



DISTRIBUTION AND CONSERVATION STATUS OF PRAIRIE DOGS *CYNOMYS MEXICANUS* AND *CYNOMYS LUDOVICIANUS* IN MEXICO

Gerardo Ceballos

Centro de Ecología, Universidad Nacional Autónoma de México, Apdo Postal 70-275, Mexico DF, 04510, Mexico

Eric Mellink

CISESE, PO Box 4844, San Ysidro, California, 92073, USA

&

Louis R. Hanebury

National Ecology Research Center, US Fish and Wildlife Service, Fort Collins, Colorado, USA

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Abstract

The two living species of black-tailed prairie dogs Cynomys mexicanus and C. ludovicianus are found in Mexico. Cynomys mexicanus, a Mexican endemic, is restricted to a 600-km² region in northwestern Mexico. It is found in six large arid grassland valleys associated with gypsum soils and surrounded by arid scrub. Due to the small geographic range and destruction of its habitat this species is considered endangered. Cynomys ludovicianus is found in northwestern Mexico. Its present distribution comprises a very large complex covering approximately 55 000 ha, eight major dogtowns, and more than one million prairie dogs. Indeed, this population represents the largest continuous prairie dog complex left in North America. However, its present conservation status is considered as threatened, mainly because of the rapid deterioration of its habitat.

INTRODUCTION

The historic distribution of the black-tailed prairie dogs (genus *Cynomys*) extended from southern Canada to northern Mexico (Hall, 1981; Anderson *et al.*, 1986). Millions of hectares were originally occupied, but during this century their distribution and abundance have been drastically reduced by human activities, mainly by habitat destruction, poisoning, and sylvatic plague (Bailey, 1932; Ceballos & Wilson, 1985; Anderson *et al.*, 1986; Cully, 1989).

Intensive eradication programs carried out in the USA and Canada have been very effective. In the USA, prairie dogs occupied 283 million ha last century

(Merriam, 1901), but have been reduced to 600 000 in 1971 (Anderson *et al.*, 1986). The largest dogtown left in that country covered approximately 110 000 ha, and was practically eradicated by poisoning in 1987–88 (Tschetter, 1988). Eradication programs have been quite limited in Mexico, but there has been extensive encroachment of prairie dog habitat by agriculture and cattle-raising activities.

Two species of black-tailed prairie dogs are found in Mexico (Figs 1 and 2). The geographic range of the endemic Mexican prairie dog *C. mexicanus* is restricted to a small area in northeastern Mexico (Anderson, 1972; Hall, 1981; Ceballos & Wilson, 1985). The black-tailed prairie dog *C. ludovicianus* is found in the states of Sonora and Chihuahua, in northwestern Mexico (Hall, 1981; Ceballos & Navarro, 1991).

Although there is only scanty information about the present distribution and abundance of these species in Mexico, *C. mexicanus* is considered endangered (Ceballos & Wilson, 1985; USFWS, 1989; Ceballos & Navarro, 1991) and *C. ludovicianus* threatened (Ceballos & Navarro, 1991). In this paper we document the distribution and assess the conservation status of both species of prairie dogs in Mexico.

METHODS

This study was carried out from September 1986 to October 1988. The historic distribution of prairie dogs in Mexico was determined on the basis of published records. To determine their present distribution most localities where prairie dogs had been reported were visited; many new localities where the species had not been reported previously were also recorded. Dogtowns were located through interviews with local residents

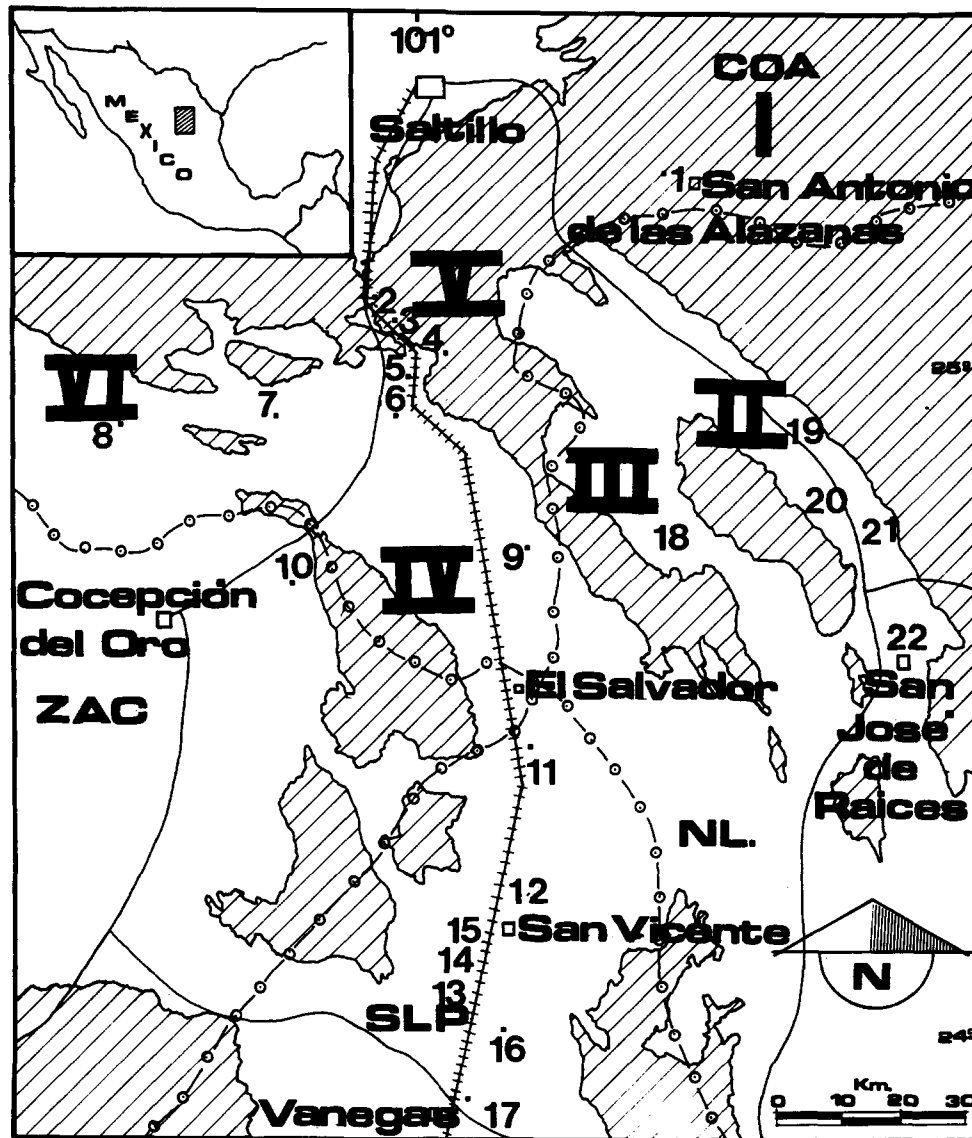


Fig. 1. Present distribution of the Mexican prairie dog *Cynomys mexicanus*. The major valleys where the species is found are San Antonio de las Alazanas (I), El Potosí (II), La Soledad (III), El Salado (IV), Agua Nueva (V), and Rocamonte (VI). Each dogtown is marked by a number, and its name, size, and geographic location are given in Table 2. The cross-hatched areas represent sites more than 2000 m above sea level.

and aerial (Chihuahua only) and ground reconnaissance, and mapped on 1:50 000-scale topographic maps. The results for *C. ludovicianus* are complete, but those for *C. mexicanus* are still preliminary.

Total and active prairie dog burrows of *C. mexicanus* were determined in San Luis Potosí in 1987, by the 'wandering quarter method' (Catana, 1963). This method consists of selecting a random direction from a starting point; a quarter is formed by laying an imaginary line 45° on each side of the random direction. The distance to the nearest den was then measured and, from that point on, the distance to the nearest den in the quarter with the same direction was measured, until 20 measurements were obtained. Active burrows were defined as those containing fresh prairie dog feces observable within or around the opening.

Total and active prairie dog burrow densities of *C. ludovicianus* were determined in Chihuahua in October

1988, by running 1-km × 3-m wide transects (0.3 ha) systematically through sections of the mapped prairie dogtowns, using rolatape distance-measuring wheels (see Fig. 3). A person walked in a predetermined direction and counted active and total numbers of prairie dog burrows that were within the transect. When a partly completed 1-km transect approached the edge of a dogtown, the transect was turned 90 degrees, toward the unsampled section of the town. After 40 m, the transect again turned 90 degrees, creating a transect parallel to the previous one, but in the opposite direction. Transects were all separated by 40 m.

Population densities were determined using 0.25 ha quadrants (50 × 50 m) in Chihuahua and 1-ha polygons (100 × 50 × 150 m) in San Luis Potosí. All individuals found in the plots were counted throughout the day every 15 min in San Luis Potosí and every 30 min in Chihuahua.

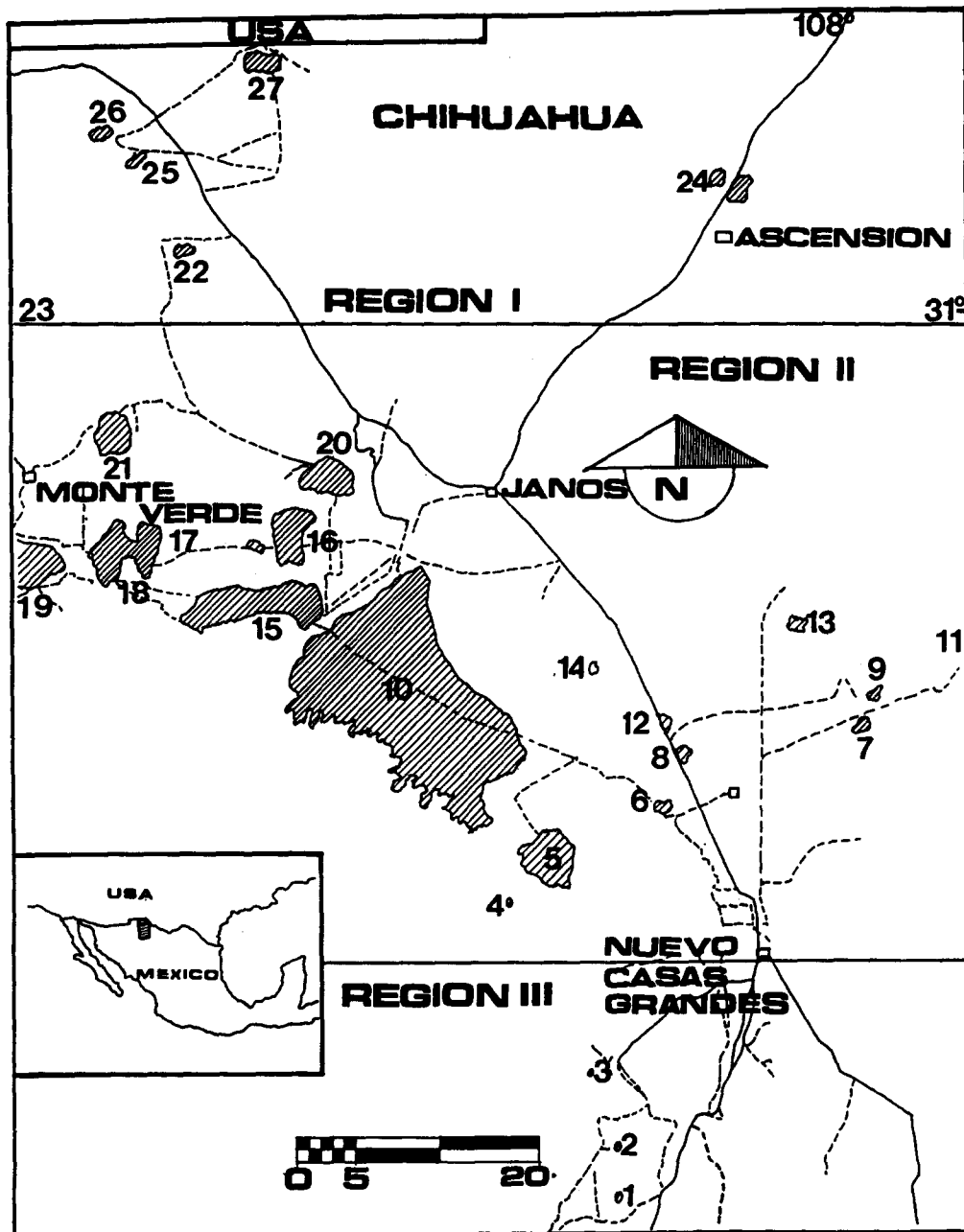


Fig. 2. Present distribution of the black-tailed prairie dog *Cynomys ludovicianus* in Chihuahua, México. Each dogtown is marked by a number, and its name, size, and geographic coordinates are given in Table 3. Note that the cross-hatched areas in this figure represent the dogtowns.

RESULTS AND DISCUSSION

Cynomys mexicanus

Current distribution

The Mexican prairie dog is a species endemic to Mexico with a historic geographic range restricted to approximately 600 km² in the states of Coahuila, Nuevo Leon, Zacatecas, and San Luis Potosi (Fig. 1; Dalquest, 1953; Baker, 1956; Matson, 1979; Hall, 1981; Ceballos & Wilson, 1985).

Its present distribution is restricted to an area 160 km long and of variable width, in San Luis Potosi (SLP), Coahuila (COA), and Nuevo Leon (NL), between 24° 00' and 25° 25' N latitude, and 100° 15' and 101° 25' W longitude (Fig. 1). Populations are found between 1600 and 2200 m above sea level, and are

limited to the north and west by the Sierra Madre Oriental, and to the south and east by semiarid hills and semiarid grasslands. The northern limit is near Saltillo and San Antonio de las Alazanas in COA, the southern is near Vanegas in SLP, the eastern near San Gerardo in NL, and the western near Melchor Ocampo, COA (Fig. 1).

Presently, there are six major, more or less well-defined areas (namely the valleys of El Potosí, La Soledad, El Salado, Agua Nueva, San Antonio de las Alazanas, and Rocamontes) in the three states where this species is still found (Fig. 1). The only population reported from Zacatecas (Matson, 1979) has been exterminated, and several populations in other states have disappeared or have been highly fragmented.

In the state of Nuevo Leon, prairie dogs are primarily

Table 1. Size and location of Mexican prairie dog *Cynomys mexicanus* towns in Mexico

State/name	Area (ha)	Latitude (N)	Longitude (W)
Coahuila			
San Antonio de las Alazanas (1)	*	25° 16' 00"	100° 34' 00"
Rancho Los Angeles (2)	1 000	25° 05' 30"	101° 04' 10"
Tanque de Emergencia (3)	*	25° 04' 19"	101° 04' 10"
San Miguel (4)	*	25° 00' 00"	100° 59' 00"
Vicente Guerrero (5)	200	24° 58' 00"	101° 02' 00"
Gómez Farías (6)	1000	24° 57' 00"	101° 02' 00"
La India (7)	?	25° 03' 00"	101° 16' 24"
Melchor Ocampo (8)	?	24° 51' 00"	101° 39' 20"
Llano de los Perros (La Ventura) (9)	200	24° 43' 00"	100° 54' 00"
Zacatecas			
Rocamonte (10)	+	24° 45' 03"	101° 09' 25"
San Luis Potosi			
El Salvador (11)	*	24° 31' 22"	100° 52' 00"
El Salado (12)	222	24° 20' 00"	100° 59' 59"
El Manantial (13)	342	24° 08' 00"	100° 55' 00"
San Vicente (14)	27	24° 09' 40"	100° 54' 00"
El Gallo (15)	28	24° 12' 45"	100° 54' 30"
La Trueba (16)	11	23° 54' 00"	100° 54' 45"
Vanegas (17)	+	23° 52' 00"	100° 57' 00"
Nuevo Leon			
Valle de la Soledad (18)	4 400	25° 03' 00"	100° 03' 00"
San Rafael (19)	*	25° 02' 00"	100° 33' 00"
El Potosi (20)	200	24° 51' 00"	100° 19' 00"
Tokio (21)	300	24° 40' 00"	100° 15' 00"
San José Raíces (22)	*	24° 34' 00"	100° 14' 00"

Numbers in parentheses identify the dogtowns in Fig. 1.

*, Colonies of unknown size.

+, Extinct colonies.

found in the valleys of El Potosí and La Soledad (Fig. 1). A few decades ago, prairie dogs in El Potosí were found in an area of approximately 4000 ha. However, these dogtowns have been highly fragmented by agriculture, and remnants are now found only in the vicinity of San Rafael, Tokio, and San José de Raíces. In La Soledad there is a large and elongated prairie dogtown of approximately 4400 ha, and several smaller dogtowns dispersed along the valley.

In the state of San Luis Potosí, prairie dogs were previously reported from the El Salado valley, which extends up to southern Coahuila (Dalquest, 1953) and Vanegas (Hall, 1981). Presently, there are seven dogtowns in SLP in this valley, but only two are larger than 100 ha. The dogtown near Vanegas has disappeared (Table 1).

In the state of Coahuila, at the type locality (La Ventura or Llano de los Perros) found in the El Salado valley, the dogtown occupies approximately 200 ha. Baker (1956) reported several dogtowns in this valley. Presently, there are still dogtowns near Gómez Farías and Vicente Guerrero, and probably in San Miguel and La India. Prairie dogs are also found in two other areas in this state, San Antonio de las Alazanas and Agua Nueva.

Baker (1956) reported several dogtowns in the San Antonio de las Alazanas. The valley has been highly modified for agriculture and dogtowns were not lo-

cated, although the valley was not properly surveyed; there are probably a few small dogtowns left in this region. Those in Agua Nueva valley are found approximately 30 km south of Saltillo. Four dogtowns, including two larger than 100 ha, are found in Rancho Los Angeles, owned by the Antonio Narro Agrarian University. Another colony, Tanque de Emergencia, is found 5 km to the south. Finally, we have unconfirmed reports of a population in the Rocamonte valley.

Habitat characterization and population densities

Mexican prairie dogs are found in grasslands in valleys and intermontane basins. Prairie dogs are strongly associated with gypsum soils throughout the animal's geographic range, except in Rancho Los Angeles, where they are found in deep (≥ 2 m) alluvial soils. Interestingly, the dogtowns in the El Salado valley occur in gypsum outcrops lacking a superficial layer of calcareous material; when such a layer is present the prairie dogs are absent, and this may be related to drier and harder soils (Mellink, 1989; Meyer & Garcia Moya, 1989). Habitat availability decreases with decreasing latitude and altitude, and it is very limited in El Salado valley. Furthermore, habitat availability has been greatly reduced by agriculture in the valleys of El Potosí and San Antonio de las Alazanas.

The vegetation in Mexican prairie dogtowns is dominated by creeping herbs and grasses. Plant cover is

Table 2. Plant cover, burrow density, percentage of active burrows, and total estimated active burrows of Mexican prairie dogtowns in the Salado Valley in San Luis Potosí and Coahuila, México

Colony	Plant cover (%)	Burrow density	Active burrows (%)	Total estimated active burrows
La Trueba	4.5	98	43	463
El Manantial	19.7	41	65	9 108
San Vicente	9.0	35	63	436
El Gallo	42.0	42	50	590
Llano de los Perros [†]	19.0	72	40	5 192
(Type locality)	(8–36)	(42–107)	(28–56)	

[†] Average of five areas (range in parentheses).

highly variable; in the Llano de los Perros (COA) plant cover varied between 8% and 36% (Table 2). Most common plants in those colonies are *Muhlenbergia repens*, *Psora decipens*, *Haliomolobus* sp., *Haplopappus spinosus*, *Physalis* sp., *Guara coccinea*, and *Calylophus hartwegii*.

Burrow densities in the El Salado valley varied between 35 and 107 per hectare (Table 2); Medina and de la Cruz (1976) reported a density of 62–78 burrows/ha in Rancho de los Angeles (COA). Factors affecting burrow density have not yet been documented.

Conservation status

The geographic range and the continuity and the size of the dogtowns of Mexican prairie dogs have been highly reduced by human activities. Populations have been exterminated by poisoning (e.g. Medina & de la Cruz, 1976) and suitable habitats have been modified by agriculture (Ceballos & Wilson, 1985; Treviño-Villareal, 1990). Also, soil erosion by cattle herding sometimes covered the soil in the colonies with a calcareous layer, apparently rendering the habitat unsuitable for the prairie dogs (Mellink, 1989). Although this species is fully protected by Mexican law (Ceballos & Wilson, 1985), the Rancho Los Angeles (COA) is the only area where it receives some real protection and we agree that it is endangered.

Cynomys ludovicianus

Current distribution

At the beginning of this century the black-tailed prairie dog in Mexico occupied an area of 5600 km² in north-western Chihuahua and Sonora (Fig. 2; Mearns, 1907; Anderson, 1972; Hall, 1981).

Historically, two populations were recorded in the state of Sonora, in Las Animas Valley and the San Pedro River, south of the Mexico–USA International Boundary Monuments Nos 66 and 38, respectively (Mearns, 1907). There are no further records of these dogtowns. However, Bailey (1932) reported that in 1908 the USA dogtowns in the Animas and Playas valleys in New Mexico were extensive, but Findley *et al.* (1975) did not find any recent evidence of prairie

dogs. Indeed, the species was eradicated from southern New Mexico in the 1920s and from Arizona around 1932 (Hoffmeister, 1986). The present status of the species in Sonora is unknown; the population near monument No. 66 disappeared long ago but we have unconfirmed reports that the population near monument No. 38 still occupies 700 ha.

In the state of Chihuahua, this species is still found in grasslands from the Mexico–USA border to Mata Ortiz, extending 138 km in length and an average of 35 km in width, from 31° 20' to 30° 10' N and 107° 54' to 108° 00' W (Fig. 1). Its distribution is limited to the north by the USA–Mexico border, to the south and west by the Sierra Madre Occidental, and to the east by small mountain ranges (Fig. 2).

The geographic range of *C. ludovicianus* in Chihuahua can be divided into three regions. Region I includes all the populations found north of Sierra de El Medio (30° 59'). No populations had been recorded in this region; however, there are numerous small (<5 ha) isolated dogtowns, including those of El Berrendo, San Francisco and Los Mimbres. These dogtowns are separated by 35 km from the nearest southern dogtowns. Two small, isolated dogtowns were also recorded near Ascención, thus extending the eastern range of the species.

Region II includes all dogtowns between Sierra de El Medio and Nuevo Casas Grandes (30° 59' and 30° 30'; Fig. 3). This area sustains the largest black-tailed prairie dog populations of North America. Dogtowns are numerous west and southwest of Janos, and scattered east and south of Janos. There are basically eight large prairie dogtowns, namely Santa Anita, Monte Verde, Pancho Villa, Salto de Ojo, Loma Los Ratones, Buenos Aires, El Cuervo, and El Borrego, identified as the Janos–Nuevo Casas Grandes complex (JNCG, Fig. 2). A prairie dog complex is functionally defined in terms of its obligate predator, the endangered black-footed ferret *Mustela nigripes*. Forrest *et al.* (1985) described a prairie dog complex as 'a group of prairie dog colonies distributed so that individual black-footed ferrets (and thus genetic material) can migrate among them commonly and frequently'. Biggins *et al.* (in press) further states that no single prairie dogtown within a complex is further than 7 km from its nearest neighbor dogtown.

The JNCG prairie dog complex was estimated to have 55 258 ha, being the largest prairie dog complex in North America (Table 3). The largest single dogtown in the JNCG complex was El Cuervo, covering 34 949 ha, followed by Loma Los Ratones with 4930 ha and Buenos Aires with 4817 ha. Scattered populations were found along the highway between Casas Grandes and Janos. The dogtowns near San Pedro Corralitos reported by Anderson (1972) have disappeared.

Region III includes all the dogtowns found between Nuevo Casas Grandes and Mata Ortiz (between 30° 30' and 30° 10'). In Chihuahua, the grasslands available as prairie dog habitat decrease with decreasing latitude, and in the vicinity of Mata Ortiz and San Diego,

Table 3. Size and location of black-tailed prairie dog *Cynomys ludovicianus* towns in Chihuahua, México

Name	Area (hectares)	Latitude (N)	Longitude (W)
Mata Ortiz (1)	75	30° 12' 16"	108° 03' 37"
San Diego (2)	50	30° 14' 28"	108° 03' 37"
Colonia Juárez (3)	50	30° 16' 18"	108° 04' 06"
Tapiecitas (4)	75	30° 23' 38"	108° 23' 23"
El Borrego (5)	2510	30° 31' 38"	108° 08' 46"
Ramos (6)	400	30° 37' 21"	108° 04' 00"
Los Cuates (7)	+	30° 39' 57"	107° 46' 25"
El Chilicote (8)	50	30° 39' 57"	108° 02' 40"
Graciano Sanchez (9)	+	30° 41' 18"	108° 01' 43"
La Noria (10)	+	30° 42' 00"	107° 41' 40"
El Cuervo (11)	34949	30° 42' 38"	108° 18' 03"
San Pedro Corralitos (12)	+	30° 44' 43"	107° 61' 53"
El Nogal (13)	*	30° 44' 56"	107° 46' 25"
Las Cuevas (14)	+	30° 45' 07"	108° 03' 46"
Buenos Aires (15)	4817	30° 45' 30"	108° 22' 30"
Loma los Ratones (16)	4930	30° 45' 00"	108° 29' 08"
Los Novillos (17)	400	30° 48' 38"	108° 43' 18"
Pancho Villa (18)	3005	30° 50' 00"	108° 41' 00"
Santa Anita (19)	1214	30° 51' 32"	108° 44' 40"
Salto de Ojo (20)	2139	30° 53' 59"	108° 26' 02"
Monte Verde (21)	1457	30° 53' 59"	108° 41' 54"
San Rafael (22)	*	31° 04' 01"	108° 31' 12"
Sierra El Medio (23)	*	31° 04' 31"	108° 31' 15"
Ascención (24)	*	31° 08' 43"	107° 54' 46"
Los Mimbres (25)	*	31° 12' 32"	108° 37' 24"
San Francisco (26)	*	31° 14' 02"	108° 40' 15"
El Berrendo (27)	*	31° 19' 13"	108° 32' 03"
Total	56191 ¹		

*, Colonies of small size (> 10 hectares).

+, Extinct colonies.

¹ This figure includes a value of 10 hectares for all the small colonies (marked with an asterisk).

grasslands are as narrow as 3–4 km wide. Prairie dogtowns have been highly fragmented in this region mainly because of agriculture, but there are still scattered dogtowns in the vicinity of Tapiecitas, Colonia Juárez, San Diego, and Mata Ortiz (Fig. 2; Table 3).

Habitat characterization and population densities

Cynomys ludovicianus lives in grasslands dominated by prostrate herbs and short grasses. Suitable habitat is usually surrounded by drier hills with shrub vegetation.

The total burrow density of the dogtowns representing the JNCG complex was estimated at 79–95 burrows/ha. Active burrows were estimated at 55–97 burrows/ha (Table 4). El Cuervo, the largest dogtown in the JNCG complex, displayed the highest burrow activity rate of 74% (Table 4; Fig. 3). Among all the sampled dogtowns in the JNCG complex, 71% of the burrows were active. Burrow densities were higher in the sampled dogtowns of *C. ludovicianus* than in those of *C. mexicanus*. There are many problems in comparing the densities in Chihuahua with those in other states. Time of the year the data were collected, burrow identification criteria, sample size, and sampling intensity are usually not reported. Nevertheless, total burrow densities in USA prairie dogtowns have been estimated to be

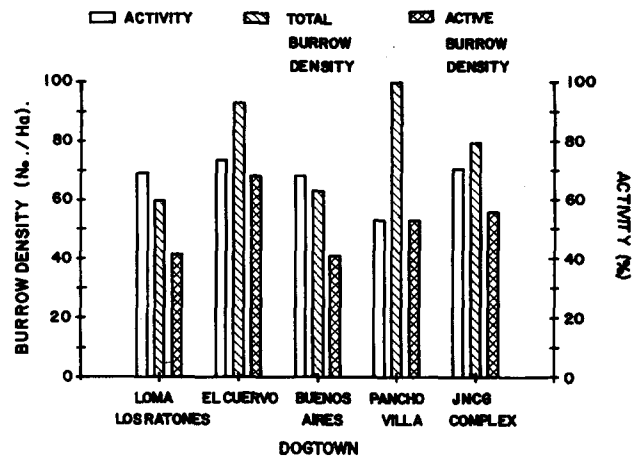


Fig. 3. Comparison of prairie dog burrow density and activity in four dogtowns from the Janos–Nuevo Casas Grandes (JNCG) Complex during the summer of 1988. The values for the JNCG Complex are an average of the data collected in the four dogtowns.

from 49 to 287/ha (Cully, 1989). Therefore, burrow densities in Chihuahua are included in the range of variation of those reported in USA.

Prairie dog densities in the Loma Los Ratones town fluctuated between 20–9 and 30–7 individuals/ha throughout 1985 (Y. Petryzyn and J. S. Brown, pers. comm.). If these values are used as representative for the whole JNCG complex, the estimated number of prairie dogs in the complex varies from 1155080 to 1,696,390.

A model has been developed to evaluate black-footed ferret habitat and potential reintroduction sites (Biggins *et al.*, in press). Utilizing the model, the JNCG complex would support 1280 black-footed ferret females and their young and 640 adult males. Considering that each female has on average 3–3 young, the JNCG complex can support a peak summer population of 6142 black-footed ferrets. This is between 10- and 20-fold better quality habitat than the best sites currently identified in the United States (Anderson *et al.*, 1986; Clark *et al.*, 1989). The integration of other qualitative factors such as density of predators, presence of disease and politic designations may render the JNCG complex even more attractive as a prairie reserve and black-footed ferret reintroduction site.

Conservation status

Black-tailed prairie dogs are still common in Mexico. However, the geographic range of the species is restricted to a small area in Chihuahua, which has been modified and reduced in the last decades. Presently, intensive pressures are continually reducing the available habitat. Unfortunately, there is not a single population protected in a biological reserve. Based on this study it is suggested that black-tailed prairie dogs are threatened in Mexico. Areas as large as the JNCG complex have been destroyed in one year in the USA (Tschetter, 1988), and recently (1989) most of the Loma Los Ratones colony was destroyed by poisoning (G. Ceballos, pers. observ.).

Table 4. Burrow density (no./ha) and prairie dog activity (%) in four black-tailed prairie dogtowns in the Janos–Nuevo Casas Grandes Complex, October 1989

Town no.	Town/subtown	No. of 1-km transects	Burrows		Activity	Burrow density	
			Total	Active		Total	Active
1.1	Loma Los Ratones SE	38	698	470	67.34	61.17	41.19
1.2	Loma Los Ratones N	58	1 188	926	77.95	68.20	53.18
1.3	Loma Los Ratones SW	58	873	512	58.65	50.43	29.64
	Total	154	2 759	1 908	69.16	59.74	41.36
2.1	El Cuervo SE	28	327	223	68.20	38.66	27.34
2.2	El Cuervo W	102	2 510	1 699	67.95	81.26	54.88
2.3	El Cuervo WC	96	3 203	2 449	76.46	110.59	84.35
2.4	El Cuervo EC	44	1 527	1 200	78.59	115.55	90.81
	Total	270	7 567	5 571	73.62	92.87	68.36
3.1	Buenos Aires E	47	893	566	63.38	69.03	40.96
3.2	Buenos Aires W	22	335	271	80.90	51.62	41.92
	Total	69	1 228	837	68.16	63.47	41.26
4.1	Pancho Villa	25	752	399	53.06	100.17	53.15
	Janos–Nuevo Casas Grandes Complex	518	12 306	8 715	70.82	79.45	55.97

CONCLUSIONS

Both species of black-tailed prairie dogs face long-term conservation problems. Loss of habitat due to agriculture, grazing activities and hunting have highly modified the geographic ranges of these species. This study supports former recommendations to consider the Mexican prairie dogs as endangered and black-tailed prairie dogs as threatened (Ceballos & Wilson, 1985; Ceballos & Navarro, 1991).

The populations of black-tailed prairie dogs in Mexico are the largest in North America. Presently, we are continuing our studies to establish biological reserves in El Manantial (SLP) and in the JNCG prairie dog complex. The JNCG complex is an ideal site for the reintroduction of other endangered species such as the black-footed ferret and bison *Bison bison*. In all North America, there is no short grass prairie reserve. The protection of these prairie dog complexes will certainly ensure the survival of a vast array of species that are dependent on the prairie dog habitat.

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