-up densities (GUD) of sunflower seeds in two microhabitats of a restored prairie in Illinois. One habitat contained protective covering by vegetative growth and the other habitat a recently burned area that provided no protective cover. The rodents observed in this area reportedly forage only at night. The birds observed in this area forage during the day and consume seeds as part of their diet. Based on results from GUD's, nocturnal rodents forage more in areas of cover compared to no cover and diurnal birds forage slightly more in areas of cover versus no cover. Foraging behavior can be affected by many factors including predator avoidance. Although not part of this study, predator avoidance may explain the difference of consumption by rodents between the two microhabitats.

Keywords: birds, foraging behavior, giving-up densities, restored prairie, rodents.

INTRODUCTION

There are many factors that can alter animal behavior including habitat differences, predator presence, food resources, rivalry with other species, a species natural instincts, and cache requirements (Kotler et. Al. 1999). This study attempted to isolate animal foraging behavior based on microhabitat. Two animal types studied were rodents and birds within a restored prairie of Illinois. Three of the birds known to be common to this area are the American goldfinch, house sparrow (*Passer domesticus*), and the European starling. The American goldfinch is a widespread bird that has a strong preference for sunflower seeds (Middleton 1998). The house sparrow is also very widespread and is known to search in both vegetation and on ground for its diet that includes sunflower seeds (Clement 1993). The rodent species in the study area include the white-footed mouse, *Peromyscus leucopus*, which frequent grasslands with brush nearby (Hoffmeister 1989), and the meadow vole (*Microtus pennsylvanicus*). According to Hoffmeister, the white-footed mouse roams only nocturnally unless nests are disturbed and diet consist of many seeds including sunflowers. Squirrels are very common in most areas of Illinois, but are not reported to be in this study area.

This experiment evaluates the giving-up densities of sunflower seed trays to determine the amount of consumed food. The giving-up density is the weight of seed after the experiment. GUD is inversely related to the amount consumed. For example, if the initial seed weight was 5.00 grams and the GUD was 4.72 grams (high GUD), then the consumption was 0.38 grams (low). This method provides for a clear analysis of seeds removed.

Given that predator avoidance is one of the factors of animal behavior, I hypothesized that the bird consumption of seeds would be higher in the no cover zone. I also hypothesized that rodent seed consumption would be higher in the cover zone.

METHODS

The methods used for this procedure entailed dispersing seed trays in two different microhabitats of a restored prairie with temporal distribution mechanisms for both birds and nocturnal rodents. The experimental site was part of the Russell R. Kirt prairie of the College of DuPage, Glen Ellyn, Illinois. A restored prairie planted in 1986 containing native prairie grasses and forms in soil of clay and rubble and a thin layer of topsoil; this area is burned annually, half of which took placed in April two weeks prior to the experiment. The experiment took place from April 22-23, 2003. The study location includes two microhabitats, one burned rendering a large open area and the other unburned containing previous growing season native grasses and herbaceous, non-grass, flowering plants (Fig.1). Divided equally between the two study area were 160 petri dish seed trays consisting of 5.00 grams of black oil sunflower seed and 25 ml of sand as a weighting substrate, each tray anchored into the ground to prevent avoidable spilling. The sand substrate also served as a mechanism to attempt duplication of natural seed hunting given that animals are not accustomed to finding piles of food in plastic dinner trays, the organisms were required to dig out the seed from the shallow cover of sand. Two group studies were conducted, the consumption of seeds by birds and rodents (80 trays, 40 in cover, 40 no cover), and the consumption of seeds by birds (80 trays, 40 in cover, 40 no cover), assuming that rodents forage only nocturnally based on prior noted research. The bird and rodent study spanned the duration of 23 hours; in contrast the bird study took place from dawn to dusk, approximately 12 hours. In both studies, 80 of the trays were placed directly on the ground in areas of tall grass cover and the other 80 trays in the open roughly 1 meter apart. After collection, the substrate was removed and remaining seeds and hulls were weighed to determine the giving-up densities. To determine rodent consumption bird results were subtracted from bird and rodent results.

RESULTS

The giving-up densities of the seed trays were used to determine all results based on each seed tray having exactly 5.00 grams of sunflower seeds initially. The data results were non-normally distributed, and contained zero values, particularly in the rodent cover trials. For that category the data shows that some trays had most of the seeds removed, but other trays in the same area had no seeds consumed. The average seed consumption for rodents in the covered area was 1.00 gram. However, the standard deviation for rodents with cover was also 1. Considering that precise data produces a standard deviation for the rodents is very high findings indicate on average that the rodents removed the greatest quantity of seed in areas of cover; however, they did not consume any seeds in the open area (Fig. 2). The birds removed only a small amount of food in both areas. The consumption participation of birds in this study was not as large as rodent participation.

DISCUSSION

Comparisons among taxa showed that rodents removed significantly more seed in the study area than birds and rodents removed more seed from cover. Birds did not remove a large amount of food in either condition and removed only slightly more in the covered areas. The initial hypothesis, which reasoned that mice would forage from covered environments, is supported by the data. Rodent behavior only suggests that areas of high vegetation offer protection for overhead predators. The hypothesis that birds would forage more in open area was not supported by this experiment. Interestingly, only a small amount of bird seed consumption took place which leads to the debate about the absence of birds during the study period, one change that should be made to this procedure is to acclimate the birds to the seed trays by scattering seeds for a few days prior to the experiment (Linzey and Washok 2000). This would ensure that all birds present would habituate to the seed trays. Further research should be done to understand the decisions animals of this area made based on predator avoidance (Brown 1988). This experiment serves as a one case scenario that rodents prefer cover foraging; the next reasonable step is to

determine why their behavior exhibits that preference.

An additional disadvantage of this particular study is humans altering the behavior of animals simply by entering their habitats; twenty students at a time trampling down natural brush and grasses possibly changing natural landmarks that animals use to forage could have alerted the animals to the presence of predators, the humans. The recourse for that distinction remains that the animals present are considered urbanized and acclimated to the presence of humans. Supportively, the white-footed mouse builds its nests in brush growth, not in grasslands (Hoffmeister, 1989), so humans accessing the area of cover would not have disturbed its nest.

Now that the area of seed consumption has been identified for these rodents and birds the next step would be to study the factors that influence their foraging behavior such as predator avoidance, resource availability, cache requirements.

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Figures

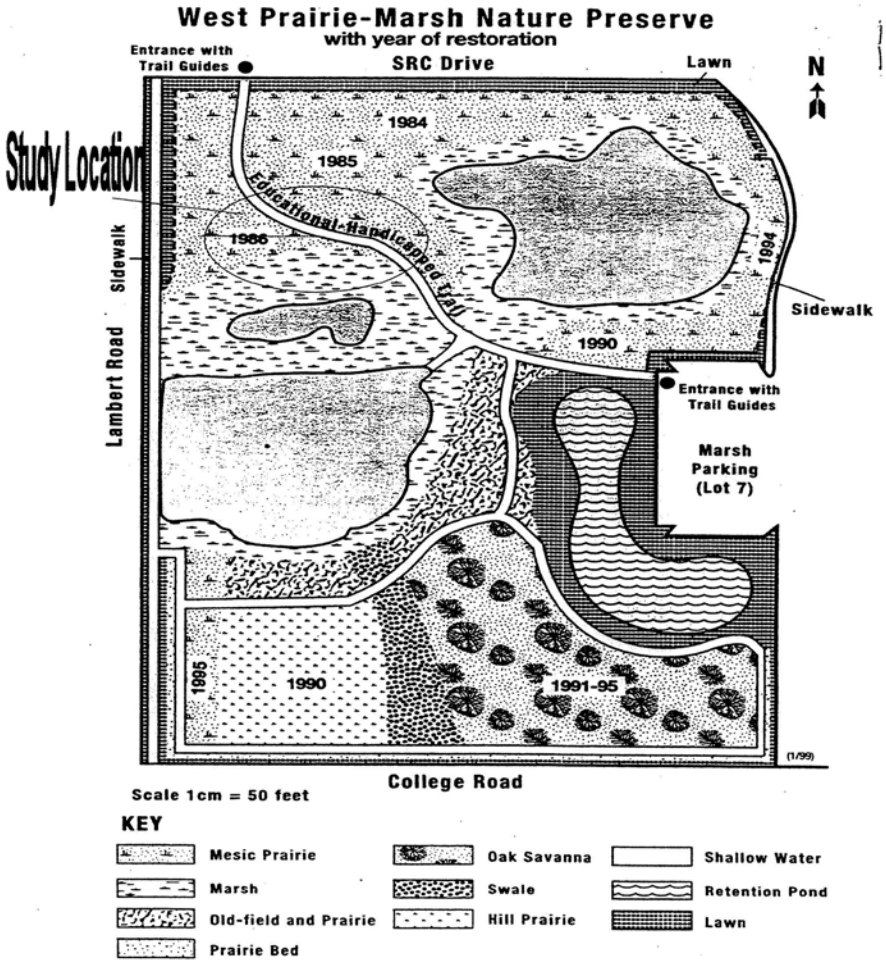

Figure 1. A map of the study location used in this experiment. The area highlighted and north of the dotted line and north of the trail was the area of no cover and was burned two weeks prior to this study. The area highlighted and south of the dotted line and south of the trail was the area of cover. Cover area had tall grasses from the previous year's growth.

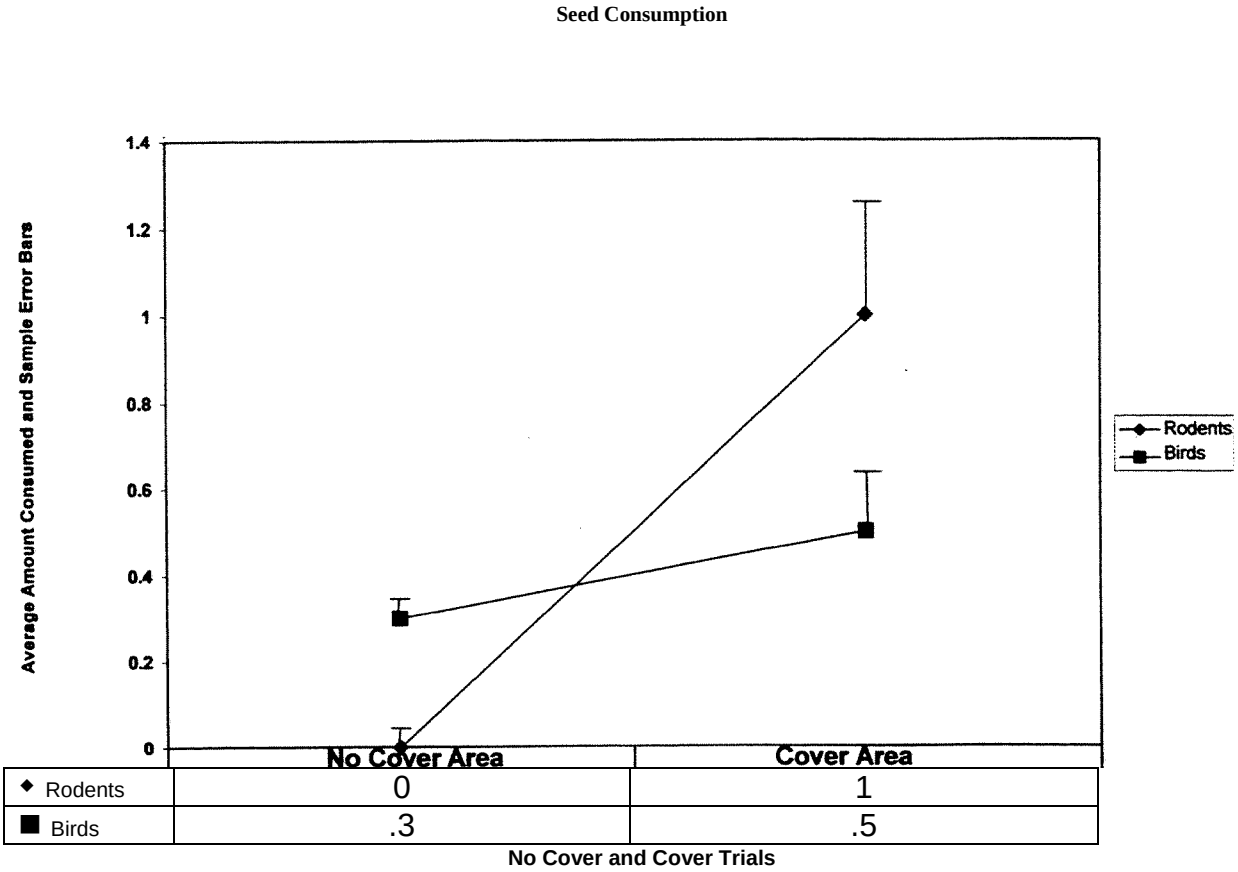

Figure 2. Lines indicate rodents or birds seed consumption based on giving-up densities of sunflower seed trays. Sample standard error bars indicate level of variance. The part of the study with the most amount of errors was the rodent with cover. According to the data some trays had a large amount of seeds removed in the cover area but some trays had no seeds removed. This graph indicates that the animals in this study ate more from the area with protective covering such as tall grasses.