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Interactions of Winter Sheep Grazing and Small Mammal Populations

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INTERACTIONS OF WINTER SHEEP GRAZING AND SMALL MAMMAL POPULATIONS

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ABSTRACT

This report describes how experimental winter sheep grazing has affected the distributions and populations of selected small mammal species. Experimental pastures representing a diversity of grazing intensities were chosen for sampling of small mammal populations. The mini-grid approach of Jorgensen and Smith (1974) was utilized to estimate population densities. Population densities increased between June 1972 and September 1972. The magnitude of change during this interval was used to adjust the densities on the pasture mini-grids.

INTRODUCTION

Small mammals, with the possible exception of rabbits and hares, have generally been neglected in range studies, even though several reports have been submitted that attest to their importance (Vallentine 1971). Since this report deals entirely with small mammals (rats, mice and ground squirrels), and how the experimental winter sheep grazing has affected their distributions and populations, it will not be necessary to review literature concerned with the impact of small mammals on the ranges per se. Some observations may help in understanding why the study was initiated, however, since most small mammals are thought to be in direct competition with sheep.

Small mammals probably have their greatest impact at times when the ranges are in their poorest condition, most frequently during low-production dry years when they may actually do considerable damage while digging up root systems (Reynolds and Martin 1968; Wood 1969). Likewise, the community may have its greatest impact on small mammals at the same time. Grazing has a history of promoting changes in the composition of plant species; thus, one might expect to see new seedlings, as well as more herbaceous species, more frequently on ranges that are repeatedly used (Vallentine 1971). Seedlings are particularly vulnerable to small mammal damage, whether natural or planted (Plummer et al. 1968; Springfield 1970), and often require small mammal control to insure success (Brown and Martinsen 1959).

Small mammals sometimes have a substantial effect on changes in plant species among the western ranges because their feeding habits cause unusual seed dispersal and propagation (Reynolds 1958; Reynolds and Glendening 1949). Although this behavior is sometimes helpful, it often leads directly to substantial range deterioration. Several species have been recorded as having rather heavy impacts on some range management efforts. *Peromyscus maniculatus* (white-footed deer mouse) was recorded to have consumed as much as 98% of bunchgrass seed broadcast for propagation (Nelson et al. 1970), and prevented successful establishment of *Purshia* sp. (bitterbush) with untreated seed (Brown and Martinsen 1959; Holmgren and Basile 1959). This has caused some to suggest that clean cultivation and other treatments are required to prevent small mammal depredation of artificial plantings (Storer and Jameson 1965; Turkowski and Reynolds 1970).

Many reasons for studying small mammal populations on western ranges can be projected, but most deal generally with competition between livestock or game and the small mammals. Since the latter are rather closely tied to the plant species offering food and cover, interactions within small mammal populations are complex and essential for their survival. As plant species compositions change, so also change the animal compositions, or they must adapt to the new environment. This study was initiated to examine these interacting changes, and works specifically with small mammal distributions and numbers as the data sources.

The U.S. Forest Service, under the supervision of the Intermountain Forest and Range Experiment Station established a 22.258-ha winter sheep experimental range in the salt-desert shrub areas in western Utah (the Desert Experimental Range) in 1933 (Hutchins and Stewart 1953). The Desert Experimental Range was subdivided into several allotments and experimental pastures where the grazing could be controlled as to intensity and season. The experimental pastures and an ungrazed area were used in this study.

METHODS

The experimental pastures sampled for small mammal populations are summarized in Table 1 for 1972 and 1973. Selections in 1972 were based largely on diversity of grazing, while the 1973 selections were made to correlate with work being done by Wilkin and Norton (unpubl. data) attempting to predict forage utilization. All pastures were grazed at least once each winter, while seven (3, 4, 5, 6, 7, 10 and 14) were grazed twice (Table 1). In 1934, when these pastures were first described (Hutchins and Stewart 1953), they were all included in one of three plant associations: 1) shadscale-winterfat-grass; 2) winterfat; and 3) shadscale-grass; but after many years of controlled grazing, these associations have changed appreciably, even though the species have remained much the same.

Small mammal sampling procedures have been described adequately by Jorgensen and Smith (1974), including an analytical discussion of how data from the base grid were used to interpret data obtained from base mini-grids and pasture mini-grids. Numbers of small mammals (N_m) in the pastures were determined by:

$$N_m = \frac{\text{Average captures per pasture mini-grids}}{\text{Average captures per base mini-grids}} \times \text{Population density on the base grid}$$

Table 1. Summary and description of pastures sampled for small mammals

Grazing Intensity	Grazing Schedule	Small Mammal Sampling Year	Pasture No.[a]
	Early Winter	1972	13
	Middle Winter	1973	11
Light	Late Winter	1972	17
	Early-Middle Winter	1973	4
	Early-Late Winter	1973	3
	Middle-Late Winter	1973	10
	Middle Winter	1973	9
Moderate	Late Winter	1973	19
	Early-Middle Winter	1973	5
	Middle-Late Winter	1973	6
	Early Winter	1972,1973	8
Heavy	Late Winter	1972,1973	18
	Early-Middle Winter	1973	7
	Middle-Late Winter	1973	14

[a]Proximities of these pastures to each other can be seen in Fig. 21.

Generally, the five pasture mini-grids were located where they could be conveniently accessed by vehicles, rather than by some random method. Although the vegetative composition is not homogenous throughout the entire pasture, specific plant data were not collected at each pasture mini-grid site. This was justified, largely because the objective of this work was to examine the effects of grazing rather than the association of small mammals with plant composition and/or cover in a very localized area.

Small mammal pasture mini-grids were sampled in 1972, partly to establish some preliminary data on which pasture selections could be made for the 1973 sampling season. In this case, extremes of light grazing intensity early and late in the winter were sampled, in contrast to heavy grazing during the same periods. Similar criteria were used for the 1973 sampling, except the first set of pastures (6, 8, 9, 10, 11 and 18) was used to establish base-line data on which to predict the results to be obtained from pastures 3, 4, 5, 7, 14 and 19 (Fig. 1).

Another sampling effort was made in 1976 with a somewhat modified design. Fourteen (3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 17, 18 and 19) pastures were trapped along with the mini-grids on the IBP validation grid (Fig. 1). These data were gathered in May, June and July between times when the grid was sampled for pre- and post-reproduction. Each pasture was sampled six times for this part of the work, with the pasture mini-grids being located far enough apart to avoid interaction and to facilitate sampling of different habitats in each pasture. Also, local vegetation and habitat characterizations were made to emphasize interactions between the small mammals and vegetation.

RESULTS

Estimates of small mammal densities during 1972 for the grid (Table 2) were completed for 10 days in June, but only for three days in September. The September data, although scanty, were used to provide the bases of change that may have occurred during the growing season while mini-grids were sampled (Table 3), since an estimate of density on the base mini-grids is needed to interpret data from pasture mini-grids. Data from the pasture and base mini-grids fail to partition the species into classes, so that it is not necessary to work with classes and totals, for the grids are sufficient for comparative and interpretative purposes.

Once the magnitude of change between June and September had been determined for the grid, the adjusted density on the grid after pasture base grids had been sampled could be estimated by scaling the difference to daily rate of change (Jorgensen and Smith 1974). This rate was then used to project the expected grid densities at the time pasture mini-grids were sampled, after which the formula presented earlier was used to obtain an estimate (Table 4).

Results from the 1973 season for the base grid and mini-grids are presented in Tables 5 and 6, respectively, with the prescribed interpolation found in Table 4. The total density estimates in Table 4 are logically greater than any of the single species since they include all species, those in the table as well as those that could not be estimated because too few animals were captured. Also, these totals should approximate the sum of the most abundant species. These two positions are essentially satisfied for the base grid data, although there are often rather wide disparities in the estimated pasture densities. These disparities could be caused by highly variable recapture behavior for specific classes within a species, by some peculiarities of the estimate, or perhaps by some interactions between them. Because of the disparities apparent in these data, the total densities are probably the most reliable for the pastures. These estimates also make unnecessary the representation of all species in the base grid data, although small mammal production would be difficult to obtain.

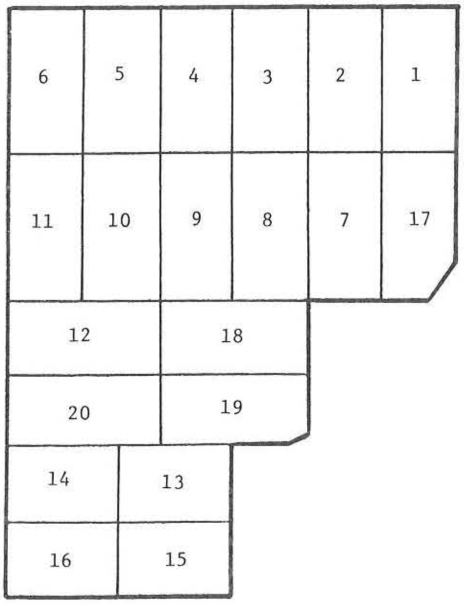

Figure 1. Winter sheep pastures, illustrating the proximities of those included in this study.

Table 2. Population estimates (n/ha) of small mammal species on the base grid (1972)

Species and Class	Small Mammal Densities/Day[a]									Number Dead
	1	2	3	4	5	6	7	8	9	
June, 1972										
Peromyscus maniculatus										
Adults	5.26	6.76	7.65	8.38	8.60	8.13	10.37	7.43	4.71	13.68
Subadults	.00	.00	.88	.88	2.90	1.69	1.91	1.91	1.91	4.78
Juveniles	.00	.00	1.10	1.10	2.21	3.31	2.57	2.57	2.57	.00
Adult Males	3.90	2.94	3.79	5.40	5.61	5.18	5.44	4.23	2.43	8.97
Adult Females	1.84	4.49	5.40	2.98	2.98	2.94	4.78	3.38	2.35	4.63
Total	11.91	11.29	9.85	13.53	13.86	13.68	16.73	14.19	9.17	17.50
Perognathus longimembris										
Adults	.00	14.09	14.87	13.44	15.64	15.22	13.75	15.74	15.37	2.80
Adult Males	.00	9.19	6.37	6.89	8.80	8.19	7.96	7.61	8.01	1.36
Adult Females	.00	5.97	9.19	6.25	7.02	7.02	5.94	8.74	7.42	1.39
Total	.00	14.09	14.87	13.44	15.64	15.22	13.75	15.74	15.37	2.80
Dipodomys microps										
Adults	1.47	2.57	2.57	2.57	1.47	1.47	1.10	.00	.00	3.03
Adult Males	.00	.00	1.10	1.10	1.10	1.10	.00	.00	.00	.93
Adult Females	1.47	1.47	1.47	1.47	.37	.37	.37	.00	.00	1.82
Subadults (♂ and ♀)	.00	.00	.00	.00	.00	.37	.37	.74	.74	.00
Total	1.47	2.57	2.57	2.57	1.47	1.47	1.47	.00	.00	3.03
All Species Total[b]	13.38	27.95	27.29	29.54	30.97	30.37	31.95	29.93	25.08	23.33
September, 1972										
Peromyscus maniculatus										
Adults	30.88	35.91	--	--	--	--	--	--	--	5.81
Subadults	11.03	4.19	--	--	--	--	--	--	--	.24
Adult Males	14.83	17.56	--	--	--	--	--	--	--	3.75
Adult Females	18.38	16.18	--	--	--	--	--	--	--	2.47
Total	42.06	38.13	--	--	--	--	--	--	--	4.96
Perognathus longimembris										
Adults	14.50	9.36	--	--	--	--	--	--	--	3.14
Adult Males	6.62	2.74	--	--	--	--	--	--	--	2.11
Adult Females	.00	6.49	--	--	--	--	--	--	--	1.19
Total	14.50	9.36	--	--	--	--	--	--	--	3.14
All Species Total[c]										

[a]Totals were not obtained on total parameter data; thus, all totals are simply the sums of appropriate categories.

[b]Other species captured during June in numbers too small to estimate were: Onychomys leucogaster and Perognathus parvus.

[c]The grid was trapped only three days. Other species captured during September in numbers too small to estimate were Dipodomys microps.

Table 3. Average numbers of small mammal captures from the five mini-grids on the base grids and on the pastures (1972)

Grid Location and Species	Average Numbers/Mini-Grid[a]	
	Base Mini-Grids	Pasture Mini-Grids
BASE GRID		
Peromyscus maniculatus	9.60	
Perognathus longimembris	.80	
Onychomys leucogaster	.40	
Pasture 8		
Peromyscus maniculatus		7.00
Perognathus longimembris		
Pasture 13		
Peromyscus maniculatus		5.80
Perognathus longimembris		.60
Dipodomys microps		.20
Pasture 17		
Peromyscus maniculatus		2.00
Perognathus longimembris		3.00
Pasture 18		
Peromyscus maniculatus		1.60
Perognathus longimembris		1.00

[a]Data for each mini-grid (5 per pasture on base-grid) were not kept separately during the first year's (1972) sampling; thus, only averages could be determined.

Table 4. Summary of grid density adjustments and density estimates in the pastures (1972)

Pasture Number and Species Class	Grid Estimates[a] Spring	Fall	Adjusted	Mini-Grid Estimates Base	Pasture	Pasture Density[b]
1972						
Pasture 8						
Peromyscus maniculatus	9.71	38.13	19.32	9.60	7.00	14.09
Perognathus longimembris	15.37	9.36	11.39	.80	3.60	51.26
Total	25.08	47.49	32.66	10.40	10.60	33.06
Pasture 13						
Peromyscus maniculatus	9.71	38.13	19.32	9.60	5.80	11.67
Perognathus longimembris	15.37	9.36	11.39	.80	.60	8.54
Total	25.08	47.49	32.66	10.40	6.60	20.73
Pasture 17						
Peromyscus maniculatus	9.71	38.13	19.32	9.60	2.00	4.02
Perognathus longimembris	15.37	9.36	11.39	.80	3.00	42.71
Total	25.08	47.49	32.66	10.40	5.00	15.70
Pasture 18						
Peromyscus maniculatus	9.71	38.13	19.32	9.60	1.60	3.22
Perognathus longimembris	15.37	9.36	11.39	.80	1.00	14.24
Total	25.08	47.49	32.66	10.40	2.60	8.17
1973						
Pasture 11						
Perognathus longimembris	.00	6.99	3.88	2.00	.40	.78
Neotoma lepida	.00	.00	.00	.00	.20	--
Perognathus parvus	.00	.00	.00	.40	.20	--
Total	2.21	7.76	5.29	28.00	.80	.15
Pasture 18						
Perognathus longimembris	.00	6.99	3.88	2.00	.80	1.55
Perognathus parvus	.00	.00	.00	.40	.20	--
Dipodomys microps	1.65	1.14	1.43	25.40	.40	.02
Total	2.21	7.76	5.29	28.00	1.40	.15
Pasture 3						
Dipodomys microps	1.65	1.14	1.43	25.40	1.40	.08
Total	2.21	7.76	5.29	28.00	1.40	.15
Pasture 4						
Dipodomys microps	1.65	1.14	1.43	25.40	1.60	1.60
Perognathus longimembris	.00	6.99	3.88	2.00	.20	.39
Total	2.21	7.76	5.29	28.00	1.80	.34
Pasture 5						
Dipodomys microps	1.65	1.14	1.52	16.80	.60	.05
Perognathus longimembris	.00	6.99	5.15	8.40	1.40	.86
Total	2.21	7.76	6.30	26.60	2.00	.47
Pasture 7						
Dipodomys microps	1.65	1.14	1.52	16.80	.20	.02
Perognathus longimembris	.00	6.99	5.15	8.40	1.20	.74
Peromyscus maniculatus	.00	.00	.00	.00	.20	--
Total	2.21	7.76	6.30	26.60	1.60	.38
Pasture 14						
Dipodomys microps	1.65	1.14	1.52	25.40	.20	.01
Total	2.21	7.76	6.30	28.00	.20	.04
Pasture 6						
Dipodomys microps	1.65	1.14	1.34	17.20	.20	.02
Total	2.21	7.76	4.34	17.20	1.00	.25
Pasture 8						
Perognathus longimembris	.00	6.99	2.68	.00	.80	--
Total	2.21	7.76	4.34	17.20	.80	.21
Pasture 9						
None						
Pasture 10						
Onychomys leucogaster	.00	.00	.00	.00	.20	--
Peromyscus maniculatus	.00	.00	.00	.00	.20	--
Total	2.21	7.76	4.34	17.20	.40	.10

Table 4, continued

Pasture Number and Species Class	Grid Estimates[a]			Mini-Grid Estimates		Pasture Density[b]
	Spring	Fall	Adjusted	Base	Pasture	
Pasture 19						
Dipodomys microps	1.65	1.14	1.52	16.80	.80	.08
Perognathus longimembris	.00	6.99	5.15	8.40	.20	.12
Total	2.21	7.76	6.30	26.60	1.00	.24

[a]The total includes all species, even those caught too infrequently to estimate specifically.

[b]When data were not available from the base grid or the base mini-grid, density estimates could not be determined.

Table 5. Population estimates (n/ha) of small mammal species on the base grid (1973)

Species and Class	Small Mammal Densities for Each Trapping Day									Number Dead
	1	2	3	4	5	6	7	8	9	
May, 1973										
Dipodomys microps										
Adults	.00	.74	.74	1.91	.92	1.10	2.72	.99	.74	2.21
Juveniles	.00	.00	.00	.00	.00	.74	.66	.48	.48	.40
Adult Males	.00	.37	.37	.37	.37	1.00	.00	.00	.00	1.10
Adult Females	.00	.37	.37	.74	.66	.74	1.32	.66	.37	1.10
Total	.00	.74	.74	2.54	2.57	1.88	3.09	1.40	1.65	2.57
All Species Total[a]	.00	.74	.74	3.16	3.09	1.88	3.05	1.40	2.21	2.94
September, 1973										
Dipodomys microps										
Adults	1.73	1.73	.00	.00	.00	.00	.00	.00	.00	2.21
Males	.55	.55	.00	.00	.00	.00	.00	.00	.00	1.10
Females	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.10
Total	1.14	1.14	1.14	1.14	.00	.00	.00	.00	.00	3.68
Perognathus longimembris										
Adults	11.69	9.41	6.65	4.15	4.82	3.46	2.98	2.50	2.50	6.95
Subadults	5.11	5.11	6.25	4.96	10.44	5.48	5.37	4.52	4.52	5.07
Adult Males	17.94	7.32	5.18	3.20	3.53	2.46	2.17	1.95	1.95	5.55
Adult Females	1.43	1.43	1.43	1.43	1.43	1.43	.74	.74	.74	1.29
Subadult Males	.74	.74	1.65	1.40	2.50	3.01	2.17	2.35	2.35	1.07
Subadult Females	4.26	4.26	5.77	3.49	3.49	2.10	3.93	1.95	1.95	4.04
Total	17.35	31.29	13.75	11.03	12.68	8.90	8.24	6.99	6.99	12.98
All Species Total[b]	18.31	40.59	17.46	11.73	18.64	11.18	9.96	7.76	7.76	17.46

[a]Other species captured during May in numbers too small to estimate are Peromyscus maniculatus.

[b]Other species captured during September in numbers too small to estimate are Peromyscus maniculatus and Dipodomys ordii.

Table 6. Number of small mammal captures from the 12 pasture mini-grids on the base mini-grid and on the pastures

Grid Location and Species	Numbers of Small Mammals on the Mini-Grids											
	Pasture Mini-Grids						Base Mini-Grids					
	1	2	3	4	5	Avg.	1	2	3	4	5	Avg.
Pasture 4												
Dipodomys _microps_	3	2	3	0	0	1.60						
Perognathus _longimembris_	0	1	0	0	0	.20						
Pasture 11												
Perognathus _longimembris_	0	2	0	0	0	.40						
Perognathus _parvus_	1	0	0	0	0	.20						
Neotoma _lepida_	1	0	0	0	0	.20						
Pasture 14												
Dipodomys _microps_	0	1	0	0	0	.20						
Pasture 18												
Dipodomys _microps_	0	0	1	1	0	.40						
Perognathus _longimembris_	3	0	0	0	1	.80						
Perognathus _parvus_	0	0	1	0	0	.20						
BASE-GRID (Aug. 8-17)												
Dipodomys _microps_							2	20	9	22	31	16.80
Perognathus _longimembris_							4	5	20	8	5	8.40
Perognathus _parvus_							0	2	0	5	0	1.40
Pasture 5												
Dipodomys _microps_	0	0	0	0	3	.60						
Perognathus _longimembris_	0	1	2	4	0	1.40						
Pasture 7												
Dipodomys _microps_	0	0	0	1	0	.20						
Perognathus _longimembris_	2	1	1	1	1	1.20						
Peromyscus _maniculatus_	0	0	1	0	0	.20						
Pasture 19												
Dipodomys _microps_	0	0	0	3	1	.80						
Perognathus _longimembris_	2	3	1	1	4	2.20						
BASE-GRID (July 4-13)												
Dipodomys _microps_							11	28	8	19	20	17.20
Pasture 6												
Dipodomys _microps_	0	0	1	0	0	.20						
Perognathus _longimembris_	0	2	0	0	0	.40						
Perognathus _parvus_	0	2	0	0	0	.40						
Pasture 8												
Perognathus _longimembris_	0	0	0	4	0	.80						
Pasture 10												
Onychomys _leucogaster_	0	0	1	0	0	.20						
Peromyscus _maniculatus_	0	1	0	0	0	.20						
Pasture 9												
none												
BASE-GRID (July 21-30)												
Dipodomys _microps_							12	27	29	32	27	25.40
Perognathus _longimembris_							1	1	5	2	1	2.00
Perognathus _parvus_							0	0	0	1	1	.40
Peromyscus _maniculatus_							0	1	0	0	0	.20
Pasture 3												
Dipodomys _microps_	0	1	6	0	0	1.40						

Since small mammals are usually tied rather closely to the vegetation, their distribution and numbers are often explained by a general description of the plants. This is provided by an analysis of cover and composition for surveys of the pastures completed in 1935 (Table 7) and 1967 (Table 8).

Results of the 1976 trapping (Table 9) have not yet been analyzed, and will have to be integrated into the manuscript at a later date. These data coupled with the vegetative data will be very helpful in assessing the historical interaction of winter grazing and small mammal foraging.

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Table 7. Percentage cover of the principal plant species in the pasture and the base grid in 1935

Plant species	Pasture number													
	3	4	5	6	7	8	9	10	11	13	14	17	18	19
Aristida fendleriana	.44	.55	1.04	1.97	.22	.37	.26	.81	.63	.24	.03	.32	.07	.22
Artemisia spinescens	.33	.82	1.80	1.28	.03	.79	1.73	2.86	2.51	2.62	1.01	.22	.82	.98
Atriplex confertifolia	13.83	13.60	14.45	17.24	21.85	22.26	16.03	8.64	7.36	18.67	10.86	21.74	11.62	15.46
Blepharidachne kingii	.46	.60	.48	1.29	.53	.59	.46	1.59	1.90	.08	---	.01	---	---
Bouteloua gracilis	2.41	.76	1.13	.18	.23	.08	---	---	1.23	---	---	.05	---	.02
Chrysothamnus sp.	.78	2.47	2.52	.90	.82	.36	1.19	1.84	2.66	.50	---	.01	.16	1.03
Emplectocladus fasciculatus	1.57	1.50	1.90	.05	1.09	.69	.49	.58	2.10	.13	---	.06	---	.07
Ephedra nevadensis	1.24	.72	2.12	2.33	.16	.13	.89	2.78	3.49	.01	---	.15	.01	---
Ceratoides lanata	8.75	6.69	1.99	1.74	15.93	15.42	6.44	.10	.22	9.05	33.11	14.30	26.27	20.01
Gutierrezia sarothrae	.19	.39	.86	2.74	.01	.23	.22	.39	1.12	---	.01	.47	.27	.22

Table 7, continued

Plant Species	Pasture Number													
	3	4	5	6	7	8	9	10	11	13	14	17	18	19
Hilaria jamesii	9.74	15.10	8.52	5.78	4.63	4.34	8.67	7.69	6.37	13.84	3.52	3.72	2.45	5.48
Lesquerella scopulorum	.57	.46	.56	.52	1.42	.65	.38	.18	.19	.04	---	.06	.44	.12
Muhlenbergia squarrosa	.09	---	.11	.01	.09	.03	.09	.07	.14	.03	---	.04	.01	---
Oryzopsis hymenoides	.81	.73	3.60	5.38	.34	.56	1.62	3.41	3.48	2.56	.75	1.02	.94	1.87
Sporobolus cryptandrus	8.00	6.22	7.86	6.31	3.16	3.61	11.08	18.11	15.80	.53	.16	2.42	2.83	.47
Sphaeralcea grossulariaefolia	.71	.87	1.24	1.07	.69	.50	.81	.97	.93	1.59	.48	1.79	1.19	.77
Total*	51.07	50.86	51.85	52.40	52.39	51.42	51.06	51.71	53.46	50.50	50.00	51.12	50.50	50.19

* The differences between these totals and those obtained when all species are added is due to small amounts of minor species.

Table 8. Percentage cover of the principal plant species in the pasture and the base grid in 1967

Plant Species	Pasture Number													
	3	4	5	6	7	8	9	10	11	13	14	17	18	19
Aristida fendleriana	.10	.05	.10	.20	.05	.10	--	.15	.10	--	.10	.10	--	.10
Artemisia spinescens	.10	1.95	3.10	.25	.20	4.90	4.70	.20	2.95	1.95	.05	--	--	.10
Atriplex confertifolia	14.50	16.60	19.05	20.80	17.15	16.15	16.75	22.15	16.60	14.60	18.80	23.70	25.95	13.55
Blepharidachne kingii	--	.05	.15	.60	--	--	.10	.25	.25	--	--	--	--	--
Bouteloua gracilis	2.55	.25	1.45	.10	--	.10	--	.05	2.55	--	--	.20	--	--
Chrysothamnus stenophyllus	.60	1.05	.60	1.75	--	--	.20	.50	1.90	2.05	.15	1.25	--	3.40
Chrysothamnus sp.	.25	1.75	.35	.15	--	--	.40	.40	2.50	--	--	--	--	--
Emplectocladus fasciculatus	1.0	.35	.15	.05	.55	.25	--	.30	.85	--	--	--	--	--
Ephedra nevadensis	1.05	.70	1.70	2.45	.10	.10	.55	1.55	2.85	--	--	.15	.15	--
Ceratoides lanata	5.0	5.25	1.40	.65	15.35	14.90	7.20	--	.10	13.85	25.55	10.35	13.60	24.70
Gutierrezia sarothrae	.35	.40	.30	1.10	.40	.30	.25	.35	.85	--	--	.20	--	--
Hilaria jamesii	16.00	12.85	9.65	7.20	4.55	3.60	8.55	9.0	5.35	12.60	3.40	3.80	2.55	5.40
Lesquerella scopulorum	.30	.65	.60	.80	.45	.75	.70	.75	1.25	.05	.20	--	.20	--
Muhlenbergia squarrosa	.05	--	.05	.20	.40	.15	.20	.25	.05	--	--	1.25	.05	--
Oryzopsis hymenoides	1.70	2.85	4.30	4.20	1.90	1.15	1.55	1.50	1.65	.85	1.45	4.75	4.0	2.30
Salsola kali	.45	.50	1.50	.05	6.0	2.5	2.60	.25	.95	41.85	7.50	64.50	68.85	46.55
Sporobolus cryptandrus	5.25	4.55	6.75	8.85	8.70	7.50	9.15	13.10	10.95	.70	.10	3.55	2.50	.20
Sphaeralcea grossulariaefolia	.80	.90	.55	.35	.40	.85	.45	.30	.40	.60	.35	.50	.15	.15
Totals	50.05	50.70	51.75	49.75	56.20	53.30	53.35	51.05	52.10	89.10	57.65	114.30	118.0	96.45

Table 9. Summary of small mammals collected from the pasture mini-grids (1976)

Trapping Period and Species[a]	Number of Specimens Collected From Each Pasture Number														
	IBP	3	4	5	6	7	8	9	10	11	13	14	17	18	19
May 19 - May 23															
AMM LEU	--	--	1	--	--	--	--	--	--	--	1	--	--	--	1
DIP MIC	2	--	--	--	--	--	--	1	1	--	--	--	--	--	--
DIP ORD	1	2	1	--	1	1	1	1	--	3	--	--	2	--	3
NEO LEP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ONY LEU	--	--	1	--	--	--	--	--	--	--	--	--	--	1	--
PRG FOR	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
PRG LON	4	3	1	--	4	6	--	--	1	2	--	2	4	3	--
PRG PAR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PER MAN	--	2	3	5	2	2	3	3	3	5	--	1	1	3	4
Total	7	7	7	5	7	9	4	5	5	10	1	3	8	7	8
May 26 - May 30															
AMM LEU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIP MIC	2	1	--	--	--	--	--	--	1	--	--	--	--	--	--
DIP ORD	1	--	2	--	1	--	1	1	--	2	--	--	1	1	--
NEO LEP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ONY LEU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG FOR	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
PRG LON	5	5	1	1	1	2	3	1	2	1	4	--	2	--	2
PRG PAR	--	--	--	1	--	--	--	--	2	1	--	--	--	--	1
PER MAN	1	1	1	1	3	2	1	1	1	4	1	--	6	2	2
Total	9	7	5	3	5	4	5	3	6	8	5	--	9	3	5
June 16 - June 20															
AMM LEU	1	--	--	--	--	2	1	--	1	--	--	--	--	--	--
DIP MIC	--	1	--	1	2	2	--	--	1	1	--	--	--	2	--
DIP ORD	8	2	--	1	--	--	--	--	--	4	2	--	--	2	1
NEO LEP	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ONY LEU	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG FOR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG LON	6	5	8	3	4	4	1	--	1	7	6	6	1	--	3
PRG PAR	1	2	1	1	--	2	--	--	--	2	--	--	--	--	--
PER MAN	2	2	1	1	--	--	1	1	2	2	--	2	--	--	--
Total	20	12	10	7	6	10	3	1	5	16	8	8	1	4	4
June 21 - June 25															
AMM LEU	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--
DIP MIC	4	3	--	--	2	1	--	1	3	1	--	--	--	--	1
DIP ORD	--	--	1	--	1	4	--	--	--	--	--	--	3	10	1
NEO LEP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ONY LEU	--	2	--	--	--	--	--	--	--	--	1	--	--	--	--
PRG FOR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG LON	4	1	3	2	3	4	2	2	2	3	5	3	--	3	1
PRG PAR	--	--	1	--	--	--	--	1	--	--	--	--	--	--	--
PER MAN	1	2	3	3	1	1	3	1	5	2	--	1	1	2	3
Total	10	8	9	5	7	10	5	5	10	6	6	4	4	15	6
July 14 - July 18															
AMM LEU	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
DIP MIC	--	--	2	3	1	--	1	--	1	--	1	1	--	--	2
DIP ORD	2	--	1	--	--	2	--	--	--	--	4	--	--	4	--
NEO LEP	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
ONY LEU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG FOR	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
PRG LON	1	1	1	1	1	4	--	--	2	--	3	5	1	2	--
PRG PAR	--	--	--	--	1	--	--	--	--	--	--	--	--	--	1
PER MAN	1	2	--	--	1	--	--	1	--	1	1	--	--	--	--
Total	4	3	4	4	4	7	1	1	3	1	11	6	1	6	3
July 19 - July 23															
AMM LEU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DIP MIC	--	--	2	1	--	3	--	--	1	1	--	--	1	--	--
DIP ORD	--	--	--	--	--	1	1	1	--	--	--	1	--	4	3
NEO LEP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ONY LEU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG FOR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRG LON	3	--	1	2	--	2	--	--	1	2	3	--	2	--	--
PRG PAR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PER MAN	1	3	--	--	--	--	--	1	--	1	--	--	--	--	--
Total	4	3	3	3	--	6	1	2	2	4	3	1	3	4	3

[a] AMM LEU = Ammospermophilus leucurus, DIP MIC = Dipodomys microps, DIP ORD = Dipodomys ordii, NEO LEP = Neotoma lepida, ONY LEU = Onychomys leucogaster, PRG FOR = Perognathus formosus, PRG LON = Perognathus longimembris, PRG PAR = Perognathus parvus, PER MAN = Peromyscus maniculatus