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THE MAMMALS OF JUSTICEBURG WILDLIFE MANAGEMENT AREA AND ADJACENT AREAS, GARZA AND KENT COUNTIES, TEXAS

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A study of the biodiversity of mammals on the Justiceburg Wildlife Management Area (JWMA), Garza and Kent counties, Texas, was initiated in the spring of 1992. The objective of the project was to compile information regarding the distribution and natural history of the mammals on the JWMA and the adjacent area. This report contains information that should be useful to scientists and managers with regard to the development of long-term planning, research, and sustained use of the JWMA and the surrounding Rolling Plains of West Texas.

METHODS AND MATERIALS

Between May, 1992, and November, 1993, periodic trips were made to the JWMA to collect and observe mammals. Most small mammals were collected in Sherman live-traps baited with oatmeal. These were set 10 meters apart in line transects through various habitats. Traps were set before sundown and retrieved after dawn the following morning. Some mammals, such as pocket gophers, required specialized traps. Other mammals were collected with firearms. Mist

nets were used to attempt to capture bats. Thorough field records were kept on all observations of mammals and mammal signs.

Mammals acquired during the course of this study were identified, prepared as voucher specimens (standard museum skins and skulls), and deposited in the Collection of Recent Mammals in the Natural Science Research Laboratory of the Museum of Texas Tech University. In addition, specimens of mammals from Kent and Garza counties housed in this facility were surveyed to supplement our field data.

DESCRIPTION OF THE STUDY AREA

The JWMA is located in southern Garza and Kent counties, Texas (Fig. 1). Lake Alan Henry Reservoir, which has been created by the construction of a dam across the Double Mountain Fork of the Brazos River, is situated adjacent to the JWMA. The entire area is located in a drainage plain immediately east of the Llano Estacado on the Rolling Plains region of Texas.

Topography of the site varies from nearly level plains on most of the JWMA, to high relief areas with steep, broken slopes and drainage channels leading down to the Double Mountain Fork of the Brazos River. The escarpment areas and dry creeks all serve as watersheds of the plains area and contribute runoff water to the Brazos River system and, hence, to Lake Alan Henry. The entire area is a narrow projection of the southwestern Rolling Plains, which originally was eroded away between the High Plains to the north (Llano Estacado) and the Edwards Plateau region to the south.

Soil associations vary depending upon location on the site. Data on soils were taken from county soil surveys for Garza and Kent counties prepared by the U.S. Department of Agriculture Soil Conservation Service (Richardson and Girdner, 1973; Richardson et al., 1975). Soils of the plains areas above the broken land and escarpments are mostly loams and clay loams. These soils are moderately deep and support a variety of vegetation. Soils found along small arroyos and gullies often are red clays, which are slowly permeable and easily saturated. Soils along the escarpment and soils leading down to the river channel of the Brazos are shallow, stony, and have developed

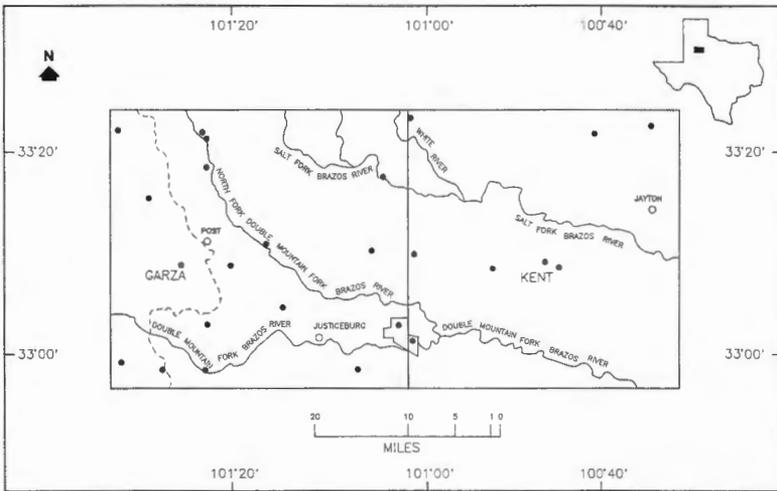


Figure 1. Map of Garza and Kent counties, Texas. The Justiceburg Wildlife Management Area is indicated by cross-hatching.

from Permian red clay beds and caliche. Vegetation on these rough, broken-land areas is sparsely distributed and, therefore, erosion potential is high for these localities. Soils along the river channel have been formed from alluvial materials and are mostly deep, fine sands, and silty loams.

Three plant communities may be described for the vicinity of the JWMA. The vegetation community of the level plains areas of the JWMA can be described as mesquite grassland. It is dominated by mesquite (*Prosopis glandulosa*) which is an invading, increaser species. Grasses present include blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), Canada wildrye (*Elymus canadensis*), Johnson-grass (*Sorghum halepense*), sideoats grama (*Bouteloua curtipendula*), silver bluestem (*Bothriochloa saccharioides*), and white tridens (*Tridens albescens*). Invading plants include broomweed (*Gutierrezia* sp.), croton (*Croton* sp.), catclaw (*Acacia wrightii*), Mormon tea (*Ephedra antisiphylitica*), prickly pear (*Opuntia* sp.), silver-leaf nightshade (*Solanum elaeagnifolium*), skeleton-plant (*Lygodesmia texana*), sunflower

(*Helianthus annuus*), tasajillo (*Opuntia leptocaulis*), three-awn grass (*Aristida* sp.), and western ragweed (*Ambrosia psilostachya*).

The vegetation community of the rough, broken, and steeply sloped areas are considered juniper roughland and are dominated by red-berry juniper (*Juniperus pinchotii*). Grasses generally are sparse, but include Canada wildrye, fall witchgrass (*Leptoloma cognatum*), hairy grama (*Bouteloua hirsuta*), and sideoats grama. Invading plants and other forbs of these communities include agarita (*Berberis trifoliolata*), catclaw, condalia (*Condalia* sp.), desert sumac (*Rhus microphylla*), prickly pear, and yucca (*Yucca* sp.). These communities are sensitive to erosion and other disturbances, and community structure is easily altered by abiotic and biotic factors.

The third plant community occurs adjacent to the Double Mountain Fork of the Brazos River, and is riparian in nature. Dominant tree species include black willow (*Salix nigra*), cottonwood (*Populus deltoides*), and hackberry (*Celtis occidentalis*). Grasses include Canada wildrye, little bluestem (*Schizachyrium scoparium*), sand dropseed (*Sporobolus cryptandrus*), and switchgrass (*Panicum virgatum*). Forbs and other invading plants include cocklebur (*Xanthium strumarium*), curly-cup gumweed (*Grindelia squarrosa*), prickly poppy (*Argemone albiflora*), salt cedar (*Tamarix* sp.), sand sage (*Artemisia filifolia*), western ragweed, wild plum (*Prunus rivularis*), and yucca. Community composition and structure is somewhat fragile, and plant replacement may be rather frequent because these areas periodically are subjected to flooding.

One upland plains locality on the eastern side of the JWMA has been burned and other brush control methods have been applied on this site since the beginning of this survey. These land management practices should help to restore, at least partially, the original vegetation in this section of the study site. Two localities within the JWMA, each approximately one half hectare in size, have been cleared of brush and seeded with wheat and barley. This practice helps to provide both winter grazing for deer, and, upon plowing, seeds for dove, quail, and other birds, as well as small mammals.

RESULTS AND DISCUSSION

During the course of this study, 21 species of mammals were documented to occur on the JWMA. These included one insectivore, one chiropteran, one geomyid, three heteromyids, nine murids (including one non-native form), four carnivores, and two cervids. In addition, there are 24 species of mammals in seven orders (Didelphimorphia, Insectivora, Chiroptera, Xenarthra, Lagomorpha, Rodentia, Carnivora) that were not documented from the JWMA, but, based on museum specimens and literature records, are known to occur in adjacent areas of either Garza or Kent County. We herein report a total of 45 species of mammals from the general area. Of these 45 species, 43 are known from Garza County, and 18 are recorded from Kent County. Moreover, this study resulted in the documentation of 15 new records of mammals from Garza County, and 10 new records of mammals from Kent County.

The large difference in the number of species of mammals noted from the JWMA, as opposed to Garza and Kent counties in general, does not indicate that there is a limited mammalian fauna on the study area. Most of the species of mammals known from similar habitats in Garza and Kent counties probably occur on the JWMA, either as residents or transients. It is predicted that continued monitoring and additional studies of the mammalian fauna will result in a longer list of species known to inhabit the JWMA.

ACCOUNTS OF SPECIES

In the following accounts, we discuss the 45 species of mammals recorded from the JWMA and elsewhere in Garza and Kent counties. Ordinal and familial headings are not included; however, accounts are presented in currently accepted phylogenetic order through genera. Species are arranged alphabetically within each genus. Scientific and vernacular names follow those of Jones and Jones (1992). For each species, we discuss its presence within the JWMA based on field work we conducted within the boundaries thereof. If undetected from the JWMA, we comment on its occurrence in adjacent areas of Garza and Kent counties. All linear measurements presented are in millimeters.

Didelphis virginiana virginiana Kerr, 1792
Virginia Opossum

The Virginia opossum is an inhabitant of woody areas along watercourses and streams (Blair, 1954; Jones et al., 1988), as well as juniper woodlands (Packard and Judd, 1968). Also, these mammals frequently are found near human dwellings (Jones et al., 1988). Although not detected during our investigation, Davis and Schmidly (1994) reported the occurrence of this marsupial from Garza County.

Specimens examined (0).

Cryptotis parva parva (Say, 1823)
Least Shrew

This small, somewhat gregarious shrew (Nowak, 1991) appears to be confined to mesic habitats (Jones et al., 1988), especially in grasslands (Nowak, 1991). Two specimens were taken during our survey of the JWMA, both in mesquite grassland of Garza County. A female, acquired on 7 August, was pregnant with five embryos (crown-rump length, 5) and a male, captured on 27 August possessed testes measuring 5 X 7.

Specimens examined (2).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 2.

Notiosorex crawfordi crawfordi (Coues, 1877)
Desert Shrew

The desert shrew favors xeric environments, primarily desert scrub (Jones et al., 1985). It is not, however, restricted to desert or semidesert conditions and has been taken in mesic habitats (Blair, 1954). No specimens of *N. crawfordi* were obtained during our field work, but museum specimens from Garza County do exist. Failure to collect this species does not necessarily indicate its absence from the JWMA. Both Blair (1954) and Jones et al. (1988) acknowledge the difficulty in capturing small shrews in conventional traps.

Specimens examined (29).—Garza Co.: 6.5 mi. E, 1 mi. S Post, 1; SN Ranch, 5 mi. S Post, 1; 1 mi. SE Post, 4; Post, 7; 1 mi. S Post, 14; 2 mi. S Post, 1; 10 mi. S Post, 1.

Scalopus aquaticus aereus (Bangs, 1896)
Eastern Mole

The eastern mole is associated with moist, sandy soil (Jones et al., 1988). No sign of this species was noted during our study. However, it is known from Garza County on the basis of a single specimen.

Specimens examined (1).—Garza Co.: 12 mi. S White River Lake, McArthur Ranch, 1.

Myotis velifer magnamolaris Choate and Hall, 1967
Cave Myotis

The cave myotis prefers caves, tunnels, rock crevices, and occasionally human structures as roost sites (Schmidly, 1991). We did not document its presence at the JWMA, nor did we examine any museum specimens of this bat from the area. It is known from Garza County only on the basis of literature records (Schmidly, 1991; Davis and Schmidly, 1994).

Specimens examined (0).

Pipistrellus hesperus maximus Hatfield, 1936
Western Pipistrelle

The western pipistrelle seems to favor rock crevices and areas underneath rocks as roost sites, but utilizes caves and tunnels as winter hibernacula (Schmidly, 1991). A single specimen was taken underneath an overhanging rock in the breaks at the eastern edge of the JWMA in Garza County. The individual was a gravid female carrying two near-term embryos (crown-rump length, 21) on 10 June.

Specimens examined (5).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 1; Justiceburg, 3; 14 mi. S, 2 mi. E Post, 1.

Eptesicus fuscus pallidus Young, 1908
Big Brown Bat

Although big brown bats often prefer buildings as roost sites, they also are known to roost in hollow trees, rock crevices, and tunnels (Schmidly, 1991). We took no specimens of *E. fuscus* from the JWMA, but museum records of this bat from both Garza and Kent counties are existent.

Specimens examined (167).—Garza Co.: Salt fork of Brazos River, Justiceburg, 2; Justiceburg, 1; 3 mi. E Justiceburg, 2; Post, 14; 14 mi. S, 1 mi. E Post, 1. Kent Co.: Girard, 147.

Plecotus townsendii pallescens (Miller, 1897)
Townsend's Big-eared Bat

Primarily a cave dweller (Schmidly, 1991), Townsend's big-eared bat was not recorded during the course of our field work. Three museum specimens, however, are known from Garza County.

Specimens examined (3).—Garza Co.: Post, 3.

Antrozous pallidus bunkereri Hibbard, 1934
Pallid Bat

Pallid bats frequently roost in caves, crevices, and buildings near rocky outcrops (Schmidly, 1991). We were unable to collect this species during our study, but specimens have been recorded from Garza County.

Specimens examined (2).—Garza Co.: 14 mi. S, 1 mi. E Post, 1; 7 mi. W Justiceburg, 1.

Tadarida brasiliensis mexicana (Saussure, 1860)
Brazilian Free-tailed Bat

The Brazilian free-tailed bat is among the most abundant and widespread bats of North America. In Texas, this species most often roosts in caves, but may also utilize buildings, bridges, rock crevices, and cliff swallow nests. Although not collected during our study, *T. brasiliensis* is known from both Garza and Kent counties. Prior to the examination of museum specimens, this bat was undocumented from Kent County (Yancey et al., 1995).

Specimens examined (94).—Garza Co.: Justiceburg, 1; Post, 1. Kent Co.: Girard, 92.

Dasypus novemcinctus mexicanus Peters, 1864
Nine-banded Armadillo

The nine-banded armadillo prefers woodlands, savannas, and scrub areas (Jones et al., 1985), especially those found on friable soils (Davis and Schmidly, 1994). We failed to detect this species within the boundaries of the JWMA. We did, however, collect one specimen just outside of the JWMA on Highway 84, one mile west of the Lake Alan Henry turnoff. This is the only known specimen of this species from Garza County (Yancey et al., 1995). In addition, employees of Granite Construction Company reported to have sighted armadillos in the general area of the dam.

Specimens examined (1).—Garza Co.: 12 mi SE Post, 1.

Sylvilagus audubonii neomexicanus Nelson, 1907
Desert Cottontail

The desert cottontail is primarily an inhabitant of upland habitats (Jones and Jones, 1992). None was collected by us during our investigation, but we examined two museum specimens taken from Garza County. This account represents the first published record of this species from Garza County.

Specimens examined (2).—Garza Co.: 7 mi. E Southland, 1; 8.5 mi. E Southland, 1.

Sylvilagus floridanus llanensis Blair, 1938
Eastern Cottontail

The eastern cottontail favors brushy areas (Davis and Schmidly, 1994) typical of several areas within the JWMA. During the course of our field work, we took three specimens of this species (all within Garza County) and several others were sighted. Of the three individuals collected, two were males with testes measuring 40 X 19 and 20 X 15 on 2 April and 26 August, respectively. The other was a female that exhibited four uterine scars on 16 April.

Specimens examined (4).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 3; 2 mi. S, 2 mi. W Post, 1.

Lepus californicus melanotis Mearns, 1890
Black-tailed Jackrabbit

The black-tailed jackrabbit has been reported as a resident of hot, dry scrubland (Davis and Schmidly, 1994), such as that found at the JWMA. Although sighted on rare occasions, none was taken during this study. We did, however, examine two specimens from Garza County, and one from Kent County. Although this species is common and widespread throughout West Texas (Davis and Schmidly, 1994), this report is the first documentation of specimens from these two counties.

Specimens examined (3).—Garza Co.: 2 mi. NE Jct. FM Rd 207 and FM Rd 211, 1; 2 mi. NW Post, 1. Kent Co.: 28 mi. W Girard, 1.

Spermophilus mexicanus parvidens Mearns, 1896
Mexican Ground Squirrel

The Mexican ground squirrel is associated with brushlands, as well as grasslands containing mesquite and cactus (Davis and Schmidly, 1994). Although these types of habitats are common within the JWMA, we detected no sign of this species. We did collect a single individual on land adjacent to the JWMA, and museum records

indicate the presence of this squirrel in both Garza and Kent counties. This represents the first published report of this species from Kent County.

Specimens examined (15).—Garza Co.: 1 mi. N Post, 1; 4 mi. SE Post, 1; 3 mi. N, 3 mi. W Post, 1; 3.5 mi. N, 5 mi. E Justiceburg, 1. Kent Co.: 6 mi. W Clairemont, 1.

Spermophilus spilosoma marginatus V. Bailey, 1890
Spotted Ground Squirrel

Spermophilus spilosoma, which favors sandy soils (Jones et al., 1988), was neither collected nor seen during our study. A museum specimen does, however, indicate its presence in Garza County. This is the first published record of a spotted ground squirrel from Garza County.

Specimens examined (1).—Garza Co.: 4.6 mi. E Southland, 1.

Spermophilus tridecemlineatus arenicola (A. H. Howell, 1928)
Thirteen-lined Ground Squirrel

Thirteen-lined ground squirrels are common inhabitants of short-grass habitats (Jones et al., 1988). As was the case with the previous two species of *Spermophilus*, we were unsuccessful in obtaining specimens of this squirrel during our study. However, a museum record indicates its presence in Garza County, from which it was previously unreported.

Specimens examined (1).—Garza Co.: 1 mi. W Post, 1.

Cynomys ludovicianus ludovicianus (Ord, 1815)
Black-tailed Prairie Dog

Black-tailed prairie dogs occur in colonies on short grass rangelands (Jones et al., 1988). We found no sign of these animals at the JWMA. There are, however, 18 museum specimens from a single locality in Garza County. These are the first specimens of black-tailed

prairie dogs reported from Garza County.

Specimens examined (18).—Garza Co.: 4 mi. W Post, 18.

Geomys bursarius major Davis, 1940
Plains Pocket Gopher

The plains pocket gopher favors sandy soils (Goetze and Jones, 1992), where it often is common and sometimes abundant (Jones et al., 1988). We collected four specimens of this species from our study area, all within Garza County. Museum specimens indicate its presence in Kent County as well. In addition, several burrows were noted in both Garza and Kent counties.

Of the four specimens taken, three were nongravid females caught on 24 January, 1 May, and 12 May. The other was a male (testes 25 X 20) captured on 24 January. Seasonal molting of an adult was observed on 24 January and subadult pelage of an individual was seen on 12 May.

Specimens examined (37).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 4; 4.5 mi. NW Post, 1; 3 mi. NW Post, 1; 10 mi. N Post, 1; 4 mi. E Justiceburg, 2; 7 mi. N Post, 6; 5.5 mi. SE Southland, 1; 0.25 mi. SE Justiceburg, 1; 0.3 mi. N, 0.5 mi. E Justiceburg, 1; 5.5 mi. S, 0.5 mi. W Post, 1; 2 mi. E Post, 2; 11 mi. E Post, 2; 0.5 mi. N, 1.5 mi. E Justiceburg, 1; 6 mi. SE Justiceburg, 1; 13.5 mi. S, 1 mi. W Post, 1; 0.5 mi. S, 3 mi. W Post, 1; 0.5 mi. S, 8.5 mi. W Post, 1; 8 mi. N, 8.5 mi. W Post, 1; 5 mi. N, 6.5 mi. W Post, 1; 2 mi. E Post, 1; 6 mi. SE Justiceburg, 1. Kent Co.: 2 mi. N, 26 mi. W Girard, 3; 1 mi. N, 15.5 mi. W Clairemont, 1; 2 mi. W Clairemont, 1.

Perognathus flavus gilvus Osgood, 1900
Silky Pocket Mouse

Silky pocket mice utilize a variety of habitats, including those with sandy substrates, hard soils, and large rocks (Davis and Schmidly, 1994). During our field work, we collected 45 of these small heteromyids throughout the JWMA (39 from Garza County and six from Kent County). Next to members of the genus *Peromyscus*, these

were the most frequently trapped mammals.

Pregnant females were observed on 12 May (five fetuses, crown-rump length, 6), 24 June (four fetuses, crown-rump length, 3), 21 July (five fetuses, crown-rump length, 9; six fetuses, crown-rump length, 4), and 29 July (three fetuses, crown-rump length, 13; four fetuses, crown-rump length, 9). Dimensions of testes of adult males ranged as follows: March, 4 X 2; April, 5 X 3 to 6 X 4; June, 3 X 2 to 7 X 3; July, 2 X 1 to 5; August, 2 X 1 to 3 X 2. Juveniles were caught on 1, 21, and 29 July, and 8, 15, and 27 August. Subadults undergoing post-juvenile molt were taken on 1, 21, 23, and 29 July. Adult pocket mice were in the process of seasonal molt on 12 May, 21 and 23 July, and 15 August.

Specimens examined (81).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 39; 3 mi. SW Post, 1; 6 mi. N Post, 2; Post, 1; 5 mi. E Justiceburg, 3; 10 mi. S Post, 1; 13 mi. S Post, 1; 4.6 mi. E Southland, 22; 14 mi. S, 1 mi. E Post, 4. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 6; 10 mi. N Jayton, 1.

Chaetodipus hispidus paradoxus (Merriam, 1889)
Hispid Pocket Mouse

This species of pocket mouse, which appears to favor sparsely vegetated prairies (Dalquest and Horner, 1984) as well as grassy and brushy habitats (Jones et al., 1988), was captured throughout much of the JWMA, but never in large numbers. A total of 12 specimens was taken; 9 from Garza County and three from Kent County. This is the first published report of *C. hispidus* from both Garza and Kent counties.

A gravid female that was collected on 21 July carried five fetuses (crown-rump length, 20). For males collected, testes measured as follows: April, 9 X 5 to 10 X 6; July, 5 X 3 to 9; August, 5 x 3 to 9. Subadults were taken on 21 July, and 27 and 30 August. Seasonal molting of adults was noted on specimens collected on 12 May.

Specimens examined (28).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 9; 6 mi. N Post, 1; Post, 1; Southland, 1; 2 mi. E Southland, 1; 4.6 mi. E Southland, 1; 7 mi. W Justiceburg, 2; 14 mi. S, 1 mi. E Post, 8; 7 mi. N Post, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 3.

Dipodomys ordii medius Setzer, 1949
Ord's Kangaroo Rat

This heteromyid inhabits areas with sandy soils (Jones et al., 1988), and was trapped on these soils during our study. Three specimens were taken in Kent County near the edge of the dry bed of the Brazos River. A female pregnant with three fetuses (crown-rump length, 19) was taken on 20 November. Two adult males captured on 20 November had testes measuring 10 X 5 and 11 X 7. Adults were undergoing seasonal molt on 20 November.

Specimens examined (49).—Garza Co.: 7 mi. E Post, 1; 6 mi. N Post, 1; 9 mi. N Post, 1; 10 mi. E Southland, 32; 6 mi. S Southland, 2; 14 mi. S, 1 mi. E Post, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 3; 2 mi. N, 26 mi. W Girard, 1; 26 mi. W Girard, 7.

Reithrodontomys megalotis aztecus J. A. Allen, 1893
Western Harvest Mouse

This harvest mouse has an affinity for grassy habitats (Davis and Schmidly, 1994; Jones et al., 1988), but apparently is uncommon near the JWMA. We took a single specimen from each of Garza and Kent counties. These two specimens of the western harvest mouse were the first reported from Garza and Kent counties (Yancey, et al., 1995).

Specimens examined (2).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 1.

Reithrodontomys montanus griseus V. Bailey, 1905
Plains Harvest Mouse

This species is reported to favor more xeric, upland conditions than does *R. megalotis* (Jones et al., 1985; 1988). We did, however, capture both species at the same site on two different occasions, both in grassy habitat. A total of five specimens was collected; two from Garza County and three from Kent County. The specimens taken from Kent County are the only ones known from this county (Yancey, et al., 1995). Testes of males measured 5 X 3, 6 X 3, and 2 X 1 on 3

April, 17 October, and 20 November, respectively.

Specimens examined (10).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 2; 4.6 mi. E Southland, 1; 4 mi. E Southland, 1; 1 mi. S, 9 mi. E Draw, 2; 1 mi. S, 6 mi. E Post, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 3.

Peromyscus attwateri (J. A. Allen, 1893)

Texas Mouse

The Texas mouse is an inhabitant of rocky outcrops with woody vegetation (Etheredge et al., 1989), typical of the habitat found near the breaks of the JWMA. This species was the most frequently captured mammal during our study. We took a total of 73 specimens, most from rocky areas associated with juniper from both Garza and Kent counties.

A single pregnant female carrying three fetuses (crown-rump length, 10) was taken on 30 August. Testes of adult males ranged as follows: January, 5 X 3 to 10 X 4; February, 6 X 4 to 8 X 5; March, 6 X 3; April, 5 X 3 to 9 X 5; May, 5 X 2 to 7 X 2; June, 4 X 2 to 8 X 4; July, 9 to 10 X 5; August, 8 X 5 to 13 X 8. A juvenile and a subadult were noted in the population on 11 June and 12 May, respectively. Adults were in the process of seasonal molting on 24 January, 11 June, and 30 August.

Specimens examined (115).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 66; 6 mi. E, 1 mi. S Post, 5; 4.5 mi. S Post, 1; 5 mi. E Post, 4; 5 mi. E Justiceburg, 1; 10 mi. S Post, 10; 5.5 mi. S Post, 1; 7 mi. W Justiceburg, 1; 4 mi. S Post, 1; 14 mi. S, 1 mi. E Post, 2; 15 mi. S, 5 mi. E Post, 4; 8 mi. S, 9 mi. W Post, 2; 7.25 mi. S, 8.5 mi. W Post, 5; 4.8 mi. S Post, 2; 4.5 mi. S Post, 2; 6 mi. E Post, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 7.

Peromyscus leucopus

White-footed Mouse

The systematic affinities of this species in the Garza-Kent County area are not well known. This region is near the geographic boundary

of two subspecies, *P. l. tornillo* Mearns, 1896 and *P. l. texanus* (Woodhouse, 1853), and may represent a zone of intergradation. It also is possible that the eastern escarpment of the Llano Estacado acts as a barrier, restricting *P. l. tornillo* to the Llano, with *P. l. texanus* occupying the area to the southeast (Choate, 1991). Close examination of these mice in this area is required before assigning them to a specific subspecies.

The white-footed mouse is one of the most common mammals of West Texas, due in part to its ability to utilize a variety of habitats, especially brushy or wooded areas (Davis and Schmidly, 1994). Our results are in accordance, as we trapped more members of this species than any other kind of mammal, with the exception of *Peromyscus attwateri*. Forty-eight individuals were taken throughout Garza and Kent counties. Pregnant females (numbers of fetuses and crown-rump lengths in parentheses) were noted on 6 June (2, 18), (4, 18); 24 June (4, 20); 30 August (5, 3), (4, 3); and 18 October (4, 8). Measurements of testes of adult males taken ranged as follows: January, 6 X 3 to 8 X 5; March, 7 X 4; April, 9 X 5 to 11 X 5; June, 4 to 7; July, 9 X 5 to 10; August, 10 X 6 to 16 X 4; September, 7 X 5 to 10 X 4; October, 9 X 6 to 11 X 7; November, 8 X 6 to 10 X 5. Juveniles were recorded from the population on 23 June; 9 and 23 July; 28 September; and 28 October. Subadults were noted in the population on 6 June and 20 November. Seasonal molting of adult pelage was seen on 5 and 6 June, 27 and 30 August, 17 October, and 20 November.

Specimens examined (129).—Garza Co.: 3 mi. N, 9 mi. E, Justiceburg, 35; 6 mi. E, 1 mi. S Post, 2; 4 mi. SW Post, 1; 2.5 mi. SE Post, 2; 6.5 mi. N Post, 3; Post, 1; 1 mi. N Post, 2; 6 mi. S Southland, 1; 6 mi. E Southland, 1; 10 mi. S Post, 4; 2 mi. E Southland, 3; 7 mi. W Justiceburg, 3; 13 mi. S Post, 26; 14 mi. S, 1 mi. E Post, 3; 16 mi. S, 5 mi. E Post, 1; 1 mi. S, 9 mi. E Draw, 4; 8 mi. S, 9 mi. W Post, 2; 6 mi. S, 6.5 mi. E Post, 16. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 13; 2 mi. N, 26 mi. W Girard, 4; 26 mi. W Girard, 2.

Peromyscus maniculatus luteus Osgood, 1905
Deer Mouse

Because of its ability to utilize a wide variety of habitats, the deer mouse is the most broadly distributed species of *Peromyscus* in North America (Glazier, 1980). Its range extends from coast to coast (Hall, 1981), and it is known from every major ecological area of North America (Baker, 1968). The subspecies known from Garza County may actually be an intergrade between *P. m. luteus* and *P. m. pallescens* (Cooper et al., 1993). Although this taxon has an ecological affinity for mesquite grassland (Cooper et al., 1993), which is abundant on the JWMA, we collected no specimens. However, museum records verify its presence in Garza County, and it is reported in the literature from both Garza and Kent counties (Davis and Schmidly, 1994).

Specimens examined (13).—Garza Co.: 0.75 mi. E Post, 1; Southland, 3; 6 mi. SE Southland, 1; 1 mi. N Post, 1; 6 mi. E Southland, 2; 1 mi. W Post, 3; 4 mi. E Southland, 1; 4 mi. S Post, 1.

Baiomys taylori taylori (Thomas, 1897)
Northern Pygmy Mouse

The pygmy mouse tends to favor short grass situations (Davis and Schmidly, 1994), and a total of five individuals was trapped in such habitats in both Garza and Kent counties, within the JWMA. Four individuals listed here are the only known specimens of this species from Kent County (Yancey, et al., 1995).

A pregnant female captured on 24 June carried three fetuses, and a lactating female taken on 27 August presented three placental scars. Three adult males acquired on 3 April possessed testes measuring 4 X 2, 5 X 2, and 5 X 3.

Specimens examined (9).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 1; 10 mi. S Post, 2; 4 mi. E Southland, 1; 4 mi. E Justiceburg, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 4.

Onychomys leucogaster arcticeps Rhoads, 1898
Northern Grasshopper Mouse

The northern grasshopper mouse primarily is an upland species that often is found on rangelands with sandy substrates (Jones et al., 1988). We failed to collect any specimens during our field work, but based on five museum specimens, the species is known from Garza County.

Specimens examined (5).—Garza Co.: 1.4 mi. S, 1 mi. E Post, 1; 16 mi. S, 5 mi. E Post, 2; 1 mi. S, 9 mi. E Draw, 1; Southland, 1.

Sigmodon hispidus berlandieri (Baird, 1855)
Hispid Cotton Rat

The hispid cotton rat is reported as a common resident of several habitats, including riparian environments (Jones et al., 1988), areas of dense herbaceous vegetation, and field edges (Jones et al., 1985). We found these rats to be both widespread and abundant within both counties of the JWMA. Surprisingly, prior to this report, there were no published accounts of this species from Kent county.

Gravid females were obtained on 6 June (four fetuses, crown-rump length, 17); 24 June (six fetuses, crown-rump length, 5; six fetuses, crown-rump length, 10); 21 July (12 fetuses, crown-rump length, 9); 4 August (seven fetuses, crown-rump length, 50); 27 August (five fetuses, crown-rump length, 10; 10 fetuses, crown-rump length, 4); and 30 August (eight fetuses, crown-rump length, 12). Males taken had testes with measurements that ranged as follows: April, 20 X 10 to 22 X 11; May, 19 X 11. The presence of juveniles was noted on 8 August, 27 August, and 27 September. A subadult was collected on 24 June.

Specimens examined (28).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 13; 1 mi. W Post, 7; 5.5 mi. S Post, 1; 7 mi. W Justiceburg, 1. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 6.

Neotoma albigula albigula Hartley, 1894
White-throated Woodrat

This woodrat lives among rocky outcroppings and slopes, especially in the presence of juniper (Jones et al., 1988). Twenty-seven specimens were collected in such habitats within Garza and Kent counties, indicating a fair abundance of this species within the JWMA. Prior to the acquisition of four individuals during our field work, *N. albigula* was unreported from Kent County (Yancey, et al., 1995).

Pregnant females were taken on 24 July (one fetus, crown-rump length, 8), and 30 August (one fetus, crown-rump length, 45; two fetuses, crown-rump length, 7). Measurements of testes for adult males ranged as follows: January, 10 X 7; May, 14 X 7 to 16 X 9; September, 9 X 5 to 17 X 5. Subadults were recorded on 12 May, 30 August, and 18 September. Seasonal molting of an adult was noted on 18 September.

Specimens examined (36).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 23; 1 mi. S, 6 mi. E Post, 1; 3 mi. SW Post, 1; Post, 1; 3 mi. SE Southland, 1; 6 mi. E Southland, 1; 10 mi. S Post, 1; 4 mi. E Southland, 1; 4 mi. S Post, 2. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 4.

Neotoma micropus canescens J. A. Allen, 1891
Southern Plains Woodrat

In contrast to the white-throated woodrat, this species favors open areas occupied with such vegetation as brush, mesquite, prickly pear, and yucca, next to which it may build its nest (Jones et al., 1988). It has, however, been known to inhabit rocky outcrops in the absence of *N. albigula* (Finley, 1958; Jones et al., 1988). Our trapping efforts yielded 23 specimens of this species from the grasslands of both Garza and Kent counties, suggesting a moderate abundance within the JWMA. The two specimens taken from Kent County represent the only known specimens from the county (Yancey et al., 1995).

Two gravid females were taken, one on 3 April (two fetuses, crown-rump length, 10) and the other on 30 August (two fetuses,

crown-rump length, 13). Testes of adult males had the following ranges of dimensions: July, 8 to 12; August, 9 X 4 to 22 X 12; September, 10 X 6 to 13 X 9. A juvenile was caught on 17 April, and subadults were noted on 12 May; and 4, 8, and 27 August.

Specimens examined (139).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 21; 10 mi. S Post, 4; Post, 18; 1 mi. S Post, 42; 1 mi. E Post, 3; 1 mi. SE Post, 23; 0.5 mi. S Post, 7; 1.5 mi. S Post, 3; 10 mi. S Post, 6; 7 mi. S Post, 1; 5.5 mi. S Post, 1; 14 mi. S, 1 mi. E Post, 4; 2 mi. E Southland, 1; 7 mi. W Justiceburg, 1; 6 mi. S, 6.5 mi. E Post, 2. Kent Co.: 7 mi. S, 17 mi. W Clairemont, 2.

Mus musculus Linnaeus, 1758

House Mouse

The house mouse is a common, non-native species frequently affiliated with human settings. A single individual was captured in Kent County. Based on museum specimens, it also is known from Garza County.

Specimens examined (3).—Garza Co.: 1 mi. N Post, 3.

Canis latrans texensis Bailey, 1905

Coyote

The coyote is widespread throughout North America (Hall, 1981; Nowak, 1991). Although we collected no specimens during the course of our field work, coyotes frequently were heard, occasionally seen, and often detected by sign (tracks, scat) at several localities within both counties. Also, we examined 72 museum specimens from Garza County. Even though *C. latrans* is especially common in West Texas (Jones et al., 1988), this is the first documentation of specimens from Garza County.

Specimens examined (72).—Garza Co.: 12 mi. N Post, 1; 8 mi. N Post, 1; 10 mi. N Post, 1; 6 mi. N Post, 66; 13 mi. S, 2 mi. E Post, 1; 14 mi. S, 1 mi. E Post, 1; 16 mi. S, 2 mi. E Post, 1.

Urocyon cinereoargenteus scottii Mearns, 1891
Common Gray Fox

Widespread throughout most of Texas, the gray fox appears to favor woodland edges (Schmidly, 1984). No specimens were collected during our study and we know of no museum specimens of this fox from either Garza or Kent counties. However, a single individual was sighted in juniper woodland along the breaks at the eastern edge of Garza County, from which it was previously unreported.

Specimens examined (0).

Bassariscus astutus flavus Rhoads, 1894
Ringtail

These procyonids are common residents of rocky, brushy habitats of West Texas (Schmidly, 1984). Even so, we detected no evidence of their presence at the JWMA. We can, however, document their presence in Garza County on the basis of two museum specimens. This is the first published account of the ringtail in Garza County.

Specimens examined (2).—Garza Co.: 16 mi. S, 5 mi. E Post, 2.

Procyon lotor fuscipes Mearns, 1914
Common Raccoon

The raccoon is a common resident in several habitats throughout Texas, provided there is a source of water present. It dens most often in trees and rock ledges, but, in their absence, will utilize man-made structures or ground dens of opossums or striped skunks (Schmidly, 1984). We did not collect any of these mammals. However, based on the presence of tracks along streamsides, we did confirm their existence in both the Garza and Kent County sections of the JWMA. In addition, their presence in these two counties is supported by museum records. This is the first documentation of this mammal from both Garza and Kent counties.

Specimens examined (6).—Garza Co.: 12 mi. N Post, 1; 1 mi. N Justiceburg, 1; 10 mi. S Post, 1; 15 mi. S, 5 mi. E Post, 1; 8 mi. N Post, 1. Kent Co.: 0.5 mi. N Clairemont, 1.

Taxidea taxus berlandieri Baird, 1858
American Badger

Badgers favor open prairies and plains with sandy soil, avoiding wooded regions and rocky substrates (Schmidly, 1984). During this study, they were not collected, but were observed on two different occasions. Both sightings were in open grasslands of Garza County. In support of these sight records, four museum specimens from Garza County were examined. This is the first verified report of badgers from Garza County.

Specimens examined (4).—Garza Co.: 10 mi. N Post, 2; 14 mi. NE Post, 1; 5 mi. SE Post, 1.

Spilogale gracilis leucoparia Merriam, 1890
Western Spotted Skunk

The western spotted skunk tends to associate itself with rocky, brushy situations (Schmidly, 1984). No sign of this locally rare mammal was noted on the JWMA. Museum records indicate its presence in Garza County.

Specimens examined (1).—Garza Co.: 5.5 mi. E Justiceburg, 1.

Spilogale putorius interrupta (Rafinesque, 1820)
Eastern Spotted Skunk

This skunk is known from a wide range of habitats, such as prairies, woodlands, forest edges, and cultivated fields (Schmidly, 1984). As was the case with its congener, the western spotted skunk, this regionally uncommon mustelid was not detected on the JWMA, but is known from Garza County.

Specimens examined (1).—Garza Co.: 1 mi. S Post, 1.

Mephitis mephitis varians Gray, 1837
Striped Skunk

The striped skunk occurs in a variety of habitats, including deserts, forests, grasslands, and montane situations (Schmidly, 1984). We failed to obtain evidence of its existence at the JWMA, but a single museum specimen confirms its presence within Garza County. Although *M. mephitis* is quite common throughout Texas (Schmidly, 1984), this is the only published report of verified occurrence in Garza County.

Specimens examined (1).—Garza Co.: 2 mi. NW Justiceburg, 1.

Felis concolor stanleyana Goldman, 1938
Mountain Lion

The mountain lion is a wide-ranging mammal that prefers rocky canyons and escarpments (Davis and Schmidly, 1994). We detected no evidence of this cat during our field work, and there were no museum specimens available for examination. Davis and Schmidly (1994) report *F. concolor* from Garza County, but currently, due to a decline of its range in Texas, this species, except for rare occurrences, may be restricted to the Trans-Pecos region (Jones and Jones, 1992).

Specimens examined (0).

Lynx rufus texensis J. A. Allen, 1895
Bobcat

Primarily a resident of wooded and broken habitats, the bobcat occurs throughout Texas (Schmidly, 1984). We discovered no sign of bobcats within the boundaries of the JWMA. We did find one dead on the road in close proximity to the study site (Garza Co.: 5.5 mi. E Post). Museum specimens support the existence of this species in Garza County. In addition, Davis and Schmidly (1994) report this cat from both Garza and Kent counties.

Specimens examined (5).—Garza Co.: 10 mi. N Post, 1; 8 mi. N Post, 1; 15.4 mi. N Post, 1; 13 mi. S, 2 mi. E Post, 1; 14 mi. S, 1 mi. E Post, 1.

Odocoileus hemionus crooki (Mearns, 1897)

Mule Deer

The mule deer is a resident of several types of habitats, including the open country, rocky breaks, and hillsides associated with juniper (Davis and Schmidly, 1994), all typical of the JWMA. These animals were seen on several occasions in a variety of habitats on the Garza County portion of our study site. Also, two mule deer skulls were collected in Garza County within the boundaries of the JWMA.

Specimens examined (2).—Garza Co.: 3 mi. N, 9 mi. E Justiceburg, 2.

Odocoileus virginianus texana (Mearns, 1898)

White-tailed Deer

This deer has an affinity for wooded areas and riparian habitats, usually excluding itself from canyons and breaks (Jones et al., 1988; Davis and Schmidly, 1994). A single individual was sighted in mesquite grassland on the Garza County side of the JWMA.

Specimens examined (0).

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