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Faunal Survey of
Scotts Bluff National Monument

**A Report
to the**

**National Park Service
United States Department of the Interior
Midwest Region
Omaha, Nebraska**

by

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EXECUTIVE SUMMARY

Introduction

Scotts Bluff National Monument is an important historical landmark that preserves both cultural and natural resources. No formal animal survey has ever been conducted at the Monument. Baseline data is needed to determine true changes in the faunal community and to document the existence of any threatened or endangered species. This is a report of a faunal survey conducted at the Monument between June 1986 and June 1988 of existing amphibians, reptiles, birds, and mammals to determine their relative abundance, distribution, and habitat utilization.

The Monument, located in the western panhandle of Nebraska, covers 1200 ha in Scotts Bluff County. Seven major habitats were identified at the Monument: riverine woodland, coniferous woodland, mixed-grass prairie, canal riparian habitat, pine-studded bluffs, shrub-dominated slopes, and badlands. Annual mean precipitation was above the normal 43.50 cm during the two years of the study.

Appropriate sampling methods were used to detect animal species and to estimate densities of certain species. Non-structured, opportunistic sampling was important in detecting transient, migratory, and low abundant species.

Results

A grand total of 136 species of amphibians, reptiles, birds, and mammals were recorded at the Monument. The only endangered or threatened species observed was a dead bald eagle (Haliaeetus leucocephalus) found along the irrigation canal. Four amphibian species resided at the Monument. Most amphibians were detected on days immediately following heavy rains. There were eight reptilian species; the racer (Coluber constrictor) and prairie rattlesnake (Crotalus viridis) were the two most abundant snakes.

There were 96 avian species found at the Monument. The mallard duck (Anas platyrhynchos), the most abundant waterfowl species, successfully nested in the mixed-grass uplands. A variety

of raptor species was observed but the only species that was confirmed to breed at the Monument was the prairie falcon (Falco mexicanus). A golden eagle (Aquila chrysaetos) nest was located on top of South Bluff on the western boundary line. The ring-necked pheasant (Phasianus colchicus) nested throughout the Monument and was the most abundant upland game bird. Both great-horned owls (Bubo virginianus) and burrowing owls (Athene cunicularia) bred at the Monument. Northern flickers (Calaptes auratus) were the most abundant woodpeckers of the four species detected. Black-billed magpies (Pica pica) and rufous-sided towhees (Pipilo erythrophthalmus) were the most conspicuous passerines; their prominence was largely due to their association with slopes and draws dominated by Rocky Mountain juniper (Juniperus scopulorum). The introduced European starling (Sturnus vulgaris) and the brown-headed cowbird (Molothus ater) were the two most abundant avian species in the canal riparian habitat. Ten sparrow species utilized the various grassland niches.

Twenty eight mammalian species were identified. Eastern cottontails (Sylvilagus floridanus) and desert cottontails (Sylvilagus audubonii) occurred in sympatric populations. Rodents comprised the majority of the mammalian species. A small prairie dog colony existed at the Monument's extreme northwestern corner creating its own microhabitat within the mixed-grass prairie. Deer mice (Peromyscus maniculatus) and prairie voles (Microtus orchogaster) were the two most abundant small mammals. The porcupine (Erthizon dorsatum), the largest rodent, was predominately found in the coniferous woodland at the base and slopes of South Bluff. Mule deer (Odocoileus hemionus) and white-tailed deer (Odocoileus virginianus) were present. It appeared that hybridization was occurring between these species.

Seven species of amphibians and reptiles (Lynch 1985), 74 avian species (Nebraska Bird Review 1985-1988, Johnsgard 1979), and 18 mammalian species (Jones et al. 1983), that have been cited in the literature as existing within the Nebraska Panhandle region were not detected during the survey. Their absence may have been attributed to low numbers and/or the limited habitats of coniferous trees, sandy soil blowouts, and wetland areas.

Management Recommendations

Preservation of the fauna must be carefully practiced with a clear understanding of species interrelationships in such a small park as the Monument which contains little or no buffer zones along its boundaries. We believe the potential exists for the reintroduction of pronghorn (Antilocarpa americana) and sharp-tailed grouse (Tympanuchus phasianellus).

INTRODUCTION

The Scotts Bluff National Monument, located in the Nebraska Panhandle is an area characterized by rolling xeric short- and mixed-grass prairie intermixed with rocky bluffs and adjacent to the North Platte River. In 1820 Major Stephen H. Long, sent by the U.S. Congress, lead an expedition along the Platte River to the Rocky Mountains. He called this area in his report "The Great Desert." He described it as: "wholly unfit for cultivation . . . The whole region seems peculiarly adapted as a range for buffaloes, wild goats, and other wild game; incalculable multitudes of which find ample pasturage and subsistence upon it." (Brown 1984:45).

Since 1820, the eroding bluffs have changed little except for the increased coverage of ponderosa pine (Pinus ponderosa) and Rocky Mountain juniper (Juniperus scopulorum). The banks and islands of the North Platte River are now a wooded riparian habitat where once few trees were found (Currier et al. 1985). Dramatic changes have occurred on the prairies of the Nebraska Panhandle. Native prairie has been severely altered by agricultural crop production and domestic livestock grazing. Although many of the large wild game species Major Long encountered are no longer found in the Nebraska Panhandle, the majority of the native fauna may still be found on protected lands such as the Monument. The Monument, though small in size, has highly diversified habitat types. There are other protected public lands in the Panhandle of greater acreage, but no other land holding contains both riparian habitat of the North Platte River and pine-studded bluffs.

In the Congressional Act of 1916 which created the National Park Service (NPS), a commonly quoted passage stating the purpose of the NPS is ". . . to conserve the scenery and the natural historic objects and the wild life therein . . ." (Leopold et al. 1963). In the past, natural resource management emphasized the Monument's native prairie. Presently, the potential exists to expand natural resource management to include selected faunal species. Park personnel must know what fauna exists on the Monument before proper management can be implemented. The purpose of this study was to inventory the existing amphibian, reptilian, avian, and mammalian species, and to determine their relative numbers, distribution, and habitat utilization at the Scotts

Bluff National Monument.

Faunal Records

Records of wild animals were scant for Scotts Bluff National Monument. Reports from 1941 on file at the Monument briefly listed the most prominent wildlife animals as: prairie dogs (Cynomys ludovicianus), cottontail rabbits (Sylvilagus spp.), magpies (Pica pica), western bluebirds (Sialia mexicana), and western sparrows. Photographs were taken in 1941 of a prairie dog colony located approximately 150 m east of the Visitor Center. The colony was eliminated in 1944. The species to which the records refer to as a western bluebird was most likely a blue grosbeak (Guiraca caerulea). Western bluebirds have never been authentically documented in Nebraska (Bray et al. 1986). Also, birds identified as western sparrow were most likely lark sparrows (Chondestes grammacus).

In 1969, Peter Meserve studied the population ecology of the prairie vole (Microtus orchogaster) at the Monument. In his trapping plots located at the Monument's southwest edge, only three other small mammal species (low in abundance) were caught: deer mice (Peromyscus maniculatus), hispid pocket mice (Perognathus flavescens), and western harvest mice (Reithrodontomys megalotis). Meserve also mentioned that prairie vole predators were present at the Monument such as coyotes (Canis latrans) which were rare and red foxes (Vulpes vulpes) which were infrequently seen crossing roads and open fields near his plots. Raccoons (Procyon lotor), striped skunks (Mephitis mephitis), and badgers (Taxidea taxus) were said to have been common on the Monument (Meserve 1971). He also observed rough-legged hawks (Buteo lagopus) and Swainson's hawks (Buteo swainsoni) flying over the Monument. Mattes (1958) reported red-tailed hawks (Buteo jamaicensis), long-eared owls (Asio otus), and great horned owls (Bubo virginianus) as occurring adjacent to the Monument. Reptilian predators noted by Meserve (1971) were prairie rattlesnakes (Crotalus viridis), racers (Coluber constrictor), and bullsnakes (Pituophis sayi).

A 1980 Natural Resources Management report stated that as many as 25 mule deer

(Odocoileus hemionus) and 10 white-tailed deer (Odocoileus virginianus) utilized the Monument. Appendix A of the report provided a preliminary list of plant and animal species of the Monument. Mammals, birds, reptiles, and amphibians listed were species that potentially occurred in the region but not necessarily found at the Monument.

In 1983 and 1984 research was conducted to determine the status of the newly established prairie dog colony and to make recommendations for its management (Franklin 1983, Franklin 1984).

STUDY AREA

Scotts Bluff National Monument in Scotts Bluff County, Nebraska covers 1200 ha. The Monument lies on the south side of the North Platte River, directly west of the Gering city limits and Municipal golf course. Scotts Bluff, elevation 1417 m, is the major topographical feature. The redstone bluff rises 183 m above surrounding terrain. Ponderosa pine and Rocky Mountain juniper are found on the summit, along with a sparse coverage of mixed-grass species. Between Scotts Bluff and the river is a small area of badlands (bare ridges and valleys of eroding sandstone). Along the Monument's southern border is South Bluff, a segment of a long bluff that extends east and west through the county. The only water source, besides the adjacent North Platte River, is an irrigation canal that extends across the northern edge of the Monument.

From the use of existing habitat maps of the Monument and present knowledge of the Monument's vegetation characteristics, we identified seven major habitats: riverine woodland, coniferous woodland, mixed-grass prairie, canal riparian habitat, pine-studded bluffs, shrub-dominated slopes, and badlands (Figure 1). Dominant tree species in the riverine woodland were cottonwood (Populus deltoides), box elder (Acer negundo), willows (Salix spp.), American elm (Ulmus americana), and green ash (Fraxinus pennsylvanica). Its understory included Carex spp., Bromus spp., Typha glauca, and Scirpus spp. The coniferous woodland was dominated by ponderosa pine and Rocky Mountain juniper. Dominant grass and sedge species of the mixed-grass prairie were



needle-and-thread (Stipa comata), western wheatgrass (Agropyron smithii), downy brome (Bromus tectroum), prairie sandreed (Calamovilfa longifolia), side-oats grama (Bouteloua curtipendula), and threadlead sedge (Carex filifolia). Common forbs and shrubs in the mixed-grass prairie were western wallflower (Erysimum asperum), prickly pear (Opuntia compressa), sweet clover (Mellilotus spp.), kochia (Kochia scoparia), yucca (Yucca glauca), fringed sage (Artemisia frigida), sand sagebrush (Artemisia filifolia), winterfat (Ceratoides lanata), rubber rabbitbrush (Chrysothamnus nauseosus), skunkbush sumac (Rush trilobata), and snowberry (Symphoricarpos albus). Dominant tree species in the riparian habitat along the canal were cottonwood and willow; major shrubs were choke cherry (Prunus virginiana), snowberry, and Ribes spp; the most common understory plant was poison ivy (Toxicodendron rydbergii). Pine-studded bluffs were dotted with ponderosa pine and Rocky Mountain juniper. Shrub-dominated slopes were primarily covered with skunkbush sumac and Rocky Mountain juniper. The major cover type of depressions and drainages of the badlands were Carex spp., downy brome, rubber rabbitbrush, and willow.

Except for a small portion of land (in the extreme northwest corner) purchased in 1970, called the Morrision tract, all vegetation has been protected from grazing by domestic animals since the 1930's. Average annual mean precipitation from 1978 through 1987 for Scotts Bluff County was 43.50 cm. Over 50% of the precipitation occurs during spring and early summer in the form of violent but brief thundershowers (Meserve 1971). Above-normal rainfall occurred during two years of this survey -- 55.22 cm for 1986 and 59.03 cm for 1987.

METHODS

The Monument was surveyed between June and August 1986 and April and July 1987 by one researcher and one field assistant. Additional observations and findings during April and June 1988 were also included. Birds were surveyed by line transects, mammals with various trapping schemes, and reptiles and amphibians with the use of drift fences.

Three 1400 m permanent avian line transects were established to estimate bird species for three selected areas (Figure 2). Each transect was walked six times during early morning and

evening hours during July 1986. Perpendicular distances from the transect were estimated for all visual and auditory avian detections (Burnham et al. 1980, Mikol 1980, Emlen 1971). Species diversity (Shannon and Weaver 1964) was calculated for all three areas sampled by the line transects. All other habitat types not sampled by the permanent avian line transects were opportunistically sampled.

Small mammals were surveyed in a permanent trapping web and also along various linear transects placed in all habitat types (Figure 3). The 4 ha trapping web consisted of 68 Sherman live traps and 32 pitfall traps located on 16 equidistant lines radiating from a center point (Wilson and Anderson 1985). Sherman live traps, baited with a combination of rolled oats, peanut butter, and maple extract, and unbaited pitfall traps, were opened during four-day trapping periods. Traps were set during early morning hours and left open for 24 hours. Four-day trapping periods for the trapping web began 20 July 1986 and 28 April and 11 June 1987. Linear transects of either Sherman live traps (mark-recapture estimation) or snap traps (removal estimation) were placed throughout representative habitat types for four-day trapping periods: 26 June to 12 August 1986 and 6 May to 2 June 1987.

Prairie dogs were censused 12 June to 5 October 1986 and 12 April to 31 July 1987, with Tomahawk single-door and double-door live traps baited with rolled oats. All prairie dogs were ear tagged, fur dyed, weighed, sexed, and aged. Five permanent 0.4-ha plots were randomly selected throughout grassland sites to estimate pocket gopher densities on 1 July 1987 (Figure 2). Estimation was based on freshly dug gopher mounds (less than one week old) in 10 subsamples (4 m² each) within each plot (Reid et al. 1966).

Spotlighting was done along the canal, one hour after sunset, three times during the summer 1987 to detect deer and furbearer species. Bats were mist-netted in the tunnels of the summit road from dusk to 0100 hrs in June and July 1986 and 1987, seven times each year.

Two 1 x 15 m drift fences made of aluminum flashing were erected to sample amphibians and reptiles (Campbell and Christman 1982, Vogt and Hine 1982). One was placed in a wet

meadow next to the canal and another in mixed-grass prairie at the west base of Scotts Bluff (Figure 2). Pitfall traps were located on each end, and one funnel trap was located at the middle of each side of each fence. Traps were left open and checked every other day from 24 April to 24 July 1987.

In addition to the previously defined methods, animals were sampled opportunistically throughout the Monument June to August 1986, and March to August 1987. Interviews with adjacent landowners were conducted to document movement of animals on and off the Monument. Sightings by the Monument staff were verified and recorded along with roadkills on roads within or adjacent to the Monument. Skulls, nests, and tracks were identified and provided useful information on the existing fauna.

Taxonomic nomenclature for the herpetofauna was from Lynch (1985), birds from AOU checklist (1983), and mammals from Jones et al. (1983). Scientific names for all faunal species presently found to exist at the Monument during this faunal survey are given in tables 2, 3, 4, and 8. Symbols used to show highly significant and significant statistical differences are "" and ", respectively.

RESULTS

All abbreviations for habitat types, residency status, and relative abundance are defined in Table 1. A dead bald eagle found along the irrigation canal was the only endangered or threatened species found at the Monument during the two years of the study. The numbers of animal species detected include: 4 amphibians, 8 reptiles, 28 mammals, and 96 birds. These numbers reflect species either observed, captured, heard, or positively identified by sign at one or more times during the three year period. Other species that may have occurred at low abundance and went undetected will be discussed separately. Generally, species richness was higher in areas adjacent to water -- either the canal or the river. Amphibian species richness was low because of the absence of a permanent, nonflowing water source.

Amphibians

The Woodhouse's toad found on open grasslands, was the most common of the four species of amphibians (Table 2). The Great Plain's toad was only found on the lawns of the Visitor Center. The western striped chorus frog and tiger salamander were caught in pitfall traps at the end of the drift fences. Amphibians were most frequently seen at the Monument on days immediately following heavy rains. At other times they were found in thick vegetation, under objects, and in rodent burrows. All amphibian species found, use permanent and temporary nonflowing pools for breeding. Their eggs are deposited and become attached to vegetation in shallow water (Hammerson 1982, Spencer 1974, Reese 1973). Such pools may have occurred in the river bottom and within the badlands where water runoff collected.

Reptiles

Three turtle species were identified (Table 3). The painted turtle found along the river and adjacent uplands, utilized tree limbs extending over shallow water of the river for basking. Western box turtles were common in open grasslands, and are known to spend winter underground in burrows dug by the turtles or by rodents (Hammerson 1982). Favorable habitat may harbor 3-6 western box turtles/acre (1.2-2.4/ha) (Hammerson 1982).

Of the five snake species identified (Table 3), the racer commonly referred to as a "blue" racer, and the prairie rattlesnake were the two most abundant snakes. Although both species were found in shrubs and dense grass during any part of the day, the prairie rattler was commonly associated with shorter, sparser vegetation than the racer. Racers prey on large insects, small mammals, and newborn rattlesnakes (Hammerson 1982). One racer was observed with a live juvenile prairie vole in its jaw. Despite their scientific name, racers are not constrictors; rather, they crush and kill prey with their jaws. A prairie rattlesnake collected from a corn field planted on the Monument contained three undigested house mice. With exceptions of isolated populations of house mice, the prairie vole may be the major prey species for rattlesnakes at the Monument. The earliest sighting of a prairie rattler in 1987 was 29 April.

During mid-June through the first week of August 1986, 18 different rattlesnakes were observed in separate areas located throughout the Monument. During this same period in 1987, 19 rattlesnakes were detected. Only perennially wet areas, such as those in the river bottom, seem to be avoided by rattlesnakes. Bullsnares were found throughout the Monument and were common next to the maintenance shop where there was an abundant small mammal population. Bullsnares have been reported in areas of localized abundant small mammal populations (Hammerson 1982).

Birds

Pelecaniformes, Ciconiiformes, and Anseriformes -- Nine species from these orders were found on the Monument (Table 4). The double-crested cormorant was observed on the banks of the Platte River during the summer. Great blue herons were seen frequently in the river and occasionally foraging in the canal. On 10 March 1987, three flocks of snow geese were observed migrating over the Monument. A pair of wood ducks was seen consistently on the west side of the canal. A female wood duck and her ducklings were also seen in the canal, but no nest was found. The mallard duck was the most abundant waterfowl species at the Monument. From five to ten mallards were sighted on any one day during the summer feeding along the banks or preening on the sandbars of the river. Two successful mallard nests were found. One nest in a snowberry bush within a draw leading up toward Crown Rock south of Highway 92 produced ten ducklings. Another nest within the prairie dog colony in cover of downy brome and mustard produced nine ducklings.

Falconiformes -- A total of nine raptor species was observed (Table 4). On 5 April 1988, an adult bald eagle was found dead next to the canal in the northwest corner of the Monument. The eagle had been dead less than one week when found but the cause of death could not be determined from external examination. A necropsy performed at the National Wildlife Disease Laboratory in Madison, Wisconsin showed that the eagle died of pulmonary hemorrhage, possibly caused by electrocution. The only raptor confirmed to breed at the Monument was the prairie falcon. In 1986 two successful nests were found in rock crevices of Scotts Bluff. One of the

nests located in the south face of Eagle Rock had three fledglings; the other nest was suspected to be above the summit trail with an unknown number of fledglings. In 1987, there were again two successful nests -- the nest above the summit trail had five fledglings and the same nest site in Eagle Rock had four nestlings but one fell from the nest on 27 June and later died. Sightings of juveniles were strong evidence that American kestrels and turkey vultures nested within Scotts Bluff, although no nests were located. A golden eagle nest was located on top of South Bluff 20 m west of the Monument's boundary line on 6 June 1987. A pair of adults was observed in the nest but no evidence was found to indicate that any nestlings had been raised. It was likely that the pair had other nests located in the vicinity and they may have alternated the use of the nests in different years (Johnsgard 1979).

American kestrels were frequently observed feeding on prairie voles. One observation was made of a prairie falcon that killed and flew away with a juvenile prairie dog under extremely high wind conditions during mid-morning, 1 June 1987. A pair of red-tailed hawks and golden eagles were frequently observed soaring over the grasslands at the base of South Bluff and west of Scotts Bluff. The primary food base for the raptors on the Monument was prairie voles, deer mice, and Sylvilagus spp. (Bent 1937). Rock doves may have been a source of food for the larger raptors but no kills were observed.

Galliformes -- The introduced ring-necked pheasant, is well established on the Monument. From numerous opportunistic observations and knowledge of pheasant movements, 20-25 adult cock pheasants were estimated to have occurred on the Monument during the May-June post-hatch period of 1987. Gates and Hale (1974) calculated a spring adult hen/cock ratio under cock harvesting and high hen winter mortality to be 1.25 in Wisconsin. Though no hunting is allowed on the Monument, it is small enough so that a portion of birds may move into private lands to feed on corn and other crops during the fall and are thus subject to harvest. Flushing of pheasants during the study indicated that the hen/cock ratio was even lower than 1.25. Assuming a 0.85 hen/cock ratio, an observed 5.5 fledglings/brood ratio, and 78% hen nest production (Wagner et al. 1965), the Monument may have supported an estimated maximum peak

population of 106 pheasants during August and September. Hailstorms during the pheasant's 1987 nesting season caused nest destruction. Of three nests located, all had been destroyed following a severe hailstorm. The extent of pheasant nest predation was not determined.

The greatest concentration of northern bobwhite was along the canal on the west side of the Monument where an abundant supply of seeds and plant material was found from weedy plant species. The northern bobwhite was known to reproduce on adjacent lands from sightings of fledglings but no nests were located on the Monument. The largest covey observed numbered 13 bobwhite.

Gruiformes and Charadriiformes -- Species of these two orders were uncommon at the Monument (Table 4). In all three field seasons, a pair of upland sandpipers was observed in the prairie dog colony but no nest was found. Herring gulls and Franklin's gulls were seen infrequently flying over the Monument between their feeding bouts in adjacent plowed fields in the spring.

Columbiformes and Cuculiformes -- Rock doves flying in and out of crevices were a prominent sight on the faces of Scotts Bluff. The mourning dove, although not in high abundance, had nests located throughout the Monument. Five nests were located in 1987 -- three on the ground and two in trees. The only representative of the Cuculiformes order was the yellow-billed cuckoo, an uncommon resident along the river bottom.

Strigiformes -- Great horned owls were commonly seen in the pine woodland and in the badlands. A successful nest was located in a mud bank of the badlands in 1987 by George Oviatt, Monument resource manager. Two burrowing owls were sighted frequently in the prairie dog colony in 1986. In 1987, there was one nesting pair in the northern, old colony, and one nesting pair in the southern, new colony. Seven owls were fledged in the old colony and four in the new colony during the first week of July. Burrowing owls were often observed hovering over the prairie dog colony and diving upon small mammals. Pellets collected on prairie dog mounds contained mostly prairie voles. The only barn owl seen was a road kill found on 8 July

1987, along Highway 92.

Caprimulgiformes and Apodiformes -- Common poor-wills were observed at dusk vocalizing their distinctive call while flying over Scotts Bluff. Throughout the summer, aggregations of common nighthawks foraged aerially for flying insects. They were observed over Scotts Bluff at dusk performing steep dives ending with a booming noise. Such dives are often located over nest sites (Johnsgard 1979). The white-throated swift was more abundant than the chimney swift. Nests of the white-throated swift were located in crevices of Scotts Bluff and fledglings were observed during August.

Coraciiformes and Piciformes -- Belted kingfishers were often seen along the canal and shores of the North Platte River. No nests were located, but the vertical bluffs in the river bottom were suspected to provide potential nest sites (Johnsgard 1979). The northern flicker was the most abundant of the four woodpeckers at the Monument. Both red-shafted and yellow-shafted northern flickers were observed, with the Monument located within their hybridization zone.

Passeriformes -- Four species of flycatchers occurred at the Monument (Table 4). The Say's phoebe, eastern kingbird, and western kingbird were found in the prairie dog colony, along the canal, and in grasslands with shrub-dominated draws surrounding Scotts Bluff. Swallows were common along the canal, river, and their adjoining uplands. Cliff swallows in large aggregations, were often observed foraging over the prairie dog colony and adjacent western wheatgrass field.

The black-billed magpie was the most abundant corvid. Besides the rufous-sided towhee the magpie was the most visible bird species at the Monument. Their nests, made of a large mass of sticks, were quite visible and were mostly found in junipers. The magpie was highly associated with draws and slopes containing stands of junipers.

House wrens were abundant in the canal riparian habitat and in the riverine woodland, while the rock wrens occupied slopes of both bluffs, badlands, and shrub-dominated ravines.

Mountain and eastern bluebirds were uncommon transients during spring and summer months. Mountain bluebirds were seen along Saddle Rock trail east of the Visitor Center during mid-April (Lynne Vacanti, pers. comm.). The eastern bluebird was observed only in the riverine woodland. The townsend's solitary was a common fall migrant in the coniferous woodland. The American robin was widely distributed throughout the Monument. Brown thrashers were found where there was abundant tree and shrub cover of willows, elms, junipers, or mountain mahogany.

The introduced European starling had colonized the canal riparian woodland. It and the brown-headed cowbird were the most abundant avian species along the canal. The warbling vireo occurred in the river bottom woodland and was the only vireo species observed.

Three wood warblers were present (Table 4). The yellow warbler and common yellowthroat were seen only in the canal riparian and riverine woodland habitats. The yellow-breasted chat, found in these two habitats, was also common in shrubby ravines and in the coniferous woodland.

The black-headed grosbeak was seen only along the Saddle Rock trail next to Scotts Spring. Blue grosbeaks were abundant in thickets along the canal and shrub-dominated slopes. Both the lazuli bunting and indigo bunting were common within the same habitats as the blue grosbeak.

Rufous-sided towhees were abundant and also conspicuous because they typically perched on the outer branches or tops of junipers and sang their distinctive song. They nested in thick vegetation of shrubs and vines. Like the robin, they occurred in almost every habitat type.

Ten species of sparrows occurred at the Monument (Table 4). Four of the summer residents, lark buntings, lark sparrows, chipping sparrows, and grasshopper sparrows all bred at the Monument. Lark sparrows utilized juniper stands for nest sites, whereas chipping sparrows nested in and around deciduous trees along the canal. Lark buntings and grasshopper sparrows require similar nesting habitat of mixed-grass prairie interspersed with rabbitbrush, fringed sage, and other branching forbs (Johnsgard 1982). The other summer resident, the vesper sparrow, was uncommon in the grasslands north and west of Scotts Bluff. Large migrating flocks of white-crowned sparrows were seen in the fall and spring. Migrating Brewer's and clay-colored

sparrows were observed in the trees surrounding the Headquarters in May 1988. Dark-eyed juncos and American tree sparrows were winter residents.

The Red-winged blackbird was the only blackbird on the Monument and was seen only within the canal riparian habitat and the river bottom. Western meadowlarks were prominent throughout mixed-grass prairie. One nest of five eggs was found in the prairie dog colony and another with six eggs was found directly south of Crown Rock.

Common grackles were abundant in the prairie dog colony and common where ever trees were located. Most of their nesting occurred along the canal in cottonwood and willow trees. Brown-headed cowbirds were the most abundant bird on the line transects within the canal riparian habitat. They are obligate parasitic nesters, depositing their eggs in nests of other birds (Johnsgard 1982). Birds thought to be potential hosts at the Monument were yellow-breasted chats, yellow warblers, red-winged blackbirds, lark sparrows, chipping sparrows, western meadowlarks, indigo buntings, lazuli buntings and the flycatchers.

Orchard orioles were more abundant than the bullock's race of the northern oriole, at the Monument. Orchard orioles were concentrated along the canal and river bottom. Northern orioles were found in both deciduous tree stands and adjacent grasslands.

American goldfinches were abundant throughout the Monument, with highest densities along the canal. They were often seen picking down from thistles (Cirsium spp) to use as nest material. House finches were associated with shrubby vegetation within riparian areas, grasslands, and the badlands. Both house finches and pine siskins were permanent residents. The house sparrow, another North American introduced species, was common around the Visitor Center and canal riparian woodland. They nested in and around the buildings at the Visitor Center.

Results of the line transects for individual species densities, overall bird density, species richness, and diversity index are given in Tables 5, 6, and 7. These parameters collected within mixed-grass prairie, shrub-dominated slopes, and canal riparian habitat are characteristic of these habitat types only and are not to be extrapolated to represent the entire Monument's bird

population. The canal riparian habitat transect had the highest overall abundance compared to the transects in mixed-grass prairie and shrub-dominated slopes ($F = 15.15^{**}$, $P < .001$). Species richness, a measure of the number of different species, was highest in the canal riparian habitat ($F = 4.79^*$, $P < .100$). The Shannon diversity index for the canal riparian habitat, which gives equal weight to both the number of different species and abundance of each species, was not significantly different than the other two transects of mixed-grass prairie ($F = 1.98^{ns}$, $P = .100$).

Mammals

Marsupialia -- Opossums were observed along the irrigation canal east and west of the Monument, and tracks were detected along the canal road within the Monument boundaries. An old swimming pool foundation containing debris, located on the eastern edge of the Monument directly south of the canal, and brush piles scattered along the north bank of the canal are suspected to have provided den sites. Fitch and Sandidge (1953) noted the preference of opossums for forage along the edges of fields, creeks and gullies in nonforested areas, and streams and rock ledges in woodlands. Wisemen and Hendrickson (1950) found opossum densities of 1/43.2 ha in mixed-grass pasture, woodland, and agricultural habitat in Iowa.

Insectivora -- The eastern mole was the only species of this order found at the Monument. Areas having the highest densities were within the prairie dog colony, side slopes of draws, and disturbed grassland sites.

Chiroptera -- The only bats observed were the small-footed myotis and big brown bat. The small-footed myotis was the most common bat captured in the tunnels of the summit road. Jones et al. (1983) stated that small-footed myotis occur in the tristate (Colorado, Nebraska, and Wyoming) region where bluffs, ridges, cliffs, or major outcroppings prevail. Small-footed myotis were also sighted feeding over the canal.

Lagomorpha -- Eastern cottontails and desert cottontails occurred at the Monument. Desert cottontails are smaller, have slightly larger ears and their pelage is paler on the head, nape, and

neck than that of the eastern cottontail (Jones et al. 1983). Desert cottontails were found in the more xeric areas such as the bluffs, grasslands, and shrub-dominated slopes. Small shrubs, like snowberry and skunkbush sumac, were used by cottontails for cover and feeding sites within grasslands and associated gullies. Eastern cottontails inhabited wooded, more mesic sites, but also were found in the grasslands in association with desert cottontails. Based on litters found throughout the Monument, both species had high fecundity rates. Ten fetuses were removed from an eastern cottontail collected within the prairie dog colony.

Rodentia -- Two scuirids occurred at the Monument, the fox squirrel and the black-tailed prairie dog. Two adjoining prairie dog colonies existed in the extreme northwest corner of Monument near the irrigation canal. In 1986, 109 individuals were counted in the old colony nearest the canal and 89 individuals were counted in the new colony directly south of the old colony. Both colonies combined occupied 5.77 ha. In the fall 1986, after censusing, population sizes were reduced by trapping and removal. In spring 1987, the old colony had 213 prairie dogs and the new colony 88. Both colonies combined occupied 8.63 ha in August 1987 (1.1% of the Monument's inhabitable grassland).

The new colony was predominately covered by sideoats grama in 1986. In 1987, a large portion of the new colony was covered by the biennial, sweet clover, whereas in 1986 very few plants were present. The area in which the prairie dogs exist has been structurally modified by the prairie dogs or "ecosystem regulators" (Uresk and Bjugstad 1983). They have created their own microhabitat within the mixed-grass prairie habitat. We found a number of animals coexisting with the prairie dogs within this microhabitat, including woodhouse toads, prairie rattlesnakes, western box turtles, prairie voles, hispid pocket mice, Ord's kangaroo rat, cottontail rabbits, burrowing owls, upland sandpipers, lark buntings, and kingbirds. Agnew et al. (1986) found many of these same animals to be abundant on prairie dog colonies in South Dakota.

The fox squirrel occurred on the Monument in localized wooded habitat in low numbers. They are possibly limited by appropriate food sources such as black walnuts, the only source of mast on the Monument. Western Nebraska is the extreme western edge of the fox squirrel

range (Jones et al. 1983).

Plains pocket gophers were abundant in the grasslands throughout the Monument. High numbers of new burrow mounds were observed in the prairie dog colony, 100–200 m north of Highway 92 on the western edge of the Monument, and east of the Visitor Center. Five 0.4 ha plots were randomly located throughout the grasslands to sample pocket gopher signs (Reid et al. 1966). With an equation developed by Reid et al. (1966), pocket gopher densities were estimated from samples taken of fresh gopher mounds in 4-m² subplots within each plot. With 25 mounds/ha, pocket gopher densities were estimated at 4.67/ha within mixed-grass prairie. An assemblage of animals has been noted to utilize pocket gopher burrows: tiger salamanders, western box turtles, bullsnakes, prairie rattlesnakes, eastern moles, desert cottontails, Ord's kangaroo rats, deer mice, meadow voles, and long-tailed weasels (see Vaughan 1961).

Localized populations of hispid pocket mice occurred in disturbed mixed-grass prairie due to previous dry-land farming. These disturbed areas had a variety of exotic broadleaf plant species and a high volume of seeds. Despite 4152 trap nights during the periods 6 June to 15 August 1986 and 4 April to 14 June 1987, Ord's kangaroo rats were captured only within the prairie dog colony. They have been reported to prefer seeds of shadscale (Atriplex confertifolia), prickly pear, bluestem, tansy mustard (Descurainia pinnata), and leaves of sweet clover, grasses, shadscale, Russian thistle (Salsola iberica), tansy mustard, kochia and saltbushes (Jones et al. 1983). Kangaroo rats were most likely found in the prairie dog colony because of their selection of seeds from the weedy plant species associated with the colony.

Western harvest mice occurred in the prairie dog colony, in grassland below Crown Rock, and on top of Scotts Bluff. They are typically found in dense patches of prairie sandreed or bluestem, shrubby areas of rabbitbrush and sumac, yucca-grass associations, brushy riparian habitats, and weedy vegetation (Jones et al. 1983). Western harvest mice and deer mice construct ground nests of loose vegetation.

Deer mice were the most widely distributed small mammal at the Monument as they are in

many other regions of the United States. They were captured in all types of grassland sites, ravines, river bottom, and on top of Scotts Bluff. Deer mice are able to occupy sites with lower amounts of cover, more so than western harvest mice (Jones et al. 1983). Population estimates were calculated using the program CAPTURE (Otis et al. 1978). Naive density estimates (calculated by dividing the estimated population size by a naive estimate of the area trapped) from removal trapping in a kochia field next to the prairie dog colony and on top of Scotts Bluff were 31.5 deer mice/ha and 12.5 deer mice/ha, respectively. Naive density estimate from mark-recapture sampling in a sparsely vegetated area along Dome Rock was 11.9 deer mice/ha.

Bushy-tailed woodrats were uncommon at the Monument. One specimen was found on top of Scotts Bluff. They have been found to occur (almost exclusively) in rocky areas with their houses situated beneath rocks and among fallen timber (Jones et al. 1983).

The house mouse, an Eurasian introduction, occurred in and amongst storage buildings and in exotic broadleaf vegetation sites, such as the kochia field next to the prairie dog colony. The house mouse population was sampled along the same transect as the deer mouse population next to the prairie dog colony. Naive density was estimated to be a minimum of 31.5 house mice/ha -- house mouse trapping success did not decrease through the entire five-day sampling period.

Two species of voles, prairie vole and meadow vole, occurred on the Monument. The prairie vole was the most abundant small mammal in the grassland habitat. Prairie voles also inhabited the badlands, riverine woodland, canal riparian habitat, and rocky areas. They have been found to create extensive runways in the grass, requiring a dense ground cover and feed exclusively on green vegetation primarily of sedges, grasses, Mellilotus spp., and other legumes (Jones et al. 1983). Meserve (1971) found estimates of 10-14 voles/acre (25-35/ha) in grassland sites of the Monument's southwest corner. Program TRANSECT was used to estimate vole densities in the trapping web (Anderson et al. 1983). Prairie vole density for the late April trapping session in 1987 was 38.54 voles/ha (S.E. 14.16), an apparent increase from Meserve's estimates. Poor trapping success was experienced in the trapping web in June 1987 and the August 1986 trapping web failed to capture any small mammals over the four-day trapping period. Possible

reasons for low trapping success were ample food sources provided by the lush vegetation due an unusually wet spring, little snow cover during winter causing high mortality rates or high predation rates during early summer. Meadow voles occurred sympatrically with prairie voles in the riverine woodland. During trapping sessions in the river bottom fewer meadow voles (5) were caught than prairie voles (12).

Muskrats occurred mostly as transients along the canal. The canal could have provided winter shelter if muskrats would have dug burrows in its banks, but without cattails or bulrushes along the canal, their existence on the Monument was only temporary. The Platte River doesn't flood far enough inland to create standing water at a level for muskrat dens to be constructed so muskrat shelter would have been limited to dens burrowed in the river bank.

The largest rodent that occurred was the porcupine. The porcupine utilizes the coniferous woodland during all seasons and may be found in adjacent prairie and shrub-dominated slopes during the spring, summer, and fall. Opportunistic sampling in the coniferous woodland and slopes of South Bluff revealed that pine tree girdling was evident but not abundant. An active den was located in a side bank of a draw 200 m west of Coyote Pass. The entire population of porcupines on the Monument estimated from signs of tree girdling, tracks, and den sites discovered was less than ten.

Carnivora -- Coyotes were observed in the draws and ravines west of Scotts Bluff and South Bluff. In July 1986, three pups were observed in draws west of Scotts Bluff. On 7 August 1987, four juvenile coyotes and an adult were observed foraging at the northwest base of Scotts Bluff. Coyote scats were found throughout the prairie dog colony. Remains of prairie voles were found in the scats but prairie dog remains were absent. The coyote population in August 1987 was estimated to be 10-20 individuals.

Red fox tracks were encountered occasionally along the canal. The only sighting of a red fox was next to the railroad grade along the river bottom in July 1987. In 1985, a red fox was chased from the top of Scotts Bluff and over a cliff by a domestic dog. Red fox numbers

may be regulated by the coyote population through interspecific competition (Major and Sherburne 1987), but their low numbers may also have been due to red fox preference for more riparian habitats and wooded areas (Jones et al. 1983).

Raccoons occurred along the canal, in the river bottom, in areas of dense cover, and in water drainages. Raccoons may cover large distances along drainages in search of easily accessible food sources (Jones et al. 1983), such as the garbage dumpster sites on the Monument. Densities have been reported to range from 0.5/km² on the prairie of North Dakota (Fritzell 1978) to 20/km² in bottomlands and marshes of Alabama (Johnson 1970). Estimates based on tracks and observations indicated the Monument's raccoon population was 5-20 individuals. Russ McCehan, County Conservation Officer, relocated a juvenile and an adult into the riverine woodland in 1986 and 1987, respectively.

A long-tailed weasel skull was found along the southwest boundary fence in 1987. While live-trapping prairie dogs in June 1988, a long-tailed weasel was captured in the southern portion of the old colony. The weasel seemed to be using an abandoned prairie dog burrow as a den site.

During June 1988 a mink was observed along the bank of the canal on the east side of the Monument. The mink is a semiaquatic mustelid which forages along watercourses such as the canal and river. Their diet consists primarily of frogs, snakes, crayfish, and small invertebrates (Jones et al. 1983).

A three-quarter grown badger was sighted by a park employee in a snowberry thicket directly north of the Visitor Center in July 1987. In April 1988, 36 prairie dog burrow mounds were found dug out by a badger in the new colony. No evidence of badger activity was sighted again until mid-May when two new holes were found dug out by a badger in the extreme southern part of the new colony.

Striped skunks were observed during spotlighting along the canal and adjacent lands in 1987. Tracks were also found within the river bottom. Striped skunks prefer natural cavities among

rocks, under logs and brush piles, and in steep banks for den sites (Jones et al. 1983).

Artiodactyla -- Both mule deer and white-tailed deer occurred on the Monument. Mule deer used all habitat types. In the spring and summer mule deer tended to graze more on grasses and forbs than to browse on trees and shrubs. Downy brome, which was highly palatable during early spring, was heavily grazed by both species. A healthy stand of mountain mahogany (Cercocarpus montanus), known as a highly preferred browse (Stubbendieck et al. 1986), was located on the northeast slope of South Bluff but was not observed to have been browsed by the deer. Because of the abundant native forage species on the Monument and agricultural crops on adjacent lands, food was not a limiting factor on the deer population. Cover may be an important factor during harsh winters with extreme snowfall.

Sightings of white-tailed deer were mostly restricted to the riverine woodland and grasslands north of Scotts Bluff. With an increase in wooded riparian habitat and agricultural practices and reduction of rangeland, white-tailed deer populations have increased in the Nebraska Panhandle in recent years (Menzel 1984). Though white-tailed deer are mainly associated with forested edges and riparian vegetation, they are highly adaptable to habitats adjacent to croplands.

Little is known about the interaction of sympatric populations of these two species. Though they are considered two separate species, hybridization has been documented in Texas, Kansas, Nebraska, Washington, and Alberta (Stubbenfield et al. 1986, Day 1980, Wishart 1980, Kramer 1973). Wishart (1980) studying a captive herd, found that some hybrids were fertile and produced viable offspring. Hybridization is suspected to occur at the Monument. A male deer having a distinct white-tailed antler formation but with a black tail was observed next to the canal during the summer of 1986.

In March 1987, two deer herds were sighted between the canal and Scotts Bluff. One herd had 33 mule and 3 white-tailed deer, while a smaller herd consisted of only 6 white-tails. Both were in the same location but were separated by 150 m and moved away in different directions when disturbed. The herds dissipated in mid-April with no more than 8 mule deer

ever observed again in one group.

Daily deer observations were recorded for specific areas during both years of the survey for the period of 15 July to 5 August. Deer observed/day were 3.4 in 1986 and 3.6 in 1987. White-tails comprised an average of 14% of the daily counts in 1986 (highest daily percentage of 15%). In 1987, white-tails averaged 10% of the daily counts (highest daily percentage of 21%). In 1987, opportunistic sampling was not equal for all areas of the Monument -- the 10% daily average reflects a bias toward sampling more areas containing exclusively mule deer.

Recruitment by the deer population indicated a growing and healthy population. In 1987, observations for fawns were made throughout the entire fawning period. Ten different mule and three different white-tailed deer fawns were detected beginning with the first sighting on 4 May (unusually early). On 16 July 1987, a vehicle was driven on the canal road from west to east through the Monument beginning at 2000 hr. Eight mule deer does were sighted, three of which had twins with them. Because the Monument is small and deer movement across boundaries may be frequent (especially during the winter), large variations in population estimations were observed. In broad terms, the population in 1987 may have been between 50 and 100 individuals.

Species Richness by Habitat

Fig. 4 shows the distribution of species by habitat type. The riverine woodland, which accounted for only 4% of the total area, had 57% of the total species. The canal riparian habitat, which made up 6% of the area, had 54% of the total species. The mixed-grass prairie's surface area of 47% was proportional to its 50% species occurrence. The riverine woodland and canal riparian habitat had the greatest percent of bird species at 58% and 54%, respectively. The richest mammalian habitat was the mixed-grass prairie with 71% of the total mammalian species. The herpetofauna species richness was greatest in the riverine woodland. Fourteen wildlife species were unique in the riverine woodland and 12 species were unique in the mixed-grass prairie.

Undetected Species

Because of the briefness of the faunal survey, the relatively small size of the Monument, or low detectability, certain species in all four faunal classes that have been reported to occur in the Nebraska Panhandle were not detected in this study. Three important habitats, coniferous forest, sandy soil blowouts, and wetland areas were rare or occurred in extremely small sites and may have precluded the occurrence of many fauna species. Herpetofauna cited by (Lynch 1985) as occurring in Scotts Bluff County but not observed during the survey were: northern leopard frog (Rana pipiens), bullfrog (Rana catesbeiana), short-horned horned toad (Phrynosoma douglassii), lesser earless lizard (Holbrookia maculata), northern prairie lizard (Sceloporus undulatus), western hognose snake (Heterodon nasicus), milk snake (Lampropeltis triangulum).

Avian species cited by observers in Nebraska Bird Review since 1985 and Johnsgard (1979) as occurring or breeding in the Nebraska Panhandle, were not observed during this study. These included: 1 species of loon, 3 grebes, 1 pelican, 4 herons and bitterns, 14 waterfowl species, 4 raptors, 1 crane, 19 shorebirds, 1 cuckoo, 3 owls, 2 hummingbirds, 1 woodpecker, and 20 passerines.

Mammalian species cited by Jones et al. (1983) and Jones and Choate (1978) as occurring in the Panhandle not found during the survey were: masked shrew (Sorex cinereus), silver-haired bat (Lasiorycteris noctivogans), red bat (Lasiurus borealis), hoary bat (Lasiurus cinereus), fringed-tailed myotis (Myotis thysanodes) (all bats species are seasonal migrants), black-tailed jackrabbit, white-tailed jackrabbit, northern pocket gopher (Thomomys talpoides), olive-backed pocket mouse (Perognathus fasciatus), plains pocket mouse (Perognathus flavescens), silky pocket mouse (Perognathus flavus), plains harvest mouse (Reithrodontomys monotanus), and northern grasshopper mouse (Onychomys leucogaster), spotted ground squirrel (Spermophilus spilosoma), Thirteen-lined ground squirrel (Spermophilus tridecemlineatus), beaver (Castor canadensis), bobcat (Felis rufus), gray fox (Urocyon cinereoargenteus). Future work at the Monument may find some of these species to be present.

MANAGEMENT RECOMMENDATIONS

The Monument has a multitude of resources to preserve including wildlife, native prairie, historical perspectives, aesthetics, and recreation. Interrelationships still exist among the various resources and must be taken into consideration when management decisions are made. Recommendations are presented for the preservation and conservation of the Monument's fauna with the interrelationships considered.

The low diversity of amphibian life at the Monument is probably normal for the region that lacks shallow water basins and is typified by low annual precipitation. Scotts Spring, located along the summit trail at the base of Scotts Bluff, was reported to have contained permanent water during the pre-settlement days. Today, due to current trends in the ground water conditions, the spring holds water for only short periods in the spring and summer. Even though the spring is only a temporary water source, it may be used as a breeding site for salamanders and toads. Efforts should be made to preserve the vegetation surrounding the spring and to prevent any disturbance of the area during the spring and summer months. Other sites containing suitable habitat for amphibians are two small drainages that lead off the canal toward the river and parts of the riverine woodland during years when the North Platte River overflows. These other sites should also be carefully protected.

The Monument has a rich snake community. Prairie rattlesnakes are common on the Monument and we believe they are in balance with the abundant prey base of small mammals. We recommend that an active educational program be initiated to make the public aware that rattlesnakes do occur on the Monument and encourage the public not to harm them.

Trees on the Monument are essential nesting structures for many avian species. Even dead trees provide valuable shelter and food not only for birds but other animals as well. Deciduous trees along the canal and of the riverine woodland provide habitat that contains the most abundant and diverse bird life at the Monument. Removal of trees should be discouraged unless absolutely necessary.

Prescribed burning is an active management tool applied to the mixed-grass prairie on the Monument. With respect to benefiting wildlife, results may be quite variable depending on frequency, time of year, and surface area of the burn. Wright and Bailey (1982) concluded that there is no benefit to burning shortgrass prairie in the Central Great Plains unless a need exists for removal of unusually heavy accumulations of litter. Burning at the Monument to enhance new growth, to change plant species composition, and to reduce litter accumulations should be critically evaluated. Fires in grasslands where shrub cover is limited are often destructive to the nesting habitat of songbirds (Renwald et al. 1978). Species at the Monument that depend on the shrub-dominated slopes and ravines for nesting are black-billed magpies, rufous-sided towhees, lark sparrows, buntings, grosbeaks, and flycatchers. Abundance of these species may be reduced temporarily until shrub growth is regained. Peterson and Best (1987) stated that moderate, incomplete burns that create a mosaic burn pattern are not detrimental to nongame bird populations.

Small mammals may be temporarily reduced during the first year following a burn. Immediately after the burn deer mice numbers may drop 50-84% (Buech et al. 1977). However, after the first growing season, their population levels return to normal levels on grassland burns (Cook 1959). Recovery of vole populations in a burned grassland has been reported to occur 12-16 months after the burn because voles need a minimum of 1 year's accumulation of litter to furnish runways (Cook 1959, Vacanti and Geluso 1985).

Extreme caution should be used when burning within 500 m of the prairie dog colony. Almost 40% of the prairie dogs in 1985 dispersed into an adjacent burn area located within 100 m of the outer limits of the colony's boundary. Other vegetative disturbances such as mowing or extreme drought which reduce plant height may cause similar movement.

Prairie dogs are a vital part of the pristine native prairie at Scotts Bluff National Monument. We support the 1987 Resource Management Plan to contain the prairie dogs within a designated area of the Monument. Although a separate prairie dog management document will be written, a few preliminary comments will be made. The prairie dogs will pose no threat to the adjacent

prairie nor the Oregon trail ruts with proper monitoring and control during specific periods of the year. A survey of the colony's outer boundaries and population estimation should be completed in September. During the last week in April and continuing through May, pups will be emerging above ground for the first time. If burrow mounds are found outside the prairie dog's designated area and it is deemed necessary to remove individuals to prevent further expansion, zinc phosphide treated oats are recommended.

The pocket gopher is a fossorial mammal, like the prairie dog, that is able to impact the native plant species composition by altering plant succession and introducing exotic plant species. Annual grasses have been shown to be greater on gopher-disturbed sites when compared to undisturbed range sites (Foster and Stubbendieck 1980). Though pocket gophers have been found to reduce forage production on rangeland sites primarily for cattle grazing (Foster and Stubbendieck 1980), the Monument is not a rangeland for cattle nor is forage production a major concern at this time. It is recommended that more permanent sampling grids be placed in the grasslands to assess the changes in plant composition relative to changes in burrow mound densities. Pocket gopher mounds may not be aesthetically pleasing, but we believe their function of providing shelter for a variety of amphibians, reptiles, and small mammals (see Vaughan 1961) is a vital link in the grassland ecosystem.

The porcupine population is at a low density, typical of an area with limited numbers of conifers and hardwoods for winter forage. Girdling of the ponderosa pine is almost exclusively restricted to the slopes of South Bluff. No girdled trees were found to be fatally damaged. A timber cruise of the coniferous woodland could be done every two years to count recently girdled trees to provide an index of the relative abundance of the porcupine.

The Monument appears to have a stable coyote population with an abundant small mammal food base. Coyotes were not found to prey upon the prairie dogs. Scats collected from coyotes at Wind Cave National Park, where prairie dogs are at much higher population levels, indicated that prairie dogs were not an important food item in the coyote diet (William Franklin and Rich Klukas, pers. comm.). Some may argue that the Monument is a "pool" of coyotes which

spills into the adjacent private lands or "sinks". Rangelands and foothills off the Monument may contribute many more coyotes to the area than the Monument alone. If coyote activity greatly increases on adjacent lands, further research would be needed to establish the location of coyote home ranges and where the majority of the coyote dens are located.

Both mule deer and white-tailed deer seem to show normal to high recruitment. Though deer are both browsers and grazers, they will consume the available vegetation that contains good nutritional value. An increase coverage of downy brome, a highly palatable and nutritious grass during the early spring and late fall, at the Monument (George Oviatt, Monument resource manager, pers. comm.) has increased the carrying capacity for deer. The carrying capacity increase is due also to agricultural practices on the adjacent private lands. The deer become mobile in winter and feed on baled hay on private lands. Hay and adequate cover have allowed greater numbers of deer to survive through the winter. Population levels may depend on adjacent landowner tolerance to crop depredation by deer. James John, adjacent private landowner and deer hunter, stated that few deer are harvested surrounding the Monument during the fall. As long as there is palatable and nutritious hay on private lands and adequate hiding cover on the Monument, there will be deer crossing Monument boundaries. We recommend that the Park personnel contact private landowners periodically to be keep informed of the status of the deer which range over both the Monument land and private agricultural land. Also, Park personnel should contact the Nebraska Game and Parks Commission to possibly determine the previous deer harvest rates surrounding the Monument. If the reproductive success of the deer continue and adequate winter food is available, deer densities will rise. This may warrant more intensive monitoring in cooperation with adjacent landowners and the Nebraska Game and Parks Commission.

POTENTIAL SPECIES FOR REINTRODUCTION

Though the Monument is relatively small in size, there is the potential for reintroduction of absent native wildlife species. We feel that with cooperation and support from adjacent landowners and local citizens, pronghorn antelope (Antilocarpa americana) and the sharp-tailed grouse (Tympanuchus phasianellus) are two possible candidates for reintroduction. The pronghorn

was a prominent native ungulate on the grasslands of western Nebraska during pre-settlement days. Pronghorn occur in eastern Wyoming, but populations in western Nebraska are limited. The Monument's small size of 1200 ha. is an important factor in determining whether it would accommodate normal pronghorn home ranges. Home ranges have been found to vary from 440 to over 1200 ha for nursery and bachelor herds in Palouse Prairie habitat (Kitchen 1974) and 165 to 2300 ha in central Montana (Bayless 1969). Both figures are greatly influenced by the type of habitat and quantity of available forage. Forb cover on the Monument may be limiting; forbs are reported to make up 44% of the pronghorn year-round diet (Kitchen and O'Gara 1982). Thorough sampling of the Monument's plant community would be needed to verify if forbs were in relatively low abundance. We believe pronghorn could greatly enhance the existing fauna, but the decision must be made based on a thorough evaluation of the Monument's food base and potential impact on surrounding private lands.

Sharp-tailed grouse occur in Western Nebraska but none were found within the Monument (Sisson 1976). Kirsh (1974) recommended a minimum of two square miles of good habitat for prairie chicken populations. Native and exotic prairie vegetation and insects are eaten in the summer, with a slight shift to cultivated grains in the fall and winter (Evans 1968). Booming grounds for breeding purposes are an important part of the sharp-tailed grouse life cycle. Booming grounds are established in areas of bare or grassy knolls and used year after year (Swenson 1985). Male grouse often show preferential use of arenas burned by fire (Sexton and Gillespie 1970). If grouse were reintroduced to the Monument, we recommend burning a small and elevated area of prairie the first year they are transplanted to entice males to set up booming grounds on the burn site. The Nebraska Game and Fish Commission could provide important information concerning grouse reintroductions.

Other extirpated native wildlife species which were not considered for reintroduction are: black-tailed jackrabbit (Lepus californicus), white-tailed jackrabbit (Lepus townsendii), 13-lined ground squirrel (Spermophilus tridecemlineatus), spotted ground squirrel (Spermophilus spilosoma), swift fox (Vulpes velox), and bobcat (Felis rufus).

CONCLUSION

The Monument is a relatively small park containing little or no buffering capacity along its boundaries due to its close proximity to the city of Gering on the east and north boundary and intensive row crop farming on the south and west boundary. Species which lack similar habitats to those found on the Monument in the surrounding Panhandle region or which are unable to disperse to other habitats which are available, will require resourceful management.

The Monument has a rich and diverse native fauna typifying mixed-grass prairie. It will be important in the future to periodically reassess the status of the fauna to insure proper balance in terms of species diversity and relative abundance. Management will be necessary to maintain the existing native species and to encourage other faunal species native to this grassland-woodland ecosystem. We recommend that future faunal research projects at the Monument include studies on the interaction of the sympatric populations of mule and white-tailed deer, movement and predator-prey relationships of the prairie rattlesnake, impact of pocket gopher activity on plant species composition, and the potential reintroduction of sharp-tailed grouse and pronghorn.

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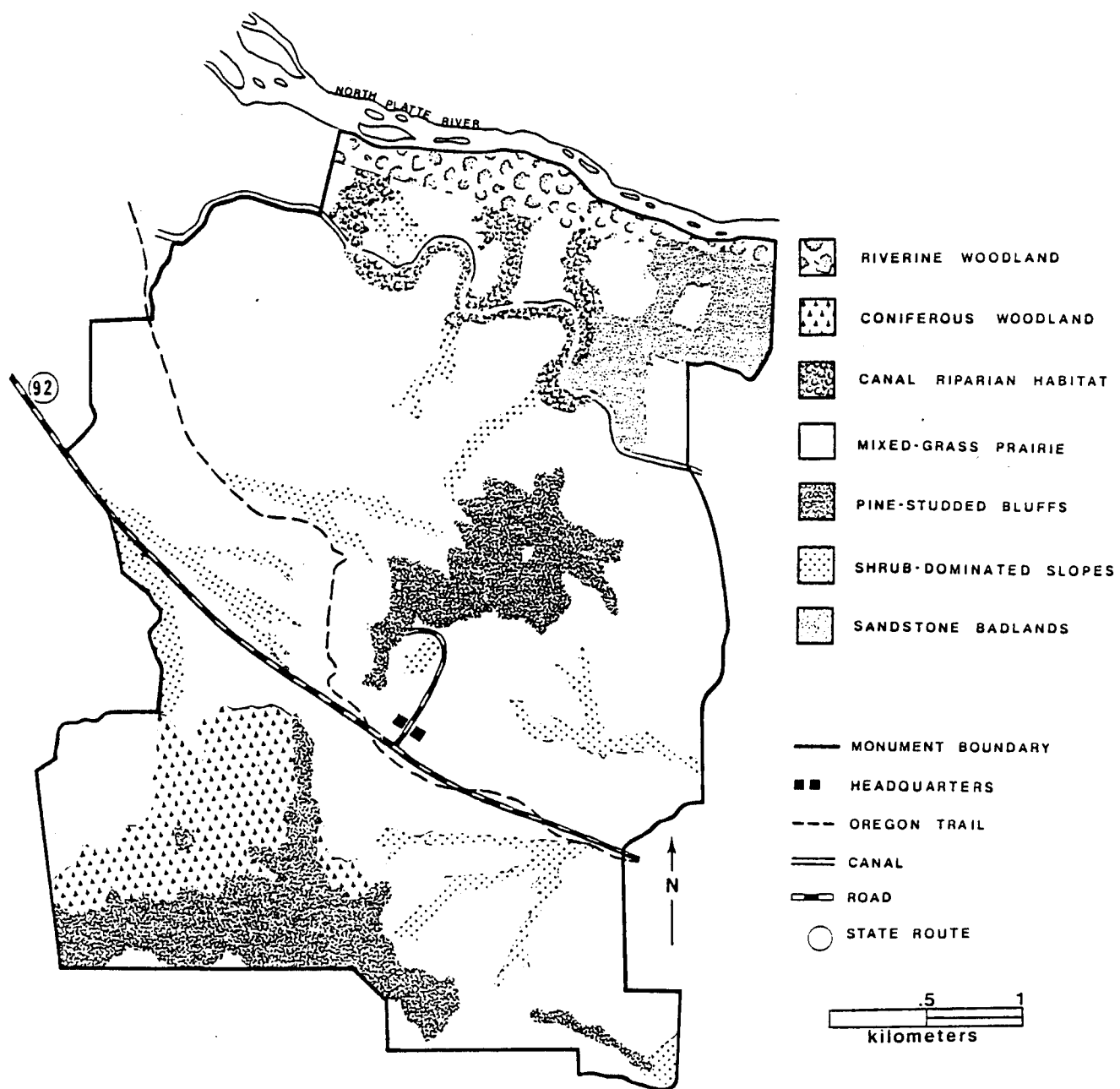


Figure 1. The seven major habitat types of Scotts Bluff National Monument, Nebraska.

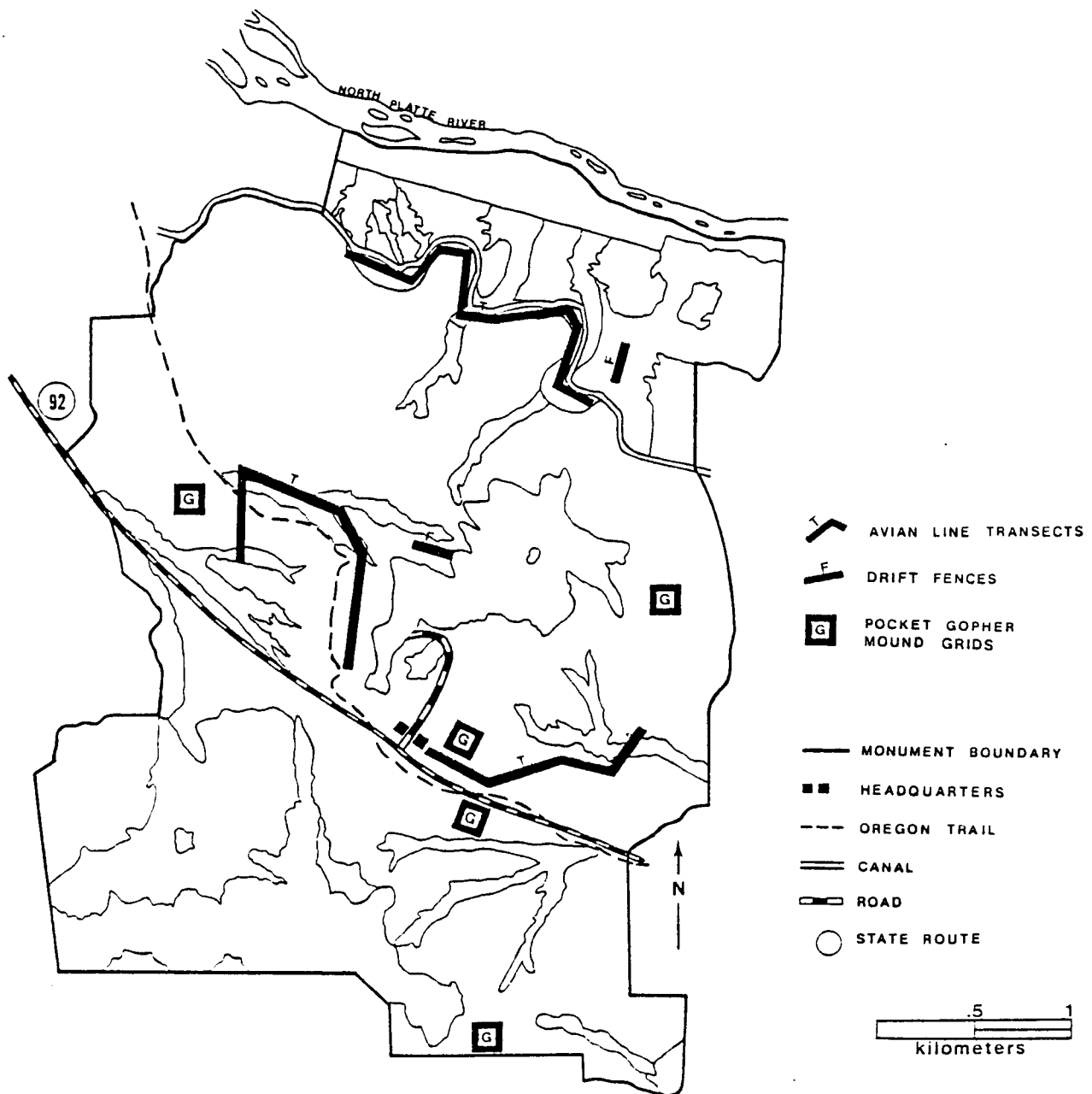


Figure 2. Locations of avian line transects, amphibian and reptilian drift fences, and pocket gopher mound sampling grids used during the faunal survey in relation to habitat types outlined in thin black lines (see Fig. 1).

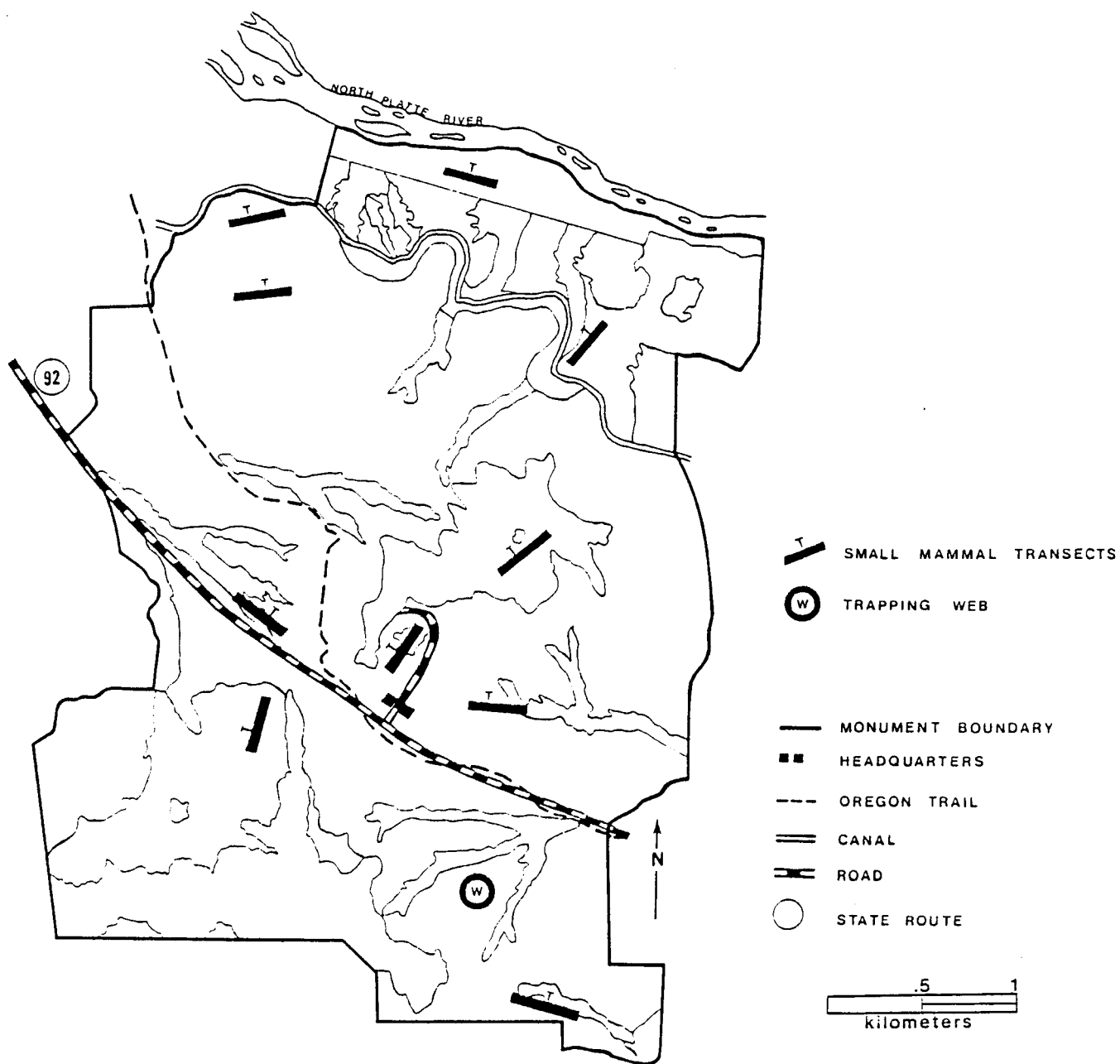


Figure 3. Locations of small mammal sampling transects and trapping web during the faunal survey in relation to habitat types.

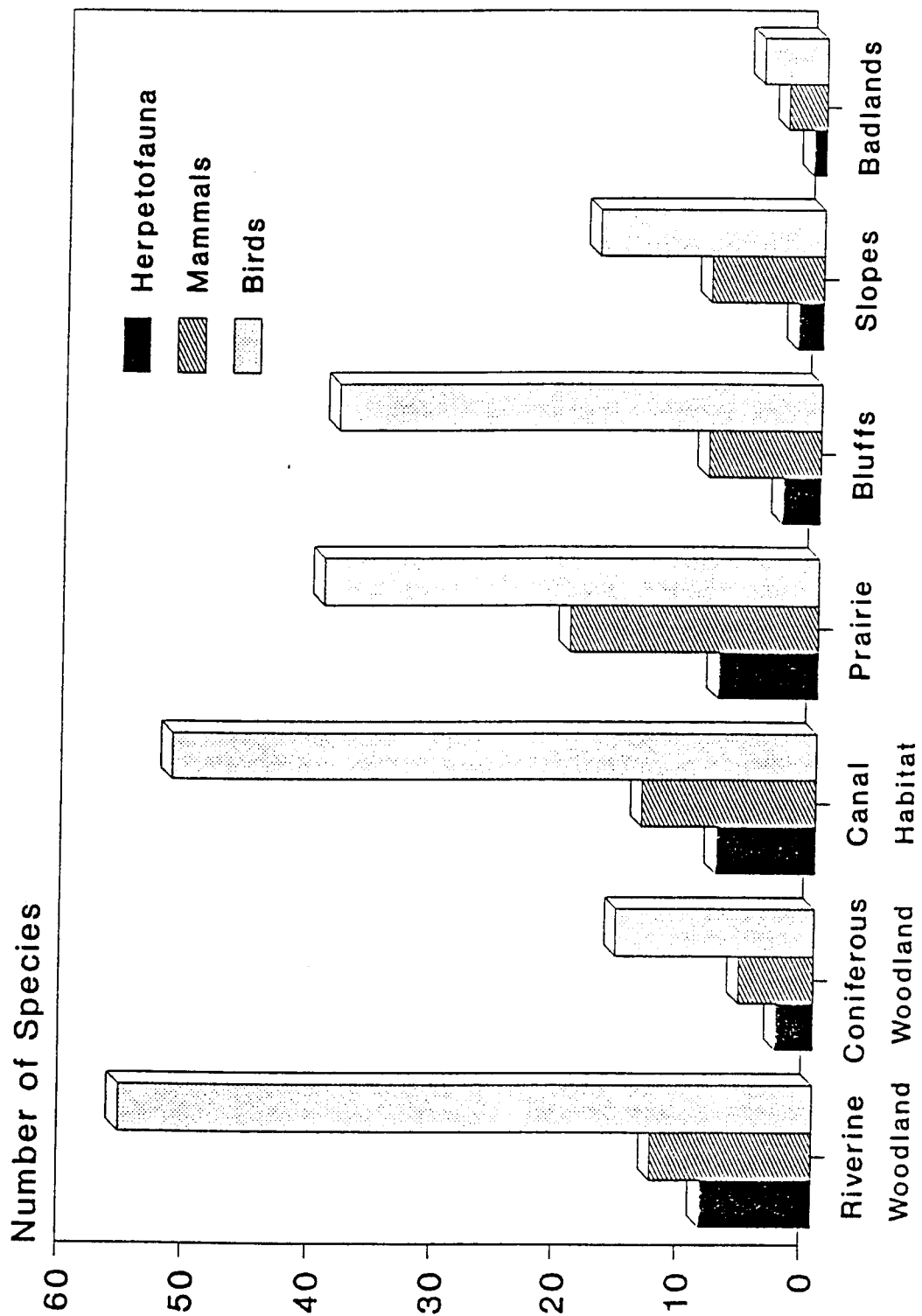


Figure 4. Wildlife species richness for seven habitat types at Scotts Bluff National Monument.

Table 1. Definitions of abbreviations used in tables for residency status, habitat types, and relative abundance.

RESIDENCY STATUS

P	=	Permanent resident, breeding not documented
PB	=	Permanent resident, breeding documented
S	=	Summer resident (April – October), breeding not documented
SB	=	Summer resident, breeding documented
W	=	Winter resident (October – April)
M	=	Spring or fall migrant
T	=	Transient, present for only short duration

HABITAT TYPES

RW	=	Riverine woodland
CW	=	Coniferous woodland
CRH	=	Canal riparian habitat
MGP	=	Mixed-grass prairie
PSB	=	Pine-studded bluffs
S	=	Shrub-dominated slopes
B	=	Sandstone badlands

RELATIVE ABUNDANCE

A	=	Abundant
C	=	Common
U	=	Uncommon
R	=	Rare

Table 2. Amphibian species residency status, distribution by habitat, and abundance at Scotts Bluff National Monument. Abbreviations are explained in Table 1.

Common name <u>Scientific name</u>	Residency status	Habitat Types						
		RW	CW	CRH	MGP	S	PSB	B
✓ ~~Tiger salamander~~ <u>Ambystoma tigrinum</u>	PB	U		U	U			
✓ ~~Great Plains toad~~ <u>Bufo cognatus</u>	PB				U			
✓ ~~Woodhouse's toad~~ <u>Bufo woodhousii</u>	PB	C		C	C	U		U
✓ ~~Western striped chorus frog~~ <u>Pseudacris triseriata</u>	PB	C		U				U

Table 3. Reptilian species residency status, distribution by habitat, and abundance at Scotts Bluff National Monument. Abbreviations are explained in Table 1.

Common name <u>Scientific name</u>	Residency status	Habitat Types							
		RW	CW	CRH	MGP	S	PSB	B	
✓ Painted turtle <u>Chrysemys picta</u>	PB	C		C	U			U	
✓ Western box turtle <u>Terrapene ornata</u>	PB	C		C	C	U	U	U	
✓ Spiny softshell turtle <u>Trionyx spiniferus</u> <i>apalone spiniferus</i>	P	U							
✓ Racer <u>Coluber constrictor</u>	PB	A	C	A	A	C	U	U	
✓ Bullsnake <u>Pituophis catenifer</u>	PB	C	C	C	A	C	U	U	
✓ Plains garter snake <u>Thamnophis radix</u>	PB	U		C	U			U	
✓ Common garter snake <u>Thamnophis sirtalis</u>	PB	C		C	R				
✓ Prairie rattlesnake <u>Crotalus viridis</u>	PB	U	C	U	A	C	C	U	

Table 4. Avian species residency status, distribution by habitat, and abundance at Scotts Bluff National Monument. Abbreviations are explained in Table 1.

Common name Scientific name	Residency status	Habitat Types						
		RW	CW	CRH	MGP	S	PSB	B
✓ Double-crested cormorant <u>Phalacrocorax auritus</u>	S	U						
✓ Great blue heron <u>Ardea herodias</u>	S	C		U				
✓ Snow goose <u>Chen caerulescens</u>	M							
✓ Canada goose <u>Branta canadensis</u>	S	U						
✓ Wood duck <u>Aix sponsa</u>	S	U		U				
✓ Green-winged teal <u>Anas crecca</u>	S	U						
✓ Blue-winged teal <u>Anas discors</u>	S	U						
✓ Mallard <u>Anas platyrhynchos</u>	SB	C		C	U			
✓ Common merganser <u>Mergus merganser</u>	S	U						
✓ Turkey vulture <u>Cathartes aura</u>	SB		U		C		C	
✓ Osprey <u>Pandion haliaetus</u>	T						R	
✓ Northern harrier <u>Circus cyaneus</u>	P				U		R	
✓ Swainson's hawk <u>Buteo swainsoni</u>	S		U		U			
✓ Red-tailed hawk <u>Buteo jamaicensis</u>	P	U	U		U		U	U
✓ Golden eagle <u>Aquila chrysaetos</u>	P		R		R		U	

Table 4 cont.

Common name <u>Scientific name</u>	Residency status	Habitat Types							
		RW	CW	CRH	MGP	S	PSB	B	
~~X~~ Bald eagle <u>Haliaeetus leucocephalus</u>	M	R		R					
~~X~~ American kestrel <u>Falco sparverius</u>	SB	R	U	C	C	U	C	U	
~~X~~ Prairie falcon <u>Falco mexicanus</u>	SB		U	R	C		C		
~~X~~ Ring-necked pheasant <u>Phasianus colchicus</u>	PB	U	U	U	C	C		R	
~~X~~ Wild turkey <u>Meleagris gallopavo</u>	P	R		R					
~~X~~ Northern bobwhite <u>Colinus virginianus</u>	P			U	C	R			
~~X~~ Sora <u>Porzana carolina</u>	S	R							
~~X~~ Killdeer <u>Charadrius vociferus</u>	S	U		U	U				
~~X~~ Upland sandpiper <u>Bartramia longicauda</u>	S				R				
~~X~~ Franklin's gull <u>Larus pipixcan</u>	S				U				
~~X~~ Herring gull <u>Larus argentatus</u>	S				U				
~~X~~ Rock dove <u>Columba livia</u>	P						C		
~~X~~ Mourning dove <u>Zenaida macroura</u>	SB	C	U	C	C	C	U	R	
~~X~~ Yellow-billed cuckoo <u>Coccyzus americanus</u>	S	R							
~~X~~ Barn owl <u>Tyto alba</u>	P				R	R			
~~X~~ Great horned owl <u>Bubo virginianus</u>	PB	U	C	C	U	C	U	C	

Table 4 cont.

Common name <u>Scientific name</u>	Residency status	Habitat Types						
		RW	CW	CRH	MGP	S	PSB	B
X ✓ Burrowing owl <u>Athene cunicularia</u>	SB				C			
X ✓ Short-eared owl <u>Asio flammeus</u>	P		R		R	R		
X ✓ Common nighthawk <u>Chordeiles minor</u>	SB	U		U	C		C	U
X ✓ Common poor-will <u>Phalaenoptilus nuttallii</u>	SB						U	
X ✓ White-throated swift <u>Aeronoutes saxatalis</u>	SB			U	U	U	A	
X ✓ Chimney swift <u>Chaetura pelagica</u>	S				U		U	
X ✓ Belted kingfisher <u>Ceryle alcyon</u>	S	U		U				
X ✓ Northern flicker <u>Colaptes auratus</u>	SB	C		C	U	U		
X ✓ Hairy woodpecker <u>Picoides villosus</u>	PB	U		U				
X ✓ Downy woodpecker <u>Picoides pubescens</u>	PB	C		U				
X ✓ Red-headed woodpecker <u>Melanerpes erythrocephalus</u>	S	R		R				
X ✓ Western wood-pewee <u>Contopus sordidulus</u>	S		R	R				
X ✓ Say's phoebe <u>Sayornis saya</u>	S	U	U	U	C	U		
X ✓ Eastern kingbird <u>Tyrannus tyrannus</u>	SB	U	U	C	C	C	U	
X ✓ Western kingbird <u>Tyrannus verticalis</u>	SB	U		U	C	U		
X ✓ Horned lark <u>Eremophila alpestris</u>	P				U			

Table 4 cont.

Common name <u>Scientific name</u>	Residency status	Habitat Types							
		RW	CW	CRH	MGP	S	PSB	B	
~~X~~ ~~W~~ Northern-roughwinged swallow <u>Stelgidopteryx serripennis</u>	S	C		C	U				
~~X~~ ~~B~~ Bank swallow <u>Riparia riparia</u>	S	U							
~~X~~ ~~C~~ Cliff swallow <u>Hirundo pyrrhonota</u>	SB	C		C	C				
~~X~~ ~~B~~ Barn swallow <u>Hirundo rustica</u>	SB	C		C	C	U			
~~X~~ ~~B~~ Blue jay <u>Cyanocitta cristata</u>	P	U		U					
~~X~~ ~~B~~ Black-billed magpie <u>Pica pica</u>	PB	C	C	C	C	C	C		
~~X~~ ~~A~~ American crow <u>Corvus brachyrhynchos</u>	P	R		R					
~~X~~ ~~B~~ Black-capped chickadee <u>Parus atricapillus</u>	PB	C	C	C		U	C	U	
~~X~~ ~~B~~ Rock wren <u>Salicetes obsoletus</u>	SB	U	U	U		C	A	C	
~~X~~ ~~H~~ House wren <u>Troglodytes aedon</u>	SB	A		A					
~~X~~ ~~E~~ Eastern bluebird <u>Sialia sialis</u>	S	U							
~~X~~ ~~M~~ Mountain bluebird <u>Sialia currucoides</u>	S					U			
~~X~~ ~~T~~ Townsend's solitaire <u>Myadestes townsendi</u>	W		C						
~~X~~ ~~S~~ Swainson's thrush <u>Catharus ustulatus</u>	M	U							
~~X~~ ~~A~~ American robin <u>Turdus migratorius</u>	SB	C	A	C	C	C	U	C	

Table 4 cont

Common name Scientific name	Residency status	Habitat Types						
		RW	CW	CRH	MGP	S	PSB	B
X ✓ Brown thrasher <u>Toxostoma rufum</u>	SB	U		U		U		
X ✓ Cedar waxwing <u>Bombycilla cedrorum</u>	M	U		U				
X ✓ Loggerhead shrike <u>Lanius ludovicianus</u>	S				U	C		
X ✓ European starling <u>Sturnus vulgaris</u>	PB	A	C	A		U	U	
X ✓ Warbling vireo <u>Vireo gilvus</u>	S	R						
X ✓ Yellow warbler <u>Dendroica petechia</u>	S	C		U				
X ✓ Common yellowthroat <u>Geothlypis trichas</u>	S	C		U				
X ✓ Yellow-breasted chat <u>Icteria virens</u>	SB	C	U	C	U	C		
X ✓ Western Tanager <u>Piranga ludoviciana</u>	M		R	R				
X ✓ Black-headed grosbeak <u>Pheucticus melanocephalus</u>	S					R		
X ✓ Blue grosbeak <u>Guiraca caerulea</u>	SB	U	C	C	U	C	U	
X ✓ Lazuli bunting <u>Passerina amoena</u>	SB	C	U	C		U		
X ✓ Indigo bunting <u>Passerina cyanea</u>	SB	U	U	C		U		
X ✓ Rufous-sided towhee <u>Pipilo erythrophthalmus</u>	SB	C	C	C	U	A	C	
X ✓ American tree sparrow <u>Spizella arborea</u>	W					U		
X ✓ Chipping sparrow <u>Spizella passerina</u>	SB		U	U	C	U		

Table 4 cont.

Table 4 cont.

Common name <u>Scientific name</u>	Residency status	Habitat Types							
		RW	CW	CRH	MGP	S	PSB	B	
~~X~~ ✓ Vesper sparrow <u>Pooecetes gramineus</u>	S				U	U			
~~X~~ ✓ Brewer's sparrow <u>Spizella breweri</u>	M				U	U			
~~X~~ ✓ Clay-colored sparrow <u>Spizella pallida</u>	M				U	U			
~~X~~ ✓ Lark sparrow <u>Chondestes grammacus</u>	SB		U	C	U	C	U		
~~X~~ ✓ Lark bunting <u>Calamospiza melanocorys</u>	SB				C	U			
~~X~~ ✓ Grasshopper sparrow <u>Ammodramus savannarum</u>	SB				C				
~~X~~ ✓ White-crowned sparrow <u>Zonotrichia leucophrys</u>	M	C	C	C	U	C		C	
~~X~~ ✓ Dark-eyed junco <u>Junco hyemalis</u>	W		C			C			
~~X~~ ✓ Red-winged blackbird <u>Agelaius phoeniceus</u>	S	C		U					
~~X~~ ✓ Western meadowlark <u>Sturnella neglecta</u>	SB		U	C	A	C			
~~X~~ ✓ Common grackle <u>Quiscalus quiscula</u>	SB	A		C		C			
~~X~~ ✓ Brown-headed cowbird <u>Molothrus ater</u>	SB	C		A	C	C			
~~X~~ ✓ Orchard oriole <u>Icterus spurius</u>	SB	U		C					
~~X~~ ✓ Northern oriole <u>Icterus galbula</u>	S	U		U	R				
~~X~~ ✓ House finch <u>Carpodacus mexicanus</u>	PB	U		U		C		U	

Table 4 cont.

Common name Scientific name	Residency status	Habitat Types						
		RW	CW	CRH	MGP	S	PSB	B
X ✓ Pine siskin <u>Carduelis pinus</u>	P			U		U		
✓ American goldfinch <u>Carduelis tristis</u>	PB	C	U	A	C	U	U	
I X ✓ House sparrow <u>Passer domesticus</u>	PB	C	U	C	U	C	U	

Table 5. Results of the bird line transect in canal riparian habitat. Densities are given as the number of birds/100 ha. Bird species with densities of <0.30/100 ha are not listed.

Bird species	Density	Bird species	Density
Brown-headed cowbird	13.50	Rock Dove	2.95
European starling	12.64	Red-winged blackbird	2.40
American goldfinch	12.48	Common grackle	2.00
Mourning dove	10.05	Orchard oriole	1.76
Yellow-breasted chat	7.79	Lazuli bunting	1.39
Blue grosbeak	7.13	House wren	1.35
Rufous-sided towhee	7.09	Barn swallow	0.69
American robin	6.54	Western meadowlark	0.68
Eastern kingbird	4.84	Black-billed magpie	0.66
Rough-winged swallow	4.66	Northern bobwhite	0.50
Black-capped chickadee	4.39	White-throated swift	0.39
Indigo bunting	3.86	Downy woodpecker	0.35

Mean overall abundance = 40.90/100 ha $\pm$ 7.39

Mean species richness = 22 $\pm$ 4.09

Shannon diversity index¹ = 1.29

¹Shannon diversity index = $-\sum [(n_i/N)(\log n_i/N)]$

Table 6. Results of the bird line transect east of the Visitor Center in mixed-grass prairie with shrubby draws. Densities are given as the number of birds/100 ha. Bird species with densities of <0.30/100 ha are not listed.

Bird species	Density	Bird species	Density
Western meadowlark	10.08	Barn swallow	0.60
Rufous-sided towhee	2.00	Yellow-breasted chat	0.54
House finch	1.66	Black-billed magpie	0.45
Blue grosbeak	1.63		

Mean overall abundance = 10.4/100 ha $\pm$ 12.52

Mean species richness = 11.3 $\pm$ 2.70

Shannon diversity index¹ = 0.83

¹Shannon diversity index = $-\sum [(n_i/N)(\log n_i/N)]$

Table 7. Results of the bird line transect west of Scotts Bluff in mixed-grass prairie with shrubby ravines. Densities are given as the number of birds/100 ha. Bird species with densities of <0.30/100 ha are not listed.

Bird species	Density	Bird species	Density
Lark sparrow	2.63	Mourning dove	0.99
Rufous-sided towhee	2.24	Rock wren	0.62
Black-billed magpie	1.02	Blue grosbeak	0.56

Mean overall abundance = 4.83/100 ha $\pm$ 1.05

Mean species richness = 8.20 $\pm$ 3.15

Shannon diversity index¹ = 0.77

¹Shannon diversity index = $-\sum [(n_i/N)(\log n_i/N)]$

Table 8. Mammalian species residency status, distribution by habitat, and abundance at Scotts Bluff National Monument. Abbreviations are explained in Table 1.

Common name <u>Scientific name</u>	Residency status	Habitat Types							
		RW	CW	CRH	MGP	S	PSB	B	
X ✓ Virginia opossum <u>Didelphis virginiana</u>	P	R		U					
X ✓ Eastern mole <u>Scalopus aquaticus</u>	PB	C	U	U	C				
X ✓ Small-footed myotis <u>Myotis leibii</u>	SB	C		C			A		
X ✓ Big brown bat <u>Eptesicus fuscus</u>	SB						U		
X ✓ Desert cottontail <u>Sylvilagus audubonii</u>	PB		U		A	C	C	U	
✓ Eastern cottontail <u>Sylvilagus floridanus</u>	PB	C	U	C	C	C			
X ✓ Black-tailed prairie dog <u>Cynomys ludovicianus</u>	PB				C				
X ✓ Fox squirrel <u>Sciurus niger</u>	PB	U		U					
X ✓ Plains pocket gopher <u>Geomys bursarius</u>	PB	C	U	U	A	U			
X ✓ Hispid pocket mouse <u>Perognathus hispidus</u> (<u>Chaetodipus hispidus</u>)	PB				C				
X ✓ Ord's kangaroo rat <u>Dipodomys ordii</u>	PB				U				
X ✓ Western harvest mouse <u>Reithrodontomys megalotis</u>	PB				C		U		
X ✓ Deer mouse <u>Peromyscus maniculatus</u>	PB	C	C	C	A	C	C	U	
X ✓ Bushy-tailed woodrat <u>Neotoma cinerea</u>	P						U		

Table 8 cont.

Common name <u>Scientific name</u>	Residency status	Habitat Types							
		RW	CW	CRH	MGP	S	PSB	B	
I ~~X~~ House mouse <u>Mus musculus</u>	PB				C				
~~X~~ ~~P~~ Prairie vole <u>Microtus ochrogaster</u>	PB	C		C	A	U		U	
~~X~~ ~~W~~ Meadow vole <u>Microtus pennsylvanicus</u>	PB	C							
~~X~~ ~~M~~ Muskrat <u>Ondatra zibethicus</u>	T			U					
~~X~~ ~~P~~ Porcupine <u>Erethizon dorsatum</u>	P		U						
~~X~~ ~~C~~ Coyote <u>Canis latrans</u>	PB		U	U	C	C	U		
~~X~~ ~~R~~ Red fox <u>Vulpes vulpes</u>	P	U		R	U				
~~X~~ ~~R~~ Raccoon <u>Procyon lotor</u>	P	U		C	U		U		
~~X~~ ~~L~~ Long-tailed weasel <u>Mustela frenata</u>	P	U			U	U			
~~X~~ ~~M~~ Mink <u>Mustela vison</u>	P			U					
~~X~~ ~~B~~ Badger <u>Taxidea taxus</u>	T				R				
~~X~~ ~~S~~ Striped skunk <u>Mephitis mephitis</u>	P	U		U					
~~X~~ ~~M~~ Mule deer <u>Odocoileus hemionus</u>	PB	U	C	U	C	A	U	U	
~~X~~ ~~W~~ White-tailed deer <u>Odocoileus virginianus</u>	PB	C		U	U	U			

Table 9. List of specimens donated to Scotts Bluff National Monument Museum.

✓ 1. ✓ Eastern mole <u>Scalopus aquaticus</u> ✓	study skin and skull
✓ 2. ✓ Prairie vole <u>Microtus ochrogaster</u> ✓	study skin and skull
✓ 3. ✓ Prairie vole <u>Microtus ochrogaster</u> ✓	skin and skull
✓ 4. ✓ Eastern cottontail <u>Sylvilagus floridanus</u> ✓	skull
✓ 5. ✓ Eastern cottontail <u>Sylvilagus floridanus</u> ✓	study skin and skull
✓ 6. ✓ Deer mouse (juvenile) <u>Peromyscus maniculatus</u> ✓	study skin and skull
✓ 7. ✓ Desert cottontail <u>Sylvilagus audubonii</u> ✓	skull
✓ 8. ✓ Long-tailed weasel <u>Mustela frenata</u> ✓	skull
✓ 9. ✓ Raccoon <u>Procyon lotor</u> ✓	skull
✓ 10. ✓ Black-tailed prairie dog <u>Cynomys ludovicianus</u> ✓	skull
✓ 11. ✓ Plains pocket gopher <u>Geomys bursarius</u> ✓	study skin and skull
✓ 12. ✓ Western harvest mouse <u>Reithrodontomys megalotis</u> ✓	study skin and skull
✓ 13. ✓ Deer mouse <u>Peromyscus maniculatus</u> ✓	study skin and skull
✓ 14. ✓ Western harvest mouse <u>Reithrodontomys megalotis</u> ✓	study skin
✓ 15. ✓ Deer mouse <u>Peromyscus maniculatus</u> ✓	study skin

Table 9. cont.

✓ 16. Kangaroo rat <u>Dipodomys ordi</u>	study skin and skull
✓ 17. Hispid pocket mouse <u>Perognathus hispidus</u>	study skin and skull
✓ 18. Small-footed myotis bat <u>Myotis liebii</u>	study skin and skull
✓ 19. Black-tailed prairie dog (juvenile) <u>Cynomys ludovicianus</u>	study skin and skull
✓ 20. Striped skunk <u>Mephitis mephitis</u>	skull
✓ 21. Coyote <u>Canis latrans</u>	skull
✓ 22. House mouse <u>Mus musculus</u>	study skin and skull
✓ 23. Porcupine <u>Erethizon dorsatum</u>	skull
✓ 24. Black-tailed prairie dog <u>Cynomys ludovicianus</u>	study skin and skull
✓ 25. Barn owl <u>Tyto alba</u>	study skin
✓ 26. Desert cottontail <u>Sylvilagus audubonii</u>	skull
✓ 27. Prairie rattlesnake <u>Crotalus viridis</u>	skin