

Small Mammals of the Guthrie-Bancroft Farm - Year 3
Colby Hill Ecological Project, Lincoln and Bristol, Vermont

2002 Final Report

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Summary

In 2002 we resampled the small mammals of the Guthrie-Bancroft parcel in ecosystems 6, 14, 20 and 25. Riparian ecosystem 10 was added as a new site. This year 159 individual captures were made including nine species of non-flying small mammals. New species encountered this year included both Northern and Southern flying squirrel (*Glaucomys sabrinus* and *G. volans*) and the Short-tail weasel (*Mustela erminea*). We also verified the presence of the bats *Myotis lucifugus* and *Lasiurus cinereus* for the first time in 2002. Visual observations included black bear and bobcat.

Introduction

Following our objective to verify additional species and observe changes in the small mammal communities over time the small mammal survey continued in 2002 and included three ecosystems (ES 14, 20 and 25) that had already been sampled in the two previous years, one ecosystem (ES 6) that had been sampled only in 2001, and one new ecosystem (ES 10) characterized by Lapin (2000) as "moderately well drained, level, extremely stony sandy loam small stream riparian, yellow birch-sugar maple-white ash forest." This year's sampling took place between 22 July and 13 August 2002 and included four nights of bat netting.

Material and Methods

As in previous years ecosystems were sampled with single (26 traps) or double (52 traps) traplines with two traps per station and seven pitfall traps installed along a plastic driftfence. This year traplines were run for three consecutive nights totaling 281 trapnights. Sherman live traps were used exclusively and baited with rolled oats flavored with peanut butter. As in 2002, habitat data were recorded at each successful trap site using simple estimates of tree and log density and canopy and ground cover. For a classification of ecosystems by clustering based on the three-year summer data now available for the Guthrie-Bancroft parcel we used the program BioDiversity Pro from the Scottish Association for Marine Science (<http://www.sams.ac.uk/>). For this analysis data were standardized by converting abundances of small mammal species in each ecosystem to percent of trapping effort (Table 2.1).

This year we also recorded maximum and minimum temperature and rainfall with a digital thermohygrometer (Oregon Scientific, Inc.) and a standard All Weather Rain Gauge (Productive Alternatives, Inc., MN) placed in ecosystem 20 (alder swamp, sedge meadow, edge of former beaver pond), which we monitored daily throughout the study.

Results and Discussion

Terrestrial Small Mammals

Figure 1 presents the map of the study area with the sites sampled in 2002 and bar graphs showing the occurrence of small mammal species as a percentage of trapping effort combined for all years in the six sites sampled in 2002. Figure 2 also presents the distribution of small mammals in the ecosystems sampled in 2002 but with separate bar graphs for the three years, showing the considerable variations in occurrence and abundance of individual species. The new species caught are responsible for a continued increase in the species accumulation curves and still no pronounced leveling of the curve in the third year of this study (Fig. 3).

Table 1.1 shows an overview of trapping results including results from previous years for the ecosystems sampled in 2002. Table 1.2 presents diversity indices calculated from proportions of the total number of small mammal captures in each ecosystem. As in 2001 the highest Shannon Wiener diversity was obtained in ES 14 ($H' = 1.76$). The highest Simpson Index was obtained in ES 6 ($1-D = 0.65$; ES 25 in 2001: $1-D = 0.74$). In Table 1.3 estimated biomass of small mammals per 100 trapnights are calculated using published average or actual weights of species caught. In 2002 the newly added ES 10 tops the list with 748.1 g per 100 trapnights, whereas ES 1 led with 869.1 g in 2000 and ES 14 with 830.3 in 2001, showing considerable fluctuations in biomass between the resampled ecosystems.

The list of small mammals includes three additional species recorded on the Guthrie-Bancroft Parcel in 2002 including one southern flying squirrel (*Glaucomys volans*) captured in ES 6 and one short-tailed weasel or ermine (*Mustela erminea*) captured in ES 20. One northern flying squirrel (*Glaucomys sabrinus*) captured on 9 August 2002 in a bat net set across a trail belonging to ES 12 ("moderately well-drained yellow birch northern hardwood forest") was not included in Tables 1.1-1.3 because it was not recorded using the standardized trapping scheme. Its capture location is shown in Figure 1. Appendix II provides an overview over all ecosystems sampled and all captures made since summer 2000.

Classification of Ecosystems based on Small Mammal Data

A dendrogram based on the three-year small mammal data available to date for the Guthrie-Bancroft land is shown in Figure 4. The corresponding similarity matrix is provided in Table 2.2. When we compare the dendrogram with the data in Table 2.1 and the habitat descriptions in Appendices I and II (or in Lapin, 2000), some patterns clearly emerge. Ecosystem 22, the ecosystem with most recent anthropogenic disturbance (unmaintained oldfields), clusters clearly apart from the other ecosystems with its high numbers of *B. breviceauda*, very few *Peromyscus* sp. and high number of *M. pennsylvanicus*. ES 12 and ES 1, both northern-hardwood forest types, probably cluster together because of their high proportion of *Peromyscus* sp., similar proportions of shrews and relatively few other species. ES 20 and 25, which both include a small intermittent stream, extensive seepage areas with a dense goldenrod, alder and sedge zone, cluster together because of similar proportions of *B. breviceauda*, *Peromyscus* sp. and *C. gapperi*. ES 26 and ES 8, only sampled in the first year, are both located along the same permanent mountain stream and yield the same three species in similar proportions. ES 2 and ES 7 are both "well-drained" hardwood forests quite similar in their *Blarina* - *Peromyscus* - *Napaeozapus* ratios. However, "Poorly drained" ES 14 and ES 18 group closely together with "excessively drained" ES 9, probably because they share a diverse microtopography supporting relatively similar small mammal species numbers and ratios.

Microhabitat Data

Microhabitat Data collected at each trap stations as summarized by ecosystem in Figure 5. The bar graphs show the overall forest character of the six ecosystems except for ES 20, which, as a former pond/swamp habitat, has low canopy cover (Fig. 5 a) and correspondingly more herbaceous and grass cover (Fig. 5 f and g). The riparian ecosystems 10 and 25 are characterized by more bare soil and rocky ground cover (Fig. 5 h and j). Ecosystem 6 appears as having the largest standing trees and logs and highest leaf litter (Fig. 5 c, e and i) based on these data from trap stations.

In Fig. 6 microhabitat data are summarized by small mammal species. The short-tailed shrew (*Blarina breviceauda*) appears to be associated most often with large logs and bare soil and to some degree with rocky creek beds (Fig. 6 e and h). The meadow vole (*Microtus pennsylvanicus*) as in 2001 appeared most often in habitats with low canopy cover, and high herbaceous and grass cover (Fig. 6 a, f and g), although in 2002 it was not captured in the dense herbaceous cover of ES 25 as in previous years (cf. Appendix II). As in 2001 the woodland jumping mouse

(*Napaeozapus insignis*) was most often associated with bare soil and rocky ground cover along the stream in ES 10, although just like *M. pennsylvanicus* it was not recorded in ES 25 in 2002.

In order to qualify these results it should be remarked here that microhabitat data are not obtained from completely randomized sampling points but from trap sites which are often consciously placed near the base of trees or along logs.

Bats

This year we were able to verify two additional species of bats for the Guthrie-Bancroft land. On 5 August 2002 at 20:40h we captured one little brown myotis (*Myotis lucifugus*) on a trail just west of ES 20 (former beaver pond area). On 12 August 2002 we captured one ♂ hoary bat (*Lasiurus cinereus*) at 23:00 h in a raised 12-meter net placed along the small pond near the gate to the Guthrie Bancroft property (see Fig. 1). On the same evening we caught two more ♀ northern myotis (*Myotis septentrionalis*) at 23:00h and 00:45h. in a small 2.6-meter net blocking off the driveway just inside the gate.

Climate Data

Minimum and maximum temperature and humidity and amount of rainfall, as recorded in Ecosystem 20 in 2002, are shown in Figure 7 and 8, respectively. Note the substantial shifts in minimum (nocturnal) temperature and drops in minimum temperature associated with rainfall within the three-week period.

Comments on new species caught in 2002

Southern Flying Squirrel (*Glaucomys volans*). One male of this nocturnal species was caught in a Sherman trap on 25 July 2002, the third trap night in ES 6 at the base of a large beech (*Fagus grandifolia*) on one of the "corrugated" ridges (Lapin, 2000) found commonly in this ecosystem. Other nearby plants were several ferns and hobblebush (*Viburnum alnifolium*). The animal was found dead in the trap probably because of the relatively cold night (10.5°C min. temp., see Fig. 7). The weight of 41 g indicates that this was a younger individual when compared to the published range of weights for 64 individuals from Indiana (45-87 g; Whitaker and Hamilton, 1998). The habitat of *G. volans* has been characterized as "deciduous and mixed woodland" with "oak, hickory beech, aspen, and maple forests of the north" (Whitaker and Hamilton, 1998). In the colder parts of its range *G. volans* particularly depends on nests in hollow trees, which

it also uses for food storage and where several individuals may be found huddling together (Weigl, 1978).

Northern Flying Squirrel (*Glaucomys sabrinus*). A male of this slightly larger flying squirrel species was caught in a bat net set across the trail leading around the east side of the old beaver pond (ES 20) on 9 August 2002 at 22:15 hours. This individual was released immediately after it was freed from the bat net. The locality belongs to ES 14 (red spruce-balsam fir-hemlock-yellow birch forest), which matches the "dense spruce/fir forests and stands of yellow birch and hemlock" described in Whitaker and Hamilton (1998). *G. sabrinus* is less dependent on nuts and seeds than its smaller southern counterpart. At least in western North America it was found to be an "obligate mycophagist" feeding on hypogeous fungi, puffballs, lichens and other fungi (Hall, 1991). Due to its larger size and thicker fur *G. sabrinus* is less dependent on tree cavities than *G. volans* and also uses outside nests (Weigl, 1978).

Short-tailed Weasel (*Mustela erminea*). A female weighing 52 g was captured in a Sherman trap in dense undergrowth with ferns and clematis at the edge of ES 20 on 6 August 2002. Again this animal was caught during a relatively cold night (11.1°C min. temp.) with 0.4 inches of rainfall based on the measurements in ES 20 (Fig. 4 and 5) and the animal did not survive in the Sherman trap. Based on comparisons with published weights of females from Michigan (45-75g; Whitaker and Hamilton, 1998) this was an adult individual.

Little Brown Myotis (*Myotis lucifugus*). The little brown bat or little brown myotis (*Myotis lucifugus*) occurs throughout much of North America and in the more northern parts of its range including Canada it is often the most abundant bat (Prescott and Richard, 1996; Whitaker and Hamilton, 1998). In summer they use trees, rock piles, buildings or piles of wood as day roosts and nursery roosts. *M. lucifugus* banded in a hibernation cave in Aeolus Cave, Southwestern Vermont were found to migrate to summer colonies as far as 172 miles away (Davis and Hitchcock, 1965; Fenton and Barclay, 1980). Even though this is the commonest bat species in Vermont "populations have declined in numbers in many parts of its range" (Fenton and Barclay, 1980:4). A little brown bat from a mine shaft in Essex County, New York, banded in 1961, also holds the longevity record of 33 years, when it was retrieved at the same locality on 1 February 1994 (Davis and Hitchcock, 1994).

Hoary Bat (*Lasiurus cinereus*). The hoary bat is the largest species of bat in the Northeast and this is the most widely distributed species of bat in North and South America. However, there appear to be only very few actual published records of this species from Vermont. Two older records are of one "taken at Colchester soon after 1840 and presented to the state collection by Zadock Thompson" (Kirk, 1916:33) and another one "[c]ollected by Carl Pember at Woodstock, 1921" (Osgood, 1938). Two other new record date from 16 and 17 July 2001 from sites called Salisbury # 2 near Farmingdale and near Orwell, Vermont, respectively (Kiser et al., 2001). Recent mammal books and review articles assume that *L. cinereus* occurs throughout Vermont based on its occurrence in adjacent states (Godin, 1977; Shump and Shump, 1982; Whitaker and Hamilton, 1998) and in Quebec (Prescott and Richard, 1996) but they do not provide any recent localities for Vermont. Hoary bats roost solitarily in tree foliage. They feed primarily on moths but also take midges, beetles and dragonflies. *L. cinereus* migrates in groups or large flocks to wintering grounds south of the United States (Whitaker and Hamilton, 1998).

Other Observations in 2002

Black Bear (*Ursus americanus*). One black bear sighting was made on 29 July 2002 at about 19:00h on the North end of the meadow (ES 21) at the top of the "tongue extension" of the meadow along an un-mowed area containing fruit trees and wild raspberries (see map, Fig. 1).

Bobcat (*Lynx rufus*). On 5 August 2002 at 19:00h we spotted a bobcat on the southwestern edge of the meadow along the forest edge (see Map, Fig. 1). Bobcats occur throughout Vermont and there are many published localities for the state (e.g. Godin, 1977). They are an important predator for many of the small mammals encountered in this study (Whitaker and Hamilton, 1998).

Conclusions

The third-year-sampling of small mammals at the Guthrie-Bancroft parcel has shown that additional species may be encountered if we continue efforts. Based on general distributional information we can reasonably expect to find both hairy-tailed mole (*Parascalops breweri*) and star-nosed mole (*Condylura cristata*) on the Guthrie-Bancroft Land or in the immediately surrounding areas. Based on a more recent survey (Chipman, 1994) we may also still expect to find the pygmy shrew (*Sorex hoyi*).

The cluster analysis (Fig. 4) demonstrates that the ecosystems can be grouped quite sensibly using small mammal species data. It will be interesting to compare this with cluster analyses of species presence or absence from other animal groups and with more quantitative vegetation and soil data for the ecosystems once they become available.

We recommend a continued attempt to verify additional species of bats (including use of a bat detector) in 2003 and perhaps continue a more standardized resampling of terrestrial small mammals in three or four representative ecosystems every three to five years, in an attempt to follow long-term trends of small mammal assemblages in the successional stages of different ecosystems.

Several more specific questions emerge from the data obtained so far. Which environmental factors determine the degree of sympatry of both species of *Peromyscus* in the different ecosystems?

Do the two flying squirrel species actually occur together in some ecosystems, or do they temporarily or spatially exclude each other? There is some experimental evidence that *Glaucomys volans* prefers deciduous hardwood forest, whereas *G. sabrinus* is more flexible using both coniferous and deciduous habitat, but when both species occur together *G. volans* will usually displace *G. sabrinus* into the conifers (Weigl, 1978).

Which other small carnivores occur on the Guthrie-Bancroft land and how could they be monitored more quantitatively? Whitaker and Hamilton (1998) note that fisher (*Martes pennanti*), long-tailed weasel (*Mustela frenata*), mink (*Mustela vison*) and river otter (*Lutra canadensis*) occur throughout Vermont.

Acknowledgments

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Appendix I

Ecosystem descriptions and summary comments of small mammal findings for sites sampled in 2002

Ecosystem descriptions are based on M. Lapin (2000) with the nearest equivalent natural community from Thomson and Sorenson (2000) in parentheses.

ES 1 = Well-drained, steeply sloping, fine sandy loam spodosol beech-maple-red oak-sweet birch forest (*mesic red oak hardwood forest*). - This habitat had second highest leaf litter ground cover (79.5%) after ES 6 this year (Fig. 5i) and much lower density of mice of the genus *Peromyscus*, but one additional species (*Sorex cinereus*; Fig 2 a)

ES 6 = Seepy terrain rich, moderately well-drained, steeply to very steeply sloping, seepy loam over fine sandy loam spodosol, Northern Hardwood Forest (*Rich Northern Hardwood forest*). Resampled from first year. Very similar ratios of small mammal species as in 2000 (Fig. 2 b). Woodland jumping mouse (*Napaeozapus insignis*) and Southern Flying squirrel (*Glaucomys volans*) were added to the species list in this ES in 2002.

ES 10 = Moderately well-drained, level, extremely stony sandy loam (Inceptisol?), small stream riparian, yellow-birch-sugar maple ash forest (*no correlate*). - New site sampled in 2002. - Only three small mammal species recorded so far. High dominance of *Peromyscus* sp. (Fig. 2 c)

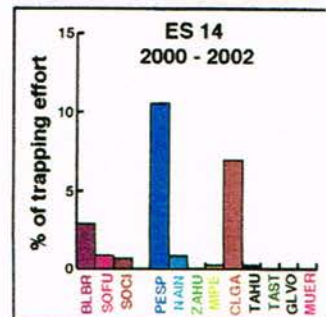
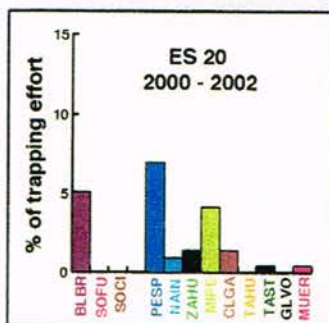
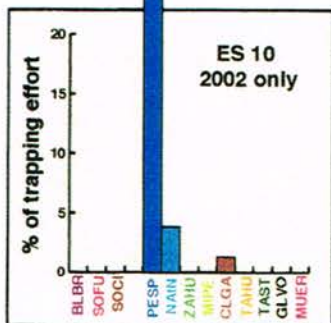
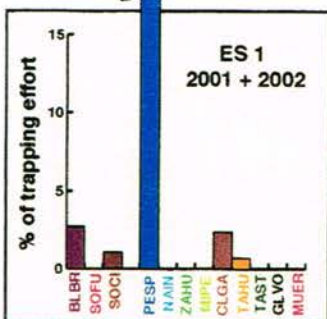
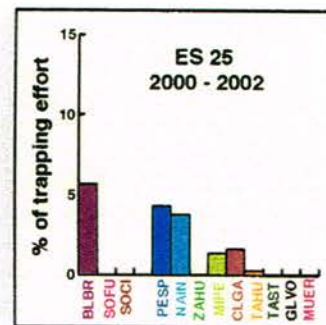
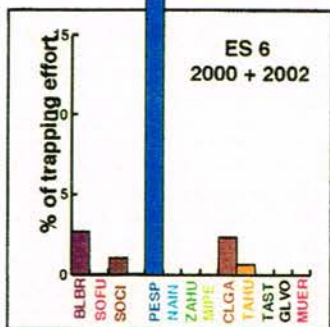
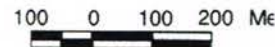
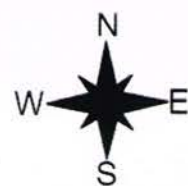
ES 14 = Somewhat poorly drained, gently sloping, stony silt loam to fine sandy loam inceptisol, red spruce-balsam fir-hemlock-yellow birch (*spruce-fir northern hardwood forest*). - Very similar findings to 2001 (Fig. 2 d). Six small mammal species. New capture record: Eastern Chipmunk (*Tamias striatus*).

ES 20 = Very poorly drained, level, muck over stony sandy loam inceptisol, alder-willow shrub swamp/sedge meadow (*Alder swamp/sedge meadow complex*). - This edge of a former "beaver pond" with abundant touch-me-not (*Impatiens*), and goldenrod (*Solidago* sp.) had the highest herbaceous cover and lowest canopy cover (Fig. 5a and f) making this the most open habitat with a constant number of meadow voles (*Microtus pennsylvanicus*) sampled in all three years. New species recorded this year: Ermine or short-tailed weasel (*Mustela*

erminea). The meadow jumping mouse (*Zapus hudsonius*) was not recorded since the first year (Fig. 2 e)

ES 25 = Small, intermittent, mid-elevation, cold, mountain stream and open woodland seep. ES 25 was characterized by the abundance of *Napeozapus insignis* in the first two years (Fig. 2 f), which was most often caught along the stream bed confirming habitat characterizations in the literature (Whitaker and Hamilton, 1998). Surprisingly no *Napeozapus* or *Microtus pennsylvanicus* were recorded in 2002.

Figure 1-Map of Guthrie-Bancroft 2002 survey sites with graphs showing multiple year small mammal data.



SMALL MAMMAL SPECIES

- BLBR = *Blarina brevicauda*
- SOFU = *Sorex fumeus*
- SOCI = *Sorex cinereus*
- PESP = *Peromyscus sp.*
- NAIN = *Napeozapus insignis*
- ZAHU = *Zapus hudsonius*
- MIPE = *Microtus pennsylvanicus*
- CLGA = *Clethrionomys gapperi*
- TAHU = *Tamiasciurus hudsonicus*
- TAST = *Tamias striatus*
- GLVO = *Glaucmys volans*
- MUER = *Mustela erminea*

- *Glaucmys sabrinus* location
- 2002 Black Bear sighting
- 2002 Bobcat sighting

Map Legend:

- Ecosystem Boundaries
- Property Line
- Road
- Trails
- Permanent Str
- Intermittent St
- Pond
- Hedgerow or tree island

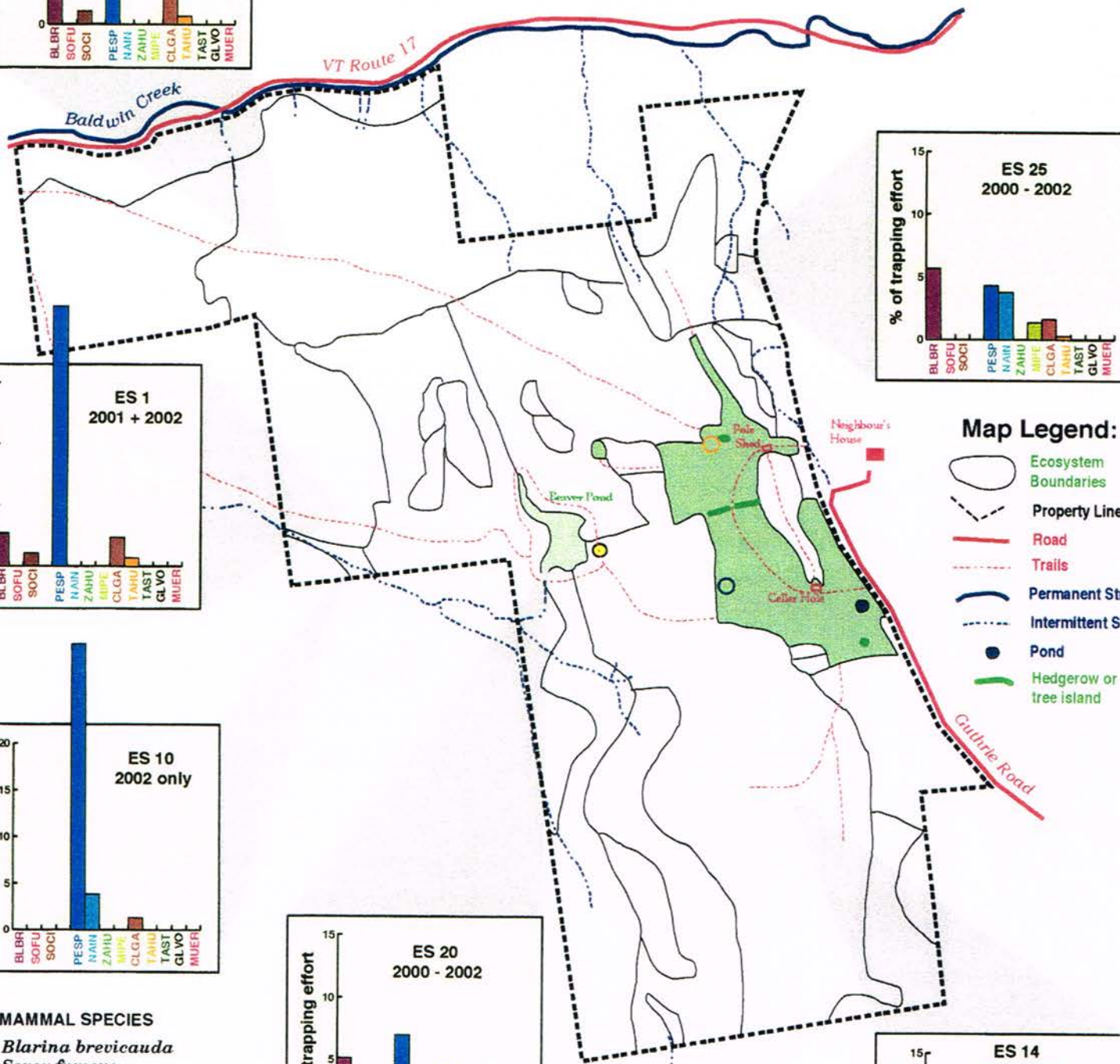


Figure 2-- Distribution of Small Mammals in the Guthrie-Bancroft Ecosystems sampled and resampled in 2002. Numbers expressed in percent of trapping effort (*Blbr* = *Blarina brevicauda*, *Sofu* = *Sorex fumeus*; *Soci* = *Sorex cinereus*; *Pesp* = *Peromyscus* sp.; *Nain* = *Napeozapus insignis*; *Zahu* = *Zapus hudsonius*; *Mipe* = *Microtus pennsylvanicus*; *Clga* = *Clethrionomys gapperi*; *Tast* = *Tamias striatus*; *Tahu* = *Tamiasciurus hudsonicus*; *Glvo* = *Glaucomys volans*; *Muer* = *Mustela erminea*).

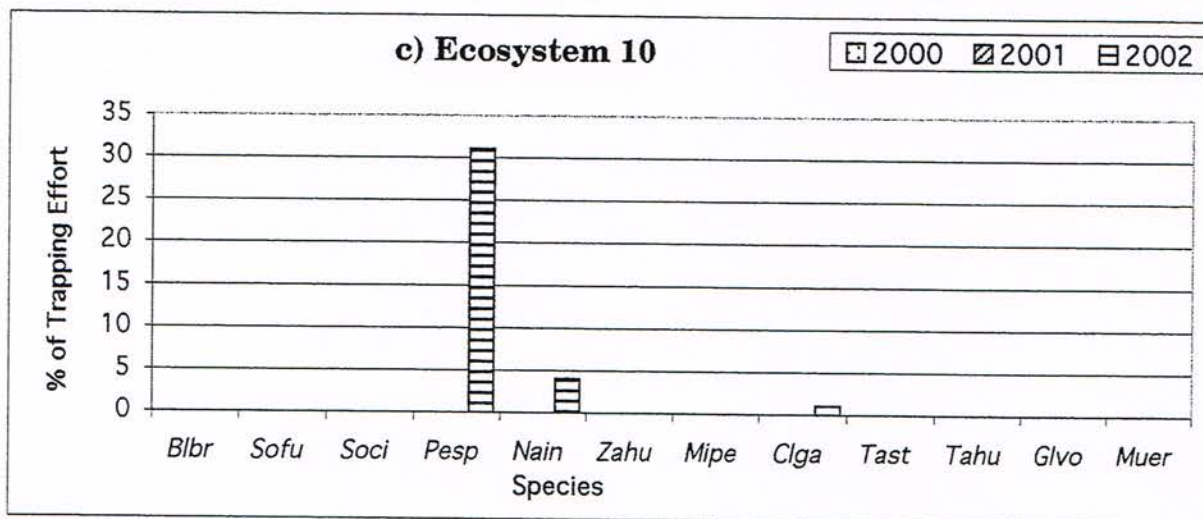
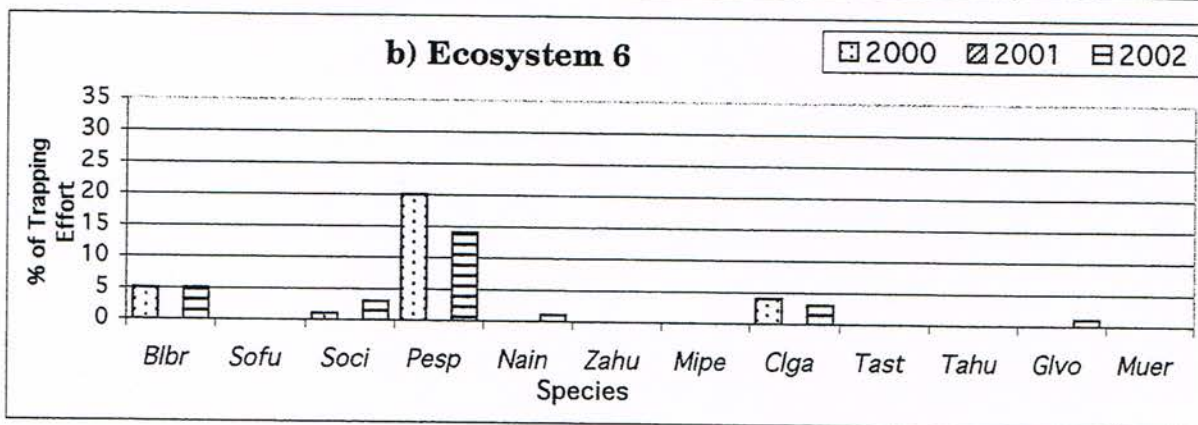
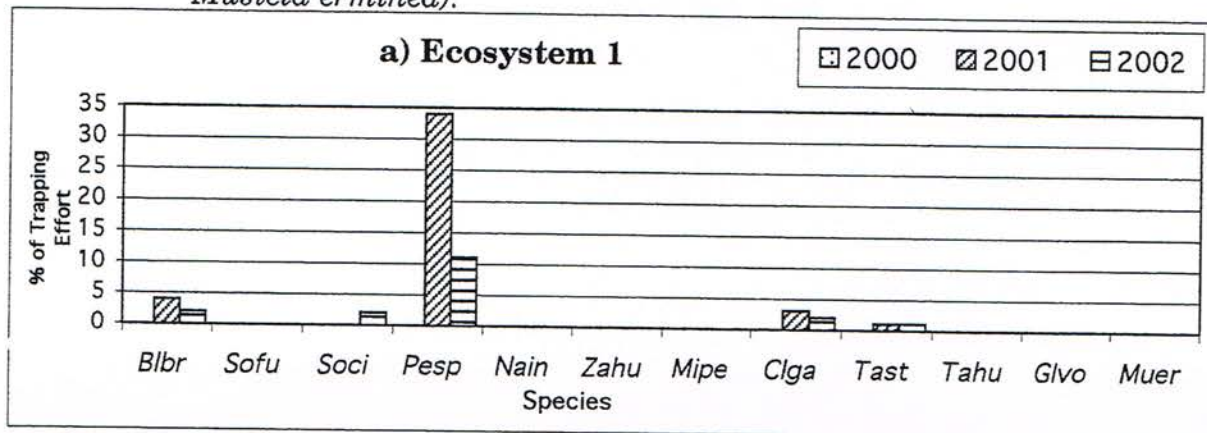


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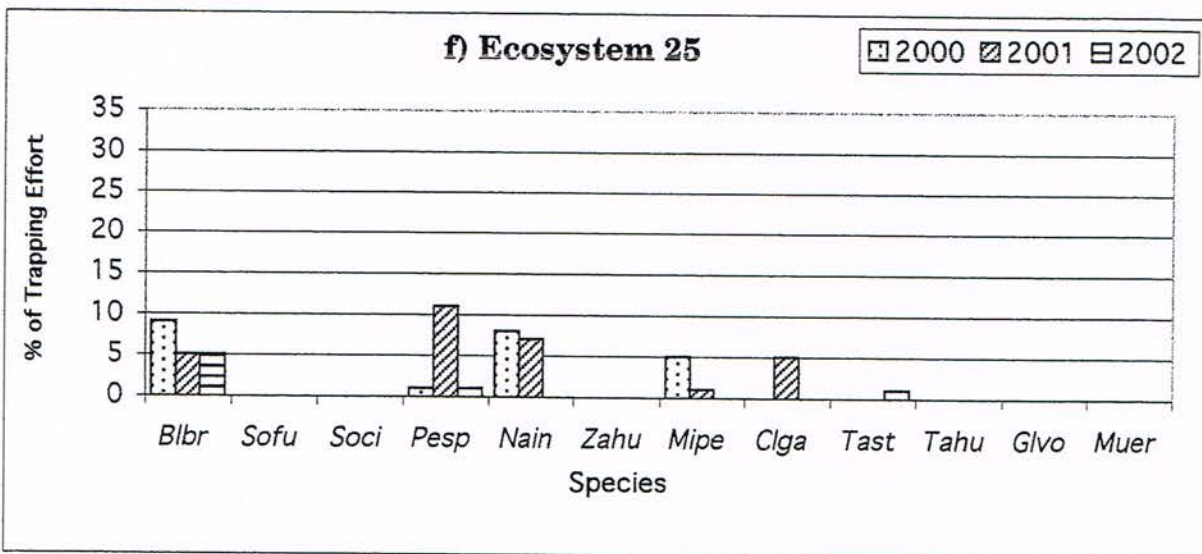
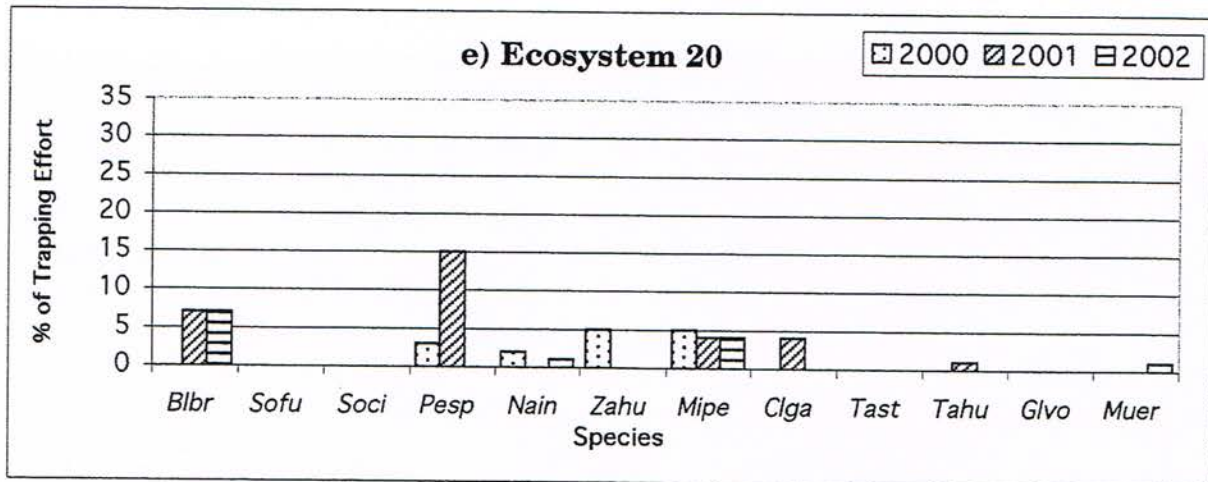
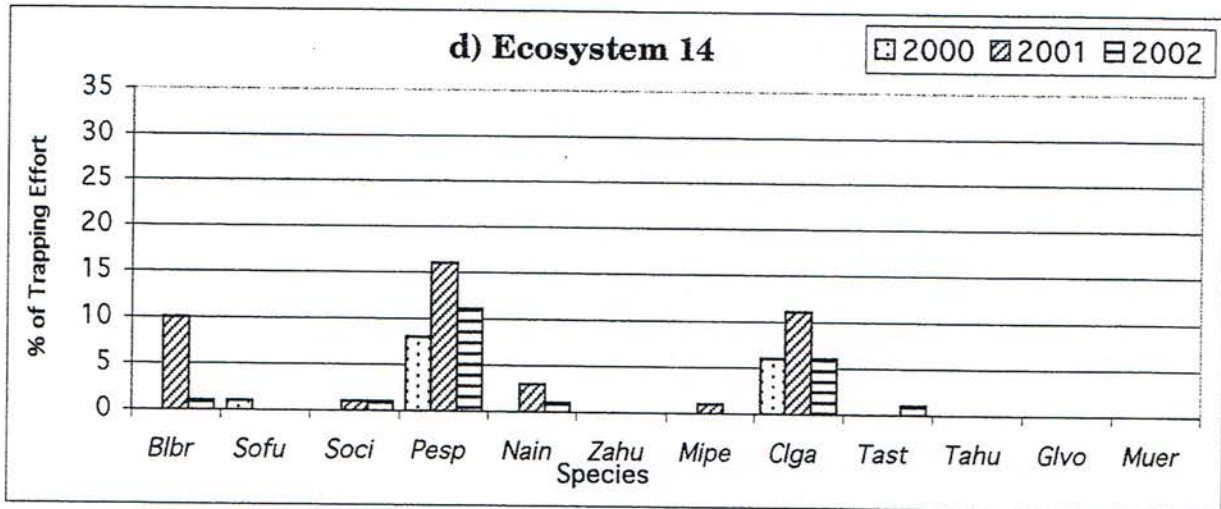
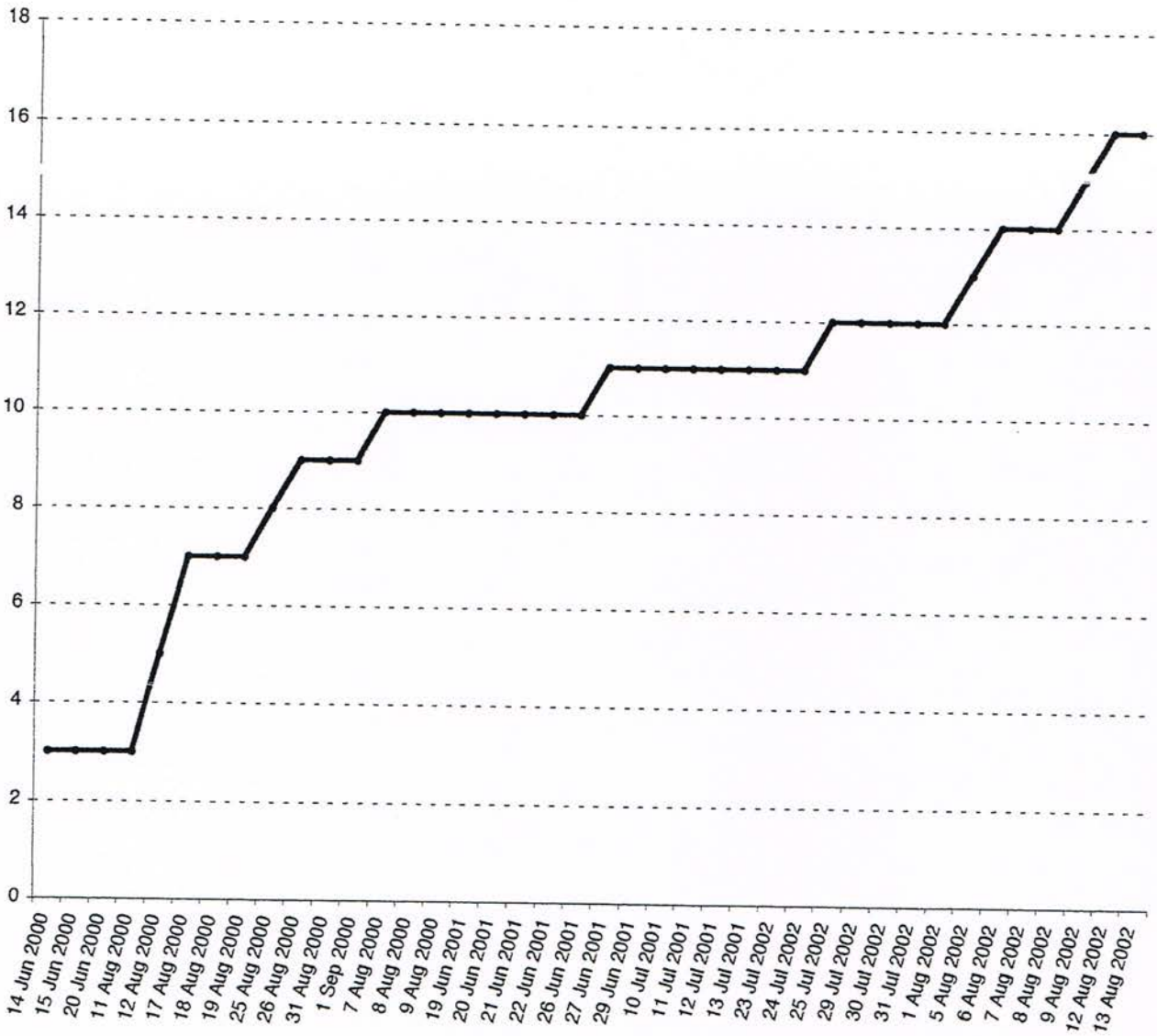


Fig. 3--Cumulative number of small mammal species recorded on the Guthrie-Bancroft Land (2000-2002)

No. of Species



Date

Figure 4--Cluster Analysis of 14 Colby Hill (Guthrie Bancroft) Ecosystems based on abundances of small mammal species expressed in percent of trapping effort in each ecosystem for the three-year period 2000-2002 (see Table 2.1). For the corresponding similarity matrix see Table 2.2.

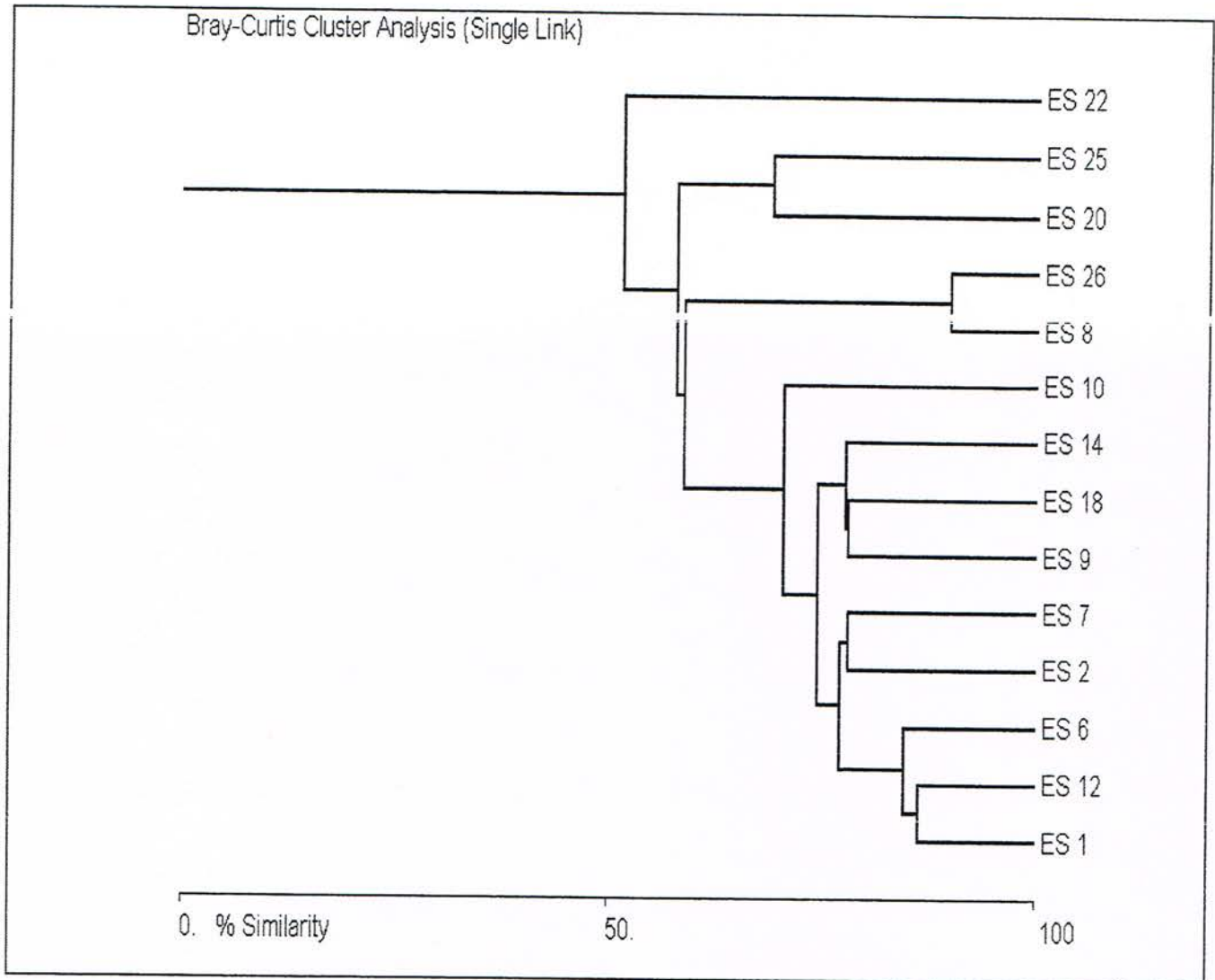


Figure 5-- 2002 Microhabitat Data from trap sites summarized by Ecosystem.

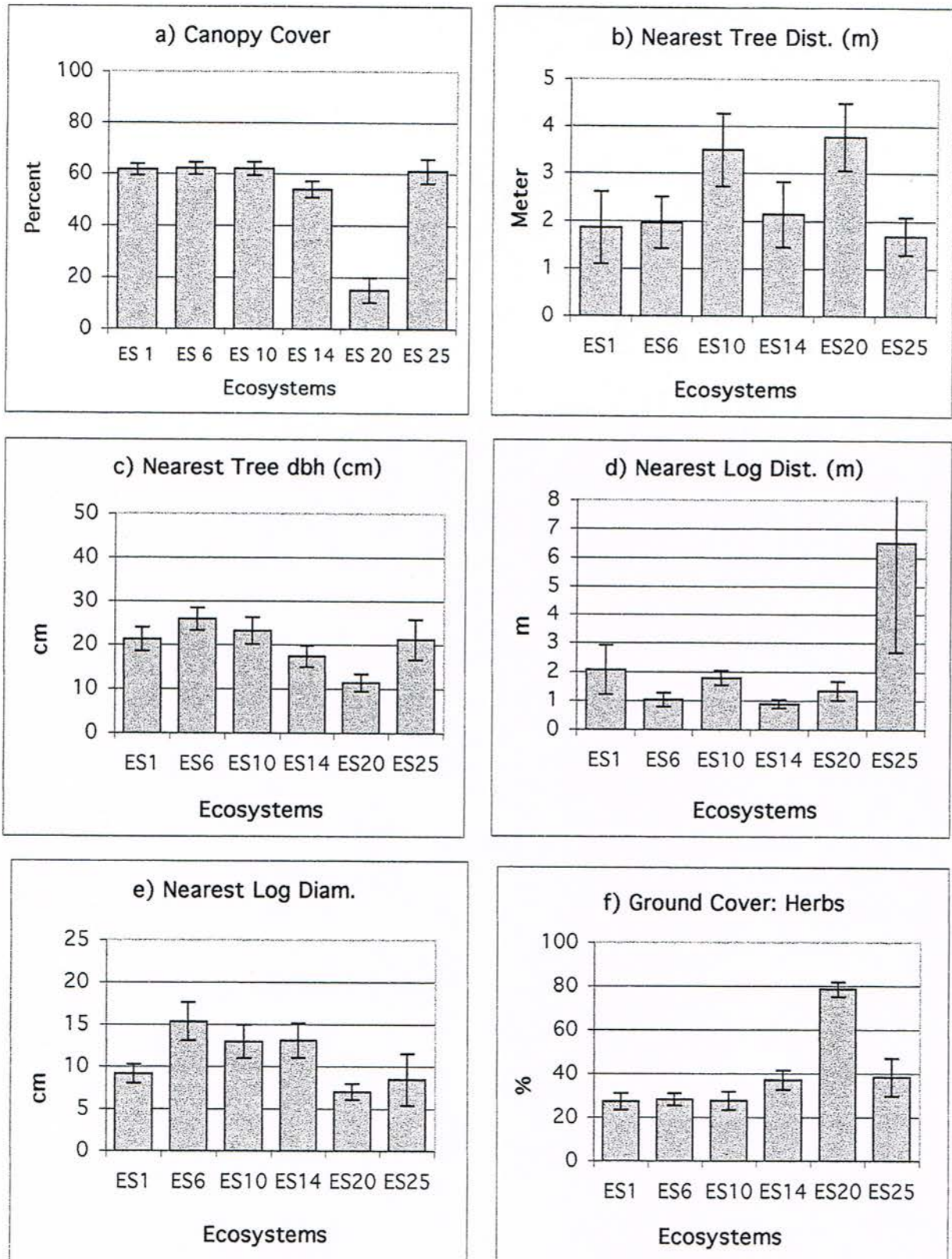


Figure 5 contd.--2002 Microhabitat Data summarized by Ecosystem

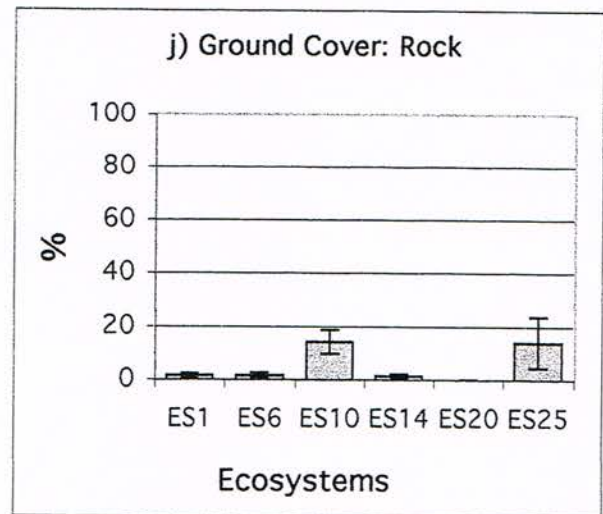
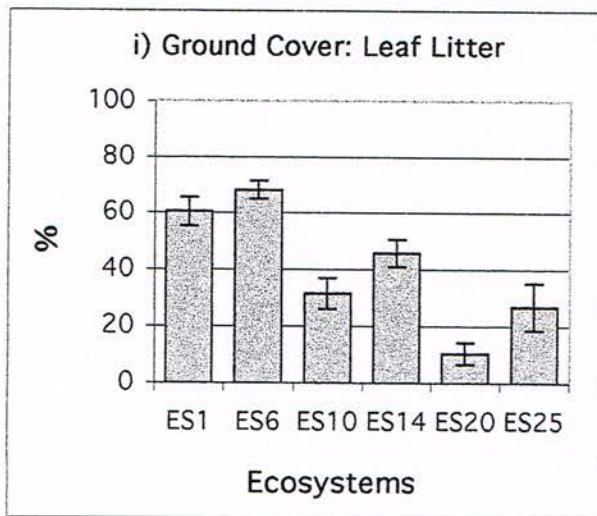
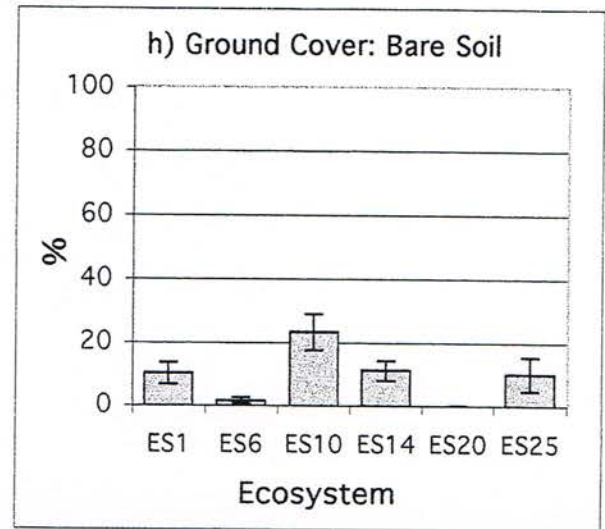
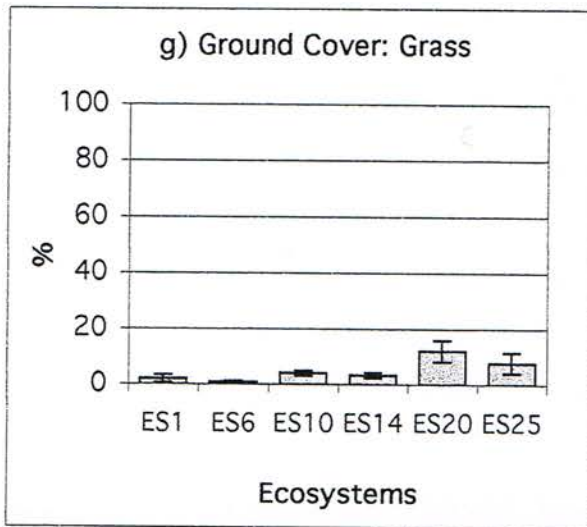


Figure 6-- 2002 Microhabitat Data from trap sites summarized by Small Mammal Species. Species abbreviations and sample sizes are: *Blbr* = *Blarina brevicauda* (n=26), *Soci* = *Sorex cinereus* (n=8), *Pesp* = *Peromyscus* sp. (n=88); *Nain* = *Napaeozapus insignis* (n=7), *Mipe* = *Microtus pennsylvanicus* (n=3), *Clga* = *Clethrionomys gapperi* (n=19), *Tast* = *Tamias striatus* (n=3), *Glvo* = *Glaucomys volans* (n=1), and *Muer* = *Mustela erminea* (n=1).

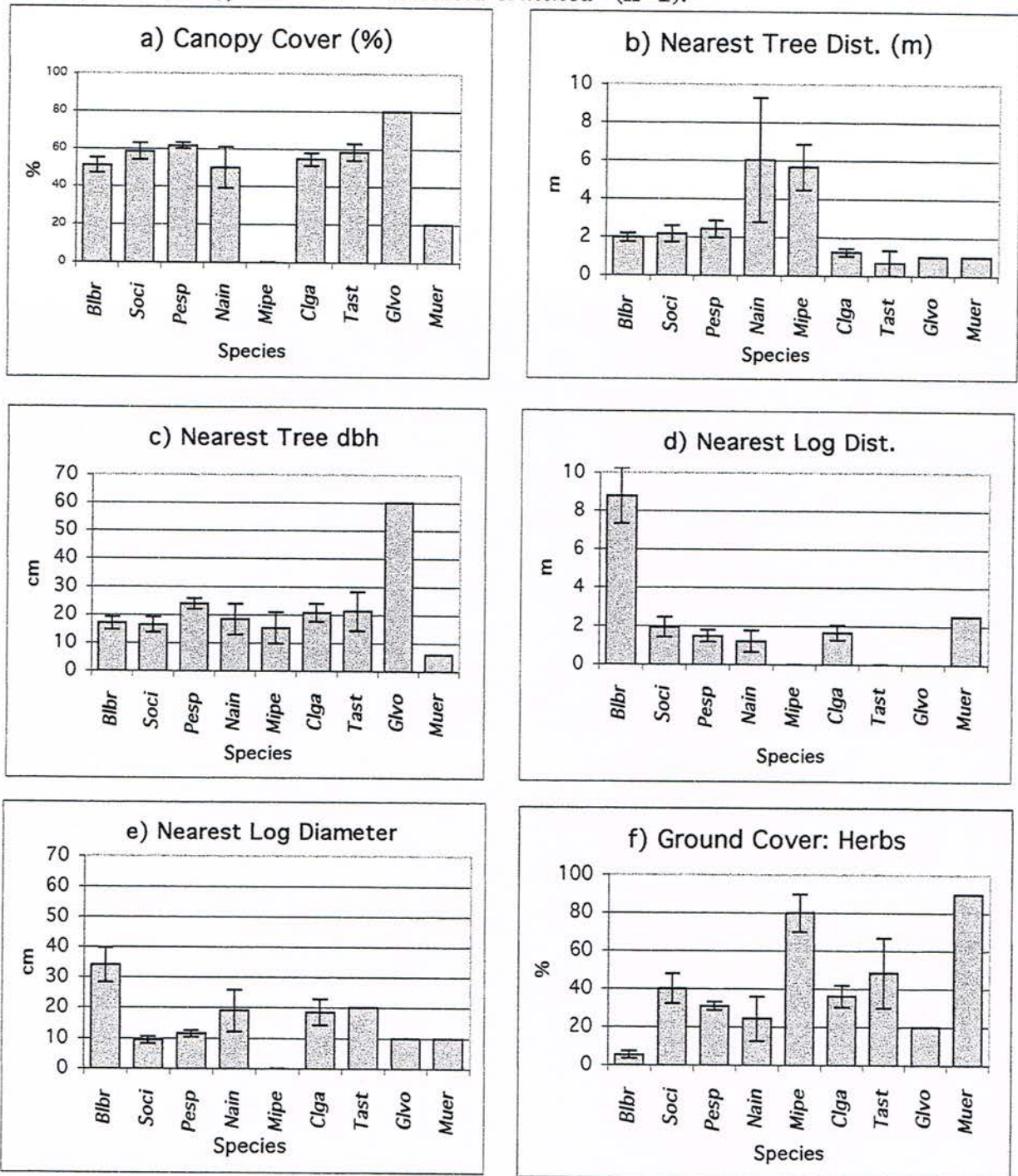


Figure 6-- 2002 Microhabitat Data summarized by Small Mammal Species.

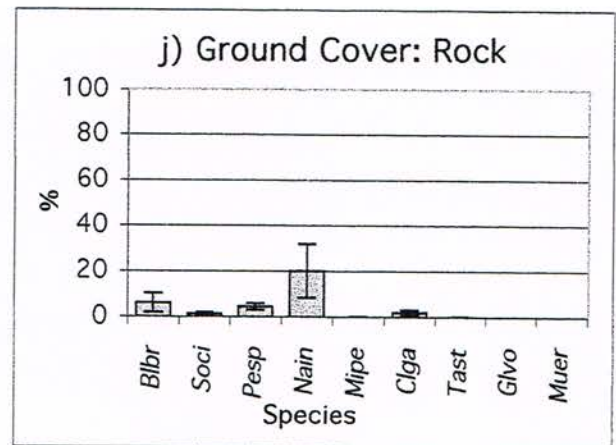
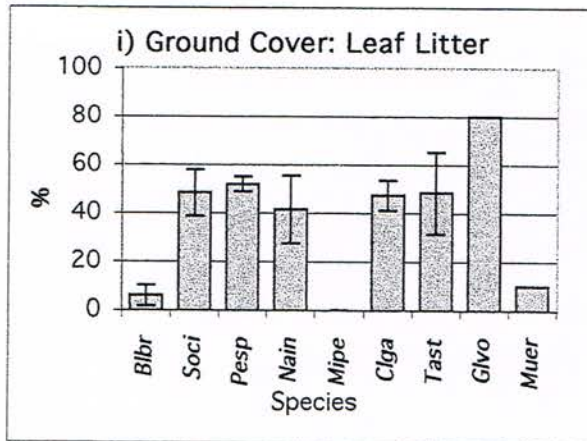
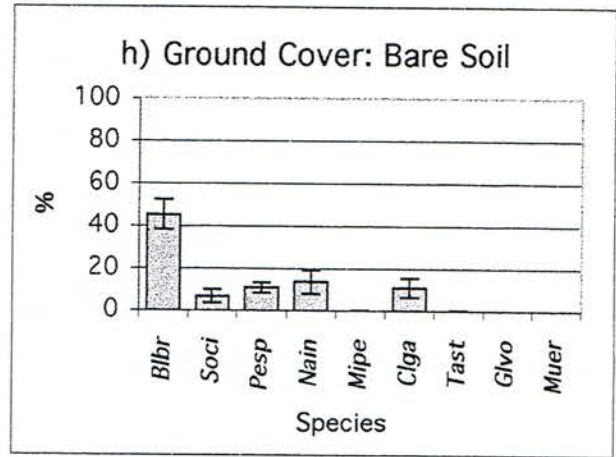
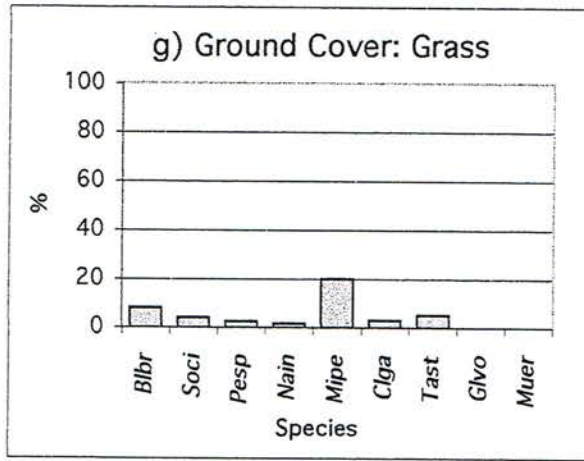


Fig. 7--2002 Min/Max Temperature (°C) and Humidity (%) measured at edge of ES 20.

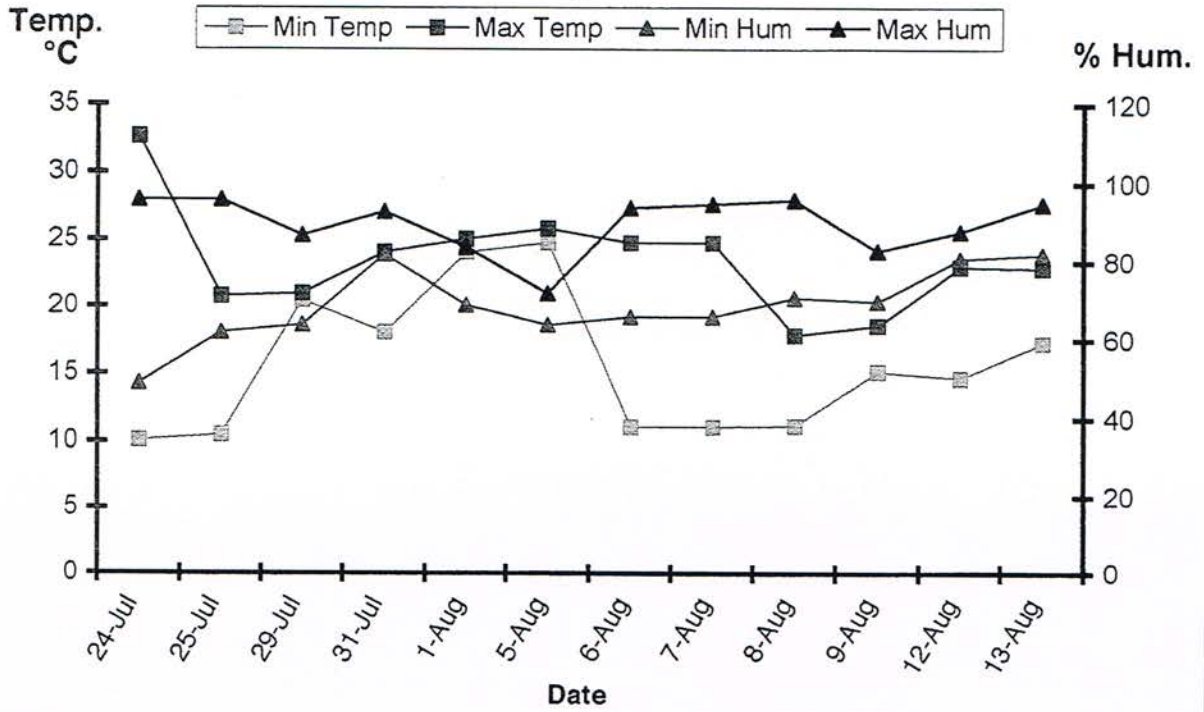


Fig. 8--2002 Rainfall (mm) measured in ES 20

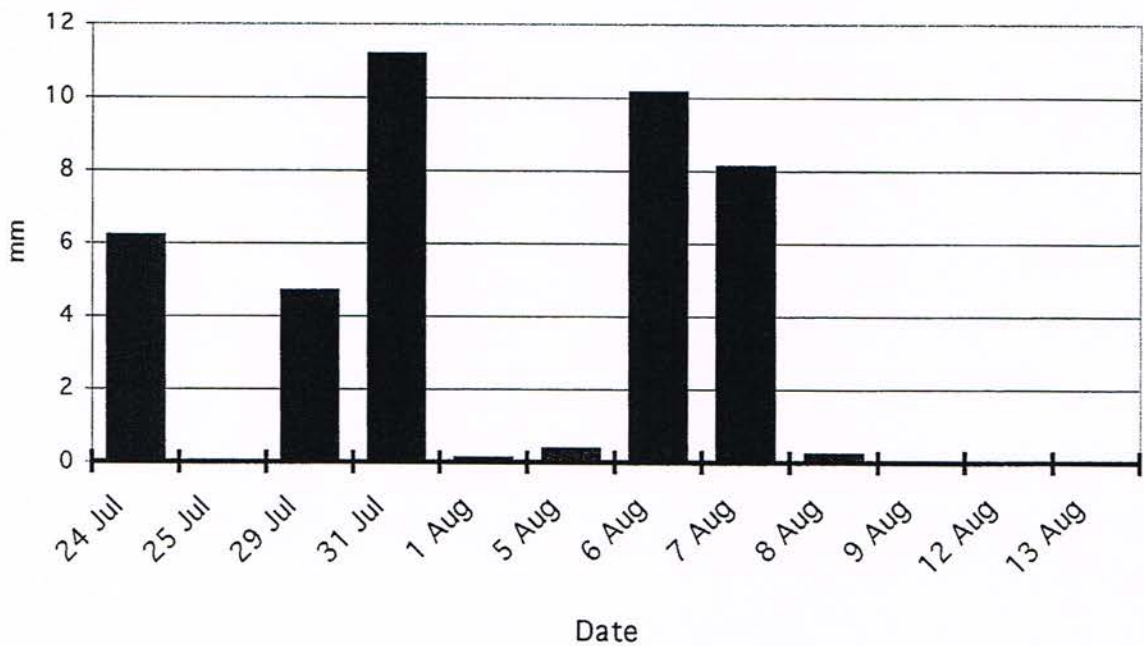


Table 1.1-- Overview: 2001 Small mammal captures on Guthrie-Bancroft Farm, Lincoln, Vermont (Sherman and Museum Special traps only). 2002 data are in blue.

Ecosystem (ES) No. ES Type:	1		6		10	14			20			25		
	well-drained mesic red oak hw forest		seepy terrain rich northern hw forest		small stream riparian,..... forest	poorly drained spruce-fir northern hw forest			alder swamp/sedge meadow edge of former beaver pond			Along small intermittent cold-mountain stream		
Year:	2001	2002	2000	2002	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002
No. of nights trapped	4	3	3	3	3	3	4	3	3	3	3	3	4	3
No. of Traps	32	56	52	58	26	52	30	59	20	28	24	26	30	58
Trapnights	128	168	156	174	78	156	120	177	60	84	72	78	120	174
Shrews														
<i>Blarina brevicauda</i>	5	3	8	8			12	2		6	5	7	6	8
<i>Sorex fumeus</i>						2								
<i>Sorex cinereus</i>		3	1	5			1	2						
Rodents														
<i>Peromyscus sp.</i>	44	19	31	25	24	12	19	19	2	13		1	13	2
<i>Napeozapus insignis</i>				2	3		3	1	1		1	6	8	
<i>Zapus hudsonius</i>									3					
<i>Microtus pennsylvanicus</i>							1		3	3	3	4	1	
<i>Clethrionomys gapperi</i>	4	3	7	5	1	10	13	10		3			6	
<i>Tamias striatus</i>	1	1						1						1
<i>Tamiasciurus hudsonicus</i>										1				
<i>Glaucomys volans</i>				1										
Carnivores											1			
<i>Mustela erminea</i>														
No. of Species	4	5	4	6	3	3	6	6	4	5	4	4	5	3
No. of Captures	54	29	47	46	28	24	49	35	9	26	10	18	34	11
Trap Success	0.42	0.17	0.30	0.26	0.36	0.15	0.41	0.20	0.15	0.31	0.14	0.23	0.28	0.06

Table 1.2-- Diversity indices calculated from proportions of small mammal captures in each ecosystem (Sherman and Museum Special traps only). 2002 data are in blue.

Ecosystem (ES) No. Year:	1		6		10	14			20			25		
	2001	2002	2000	2002	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002
Shrews														
<i>Blarina brevicauda</i>	0.09	0.10	0.17	0.17	0.00	0.00	0.24	0.06	0.00	0.23	0.50	0.39	0.18	0.73
<i>Sorex fumeus</i>	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Sorex cinereus</i>	0.00	0.10	0.02	0.11	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Rodents														
<i>Peromyscus sp.</i>	0.81	0.66	0.66	0.54	0.86	0.50	0.39	0.54	0.22	0.50	0.00	0.06	0.38	0.18
<i>Napeozapus insignis</i>	0.00	0.00	0.00	0.04	0.11	0.00	0.06	0.03	0.11	0.00	0.10	0.33	0.24	0.00
<i>Zapus hudsonius</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00
<i>Microtus pennsylvanicus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.33	0.12	0.30	0.22	0.03	0.00
<i>Clethrionomys gapperi</i>	0.07	0.10	0.15	0.11	0.04	0.42	0.27	0.29	0.00	0.12	0.00	0.00	0.18	0.00
<i>Tamias striatus</i>	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.09
<i>Tamiasciurus hudsonicus</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
<i>Glaucomys volans</i>	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carnivores														
<i>Mustela erminea</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
Number of Species	4	5	4	6	3	3	6	6	4	5	4	4	5	3
Simpson's Index D *	0.68	0.46	0.49	0.35	0.75	0.43	0.29	0.38	0.28	0.33	0.36	0.31	0.26	0.57
1-D **	0.32	0.54	0.51	0.65	0.25	0.57	0.71	0.62	0.72	0.67	0.64	0.69	0.74	0.43
Shannon-Wiener H' ***	0.94	1.58	1.36	1.02	0.71	1.33	2.01	1.76	1.89	1.89	1.69	1.77	2.05	1.10

* = Probability of picking two organisms that are the same species.

** = Probability of picking two organisms that are different species.

*** = Average degree of uncertainty in predicting to what species an individual chosen at random from a sample will belong.

Table 1.3-- Estimated small mammal biomass obtained per 100 trapnights in each ecosystem, based on average adult weight of species caught, for Ecosystems sampled in 2002. New 2002 data are in blue.

Ecosystem (ES) No.	1		6		10		14		20		25			Indiv. Weight (g)*	
	2001	2002	2000	2002	2002	2000	2001	2002	2000	2001	2002	2000	2001		2002
Shrews															
<i>Blarina brevicauda</i>	63.7	29.1	83.6	74.9			163.0	18.4		116.4	113.2	146.3	81.5	74.9	16.3
<i>Sorex fumeus</i>						9.9									7.7
<i>Sorex cinereus</i>		6.4	2.3	10.3			3.0	4.1							3.6
Rodents															
<i>Peromyscus sp.</i>	687.5	226.2	397.4	287.4	615.4	153.8	316.7	214.7	66.7	309.5		25.6	216.7	23.0	20.0
<i>Napeozapus insignis</i>				30.5	101.9		66.3	15.0	44.2		36.8	203.8	176.7		26.5
<i>Zapus hudsonius</i>									107.5						21.5
<i>Microtus pennsylvanicus</i>							21.3		128.0	91.4	106.7	131.3	21.3		25.6
<i>Clethrionomys gapperi</i>	75.0	42.9	107.7	69.0	30.8	153.8	260.0	135.6	0.0	85.7			120.0		24.0
<i>Tamias striatus</i>	43.0	32.7						31.1						31.6	55.0
<i>Tamiasciurus hudsonicus</i>										154.8					130.0
<i>Glaucomys volans</i>			23.6												41.0
Carnivores															
<i>Mustela erminea</i>											72.2				52.0
TOTAL Biomass/ES (in gram):	869.1	337.3	591.0	495.6	748.1	317.6	830.3	418.8	346.3	757.9	328.9	507.1	616.2	129.5	

*= Average adult weight taken from Whitaker & Hamilton, 1998; actual weight of captured individual used for *T. hudsonicus*, *G. volans* and *M. erminea*.

