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David C. Lovell  
*Colorado Division of Wildlife*

William R. Whitworth  
*National Park Service*

Jerry R. Choate  
*Fort Hays State University*

Steven J. Bissell  
*University of Denver*

Michael P. Moulton  
*University of Florida*

*See next page for additional authors*

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David C. Lovell1,2, William R. Whitworth1,3, Jerry R. Choate1, Steven J. Bissell4, Michael P. Moulton1,5, and Justin D. Hoffman1

1Sternberg Museum of Natural History
Fort Hays State University,
Hays, Kansas 67601

2Colorado Division of Wildlife
4255 Sinton Road,
Colorado Springs, Colorado 80907

3National Park Service
2680 Natchez Trace Parkway,
Tupelo, Mississippi 38804

4Environmental Policy Management Program, University College,
University of Denver
Denver, Colorado 80208

5Department of Wildlife Ecology and Conservation,
P.O. Box 110430, University of Florida
Gainesville, FL 32611

ABSTRACT

Distributional patterns of the four species of pocket gophers in southeastern Colorado are variously parapatric, allopatric, or sympatric. More specifically, Geomys bursarius is parapatric with Thomomys talpoides, Thomomys bottae, and Cratogeomys castanops; T. bottae is both sympatric and parapatric with C. castanops; and both C. castanops and T. bottae are allopatric with T. talpoides. Geomys bursarius is restricted to sandy soils and soils of cultivated or otherwise disturbed habitats. Cratogeomys castanops and T. bottae occupy a wide variety of soils but are found most commonly in compacted rangeland soils. Thomomys talpoides is found in well-drained upland soils. The distribution of C. castanops in southeastern Colorado is much more extensive than previously believed. Our new data support the competitive exclusion model with respect to these species but suggest that the geographic relationships among them are more complex than previously supposed.

† † †

Four species of three genera of pocket gophers (Geomyidae) reach limits of their geographic distributions in southeastern Colorado (Fitzgerald et al. 1994). Botta's pocket gopher (Thomomys bottae) is a southwestern species that ranges eastward across southern Colorado. The northern pocket gopher (Thomomys talpoides) is a montane species that is widely distributed in mountainous areas of Colorado and ranges eastward onto the plains only on the divide between the Platte and Arkansas rivers. The plains pocket gopher (Geomys bursarius) is a Great Plains species that ranges westward into eastern Colorado. Finally, the yellow-faced pocket gopher (Cratogeomys castanops) is a species of the Mexican Plateau that ranges northward into southeastern Colorado (Armstrong 1972). The geographic distributions of the four species come together in a complex fashion in southeastern Colorado.

It has been assumed that pocket gophers have similar niches and that their distributions tend to be allopatric (Best 1973, Blair and Miller 1949, Hansen 1960, Miller 1964, Thornton and Creel 1975, Turner et al. 1977, Vaughan 1967, Vaughan and Hansen 1964). One of these studies (Miller 1964) often is cited as evidence for the competitive exclusion principle (Hardin 1960). Miller (1964) studied the four species of pocket gopher.
in southeastern Colorado and concluded that optimal conditions for all four were deep, friable (usually sandy) soils. When the four species competed for optimal habitat, they could be arranged in a series (G. bursarius, C. castanops, T. bottae, and T. talpoides) with the first species tending to displace all others and the last species displacing none. Sizes of their fundamental niches, however, were inversely related to competitive ability in optimal habitat. Thus, G. bursarius lives in the best habitat because it can displace all species there, but it cannot invade less suitable habitats. In contrast, T. talpoides, although it potentially has the largest fundamental niche, usually exists in marginally poor habitats that are unsuitable for the other species (Hutchinson 1965). Miller (1964) concluded that the distributions of pocket gophers in southeastern Colorado were the result of past or present competition.

Miller (1964) evidently was unaware that an earlier investigator had noted that G. bursarius and C. castanops occurred together over much of southeastern Colorado, G. bursarius being restricted to sandy soils and C. castanops occurring in less friable rangeland soils (Cary 1911). Moulton et al. (1983) substantiated Cary’s (1911) findings by documenting the presence of G. bursarius in sandy roadside ditches immediately adjacent to hardpan rangeland in which C. castanops occurred. Miller (1964: 256) believed that “Two species may exist in close proximity and their ranges may even interdigitate, but they maintain a relationship of contiguous allopatry and do not form mixed-species populations.” Today, “contiguous allopatry,” in which otherwise sympatric species are separated ecologically, is known as paraapatry (e.g. Vaughan 1967).

Armstrong (1972) and Fitzgerald et al. (1994) summarized known distributional data for pocket gophers in Colorado. They agreed with Miller (1964) that distributional patterns of pocket gophers were parapatric, and they supported the competitive exclusion explanation. However, Moulton et al. (1979, 1983) discovered a narrow zone of sympatry of T. bottae and C. castanops atop Mesa de Maya in southeastern Colorado (Las Animas Co.) and suggested that competitive exclusion might not adequately explain these distributions. They noted that three additional instances of sympatric populations of pocket gophers had been documented elsewhere (Hall and Villa-R. 1949, Reichman and Baker 1972, Russell 1968), but that no attempt had been made to determine whether those sympatric populations exhibited differentiation in realized niches.
We believed that the actual distributions of pocket gophers in southeastern Colorado were not sufficiently understood to address those issues. The purposes of our study, therefore, were to delineate those distributions more clearly and to assess the validity of Miller's (1964) conclusions.

METHODS AND MATERIALS

Our study area (Fig. 1) included parts of the High Plains, Colorado Piedmont, and Raton Sections of the Great Plains Physiographic Province in southeastern Colorado (Fenneman 1931). The area was defined on the west by Interstate Highway 25, on the south by the state boundaries of New Mexico and Oklahoma, on the east by the Kansas state line, and on the north by the First Standard Parallel South. The study area encompassed about 50,000 km².

All known localities of capture for pocket gophers from southeastern Colorado were compiled and mapped. Additional pocket gophers were collected using Victor and Macabee traps in spring and summer from 1980 through 1985. All specimens were preserved and deposited at the Denver Museum of Nature and Science or the Sternberg Museum of Natural History. A soil sample was taken from each pocket gopher's mound, and vegetation and land use in the surrounding area were recorded. Burrow depth was measured from the surface to the bottom of the tunnel where it became horizontal. If the burrow branched, depths of both branches were measured and the average was recorded. Soil samples were analyzed using the hydrometer method (Kilmer and Alexander 1949). Descriptive statistics for burrow depth and soil texture were determined for each species using the UNIVARIATE procedure of Statistical Analysis System (SAS) 84.2 (SAS Institute Inc. 1982). Means were compared using Tukey’s Studentized Range Test (HSD) of the TUKEY option (GLM procedure) of SAS.

RESULTS

All known distributional records for pocket gophers in southeastern Colorado, including > 400 specimens that we collected, are listed in Appendix 1. Geographic patterns shown by those distributional records are described below.

Northern pocket gopher

Specimens of *Thomomys talpoides* were collected on the plains that separate the South Platte drainage to the north from the Arkansas drainage to the south and extending from the Front Range of the Rocky Mountains eastward to a place 2.4 km west of Seibert, Kit Carson Co. (Fig. 2). Hall (1951) reported that this species occurred even farther east, at a place 8 mi. south of Seibert (Hall 1981). Although we observed activity of pocket gophers at that location, we were unable to capture any individuals. We documented the existence of the species for the first time in Cheyenne Co. (Fitzgerald et al. 1994).

Plains pocket gopher

The distribution of *Geomys bursarius* (Fig. 3) does not differ appreciably from that described by Armstrong (1972) except that we documented the species in burrow pits in Lincoln Co. along Colorado highway 94 from...
The first, approximately 5 km wide, was documented by Moulton et al. (1979) on the west end of Mesa de Maya in Las Animas Co. Vegetation on the mesa consists of shortgrass and midgrass prairie with piñon pine (Pinus edulis) and one-seeded juniper (Juniperus monosperma) on breaks (Rogers 1953). We discovered a second zone of sympatry, southeast of Walsenburg in Huerfano and Las Animas counties, that is approximately 40 km long and 25 km wide and encompasses an area of 1000 km². Predominant vegetation in that area of shortgrass prairie includes buffalo grass (Buchloë dactyloides), blue grama (Bouteloua gracilis), yucca (Yucca glauca), and prickly pear (Opuntia sp.). In both instances of sympatry, the soil was compact. East of Walsenburg, on the north side of highway 10, Huerfano Canyon appeared to be a geographic barrier preventing interaction between T. bottae and C. castanops as far north as the Arkansas River. T. bottae was captured only on the west side of the canyon, and C. castanops was taken only on the east side. No attempt was made to trap pocket gophers in the canyon or farther north, where the canyon fans out into a broad alluvial plain.

We also discovered another possible zone of sympatry between C. castanops and T. bottae in the vicinity of Boone and Avondale along the south side of the Arkansas River east of Pueblo in Pueblo Co. However, in that area T. bottae was trapped in cultivated fields adjacent to the river, whereas C. castanops occupied rangeland sites adjacent to the cultivated fields. Therefore, this relationship was parapatric.
Table 1. Textural components of soils inhabited by pocket gophers in southeastern Colorado. Vertical lines indicate groups that were not significantly different at the 5% level.

<table>
<thead>
<tr>
<th>Species</th>
<th>n</th>
<th>mean</th>
<th>range</th>
<th>mean</th>
<th>range</th>
<th>mean</th>
<th>range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomys bursarius</td>
<td>128</td>
<td>71.5</td>
<td>16.5-97.0</td>
<td>17.1</td>
<td>2.1-58.0</td>
<td>11.3</td>
<td>0.0-28.0</td>
</tr>
<tr>
<td>Thomomys talpoides</td>
<td>99</td>
<td>55.4</td>
<td>16.0-88.0</td>
<td>28.8</td>
<td>5.7-71.3</td>
<td>15.9</td>
<td>2.0-35.9</td>
</tr>
<tr>
<td>Thomomys bottae</td>
<td>45</td>
<td>44.3</td>
<td>21.0-76.0</td>
<td>29.8</td>
<td>10.0-47.9</td>
<td>25.8</td>
<td>11.4-40.0</td>
</tr>
<tr>
<td>Cratogeomys castanops</td>
<td>51</td>
<td>39.1</td>
<td>10.5-82.0</td>
<td>36.1</td>
<td>9.1-79.5</td>
<td>24.2</td>
<td>8.9-41.7</td>
</tr>
</tbody>
</table>

DISCUSSION

Geomys bursarius

Geomys bursarius is strongly associated with sandy soils and with soils that originally were compact but were made more friable by cultivation. The latter soils frequently have been invaded by disturbance vegetation. Other investigators have documented the affinity of G. bursarius for sandy, disturbed areas (Best 1973, Davis et al. 1938, Hansen 1960, Miller 1964, Moulton et al. 1983, Russell 1953). Conversely, clay soils act as a barrier to G. bursarius (Downhower and Hall 1966, Russell 1968). In southeastern Colorado, G. bursarius was conspicuously absent in native rangeland with compacted soils. In the area around Mesa de Maya in Baca and Las Animas counties, Moulton et al. (1983) found G. bursarius restricted to sandy roadside ditches (the sand having been trucked in for road maintenance), cultivated fields, and other disturbed habitats.
North of Avondale in Pueblo and El Paso counties, G. bursarius was restricted to an area of aeolian sand extending north from the Arkansas River and surrounded by compacted rangeland soils. Miller (1964) thus was correct in his assertion that G. bursarius prefers sandy soils. Also, it is possible that G. bursarius, which has the narrowest niche requirements of the four species in southeastern Colorado in terms of soil texture, is the superior competitor in this soil type and excludes the other species.

The overall distribution of G. bursarius also has been influenced by the environmental history of the region. Most sandy soil in southeastern Colorado is associated with the Cimarron and Arkansas rivers and their tributaries. Before development of agriculture and the onslaught of the Dust Bowl in this region, G. bursarius likely was restricted to these areas. Moulton et al. (1983) believed that intensive cultivation in certain areas of southeastern Colorado in the early 1900s established corridors of friable soils that supported disturbance vegetation. Subsequent construction of elevated, sandy roads increased the number of favorable routes for dispersal of this species into areas previously occupied by C. castanops and possibly T. bottae. Additionally, wind blown sand and silt from the Dust Bowl was deposited throughout southeastern Colorado, further enabling G. bursarius to expand its range. We predict that the range of G. bursarius will continue to expand along roadside ditches and creek margins and in areas where native prairie is converted into cropland.

Thomomys talpoides

The range of T. talpoides in southeastern Colorado is parapatric with that of G. bursarius and allopatric with those of C. castanops and T. bottae. T. talpoides is present in habitats characterized by short and midgrass prairie and scattered ponderosa pine (Pinus ponderosa), one-seeded juniper, and scrub oak (Quercus). The soil is well drained, and the topography (except on the divide between the South Platte and Arkansas river drainages) generally is unsuitable for cultivation. The distribution of T. talpoides may not be limited to a great extent by soil texture or friability (Miller 1964).

These observations suggest that T. talpoides is able to avoid competition with G. bursarius by occupying habitats that are not suitable for that species. However, the habitat refugium occupied by T. talpoides on the land separating the South Platte and Arkansas river drainages is being negatively impacted by intensive agricultural development that has taken place in the past 20 years, and these agricultural perturbations have enabled G. bursarius to encroach upon that habitat. On the western end of the divide between the South Platte and Arkansas rivers, T. talpoides also is being impacted by urban and suburban development. We predict that the range of T. talpoides in southeastern Colorado will become increasingly restricted due to changes in land use.

Thomomys bottae

The range of T. bottae in southeastern Colorado appears dendritic in that it is associated with the Fountain, Arkansas, Cucharas, and Huerfano drainages. We documented T. bottae predominantly in areas characterized by compacted soils and shortgrass prairie, although it also was captured in irrigated fields southeast of Colorado Springs, south of the Arkansas River in the vicinity of Boone and Avondale (Pueblo Co.), and east of Walsenburg (Huerfano Co.). soils occupied by T. bottae tend to contain much less sand and more clay than those occupied by G. bursarius, but T. bottae also was found in sandy soils in areas not yet reached by G. bursarius. Previous authors (e.g., Fitzgerald et al. 1994) assumed that this species preferred sandy soils and avoided soils high in clay.

Cratogeomys castanops

Cratogeomys castanops was found almost exclusively in compacted rangeland soils. These soils sometimes contain more clay than soils occupied by G. bursarius. In southeastern Colorado, C. castanops seldom was found in sandy soils and disrupted habitats. In contrast, Fitzgerald et al. (1994), like Miller (1964), assumed that sandy soils were the preferred habitat of C. castanops. In fact, Miller (1964) based his assertion that C. castanops was an inferior competitor to G. bursarius, the latter having displaced C. castanops over much of its range in southeastern Colorado, on that assumption. We found no evidence of this in our study, but we assumed this was the result of competitive exclusion from those habitats. Our results suggest that C. castanops is as much at home in compacted soils as in sandy or otherwise friable soils.

Sympatric T. bottae and C. castanops

Thomomys bottae and C. castanops are sympatric in at least two areas of southeastern Colorado. Soils and vegetation do not appear different between areas of sympathy and other areas where only one or the other of these species occur. Moulton et al. (1979) hypothesized that differences in burrow depth might reduce the frequency of interspecific encounters, but we found no significant differences in our study. Moreover, burrow depths may not effectively reduce the frequency of interspecific encounters because pocket gophers periodically burrow to the surface to feed or expel soil, and interactions could occur when feeding tunnels inter-
sandy soil is the preferred habitat of all four species and that *C. gophers* in southeastern Colorado are all allopatric or parapatric with *C. castanops*; *T. bottae* is the better competitor of the two species and should exclude *C. bottae* from the sandier, more friable soil in cultivated fields. In this regard, *C. castanops* is a species of the Mexican Plateau that reaches the northern limits of its range in southeastern Colorado, whereas *T. bottae* is a southwestern species that reaches the northeastern limits of its range in southeastern Colorado. These two species thus are variously sympatric and parapatric near the limits of their ranges in habitats that might be marginal for both. If so, then their distributions in southeastern Colorado might be influenced nearly as much by chance as by competition.

**CONCLUSIONS**

Distributional patterns of pocket gophers in southeastern Colorado are variously parapatric, allopatric, or sympatric. More specifically, *Geomys bursarius* is parapatric with *Thomomys talpoides*, *Thomomys bottae*, and *Cratogeomys castanops*; *T. bottae* is both sympatric and parapatric with *C. castanops*; and both *C. castanops* and *T. bottae* are allopatric with *T. talpoides*. Competition to the extreme, resulting in competitive exclusion, cannot be ruled out as the initial cause of environmental preferences and specialization exhibited today by the four species of pocket gophers. Accordingly, Miller's (1964) investigation of the four species remains an extraordinary example of the competitive exclusion model. However, we have shown that Miller's (1964) assertion that the ranges of the four species of pocket gophers in southeastern Colorado are all allopatric or parapatric is incorrect. Moreover, his assumptions that sandy soil is the preferred habitat of all four species and that *C. castanops* is competitively superior to *T. bottae* are suspect. Obviously, more work remains to be done to fully understand the biogeography of these species.

**ACKNOWLEDGMENTS**

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**LITERATURE CITED**


**APPENDIX 1**

The following list includes all museum specimens of *C. castanops*, *G. bursarius*, *T. bottae*, and *T. talpoides* known to us from southeastern Colorado, including those we collected during the course of our study. Specimens listed are housed in institutions identified by the following abbreviations: AMNH, American Museum of Natural History; CSU, Colorado State University; DMNS, Denver Museum of Nature and Science; KU, University of Kansas Natural History Museum; MIZ, Museum of Comparative Zoology, Harvard University; MHP, Sternberg Museum of Natural History, Fort Hays State University; NMNH, National Museum of Natural History; NMSU, New Mexico State University; SC, Southern Colorado State College; TTU, The Museum of Texas Tech University; UCM, University of Colorado Museum; UMMZ, Museum of Zoology, University of Michigan; UCLA, United States Army Construction Engineering Research Laboratory Biological Inventory Collection, Champaign, Illinois; USGS, U. S. Geological Survey, Biological Survey Collections; WC, Western College of Colorado (now housed in the University of Colorado Museum). Localities are arranged alphabetically by reference location, north to south with respect to reference locations, and west to east at a particular latitude.

**Cratogeomys castanops**

**BACA COUNTY:** 6 mi S, 10 mi W Camp, Picture Canyon, 1 (UCM); Furnace (Furnish) Canyon, 9 (DMNS); Gaume’s Ranch, 4600 ft., 2 (WC); Monon, 2 (WC); 17 mi S, 4 mi W Pritchett (T34S, R49W, Sec. 5), 3 (MHP); 18 mi S, 4.25 mi W Pritchett (T34S, R49W, Sec. 8), 1 (MHP); Regnier, 1 (DMNS); Bear Creek, N of Springfield, 6 (WC).

**BENT COUNTY:** prairie road to Bent’s Fort, 1 (NMNH); 2.2 mi S, 1.5 mi W John Martin Dam (T23S, R50W, Sec. 25), 2 (MHP); 3 mi S, 1.5 mi W John Martin Dam (T23S, R50W, Sec. 36), 1 (MHP); 5.5 mi S, 1.5 mi W John Martin Dam (T24S, R50W, Sec. 12), 1 (MHP); Las Animas, 6 (DMNS); 12 mi E La Junta, 1 (KU); 14 mi E La Junta, 1 (KU).

**EL PASO COUNTY:** 18.5 mi N, 9 mi W Boone, Pueblo Co. (T17S, R36W, SE ¼ Sec. 33), 1 (DMNS); 14 mi W Elliott (T16S, R36W, Sec. 29), 1 (MHP); 16 mi S, 2 mi W Elliott (T17S, R36W, Sec. 4), 1 (MPH); 17 mi S, 4 mi W Elliott (T17S, R36W, Sec. 8), 1 (MHP). **HUERFANO COUNTY:** 3.5 mi E jct of I-25 and highway 10, 1 (MHP); 2.5 mi S, 7.5 mi E jct of I-25 and highway 10 (T27S, R66W, NW ¼ Sec. 25), 1 (DMNS); 5 mi S, 7.5 mi E jct of I-25 and highway 10 (T27S, R66W, SW ¼ Sec. 31), 1 (DMNS); 5.5 mi S, 7.5 mi E jct of I-25 and highway 10, 1 (MHP); 5.25 mi S, 7.5 mi E jct of I-25 and highway 10 (T28S, R64W, SW ¼ Sec. 7), 1 (DMNS); 7 mi S, 13.5 mi E jct of I-25 and highway 10, 1 (MHP); 8.6 mi S, 7.5 mi E jct of I-25 and highway 10 (T28S, R64W, NE ¼ Sec. 20), 1 (DMNS); 9.6 mi S, 7.5 mi E jct of I-25 and highway 10 (T28S, R64W, NE ¼ Sec. 20), 1 (DMNS); 9.6 mi S, 7.5 mi E jct of I-25 and highway 10 (T28S, R64W, NE ¼ Sec. 21), 1 (DMNS); 15 mi N, 19 mi E Walsenberg (T25S, R63W, NE ¼ Sec. 27), 1 (DMNS); 14.5 mi N, 14 mi E Walsenberg (T26S, R63W, SW ¼ Sec. 26), 1 (DMNS); 13.5 mi N, 14 mi E Walsenberg (T25S, R63W, SW ¼ Sec. 35), 1 (DMNS); 12.5 mi N, 14 mi E Walsenberg (T26S, R64W, NW ¼ Sec. 2), 1 (DMNS); 12 mi N, 14 mi E Walsenburg (T26S, R64W, SW ¼ Sec. 2), 1 (DMNS); 12 mi N, 18.5 mi E Walsenburg (T26S, R63W, SW ¼ Sec. 4), 1 (DMNS); 10.5 mi N, 19 mi E Walsenburg (T26S, R63W, NE ¼ Sec. 16), 4 (DMNS). **LAS ANIMAS COUNTY:** 9 mi N, 11.5 mi...
Pocket gophers in southeastern Colorado

Geomys bursarius

BACA COUNTY: 9.8 mi N Campo, 1 (KU); 15.3 mi W Campo, 2 (KU); 3.6 mi W Campo, 2 (KU); 8 mi S, 1.6 mi E Campo, 1 (KU); 8 mi S, 12.7 mi E Campo, 1 (KU); Craugh Ranch, Chimarron River, 1 (DMNS), Monocot, 3 (WC); 8 mi S Pritchett, 1 (KU); 13.5 mi S, 2 mi W Pritchett (T33S, R49W, Sec. 15), 1 (MHP); 15 mi S, 6.5 mi W Pritchett (T33S, R50W, Sec. 20), 1 (MHP); 17.25 mi S, 7.25 mi W Pritchett (T33S, R50W, Sec. 2), 1 (MHP); 12.3 mi S, 5.5 mi W Pritchett (T33S, R50W, Sec. 2), 1 (MHP); 20 mi S, 4.5 mi W Pritchett (T34S, R40W, Sec. 17), 3 (MP), Regnier, 1 (DMNS), 14 mi E Springfield (in owl pellet, KU uncataloged).

BENT COUNTY: Las Animas, 11 (1 USGS, 3 SC, 7 NMNH).

CHEYENNE COUNTY: 6 mi N Cheyenne Wells, 1 (WC); 5 mi W Kit Carson, 2 (NMNH); Kit Carson, 2 (NMNH); near Twin Buttes, 4800 ft., 1 (NMNH); 16 mi N Wild Horse, 5 (MP); 12 mi N, 5 mi E Wild Horse (T12S, R49W, Sec. 22), 1 (MP); 11 mi N Wild Horse (T12S, R50W, Sec. 21), 1 (MP); 10 mi N Wild Horse (T12S, R50W, Sec. 28), 1 (MP); 8 mi N, 5 mi E Wild Horse (T13S, R49W, Sec. 9), 1 (MP); 4 mi N, 6 mi E Wild Horse (T13S, R49W, Sec. 32), 1 (MP); 3 mi. N Wild Horse (T13S, R50W, Sec. 33), 1 (MHP); 11.6 mi W (by highway 94) Wild Horse, 3 (MP); 4.4 mi W (by highway 287) Wild Horse, 1 (MP); 3.5 mi S Wild Horse (T15S, R50W, Sec. 5), 1 (MP).

DOUGLAS COUNTY: Rose (D'Arcy) Ranch, 2 mi N Parker, 5 (KU).

ELBERT COUNTY: 6 mi NE Agate, 9 (KU); 5 mi N, 5 mi E Kiowa (T7S, R62W, Sec. 9), 1 (MHP); 15 mi S, 6.5 mi W Pritchett (T33S, R50W, Sec. 20), 1 (MHP); 12 mi S, 5.5 mi W Pritchett (T33S, R50W, Sec. 19), 1 (MHP).

EL PASO COUNTY: 1.5 mi N, 9 mi E Colorado Springs, 4 (CSU); Colorado Springs, 2 (WC); 1 mi E Colorado Springs Airport (T14S, R65W, Sec. 34), 2 (MP); 3 mi E Colorado Springs (T13S, R65W, Sec. 4), 1 (MP); 6 mi E Colorado Springs (T13S, R65W, Sec. 23), 2 (MP); 3.5 mi SW Colorado Springs, 2 (KU); 4 mi SE Colorado Springs, 1 (KU); 9 mi S, 4 mi W Elliott (T15S, R65W, Sec. 32), 1 (MP); 10 mi S, 3 mi W Elliott (T16S, R63W, Sec. 4), 1 (MP); 13 mi S, 4 mi W Elliott (T16S, R63W, Sec. 3), 1 (MP); 13 mi S, 4 mi W Elliott (T16S, R63W, Sec. 20), 1 (MP); 13 mi S Elliott (T16S, R63W, Sec. 20), 1 (MP); 14 mi S, 4 mi W Elliott (T16S, R63W, Sec. 28), 2 (MP); 15.5 mi S, 4 mi W Elliott (T16S, R63W, Sec. 33), 3 (MP); 16 mi S, 2 mi W Elliott (T17S, R63W, Sec. 5), 2 (MP); 16 mi S, 2 mi W Elliott (T17S, R63W, Sec. 4), 1 (MP); 15 mi N, 2 mi E Elliott (T17S, R62W, Sec. 5), 1 (MP); 17 mi S, 4 mi W Elliott (T17S, R63W, Sec. 8), 3 (MP); 17 mi S, 3.5 mi W Elliott (T17S, R63W, Sec. 4), 1 (MP); 0.5 mi E Fountain (T16S, R65W, Sec. 8), 1 (MP); 8 mi E Security (T15S, R64W, Sec. 6), 1 (MP); 13 mi S, 9 mi W Yoder (T16S, R62W, Sec. 16), 1 (MP); 14 mi S, 8 mi W Yoder (T16S, R62W, Sec. 21), 1 (MP).
EL PASO COUNTY: Colora...
Sec. 24), 1 (MHP); 10 mi (by hwy 83) S Franktown (T9S, R65W, Sec. 18), 1 (MHP); 6 mi N Monument, El Paso Co. (T10S, R67W, Sec. 24), 2 (MHP); 6 mi N, 4 mi E Monument, El Paso Co. (T10S, R66W, Sec. 4), 1 (MHP). **ELBERT COUNTY:** near head of Beaver Creek, 8 mi N Agate, 1 (DMNS); 1 mi S, 5 mi W Agate (T17S, R59W, Sec. 7), 1 (MHP); Bijou Creek, near El Paso Co. line, 3 (DMNS); 0.5 mi E Elbert (T9S, R64W, Sec. 23), 1 (MHP); 4 mi N, 3 mi E Elizabeth (T7S, R57W, Sec. 7), 1 (MHP); 4 mi N, 2 mi E Elizabeth (T7S, R58W, Sec. 9), 1 (MHP); 3 mi E, 2 mi W Elizabeth (T7S, R58W, Sec. 11), 1 (MHP); 1 mi S, 5 mi W Limon, Lincoln Co. (T12S, R57W, Sec. 3), 1 (MHP); 1 mi S, 5 mi W Limon, Lincoln Co. (T12S, R57W, Sec. 13), 1 (MHP); 4 mi N, 3 mi W Limon, Lincoln Co. (T12S, R60W, Sec. 8), 1 (MHP); 4 mi N, 5 mi W Limon, Lincoln Co. (T12S, R61W, Sec. 19), 1 (MHP); 12 mi S, 2 mi W Limon, Lincoln Co. (T11S, R63W, Sec. 28), 1 (MHP); 12 mi S, 4 mi W Limon, Lincoln Co. (T11S, R64W, Sec. 26), 1 (MHP); 13 mi S, 4 mi W Limon, Lincoln Co. (T11S, R64W, Sec. 28), 1 (MHP); 12 mi S, 4 mi W Limon, Lincoln Co. (T11S, R64W, Sec. 28), 1 (MHP); 9 mi S, 5 mi W Limon, Lincoln Co. (T11S, R64W, Sec. 28), 1 (MHP). **EL PASO COUNTY:** 1 mi N, 4 mi W Calhan (T11S, R63W, Sec. 3), 1 (MHP); 1 mi S, 5 mi W Calhan (T11S, R63W, Sec. 21), 1 (MHP); 5 mi S, 2 mi W Calhan (T10S, R62W, Sec. 34), 1 (MHP); 5 mi S, 4 mi E Calhan (T10S, R64W, Sec. 4), 2 (MHP); 9 mi S, 9 mi W Calhan (T10S, R63W, Sec. 21), 2 (MHP); 13 mi N Colorado Springs, 1 (UMMZ); 6.3 mi N Colorado Springs, 5 (KU); 3 mi N Colorado Springs, 2 (USM); 2 mi N Colorado Springs, 4 (USM); Colorado Springs, 8 (3 AMNH, 2 CU, 2 MCZ, 1WC); near Colorado Springs, 2 (WC); E of Colorado Springs, 1 (WC); 20 mi E Colorado Springs, 2 (UMMZ); 3 mi E Falcon (T13S, R64W, Sec. 10), 1 (MHP); 5 mi S, 2 mi E Falcon (T14S, R64W, Sec. 4), 2 (MHP); 1.5 mi N, 2.5 mi E Monument, 1 (MHP); Monument (Warren, 1937); 6 mi E Monument (T11S, R56W, Sec. 10), 1 (MHP); 14 mi E Monument (T11S, R64W, Sec. 13), 1 (MHP); 2 mi N, 1 mi W Peyton (T11S, R63W, Sec. 31), 1 (MHP); 5 mi E Peyton, 2 (KU); 2 mi W Ramah, 1 (KU); 2 mi W Ramah State Recreation Area (T11S, R61W, Sec. 18), 1 (MHP); 4 mi S, 1 mi E Ramah (T11S, R60W, Sec. 30), 1 (MHP); 7 mi N Rush (T9S, R60W, Sec. 11), 1 (MHP); 2 mi S Rush (T14S, R60W, Sec. 26), 1 (MHP); 1 mi E United States Air Force Academy (T12S, R66W, Sec. 20), 2 (MHP); 5 mi E United States Air Force Academy (T12S, R65W, Sec. 32), 1 (MHP). **KIT CARSON COUNTY:** Flagler, 1 (NMNH); 1 mi S Flagler (T9S, R51W, Sec. 11), 2 (MHP); 3 mi S, 4 mi E Flagler (T9S, R50W, Sec. 23), 1 (MHP); 5 mi S, 3 mi W Flagler (T9S, R51W, Sec. 33), 1 (MHP); 6 mi S, 5 mi W Flagler (T10S, R51W, Sec. 5), 1 (MHP); 6 mi S, 3 mi E Flagler (T10S, R51W, Sec. 4), 1 (MHP); 9 mi S Flagler (T10S, R51W, Sec. 24), 1 (MHP); 9 mi S, 1 mi E Flagler (T10S, R51W, Sec. 25), 1 (MHP); 9 mi S, 2 mi E Flagler (T10S, R50W, Sec. 19), 1 (MHP); 9 mi S, 3 mi E Flagler (T10S, R50W, Sec. 21), 1 (MHP); 12 mi S Flagler (T11S, R51W, Sec. 1), 1 (MHP); 16 mi S, 5 mi E Flagler (T11S, R50W, Sec. 26), 1 (MHP); 8 mi S Seibert (Hall, 1981); 12 mi S, 4 mi W Seibert (T11S, R50W, Sec. 1), 1 (MHP); 13 mi S, 4 mi W Seibert (T11S, R50W, Sec. 2), 1 (MHP); 13.5 mi S, 4 mi W Seibert (T11S, R50W, Sec. 11), 1 (MHP); 14 mi S, 4 mi E Seibert (T11S, R50W, Sec. 13), 1 (MHP); 17 mi S, 4.5 mi W Seibert (T11S, R50W, Sec. 26), 1 (MHP). **LINCOLN COUNTY:** 11 mi N, 2 mi W Bovina (T7S, R54W, Sec. 22), 1 (MHP); 11 mi N, 1 mi E Genoa, 1 (MHP); 10 mi N, 4 mi E Genoa, 1 (MHP); 4.5 mi N, 3 mi E Genoa (T8S, R54W, Sec. 16), 1 (MHP); 7 mi N, 3 mi E Limon (T8S, R56W, Sec. 28), 3 (MHP); Limon (Cary, 1911); 8 mi E Rush, El Paso Co., 1 (MHP); 11 mi E Rush, El Paso Co., 1 (MHP).