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12-5-1939

## A Study of Local Size Variations in the Prairie Pocket-Gopher (*Geomys bursarius*), with Description of a New Subspecies from Nebraska

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Swenk, Myron H., "A Study of Local Size Variations in the Prairie Pocket-Gopher (*Geomys bursarius*), with Description of a New Subspecies from Nebraska" (1939). *Mammalogy Papers: University of Nebraska State Museum*. 299.

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## MISSOURI VALLEY FAUNA

Occasional Papers on the Animal Life of the Missouri Valley Region

Published by Missouri Valley Fauna, 1410 North 37th Street,  
Lincoln, Nebraska

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A STUDY OF LOCAL SIZE VARIATIONS IN THE PRAIRIE  
POCKET-GOPHER (*GEOMYS BURSARIUS*), WITH  
DESCRIPTION OF A NEW SUBSPECIES  
FROM NEBRASKA

By MYRON H. SWENK

As a species, the prairie pocket-gopher (*Geomys bursarius*)—independently of the distinctly different *Geomys illinoensis* Komarek and Spencer (3), which is now regarded by Lyon (6) as a valid species—enjoys a wide range in the Transition and Upper Austral life zones of the Upper Mississippi Valley, possibly from southwestern Manitoba (11) and certainly from about longitude 98° in eastern North and South Dakota, eastern Nebraska and northeastern and east-central Kansas, east through western, central and southern Minnesota to western and south-central Wisconsin, eastern Iowa and eastern Missouri.

Merriam (8) stated that over this great area *Geomys bursarius* varied “considerably in size in different localities. The largest form inhabits the region about Knoxville, Iowa, where the males average a foot in length.” But he did not subspecifically segregate any of these size variants, for reasons that are obvious when one notes his previous reference on the same page to the average measurements of large series from eastern North Dakota (26 specimens), Fort Sisseton, South Dakota (73 specimens), and Elk River, Minnesota (40 specimens), made, respectively, by J. Alden Loring, C. E. McChesney, and Vernon Bailey, in which he stated: “Many of the specimens are not fully grown, hence the measurements are too small. Unfortunately no satisfactory series of measurements is available.”

Beginning in the fall of 1913, the writer has continuously been interested in accumulating accurate body measurements, taken in the flesh, of Nebraska pocket-gophers. As a result quite an assemblage of such data has been secured. In the case of *Geomys bursarius*, the bulk of these data relates to specimens trapped in the vicinity of Lincoln, Lancaster County, involving to date 48 adult and 38 immature ♂ and 50 adult and 65 immature ♀♀. Recently these measurements have been tabulated and compared with such measurements of the species as have been recorded in the literature from other parts of its range.

The observation by Merriam, above quoted, that no satisfactory series of measurements was then available, still largely obtains. However, when the data afforded by the published measurements of the above-mentioned rather large series from eastern North Dakota, Fort Sisseton, South Dakota, and Elk River, Minnesota, are supplemented by the measurements of smaller series from east-central Wisconsin (9 specimens), eastern Iowa (4 specimens), St. Louis, Missouri (5 specimens), and Hunter and Williamsville, Missouri (12 specimens), as published

by Schmidt (15), Baird (1), and Merriam (8), and all are carefully compared, it is quickly obvious that the prairie pocket-gopher of eastern Nebraska is decidedly larger than the individuals representing the same species in western Wisconsin, eastern and southern Minnesota, and eastern and southern Missouri. The Nebraska animals are less decidedly, but still measurably, larger than those from the Red River Valley region of Minnesota and the Dakotas. The eastern Nebraska old ♂♂ average over a foot, and the largest ones exceed 14 inches, in total length, thus surpassing in size "the form that inhabits the region about Knoxville, Iowa," which was the "largest form" known to Merriam.

The above-mentioned Nebraska series of measurements is adequate in numbers, and the individuals composing it may definitely be segregated as to sex and age, in this way being superior to other published large series of measurements of the species. The next most adequate series of measurements is that of McChesney (7), which covers a sufficiently large number of specimens as to be fairly representative of the prairie pocket-gopher of the extreme northeastern corner of South Dakota. This series can also be segregated, with a fair degree of probability, into (1) adult and subadult and (2) immature groups. Comparison shows the Lincoln series of adult ♂♂ averages 20.3 mm. in total length, 14.5 mm. in length of tail, and 3 mm. in length of hind foot, more than the average of the Fort Sisseton series of adult (?) ♂♂, while the largest Lincoln ♂ exceeds the largest ♂ of the Fort Sisseton series by 30.5 mm. in total length, 6.8 mm. in length of tail, and 3 mm. in length of hind foot. In the ♀♀, the Lincoln series of adults averages 29.6 mm. greater in total length, 14.4 mm. in length of tail, and 2.8 mm. in length of hind foot, than the average of the Fort Sisseton series of adult (?) ♀♀, while the largest Lincoln ♀ specimen exceeds the largest Fort Sisseton ♀ specimen by 37.2 mm. in total length, 13 mm. in length of tail, and 4.2 mm. in length of hind foot. Taking the two series as a whole, the Lincoln series averages 13 mm. in total length, 10.7 mm. in length of tail, and 2.5 mm. in length of hind foot greater than the Fort Sisseton series. These would seem to represent a significant size difference between the two series.

The series of 26 specimens from eastern North Dakota reported by Merriam (8, p. 122) apparently represents a somewhat larger animal than occurs in the northeastern corner of South Dakota, showing on the average distinctly longer tails and hind feet. This North Dakota series, taken as a whole, averages only 0.2 mm. less in total length than the average of the Fort Sisseton series, but 13.8 mm. less than the Lincoln series. In length of tail and of hind foot, however, this North Dakota series as a whole exceeds the Fort Sisseton series by 4.8 mm. and 1.6 mm., respectively, but falls short by 5.9 mm. and 0.9 mm., respectively, of attaining the average measurements of the Lincoln series. The smaller series of 6 ♂♂ and 10 ♀♀, the measurements of which are separately given (8, p. 202), presumably represent selected adults from "southeastern" North Dakota. They average in the ♂♂ 3.3 mm. less in total length, but 9.3 mm. and 1.3 mm. more, respectively, in length of tail and hind foot, and in the ♀♀ 4.4 mm. more in total length, 3.8 mm. more in length of tail, and 1.4 mm. more in length of hind foot, than the comparable Fort Sisseton groups. As compared with the Lincoln series, the 6 ♂♂ alone average 23.6 mm. in total length, 5.2 mm. in length of tail, and 1.7 mm. in length of hind foot, less, and the 10 ♀♀ alone 25.2 mm. in total length, 10.6 mm. in length of tail, and 1.4 mm. in length of hind foot, less, than the comparable averages of the Lincoln series. The discrepancy in size between the eastern North Dakota and Lincoln series is obviously much less marked than between the Fort Sisseton and Lincoln series, but the Lincoln animals still average about an inch greater in their total length.

The series of 40 prairie pocket-gophers from Elk River, Sherburne County, south-central Minnesota, reported by Merriam (8, pp. 122 and

202), runs smaller in average total length than the recorded measurements of the same species from the Dakotas and Nebraska. The ♂ average, respectively, 16 mm., 15.3 mm., and 35.6 mm., and the ♀ average, respectively, 22 mm., 17.6 mm., and 47.2 mm., less in total length, as compared with the three series from eastern North Dakota, northeastern South Dakota (Fort Sisseton), and southeastern Nebraska (Lincoln). The average for the total Elk River series, including both sexes, is only 6.5 mm. less than the North Dakota series and 6.7 mm. less than the South Dakota series, but 23.3 mm. less than the Nebraska series. The small series of 9 specimens from west-central Wisconsin reported by Schmidt (15) averages somewhat greater (9.4 mm.) in total length than the Elk River, Minnesota, series, and slightly greater (2.9 mm. and 2.7 mm., respectively) than the North Dakota and South Dakota series, but 10.9 mm. less, on the average, than the Nebraska series.

From inadequate data published by Baird (1), it is still fairly evident that the prairie pocket-gophers of the territory bordering the Mississippi River in eastern Iowa are animals of rather good size, exceeding in average measurements those of the Dakotas, Minnesota and western Wisconsin; and as has been mentioned above, Merriam has commented on the maximum size of the prairie pocket-gophers from the region of Knoxville, Marion County, in south-central Iowa. Measurements from

TABLE 1.—*Extreme and average body measurements in millimeters of Geomys bursarius as recorded from different parts of its range*

Locality	Specimens			Total Length			Tail Vertebrae			Hind Foot		
	No.	Age	Sex	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum	Mini- mum	Aver- age	Maxi- mum
Chippewa Co., Wis. (15)	4		?		254.0			75.0			33.0	
Clark Co., Wis. (15)	5		?	280.0	288.0	305.0	78.0	86.0	91.0	34.0	36.0	38.0
West-central Wis. (15)	9		?		272.9			81.1			34.4	
Elk River s. cent. Minn. (8)	20		♂		284.0							
Do.	20		♀		243.0							
Do.	40		♂ ♀		263.5							
Eastern Iowa (1)*	4		?	252.5	281.3	310.1	55.0	64.8	83.1	33.5	35.3	37.6
St. Louis, e. cent. Mo. (1)*	5		♂ ♀	249.6	264.2	281.5	58.1	73.8	85.8	28.3	34.2	35.5
Carter & Wayne Cos., s. e. Mo. (8)	4		♂		256.0			74.0			33.0	
Do.	8		♀		223.0			63.0			30.0	
Do.	12		♂ ♀		234.0			66.6			31.0	
Eastern N. D. (8)	6		♂		296.0			90.0			37.0	
Do.	10		♀		265.0			78.0			34.0	
Do.	26		♂ ♀		270.0			80.0			35.0	
Ft. Sisseton, n. e. S. D. (7)*	30	Ad.?	♂	271.0	299.3	321.5	64.0	80.7	100.2	32.5	35.7	40.0
Do.	6	Imm.?	♂	178.3	229.0	266.2	50.5	66.5	77.0	27.6	31.6	35.0
Do.	36		♂	178.3	287.6	321.5	50.5	78.3	100.2	27.7	35.0	40.0
Do.	28	Ad.?	♂	248.3	260.6	278.8	63.5	74.2	89.0	27.0	32.6	34.8
Do.	9	Imm.?	♂	199.0	230.7	244.3	50.5	65.7	82.8	19.0	29.2	34.5
Do.	37		♂	199.0	253.3	278.8	50.5	72.1	89.0	19.0	31.7	34.8
Do.	73		♂ ♀	178.3	270.2	321.5	50.5	75.2	100.2	19.0	33.4	40.0
Lincoln, s. e. Nebr.	48	Ad.	♂	294.0	319.6	352.0	75.0	95.2	107.0	36.0	38.7	43.0
Do.	38	Imm.	♂	237.0	271.4	295.0	67.0	83.4	99.0	32.0	35.9	40.0
Do.	86		♂	237.0	298.3	352.0	67.0	89.4	107.0	32.0	37.4	43.0
Do.	50	Ad.	♂	278.0	290.2	316.0	77.0	88.6	102.0	33.0	35.4	39.0
Do.	65	Imm.	♂	196.0	259.6	283.0	55.0	79.2	96.0	30.0	33.9	38.0
Do.	115		♂	196.0	272.9	316.0	55.0	83.3	102.0	30.0	34.6	39.0
Do.	201		♂ ♀	196.0	283.8	352.0	55.0	85.9	107.0	30.0	35.9	43.0

\*Translated from inches into millimeters.

Baird (1) indicate that lower down along the Mississippi, in the vicinity of St. Louis, Missouri, pocket-gophers again run smaller in size; and the measurements of a dozen specimens supplied by Merriam (8, p. 202) from Carter and Wayne Counties, in southeastern Missouri, show definitely a still further decrease in size of the animals as one approaches the extreme southeastern portion of the range of the species. The average of 4 ♂♂ from southeastern Missouri is 63.6 mm., of 8 ♀♀ is 67.2 mm., and of the 12 is 49.8 mm., less, in total length, as compared with the Lincoln series. An adult ♂ from Carroll County, in central Missouri, also runs distinctly smaller, as well as being much darker colored mid-dorsally, than any of the large series of fully adult Nebraska ♂♂ examined by the writer.

The measurement figures from which the preceding analysis has been drawn are given in the foregoing Table 1. It may be added that specimens from northeastern Kansas apparently run intermediate in size between the small ones from southeastern and central Missouri and the large ones from southeastern Nebraska. Scheffer (14) writes as follows concerning the size of *Geomys bursarius* in northeastern Kansas: "Specimens taken about Manhattan average ten to eleven inches (254-267 mm.) in length from the tip of nose to tip of tail. The latter is about three and one-fourth inches (83 mm.) long. The hind foot measures one and one-third inches (34 mm.). The average weight is very close to twelve ounces."

Available cranial measurements, as shown in the following Table 2, in general bear out the above analysis of regional size variation in *Geomys bursarius* as based on body measurements. The smallest skulls of adults come from central Missouri and south-central Minnesota, while skulls from the Red River Valley in west-central Minnesota and east-central North Dakota, as well as more adequate series from south-central Iowa and southeastern Nebraska, run distinctly larger.

TABLE 2.—*Extreme and average cranial measurements in millimeters of Geomys bursarius as recorded from different parts of its range*

Locality	Specimens		Greatest Basal Length			Zygomatic Breadth			Greatest Breadth Across Squamosals			Greatest Length of Mandible		
	No.	Age and Sex	Mini-mum	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum
Carroll Co., cent. Mo.	1	Ad. ♂	50.5			30.0			27.0			34.0		
Elk River s. cent. Minn. (8).....	2	Ad. ♂	53.5	53.5	53.5	32.0	32.0	32.0	28.5	28.7	29.0	36.0	36.2	36.5
Ortonville, w. cent. Minn. (8).....	1	Ad. ♂	58.0			36.0			32.0			39.5		
Portland, e. cent. N. D. (8).....	1	Ad. ♂	60.0			36.0			31.5			40.0		
Knoxville, s. cent. Iowa (8).....	4	Ad. ♂	58.0	58.9	59.5	36.0	37.2	38.0	33.0	33.7	34.5	39.5	39.8	40.0
Do.....	4	Ad. ♀	45.0	47.5	50.0	27.5	28.5	30.0	26.0	27.0	29.0	30.0	32.1	33.5
Lincoln, s. e. Nebr. .	6	Ad. ♂	58.7	60.0	62.0	35.0	36.5	38.7	33.2	34.1	36.3	38.6	40.1	41.5
Do.....	2	Imm. ♂	52.2	52.7	53.2	30.8	31.4	32.0	29.5	29.5	29.6	34.9	34.9	35.0
Do.....	9	Ad. ♀	45.5	48.4	50.3	27.0	28.7	30.9	26.0	27.4	29.0	31.4	32.7	33.8

Merriam (8) has rather fully outlined the early history of *Geomys bursarius*, and in his account has given reasons for believing that the type specimen of the *Mus bursarius* of Shaw (16), which was reported as having been "taken by some Indian hunters in the upper parts of

interior Canada, and sent down to Quebec", was either the race (*rufescens*) of *Thomomys talpoides* common in that general region, or else the type specimen came from elsewhere in the northern part of the range of *Geomys bursarius*. Merriam further cited Shaw's descriptions of the color of the type specimen, and his figures of the size of its teeth and fore feet and claws, as indicating the *Thomomys* rather than the *Geomys*. But immature individuals, or even some early fall adults of *Geomys bursarius*, could qualify for Shaw's "ash-colour" (16) or "pale greyish-brown" (17) color reasonably well, and immaturity could well account for the relatively small size of the teeth and fore feet and claws. Shaw's failure to refer to the bisulcate upper incisors in his descriptions might well have been a mere inadvertence, especially since in the outline figure of the front view in natural size (17), there is what Merriam has described as "an incomplete dotted line near the middle of each upper incisor", but concerning which Coues (2) says "the plate clearly shows the grooved incisors".

Kuhl (4) placed the *Mus bursarius* of Shaw in a new genus, *Saccophorus*, synonymous with the prior genus *Geomys* of Rafinesque (12), after examining a specimen then in Paris but that formerly was in Bullock's Museum in London. In lack of any definite statement on the point by Kuhl, this may or may not have been the same specimen as that upon which Shaw based his descriptions of *Mus bursarius*; but as Shaw's specimen was in the Bullock Museum in 1819 (*vide* Lichtenstein, 5), and the specimen seen by Kuhl came from the Bullock Museum, it would be a likely assumption that Kuhl's *Saccophorus bursarius* was based on Shaw's original specimen. Merriam (8, p. 126), however, has pointed out some discrepancies between Shaw's and Kuhl's descriptions that tend to shed doubt upon such an assumption. But at any rate, unquestionably Kuhl's specimen represented a true *Geomys*, because in his generic diagnosis of *Saccophorus* the characteristic bisulcate upper incisors of *Geomys* are definitely mentioned, and probably his type specimen represented an immature individual of *G. bursarius*.

Lichtenstein (5) stated that he saw the specimen upon which Shaw had based his descriptions of *Mus bursarius* in the Bullock collection when he was in London in the summer of 1819. Richardson (13, p. 203) not only definitely stated that in Shaw's specimen the upper incisors "were deeply grooved in the middle, and more faintly close to their inner margins", thus definitely indicating that it was a *Geomys* (to which genus he then somewhat doubtfully, but later definitely referred it), but that (13, p. 199) "the identical specimen described by Shaw, \* \* \* on the dispersion of Mr. Bullock's collection, passed into the hands of Mr. Temminck." Merriam (8, p. 126) verified that in 1895 a specimen bearing the words "*Mus bursarius*, Cabinet Bullock, Londres" written with pencil on the under side of the stand, that undoubtedly had come from the Bullock collection, and that by its "deeply grooved" upper incisors was indicated to be a *Geomys*, was in the Leiden Museum. Altogether, the considerations and strong circumstantial evidence cited above make the burden of proof indicate that the type specimen of *Mus bursarius* of Shaw and the mammal that for decades has been referred to as *Geomys bursarius* (Shaw) really represent the same species, and that the Indian hunters who took the type specimen did so at a locality considerably farther south than was reported by Shaw.

Merriam (8, p. 120) designated the type locality of *Geomys bursarius* vaguely as an unknown place somewhere in the Upper Mississippi Valley. It seems clear to the writer that with a closer study of *Geomys bursarius*, subspecific segregates within the species eventually will be made, and that as a basis for such a development a more closely defined type locality is desirable. Passing by the *Mus ludovicianus* of Ord (10) and the *Diplostoma fusca* of Rafinesque (12) as *nomina nuda*, or nearly so, the

first adequately described synonym of *Mus bursarius* Shaw, with a definitely cited type locality within the present known range of the species, is the *Mus saccatus* of Mitchill (9), described "from the region bordering on Lake Superior", which would be somewhere in northwestern Wisconsin or northeastern Minnesota. Since there is extant in collections adequate material from Elk River, Sherburne County, Minnesota, in this general region, that locality is here designated as the restricted type locality of *Geomys bursarius* (Shaw).

The writer realizes the undesirability of unduly multiplying the named mammalian subspecies that are based solely or primarily upon size characters (so-called "millimeter subspecies"), but after a careful study of the measurement data summarized in the preceding Tables 1 and 2 has concluded that the unusually large form of prairie pocket-gopher inhabiting eastern Nebraska and western and south-central Iowa merits subspecific recognition by name, and therefore proposes that it be called

***Geomys bursarius majusculus* subsp. nov.**

**GREATER PRAIRIE POCKET-GOPHER**

*Type*.—Lincoln, Lancaster County, Nebraska, July 7, 1919. Old adult ♂, skin and skull. C. E. Mickel, collector. Allotopotype old adult ♀, skin and skull, July 7, 1919 (C. E. Mickel). Numerous ♂ and ♀ topotypes, skins and skulls, of various ages and pelages. Collection of M. H. Swenk.

*Subspecific Characters*.—Similar to typical *G. b. bursarius* of western Wisconsin, eastern and south-central Minnesota and eastern and central Missouri, but old adults attaining a decidedly larger size (see preceding tables of comparative measurements).

*Distribution*.—Eastern Nebraska (Knox, Pierce, eastern Madison, eastern Platte, Polk, Hamilton, Adams and Webster Counties, east to the Missouri River) and adjacent portions of southeastern South Dakota and northeastern Kansas, east through western and southern Iowa at least to Marion County.

*Color*.—*Adults in fresh late fall pelage* (October and November). Upper-parts variable in general color, but usually a rather dark reddish brown (about Hazel<sup>1</sup> of Ridgway<sup>2</sup>), this frequently varying to a more olivaceous hue (about Sayal Brown to Tawny Olive), the color usually palest and clearest on the sides, rump and base of tail; dorsal area variably admixed with dark-tipped hairs (which do not, however, form a distinct mid-dorsal band) but the sides and top of the head are so strongly admixed with such dark hairs as to cause a shading to a general dark brown (about Chestnut-Brown) color on the crown. Underparts usually pale brown (about Cinnamon) with the throat always wholly or largely white, the belly sometimes more or less grayish white, especially mid-ventrally. Fore and hind feet white, and usually terminal two-thirds of tail grayish white. *Adults in late winter and early spring* (February and March). Like fall adults, but upperparts a much duller brown (about Army Brown to Buffy Brown). *Adults in mid-summer* (July). Like fall adults, but upperparts distinctly redder and often slightly paler (about Kaiser Brown to Cinnamon-Rufous). *Adults in early fall* (September). Like adults in late winter and early spring but upperparts a yet paler and duller brown (varying from about Pecan Brown to about Fawn Color to Wood Brown, and even to Avellaneous).

<sup>1</sup>In none of the Nebraska series of *G. bursarius majusculus* examined by the writer is the general coloration as dark as Chestnut or Liver Brown, as is given by Merriam (8) for *G. bursarius*.

<sup>2</sup>Named colors are those of Ridgway, *Color Standards and Nomenclature* (1912).

*Juveniles in summer and early fall.* Upperparts about uniform Light Drab, darkening to about Dusky Drab on the crown, the underparts Drab-Gray, the throat, fore feet and terminal two-thirds of the tail whitish.

*Body Measurements* (in mm.).—Of type ♂: Length, 352; tail, 97; hind foot, 40. Of allotypotype ♀: 295; 85; 34.

*Skull.*—Somewhat larger than in typical *G. b. bursarius* (see preceding Table 2). Form long and angular, with, in the adult ♂, a long and narrow rostrum; temporal impressions united in the adults to form a well-developed sagittal crest, which is long and high in the ♂; palatopterygoids broadly tongue-shaped and tapering posteriorly; brain case rather long and high; in the ♀ the skull is much smaller than in the ♂, with a shorter rostrum, broader interorbital region, fuller brain case and lower or but feebly developed sagittal crest; in juveniles the zygomata are much less spreading and narrower anteriorly than posteriorly, instead of the reverse, the rostrum is shorter, the squamosals more reduced, the interparietal larger and subquadrate instead of small and triangular, and the sagittal crest is not at all developed. Measurements (in mm.). Of type ♂: Greatest basal length, 62.0; basal length, 57.0; basilar length of Hensel, 52.5; zygomatic breadth, 35.3; greatest breadth across squamosals, 33.3; breadth at postglenoid notch, 22.0; interorbital breadth, 6.5; height of cranium above palate, 20.0; height of cranium above basion, 15.7; upper molar series on alveoli, 9.7; breadth of muzzle at root of zygoma, 11.3; greatest length of single half of mandible without teeth, 41.5; greatest breadth of mandible across angular processes, 37.0; distance from condyle to angular process, 14.7. Of allotypotype ♀: 49.0; 46.0; 42.2; 30.0; 29.0; 20.5; 8.0; 17.8; 14.4; 8.0; 10.1; 32.9; 30.3; 11.5.

The cultivable soil of eastern and south-central Nebraska is a fine and even-textured, loose and friable, soft silt loam, known as the loess formation. This loess soil is the home of *Geomys bursarius majusculus*, which, while its distribution does not cover all of the loess soil area of Nebraska, is not to be found out of it.

In that part of the state lying east of about longitude 97°, the loess soil is very deep and quite uniform in structure, being chiefly of a characteristic pale yellowish brown or light grayish brown to grayish yellow color, with the surface soil much darker, varying from dark grayish brown to almost black. The surface soil is locally known commonly as "black dirt", and the buffy subsoil as "yellow clay"; but the latter transforms into the former on continued exposure and the accumulation of humus. The parent substratum, and sometimes also the surface soil, contains considerable lime, and usually there is also a little fine sand and clay. This loess soil forms the level or gently rolling prairies of southeastern Nebraska and the undulating to sharply rolling prairies of northeastern Nebraska. It absorbs and holds rains very well, and in seasons of normal precipitation is quite moist. The vegetation of the uplands can withstand ordinary drouths, consisting as it does chiefly of the tall prairie grasses, largely bluestems (*Andropogon* sp.), with narrow strips of cottonwood, ash, elm, hackberry and, southwardly, some hardwood trees, in the valleys and along the stream bottoms.

From this parent loess have been derived several important soil types. In Nebraska, along the Missouri River bluffs from about opposite Sioux City, in Dakota County, south to about Peru, Nemaha County, over Douglas, Sarpy, Cass and Otoe Counties, west through southern Dodge to southern Colfax, and through Saunders to northeastern Butler and Lancaster Counties, and eastward over a large area in western and central Iowa and northwestern Missouri, the silty loess soils of the Marshall series are the most important. The level to gently rolling uplands over the rest of southeastern Nebraska east of Seward, Saline and Jefferson Counties, and south through northeastern Kansas to the Kansas

River, are chiefly composed of the loamy soils of the Carrington series, the scattered pink Sioux quartzite boulders indicating the presence of glacial drift. And in northeastern Nebraska east of longitude 98°, in Knox, Cedar, Dixon, Pierce, Madison, Wayne, Stanton, Cumming and the more western parts of Dakota, Thurston and Burt Counties, as well as northward in the valley of the Big Sioux River in South Dakota and in extreme northwestern Iowa, occur the more sharply rounded loess hills, largely composed of soils of the Moody series, in which the surface soils are higher in lime content than the very similar Marshall soils. Prairie pocket-gophers are normally rather uniformly distributed over the uplands of all of the areas above mentioned, and in the more sandy loam soil types on the bottomlands, but they generally avoid the heavy black river bottom soils, or "gumbo", which is a harder digging medium and more subject to excessive moisture accumulation.

West of southeastern Jefferson, Gage, Lancaster and eastern Seward and Butler Counties, in southeastern Nebraska, the Carrington and Marshall soils are replaced by loess-covered claypan soils of the Crete and Hastings series, which are dark grayish brown silt loam surface soils overlying a brown and more or less heavy claypan upper subsoil, which in turn overlies a lime-bearing silty lower subsoil. These soils are not quite so well adapted to the activities of the prairie pocket-gopher, but nevertheless it occupies them over western Butler, western Seward, Saline, western Jefferson, Polk, York, Fillmore, Thayer, eastern and southern Hamilton, Clay, eastern Adams, and most of Nuckolls and Webster Counties. West of the Crete and Hastings soils, in south-central Nebraska and adjacent parts of Kansas, and west of eastern Platte County just north of the Platte River, the upland soils are chiefly those of the Holdrege series, which, while lacking the claypan and being composed of a silt loam loess, apparently are so deficient in moisture as to form a barrier for the further westward penetration of *Geomys bursarius*. North of southern Dodge, Colfax and Platte Counties, the westward range of this species conforms very closely to the areas in which the Moody soils are dominant, and ends where these give way to the relatively shallow and dry shale-derived Boyd and sandstone-derived Holt soils, or the sandhill dune sand.

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