

KROGER HILLS  
SMALL MAMMAL SURVEY

Submitted by

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## INTRODUCTION

A small mammal survey was conducted on the Kroger Hill Park land. The main objectives of this study were to determine what small mammals were present and their population densities. It was also to be determined what the vole status was with respect to the "meadow."

This study was carried out during the months of June, September, October, and November. The trapping was done primarily during the fall by Xavier University senior biology students and by the author.

## METHODS

Sherman live traps supplied by the Hamilton County Park Board were utilized. Trapping was carried out in grids and lines following the lay of the land. The traps were baited with peanut butter, oats, or a combination of both. In one trapping period hay bales were utilized to create artificial cover therefore, hopefully, attracting more mammals to the trapped area.

In another trapping session pit fall traps were employed in conjunction with the hay bales.

Population density was determined by direct count of marked individuals, mice/100 trap nights, the Lincoln Index, and an average Lincoln Index. It must be recognized that any population index is an estimate and is effected by the

randomness of mark recapture and the duration of time the traps are set, therefore, some of the index measurements are probably bizarre.

The relative grid areas trapped were estimated as:

AREA = width of plot in meters X length in meters  
(area = meters squared)

The distances, width or length, were determined by multiplying traps per row or column by 15 meter spacing. Mammal density was normalized to number per hectare (10,000m<sup>2</sup>).

Eight main grids or plots were utilized for data collection.

Several other plots were constructed but no data could be obtained due to harassment by raccoons and pedestrian traffic. Several small plots were constructed in strange or unique habitats looking for rare mammals but it became evident that *Peromyscus* generally dominated even in most of the unique or odd habitat.

The following is a list and description of the study plots or grids:

FALL AND WINTER

Grid #1

Beech, maple, walnut forest; ground covering sparse, mayapple, small walnut trees. Really poor cover; almost bare.

Grid #2

Half of the grid was a successional scrub growth, mixed weeds, wildflower, some fescue and brome grass, small beech, maple, box elder; honeysuckle. The other half was entirely in brome and fescue grass.

Grid #2 and Summer Grid #2 -- since the habitat in these two grids is one-half grass and the other half successional scrub and *Peromyscus* were only caught in the scrub population, estimates for *Peromyscus* should really be based on only half the grid size. To help correct this, in comparing population density I doubled the population number and placed it in parentheses in the appropriate place in the tables of data.

Grid #3

A successional scrub area right next to grid #2; some cement building foundations.

Grid #4

(a) 10 trap sites along Kroger Hills Lane, each site 0.1 mile apart, each site consisted of a bale of hay and two traps on one side of the Lane and a single trap on the other side of the Lane. The sites are numbered from #1 at Terrace Park to 10 at the west end.

(b) The same traps as in (a); but with the addition of a #10 can pit fall trap.

The main function of this grid or line was to sample many diversified areas along the lane for unique or different species. Since it is a very long line (1 mile), it is difficult to compare the numbers of mice caught with the mice caught in the other grids. Therefore, for sake of comparison, it was treated as a grid 150 meters long, the assumption being 10 trap sites are 10 trap sites whether they fill 150 meters or 1 mile.

Grid #5

Basically the same as Summer Grid #1, but after the area had been bush hogged.

SUMMER

Grid #1

A successional area of mixed herbacious growth, honeysuckle, poison ivy, and small trees such as beech, maple, box elder.

Grid #2

A brome, fescue grass field with a small area of overlap into the successional scrub; in the barn area.

Grid #3 (trapline on old railroad right-of-way)

Traps were set on the side under a thick viney growth. The vine appears to be honeysuckle vine, poison ivy, and trees. This is basically forest edge.

Several attempts to trap in the forest north of Wooster Pike were extremely discouraging due to raccoons or foxes tearing up the trap lines. No data could be collected. This predation is most probably raccoons based on the intercanine distance very evident on the traps. Several small clusters of traps were set in botanically odd-looking areas, but *Peromyscus* was still the predominant animal and no interesting species were captured so trapping was discontinued. Grid or plot size was smaller than in the original proposal to ensure at least some of the traps from possible pedestrian theft.

The Lincoln Index and Lincoln index average method for determining population density were first utilized by Peterson (1896) and Schnabel (1938), but now these methods are used in a variety of different forms. In this research since we were only interested in relative abundances and types of species, no attempt was made to be a mathematical purist in estimating densities.

RESULTS

The results of this study are summarized in several tables.

TABLE #1

## SUMMER GRIDS

	Grid #1 6/1-9	Grid #2 6/10-16	Grid #4 6/25-26
Peromyscus per 100 trap nights	8.8	3.6(7.2)	31.25
Microtus per 100 trap nights	0	0.36	0
Marked Peromyscus	12	9	9
Marked Microtus	0	1	0
Blarina	2	0	0
Juvenile Pero.	2	3	0
Lactating female Pero.	5	1	0
Lincoln Index Pero./hectare	20 19.7	9(18) 12.1(24.2)	24 33
Lincoln Index(avg) Pero./hectare	11 10.8	9.4 12.7	24 33
AREA	10125 meters <sup>2</sup>	7425 meters <sup>2</sup>	7200 meters <sup>2</sup>
TRAP NIGHTS	315	276	32



TABLE #2

	Grid #1 9/18-22	Grid #2 10/1-10	Grid #3 10/14-20	Grid #4 Lane 10/27--11/8
Pero. per 100 trap nights	4.2	4.7	5.8	8
Mic. per 100 trap nights	0	0.6	1.2	0
Marked Mice	4	4	7	7
Fumbles+	1	1	3	4
Microtus	1	1	3	0
Blarina	2	0	0	1
SubAdult Pero.	0	0	1	1
Lactating Female Pero.	1	1	0	0
Lincoln Index	6	6	9	13.5
Pero./ hectare	7.6	6.3(12.6*)	10(15*)	30.0
Lincoln Index(avg)	12	6	11.5	18
Pero./ hectare	15.2	6.3	12.8	40
AREA	7875 meters <sup>2</sup>	9450 meters <sup>2</sup>	9000 meters <sup>2</sup>	4500 meters <sup>2</sup>
TRAP NIGHTS	140	168	240	200

\*estimates of density if all habitat were scrub in the grid rather than partially in grass.

+mice caught but accidentally released or escaped prior to marking.

After the fall cutting grid #5 produced no mice in 200 trap nights.

## DISCUSSION

The variety of small mammals in Kroger Hills is not as great as one might hope for. Mammals revealed by trapping are the white-footed mouse (Peromyscus leucopus), the common short-tailed shrew (Blarina brevicauda), the field vole (Microtus pennsylvanicus), and the chipmunk (Tamias striata). White-tail deer, woodchuck, rabbit, and beaver are commonly seen. Raccoon and fox were seen rarely in the early morning. Possum and skunk are also known to be in the area since they were seen dead on the road in the vicinity.

Microtus pennsylvanicus, the common field vole was found to be present, summer grid #2 Table 1, fall grid #2 and #3 Table 2. Grid #3 is a successional area of mixed herbaceous growth plus fescue and brome grass intermixed. The density here is about 3.3 Microtus per hectare; the highest Microtus density found in the Kroger Hill meadow. Microtus can therefore be found in numbers great enough to colonize the meadow as it grows following the fall cutting.

Meadow voles in the appropriate habitat are generally very efficient reproductive machines. Blair (1948) reported vole density at 74.5 mice per hectare in a Michigan population. Gottshang has estimated vole density from 5 to 82.5 individuals per hectare. Hamilton (1941) reported as many as 500 per hectare could exist. The vole density at Kroger Hills is obviously low, but the reason is not at all obvious. The habitat is not prime but many researchers have reported voles living in a scrub successional field with patchy grass such as we have at Kroger Hills. Microtus does undergo 3 to 5

year cycles so perhaps it was at a low in the cycle. I think a better explanation is that it is unable to compete with Peromyscus leucopus in the successional habitat. The white-footed mouse's habitat is forest and Kroger Hills is surrounded by forest, therefore, population increase forces Peromyscus into the fields in very large numbers and Microtus takes refuge in the grassiest areas which are few in the park.

Blarina brevicauda were captured in summer grid #1, fall grid #4 (the Lane), and in the woods of fall grid #1. The hay bale, pit falls of fall grid #4 may prove to be very successful in the spring, but the drop in temperature slowed down shrew movement in November. No Sorex or Cryptotus have as yet been captured.

Peromyscus leucopus, the white-footed mouse is the dominant and predominant small mammal in the park. In similar meadow like habitats, the deer mouse, Peromyscus maniculatus would be expected; i.e., it is a meadow species. All key characteristics verify the Kroger Hill Peromyscus to be leucopus, since the forests of the area are inhabited exclusively by Peromyscus l. They are able to move right into marginal or successional areas. This mouse was also seen to be frequenting several of the bluebird houses during the summer and will probably take up winter residence in them. Utilizing the Lincoln Index estimate which is a maximum estimate, it is seen that the density of the successional meadow ranges from 12.1 to 19.7 mice/hectare in a reproducing summer population down to 6.3 to 10 mice/hectare in the fall population. The lowest population density was found to be <sup>6.3</sup>~~7.6~~/hectare in fall grid #2 population and the highest

11

densities were the forest edge railroad right of way (Grid #3, summer) of 33/hectare and 30.0/hectare in the fall grid #4 or Lane trap line.

The population density of *Peromyscus* in Kroger Hills compares with Burt's study (1940), where density ranged from 7.7 to 27.2 mice per hectare. Greater densities have been reported by Ruffer who found 19 mice per 0.29 hectare (68 per hectare). Burt's and Ruffer's study sampled woodlot animals, however.

The density estimates utilizing a comparison of total marked mice per plot, or mice per 100 trap nights show the same relative differences as the Lincoln Index.

*Peromyscus leucopus* is described as a woodland mouse but in dealing with this mouse for 25 years in the Cincinnati area I have always found higher populations in a marginal or forest edge habitat rather than pure forest. This may reflect the use of trees by the mouse and therefore a reduced probability of catching the mouse on the ground or perhaps in this area it really prefers margins.

During the summer and in September weanling mice were caught in the traps, however, I did not mark them. Females of the summer or early fall were also seen to be lactating or pregnant. This leads one to believe that *Peromyscus* is breeding through October in the Kroger Hill property.

*Peromyscus leucopus* will not enter grassy habitat as shown by the failure to catch the animal in the grassy part of summer grid #2, or in the grassy part of fall grid #2. Grass appears to be a more effective barrier than a wall to *Peromyscus leucopus*. The fall grid

also showed that *Peromyscus* will not use a completely open field; i.e., no mice were captured after the fall cutting.

One of the objectives of this study was to determine whether the area was capable of supporting barn owls. Barn owls are a meadow species which at one time was widely distributed over the meadows or hayfields of Ohio, but in the 60's declined in numbers. This decline is attributed to the decline in farming and the building boom. Part of the owl problem must take into consideration the fact that it is a creature of the open plains and moved into Ohio through prairie extensions into the state and then into farmed meadows so it really never occurred in areas with much forest. Since the "Kroger Meadow" was really a successional area of mixed herbaceous plants, grass, and small trees with a moderate to good population of *Peromyscus leucopus*, we could not describe it as optimum barn owl habitat. If it is seeded as a meadow or hayfield and maintained as such permitting a vole population to build up, it may be able to support a pair of owls.

Assuming an owl weighs about six pounds and must consume between 10 and 25% of their body weight a day and assuming the vole population contained 50 female voles per hectare, each female could produce 6 young in 21 days; summing across 26 hectares (Kroger Hill meadow) and assuming each offspring would weigh 30 gms at adult size, the area could produce 520 pounds of mice usable for food in several months. Assuming a 6 lb. owl eats about 1.5 lbs. a day, we can see owl nutrition at peak densities would be no problem. If the number of female voles dropped much below ten per hectare, the owls would have difficulty. There is another problem with barn owls in Kroger Hills

or for that matter a great deal of the land that the state is interested in putting barn owls into. The food species available to barn owls is restricted to meadow voles. During a vole population crash an owl must have a buffer species to prey upon. In the prairie states or southern states the owl can switch to gophers, harvest mice, jumping mice, cotton mice; i.e., many species depending on the area. Ohio owls really don't have much of an alternative. In certain areas deer mouse, house mice, or harvest mice might serve as a buffer to barn owls, but for the most part I think the owls would just have to hunt farther during a vole population crash. They might leave the area entirely. Everything considered I think it is worth giving a try.

Since the grid trapping had two purposes (i.e., estimating density and determining species composition) they were not optimum for estimating density. If we would have been interested solely in mouse numbers, we would have used fewer plots and more trap sites, but we had to survey, estimate density, and protect from possible theft.

Further study of the Kroger Hills land is warranted and would be of interest. I would like to set up several plots in various parts of the meadow and monitor the vole population density as it hopefully takes over the meadow. It will be extremely interesting to study the competition between *Microtus* and *Peromyscus* in an area such as this; i.e., a meadow completely surrounded by forest. It appears that this situation is an ideal one for studying niche width and competition between these two species.

## Literature Cited

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Budget

Total trapping 31 days

Summer

Mileage 4.8 mi/day

31 x 4.8 = 148 mi.

\$0.15/mi x 148.8 = 22.32

Peanut Butter 6.00

Sub Total \$28.32

Fall

Peanut Butter \$12.00

Hay Bales 25.00

Oats (3x\$1.69) 5.07

Mileage

72 trips of 12 miles

(72x12x\$0.15) 129.60

Sub Total \$171.67

TOTAL \$199.99