

RELATIONSHIPS BETWEEN POCKET GOPHER NUMBERS  
AND SELECTED ENVIRONMENTAL FACTORS IN PELICAN  
VALLEY, YELLOWSTONE NATIONAL PARK

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This report concerns the current investigation of selected environmental factors on numbers of pocket gophers (*Thomomys talpoides*) in Pelican Valley, Yellowstone National Park, Wyoming. The study is being supported by the University of Wyoming/National Park Service Research Center. I wish to express my appreciation to the following individuals for their contributions to the study: Dr. Robert Moore, Montana State University, who directed the study and aided in the preparation of this report; Drs. Gerald Nielsen, Clifford Montagne, and Lawrence Munn, Montana State University, for aid in classification and analysis of soil from the study area; Drs. James Bradbury and William Dorgan, Montana State University, for aid in identification of placental scars; Dr. Theodore Weaver, Montana State University, for aid in analysis of vegetation data; Roger Rudolph, Sub-district Ranger, for cooperation and assistance in the field.

Study Objectives

- A. Estimate numbers and seasonal burrowing activity of pocket gophers in representative sites in Pelican Valley.
- B. Estimate times of reproductive activity, particularly the period of nursing of young.
- C. Measure the following environmental factors at representative sites: snow depth, soil water table, depth of A<sub>1</sub> layer of organic matter content, soil texture, depth of soil available for burrowing by pocket gophers, and soil moisture.
- D. Quantitatively measure herbaceous vegetation at representative sites.

Methods

Eight study transects 100 m long and 10 m wide were established in the Pelican Valley. Pocket gophers were live-trapped and marked on two of these eight 100 m transects through use of a modified design of Baker and Williams (1972). Live-trap, mark and release was conducted for the determination

of average number of new mounds per pocket gopher in a 48 hour time period. Data on sex ratios, age structure, home range size, mortality/natality rates, and movement between habitat types are being analyzed. Pocket gophers were also collected using commercial traps for determination of reproductive status and number of placental scars in females of breeding age. Tryon (1947), found that after partus, placental scars are left in the uterus and are distinct enough to count and determine the number of young born.

Relative indices of pocket gopher numbers were made through the use of mound counts (Reid et al. 1966). This particular method requires the leveling or otherwise marking of all existing mounds and plugs on the area being investigated. Following an interval of 48 hours, the site is re-visited and all mounds and plugs made during the interval counted and recorded. Mounds were counted on the eight 100 m x 10 m transects at arbitrary intervals throughout the summer.

The vegetation on the eight 100 m transects was quantitatively measured. Scientific and common names of plants follow Booth (1950) and Booth and Wright (1959). Composition and canopy of low growing vegetation on each of the eight transects were determined from a modification of the method described by Daubenmire (1959). Twenty 2x5 decimeter plots were placed at five meter intervals along the center line of each transect. Line intercepts coinciding with the eight 100 m transects were used to quantitatively measure abundance of yampa (Perideridia gairdneri) and purple oniongrass (Melica spectabilis).

Soil samples were collected from each of the eight 100 m transects at intervals of 20 m. Soil samples from zero to four inches in depth, and from four to twelve inches in depth were collected at each interval by use of an Oakfield Apparatus. Mechanical analysis of soil follows procedures outlined by Sims (1970).

### Results and Discussion

The two major habitat types represented on the eight study transects were classified according to Mueggler and Handl (1974). Festuca idahoensis/Deschampsia caespitosa and Festuca idahoensis/Stipa occidentalis were determined to be the two habitat types using the above criteria. It is the opinion of this investigator that the percent cover by Artemisia cana is great enough to use the arbitrary type Artemisia cana/Festuca idahoensis in lieu of Festuca idahoensis/Stipa occidentalis.

A total of 38 pocket gophers were captured, marked, and released on two adjacent 100 m study transects. These two transects represented two different habitat types. Twenty-one pocket gophers were marked and released from the Festuca idahoensis/Deschampsia caespitosa habitat type transect while 17 pocket gophers were marked and released from the Artemisia cana/Festuca idahoensis habitat type transect. Individual pocket gophers were generally captured more than once; the maximum number of recaptures was that of an adult female captured 10 times. Home range sizes were determined for individuals captured more than three times.

During the month of July, 57 pocket gophers were collected from three separate sites representing two different habitat types. A sex ratio of 28 females to 29 males was obtained. This ratio suggests that females were equally susceptible to trapping at this time and thus were probably not nursing. Hansen (1960) found that in the spring the sex ratio for adults showed a higher percentage of males than females. Low numbers of females trapped were attributed to the likelihood that females were less vulnerable to traps at this time due to pregnancy, parturition, and post natal care of young. Nine of 57 pocket gophers collected from the three sites were classified as sub-adult on the basis of size, pelage, and status of internal reproductive organs.

Placental scar counts of female pocket gophers collected from two different habitat types averaged 5.3 scars per adult female from the Artemisia cana/Festuca idahoensis habitat type and 3.8 per adult female from the Festuca idahoensis/Deschampsia caespitosa habitat type. Due to difficulty of separating recent scars from old scars, individuals with over six placental scars were considered to be in their second year of breeding and not tallied in the computation of average scars per individual. Seven of 28 carcasses examined were found to have more than six placental scars and thus were considered to be in their second year of breeding. One female was found to have 15 scars and hence was considered in the third year of breeding.

Pocket gopher numbers were indexed throughout the summer months by utilizing mound counts. Mound counts were found to be lowest in the spring and to increase throughout the summer months. Highest mound counts were obtained in late August and early September. Laycock (1957) and Miller and Bond (1960) found mound-building activity increased from spring to fall. Live trapping of pocket gophers in conjunction with mound counts enabled computation of a ratio of mounds built per pocket gopher per 48 hour time period in both habitat types. Mound count data for the first week of September resulted in an average of 2.6 mounds per pocket gopher in the Festuca idahoensis/Deschampsia caespitosa habitat type. An average of 2.8 mounds per pocket gopher was computed for the Artemisia cana/Festuca idahoensis habitat type. Use of the number of mounds per pocket gopher should be limited to comparison with data collected along other belt transects of similar dimensions.

Vegetation data was compiled using a modified method of that described by Daubenmire (1959). Total canopy coverage per species for each of the eight transects was computed (Table 1). Vegetation data are being analyzed for possible correlation with numbers of mounds. Yampa (Perideridia gairdneri) and purple oniongrass (Melica spectabilis) were investigated separately for possible correlation with numbers of mounds. A correlation coefficient of 0.82 was obtained between mound counts made during July and total intercepts of yampa and purple oniongrass made during the same time interval (Figure 1). These two plant species also are of possible importance to grizzly bears (Ursus arctos) Dean Graham (Personal communication).

Mechanical analysis of soil samples from the eight study transects was accomplished. All soil samples from these transects fall into the category of 'silt loams'. No correlation appears between numbers of pocket gopher

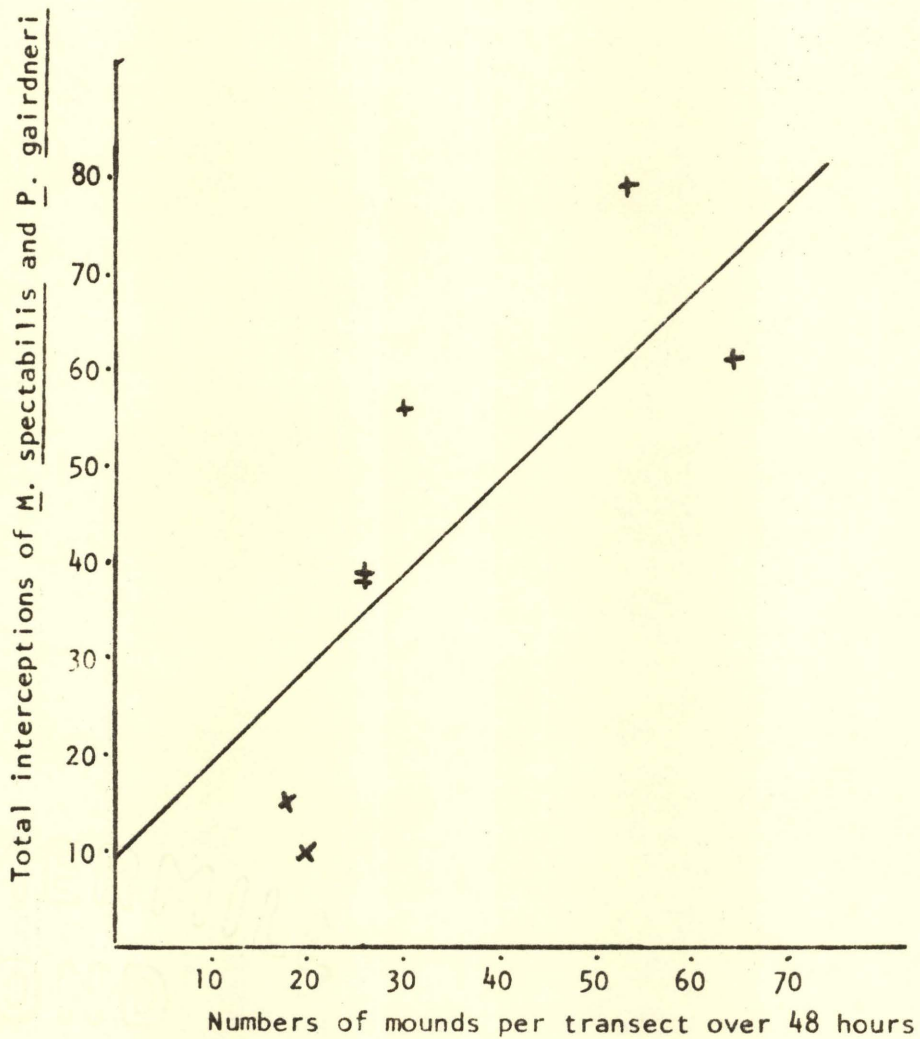
mounds and soil texture for those soils falling into the category of 'silt loams'. Data on soil moisture and organic matter are yet to be analyzed. Detailed descriptions were made of two different soil profiles, one of a site where pocket gopher activity is typically present, the other of a site where pocket gopher activity is typically absent. Although data are still being analyzed, the soil profile which pocket gopher activity is typically absent is a heavy clay loam texture. The soil profile which pocket gopher activity is typically present is a loamy to sandyloam textured soil.

#### Recommendations and/or Conclusions

Pocket gopher numbers appear to be correlated to soil and vegetation in the Pelican Valley. Forage such as yampa and purple oniongrass may increase productivity of pocket gophers. Further investigation is required on mortality/natality rates between habitat types but comparison of placental scar counts suggests differences in productivity. In order to complete investigations on these and other study objectives, I suggest this study be continued over the next year.

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$r = .82$   
 $b = .58$   
 $a = 9.09$

Figure 1. Correlation of *P. gairdneri* and *M. spectabilis* to July mounds.

Table 1. Mean canopy coverages for plant species in 20 2x5 dm plots along each of eight 100 m transect lines in Pelican Valley. A<sub>1</sub>-A<sub>3</sub> are *Artemisia cana*/*Festuca idahoensis* habitat types. F<sub>1</sub>-F<sub>5</sub> are *Festuca idahoensis*/*Deschampsia caespitosa* habitat types.

<u>Graminoid species</u>	A 1	A 2	A 3	F 1	F 2	F 3	F 4	F 5
<i>Agropyron caninum</i>	0.75	5.12	3.62	5.25	4.38	5.38	4.38	6.0
<i>Bromus caranatus</i>	2.87	1.5	-	-	1.75	4.13	0.88	2.0
<i>Carex</i> spp.	0.75	2.25	2.75	1.75	2.5	2.0	0.68	5.0
<i>Danthonia intermedia</i>	-	-	0.63	0.13	0.13	-	0.13	0.95
<i>Deschampsia caespitosa</i>	2.62	9.0	20.6	8.13	12.18	8.88	4.62	10.5
<i>Festuca idahoensis</i>	11.62	16.5	5.5	6.13	8.13	15.12	8.25	8.13
<i>Melica spectabilis</i>	0.25	0.63	2.63	3.63	1.1	1.52	3.0	0.13
<i>Phleum alpinum</i>	-	0.25	5.4	-	0.25	0.25	0.25	0.98
<i>Poa</i> spp.	0.65	2.0	0.13	2.75	1.0	1.13	3.72	2.25
<i>Stipa occidentalis</i>	0.75	0.38	-	0.88	1.25	0.25	1.0	2.0
<u>Forb species</u>								
<i>Achillea millefolium</i>	0.88	2.87	2.75	2.38	0.88	2.88	0.63	5.0
<i>Agoseris glauca</i>	2.0	1.5	0.5	1.75	0.88	2.5	-	1.63
<i>Androsace septentrionalis</i>	-	0.5	0.13	-	0.63	0.88	0.38	0.13
<i>Antennaria</i> spp.	0.13	4.12	3.68	5.0	1.5	-	0.25	7.37
<i>Arabis</i> spp.	-	0.13	-	-	-	0.13	-	-
<i>Aster</i> spp.	2.5	1.88	6.88	-	0.88	2.88	0.25	4.88
<i>Aster foliaceus</i>	0.5	-	4.0	-	0.13	-	0.88	2.0
<i>Cirsium</i> spp.	-	-	0.25	-	0.13	2.13	0.13	0.13
<i>Collomia linearis</i>	0.63	1.25	0.5	1.88	4.88	1.5	4.88	0.63
<i>Delphinium</i> spp.	-	0.75	1.13	-	-	-	0.13	-
<i>Eriogonum</i> spp.								
<i>Eriophyllum</i> spp.								
<i>Fragaria</i> spp.	-	0.75	-	-	0.13	3.5	0.25	-
<i>Galium boreale</i>	-	-	0.55	-	2.05	-	-	-
<i>Gayophytum ramosissimum</i>	0.50	-	-	1.25	-	0.13	1.25	-
<i>Linum perenne</i>	0.13	-	-	-	-	-	0.88	-
<i>Lupinus sericeus</i>	0.13	-	-	-	-	-	-	-
<i>Perideridia gairdneri</i>	1.12	0.13	-	0.25	1.0	0.38	0.5	0.63
<i>Polygonum douglasii</i>	2.62	3.88	0.5	1.60	3.25	1.88	6.48	0.63
<i>Potentilla gracilis</i>	2.88	0.88	2.75	0.13	4.38	1.52	0.38	2.45
<i>Rumex paucifolius</i>	-	-	-	-	-	-	-	-
<i>Senecio</i> spp.	-	-	-	-	-	-	-	-
<i>Stellaria</i> spp.	1.88	1.88	2.5	0.13	0.38	-	0.25	1.13
<i>Taraxicum</i> spp.	-	0.13	3.38	-	-	-	-	0.13
<i>Thalictrum</i> spp.	0.13	0.88	1.75	-	-	-	-	-
<i>Trifolium</i> spp.	-	0.5	1.75	0.63	0.25	0.25	0.13	1.2
<i>Viola</i> spp.	0.5	0.38	0.25	1.75	0.38	0.50	1.5	0.13
<u>Shrub species</u>								
<i>Artemisia cana</i>	5.62	22.5	17.35	-	-	-	-	-