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A Comparison Study of the Ecological Distribution of Small Mammals in Southwestern North Dakota

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A COMPARISON STUDY OF THE ECOLOGICAL DISTRIBUTION OF SMALL MAMMALS IN SOUTHWESTERN NORTH DAKOTA

by

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This thesis submitted by Lenette K. Svihovec in partial fulfillment of the requirements for the Degree of Master of Science in the University of North Dakota is hereby approved by the Committee under whom the work has been done.

Dean of the Graduate School

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILL. TRATIONS

ABSTRACT

The objectives of this study were to survey the small mammal fauna from eight habitats typical of southwestern North Dakota and to determine the habitat preference of the species found. Fifteen species were collected and grouped according to their occurrence in areas of varying vegetation densities.

Four species (Reithrodontomys megalotis, Microtus pennsylvanicus, Sorex cinereus, and Eutamias minimus) were collected in dense vegetation. R. megalotis and M. pennsylvanicus were most abundant and exhibited preferences for cottonwood bottomlands and lowland meadows. S. cinereus was also limited to lowland meadows, while E. minimus occurred primarily in brushy coulees.

Areas of moderate vegetation density were preferred by four species (Microtus ochrogaster, Citellus tridecemlineatus, Onychomys leucogaster and Mus musculus). M. ochrogaster inhabited similar but drier sites to those preferred by M. pennsylvanicus. C. tridecemlineatus, O. leucogaster and M. musculus were generally collected along fence lines. However, M. musculus was also collected in granaries.

Dry upland prairie and sagebrush areas were regarded as sparse vegetation, and were preferred by Dipodomys

ordii and *Perognathus fasciatus*. Furthermore, *D. ordii* occurred only in sandy areas, while *P. fasciatus* was less specific in its preferences.

Four species of bats were collected in the vicinity of Amidon. These included *Myotis lucifugus*, *M. leibii*, *Eptesicus fuscus* and *Lasiurus borealis*.

Peromyscus maniculatus was collected in every habitat sampled, and was considered to be non-selective in its habitat preference. *P. m. nebrascensis* was most abundant; some specimens were identified as *P. m. luteus*. No specimens were identified as *P. m. bairdii* or *P. leucopus aridulus*, and if present they were considered to be rare.

Treatment of bait with an insect repellent reduced bait loss, but also appeared to reduce trapping success.

INTRODUCTION

Not since Bailey (1926) completed a biological survey of North Dakota has an extensive study been made of the mammalian fauna of southwestern North Dakota. The topography of this region is unique for North Dakota and the semiarid climate differs greatly from that of the remainder of the state. Due to the exceptional geologic, edaphic and climatic factors, some North Dakota mammalian species are limited to or excluded from the southwestern part of the state. Therefore, this region provides an unusual locality for the study of mammalian species and an opportunity to study a number of small mammals that are at the eastern or northern limits of their geographic ranges.

The objectives of this study were to survey the small mammal fauna and to determine the habitat preference of the species found. Zoological nomenclature follows Hall and Kelson (1959) except where otherwise noted. Botanical nomenclature is according to Fernald (1950) except for western species which follow Stevens (1950).

DESCRIPTION OF STUDY AREA

Location and Physiography

The study area is located in Slope and Bowman counties of extreme southwestern North Dakota (Fig. 1). The average elevation of these counties is 3000 feet. The highest point in North Dakota is White Butte (3506 feet) in Slope County.

The topography west of the Missouri River is radically different from the remainder of the state; this is attributed to extensive erosion and the lack of recent glaciation. The country is rough, interspersed with jagged hills. In addition to the broken areas, there are extensive areas of gently rolling prairie. The northern portion of the Missouri Plateau is commonly referred to as the Missouri Slope and is characterized by a gently sloping plain interrupted by numerous buttes which rise 400 to 700 feet from the prairie, and by the Badlands along the Little Missouri River. The topography west of the Missouri River is, according to Leonard (1930), the result of the Tertiary erosion cycle which continued into the Pleistocene. This cycle, plus the post-Tertiary erosion and the absence of glaciation, are the chief factors responsible for the present day topography (Kazeck, 1956).

The Little Missouri River enters the state from the southwest corner, flows north for approximately 120 miles, then turns sharply east for about 70 miles to join the

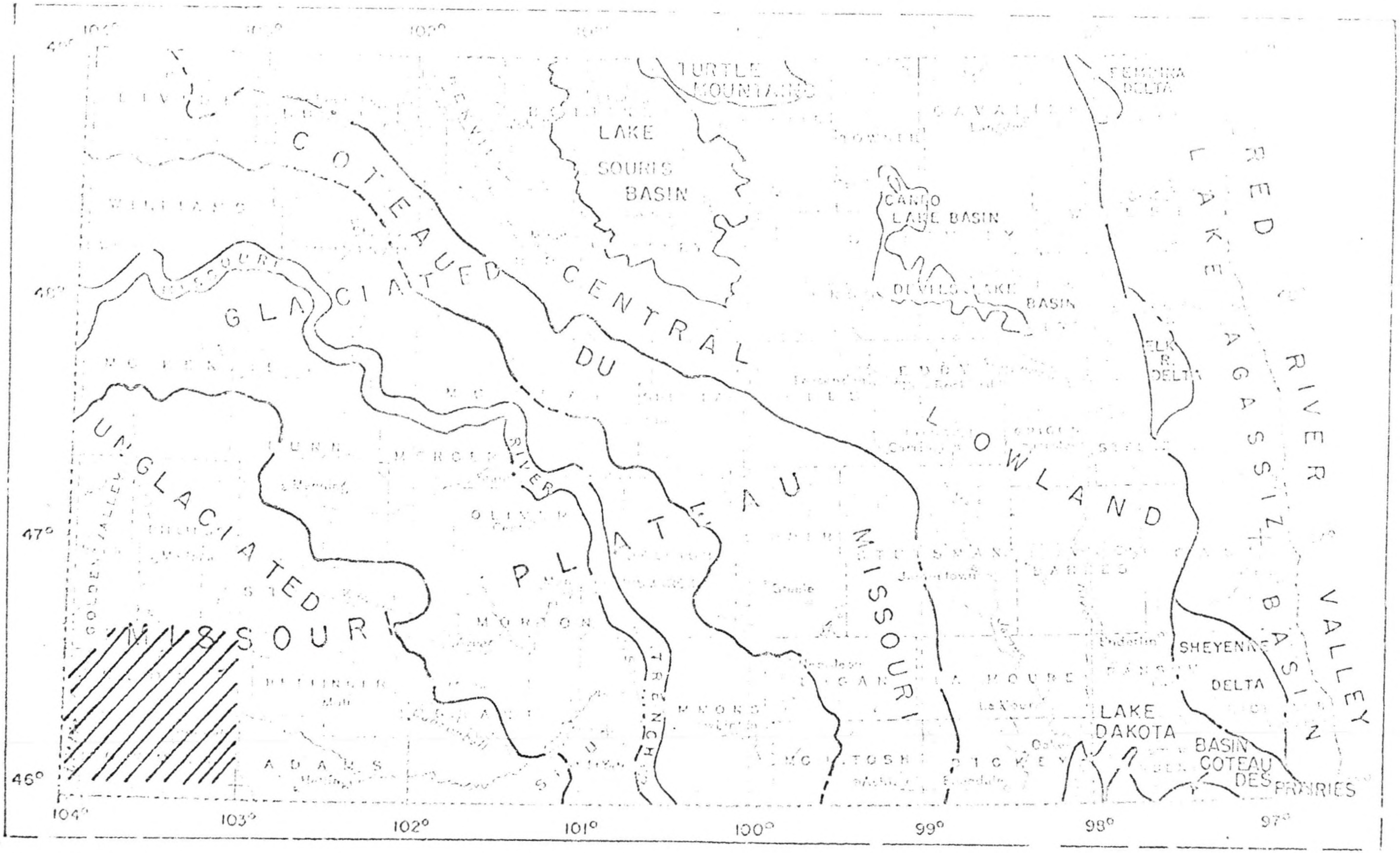

Fig. 1. Physiographic diagram of North Dakota showing location of study area. (After Hainer, 1956).

Missouri River. It is bordered by the Badlands, which form a belt whose width increases from six or seven miles in the south to 25 or more miles at the bend, and decreases again to 10 to 12 miles on the eastward course (Fenneman, 1931).

Although the annual rainfall is comparatively light in this region, it is concentrated into severe rain storms with the runoff causing considerable erosion. The stream and rain erosion acting on the sandstones and soft shales have been the major factors contributing to the development of the terrain of the Badlands. The Badlands have not been formed only along the main channel of the river, but extend back almost to the headwaters of each creek which enters the Little Missouri (Kazeck, 1956). Those formed along the numerous creeks join and overlap to form a maze of cliffs, canyons, gorges, ravines and gullies. Fenneman (1931) notes that the residual mesas and outstanding promontories of the upland increase in size and number with increasing distance from the Little Missouri River.

In many places, streams have cut through the sediments exposing strata of lignite coal, ranging from a few inches to 50 feet in thickness. Spontaneous combustion, lightning or accidental fires have often ignited these layers, causing the overlying clays to be baked into a characteristic reddish material, which is locally called scoria. Scoria is more resistant to erosion than the surrounding shales and sandstones; therefore, it forms the tops of many buttes and ridges.

Hainer (1956) assigns most of Slope and Bowman counties to the Tongue River and Ludlow formation of the Fort Union Group, which was deposited during the Paleocene. Hanson (1955) describes the Tongue River formation as consisting of unconsolidated sands, resistant calcareous sandstones, numerous carbonaceous shales and lignite.

Climate

The southwestern part of North Dakota has the mildest climate in the state with winter temperatures 10 - 15 F warmer than the northeast. Bavendick (1952) attributes this to the chinook winds, in addition to the cold Canadian air masses moving more southeasterly thus by-passing southwestern North Dakota. The growing season of this region averages 130 days, with the last spring frost usually occurring during the middle of May and the first fall frost about 15 September.

U. S. Weather Bureau statistics show the mean January temperature for Slope and Bowman counties to be 14 F and the mean July temperature, 70 F. During 1966, summer temperatures were normal with a mean of 66.0 F in June, 72.8 F in July and 65.1 F in August (U. S. Weather Bureau, 1966). Due to the warmer temperatures, Bailey (1926) classifies the western third of Slope and Bowman counties in the Upper Austral Life Zone and the remainder in the Transition Life Zone. He found that near the edge of the Upper Austral Zone, a slight inclination of a slope to the north reduces solar radiation sufficiently to change the flora and fauna wholly or in part to that of the colder Transition Zone. A steep south-facing slope would provide suitable habitats for species of the warmer Austral Zone.

The climate of southwestern North Dakota is semiarid with evaporation losses exceeding the annual precipitation. During the course of this study, precipitation was near normal with 3.4 inches in June, 6.1 inches in July and 1.3 inches in August. The total precipitation in Amidon, North Dakota for 1966 was 15.9 inches (U. S. Weather Bureau, 1966).

Kazeck (1956) observes that areas with low mean annual precipitation have a greater annual variation. He further notes that dry summer air reduces the effectiveness of showers because of the high evaporation rate. Therefore, the term mean annual precipitation has little, if any, meaning in this area since the precipitation varies greatly with approximately 75 per cent falling during the five summer months. Furthermore, the well-developed drainage pattern and the relatively impervious soils characteristic of this region enhance the rapid runoff, thus removing most of the available moisture.

Soils

Kazeck (1956) describes the chestnut and brown soils of southwestern North Dakota as in the Morton series, which consist chiefly of clay-loam or sand-loam. Morton soils are greyish-brown, tending to be lighter colored on the slopes. Other soil types of western North Dakota are the Arnegard, Bainville, Banks, Flasher, Grail, Huff, McKenzie, Moline, Rogers, Sage, Savage, Timmer and Wade series (Kazeck, 1956).

Brown and Chestnut soils were developed in temperate to cool semiarid and arid climates, under short-grass vegetation and in the absence of the influence of ground water (Wis. Agr. Exp. Sta., 1960). The clay-loams of the Brown and Chestnut soils are often poorly drained and high in alkali salts. The frequent outcroppings of sandstone and shale on the steep hills and buttes are subjected to topsoil loss by wind and water erosion. In low areas, the fertility and depth of the topsoil increases as the alluvial and aeolian clays are deposited.

Habitats

The synopsis of plant species and habitat descriptions was compiled through field observation and consultation of works of Hanson and Whitman (1938), Nelsen (1961) and Potter and Green (1964).

The floodplains of the Little Missouri River consist essentially of two communities, i.e., cottonwood (*Populus deltoides* Marsh.) bottomlands adjoining the river, and the dwarf sagebrush (*Artemisia cana* Pursh.) bottomlands which also extend upward on gradual slopes. The dry uplands support two communities: short-grass prairie on gradual clay slopes and dwarf sagebrush on semiarid sandy areas. Clay slopes also support mixed grasslands surrounding stands of ponderosa pine (Pinus ponderosa Dougl.). Brushy communities dominated by buckbrush (Symphoricarpos occidentalis Hook.) are located in ravines between buttes and hills. Lowland meadows are characteristic of poorly drained areas. Disturbed areas, such as fence lines, provide a more variable habitat than any of the preceding and alter the habitat wherever they occur.

Cottonwood Bottomlands

The principal woody species in this community is the cottonwood which overstories the dense undergrowth of yellow sweet clover (Melilotus officinalis [L] Lam.), white sweet clover (M. alba Desr.), dwarf sagebrush, western wild rose (Rosa woodsii Lindl.), prairie wild rose (R. arkansana Porter) and buckbrush. The conspicuous grasses are needle-and-thread (Stipa comata Trin. and Rupr.), feather bunchgrass (S. viridula Trin.), western wheatgrass (Agropyron smithii Rydb.), quackgrass (A. repens [L.] Beauv.), Canada wild rye (Elymus canadensis L.), bluegrasses (Poa sp.) and sedges (Carex sp.). Accompanying the undergrowth is a heavy litter of dead leaves, grasses and fallen trees.

Sagebrush Bottomlands

In this community, dwarf sagebrush is the most conspicuous, while less frequently encountered species are western wheatgrass, blue grama (Bouteloua gracilis [HBK] Lag.) and feather bunchgrass. The ground flora of the sagebrush community lacks the numerical abundance of the cottonwood community.

Upland Short Grass Prairie

Hanson and Whitman (1938) classifies this community as a western wheatgrass-grama-sedge type. The chief dominants consist of blue grama, western wheatgrass and threadleaved sedge (Carex filifolia Nutt.). Unlike the preceding habitats, the vegetation is scanty.

Upland Sagebrush

This semiarid community is dominated by dwarf sagebrush and prickly pear (Opuntia polycantha Haw.); occasionally big sagebrush (Artemisia tridentata Nutt.) is present. Though sparse, bluegrasses are the most prevalent.

Pine Grasslands

According to Potter and Green (1964), the grasslands surrounding the stands of ponderosa pine is a mixed grass prairie. It is dominated by western wheatgrass, needle-and-thread and blue grama. Numerical abundance is comparable to that of the cottonwood bottomlands.

Brushy Coulees

The most conspicuous plants in this association are the Rocky Mountain red cedar (Juniperus scopulorum Sarg.) and the green ash (Fraxinus pennsylvanica [Borkh.] Sarg.). Also present are buckbrush, prairie rose, skunkbrush (Rhus trilobata Nutt.), shrubby cinquefoil (Potentilla fruticosa L.), currants (Ribes sp.), plum (Prunus americana Marsh.) and chokecherry (P. virginiana L.). This distinctive vegetation type is found on the steep scoria or clay slopes.

Lowland Meadows

The saltgrass - alkali meadow grass type (Hanson and Whitman, 1938) is characterized by an abundant growth of saltgrass (Distichlis stricta [Torr.] Rydb.) and salt meadowgrass (Puccinellia nuttalliana [Schults] Hitchc.). Western wheatgrass is a lesser dominant. The characteristic moist areas of these meadows are favorable for luxuriant growths of grasses.

Fence Lines

These highly variable areas occur between cultivated fields and ditches, and support a dense cover of yellow sweet clover, wheatgrass, bluegrasses, and bunchgrass. Fence lines are usually disturbed by blowing soil.

Buildings

In Amidon, North Dakota, a granary containing wheat and an occupied trailer house were sampled. In western Slope County, an abandoned cabin was sampled.

LITERATURE REVIEW

The distribution of a species is restricted by its physiological tolerances to the physical and biological factors of the environment. Within the confines of a species geographic range, uniform dispersion is rarely encountered. A species may occur continuously throughout its geographic range or be restricted to a specific habitat. Internal population pressure and dispersal capacity are critical in determining the extent of favorable habitat occupation by a species (Wecker, 1963).

Various theories have been proposed to explain the distributions of small mammals among different habitats. Grinnell (1914) postulated that climatic factors were often intangible barriers restricting the distribution of birds and mammals. Chenoweth (1917), who studied *Peromyscus leucopus*, considered evaporation the most important factor in determining habitat selection in this species.

Other factors affecting the habitat distribution of mammals are vegetation, light intensity, food and soil. Dice (1931) maintained that mammals are usually dependent upon vegetation types rather than upon particular plant species. In general, mammals are very adaptable, but there appears to be a correlation between their distributions and vegetation types. Pitelka (1941) concluded that the distribution of birds in relation to certain biotic communities was influenced more by the structure of dominant vegetation than by the species composition of the stands. Allred and Beck (1963) analyzed total plant cover and average plant height, and found a positive correlation between these factors and small mammal occurrence and abundance.

Specific foods are probably not important in limiting the local distribution of most small mammals since these mammals have the ability to subsist on a diversity of small invertebrates, seeds and herbaceous plants (Jameson, 1949). This does not apply to all species as illustrated by Getz (1960) who found a positive correlation between the quantity of graminoid vegetation present and the population density of Microtus pennsylvanicus. This appeared to be a combined influence of a greater food supply and increased humidity resulting from the greater plant cover. He noted that temperature differences in various habitats exerted no major influences on the local distribution of this species.

Hardy (1945) found that soil texture influences the distribution of small mammals, both directly by the type of shelter offered, and indirectly through its effect upon soil chemistry, moisture and vegetation type. In a series f studies on Peromyscus, Dice (1939, 1939a, 1940, 1941) showed that soil color and pelage color are closely correlated. Dark-colored soils are most often inhabited by dark-colored small mammals and light-colored soils by light-colored small mammals (Hardy, 1945). In the South Dakota Badlands, Stebler (1939) found the correlation between pelage color of Eutamias minimus and Neotoma cinerea and soil color to be most closely related in habitats where the soil was extensively exposed through a lack of adequate vegetation cover.

Johnson (1926) stated that no single environmental factor was responsible for the distribution of small mammals. The distribution of a species was dependent upon its relations to the whole biotic community to which it belongs. Burt (1938) pointed out that "factors controlling mammalian distribution in time and space must be looked for in various components that go to make up the environment. Factors vary in degree of importance; therefore, it is difficult to pick out those which are critical for a given species."

MATERIAL AND METHODS

Selection of Sample Areas

During the summer of 1966, 33 areas typical of southwestern North Dakota habitats were selected for sampling (refer to Appendix A for specific trapping locations). Areas were selected among the eight major habitats as described in the introduction. Small sample units were selected, therefore a wide range of habitats and species variation could be covered. A minimum of 500 trap-nights was obtained for each habitat except brushy coulees and upland sagebrush, which had 108 and 450 trap-nights, respectively.

Sampling Methods

Snap traps, baited with rolled oats, were used exclusively and placed at 10 foot intervals along two lines, 60 feet apart. Trap lines were placed in the afternoon, checked each morning and generally were left in each trapping area for three consecutive nights. A total of 9965 trap-nights were accumulated.

Large rodents and bats were collected by shooting. All bats were collected in Amidon, North Dakota during the last week of August.

An additional study was conducted to determine the effectiveness of insect repellent in reducing insect damage to specimens and bait loss, without reducing trapping success.

Three lines of 100 traps placed at 10 foot intervals were placed at 60 foot intervals. Lines A and C were treated with an insect repellent, N,N-Diethylmetatoluamide (Airosol Co., Neodeska, Kansas). Line B, in the center, was the control. In line A, a two inch area around each trap was sprayed. In line C, the bait was treated.

Taxonomic Procedures

Standard body measurements were taken on all specimens, and the skulls were saved. Study skins were prepared of 40 per cent of the specimens collected, and deposited in the University of North Dakota collection. Specimens fro the study area in the University of North Dakota collection were used for comparison purposes.

Burt and Grossenheider (1964) was used for species identification except for *Peromyscus*, where the criteria of Osgood (1909) were employed. A discussion of the procedures used on *Peromyscus* is included in the results and discussion.

RESULTS AND DISCUSSION

The results of this study are based upon 350 specimens representing 15 species. Eleven of the 15 species (311 specimens) were collected by trapping (Table 1). These have been grouped according to occurrence in areas of varying vegetative densities. In areas of dense vegetation, the soil was completely covered by plants. If gaps between individual plants or vegetation clumps were noticeable but not extensive, the density was considered moderate. The vegetation cover was sparse when these gaps became extensive enough to expose bare areas of soil.

Distribution of Species

Dense Vegetation

Sorex cinereus haydeni Baird (masked shrew).

This species was the only insectivore collected during this study. Three specimens were taken from the same lowland meadow, which also contained a high population of other small mammals. *S. cinereus* was not abundant in the study area and its distribution was quite local.

Associated with dense vegetative cover, moisture may also be an important factor influencing the distribution of this shrew. In Michigan, Manville (1949) found moisture to be critical. However, other workers (Getz, 1960, 1961; Burt, 1948) have found this species in a variety of situations, indicating a rather broad tolerance for various

Table 1. Total number of small mammals captured in eight habitats of southwestern North Dakota.[1]

	Number of trap-nights	*S. cinereus*	*E. minimus*	*C. tridecemlineatus*	*P. fasciatus*	*D. ordii*
Cottonwood bottomlands	1650	0(0.0)[2]	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Sagebrush bottomlands	1340	0(0.0)	0(0.0)	0(0.0)	3(2.2)	1(0.7)
Upland prairie	1873	0(0.0)	0(0.0)	0(0.0)	4(2.1)	0(0.0)
Upland sagebrush	450	0(0.0)	0(0.0)	1(0.5)	1(0.5)	0(0.0)
Pine grassland	940	0(0.0)	0(0.0)	0(0.0)	6(6.4)	0(0.0)
Brushy coulees	108[3]	0(0.0)	4(37.0)	0(0.0)	2(0.0)	0(0.0)
Lowland meadows	1626	3(1.8)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Fence lines	1720	0(0.0)	0(0.0)	5(2.9)	3(1.7)	0(0.0)
Buildings	258[3]	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Totals	9965	3(1.8)	4(37.0)	6(3.4)	19(31.4)	1(0.7)

[1]does not include animals collected by shooting.

[2]figures in parenthesis give indices of relative abundance based on 1000 trap-nights.

[3]trapping effort too small for valid results.

Table 1 - continued. Total number of small mammals captured in eight habitats of southwestern North Dakota.

	Number of trap-nights	*R. megalotis*	*P. maniculatus*	*O. leucogaster*	*M. pennsylvanicus*	*M. ochrogaster*	*M. musculus*
Cottonwood bottomlands	1650	33(20.0)	18(10.9)	0(0.0)	0(0.0)	1(0.6)	2(1.2)
Sagebrush bottomlands	1340	3(2.2)	15(11.1)	0(0.0)	1(0.7)	5(3.7)	0(0.0)
Upland prairie	1873	4(2.1)	15(8.0)	0(0.0)	1(0.5)	0(0.0)	0(0.0)
Upland sagebrush	450	0(0.0)	19(10.1)	0(0.0)	0(0.0)	1(0.5)	0(0.0)
Pine grassland	940	4(4.3)	7(7.4)	0(0.0)	0(0.0)	2(2.1)	0(0.0)
Brushy coulees	180	0(0.0)	6(55.6)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Lowland meadows	1626	11(6.8)	31(19.1)	0(0.0)	33(20.3)	0(0.0)	0(0.0)
Fence lines	1720	6(3.5)	35(20.3)	2(1.2)	1(0.6)	0(0.0)	3(1.7)
Buildings	258	0(0.0)	15(58.1)	0(0.0)	0(0.0)	0(0.0)	4(15.5)
Totals	9965	61(38.9)	161(200.6)	2(1.2)	36(33.1)	9(6.9)	9(18.4)

habitat types.

Eutamias minimus pallidus (J. A. Allen) (Badlands least chipmunk).

This subspecies was collected and seen only in or around brushy coulees; four specimens were trapped and five were shot. Bailey (1926) also observed the Badlands chipmunk in brushy coulees, in addition to ranch woodpiles and around old buildings. The subspecies was fairly abundant in the study area, but it was not as vulnerable to snap trapping as were the other small rodents.

In the eastern United States, E. m. borealis inhabits coniferous forest, especially if a cover of bushes, stumps and fallen logs are present (Gunderson and Beer, 1953; Burt, 1948, 1957). Although this habitat was not abundant in the study area, brushy coulees seemed to provide an adequate habitat substitute for E. m. pallidus.

The least chipmunk of the North Dakota Badlands lacks the rusty pelage coloration of the eastern form and it is considerably paler than E. m. borealis. However, E. m. pallidus is not as pale as E. m. cacodemus found in the South Dakota Badlands (Stebler, 1939).

Reithrodontomys megalotis dychei J. A. Allen (western harvest mouse.)

This species exhibited a definite preference for moist areas with dense vegetation. Forty-four (72 per cent) of the 61 animals collected were taken from cottonwood bottomlands and lowland meadows. It was also collected in every habitat in the study area except brush, [illegible] upland sagebrush.

These results are in accord with Hall (1955), who reported a large population of harvest mice living in the lowlands along streams in Kansas. In Wisconsin, Jackson (1961) collected this species in dense vegetation, such as along herbaceous borders of cultivated fields.

Neotoma cinerea rupicola J. A. Allen (bushy-tailed woodrat).

No specimens of woodrats were collected; however, local residents reported seeing this species or its signs. Also, a recent record of *N. cinerea* has been reported for Slope County. In 1962, Dr. R. W. Seabloom shot a female under a scoria outcrop, one-fourth of a mile from the burning coal vein. This specimen is in the University of North Dakota collection.

A stick-mound structure characteristic of this woodrat was located in a coal shed connected to an abandoned cabin. Fresh scratch marks were evident around a hole leading to the attic and these may have been made by *N. cinerea*. This species may also live on cliffs and ledges or in cottonwood bottomlands where hollow logs and trees offer den sites and bushes provide protection from predators (Bailey, 1926).

Microtus pennsylvanicus inseparatus (J. A. Allen) (meadow vole).

The meadow vole apparently selected moist habitats with dense vegetation. Thirty-three of the 36 specimens collected were from lowland meadows. These findings conform with those previously reported (Conner, 1960; Getz, 1961a, De Coursey, 1957; Smith and Foster, 1957). However, these results were not in accord with Bailey's (1926) statement that this vole was more often found in grassy swales at the base of Badlands buttes. Three specimens were collected from habitats other than lowland meadows and these were single specimens from a sagebrush bottomland, a fence line and an upland prairie. None was collected from grassy areas as described by Bailey, even though such areas were sampled.

The ecologic preference of this vole is distinct, even under laboratory conditions. In an artificial habitat study, Wirtz and Pearson (1960) found a positive orientation to a meadow type habitat and Pearson (1959) reported this orientation in nature. The particular preference for meadow type areas seems to be a response to the amount of graminoid vegetation (Eadie, 1953; Mossman, 1955).

Moderate Vegetation

Citellus tridecemlineatus pallidus[4] J. A. Allen (thirteen-lined ground squirrel).

Six specimens of this species were collected. One was collected in a sagebrush bottomland with sparse vegetation, while the other five were collected along fence lines with moderate vegetation. However, numerous animals were observed along the roadsides in the area.

According to Jackson (1961), the striped ground squirrel inhabits the grassy rows between cultivated fields and along highways. Other common habitats are open grasslands, pastures and especially golf courses (Burt, 1948, 1957).

Onychomys leucogaster missouriensis (Audubon and Backman) (northern grasshopper mouse).

The grasshopper mouse was not abundant, as only two specimens were collected from separate fence lines. However, the trapping results may not be a true indication of its abundance. Bailey and Sherry (1929) regarded this species as scarce. They attributed this to its entomophagous habits and random movements, which decrease its vulnerability to trapping.

Gunderson and Beer (1953) considered O. leucogaster as a prairie species occurring in bare and exposed situations,

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[4]The use of the generic name, Citellus, follows Miller and Kellogg (1955) and replaces Spermophilus as used by Hall and Kelson (1959).

in addition to vegetated areas. However, Egoscue (1960) could not detect a clear-cut habitat preference for this species except that it avoided marshy areas, rocky situations and alkali flats. An environmental condition that may limit the local distribution of the species is edaphic conditions permitting frequent dust bathing (Egoscue, 1960).

Microtus ochrogaster haydenii (Baird) (prairie vole).

Five of the nine specimens collected were taken from relatively dry sagebrush bottomlands near the Little Missouri River. Two animals were collected in pine grasslands, one from upland sagebrush and one from cottonwood bottomlands. This species was not as plentiful in the study area as _M. pennsylvanicus_. The habitats of these two species have been reported to be similar, with the exception that the prairie vole usually occupies drier sites (Lyon, 1936; Martin, 1956).

Jackson (1961) reported that in Wisconsin, the prairie vole prefers native prairie, but it will occupy other open grasslands. In addition, Johnson (1926) noted that this species often dwells along roadsides and fence lines. Dice (1922) believed that the presence of green herbage was an important source of water for the prairie vole, and may limit its local distribution. Wooded areas were generally avoided by the prairie vole (Martin, 1956; Johnson, 1926). However, one specimen was collected in a cottonwood bottomland, but it was not known if it was a resident or a transient.

Mus musculus domesticus Rutty (house mouse).

Nine house mice were collected; four from a wheat granary, two from a cottonwood bottomland and three from a fence line adjacent to a farm. During the summer, it is not unusual for the house mouse to live and reproduce around fence lines and fields, particularly if there is an ample supply of grain (Gunderson and Beer, 1953; Over and Churchill, 1945).

This species usually will spend the winter in buildings, especially inhabited ones (Jackson, 1961). However, two specimens were collected in a cottonwood bottomland more than a mile from the nearest building. This may indicate some overwintering of house mice independent of human habitation in southwestern North Dakota.

Sparse Vegetation

Dipodomys ordii terrosus Hoffmeister (Ord kangaroo rat).

Only one specimen was obtained by trapping, but 20 were collected by shooting at night along roads traversing areas of activity. The wide runways and multiple burrow entrances easily identified areas of *D. ordii* activity.

Wherever the kangaroo rat occurred in southwestern North Dakota, it was locally abundant. Its occurrence however, appeared to be quite localized, and restricted to sandy, semiarid areas of shortgrass prairie or sagebrush. Other workers (Hall, 1955; Blair, 1939) have also observed that kangaroo rats appeared to be restricted to sandy soils. Blair believed that this was due to an inability of this species to burrow in heavier soil.

Perognathus fasciatus fasciatus Wied-Neuwied (Wyoming silky pocket mouse).

The pocket mouse occurred in every habitat sampled except lowland meadows and cottonwood bottomlands. It was most abundant in pine grasslands where six of the 19 specimens were collected. These animals were taken on the border of the pines where the ground cover was quite sparse. Several of its burrows were observed in the clay-scoria rim adjacent to the pines.

P. fasciatus did not appear to select a specific vegetation type, but rather avoided areas with dense vegetation. This was in accord with Bailey's (1926) observation that, unlike other mice, this species avoids the cover of vegetation. Burt and Grossenheider (1964) described these pocket mice as inhabiting areas of shortgrass prairie with sandy loam soils.

The trapping success could have easily been altered by failure of the traps to take this species. These small rodents can trigger a trap and be caught only temporarily by the tail.

Non-selective Species

The habitats of the bats do not conform to those described in this study. Therefore, these animals are considered non-selective in their habitat preference.

Myotis lucifugus carissima Thomas (little brown bat).

Eleven of the 14 bats collected in Amidon, North Dakota were *M. lucifugus*; undoubtedly it was the most abundant bat in the area sampled. The specific areas selected by this species were not determined as none of the daytime roosting sites was located.

Jackson (1961) stated that *M. lucifugus* can be found in caves, caverns and deep clefts in rocks. Crevices in Badlands buttes could provide adequate daytime roosting sites. However, such areas were at least two miles from the collecting site. This species is also known to roost behind blinds and loose siding on buildings. It is probable that most of these specimens had roosted in abandoned buildings within the city limits of Amidon.

Myotis leibii ciliolabrum[5] (Merriam) (small-footed myotis).

A single specimen was collected from the fairground buildings in Amidon, North Dakota. These buildings apparently were the daytime sites of this species. This

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[5]Glass and Baker's (1965) revision is followed in the use of the specific name *leibii*, formerly known as *M. subulatus*.

specimen may constitute the third record of _M. leibii_ for North Dakota. This species has also been reported 15 miles northwest of Amidon (Jones and Stanley, 1962) and two miles southwest of Medora, North Dakota (Jones and Genoways, 1966) Bailey's (1926) account of this bat applies to _M. keenii_ (Jones and Genoways, 1966).

Eptesicus fuscus pallidus Young (big brown bat).

One bat of this species was collected. The pelage coloration of this specimen was blonder than specimens from eastern North Dakota. This subspecies of _Eptesicus_ just enters the southwestern part of North Dakota (Hall and Kelson, 1959).

In Michigan, Burt (1957) found this bat residing about buildings, especially in winter. However, he noted that before the advent of man it occupied trees, caves or crevices in rock cliffs.

Lasiurus borealis borealis (Müller) (red bat).

One specimen of this species was collected; this is not surprising since it is known to prefer wooded areas. Jackson (1961) described the habitat of the red bat as deciduous forests, open woodlands and farmyards. However, it may also be found in city parks and yards if trees and tall shrubs are present. None of the daytime roosting sites was located.

Peromyscus Gloger (deer mouse).

The ubiquitous deer mouse was the most abundant small mammal in the study area. Of the 311 animals trapped, 161 belonged to this genus. Deer mice were collected at every trapline. (Refer to Table 1 for indices of relative abundance). The ecologic preference of Peromyscus may be regarded as non-selective, since this genus was not appreciably more abundant in any specific habitat.

Two species and four subspecies of Peromyscus may occur in the study area. Fig. 2 shows the known North Dakota distribution of Peromyscus maniculatus bairdii (Hoy and Kennicott), P. m. luteus Osgood[6], and P. m. nebrascensis (Coues)[6]. P. leucopus aridulus Osgood should occur throughout North Dakota, except in the Red River Valley (Hall and Kelson, 1959).

Fifty-two of the Peromyscus collected were used for subspecies identification. The criteria used are based on standard body measurements, pelage coloration and skull measurements reported by Osgood (1909) (Table 2). The data compiled from body and skull measurements are recorded in appendix B.

To distinguish the various subspecies of Peromyscus, the first criterion utilized was ear measurement. Those specimens with ears of 15 mm or greater were considered

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[6]The nomenclature revision follows Jones (1958). These were formerly known as P. m. nebrascensis and P. m. osgoodi respectively.

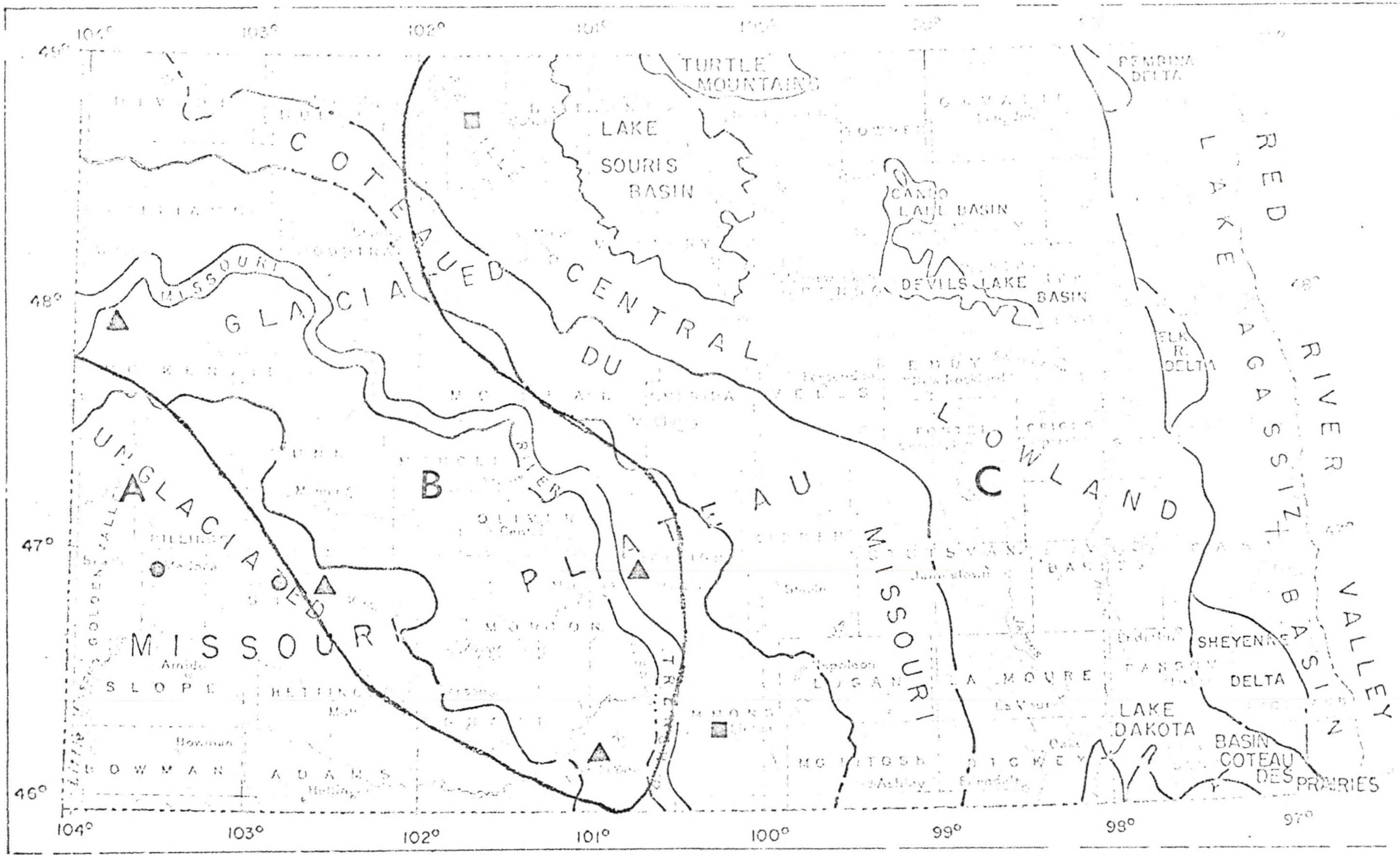

Fig. 2. Distribution of A-P.m. luteus, B-P.m. nebrascensis and C-P.m. bairdii (Hall and Kelson, 1959).

Table 2. Standard body and skull measurements of Peromyscus utilized in subspecific identification[7] (after Osgood, 1909).

Measurements	P.m. nebrascensis	P.m. luteus	P.m. bairdii	P.l. aridulus
Body				
Total length - average	158	149	---	169
extremes	147-170	142-158	140-161	160-177
Tail length - average	63.7	61.5	---	69
extremes	56-71	56-65	54-70	63-73
Hind foot length - average	20.1	19.5	---	22
extremes	20-21	19-20.5	18-19	21-23
Ear length - average	14.8	12.5	12.6	14.1
extremes	14-15.7	---	11.5-14	13.6-15.5
Skull				
Greatest length	25.4	24.8	23.7	26.8
Basilar length	19	19	19	20.7
Zygomatic breadth	13.4	13	12.4	14.3
Interorbital constriction	4	4.1	4	4.3
Interparietal	---	8X2	8X1.6	8.9X3
Nasals	10	10.4	9.5	10
Shelf of bony palate	3.9	3.6	3.6	4.3
Palatine slits	5.0	5.4	4.9	5.5
Diastema	6.7	6.7	6.6	7.3
Post palatal length	8.1	8.7	8.7	9.3
Maxillary tooth row	3.6	3.4	3.2	4.0
Pelage coloration	buffy ochraceous	buffy ochraceous	dark brown to black	buffy ochraceous
Distinctly bicolored tail	Yes	Yes	Yes	No

[7]All measurements recorded in mm.

P. m. nebrascensis, unless the other body measurements were large enough to conform to P. l. aridulus. In order to distinguish between questionable specimens of P. m. nebrascensis or P. l. aridulus, skull measurements and tail bicoloration were employed. Those specimens possessing ear measurements of 13 mm or less were considered P. m. luteus or P. m. bairdii, which, in turn, were separated on the basis of pelage coloration. P. m. luteus is buffy ochraceous and P. m. bairdii varies from dark brown to black. For intermediate specimens possessing an ear measurement of 14 mm, skull measurements were employed for identification.

Thirty-four of the 52 specimens examined were identified as P. m. nebrascensis; this subspecies apparently was the most abundant in the study area. The next most abundant form was P. m. luteus with nine specimens. Two specimens were tentatively identified as P. m. bairdii. Although the body measurements had been taken for these two specimens, they were not prepared as study skins so the criterion of pelage coloration could not be used. None of the specimens was identified as P. l. aridulus and seven specimens could not be identified.

The rare occurrence of animals similar to P. m. bairdii in the study area conforms to the findings of Bailey (1926) that at approximately the 100th meridian, or the center of North Dakota, P. m. bairdii begins to grade into P. m.

nebrascensis. Therefore, it is unlikely that a typical P. m. bairdii would be found west of the Missouri River.

When Peromyscus from western North Dakota are compared with eastern forms, it is evident that there is a marked cline in size and pelage coloration. Dice (1940) noted this cline, but he found no evenly graded series from east to west. Rather, there was an irregular progression in size and color differences. Subspecies identification may be complicated by color and size trends that are interrupted or obscured by variation in local races, especially those which depart from the expected gradient. In a single population, the extreme variations may be as wide as those between the means of two subspecies.

When morphological distinctions between subspecies are slight, the criterion of habitat preference may be employed for identification. However, this criterion may be utilized only if the ecologic preference of each subspecies is distinct and different.

The 34 P. m. nebrascensis identified were evenly distributed throughout the various habitats, except they were slightly more abundant in lowland meadows and cottonwood bottomlands. In a similar manner, P. m. luteus appeared to be evenly distributed among the various habitats. In the literature, there was no report of differential habitat selection between P. m. nebrascensis and P. m. luteus. Therefore, habitat preference does not appear to be useful in differentiation of these two subspecies, P. m. nebrascensis and P. m. luteus.

On the other hand, P. m. bairdii exhibited a preference for prairie, open fields and sand beaches (Verts, 1957). Getz (1961b) reported that P. l. aridulus inhabits wooded areas along streams. This ecologic preference may be employed to separate P. l. aridulus from P. m. nebrascensis in grassland habitats. However, this criterion would not be applicable in wooded areas since both species may be present.

Another problem to consider is the possibility that P. m. nebrascensis from North Dakota is not typical. Compared with specimens from Utah described by Lerass (1938), the North Dakota specimens were larger in body length but shorter in tail, hind foot and ear measurements.

The problems encountered during this study were similar to those experienced by Iverson (1963) with the Peromyscus of the aspen parkland of Minnesota. Specimens identified as belonging to a certain taxon on the basis of one character would be placed in another taxon on the basis of a different character. Sumner (1932) stated that it would seem more reasonable to credit such differences to intra-racial variations rather than to the coexistence of more than one subspecies in the same locality.

The term subspecies, as commonly used, is synonymous with geographic race. By definition, such groups occupy different territories and according to Sumner (1932), it would not be expedient to attempt to distinguish specimens of two or more subspecies from any single locality or habitat.

Dice (1941) probably offered the best solution to the problem of subspecies identification when he stated that little was to be gained by attempting to assign each individual specimen to a particular taxon. He concluded that it would be better to consider subspecies as representatives of geographic trends which at some localities, were clearly expressed, but in many intermediate areas, were confused by the occurrence of local conditions and local races.

Insect Repellent Study

The use of insect repellent proved to be effective in reducing bait loss by insects (Table 3). Line A (treated trap site) and Line B (control) averaged 25 to 30 per cent bait loss per day, while Line C (treated bait) averaged three per cent. However, trapping success was lowest in Line C from which 16 animals were collected in five days. During the same period of time, 22 animals were collected from Line A and 25 animals were collected from line B.

The use of treated bait appeared to reduce the trapping success since trapping success was the lowest in the line with treated bait. It was not determined if the use of insect repellent reduced insect damage to specimens. A more extensive study would be necessary for conclusive results.

Table 3. Results of insect repellent study: Number of animals collected and bait loss[8] per 100 trap-nights.

August	23	24	25	26	27	Totals
Line A (treated trap site)	4(5)	3(24)	6(30)	2(21)	7(26)	22(106)
Line B (control)	4(5)	2(28)	6(25)	4(31)	9(37)	25(126)
Line C (treated bait)	3(1)	4(5)	3(2)	3(2)	3(3)	16(13)

[8]figures in parenthesis

SUMMARY

The small mammal fauna was sampled from eight habitats typical of southwestern North Dakota. Fifteen species were collected and grouped according to their occurrence in areas of varying vegetation densities.

Four species (Reithrodontomys megalotis, Microtus pennsylvanicus, Sorex cinereus, and Eutamias minimus) were collected in dense vegetation. R. megalotis and M. pennsylvanicus were most abundant and exhibited preferences for cottonwood bottomlands and lowland meadows. S. cinereus was also limited to lowland meadows, while E. minimus occured primarily in brushy coulees.

Areas of moderate vegetation density were preferred by four species (Microtus ochrogaster, Citellus tridecemlineatus, Onychomys leucogaster and Mus musculus). M. ochrogaster inhabited similar but drier sites to those preferred by M. pennsylvanicus. C. tridecemlineatus, O. leucogaster and M. musculus were generally collected along fence lines. However, M. musculus was also collected in granaries.

Dry upland prairie and sagebrush areas were regarded as sparse vegetation, and were preferred by Dipodomys ordii and Perognathus fasciatus. Furthermore, D. ordii occured only in sandy areas, while P. fasciatus was less specific in its preferences.

Four species of bats were collected in the vicinity of Amidon. These included Myotis lucifugus, M. leibii, Eptesicus fuscus and Lasiurus borealis.

Peromyscus maniculatus was collected in every habitat sampled, and was considered to be non-selective in its habitat preference. P. m. nebrascensis was most abundant; some specimens were identified as P. m. luteus. No specimens were identified as P. m. bairdii or P. leucopus aridulus, and if present they were considered to be rare.

Treatment of bait with an insect repellent reduced bait loss, but also appeared to reduce trapping success.

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Appendix A

Location of Specific Trapping Sites

SLOPE COUNTY

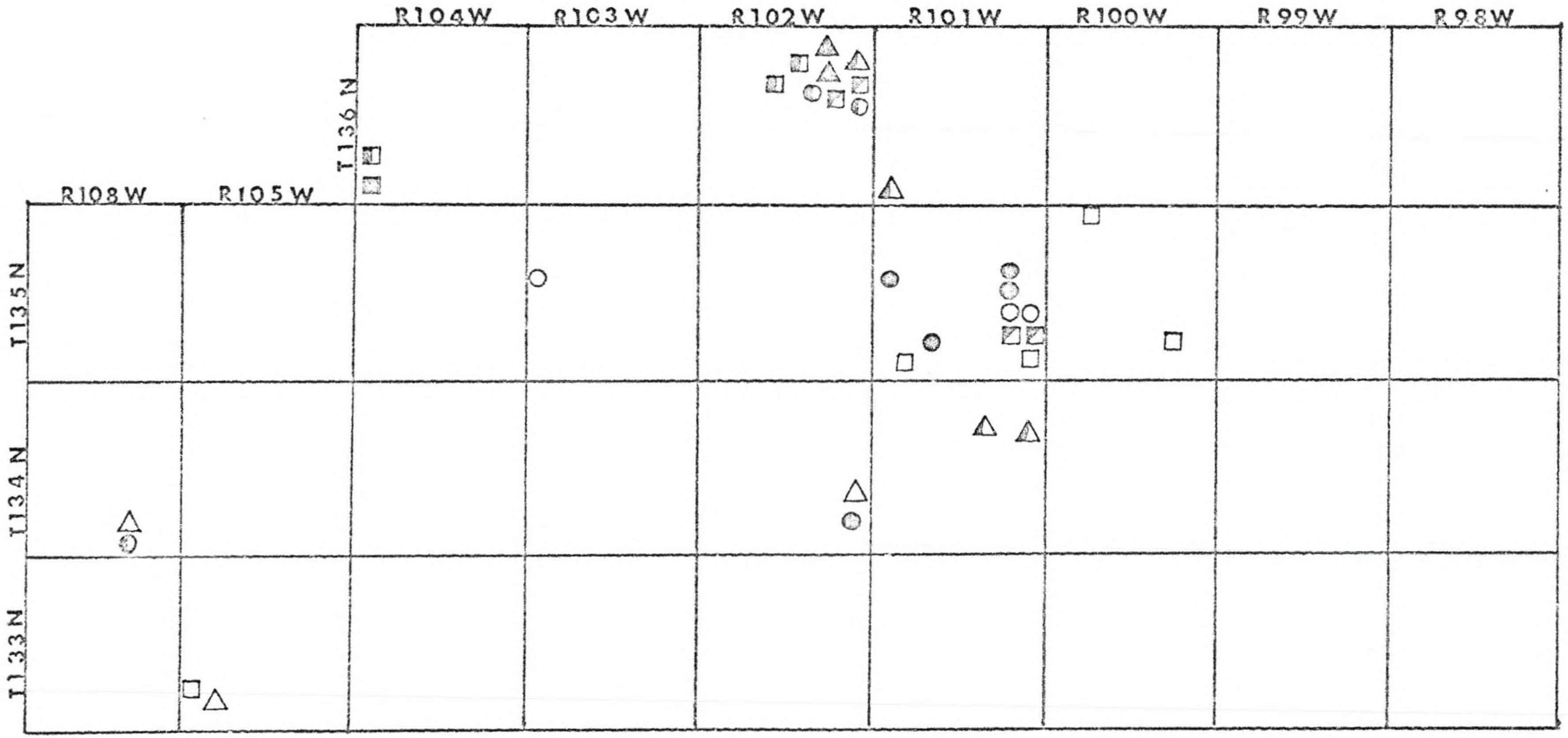

Fig. 3. Specific Trapping Locations

Cottonwood Bottomlands
Sagebrush Bottomlands
Lowland Meadows
Pine Grasslands
Upland Prairie

Upland Sagebrush
Fence Lines
Brushy Coulees
Buildings
Shootings

BOWMAN COUNTY

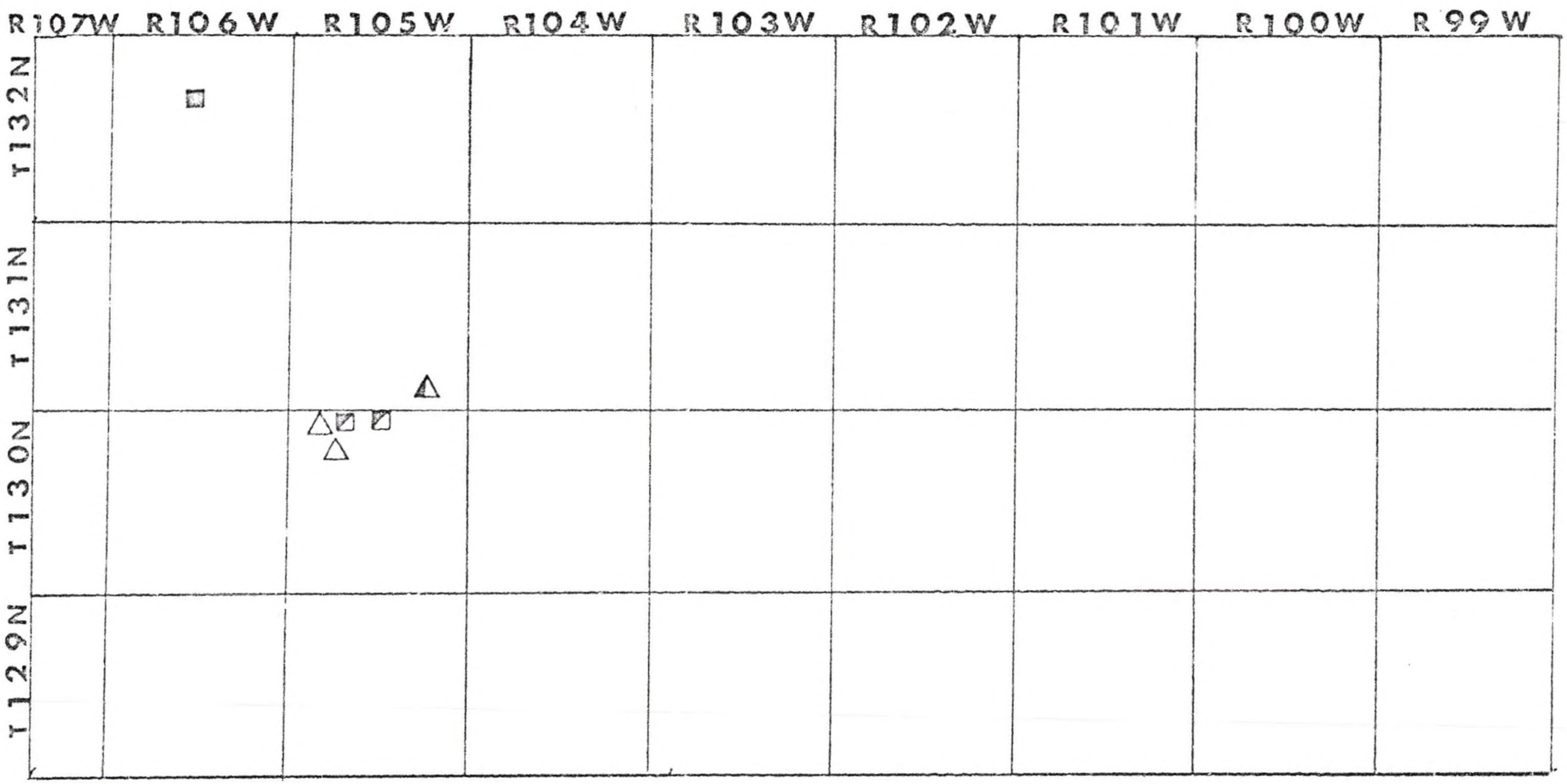

Fig. 4. Specific Trapping Locations

Cottonwood Bottomland ▨
Upland Sagebrush △
Upland Prairie ◭
Shootings ▨

Appendix B

Body and Skull Measurements of *Peromyscus*

Table 4. Body and Skull Measurements of *Peromyscus*

Measurements	Field number													
Body	5	9	13	28	29	30	31	34	35	37	44	63	69	70
Total length	143	150	150	142	155	142	152	158	165	149	146	142	157	148
Tail	50	55	60	57	57	48	67	63	65	60	57	63	61	62
Hind foot	17	19	18	18	21	17	20	19	18	18	19	20	19	19
Ear	16	15	15	16	14	16	15	16	15	15	16	17	16	15
Skull														
Greatest length	25.2	25.0	25.2	24.7	24.6	25.5	24.6	25.6	D[9]	25.1	25.2	24.2	24.6	24.1
Basilar length	18.8	18.9	19.2	18.5	18.3	19.1	19.4	18.7	D	18.9	18.5	18.1	18.0	17.8
Zygomatic breath	12.9	13.0	12.6	12.7	13.2	13.7	13.5	12.2	13.3	12.7	D	11.9	12.7	2.4
Interorbital constriction	4.1	4.0	4.3	4.6	4.1	3.9	4.0	3.9	3.9	4.0	4.0	3.8	4.2	4.6
Interparietal	2.2 / 7.1[10]	2.3 / 7.5	2.3 / 8.3	3.5 / 8.7	2.4 / D	2.5 / 7.9	2.5 / 8.3	2.5 / 8.1	D	2.8 / 9.1	2.3 / 8.6	2.0 / 8.6	2.5 / 9.7	2.6 / 9.2
Nasals	10.8	10.5	10.8	9.5	9.9	9.8	10.3	9.8	10.6	9.7	10.9	10.4	9.6	9.5
Bony palate shelf	3.6	3.3	3.2	3.6	3.5	3.8	3.6	3.4	3.1	3.6	3.3	3.2	3.5	3.2
Palatine slits	4.3	4.4	5.3	4.5	4.6	4.6	4.6	5.0	4.8	4.1	4.8	4.5	4.5	4.1
Diastema	6.2	6.7	6.6	6.0	6.3	6.3	6.4	6.4	6.8	6.3	6.7	5.8	6.3	6.3
Post palatal length	8.2	8.2	8.2	7.9	8.2	8.6	9.1	8.5	D	8.7	8.4	8.2	8.0	7.5
Maxillary tooth row	3.7	3.6	3.8	3.9	3.6	3.7	3.6	3.6	3.5	3.5	3.5	3.6	3.6	3.6
Sex	M	F	M	F	M	F	M	F	F	F	M	F	M	M
Subspecies identification	Pmn[11]	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn

[9] Damaged

[10] Upper figure denotes width and lower length of interparietal

[11] *P. maniculatus nebrascensis*

TABLE 4--Continued

Measurements	Field numbers												
Skin	73	74	77	111	112	148	189	193	194	202	208	212	215
Total length	157	145	155	154	145	143	158	160	160	150	156	162	160
Tail	61	61	61	56	55	52	62	60	64	61	57	60	64
Hind foot	19	18	18	19	19	21	19	19	19	21	18	20	19
Ear	14	15	14	15	15	16	15	15	16	14	14	16.5	14
Skull													
Greatest length	25.5	24.5	25.2	25.5	24.7	25.4	25.0	26.1	25.2	25.5	24.7	26.1	25.6
Basilar length	19.1	18.0	18.2	D	18.7	19.1	18.4	19.5	18.9	18.8	18.5	D	18.5
Zygomatic breadth	12.9	12.4	13.3	13.2	12.5	13.8	12.5	13.8	12.7	13.2	12.3	12.0	12.9
Interorbital constriction	4.0	4.1	4.3	3.9	3.7	4.1	3.7	3.8	3.9	3.9	4.1	4.0	4.0
Interparietal	2.8/8.9	2.7/8.9	2.9/9.7	3.2/8.8	2.6/9.3	2.8/8.6	2.5/8.5	2.2/9.0	D	2.8/10.0	2.8/9.1	2.8/10.8	2.6/9.0
Nasals	10.5	9.6	10.7	10.4	10.3	11.9	10.3	10.6	10.2	10.2	9.8	10.6	10.3
Bony palate shelf	3.4	3.5	3.3	3.5	3.4	3.4	3.9	3.3	3.4	3.5	3.2	3.4	3.3
Palatine slits	4.6	4.8	4.4	5.1	4.7	5.0	4.2	5.0	4.6	4.4	4.7	4.8	4.8
Diastema	6.0	6.1	6.0	6.6	6.0	6.7	6.3	6.7	6.6	6.4	6.4	6.3	6.8
Post Palatal length	8.5	7.8	8.3	D	7.7	8.6	7.9	8.9	8.1	8.4	8.5	D	8.4
Maxillary tooth row	3.8	3.7	3.6	3.7	3.7	3.4	3.6	3.4	3.5	3.6	3.3	3.8	3.3
Sex	M	M	M	M	M	M	F	M	M	F	F	F	M
Identification	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn

TABLE 4--Continued

Measurements	Field numbers												
Skin	215	229	231	236	246	247	252	6	8	23	72	113	141
Total length	160	140	145	152	149	163	160	153	146	143	145	148	145
Tail	64	52	60	61	61	65	61	56	60	60	54	59	56
Hind foot	19	18	18	20	19	21	20	17	18	19	19	18.5	18
Ear	14	15	16	17	14	15	14	13	13	13	13	14	14
Skull													
Greatest length	25.6	24.9	23.8	25.2	24.5	24.5	25.5	24.1	24.8	25.7	24.4	25.1	24.3
Basilar length	18.5	18.7	18.0	18.1	D	17.9	18.9	18.9	18.5	19.4	D	19.1	18.0
Zygomatic breadth	12.9	12.3	12.0	12.2	12.5	12.7	13.1	13.2	12.6	13.7	13.2	13.9	12.5
Interorbital constriction	4.0	3.8	4.0	3.3	3.0	3.9	4.0	4.5	4.4	4.5	4.1	4.1	4.0
	2.6	2.4	3.0	2.0	2.7	2.2	3.0	2.6	2.1	2.3	2.4	3.2	2.7
Interparietal	9.0	8,9	8,7	8.2	8.7	8.3	10.2	8.6	8.2	9.7	8.3	9.3	8.5
Nasals	10.3	10.2	9.5	10.1	10.0	9.7	10.2	9.1	10.0	10.2	9.6	10.2	9.1
Bony palate shelf	3.3	3.5	3.6	3.4	3.7	3.2	3.6	3.5	2.9	3.5	3.2	3.2	3.3
Palatine slits	4.8	4.4	4.4	4.7	4.8	4.7	4.8	4.5	4.7	4.6	4.4	4.3	4.6
Diastema	6.8	6.2	5.8	6.4	6.3	6.4	6.6	6.4	6.4	6.7	6.3	6.1	5.8
Post palatal length	8.4	7.8	7.9	8.2	D	8.3	8.9	8.5	8.5	8.6	D	8.6	8.1
Maxillary tooth row	3.3	3.8	3.7	3.6	3.6	3.5	3.7	3.9	3.6	3.8	3.8	3.6	3.4
Sex	M	M	F	F	M	F	F	M	M	M	M	M	M
Identification	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pmn	Pml[12]	Pml	Pml	Pml	Pml	Pml

[12] *P. m. luteus*

TABLE 4--Continued

Measurements	Field numbers											
Skin	152	191	248	144	146	15	62	75	107	114	145	230
Total length	146	140	149	151	145	140	151	150	141	146	147	153
Tail	61	57	58	55	56	60	64	53	55	56	57	61
Hind foot	20	19	19	18	19	18	18	17	17	19	19	17
Ear	14	14	14	14	14	14	14	14	13	D	14	14
Skull												
Greatest length	23.9	24.6	24.4	25.2	23.8	23.6	24.4	25.0	23.5	23.5	24.1	24.1
Basilar length	18.0	18.3	18.7	19.0	17.4	17.3	18.0	19.4	17.[illegible]	17.7	17.9	17.5
Zygomatic breadth	13.1	12.2	13.2	12.2	12.5	11.6	D	12.9	12.6	12.6	12.7	12.1
Interorbital constriction	4.3	4.3	4.0	3.7	4.2	4.2	3.9	4.1	4.0	3.8	4.1	3.6
Interparietal	2.8/8.9	1.9/8.7	2.1/9.7	2.7/9.1	2.7/8.9	1.8/8.3	1.6/8.4	2.8/9.2	2.2/8.7	2.5/8.1	D	2.3/8.5
Nasals	9.7	10.0	10.2	10.1	9.1	9.6	9.6	10.4	9.6	9.7	9.6	9.3
Bony palate shelf	3.1	3.3	3.5	3.3	3.2	3.2	3.0	3.6	2.9	3.1	3.2	3.4
Palatine slits	4.3	4.9	4.5	4.5	4.2	4.4	4.6	4.6	4.3	4.1	4.4	4.7
Diastema	6.0	6.0	6.5	6.2	5.3	6.0	6.5	6.7	5.8	5.9	6.0	6.0
Post palatal length	8.1	8.0	8.5	8.3	8.1	7.8	8.0	8.2	7.8	8.0	7.8	7.7
Maxillary tooth row	3.6	3.7	3.7	3.5	3.7	3.7	3.5	3.6	3.3	3.6	3.4	3.6
Sex	M	M	M	F	M	M	F	F	F	M	M	F
Identification	Pml	Pml	Pml	Pmb[13]	Pmb	?	?	?	?	?	?	?

[13] _P. m. baridii_