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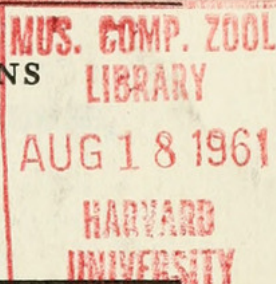
UNIVERSITY OF KANSAS PUBLICATIONS  
MUSEUM OF NATURAL HISTORY

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Volume 14, No. 2, pp. 9-27, 1 fig. in text

July 24, 1961

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And in Adjacent Regions

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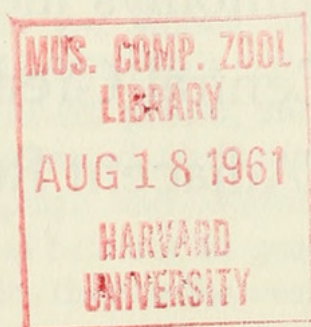
J. KNOX JONES, JR. AND B. MURSALOĞLU

UNIVERSITY OF KANSAS  
LAWRENCE  
1961

UNIVERSITY OF KANSAS PUBLICATIONS, MUSEUM OF NATURAL HISTORY

Editors: E. Raymond Hall, Chairman, Henry S. Fitch,  
Robert W. Wilson

Volume 14, No. 2, pp. 9-27, 1 fig. in text  
Published July 24, 1961



UNIVERSITY OF KANSAS  
Lawrence, Kansas

PRINTED IN  
THE STATE PRINTING PLANT  
TOPEKA, KANSAS

1961



28-7578



# Geographic Variation in the Harvest Mouse, *Reithrodontomys megalotis*, On the Central Great Plains And in Adjacent Regions

BY

J. KNOX JONES, JR. AND B. MURSALOĞLU

The western harvest mouse, *Reithrodontomys megalotis*, inhabits most parts of the central Great Plains and adjacent regions of tall grass prairie to the eastward, shows a marked predilection for grassy habitats, is common in many areas, and is notably less variable geographically than most other cricetids found in the same region. *R. megalotis* occurs (see Hall and Kelson, 1959:586, map 342) from Minnesota, southwestern Wisconsin, northwestern Illinois, Iowa and Missouri westward to, but apparently not across, the Rocky Mountains from southeastern Alberta to Colorado; it is known in Oklahoma only from the Panhandle, thence southward through the Panhandle and Trans-Pecos areas of Texas to southern México, westward across the mountains in New Mexico to the Pacific Coast, and northward to the west of the Rockies to southern British Columbia.

Hoffmeister and Warnock (1955) studied western harvest mice from Illinois, Iowa, northeastern Kansas, Minnesota and Wisconsin, concluded that one subspecific name (*Reithrodontomys megalotis dychei* J. A. Allen, 1895, with type locality at Lawrence, Douglas Co., Kansas) applied to all, and relegated *Reithrodontomys megalotis pectoralis* Hanson, 1944 (type locality at Westpoint, Columbia Co., Wisconsin) to synonymy under *dychei*. Our study, based upon an examination of 1350 specimens, concerns the area west of the Missouri River from Kansas and Nebraska westward to Montana, Wyoming, Colorado and northern New Mexico. Our objectives were to study variation in *R. megalotis* in the region indicated and to decide what subspecific names properly apply to populations of the species that occur there.

Aside from the name *R. m. dychei*, currently applied to western harvest mice from a large part of the region here under study, three other subspecific names need consideration:

"*Reithrodontomys aztecus*" J. A. Allen, 1893 (type locality, La Plata, San Juan Co., New Mexico), currently applied to specimens from northern



New Mexico and southern Colorado (and adjacent parts of Arizona and Utah) east to southwestern Kansas and the Oklahoma Panhandle;

"*Reithrodontomys megalotis caryi*" A. H. Howell, 1935 (type locality, Medano Ranch, 15 mi. NE Mosca, Alamosa Co., Colorado), proposed for, and currently applied to, harvest mice from the San Luis Valley, Colorado, but possibly a synonym of *aztecus* according to Hooper (1952:218); and

"*Reithrodontomys dychei nebrascensis*" J. A. Allen, 1895 (type locality, Kennedy, Cherry Co., Nebraska), proposed for harvest mice from western Nebraska and adjacent areas, but regarded as a synonym of *dychei* by A. H. Howell (1914:30-31).

Our comments concerning the taxonomic status of these several names appear beyond.

We are grateful to Dr. W. Frank Blair, University of Texas, for the loan of a specimen from the Texas Panhandle (TU), and to Dr. Richard H. Manville, U. S. Fish and Wildlife Service, for the loan of specimens of *R. m. caryi* from the Biological Surveys Collection (USNM). We are grateful also to persons in charge of the following collections for allowing one of us (Jones) to examine Nebraskan specimens of *R. megalotis* in their care: University of Michigan Museum of Zoology (UMMZ); University of Nebraska State Museum (NSM); and U. S. National Museum (USNM). A research grant from the Society of the Sigma Xi facilitated travel to the institutions mentioned. Specimens not identified as to collection are in the Museum of Natural History of The University of Kansas. All measurements are in millimeters, and are of adults (as defined by Hooper, 1952:12) unless otherwise noted.

### Secondary Sexual Variation

Hooper (1952) did not accord separate treatment to males and females in taxonomic accounts of Latin American harvest mice because (p. 11): "In no species . . . does sexual dimorphism in the measurements, if present at all, appear to be sufficient to warrant separating the sexes in the analysis." Hooper did not statistically test the validity of treating the sexes together in *R. megalotis*. He did test a series of *R. sumichrasti* from El Salvador, in which he found no basis for separate treatment of males and females.

Some authors (Verts, 1960:6, for instance) have recorded females of *R. megalotis* as larger than males in external measurements, whereas others (Dalquest, 1948:325, for instance) have recorded males as the larger. In order to learn something of secondary sexual variation, and to decide whether or not to separate the sexes in our study, we compared adult males and females from the southern part of the Panhandle of Nebraska (Cheyenne, Keith, Kimball, Morrill and Scotts Bluff counties) in four external and



TABLE 1. ANALYSIS OF SECONDARY SEXUAL VARIATION IN ADULT REITHODONTOMYS MEGALOTIS FROM THE SOUTHERN PART OF THE NEBRASKA PANHANDLE. FOR EACH MEASUREMENT, THE NUMBER OF SPECIMENS USED, THE AVERAGE, THE EXTREMES, AND ONE STANDARD DEVIATION ARE GIVEN.

CHARACTER	Males		Females	
Total length.....	27	135.0 (121-149)	32	141.0 (127-149)
Length of tail-vertebrae.....	27	63.9 (56-74)	32	65.2 (58-73)
Length of hind foot.....	27	17.0 (16-18)	32	17.3 (15-19)
Length of ear from notch.....	27	12.9 (12-14)	32	13.0 (12-14)
Greatest length of skull.....	27	21.0 (20.2-21.8)	28	21.3 (20.4-22.2)
Zygomatic breadth.....	25	10.7 (10.3-11.0)	28	10.9 (10.4-11.3)
Breadth of braincase.....	27	10.0 (9.6-10.5)	28	10.1 (9.8-10.7)
Depth of cranium.....	26	7.9 (7.4-8.4)	28	7.9 (7.7-8.3)
Length of rostrum.....	27	7.3 (6.8-7.6)	28	7.4 (6.9-8.0)
Breadth of rostrum.....	27	3.8 (3.6-4.1)	28	3.8 (3.5-4.0)
Length of incisive foramen.....	27	4.4 (4.1-4.6)	28	4.5 (4.1-4.9)
Length of palate.....	26	3.5 (3.1-3.8)	28	3.5 (3.2-4.0)
Alveolar length of maxillary tooth-row.....	27	3.4 (3.2-3.7)	28	3.4 (3.2-3.7)
Interorbital breadth.....	27	3.1 (2.9-3.3)	28	3.1 (2.8-3.3)
Breadth of zygomatic plate.....	27	1.9 (1.8-2.1)	28	2.0 (1.9-2.3)
Breadth of mesopterygoid fossa.....	26	0.9 (0.6-1.1)	28	0.9 (0.8-1.2)



twelve cranial measurements (see Table 1). The external measurements are those customarily taken by collectors and were read from the labels of the specimens; cranial measurements were taken to the nearest tenth of a millimeter by means of dial calipers, and are those described by Hooper (1952:9-11). Females from our sample averaged larger than males in all external and several cranial measurements, but individual variation greatly exceeded secondary sexual variation in each of these measurements and in no case was the greater size of females statistically significant. Therefore, and because we found no qualitative external or cranial differences between the sexes, males and females have been considered together in each population studied.

### Pelage and Molt

Western harvest mice that attain adulthood acquire at least three distinct types of pelage in sequence in the course of their development. The first of these, the juvenal pelage, is short, relatively sparse, and characteristically grayish brown. The molt (post-juvenal molt) from juvenal pelage to subadult pelage seemingly occurs at an early age, perhaps frequently before the young leave the nest, as individuals in juvenal pelage are few among specimens studied by us. Judging from study skins alone, the progress of post-juvenal molt in *R. megalotis* is similar to that described for *R. humulis* by Layne (1959:69-71). The subadult pelage is thicker, longer and brighter than juvenal pelage and closely resembles the pelage of adults; it differs from adult pelage dorsally in being somewhat duller and in having less contrast between back and sides.

The pelage of adults varies depending on season. In summer the individual hairs are relatively short (5-6 mm. at the middle of the back) and sparse. The over-all color of the dorsum, sides and flanks is brownish to dark brownish, and the venter is grayish. In winter the pelage is dense, long (8-9 mm. at the middle of the back) and lax. The over-all color dorsally in fresh winter pelage in most specimens is paler (more buffy) than summer pelage, the sides are markedly buffy, and the venter is whitish; even the tail is more pilose and more sharply bicolored than in summer. Adults molt, usually completely but occasionally only partially, at least twice a year—once in spring (in May and June in Nebraskan specimens) from winter to summer pelage, and once in autumn (in October and November in Nebraskan specimens) from summer to winter pelage. Of the two molts, the one in spring is most



easily discernible because the contrast in color between worn winter pelage and fresh summer pelage is considerably greater than that between worn summer pelage and fresh winter pelage, and because the progress of spring molt is seemingly more regular than that of autumn molt. In spring, molt proceeds posteriorly in a more or less regular line on both dorsum and venter; in most specimens it is completed first on the venter. In autumn, molt is irregular, or at best is coincident over large parts of the body, and frequently is seen only by searching through the pelage with a fine probe or dissecting needle. In both spring and autumn, molt seemingly is delayed in females that are pregnant or lactating.

In both winter pelage and summer pelage, the upper parts have blackish or grayish guard hairs and shorter, more numerous cover hairs. All the cover hairs are gray basally; some have a buffy band terminally and others have a buffy subterminal band with a terminal black tip. The generally darker over-all color of upper parts in summer pelage results (as seen in Nebraskan specimens) from a narrower band of buff on the cover hairs (only approximately one half the width of the band on hairs in winter pelage), a darker buffy band (ochraceous buff rather than pale ochraceous or straw color), and a relative sparseness of the pelage, which allows the gray basal portion of some hairs to show on the surface. The more grayish venter of summer-taken specimens results from much more of the grayish basal portion of the white-tipped hairs showing through than in the longer, denser pelage of winter.

Wear on the pelage seems in general to produce a paler over-all color of upper parts, evidently due mostly to abrasion of the terminal black tip of the cover hairs, but possibly actual fading of the pelage is involved also. Worn winter pelage is especially notable for its paleness; the buffy tones are accentuated and the upper parts, especially posteriorly, may even appear fulvous. The difference in color of upper parts between specimens in worn winter pelage and fresh summer pelage (or for that matter specimens in fresh *versus* worn winter pelage) from the same locality is greater in our material than the difference between some specimens in comparable pelages from localities more than 500 miles apart.

We have seen no specimens taken in winter in which we could discern that the autumn molt had been incomplete, but three old adult males in summer pelage indicate that spring molt is not always completed. KU 50154, obtained on August 14, 1952, 5 mi. N and 2 mi. W Parks, Dundy Co., Nebraska, has the entire pos-



terior back and sides still in old winter pelage and does not appear to have been actively molting; the entire venter is in summer pelage. KU 50146, obtained on August 22, 1952, 3 mi. E Chadron, Dawes Co., Nebraska, has small patches or tufts of winter pelage remaining on the rump and likewise does not appear to have been actively molting. KU 72085, obtained on October 13, 1956, 4 mi. E Barada, Richardson Co., Nebraska, is in the process of molting from summer to winter pelage, but has tufts of old winter pelage on the rump.

#### Geographic Variation

Geographic variation, both in color of pelage and in external and cranial dimensions, is less in *R. megalotis* in the region studied than in most other cricetine species that occur there. Nevertheless, meaningful variation is present. The assumption that variation in *R. megalotis* paralleled in degree that of other species, *Peromyscus maniculatus* for example, led to untenable taxonomic conclusions by some previous workers.

#### Color of Pelage

Color of pelage is remarkably uniform, considering the geographic extent of the area involved, over most of the northern part of the central grasslands. Perhaps this uniformity results partly from the predilection of the western harvest mouse for grassy habitats, for in most areas on the Great Plains the species is restricted to riparian communities, principally along river systems, where soils, cover, and other conditions approximate those of corresponding habitats farther to the east to a much greater degree than do conditions in upland habitats. Differential selective pressure, therefore, theoretically would be less between eastern and western populations of *R. megalotis* than in an upland-inhabiting species. In any event, specimens from western Nebraska, Wyoming, northern Colorado, and adjacent areas average only slightly paler dorsally than specimens in corresponding pelages from the eastern parts of Nebraska and Kansas, and many individuals from the two areas can be matched almost exactly.

To the southwest, on the other hand, a trend toward paler (pale brownish, less blackish) upper parts is apparent. Specimens from southwestern Kansas and adjacent parts of Colorado and Oklahoma average slightly paler in comparable pelages than specimens from northeastern Kansas and eastern Nebraska, but most specimens from farther southwest, in northern New Mexico and southwestern



Colorado, are discernibly, although not markedly, paler than mice from northern and eastern populations.

A "pectoral spot," fairly common in some populations of *R. megalotis* east of the Missouri River (see Hoffmeister and Warnock, 1955:162-163), is present in only a small percentage of the specimens we have studied, and when present is usually only faintly developed.

### External and Cranial Size

As seen in Figure 1, the tail and especially the ear are longer in mice from New Mexico and adjacent areas than in specimens

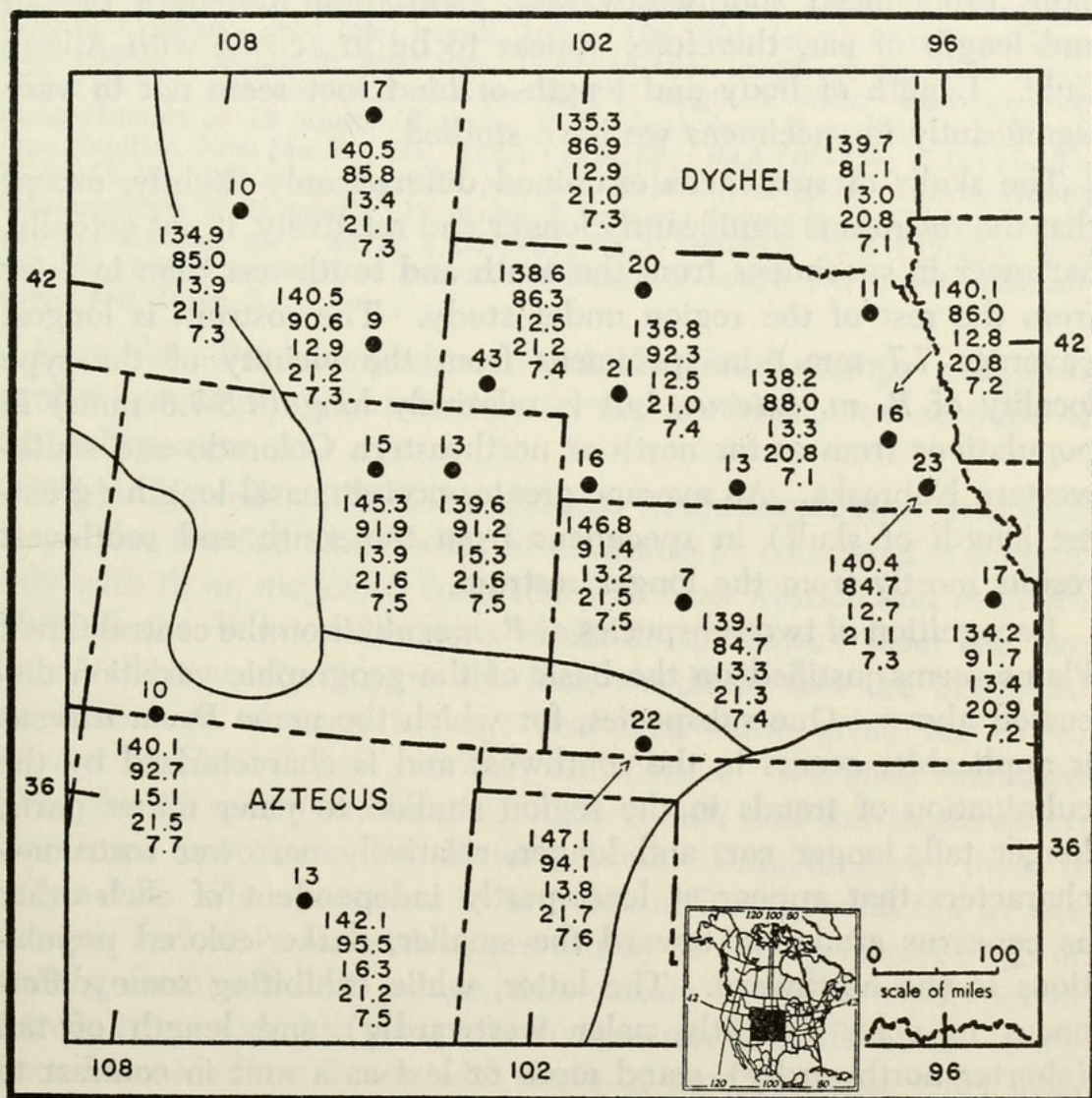


FIG. 1. Geographic variation in five measurements of *Retthodentomys megalotis* on the central Great Plains. The size of each sample is given, along with total length, length of tail expressed as a percentage of the head and body, length of ear, greatest length of skull, and length of rostrum. The approximate distribution of the species in the region shown and the approximate boundary between the subspecies *R. m. aztecus* and *R. m. dychei* also are indicated.



from northern localities. The ear, only slightly variable in size in the northern part of the region, is markedly longer in the southwest, averaging more than 2 mm. longer in specimens from New Mexico and adjacent southwestern Colorado than in specimens from Nebraska and eastern Kansas; specimens in a zone from central Colorado through southwestern Kansas and adjacent Oklahoma generally have ears of a size between the two extremes. As concerns the tail we note a slight trend toward increasing length (best expressed as percentage of length of body) from north to south throughout the central plains, but in general the trend is more pronounced southwestwardly. Variation in length of tail and length of ear, therefore, appear to be in accord with Allen's Rule. Length of body and length of hind foot seem not to vary significantly in specimens we have studied.

The skulls of specimens examined differed only slightly, except that the rostrum is significantly longer and relatively, if not actually, narrower in specimens from the south and southwest than in mice from the rest of the region under study. The rostrum is longest (average 7.7 mm.) in specimens from the vicinity of the type locality of *R. m. aztecus*, but is relatively long (7.5-7.6 mm.) in populations from as far north as northeastern Colorado and southwestern Nebraska. An average greater occipitonasal length (greatest length of skull) in specimens from the south and southwest results mostly from the longer rostrum.

Recognition of two subspecies of *R. megalotis* on the central Great Plains seems justified on the basis of the geographic variation discussed above. One subspecies, for which the name *R. m. aztecus* is applicable, occurs in the southwest and is characterized by the culmination of trends in the region studied to paler upper parts, longer tail, longer ear, and longer, relatively narrower rostrum—characters that appear at least partly independent of each other as concerns gradation toward the smaller, darker-colored populations to the northward. The latter, while exhibiting some differences in color (slightly paler westwardly) and length of tail (shorter northwardly), stand more or less as a unit in contrast to the mice from the southwest, and represent, in our judgment, a single subspecies, *R. m. dychei*. The area of intergradation between the two subspecies is relatively broad, considering all the characters mentioned, and assignment of some intergrades is admittedly difficult.



*Reithrodontomys megalotis aztecus* J. A. Allen

*Reithrodontomys aztecus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:79, April 28, 1893 (type locality, La Plata, San Juan Co., New Mexico).

*Reithrodontomys megalotis aztecus*, A. H. Howell, N. Amer. Fauna, 36:30, June 5, 1914.

*Reithrodontomys megalotis caryi* A. H. Howell, Jour. Mamm., 16:143, May 15, 1935 (type locality, Medano Ranch, 15 mi. NE Mosca, Alamosa Co., Colorado).

*Distribution*.—Western and southern Colorado, southeastern Utah, northeastern Arizona and northern New Mexico, east to the panhandles of Texas and Oklahoma and to southwestern Kansas.

*External measurements*.—Average and extremes of 10 adults (5 males, 5 females) from San Juan County, New Mexico, and adjacent Montezuma County, Colorado, are: total length, 140.1 (126-150); length of tail-vertebrae, 67.4 (56-71); length of hind foot, 17.3 (16-18); length of ear from notch, 15.1 (13-17); tail averaging 92.7 per cent of length of body. Corresponding measurements of 13 adults (7 males, 6 females) from Bernalillo and Guadalupe counties, New Mexico, are: 142.1 (129-156); 69.4 (60-75); 17.9 (17-19); 16.3 (15-18); tail averaging 95.4 per cent of length of body. Corresponding measurements of 22 adults (17 males, 5 females) from Meade County, southwestern Kansas, are: 147.1 (139-162); 71.3 (65-77); 17.6 (17-19); 13.8 (13-15); tail averaging 94.1 per cent of length of body. For cranial measurements see Table 2.

*Remarks*.—For comparisons with *Reithrodontomys megalotis dychei*, geographically adjacent to the northeast, see account of that subspecies.

When Howell (1935:143) named *Reithrodontomys megalotis caryi* from the San Luis Valley of Colorado he compared it directly only with *R. m. megalotis* from southern New Mexico and northern Chihuahua. Few adults were available to Howell from the San Luis Valley, accounting for the fact, we think, that the published measurements of *caryi* average less than those given for *R. m. aztecus* by Howell (*op. cit.*:144) and herein. We have examined 16 of the 23 specimens from Medano Ranch and the single specimen from Del Norte that Howell listed. Unfortunately, none is fully adult. The specimens from Medano Ranch, collected in late October and early November, are mostly in fresh winter pelage or molting from subadult pelage, and closely resemble topotypes of *aztecus* in comparable pelages. Comparison of skulls of the specimens from Medano Ranch with skulls of topotypes and other individuals of *aztecus* of approximately equal age indicates that the Coloradan specimens may average slightly smaller and have somewhat shorter rostra. Externally, topotypes of *caryi* have the relatively long tail of *aztecus* and approach it in length of ear (measured on dry specimens). To us, they appear to be inter-



grades between *aztecus* and *dychiei*, but to bear closer resemblance to the former, and we tentatively regard *caryi* as a synonym of *aztecus*. Benson (1935:140) noted that two adult topotypes of *caryi* were "similar to adult topotypes of *aztecus*." Specimens from southern Colorado east of the San Luis Valley, assigned to *aztecus*, are intergrades between it and *dychiei*, as are two specimens from El Paso County, to the north, which resemble *aztecus* in color but resemble *dychiei* in other characters and are tentatively assigned to the latter.

Specimens from southwestern Kansas and adjacent Oklahoma, herein referred to *aztecus*, also are intergrades with *dychiei*. Individuals from Meade County, for example, are intermediate on the average between typical specimens of the two subspecies in color of upper parts (if anything, nearer *dychiei*), resemble *dychiei* in length of ear, but resemble *aztecus* in length of tail and rostral proportions (consequently also in length of skull). Although a case could be made for assignment of the specimens from Meade County (and elsewhere in southwestern Kansas) to *dychiei*, they are, everything considered, nearer *aztecus*, to which subspecies they have been assigned consistently since first reported from the area by Hill and Hibbard (1943:24).

Of two specimens examined from 10 mi. S and 1 mi. W Gruver, Hansford Co., in the Panhandle of Texas, the one adult is clearly assignable to *aztecus* as is the specimen from 9 mi. E Stinnett, Hutchinson Co., Texas, that was referred to *dychiei* by Blair (1954:249).

*Reithrodontomys megalotis aztecus* has had a rather unstable taxonomic history. Allen, who originally named the subspecies (1893:79), regarded it two years later (1895:125) as a synonym of *R. m. megalotis*, the subspecies with geographic range to the south and west of that occupied by *aztecus*. Howell (1914:30) recognized *aztecus* as valid, but he, too, questioned its distinctness from *megalotis* in a later paper (1935:144). Hooper (1952:218), the most recent reviewer, supported the validity of *aztecus* because specimens available to him averaged "distinctly larger in skull length and size of brain case" than specimens of *megalotis*. Our comparisons of typical specimens of *aztecus* with specimens of *megalotis* from southern New Mexico and southwestern Texas confirm Hooper's observations and indicate also that *aztecus* has a longer rostrum and slightly longer ear.



*Specimens examined.*—205, as follows:

COLORADO. *Alamosa County*: Medano Ranch, 15 mi. NE Mosca, 16 (USNM). *La Plata County*: 1 mi. NW Florida, 6700 ft., 1; Florida, 6800 ft., 1. *Las Animas County*: 1 mi. S, 7 mi. E Trinidad, 2. *Montezuma County*: 1 mi. W Mancos, 5; north end, Mesa Verde Nat'l Park, 7000 ft., 3; Far View Ruins, Mesa Verde Nat'l Park, 7700 ft., 3; Park Point, Mesa Verde Nat'l Park, 8525 ft., 2; within 3 mi. Rock Springs, Mesa Verde Nat'l Park, 7500-8200 ft., 6. *Prowers County*: Lamar, 2. *Rio Grande County*: Del Norte, 1 (USNM).

KANSAS. *Finney County*: 1 mi. S, 2 mi. E Garden City, 4. *Ford County*:  $\frac{1}{2}$  mi. NW Bellefont, 10;  $6\frac{1}{4}$  mi. N Fowler, 2. *Grant County*: 2 mi. S, 9 mi. W Santanta, 1. *Kearney County*:  $3\frac{1}{2}$  mi. N, 4 mi. E Lakin, 4. *Meade County*: within  $2\frac{1}{2}$  mi. Fowler, 10; Meade County State Park, 14 mi. SW Meade, 48; 17 mi. SW Meade, 5. *Morton County*:  $7\frac{1}{2}$  mi. S Richfield, 4; 8 mi. N Elkhart, 1;  $7\frac{1}{2}$  mi. N,  $1\frac{1}{2}$  mi. W Elkhart, 2. *Seward County*: 3 mi. NE Liberal, 1. *Stanton County*: 1 mi. N,  $6-7\frac{1}{2}$  mi. W Manter, 2; dam of Lake Stanton, 1.

NEW MEXICO. *Bernalillo County*:  $6\frac{1}{2}$  mi. E Alameda, 11; 5 mi. W Albuquerque, 3. *Catron County*: 1 mi. NE Apache Creek, 4; Apache Creek, 2. *Guadalupe County*: 4 mi. SW Santa Rosa, 4700 ft., 10. *McKinley County*: Upper Nutria, 7200 ft., 2. *Rio Arriba County*: 4 mi. N El Rito, 1; 1 mi. SE El Rito, 1. *Sandoval County*: 3 mi. N La Cueva Rec. Area, 1. *San Juan County*: 2 mi. N La Plata, 15. *Santa Fe County*: 1 mi. W Santa Fe Municipal Airport, 1; La Bajada Grade, 20 mi. W Santa Fe, 1. *Socorro County*: 2 mi. S San Antonio, 4.

OKLAHOMA. *Beaver County*: 7 mi. S Turpin, 1. *Texas County*:  $3\frac{1}{2}$  mi. SW Optima, 8.

TEXAS. *Hansford County*: 10 mi. S, 1 mi. W Gruver, 2. *Hutchinson County*: 9 mi. E Stinnett, 1 (TU).

*Reithrodontomys megalotis dychei* J. A. Allen

*Reithrodontomys dychei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:120, May 21, 1895 (type locality, Lawrence, Douglas Co., Kansas).

*Reithrodontomys megalotis dychei*, A. H. Howell, N. Amer. Fauna, 36:30, June 5, 1914.

*Reithrodontomys dychei nebrascensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:122, May 21, 1895 (type locality, Kennedy, Cherry Co., Nebraska).

*Distribution.*—Southwestern Wisconsin, southern Minnesota, northwestern Illinois, Iowa, Missouri and northwestern Arkansas, west through Kansas (except southwestern part), Nebraska and the Dakotas to the foothills of the Rocky Mountains from central Colorado to southeastern Alberta.

*External measurements.*—Average and extremes of 17 adults (11 males, 6 females) from Douglas County, Kansas, are: total length, 134.2 (115-151); length of tail-vertebrae, 64.2 (59-72); length of hind foot, 16.7 (15-18); length of ear from notch, 13.4 (12-15); tail averaging 91.7 per cent of length of body. Corresponding measurements of 20 adults (14 males, 6 females) from Cherry County, Nebraska, are: 135.3 (122-155); 62.9 (56-72); 17.5 (17-18); 13.0 (12-14); tail averaging 86.9 per cent of length of body. For cranial measurements see Tables 1 and 2.

*Remarks.*—From *Reithrodontomys megalotis aztecus*, geographically adjacent to the southwest, *R. m. dychei* differs as follows: upper parts averaging darker (especially in summer pelage), owing principally to more suffusion of blackish middorsally; tail slightly



shorter; ears markedly shorter, rostrum shorter and relatively broader; occipitonasal length shorter owing to shorter rostrum.

"*Reithrodontomys dychei nebrascensis*," named by Allen (1895: 122) from Kennedy, Nebraska, was distinguished in the original description from *dychei* by "slightly larger size, relatively longer ears, and more strongly fulvous coloration." Allen applied the name *nebrascensis* to harvest mice from Montana south to central Colorado and western Nebraska. Howell (1914:30-31) placed *nebrascensis* in synonymy under *dychei* because he found specimens from Kennedy to be "indistinguishable from specimens of typical *dychei* in comparable pelage." We concur with Howell. Topotypes of *nebrascensis* that we have examined average only slightly paler than topotypes of *dychei* in the same pelage (some specimens from each series can be matched almost exactly), and do not differ significantly in any external or cranial measurements. The "fulvous" upper parts of the series from Kennedy (all taken in late April) that was available to Allen resulted from worn winter pelage. We think that Allen was led astray also by his erroneous assumption that geographic variation in color of *R. megalotis* on the Great Plains paralleled that found in *Peromyscus maniculatus*. Actually, *R. megalotis* varies in color much less geographically in the region concerned than does *P. maniculatus*.

Specimens from the northwestern part of the range of *dychei* (Wyoming, Montana and western South Dakota), like those from western Nebraska, average slightly paler dorsally than topotypes and other specimens from eastern Kansas and Nebraska (a few approach *aztecus* in this regard), but do not otherwise differ. Most specimens from northern Colorado, southwestern Nebraska (Hitchcock and Dundy counties) and western Kansas average slightly paler than typical specimens and have longer rostra, approaching *aztecus* in these particulars, but have the shorter ears and shorter tail of *dychei*. In general, these intergrades resemble *dychei* to a greater degree than *aztecus* and are accordingly assigned to the former. One exception is a series from Muir Springs, 2 mi. N and 2½ mi. W Ft. Morgan, Colorado. Specimens in this series approach typical *dychei* in color, but resemble *aztecus* in having long ears and long rostra (average 15.3 and 7.5, respectively, in 13 adults). The specimens from Muir Springs resemble *aztecus* to a greater degree than *dychei*, but are assigned to the latter because specimens from farther west and farther south in Colorado are assignable to *dychei*. Howell (1914:31) earlier noted that specimens from



northern and central Colorado were intergrades between the two subspecies.

The geographic range occupied by *R. m. dychei* (from east of the Mississippi River in Illinois and Wisconsin to the foothills of the Rockies) is large (although not so large as that currently ascribed to *R. m. megalotis*, which ranges from southern British Columbia to central México). Most other small rodents that occur in the same geographic area occupied by *dychei* are represented there by at least two subspecies, a dark one in the east and a pale one in the west. Eastern populations of *dychei* have, it is true, somewhat darker upper parts than mice from western localities, but the differences are slight; also, judging from the literature, the "pectoral spot" is more common in eastern mice.

It should be noted that *R. m. dychei* probably has extended its range both eastward and westward in the last century as a result of agricultural practices—clearing of land in the east and irrigation in the west.

*Specimens examined.*—1145, as follows:

COLORADO. *Adams County*: South Platte River, 5 mi. N Denver, 1; 3 mi. S, 1 mi. W Simpson, 1. *El Paso County*: 5 mi. E Payton, 1; 4 mi. S maingate of Camp Carson, 1. *Larimer County*: 3 mi. N Loveland, 1; 9¼ mi. W, ½ mi. N Loveland, 5600 ft., 1; 16 mi. W Loveland, 6840 ft., 1; 3½-4½ mi. W Loveland, 5030 ft., 7; 6 mi. W, ½ mi. S Loveland, 5200 ft., 14; 7 mi. W, 2½ mi. S Loveland, 5370 ft., 1. *Morgan County*: Muir Springs, 2 mi. N, 2½ mi. W Ft. Morgan, 21. *Washington County*: Cope, 6. *Yuma County*: 1 mi. W to 1 mi. E Laird, 6.

KANSAS. *Atchison County*: 1½ mi. S Muscotah, 10; 4½ mi. S Muscotah, 2. *Barton County*: 3 mi. N, 2 mi. W Hoisington, 3. *Brown County*: 1 mi. E Reserve, 2; 5 mi. S Hiawatha, 4. *Cheyenne County*: 23 mi. NW St. Francis, 1; 1 mi. W St. Francis, 12; 8 mi. S, 1½ mi. W St. Francis, 1. *Decatur County*: 1 mi. N, 2 mi. E Oberlin, 4; 5 mi. S, 8 mi. W Oberlin, 1. *Doniphan County*: Geary, 2. *Douglas County*: 5 mi. N, ½ mi. E Lawrence, 1; 1 mi. NW Midland, 1; 4½ mi. N Lawrence, 2; 4 mi. N, 1¼ mi. E Lawrence (sec. 8, T. 12 S, R. 20 E), 10; ½ mi. NW Lecompton, 1; 2½ mi. N, 1 mi. W Lawrence, 2; 2 mi. N Lawrence, 2; U. P. Railroad tracks, N of Lawrence, 1; 9½ mi. W Lawrence, 1; 5 mi. W Lawrence, 1; 2 mi. W Lawrence, 4; 1 mi. W Lawrence, 4; Fort Lake, Lawrence, 1; Lawrence, 24; 1 mi. SW Lawrence, 2; 1 mi. S, 1½ mi. W Lawrence, 2; 1¼ mi. S, 3½ mi. E Lawrence, 1; 2 mi. SW Lawrence, 2; 7-7½ mi. SW Lawrence, 4; Rock Creek, 850 ft., 10 mi. SW Lawrence, 8; N end Lone Star Lake, 9 mi. S, 7 mi. W Lawrence, 1; no specific locality, 6. *Ellis County*: ½ mi. S, 3½-4 mi. W Hays, 2250 ft., 12. *Franklin County*: 4 mi. N Ottawa, 2; ½ mi. S, 1¼ mi. E Ottawa, 4. *Gove County*: Castle Rock, 4; no specific locality, 1. *Jackson County*: ½ mi. N, 3 mi. W Holton, 4. *Leavenworth County*: Ft. Leavenworth, 2; no specific locality, 3. *Logan County*: no specific locality, 2. *Marshall County*: 2 mi. N, 4 mi. E Oketo, 1; ½ mi. N, 1½ mi. E Waterville, 1; 1 mi. E Waterville, 5; ½ mi. SW Waterville, 4. *Mitchell County*: ½ mi. S, 3½ mi. W Beloit, 1500 ft., 4. *Nemaha County*: Nebraska-Kansas line, 7 mi. N Sabetha, 1; 10½ mi. N Seneca, 1; 2½ mi. S Sabetha, 6. *Norton County*: 1½ mi. N, ¼ mi. E Norton, 1; ½ mi. N, 4 mi. E Norton, 5; 1 mi. SW Norton, 10; 4 mi. W, 1 mi. S Logan, 3. *Osage County*: 3 mi. N Lyndon, 1. *Osborne County*: ½ mi. W Downs, 5. *Phillips County*:



2¼ mi. SE Long Island, 1. *Pottawatomie County*: 1 mi. NW Fostoria, 1. *Rawlins County*: 2 mi. NE Ludell, 17; 2 mi. S Ludell, 2; Atwood, 3; Atwood Lake, 2. *Republic County*: 1½ mi. S, 1 mi. E Belleville, 1; Rydal, 8. *Scott County*: State Park, 2. *Shawnee County*: 1 mi. S Silver Lake, 857 ft., 2. *Sherman County*: ½ mi. S, 1½ mi. E Edson, 1. *Smith County*: 2 mi. E Smith Center, 9. *Stafford County*: 16 mi. N, 4 mi. E Stafford, 1. *Thomas County*: 10 mi. N, 6 mi. E Colby, 5. *Trego County*: 16 mi. S, 4½ mi. E Wakeeney, 1. *Wichita County*: 15 mi. W Scott City, 5.

MONTANA. *Big Horn County*: Big Horn River, 14 mi. S Custer, 2750 ft., 4. *Dawson County*: 1 mi. W Glendive, 2070 ft., 3. *Phillips County*: 1 mi. N, 1 mi. W Malta, 2248 ft., 1. *Powder River County*: Powderville, 2900 ft., 1.

NEBRASKA. *Antelope County*: Neligh, 16 (6 NSM, 9 USNM). *Boyd County*: 5 mi. WSW Spencer, 1; 5 mi. S, 2 mi. E Spencer, 2; 6 mi. SSE Spencer, 1. *Box Butte County*: Alliance, 2 (USNM). *Buffalo County*: Kearney, 2 (USNM). *Burt County*: 1 mi. E Tekamah, 3. *Butler County*: 2 mi. N, 2 mi. W Bellwood, 2 (NSM); 4-5 mi. E Rising City, 11; 4 mi. E, 1 mi. S Rising City, 5. *Chase County*: 2 mi. SE Enders, 1. *Cherry County*: W of Crookston, 1 (NSM); Valentine, 2 (USNM); Ft. Niobrara Nat'l Wildlife Refuge, 4 mi. E Valentine, 5 (3 NSM); 3 mi. SSE Valentine, 4; 3 mi. S Valentine, 12; 8 mi. S Nenzel, 2; Niobrara River, 10 mi. S Cody, 2 (1 USNM); 11 mi. S, 2 mi. W Nenzel, 1; 18 mi. NW Kennedy, 8 (2 NSM, 6 USNM); Two Mile Lake, 6 (4 NSM, 2 USNM); Watt's Lake, Valentine Nat'l Wildlife Refuge, 3; Hackberry Lake, 12 (UMMZ); 2 mi. W to 4 mi. E Kennedy, 25 (4 UMMZ, 12 USNM); no specific locality, 1 (USNM). *Cheyenne County*: 15 mi. S Dalton, 4300 ft., 1; 3 mi. N Sidney, 6; 4 mi. E Sidney, 42. *Cuming County*: Beemer, 1 (USNM). *Custer County*: 7 mi. NW Anselmo, 1 (UMMZ); within 1 mi. Victoria Spring, 9 (UMMZ); 2 mi. E Lillian, 1 (UMMZ); Comstock, 1 (NSM); Callaway, 3 (USNM); 6 mi. SE Mason City, 1 (UMMZ). *Dawes County*: Wayside, 1; 3 mi. E Chadron, 2; 6 mi. S Chadron, 1 (NSM); 8 mi. S Chadron, 1 (NSM); 10 mi. S Chadron, 1 (UMMZ); 1 mi. W Crawford, 2 (NSM); Crawford, 2 (UMMZ). *Dawson County*: ½ mi. S Gothenburg, 5; 3 mi. SSE Gothenburg, 4. *Deuel County*: 1 mi. N, 2 mi. W Chappell, 3. *Dixon County*: 3 mi. NE Ponca, 4. *Dundy County*: Rock Creek Fish Hatchery, 5 mi. N, 2 mi. W Parks, 42; 2 mi. N, 2 mi. W Haigler, 1; Arikaree River, Parks, 2; 2 mi. SW Benkleman, 7; Haigler, 3 (1 NSM, 2 USNM). *Franklin County*: 1½-2 mi. S Franklin, 10. *Gage County*: 1 mi. SE DeWitt, 3; ¼ mi. W Homestead Nat'l Mon., 1; 1 mi. S, 1 mi. W Barnston, 1; 1½ mi. S, 2 mi. E Barnston, 18. *Garden County*: Crescent Lake Nat'l Wildlife Refuge, 1; ½ mi. S Oshkosh, 1. *Hall County*: 6 mi. S Grand Island, 5. *Harlan County*: 1 mi. W Alma, 17. *Hitchcock County*: Republican River, Trenton, 3. *Hooker County*: Kelso, 3 (UMMZ). *Holt County*: 6 mi. N Midway, 4; 1 mi. S Atkinson, 4 (2 NSM); Ewing, 1 (USNM). *Jefferson County*: 7 mi. S, 2 mi. W Fairbury, 6; 3 mi. S, 1 mi. W Endicott, 1. *Johnson County*: 1 mi. S, 1½ mi. E Burr, 1. *Kearney County*: 1¼-3¼ mi. S Kearney, 6. *Keith County*: 4 mi. WNW Keystone, 69. *Keya Paha County*: 12 mi. N Springview, 8; 12 mi. NNW Springview, 5. *Kimball County*: 3 mi. E Kimball, 1; Smeed, 40. *Knox County*: 3 mi. W Niobrara, 2; 1 mi. SE Niobrara, 5; 2 mi. S Niobrara, 2; Verdigre, 2 (USNM). *Lancaster County*: within 5 mi. Lincoln, 21 (8 NSM). *Lincoln County*: 2 mi. N North Platte, 1; Conroy Canyon, SW corner sec. 4, T. 11 N, R. 27 W (5 mi. S, 2½ mi. W Brady), 2 (NSM). *Logan County*: 1-2 mi. NE Stapleton, 11. *Madison County*: Norfolk, 1 (USNM). *Morrill County*: 1 mi. N Bridgeport, 4. *Nemaha County*: 2 mi. SW Peru, 6; 3 mi. S, 1½ mi. E Peru, 2. *Nuckolls County*: 2 mi. WSW Superior, 5; 1 mi. SSW Hardy, 9. *Otoe County*: 1 mi. SE Nebraska City, 3; 3 mi. S, 2 mi. E Nebraska City, 3. *Pawnee County*: Turkey Creek, 4 mi. NW Pawnee City, 2 (NSM); 4 mi. S, 8 mi. W Pawnee City, 7; 1 mi. S Du Bois, 4. *Platte County*: Columbus, 3 (USNM). *Polk County*: 15 mi. W Osceola, 2. *Red Willow County*: 5 mi. S, 2½ mi. E McCook, 2; 8 mi. S, 3 mi. E McCook, 2. *Richardson County*: 5 mi. N, 2 mi. W Humboldt, 2 (1 NSM); 4 mi. E Barada, 16; 3½ mi. S, 1 mi. W Dawson, 6; 2 mi. N Falls City, 2; 4-6 mi. W Falls City, 4; ½ mi. S,



1½ mi. W Rulo, 1. *Saline County*: 2 mi. NE Crete, 1; ½ mi. W DeWitt, 1. *Sarpy County*: 1 mi. W Meadow, 1. *Saunders County*: 2 mi. NW Ashland, 3. *Scotts Bluff County*: 8 mi. NNW Scottsbluff, 1; Mitchell, 1 (NSM); ½-1 mi. S Mitchell, 13; 5 mi. S Gering, 10; 7 mi. S Gering, 1; 11-12 mi. S Scottsbluff, 4600-4800 ft., 8; 12 mi. SSW Scottsbluff, 4700 ft., 5. *Sioux County*: 1 mi. S, 4 mi. W Orella, 1 (NSM); 8 mi. N Harrison, 2 (UMMZ); 6½-7 mi. W Crawford, 3 (1 NSM); 3½ mi. N, 1 mi. E Glen, 1 (NSM); 3 mi. NE Glen, 1 (NSM); Glen, 3 (NSM); Agate, 4600 ft., 1. *Stanton County*: 1½ mi. S Pilger, 3; 6 mi. SE Norfolk, 1. *Thomas County*: 1 mi. W Halsey, 2; Halsey, 1 (NSM). *Thurston County*: 1 mi. S Winnebago, 8. *Valley County*: 2 mi. W Ord, 1; 2 mi. S, 4 mi. E Ord, 6. *Washington County*: 1 mi. E Blair, 6; 3 mi. SE Blair, 2; 6 mi. SE Blair, 7; 3 mi. S, 2 mi. E Ft. Calhoun, 1 (NSM). *Wayne County*: ½ mi. W-2½ mi. E Wayne, 3. *Webster County*: 3 mi. S Red Cloud, 2.

**SOUTH DAKOTA.** *Buffalo County*: 2 mi. S, 3 mi. E Ft. Thompson, 1370 ft., 4. *Clay County*: 2½ mi. N, ½ mi. W Vermillion, 1. *Pennington County*: 2 mi. S, 3 mi. W Scenic, 1. *Stanley County*: 1.2 mi. S, 4 mi. W Ft. Pierre, 1484 ft., 1.

**WYOMING.** *Albany County*: 27 mi. N, 8 mi. E Laramie, 6420 ft., 2. *Big Horn County*: 7½ mi. E Graybull, 4050 ft., 1; 7 mi. S, ½ mi. E Basin, 3900 ft., 1. *Campbell County*: 4 mi. N, 3 mi. E Rockypoint, 3800 ft., 3; 1½ mi. N, ¼ mi. E Rockypoint, 2; Rockypoint, 5; 5 mi. S, 4 mi. W Rockypoint, 1; Ivy Creek, 5 mi. N, 8 mi. W Spotted Horse, 2. *Crook County*: 1½ mi. NW Sundance, 5000 ft., 3. *Fremont County*: 2 mi. N, 3 mi. W Shoshoni, 4650 ft., 1; ¾ mi. NW Milford, 5357 ft., 1; Milford, 5400 ft., 1.

TABLE 2. CRANIAL MEASUREMENTS OF TWO SUBSPECIES OF REITHRODONTOMYS MEGALOTIS.

NUMBER AVERAGED AND SEX	Greatest length of skull	Zygomatic breadth	Breadth of braincase	Interorbital breadth	Depth of cranium	Length of rostrum	Breadth of rostrum	Length of incisive foramen	Length of palate	Alveolar length of maxillary tooth-row
<i>R. m. dychei</i> , Douglas County, Kansas										
Av. 17 (11♂, 6♀)	20.9	10.5	10.1	3.1	7.9	7.2	3.8	4.3	3.5	3.3
Minimum.....	20.4	10.0	9.8	3.0	7.7	6.8	3.6	4.0	3.2	3.1
Maximum.....	21.9	10.9	10.3	3.3	8.2	7.9	4.0	4.5	3.9	3.4
Cherry County, Nebraska										
Av. 20 (14♂, 6♀)	21.0	10.9	10.3	3.1	7.9	7.3	3.8	4.4	3.6	3.5
Minimum.....	20.4	10.0	9.8	2.9	7.5	6.8	3.5	4.3	3.4	3.2
Maximum.....	22.1	11.3	10.7	3.3	8.4	7.8	4.1	4.7	3.9	3.7
<i>R. m. aztecus</i> , San Juan County, New Mexico, and Montezuma County, Colorado										
Av. 10 (6♂, 4♀)	21.5	10.8	10.2	3.1	8.1	7.7	3.7	4.5	3.4	3.5
Minimum.....	20.5	10.4	9.9	2.9	7.9	7.2	3.5	3.9	3.1	3.2
Maximum.....	22.7	11.1	10.6	3.3	8.4	8.2	3.9	4.8	3.7	3.7



*Hot Springs County*: 3 mi. N, 10 mi. W Thermopolis, 4900-4950 ft., 7. *Johnson County*: 1 mi. W,  $\frac{8}{10}$  mi. S Buffalo, 4800 ft., 5;  $6\frac{1}{2}$  mi. W, 2 mi. S Buffalo, 5620 ft., 4; 1 mi. WSW Kaycee, 4700 ft., 8. *Laramie County*: Horse Creek, 5000 ft., 3 mi. W Meriden, 1; 1 mi. N,  $\frac{1}{2}$  mi. W Pine Bluffs, 5040 ft., 4; 1 mi. S Pine Bluffs, 5100 ft., 1; 2 mi. S Pine Bluffs, 5200 ft., 2. *Natrona County*: 1 mi. NE Casper, 5150 ft., 1;  $2\frac{1}{4}$  mi. W Casper, 5250 ft., 1; 7 mi. S, 2 mi. W Casper, 6370 ft., 1. *Niobrara County*: 2 mi. S,  $\frac{1}{2}$  mi. E Lusk, 5000 ft., 1. *Park County*: 4 mi. N Garland, 2; 13 mi. N, 1 mi. E Cody, 5200 ft., 2;  $\frac{6}{10}$  mi. S,  $3\frac{2}{10}$  mi. E Cody, 5020 ft., 1. *Platte County*:  $2\frac{1}{2}$  mi. S Chugwater, 5300 ft., 4. *Sheridan County*: 3 mi. WNW Monarch, 3800 ft., 4; 5 mi. NE Clearmont, 3900 ft., 6. *Washakie County*: 1 mi. N, 3 mi. E Tensleep, 4350 ft., 5.



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