

KROGER HILLS
SMALL MAMMAL SURVEY
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Submitted by

Graham F. Petri
Xavier University

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INTRODUCTION

This study is the second phase of a mammal survey which was first begun in the summer of 1986 in Kroger Hills Park. The initial or 1986 phase was performed after the Kroger Hill meadow had been undergoing succession from old field to forest. The successional meadow was cut in the fall of 1986. This study is part of a land management and barn owl conservation program advocated by the state of Ohio and the Hamilton County park administration.

The 1987 summer and fall study was done to measure possible changes in the small mammal population caused by the 1986 fall cutting, and to establish a base line for the future treatment proposed by the Park Board. Hopefully the total study will continue at least until the mammal population has changed sufficiently to establish barn owls.

METHODS

Sherman live traps supplied by the Hamilton County Park Board were utilized. Trapping was carried out in grids or lines following the lay of the land. The traps were baited with peanut butter, oats, mixed bird seed or a combination. In order to reduce theft or the possibility of theft, traps were set in smaller groups at several different places in the park. If theft would have occurred, the trap loss would be minimized. Smaller numbers of traps per area made checking and baiting traps a bit easier during the heat of the summer.

Population density was determined by direct enumeration of marked individuals, mice/100 trap nights, and the Lincoln Index method. These methods are consistent with the 1986 trapping.

The grid size was determined by calculating:

$$\text{Area} = \text{width of plot in meters} \times \text{length in meters}$$

The distances, width or length, were determined by multiplying traps in row or column by 15 meter spacing. A single line was considered 15 meters wide.

Population density was employed utilizing the techniques of Petersen 1896 and Schnabel 1938.

Mammal density was normalized to number per hectare (10,000 meters²)

Nine main plots or grids were utilized for data collection. Eight of these were within Kroger Hills and one was at the Miami Valley Golf Center. The golf course plot was located along the river on Wooster Road end of the golf course.

The trap sites sample animals in each of the vegetation treatment areas proposed by John Klein. (See Fig. 1)

The basic rationale for selecting the sites was established for several reasons. First, to sample the areas where different vegetation treatment was to occur; (see Fig. 1) second, to sample the same sites as 1986 to note change; third, to maximize the probability of finding pockets of Microtus; and last to increase the chance of trapping more Zapus and P. maniculatus which were found in the park in 1987.

The following is a list and description of the various sample sites:

Plot #1 Terrace Park (.3 mile in from Terrace Park Gate)

A meadow area made up of a mix of sweet clover, wild carrot, Queen Anne's lace, goldenrod, milkweed, poison ivy, mixed grass, thistle, honeysuckle, small maple, box elder, Sycamore trees.

Trap grid 4 x 7, 0.63 hectares; June 10 to June 21

Plot Lake Plot #2

Grassy banks of what appears to be a dried pond.
(East side pond)

Trap grid 5 x 2; June 13 to June 21

Plot Lake Plot #2a

Grassy area with small amount of encroaching honeysuckle, poison ivy, grape vines, thistle, goldenrod, milkweed. (North bank)

Trap grid 5 x 2; July 17 to July 22

Plot Lake Plot #2b

Mixed coarse grass, sweet cover, clover.
(Near middle of lake)

Trap grid 5 x 2; July 22 to July 26

Plots 2, 2a, 2b when put together constitute approximately half the area of the old pond, approximately the size of a 7 x 4.5 grid; 0.65 hectares

Plot #3

Barn meadow: an area of mixed coarse grass approximately one hectare in size.

Trap grid 5 x 3; July 17 to July 26; 0.34 hectares

Plot #4

An area of very dense mixed weeds and grass at west end of the Kroger Hills Meadow.

Trap grid 4 x 7; 0.63 hectares; July 28 to Aug. 3

Plot #5 Terrace Park Gate

An area composed partially of grassy lane border and the adjacent successional meadow. The meadow in this area is vegetatively less dense than the previous plots. Stem density much reduced. Grasses, vines, goldenrod, and Sycamore seedlings that have grown to six feet tall during the spring and summer.

Trap grid 5 x 2; .225 hectares; Aug. 3 to Aug. 14

Plot #6 Horizontal Plot

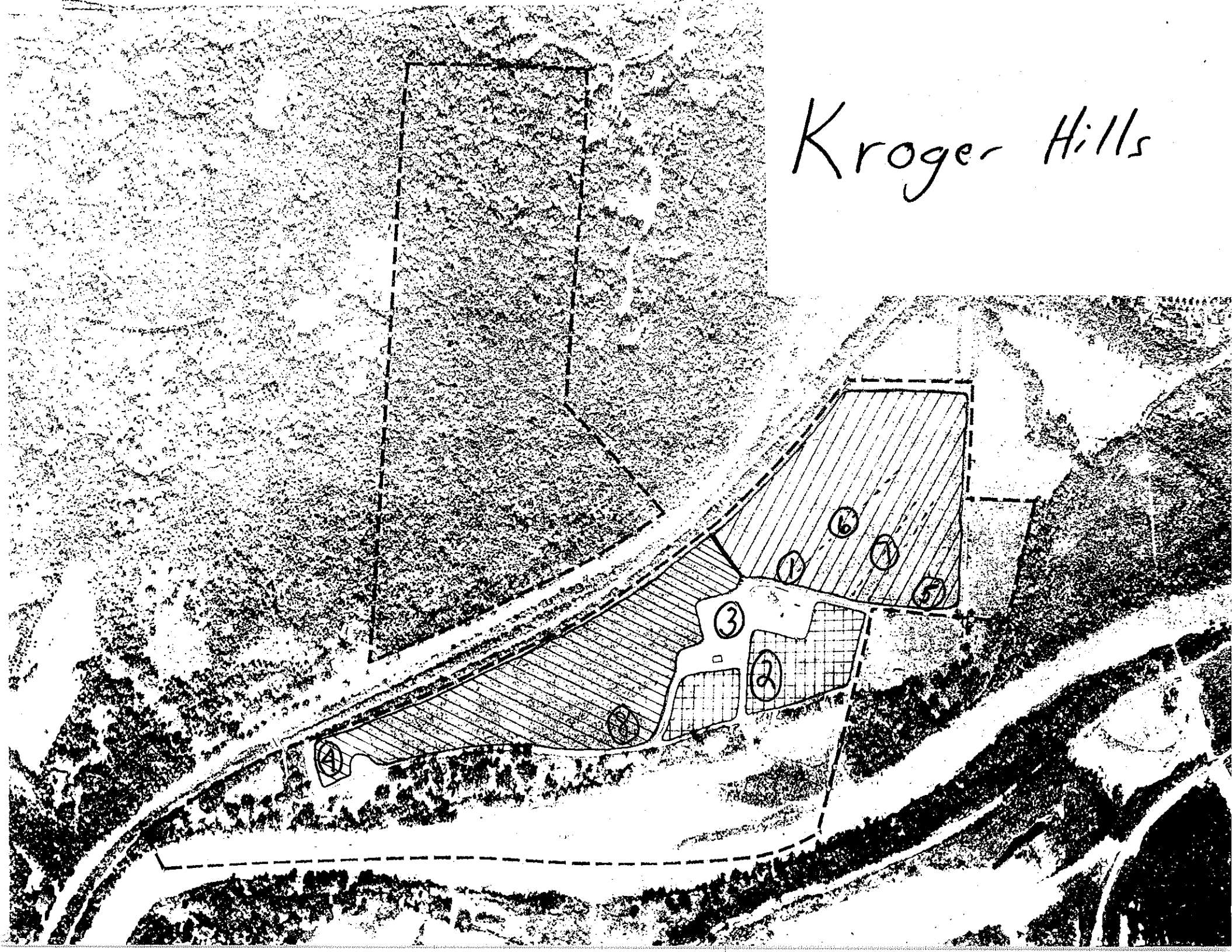
An area beginning in Plot #1 running horizontally eastward ending in the middle of the field. The vegetation is very thick at the Plot #1 end and becomes relatively sparse at center of field. The center of the field contains sparse stands of goldenrod, thistle, milkweed.

Trap line 10 traps; .225 hectares; Aug. 3 to Aug. 14

Fig. 1

Map showing 1987 sample plot locations. These plots are located in the areas proposed for different vegetation management treatments.

Kroger Hills



Plot #7 Midway Plot

An area composed of successional meadow the same as the Terrace Park Gate Plot. This plot is approximately half way between Plots 5 and 6, a distance of approximately 220 yards or .125 mi.

Trap Grid 10 x 2; 0.45 hectares; Aug. 19 to Aug. 22

Plot #8 Fall Plot

An area west of the barn area; the eastern boundary of which is at the point where the Kroger Hill lane straightens out and runs due west. The vegetation here is a mixture of grasses, burr-producing plants and goldenrod. The growth is at the most waist high. There are very few tree seedlings and no Sycamores.

Trap Grid 6 x 6; 1.10 hectares; trapping periods
Sept. 24 to Sept. 26

(2) Oct. 7 to Oct. 13

(3) Oct. 29 to Nov. 2

Little Miami Golf Course

An area at the north end of the course was trapped utilizing a 4 x 5 grid with a line of traps leading from the parking area to the grid and another line of traps leading away from the grid back to the parking area. This area consisted of mixed habitat; i.e., grassy areas, ecotone and forest. A total of 36 traps blanketed the area.

Results

During the summer of 1987 apparent changes in population numbers were noted; some of which are statistically significant; others are not. Some areas show increasing densities and effects due to cutting are evident and several new species for the park were caught.

Terrace Park plot #1 produced two *Zapus* males one of which was also caught in the Horizontal Plot #6. One *Peromyscus maniculatus* was also caught in Plot #1 and a second in plot #6. One male *Mus* was caught in the Barn Plot #3.

The results of trapping with respect to predominant animals in the park; i.e., *Peromyscus leucopus* and *Microtus*

pennsylvanicus as well as the shrew Blarina brevicauda are summarized in Tables 1 and 2.

TABLE I.

	I.	II.	III.	IV.
PEROMYSCUS L marked	13	11	5	0
MICROTUS marked	0	0	1	0
BLARINA	2	0	1	0
LINCOLN INDEX PERO L.	13	-	-	-
PERO/100 TRAP NIGHTS	8.9	13.15	3.33	0
MICROTUS/100 TRAP NIGHTS	0	0	.66	0
PEROMYSCUS DENSITY/HECTARE CALCULATED FROM LINCOLN INDEX	20.6	15.38	14.7	0
MICROTUS DENSITY/HECTARE	0	0	3	0
TRAP NIGHTS	336	190	150	150

Trapping results Plots 1 to 4 respectively
Terrace Park 1, Lake, Barn, west edge of park.

TABLE I I

	V.	VI.	VII.	VIII.
PEROMYSCUS L. MARKED	8	12	13	16
MICROTUS MARKED	5	2	0	3
BLARINA	0	0	0	5
LINCOLN INDEX PERO. L.	9	15	0	32
PERO/100 TRAP NIGHTS	16.6	20	35	7.05
MICROTUS/100 TRAP NIGHTS	5	1.8	0	.64
PERO DENSITY/HECTARE FROM LINCOLN INDEX	40	66.7	28.9	29
MICROTUS DENSITY/HECTARE	22.2	8.9	0	2.7
TRAP NIGHTS	120	110	80	468

Trapping results Plots 5 to 8 respectively;
Terrace Park Gate, Horizontal, Midway, Fall plot

One of the main questions which we should ask about the study is "Did Microtus increase between 1986 and 1987; i.e., after cutting?" During 1986, 6 Microtus were captured per 1371 trap nights and in 1987, 11 Microtus were captured in 1554 trap nights. Utilizing the Z test, $Z = .95$, $p = .17$. This is not a significant increase. A similar comparison of Peromyscus leucopus density between 1986 and 1987 discloses that Peromyscus capture increased from 52 per 1371 trap nights to 78 per 1554 trap nights; here $Z = 1.6$ and $P = .05$, a significant increase. It can be shown that Peromyscus and Microtus are remaining in the same proportion.

There appears to be a significant distortion of the sex ratio in Peromyscus leucopus; 30 females to 47 males, Chi Square 3.76 with a probability $P = .05$.

Population densities are consistent with the numbers found for Blair 1948, Burt 1940, and Gottschang 1981.

Lactating or pregnant female Microtus and Peromyscus leucopus were noted during the entire trapping period; i.e., from July to November. Weanling mice were also noted through the whole period. It is also apparent that more mice, both Peromyscus and Microtus were caught during the second half of the study period.

No animals which had been marked in 1986 were recaptured in 1987.

The area looked more like a meadow during the summer of 1987 and more meadow birds were visible or singing.

Little Miami Golf Course Plot.

Summary

The 36 traps were checked for 7 days in November; i.e., 252 trap nights.

- 7 chipmunks
- 13 Peromyscus leucopus
- 3 Microtus
- 1 Shrew

DISCUSSION

The survey of the last two years discloses important information about the Kroger Hill area. Some of the information is of a theoretical nature contributing to our body of knowledge concerning the ecology and evolution of "meadows" such as the Kroger Hill meadow in general and the species inhabiting it in particular. A great deal of the information obtained is very practical and is immediately useful in respect to the management of the park and the potential success or failure of the conservation programs advocated by the Ohio Wildlife group and the Hamilton County Park Board.

It appears that the first cutting of the park produced an immediate effect in the vegetation of the park. A casual observation shows that the area looked like and contained more meadow plants in the summer of 1987 as compared with the summer of 1986. The major small mammals in the meadow show increasing densities. Feromyscus leucopus density increased significantly and Microtus populations are up. It appears that the fall cutting and subsequent vegetation growth effects, climatic factors, or, possibly, the Cicada epidemic had positive effects on reproduction in many areas of the park. However, we would like Microtus to increase and Feromyscus leucopus to decrease in a meadow situation. As the grass in the main part of the meadow increases and plant diversity and thick stemmed plants decrease Feromyscus leucopus will leave and return to the forest or forest edge habitat. This is being substantiated by plot #4, at the west end of the meadow. During 1986 this was a good Feromyscus leucopus producing area; during the summer of 1987 no animals were caught in the plot. After cutting, the vegetation which grew consisted of thick mixed stands of grass, viney growth, with a marked decrease in plant diversity and small trees. The only reason that Microtus didn't increase or reproduce in this area is they are more prevalent in the eastern part of the meadow and didn't have time to move in.

During the 1986 survey Microtus was determined as the only mammal in the park that could be considered a meadow species capable of furnishing a food population for barn owls. Even though Microtus are 80% of the barn owls' diet, there should be an alternate food species present in the meadow. Last summer Zapus hudsonius, the meadow jumping mouse and Feromyscus maniculatus were shown to be present in certain areas of the meadow. These two species should increase as the property becomes more typical meadow.

The aberrant sex ratio in Peromyscus leucopus is interesting but I think it is artifactual. The preponderance of males may be due to two main events. First, plot #7 was sampled near the end of the summer when population density was high. Most of the animals involved were migrant male animals which had already been marked in Plots 1 and 5. The movement of males is typical but some of the migrants were older mature animals. The younger ones should have furnished the bulk of the migrants. The second factor which could have been involved in the aberrant sex ratio became apparent in plot #8 which was sampled concurrent with or just after mowing of the Terrace Park end. Most of the animals caught in plot #8 were male, trapped, and never recaptured. No recaptures were obtained until the end of the trapping period for plot #8. Therefore, many of these organisms must have been migrants moving across plot #8 from the cut areas.

Observations of the data shows that Microtus was caught in several main areas; i.e., plots 5, 6, and 8. Plot #5 is perhaps the most informative since half of the plot consisted of the mixed grasses at the edge of the lane near the Terrace Park gate. I am not confident of grass taxonomy but these grassy areas looked more like lawn varieties; i.e., bluegrass or some type of bent. The Microtus captured in plots #6 and #8 were captured in similar grass to plot #5. Areas which appeared to be grassy and by appearance looked like Microtus could have inhabited them were plots #2 and #3. The grasses of plots #2 and #3 are very coarse and thick stemmed. Some of it is Brome grass around the barn and the grass growing in or around the old pond area of plot #2 is more like reeds. If we believe the trapping data, it would say plant more grasses like timothy, blue, clover; i.e., grasses similar to plot 5.

Zapus appears to like areas which have limited plant diversity and possibly taller growth than Microtus prefers. Zapus at Kroger Hills were found in areas thick in sweet cover and wild carrot. Zapus, Microtus, and Peromyscus maniculatus can all live in the Kroger Hill meadow once it is stabilized. Peromyscus maniculatus will never attain very high density in prime Microtus habitat, however.

Gross examination of the meadow since the fall 1986 cutting establishes that growth factors are not uniform from the west to the east end of the meadow. The summer of 1987 showed that some kind of a gradient must exist in the meadow. The west end produced thicker, taller growth and young trees consisting of Boxelder, Maple and a few Sycamore. While at the east end, the plant diversity, height, density of growth decreases, and the young trees consist exclusively of Sycamore. This observation may have important consequences in planning what grasses to plant for proper production of the meadow.

The study area is also yielding much information about niche overlap, sympatry, movements, and home ranges in the small mammal fauna of the park.

The basic construction and management of a meadow that will support a family of barn owls is only one aspect of the Kroger Hills property. At the present time there are many meadow species that are utilizing the area. If the meadow is seeded and managed purely to produce a large population of voles to feed the possible owls, we just seed with mixed grasses such as timothy, blue, and prairie grasses and possibly some clover and keep out thick brome, fescue, and reedy type grasses. However, meadow birds and other meadow mammals might not utilize the area quite as much since meadow birds like other flowering type growth along with thistle, sweet clover, red clover, goldenrod, similar to the meadow as it was in 1987. It would be interesting to try to make and manage an area which would produce a large population of voles along with areas where other meadow species could thrive, possibly something subdivided into some type of blocked or zoned conformation.

The Miami Golf Course plot did not disclose any unusual animals up to the present time, but we are still sampling new areas.

During the winter and early spring I am going to trap the Kroger Hills property with two goals in mind. First, I want to determine if or how often animals are traveling into the cut areas of the meadow, and, second, I am going to trap the grassy area along the lane and find out how far west along the lane *Microtus* occurs.

SUMMARY OF WORK

1. Eight plots at Kroger Hills were sampled and one plot at the golf course.
2. Kroger Hills looks much more like a meadow.
3. Numbers of *Peromyscus* and *Microtus* are up.
4. New species for park caught:
Zapus hudsonius, Mus, and Peromyscus maniculatus
5. *Microtus* seems to be spreading.
6. *Peromyscus leucopus* is being excluded from the west end of the park which is an indication that as the meadow changes *Microtus* should become more established.
7. Much interesting data has been collected concerning home range, migration, niche overlap, habitat preference.

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