
Vertebrate Associates of Black-Tailed Prairie Dogs in Oklahoma

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During surveys of black-tailed prairie dog (*Cynomys ludovicianus*) towns in Oklahoma in 1966-1967 and 1986-1989, 72 vertebrate associates were regularly encountered as well as 25 others that were found less often. The status of several species had apparently changed during this 23-year interval. Six avian species appeared to have increased in number, but declines in populations of seven other birds, five mammals, and one reptile were indicated. ©2002 Oklahoma Academy of Science

INTRODUCTION

The black-tailed prairie dog (*Cynomys ludovicianus*) originally ranged throughout western Oklahoma (1,2). During the first half of the 20th century, however, land-owners eradicated most of the colonies, precipitating a drastic decline in prairie dog numbers from millions [Bailey (1) estimated 800 million in Texas alone in 1905] to only a few thousand. The objectives of this study were to document the occurrence of vertebrate species found in Oklahoma prairie dog towns and to compare their relative abundance reported in surveys of the 1960s (3) and 1980s (4).

METHODS

Tyler (3) conducted a prairie dog survey during 1966-1967 and Shackford (4) did the same from 1986-1989. Locations of prairie dog colonies were ascertained through consultation with area game rangers, local residents, and county agricultural extension personnel; by contacting federal predator and rodent control agents; by using locations referred to in the literature; and by independent discovery.

Those vertebrates encountered inside, above, or within 100 m of a colony were recorded. Most were visually observed, but indirect evidence of other species (e.g., mole tunnels, gopher mounds, kangaroo rat burrows, badger diggings, old bison wallows) was also used. Both authors were

afraid at all seasons except during severe cold spells, when prairie dogs were inactive.

We used several methods in attempting to locate Black-footed ferrets (*Mustela nigripes*). These included examining prairie dog burrows for "trenching" (a ferret activity) in winter, "squeaking" while spotlighting at night, and inspecting unused irrigation pipes stacked near dogtowns with the aid of a flashlight. However, we found no evidence of this rare species in Oklahoma.

RESULTS

From 1966 to 1967, Tyler (3) investigated 280 prairie dog colonies that covered some 3845 ha and contained approximately 34,500 animals in 34 Oklahoma counties. By 1989 (4), these numbers had increased to 398 colonies encompassing 7446 ha, with an estimated 66,000 animals (Fig. 1). Numbers of prairie dogs had increased greatly in the panhandle, particularly in Cimarron County, but had decreased in most other areas of western Oklahoma. In 1993, Shaw et al. (5) confirmed this rapid population growth in the panhandle. Overall, 10 counties exhibited population increases, but 22 others showed declines. A *t*-test *t* value of 1.26 and a *p* value of .21 for differences in mean numbers of prairie dogs in the 30 non-panhandle counties between 1967 and 1989 indicated that they were not significantly different at the 0.05 level.

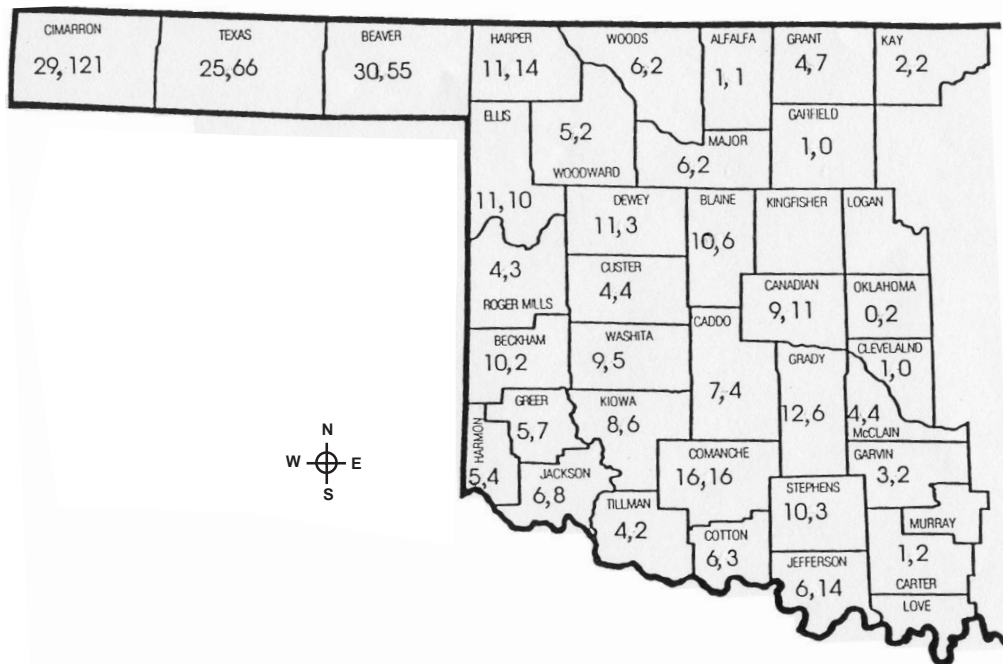


Figure 1. Comparative number (1968, 1989 respectively) of active prairie dog colonies in western Oklahoma.

Based on frequency of encounters, 97 species of vertebrates were identified as being prairie dog associates. Seventy-one of these were recorded more than five times during both studies and were arbitrarily designated as common associates (Table 1). *Bison bison* was included on the basis of old wallows that remained in some colonies. The mountain plover (*Charadrius montanus*), although encountered only three times, was also considered a common associate because of its close ecological relationship with prairie dogs (7-9). Twenty-five other commensal species that were observed on five or fewer occasions were classified as less common associates. Our preliminary results were submitted to the Oklahoma Department of Wildlife Conservation in 1991 (6).

Numbers of several regular prairie dog associates increased between surveys (Table 1). Most pronounced among these were the ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), lark bunting (*Calamospiza melanocorys*), red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), and house sparrow (*Passer domesticus*).

Some species that indicated declines included the ornate box turtle (*Terrapene*

ornata), Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*B. lagopus*), northern flicker (*Colaptes auratus*), scissor-tailed flycatcher (*Tyrannus forficatus*), American crow (*Corvus brachyrhynchos*), Lapland longspur (*Calcarius lapponicus*), northern oriole (*Icterus galbula*), black-tailed jackrabbit (*Lepus californicus*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), southern plains woodrat (*Neotoma micropus*), coyote (*Canis latrans*), and badger (*Taxidea taxus*) (Table 1).

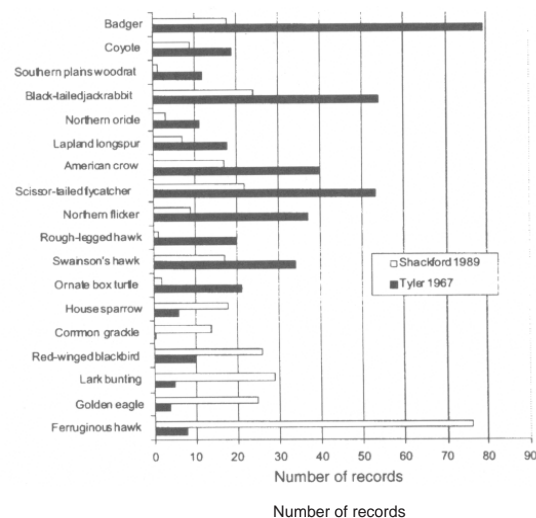


Figure 2. Prairie dog associates that increased or decreased from 1967 to 1989.

TABLE 1. Vertebrate associates of the black-tailed prairie dog in Oklahoma.^a

SPECIES	Number of times encountered 1966-1967	Number of times encountered 1986-1989
AMPHIBIANS		
*Barred tiger salamander (<i>Ambystoma tigrinum</i>)	3	0
*Green toad (<i>Bufo debilis</i>)	2	0
*Texas toad (<i>Bufo speciosus</i>)	2	0
*Rocky Mountain toad (<i>Bufo woodhousei</i>)	2	0
*Couch's spadefoot toad (<i>Scaphiopus couchi</i>)	2	1
REPTILES		
*Yellow mud turtle (<i>Kinosternon flavescens</i>)	5	0
Ornate box turtle (<i>Terrapene ornata</i>)	21	2
*Texas spotted whiptail (<i>Cnemidophorus gularis</i>)	2	1
*Six-lined racerunner (<i>Cnemidophorus sexlineatus</i>)	3	0
Lesser earless lizard (<i>Holbrookia maculata</i>)	4	5
*Texas horned lizard (<i>Phrynosoma cornutum</i>)	2	2
*Northern prairie lizard (<i>Sceloporus undulatus</i>)	2	0
PRAIRIE RATTLESNAKE (<i>Crotalus viridis</i>)	3	4
*Bullsnake (<i>Pituophis melanoleucus</i>)	3	1
BIRDS		
*Cattle egret (<i>Bubulcus ibis</i>)	0	4
Turkey vulture (<i>Cathartes aura</i>)	9	15
Mississippi kite (<i>Ictinia mississippiensis</i>)	5	1
Bald eagle (<i>Haliaeetus leucocephalus</i>)	3	11
NORTHERN HARRIER (<i>Circus cyaneus</i>)	69	63
SWAINSON'S HAWK (<i>Buteo swainsoni</i>)	34	17
RED-TAILED HAWK (<i>Buteo jamaicensis</i>)	26	25
FERRUGINOUS HAWK (<i>Buteo regalis</i>)	8	76
Rough-legged hawk (<i>Buteo lagopus</i>)	20	1
GOLDEN EAGLE (<i>Aquila chrysaetos</i>)	4	25
American kestrel (<i>Falco sparverius</i>)	18	19
*Merlin (<i>Falco columbarius</i>)	0	3
PRAIRIE FALCON (<i>Falco mexicanus</i>)	2	16
Northern bobwhite (<i>Colinus virginianus</i>)	7	15
* LESSER PRAIRIE CHICKEN (<i>Tympanuchus pallidicinctus</i>)	3	1
Scaled quail (<i>Callipepla squamata</i>)	6	13
KILLDEER (<i>Charadrius vociferus</i>)	62	87
* MOUNTAIN PLOVER (<i>Charadrius montanus</i>)	2	1
Upland sandpiper (<i>Bartramia longicauda</i>)	11	15
LONG-BILLED CURLEW (<i>Numenius americanus</i>)	7	13
*Baird's sandpiper (<i>Calidris bairdii</i>)	2	1
Rock dove (<i>Columba livia</i>)	12	10
MOURNING DOVE (<i>Zenaida macroura</i>)	83	93
*Greater roadrunner (<i>Geococcyx californianus</i>)	0	2
*Great horned owl (<i>Bubo virginianus</i>)	0	4
BURROWING OWL (<i>Athene cunicularia</i>)	193	194
Common nighthawk (<i>Chordeiles minor</i>)	11	9
*Chimney swift (<i>Chaetura pelagica</i>)	0	3
*Red-headed woodpecker (<i>Melanerpes erythrocephalus</i>)	0	2

TABLE 1. (contd.) Vertebrate associates of the black-tailed prairie dog in Oklahoma.^a

SPECIES	Number of times encountered 1966-1967	Number of times encountered 1986-1989
*Ladder-backed woodpecker (<i>Picoides scalaris</i>)	4	0
NORTHERN FLICKER (<i>Colaptes auratus</i>)	37	9
WESTERN KINGBIRD (<i>Tyrannus verticalis</i>)	23	23
Eastern kingbird (<i>Tyrannus tyrannus</i>)	8	5
SCISSOR-TAILED FLYCATCHER (<i>Tyrannus forficatus</i>)	53	22
HORNED LARK (<i>Eremophila alpestris</i>)	144	201
*Northern rough-winged swallow (<i>Stelgidopteryx serripennis</i>)	0	2
Cliff swallow (<i>Hirundo rustica</i>)	10	8
BARN SWALLOW (<i>Hirundo rustica</i>)	41	34
AMERICAN CROW (<i>Corvus brachyrhynchos</i>)	40	17
Chihuahuan raven (<i>Corvus cryptoleucus</i>)	2	7
*Common raven (<i>Corvus corax</i>)	0	3
*Mountain bluebird (<i>Sialia currucoides</i>)	0	3
*American robin (<i>Turdus migratorius</i>)	0	2
Northern mockingbird (<i>Mimus polyglottos</i>)	14	8
*Sage thrasher (<i>Oreoscoptes montanus</i>)	0	2
*Curve-billed thrasher (<i>Toxostoma curvirostre</i>)	0	4
*Water pipit (<i>Anthus spinoletta</i>)	0	4
Sprague's pipit (<i>Anthus spragueii</i>)	2	6
LOGGERHEAD SHRIKE (<i>Lanius ludovicianus</i>)	29	28
European starling (<i>Sturnus vulgaris</i>)	11	13
Vesper sparrow (<i>Pooecetes gramineus</i>)	5	29
LARK SPARROW (<i>Chondestes grammacus</i>)	47	38
Lark bunting (<i>Calamospiza melanocorys</i>)	5	29
Savannah sparrow (<i>Passerculus sandwichensis</i>)	4	4
McCown's longspur (<i>Calcarius mccownii</i>)	2	11
Lapland longspur (<i>Calcarius lapponicus</i>)	18	7
Chestnut-collared longspur (<i>Calcarius ornatus</i>)	4	8
Red-winged blackbird (<i>Agelaius phoeniceus</i>)	10	26
MEADOWLARK SPP. (<i>Sturnella</i> spp.) ^b	183	302
*Yellow-headed blackbird (<i>Xanthocephalus xanthocephalus</i>)	0	3
Brewer's blackbird (<i>Euphagus cyanocephalus</i>)	2	4
*Great-tailed grackle (<i>Quiscalus mexicanus</i>)	1	2
Common grackle (<i>Quiscalus quiscula</i>)	0	14
Brown-headed cowbird (<i>Molothrus ater</i>)	23	19
Northern oriole (<i>Icterus galbula</i>)	11	3
House sparrow (<i>Passer domesticus</i>)	6	18
MAMMALS		
Eastern mole (<i>Scalopus aquaticus</i>)	7	2
DESERT COTTONTAIL (<i>Sylvilagus auduboni</i>)	59	50
BLACK-TAILED JACKRABBIT (<i>Lepus californicus</i>)	54	24
*Spotted ground squirrel (<i>Citellus spilosoma</i>)	1	1
Thirteen-lined ground squirrel (<i>Citellus tridecemlineatus</i>)	25	9
PLAINS POCKET GOPHER (<i>Geomys bursarius</i>)	88	64
Ord kangaroo rat (<i>Dipodomys ordii</i>)	7	0
*Deer mouse (<i>Peromyscus maniculatus</i>)	3	0

TABLE 1. (contd.)Vertebrate associates of the black-tailed prairie dog in Oklahoma.^a

SPECIES	Number of times encountered 1966-1967	Number of times encountered 1986-1989
Southern plains woodrat (<i>Neotoma micropus</i>)	12	1
Coyote (<i>Canis latrans</i>)	19	9
SWIFT FOX (<i>Vulpes velox</i>)	4	2
BADGER (<i>Taxidea taxus</i>)	79	18
*Striped skunk (<i>Mephitis mephitis</i>)	2	1
*White-tailed deer (<i>Odocoileus virginianus</i>)	1	1
Pronghorn (<i>Antilocapra americana</i>)	0	8
PLAINS BISON (<i>Bison bison</i>) ^c	54	14

^a Common associates (encountered at least five times) are capped and boldfaced; species that were much less common but closely dependent on prairie dog colonies also are italicized. Rare associates (five or fewer records) are indicated by an asterisk (*).

^b Includes both *Sternella magna* and *S. neglecta*.

^c Indicated by old wallows in prairie dog colonies.

DISCUSSION

Our results, based on visual surveys, suggest that vertebrate diversity may have decreased moderately in Oklahoma prairie dog colonies, particularly among some mammalian associates and at least seven birds between 1968 and 1989 (Fig. 2). Greatest diversity remained in the Oklahoma panhandle, where dogtowns were most extensive. Barko et al. (10) observed 32 species of birds in panhandle dogtowns and concluded that during years of normal rainfall, avian diversity and abundance were greater there than on similar surrounding terrain. Clark et al. (11) identified 107 vertebrate species associated with prairie dogs within 47 colonies along a 1334-km transect from southeastern New Mexico to southwestern Wyoming. Black-tailed, Gunnison's (*C. gunnisoni*) and white-tailed (*C. leucurus*) prairie dog colonies were represented, but 89% of the surface area of all dogtown colonies was inhabited by the white-tail. Species included one amphibian (A), 25 reptiles (R), 51 birds (B), and 30 mammals (M). In Oklahoma, we found five A, nine R, 67 B, and 16 M, for a total of 97 species. [Thirteen additional species (four A, two R, five B, and two M) that were en-

countered only once were not included in Table 1.] Forty-seven (47%) of the species that Clark et al. (11) found were also recorded in Oklahoma (six R, 29 B, and 12 M).

Tyler (12) documented 53 vertebrates in a small colony (about 3 ha) in Jackson County, Oklahoma, between August 1966 and January 1970. Of this number, there were four A, eight R, 30 B, and 11 M. Campbell and Clark (13) found 64 vertebrates (four A, five R, 33 B and 22 M) on 25 white-tailed and 21 black-tailed colonies in Wyoming in 1978-1979. A total of 64% of these same species also were observed in Oklahoma dogtowns by Tyler (3) and Shackford (4). Agnew et al. (14) encountered seven M (small rodents) and 36 B on black-tailed prairie dog towns in western South Dakota during the summers of 1981 and 1982. They found that density and species richness of birds were both significantly greater on the colonies than in nearby mixed-grass prairie, as did Barko et al. (10) in Oklahoma, and that prairie dog towns in South Dakota supported greater densities, but significantly fewer species, of small rodents.

Prairie dog colonies in Oklahoma are unique sites of species richness, particularly for birds. The burrowing owl (*Athene cunicularia*) depends on abandoned holes for refuge and nidification, and other vertebrates, such as mice, ground squirrels, snakes, and lagomorphs use prairie dog burrows opportunistically for cover or as hibernacula (15). Mountain plovers, long-billed curlews (*Numenius americanus*) and horned larks (*Eremophila alpestris*) occasionally nest in dogtowns (3,4,7-9,13). Many commensals are attracted to the colonies by insect or mammalian prey availability, others favor the open character of the site, and the nutritious forage there is sought by a number of herbivores, both large and small. Several raptors and mammalian carnivores opportunistically prey on prairie dogs (3,4).

During the 23-year interval between surveys, the status of many vertebrates appears to have changed (Fig. 2). Populations of six avian species apparently increased (ferruginous hawk, golden eagle, lark bunting, red-winged blackbird, common grackle, and house sparrow), whereas numbers of 12 other vertebrates declined. Those that indicated pronounced decreases included the ornate box turtle, Swainson's hawk, rough-legged hawk, northern flicker, scissor-tailed flycatcher, American crow, Lapland longspur, northern oriole, black-tailed jackrabbit, southern plains woodrat, coyote, and badger. By 1989, burrowing owls were found in each of the 11 counties containing more than six prairie dog colonies, but in none of the 10 counties with fewer than three dogtowns. Population declines of the northern flicker and scissor-tailed flycatcher have been corroborated by the nationwide Breeding Bird Survey (BBS; 16) under the auspices of the US Fish and Wildlife Service. BBS data also showed trends toward higher numbers of red-winged blackbirds in the central US and common grackles in Oklahoma. However, although fewer northern orioles were tabulated by Shackford (4) in 1989 than by Tyler in 1967 (3), continental BBS results indicated the converse. The BBS also contradicted our findings for two other species by recording significant population

declines for the lark bunting in the central US and decreasing numbers of house sparrows in Oklahoma. However, Breeding Bird Surveys seldom transect prairie dog colonies.

These population trends may reflect actual range-wide fluctuations but could also be the result of local land use modification such as the conversion of grasslands to cultivation. Increased plowing would tend to concentrate some associates (raptors and insectivores, for instance) onto the islands of remnant prairie enclosing prairie dog towns. In addition, many migrants, such as Swainson's hawks and scissor-tailed flycatchers, must also contend with habitat alteration and environmental pollution on their wintering grounds.

In the early 1990s, large areas of Cimarron County, together with a small portion of Texas County and the adjacent panhandle of Texas, were investigated to determine if there were sufficient numbers of prairie dog colonies in close enough proximity, and that contained enough prairie dogs, to meet minimum standards for consideration as reintroduction sites for the black-footed ferret (5,17). When compared to areas surveyed for ferrets in several other states, however, the overall suitability of these combined sites was poor. In addition, sylvatic plague during 1991 and 1992 decimated prairie dogs in much of the area surveyed (5). Clearly, reevaluation of these sites should precede any contemplated release of black-footed ferrets in Oklahoma.

There is cause for guarded optimism. The black-tailed prairie dog was petitioned to be listed as "threatened" under The Endangered Species Act by several conservation organizations in 1998 and in March 1999, the US Fish and Wildlife Service declared officially that the species "may be warranted" for inclusion (18). Eleven western states are now working both independently and collectively to conserve at least 10% of original prairie dog numbers on both public and private lands in order to avert listing. Because current estimates place prairie dog numbers at only about 1% of their original population, this action will greatly increase habitat for prairie dog associates as well.

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REFERENCES

1. Bailey V. Biological survey of Texas. N Amer Fauna No. 25, Washington (DC): USDA Div Biol Surv; 1905.
2. Blair WF. Faunal relationships and geographic distribution of mammals in Oklahoma. *Amer Midl Nat* 1939; 22:85-133.
3. Tyler JD. Distribution and vertebrate associates of the black-tailed prairie dog in Oklahoma [unpubl PhD dissertation]. Norman (OK): Univ Oklahoma; 1968. Available from Univ Oklahoma Library.
4. Shackford JS. A survey of the black-tailed prairie dog in Oklahoma. 1989. Oklahoma City: Nongame Program of the Oklahoma Department of Wildlife Conservation. 18 p. Available from ODWC.
5. Shaw JH, McAbee W, Carter TS, Leslie DM Jr. Assessment of black-tailed prairie dog colonies for reintroduction of black-footed ferrets in western Oklahoma. *Proc OK Acad Sci* 1993; 73:47-52.
6. Shackford JS, Tyler JD. Vertebrates associated with black-tailed prairie dog colonies in Oklahoma. 1991. Oklahoma City: Nongame Program of the Oklahoma Department Wildlife Conservation. 24p. Available from the department.
7. Knowles CJ, Stoner CJ, Gieb SP. Selective use of black-tailed prairie dog towns by mountain plovers. *Condor* 1982; 84:71-74.
8. Knowles CJ, Knowles PR. Additional records of mountain plovers using prairie dog towns in Montana. *Prairie Nat* 1984; 16:183-186.
9. Shackford JS. Breeding ecology of the mountain plover in Oklahoma. *Bull OK Ornithol Soc* 1991; 24:9-13.
10. Barko VA, Shaw JH, Leslie DM, Jr. Birds associated with black-tailed prairie dogs in southern shortgrass prairie. *Southwest Nat*; 1999; 44:484-489.
11. Clark TW, Campbell TM III, Socha DG, Casey DE. Prairie dog colony attributes and associated vertebrate species. *Great Basin Nat* 1982; 42:572-582.
12. Tyler JD. Vertebrates in a prairie dog town. *Proc OK Acad Sci* 1970; 50:110-113.
13. Campbell TM III, Clark TW. Colony characteristics and vertebrate associates of white-tailed and black-tailed prairie dogs in Wyoming. *Amer Midl Nat* 1981; 105:269-27
14. Agnew W, Uresk DW, Hansen RM. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. *J Range Mgmt* 1986; 39:135-139.
15. Bent AC. Life histories of North American birds of prey, Pt. 2. *Bull US Natl Mus* No 170:385. US Govt Print Off, Washington (DC):1938.
16. Robbins CS, Bystrak D, Geissler PH. The Breeding Bird Survey: its first fifteen years, 1965-1979. Washington (DC): USFWS Resource Publ 157; 1986.
17. Biggins D, Miller B, Oakley B, Farmer A, Crete R, Dodd A. A system for evaluating black-footed ferret habitat. Fort Collins, CO: USFWS Interstate Coord Comm; 1989. 20 p.
18. Wildlife Management Institute. Outdoor News Bulletin 2000; 54(2):2-3. Washington DC.

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