

Development of foraging behavior of small mammals: Phase I: Catalog

Understanding Mammalian Diversity;
The Influence of Suburban Development on Foraging Behavior in Small Mammals:
Phase I: Developing a Catalog of Mammalian Diversity

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Abstract

Little has been scientifically recorded regarding the diversity of mammals at Litzsinger Road Ecology Center (LREC), although the site is an exemplar of mammalian habitats. Proximity to a fresh water source and an abundance of arboreal and fossorial habitats should encourage a wide diversity of mammals. In 1992, William Bethel attempted to catalog mammals by using live Sherman traps, but was mostly unsuccessful, due to trap disturbance and inclement weather. Only one opossum (*Didelphis virginiana*) and two mice (*Peromyscus spp.*) were identified (Ochs 1993). Anecdotal and trace evidence indicate the presence of white tailed deer (*Odocoileus virginianus*), eastern gray squirrels (*Sciurus carolinens*) and moles (*Scalopus aquaticus*). One might also expect voles, bats and small carnivores.

The purpose of this first phase of the study was to identify and catalog the mammalian diversity of the forested portion of the site using motion sensing cameras. While determining specific population densities is not possible with this method, we expected to obtain a general sense of richness and diversity of the site's mammals.

This portion – Phase One – of this study was completed on July 24, 2014. Our results show that the animals present are: wild turkey, white-tailed deer, raccoon, opossum and gray squirrel. According to our results, the most abundant mammal throughout the site is white-tailed deer.

Introduction

Mammalian diversity is an important component of any arboreal ecosystem. By cataloging the diversity at *Litzsinger Road Ecology Center* (LREC), we can better understand and manage the dynamics of the ecosystem and its inhabitants. Species diversity within the site can be maintained by conserving the number of species and their abundance. The intention in this preliminary phase was to establish a catalog to use as a base for further studying the dynamics of the mammals, especially the relationship between the surrounding suburban development and foraging decisions made by the animals.

Natural selection should favor the animal that either minimizes the costs of transport or that maximizes net energy gain per unit time (Sibley & McFarland). It is reasonable to expect that animals that forage optimally will have higher inclusive fitness than non-optimal foragers. Charnov's (1976) marginal value theorem may give some insight into a forager's decision-making process. Foragers should maximize energy gain per unit time.

Foraging activity of the individuals may not only depress the resources of a given patch but also depress the resources of the entire environment (Brown 1988). There is an overall average of potential energetic gain across all feeding patches in the environment. A forager should leave each resource patch when the patch harvest rate is no longer greater than the sum of the energetic, predation, and missed opportunity costs of foraging (Brown, 1988). If the forager chooses a patch based

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only the threats of predation, there may not be much resource present in that patch.

Thus, the forager could spend more energy trying to find food. The amount of food leftover in the resource patch is the giving up density (GUD). In a risky environment, the given up density should be much higher than in a safe environment.

Materials and Methods

Phase One of this study was performed at Litzsinger Road Ecology Center (LREC). Two Reconyx® HC500 HyperFire Semi-Covert IR cameras were rotated among five microsites to capture images of animals in the natural ecosystem.

The microsites were: Owl Tree, Prairie Path, Savannah, Deck East, and Deck West. These are shown in Figure 1. At the Owl Tree location, the camera faced a tree with a large cavity and the frame included a walking path. The camera at Prairie Path faced the margin of the prairie at the edge of the woodland and also included a walking path. The Savannah site was an open space at the west end of LREC. Of the microsites, Savannah was nearest to suburban development. The wooden deck at the base of the field station (shown in Figure 1 as a red block) served as the attachment for the camera at both the Deck West and Deck East microsites.

The cameras were secured to stable structures, such as a strong tree. In sufficient sunlight, the cameras take color photographs, while in the dark, infrared images (shown in Figures 2a and 2b). Each camera was programmed to take three photographs per second, immediately after sensing motion in the visible field. Images were recorded on a 4GB SD card, then transferred to a desktop computer for analysis. The cameras were powered by 12 NiMH batteries each.

Images were collected from June 19 through July 24, 2014. The time was divided into eight intervals ranging from two to seven days. At the beginning and end of each interval, SD cards and batteries were changed. Each recorded image was

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inspected for animal activity. Some individual animals would inevitably cross the path of the camera more than once within an interval, but this methodology does not allow for discrimination between multiple visits by one individual and single visits by multiple individuals. Thus, all visits were counted as independent events, though two individuals present in the same frame counted as two visits.

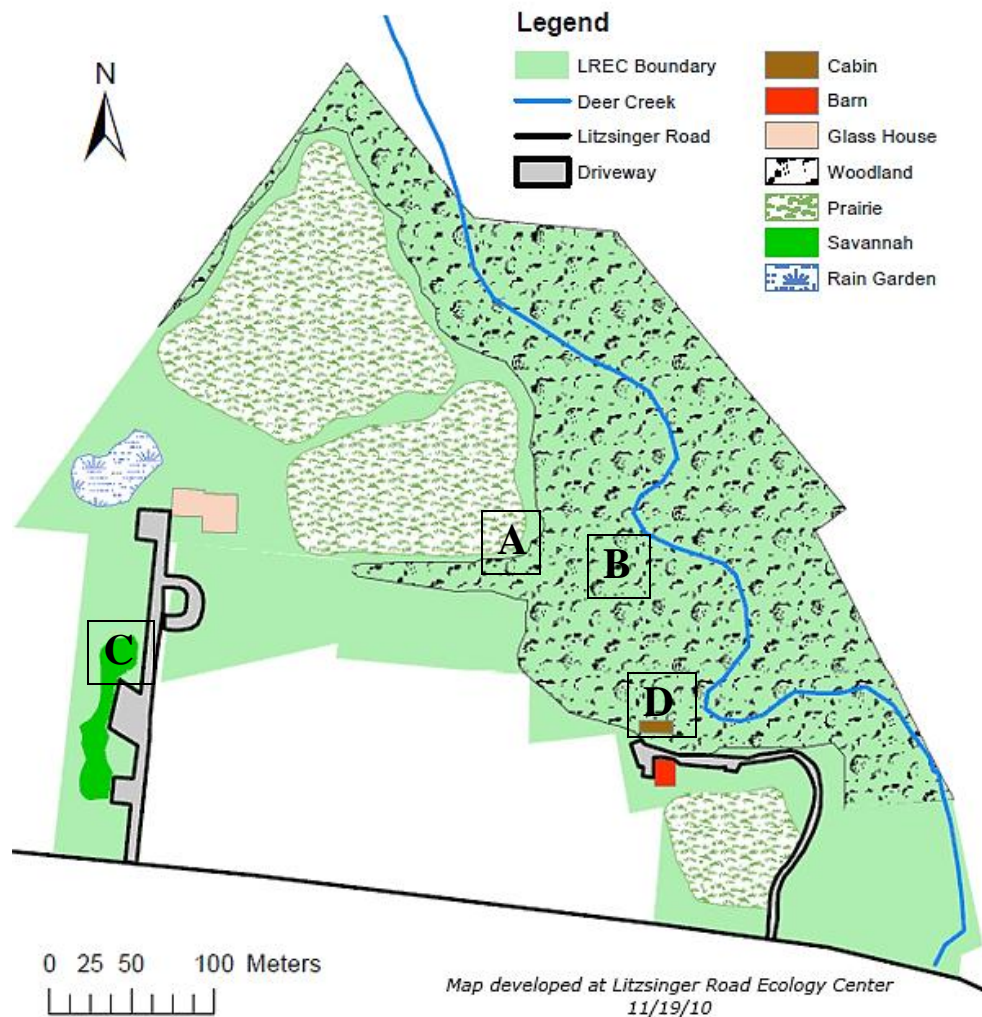


Figure 1. Location of observation microsites

A. Prairie Path B. Owl Tree C. Savannah D. Deck East/Deck West

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Figure 2a. Example of infrared image captured. Three individuals of *Odocoileus virginianus*.



Figure 2b. Example of color image captured. One individual of *Odocoileus virginianus*.

Results

Among the five microsites there were 117 mammal occurrences. Species observed were: white-tailed deer (*Odocoileus virginianus*) with 112, or 95.7% of all mammalian visits; opossums (*Didelphis virginiana*): 2 visits; gray squirrels (*Sciurus carolinensis*): 2 visits; and raccoon (*Procyon lotor*): 1 visit. The most frequent non-mammal seen was wild turkey (*Meleagris gallopavo*), with 50 visits. Table 1 shows the number of occurrences of mammals at each observation location during the time intervals listed. The most abundant mammal species observed over all microsites and time intervals was white-tailed deer.

In time interval I at Owl Tree there were a total of 17 animal occurrences. Of these were six instances of white-tailed deer and 11 instances of wild turkey. In the same interval Prairie Path location had one instance of white-tailed deer and 23 instances of wild turkey.

Intervals II, III, and IV continued to show similar results with many deer (see Table 1). During the fifth interval, beginning July 10th, there were twelve mammal occurrences at the Savannah microsite. Of these occurrences, eleven instances of white-tailed deer and one possum were seen. At the Deck West location in the same interval, eight instances of white-tailed deer were photographed and one gray squirrel was photographed. Intervals VI and VII were similar.

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Time Interval	Owl Tree	Prairie Path	Savannah	Deck West	Deck East
I 10:15am 6/19- 1:35pm 6/24	6	1	n/a	n/a	n/a
II 1:50pm 6/24- 1:10pm 7/1	21	8	n/a	n/a	n/a
III 1:10pm 7/1- 1:30pm 7/8	10	12	n/a	n/a	n/a
IV 1:30pm 7/8- 11:30am 7/10	0	1	n/a	n/a	n/a
V 12:00pm 7/10- 12:00pm 7/15	n/a	n/a	12	13	n/a
VI 12:00pm 7/15- 1:00pm 7/18	n/a	n/a	1	n/a	19
VII 1:00pm 7/18- 1:00pm 7/22	n/a	n/a	1	n/a	3
VIII 1:00pm 7/22- 2:30pm 7/24	n/a	n/a	2	n/a	7
Total	37	22	16	13	29

Table 1. Total mammal occurrences at each location site during the time intervals visited.

Discussion

The primary focus of Phase One of this study was to identify and catalog the mammalian diversity of the forested portion of the site using the two motion sensing cameras. Cameras were moved periodically to attempt to photograph greater diversity of mammalian species at LREC. Among the photographic monitoring, the most abundant animals observed were the white-tailed deer and wild turkey.

Photographic evidence confirms that there were at least three adult white-tailed deer and two fawns living on the site during this study. The results of this study showed lower mammalian diversity than expected. This might be rectified by setting up more microsites deeper in the woodlands and nearer the creek, where a greater variety of mammals may reside.

The next phase of the research will focus on the influence of nearby suburban development. A target species will be identified and GUD will be measured as a function of development. This first phase of the research has given us a preliminary understanding of the mammalian diversity, and the interaction between the animals and their environment. This study provides photographic evidence that supports previous claims of mammalian diversity at LREC.

Acknowledgements

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