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CONTINUED DECLINE IN GEOGRAPHIC DISTRIBUTION OF THE MEXICAN PRAIRIE DOG (*CYNOMYS MEXICANUS*)

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We assessed the geographic distribution of the Mexican prairie dog (*Cynomys mexicanus*) by comparing historical reports, data from a 1996 study, and our distribution estimations from 1999. We located 54 active and 22 inactive prairie dog colonies, determined size for each one, and evaluated whether colony size and isolation had an impact on the persistence of colonies and likelihood for recovery. We estimated a current total distribution of 322 km^2 within the Mexican states of Nuevo León (234 km^2), Coahuila (82 km^2), and San Luis Potosí (6 km^2). The occupied range of the Mexican prairie dog suffered a 33% reduction from 1996 to 1999 and an overall reduction of 74% when compared with its documented historical range. We found no relationship between isolation and colony size for active colonies, although geographic isolation can result in decreases in the chances of colonies surviving stochastic events. Other challenges for the recovery of this species include the increased rate of habitat loss and deterioration, and landscape desertification factors.

Key words: conservation, *Cynomys mexicanus*, distribution, fragmentation, Mexican Plateau, Mexican prairie dog, recovery

Described in the late 1800s as an abundant species in the northern prairies of Mexico, the Mexican prairie dog (*Cynomys mexicanus*) is an endemic species inhabiting the short grasslands of northeastern Mexico (Merriam 1892). After more than a century since its description, distribution of the Mexican prairie dog has been modified drastically by human activities. This modification is mainly due to agricultural practices and direct poisoning (Ceballos and Wilson 1985; Jiménez-Guzmán 1976; Medina and de la Cruz 1976; Treviño-Villarreal et al. 1996). This species historically occupied approximately 1,300 km^2 in the states of Coahuila, Zacatecas, San Luis Potosí, and Nuevo León, Mexico, but in 1996 this distribution had been reduced to 478 km^2 (Treviño-Villarreal and Grant 1998). Eradication of entire colonies of Mexican prairie dog, due mainly to habitat conversion and poisoning, prompted endangered status for this species (Diario Oficial de la Federación 1994). Eradication of colonies has not only reduced the overall distribution of this species, but it also has resulted in the fragmentation and isolation of remaining colonies.

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The Mexican prairie dog is considered a relict geographic isolate of the black-tailed prairie dog, *C. ludovicianus* (Pizzimenti 1975), which evolved a strong association with gypsum and xerosol prairie soils (Treviño-Villarreal 1990). Adaptation to these types of soils restricted this species' distribution to the Mexican Plateau, an area located at 1,600–2,000 m elevation. Plant communities in the Mexican Plateau are dominated by short grasses typical of calcareous and gypsophyllum soils, such as *Muhlenbergia repens* and *Scleropogon brevifolius* (Scott-Morales and Estrada 1999).

The Mexican prairie dog is a regionally endemic species, and its status is globally endangered (Groombridge 1993). A detailed report on its distribution in 1966 (Treviño-Villarreal and Grant 1998) and more recent reports from our study document that the distribution of the species continues to decline; some colonies have been abandoned, and others show a drastic reduction in occupied area or are fragmented. This decline, coupled with the continuous loss and degradation of the species' habitat, has had a severe impact on the current distribution and accentuates the endangered status of the species.

To quantify the decline in number of active colonies and the reduction of occupied area by Mexican prairie dogs over the last century, we determined its geographic distribution during 1999 and compared this area to the species' documented historical range. We also located all previously identified colonies that were still extant and determined their size.

Materials and Methods

Study area.—From June to November 1999 we conducted field surveys throughout the known historical range of the Mexican prairie dog to assess its geographical distribution. We conducted the research in the northeastern portion of the Central Highland of the Chihuahuan Desert, located between 24°00′ and 25°25′ N latitude, and 100°00′ and 101°25′ W longitude (Ceballos et al. 1993). The study area included portions of the states of Coahuila, Nuevo León, and San Luis Potosí (Fig. 1), where mean annual precipitation ranged from 200 to 500 mm (González-Saldívar 1990; Mellink and Madrigal 1993). The plant community is dominated by associations of *Muhlenbergia villiflora–Scleropogon brevifolius*, *Buchloe dactyloides–Scleropogon brevifolius*, and *Muhlenbergia–Scleropogon–Dasyochloa*, with occasional occurrences of *Atriplex*, *Suaeda*, *Bouteloua*, *Acacia*, *Koeberlinia*, *Pinus*, *Quercus*, and *Juniperus* species.

The state of Zacatecas was not included in this study because during previous trips across the Mexican Plateau we had verified the extirpation of the Mexican prairie dog colonies in this region that were previously reported by Ceballos et al. (1993).

Geographic distribution.—We estimated the present distribution of the Mexican prairie dog from literature and our field observations. We estimated colony distribution based on all localities previously identified by Treviño-Villarreal and Grant (1998). Each known colony location was visited and identified in the field. All new, previously unreported colonies were registered and evaluated as stated below. Colonies recorded previously as separate individual units by Treviño-Villarreal and Grant (1998), but found to be connected by corridors of active prairie dog borrows in this study, were considered as a single colony. Because Mexican prairie dogs have a daily movement <100 m (González-Saldivar 1990), we considered patches of prairie dogs burrows <200 m from each other as a single colony. For each identified colony, we walked or drove the periphery taking geographic coordinates with a geographic positioning system (Magellan GPS, San Dima, California). We loaded the GPS data in an ArcView for Windows ver. 3.2a (ESRI, Inc. 2000) for posterior mapping and calculating the area and shape of each colony. We estimate the distribution of Mexican prairie dogs by adding surface area of all active colonies.

During field visits, we found all but the following 4 of the colonies reported in 1996 (Treviño-Villarreal and Grant 1998): Campo Hidalgo, San Pablo, and Cañada de los Perros in Coahuila state, and Los Burros in Nuevo León state. Access was denied at 2 additional colonies located on private property (Las Colonias and Santa Anita), both in Coahuila state; these colonies had a reported extension of 36 and 325 ha, respectively in 1996 (Treviño-Villarreal and Grant 1998) and were excluded from the analysis for this study.

In our study we did not trap or handle Mexican prairie dogs (Animal Care and Use Committee 1998).

Colony size and isolation.—Geographic coordinates of the periphery of each colony were entered and mapped using ArcView for Windows ver. 3.2 (ESRI, Inc. 2000). Points belonging to the same colony were linked to generate polygons in order to assess area and shape of each of the extant colonies shown in Fig. 1. The degree of isolation of the active colonies was determined by the minimal distance to the nearest neighboring colony. To determine if colony size or area reductions promoted isolation, we correlated mean distances to the nearest neighbor colony with colony size. Because small colonies are more prone to extinction than larger ones, and recolonization depends on a near source for dispersal (McCullough 1996), we also calculated the mean distance between the largest colony and neighboring colonies, under the assumption that large colonies are primary sources of dispersal. In our study, we identified 4 main groups of colonies based on geographic or artificial barriers: El Manantial in San Luis Potosí (colonies 45–55), Nueva Primavera (colonies 35–40) and Hediondilla (colonies 22, 23, 24, 27–31) in Nuevo León, and La Perforadora (colonies 1–13) in Coahuila (Fig. 1). All other colonies were considered isolated.

Statistical analysis.—Comparisons between our estimates of colony area and those of Treviño-Villareal and Grant (1998) were made with paired Student's *t*-test. To identify the effect of colony size on isolation we correlated both variables using Spearman rank correlation. We used Kruskal-Wallis test to compare mean distance between the largest colony and neighboring colonies for all groups (Dytham 1999). All statistical analyses were computed using SPSS for Windows ver. 11 (SPSS Inc. 2001) with a significance level of 0.05.

Results

Geographical distribution.—We located 54 active and 22 inactive prairie dog colonies (Appendix I). We estimated the actual distribution of the species as 322 km^2, which included 234 km^2 in Nuevo León, 82 km^2 in Coahuila, and 6 km^2 in San Luis Potosí (Fig. 1). These numbers contrast with the estimates of Treviño-Villarreal and Grant (1998), who reported in 1996 a larger distribution range for the state of Nuevo León, Coahuila, and San Luis Potosí (Table 1). The largest colonies still occurred in Nuevo León state, although most of them were surrounded by active or abandoned agricultural lands.

Excluding the Coahuila state colonies where access was denied, there was a 37% (133 km^2) range reduction for the Mexican prairie dog between 1996 and 1999 in Nuevo León, 30% (3.5 km^2) reduction in San Luis Potosí, and 20% (20 km^2) reduction in Coahuila. These values represent a reduction of 33% over the total occupied area since 1996 and a 74% reduction from the documented historical range (Treviño-Villarreal and Grant 1998).

Colony size and isolation.—A majority (53%) of the remaining colonies were under 1 km^2 in size and only 5 (9%) were larger than 10 km^2. An accurate estimation of the reduction of individual colony area between 1996 and 1999 is possible only if we consider the same colonies in both studies (Appendix I). All colonies except Cienega del Toro, Valle Potosí, Chamalote, Gómez Farías 1, El Venado, Palma de Lobos and Tanque de López decreased in area between 1996 ($\bar{X} = 745$ ha $\pm$ 1,848) and 1999 ($\bar{X} = 520$ ha $\pm$ 1,654; $t = -3.22$, *d.f.* 37, $P < 0.05$). Large colonies such as La Soledad, El Guerrero, Encarnación Guzmán, El Uron, and La India shrank considerably (1996 $\bar{X}=$ 3482 ha $\pm$ 4,102; 1999 $\bar{X}=$ 2,729 ha $\pm$ 4,085), and local extinctions occurred mainly within the smallest colonies, such as the ones in San Luis Potosí state (Table 2).

Mean distance to the nearest colony (Appendix I) for all active colonies was 3.41 km; 2.16 km in Coahuila, 3.18 km San Luis Potosí, and 4.55 km in Nuevo León (Table 3). We found no correlation between colony size and distance to the nearest neighboring colony, except in Coahuila where a positive relationship between size of colony and distance occurred. The colonies reported as active by Treviño-Villarreal and Grant (1998) and later found to be inactive were all located in a periphery of the species' distribution range (Appendix I).

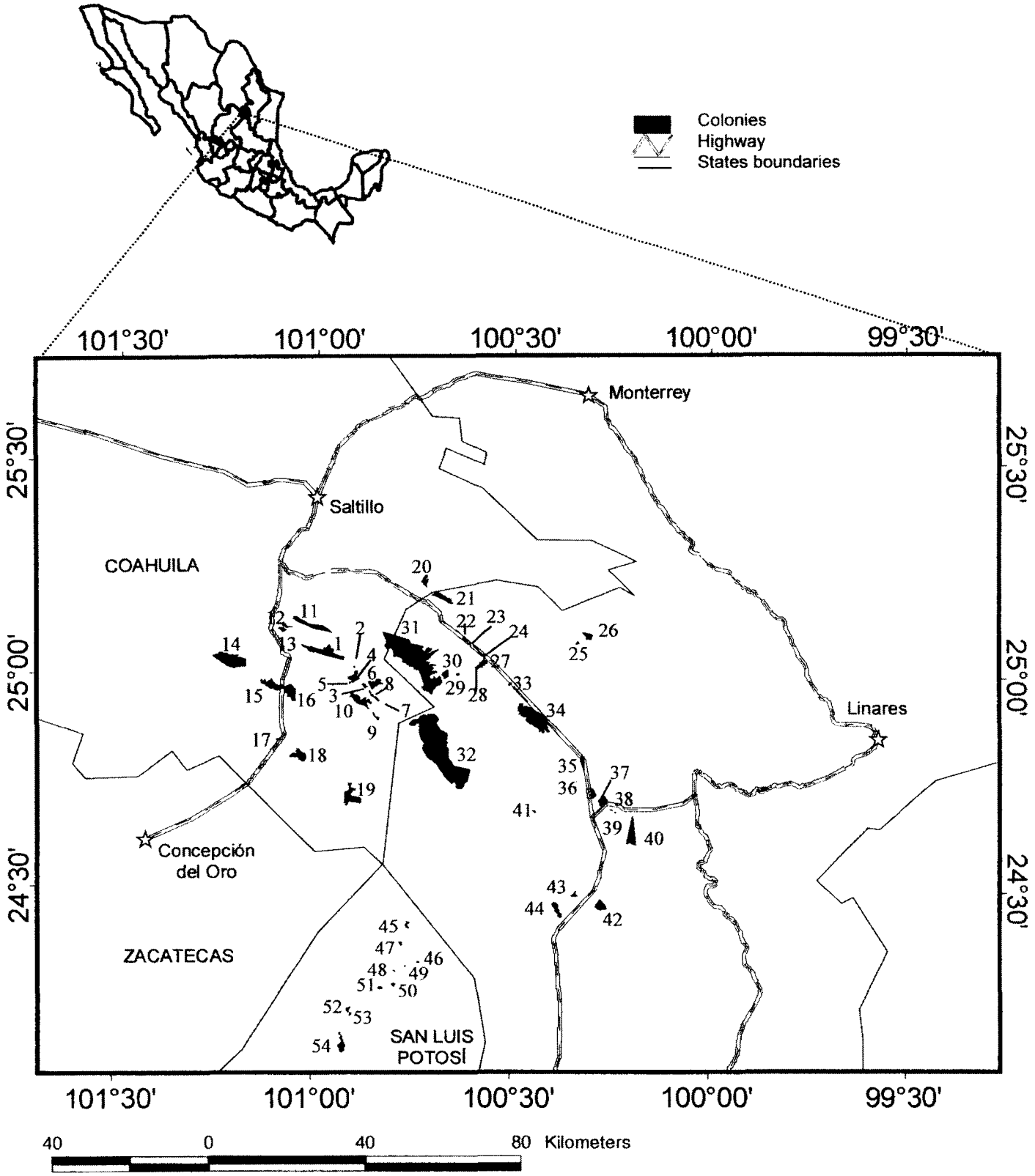

FIG. 1.—Location of the Mexican Plateau study area and distribution of colonies of *Cynomys mexicanus*. Sites numbers correspond to those listed in Appendix I.

TABLE 1.—Estimated geographic distribution of the Mexican prairie dog per state in 1996 (Treviño-Villarreal and Grant 1998) and our study in 1999.

	Geographic distribution (km)			
	1996		1999	
	$\bar{X}$	*SD*	$\bar{X}$	*SD*
Coahuila	102.6	5.3	82	4.9
Nuevo León	367.0	24.6	234	57.6
San Luis Potosí	9.5	1.0	6	0.9
All colonies	478.1	19.4	322	17.0

Mean distance between the largest colonies and neighboring colonies varied significantly among groups (Kruskal-Wallis test, $d.f. = 3$, $P < 0.05$), where El Manantial group showed the largest mean distance (23 km) followed by La Perforadora (12 km), La Hedionda (6 km), and Nueva Primavera (5 km).

DISCUSSION

Our results confirmed that a drastic reduction of the geographic distribution of *Cynomys mexicanus* in the Mexican Plateau, previously documented by Treviño-Villarreal and Grant (1998), continues. The total occupied geographic range of the Mexican prairie dog has suffered a severe reduction since 1996, which is even more drastic if we consider the species' historical range.

Earlier estimates of the distribution of the Mexican prairie dog (Ceballos and Navarro 1991; Pizzimenti and McClenaghan 1974) reported a distribution range of 800 km^2. Nevertheless, only 1 study (Treviño-Villarreal and Grant 1998) monitored distribution and status of individual Mexican prairie dog colonies, reporting 88 active colonies in a total area of 478 km^2. We recorded 54 active colonies with an area of 322 km^2. However, 22 out of the 88 active colonies found in 1996 were no longer active, and some of the largest colonies such as La Hedionda, La Trinidad, La Soledad, La India, and El Uron, were extremely reduced in size or fragmented, resulting in a severe overall range contraction (33%) since 1996.

All inactive colonies were located in a periphery of the species' distribution range (Fig. 1; Treviño-Villarreal and Grant 1998) and were small in size (Table 2). More affected however, was the southern part of the geographical distribution, where we verified not only extinction of some of the colonies, but also the presence of the smallest colonies (Table 3). The causes of status changes are unclear, but as discussed below, small colony size can increase likelihood of extinction in geographically isolated populations.

As reported by Treviño-Villarreal and Grant (1998), Nuevo León state still had 73% of the total geographic distribution of the prairie dogs; however, it also suffered the largest reduction of prairie dog habitat area. In the past, agriculture activities were the main factor contributing to reduction in habitat (Treviño-Villarreal et al. 1996); agriculture continues to be the main activity in Nuevo León (Avedaño 1999) and most of the colonies there were surrounded by agricultural land. Habitat loss due to agriculture had a direct and immediate effect on the size and survival of the colonies by fragmenting the habitat and reducing the size of colonies, as documented at La Hediondilla, Las Hormigas, and El Potosí colonies (Appendix I).

The observed distribution of active colonies over the geographic distribution of the Mexican prairie dog showed a metapopulation process (Fig. 1); the long-term persistence of a metapopulation is determinated by its own dynamic, and factors such as dispersal, isolation, and population size (Hanski 1999; Hanski and Simberloff 1997; McCullough 1996).

Dispersal data are lacking for the Mexican prairie dog, but other studies have reported dispersal distances >5 km in *C. ludovicianus* (Hoogland 1995; Koford 1958; List 1997; Roach et al. 2001). If the Mexican prairie dog has a similar dispersal pattern, then distance to the nearest colony does not appear to be a crucial factor for dispersal, as suggested by our results (Table 3). Instead, geographic isolation of some colonies such as El Uron, El Rusio, and Cienega del Toro could result in a degradation of the colonies, as inferred by observed low prairie dog densities and vegetation cover (Scott-Morales and Estrada 1999). Also, mean distance between the largest colony and all neighboring colonies showed clearly that colonies located in San Luis Potosí were more prone to isolation and extinction than other colonies. San Luis Potosí had the smallest colonies and largest mean distances between large and neighboring colonies. Our findings coincided with the isolation analysis carried out by Treviño-Villarreal and Grant (1998); they considered 14 out of the 88 active colonies to have been sufficiently isolated to reduce dispersal of individuals among populations. Eight of those isolated colonies were in San Luis Potosí state and 5 had become inactive by 1999 (La Trueba 1 and 3, Salado 2 and 3, and Vía Este). All extinct colonies in San Luis Potosí were highly isolated and small in size in 1996 (Treviño-Villarreal and Grant 1998; Table 2).

TABLE 2.—Mean size of active colonies in 1996 and colonies active in 1996 but found inactive in 1999. All size estimated from Treviño-Villarreal and Grant (1998).

	Colony size (ha)						Statistical comparison of *t*-test	
	Active colonies			Inactive colonies				
	n	$\bar{X}$	*SD*	*n*	$\bar{X}$	*SD*	*t* values	*P* values
Coahuila	17	588	690	5	48	70	1.71	< 0.05
Nuevo León	22	1,656	3,096	9	143	130	1.45	< 0.05
San Luis Potosí	10	69	116	8	32	17	0.89	< 0.05
All colonies	49	745	1,848	22	81	101		

Table 3.—Mean colony size of active colonies in 1999 per state and nearest neighbor distance.

	Colony size (ha) 1999			Distance to nearest neighbor (km) 1999		Spearman rank correlation	
	n	$\bar{X}$	*SD*	$\bar{X}$	*SD*	r_s	*P* values
Coahuila	20	407	490	2.16	3.0	0.456	< 0.05
Nuevo León	24	975	2,472	4.55	3.47	0.213	NS
San Luis Potosí	10	55	96	3.18	1.45	0.275	NS
All colonies	54	520	1,654	3.41	3.0		

Also, the mean distance between the largest colony and all neighboring colonies shows clearly that colonies located in San Luis Potosí are more prone to isolation and extinction than others colonies; the state has the smallest colonies and the maximum mean distance between the largest colony and its neighboring colonies. Moreover, erosion and transition of grasslands into shrublands are prominent in this state (Yeaton 1999), contributing to degradation of the habitat.

Area reduction or colony size did not appear to be a factor that promoted isolation, but large colonies seem to persist longer in isolation than do small ones. A similar pattern has been observed in *C. ludovicianus* (Lomolino and Smith 2001). Nevertheless, if reduction of colony area continues, the persistence of large colonies is uncertain, especially in such colonies as El Uron, El Rusio, and Cienega del Toro 1 and 2 (colonies 19, 41, 25, and 26 in Appendix I, respectively), where distances to the nearest neighboring colonies were great (12.5 km, 16 km, 26 km, and 26 km, respectively).

Because >90% of the reduction in the geographic distribution of the Mexican prairie dog is caused by human activities (Treviño-Villarreal et al. 1996), and the sources for habitat reduction still persist (Avedaño 1999), we assume that habitat loss has the greatest detrimental impact on survival of Mexican prairie dogs, especially in Nuevo León state, where grassland has been transformed to agricultural land. Changes in land use and vegetation result in a fragmented landscape that promotes loss of endemic species and diversity (L. Scott-Morales, in litt.). The loss of grassland habitat prevents the recovery of this species and increases the rate of deterioration and desertification of rangelands on the Mexican Plateau.

If prairie dogs play an important role as keystone species and improve grassland landscape (Miller et al. 1994), restoring prairie dogs should contribute to the conservation of the entire ecosystem. Despite the potential for recolonization that some researchers have attributed to prairie dogs (R. Yeaton, in litt.), it cannot be assumed that natural recolonization alone will reverse the endangered status of *C. mexicanus* in the future.

Resumen

Determinamos la distribución actual del perro llanero mexicano y comparamos nuestros resultados con los reportes hasta ahora conocidos. En todas las colonias registradas de perro llanero se obtuvo el tamaño y evaluamos si el tamaño y grado de aislamiento de las colonias, tiene un efecto en la persistencia de la misma y la recuperación de la especie. Registramos un total de 54 colonias activas y 22 inactivas. La distribución geográfica del perro llanero se estimo en un total de 322 km^2, de ellos 234 km^2 corresponden al estado de Nuevo León, 82 km^2 al estado de Coahuila, y 6 km^2 al estado de San Luis Potosí. La distribución geográfica ha sufrido una notable reducción de 33% entre 1996 y 1999 y una reducción de 74% si tomamos en cuenta los datos históricos conocidos. No se encontró relación entre el tamaño de la colonia y el grado de aislamiento, no obstante el aislamiento geográfico puede resultar en la disminución de sobreviviencia de las colonias a eventos estocásticos. La pérdida de hábitat, la degradación, y desertificación del paisaje siguen actuando como factores limitantes en la recuperación de esta especie.

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APPENDIX I

Colonies of Mexican prairie dogs studied, with colony name, geographic position, size of the colony in ha in 1996 (Treviño-Villarreal and Grant 1998) and in 1999 (this study), and distance in km to the nearest neighboring colony. Numbers preceding names identify colonies in Fig. 1. Location and size (ha) of colonies studied in 1996 (Treviño-Villarreal and Grant 1998) but no longer active in 1999 are also included. Where names of sites differed between our study and Treviño-Villarreal and Grant, date of the study are added after location site. Four 1996 colonies were fragmented into 2–3 colonies by 1999, as indicated; for these, no area is given for 1996. All localities are in Mexico.

Active colonies

Coahuila.—1, La Perforadora–El Cercado (1996), La Perforadora (1999), 25°03′57″N, 100°59′10″W, 1070 ha (1996), 1,123 ha (1999), 3.2 km; 2, El Cercado (1996), El Cercado 2 (1999), 25°01′19″N, 100°54′12″W, 2 ha (1996), 2 ha (1999), 1 km; 3, Las Águilas (1996), Las Hormigas 1 (1999), 24°58′38″N, 100°52′14″W, 18 ha (1996), 43 ha (1999), 0.68 km; 4, Valle Redondo–Valle San Vicente (1996), El Cercado (1999), 25°00′27″N, 100°53′53″W, 109 ha (1996), 248 ha (1999), 0.24 km; 5, Las Boquillas (1996), El Cercado 1 (1999), 25°00′11″N, 100°54′04″W, 494 ha (1996), 14 ha (1999), 0.24 km; 6, Las Hormigas, 24°58′16″N, 100°51′23″W, 740 ha (1996), 310 ha (1999), 0.68 km; 7, Las Hormigas 2—part of colony 6 in 1996, (1999), 24°57′59″N, 100°51′42″W, 27 ha (1999), 0.20 km; 8, Las Hormigas 3—part of colony 6 in 1996 (1999), 24°56′48″N, 100°50′25″W, 28 ha (1999), 0.20 km; 9, Las Puyas, 24°54′08″N, 100°50′12″W, 216 ha (1996), 33 ha (1999), 1.27km; 10, El Venado, 24°56′44″N, 100°52′12″W, 415 ha (1996), 637 ha (1999), 1.27 km; 11, Los Ángeles 1, 2, and 3 (1996), Los Ángeles (1999), 25°06′00″N, 100°57′32″W, 759 ha (1996), 776 ha (1999), 2 km; 12, Los Ángeles 4 (1996), Chamalote (1999), 25°07′15″N, 101°05′06″W, 59 ha (1996), 63 ha (1999), 0.57 ha; 13, Chamalote (1996), Chamalote 1 (1999) 25°06′41″N, 101°05′30″W, 153 ha (1996), 89 ha (1999), 0.57 km; 14, La India, 25°03′03″N, 101°13′56″W, 2,150 ha (1996), 1,881 ha (1999), 5.52 km; 15, Gómez Farías—not reported in 1996, (1999), 24°58′20″N, 101°04′54″W, 648 ha (1999), 0.32; 16, Gómez Farías (1996), Gómez Farías 1 (1999), 24°58′43″N, 101°07′33″W, 368 ha (1996), 666 ha (1999), 0.32 km; 17, San Juan del Retiro, 24°51′08″N,

101°05′47″W, 61 ha (1996), 12 ha (1999), 4.9 km; 18, Encarnación Guzmán, 24°48′52″N, 101°02′33″W, 1,014 ha (1996), 484 ha (1999), 4.9 km; 19, Ventura O and E (1996), El Uron (1999), 24°42′23″N, 100°54′17″W, 2,219 ha (1996), 882 ha (1999), 12.7 km; 20, Artecillas, 2 and 3 (1996), Artecillas (1999), 25°12′54″N, 100°43′23″W, 144 ha (1996), 167 ha (1999), 2.4 km.

Nuevo León.—21, El Guerrero–Puerto Grande (1996), El Guerrero (1999), 25°11′33″N, 100°42′23″W, 1,290 ha (1996), 438 ha (1999), 2.4 km; 22, Providencia 2 (1996), Providencias (1999), 25°05′07″N, 100°37′22″W, 154 ha (1996), 31 ha (1999), 0.34 km; 23, Providencia 1 (1996), Navidad (1999), 25°04′33″N, 100°36′47″W, 135 ha (1996), 24 ha (1999), 0.34 km; 24, La Rosa-El Refugio–Navidad–San Fernando–San Rafael (1996), Refugio de Rancherías (1999), 25°03′14″N, 100°35′05″W, 466 ha (1996), 92 ha (1999), 0.53 km; 25, Ciénega del Toro 2 (1996), Ciénega del Toro 1 (1999), 25°04′40″N, 100°20′20″W, 28 ha (1996), 20 ha (1999), 2.24 km; 26, Ciénega del Toro, 25°06′02″N, 100°18′02″W, 220 ha (1996), 227 ha (1999), 2.24 km; 27, San Rafael—part of colony 24 in 1996, (1999), 25°01′17″N, 100°34′48″W, 192 ha (1999), 0.53 km; 28, San Rafael (1996), Granja de Pollos 1 (1999), 25°01′08″N, 100°35′31″W, 1,425 ha (1996), 38 ha (1999), 0.16 km; 29, Granja de Pollos—part of colony 30 in 1996, (1999), 25°00′24″N, 100°38′35″W, 20 ha (1999), 2.16 km; 30, La Hedionda (1996), El Erial (1999), 24°59′48″N, 100°41′03″W, 1380 ha (1996), 172 ha (1999), 2.16 km; 31, Hendiondilla–Hedionda Grande–Valle Hedionda Grande (1996), Hedionda (1999), 24°59′58″N, 100°41′05″W, 10,942 ha (1996), 7,524 ha (1999), 0.73 km; 32, La Soledad, 24°55′29″N, 100°43′24″W, 10,760 ha (1996), 9,964 ha (1999), 5.38 km; 33, San Joaquín, 24°59′14″N, 100°30′13″W, 635 ha (1996), 15 ha (1999), 5.43 km; 34, La Paz–6 de Enero–Trinidad (1996), La Trinidad (1999), 24°54′34″N, 100°25′00″W, 3,755 ha (1996), 2,477 ha (1999), 5.43 km; 35, El Potosí, 24°47′10″N, 100°19′06″W, 1,785 ha (1996), 192 ha (1999), 5.13 km; 36, San Roberto, 24°41′38″N, 100°14′55″W, 1,234 ha (1996), 172 ha (1999), 2.6 km; 37, San Roberto 2—part of colony 36 in 1996, (1999), 24°42′24″N, 100°15′54″W, 260 ha (1999), 0.72 km; 38, El Tokio, 24°41′15″N, 100°14′05″W, 31.4 ha (1996), 1 ha (1999), 0.09 km; 39, El Tokio 2, 24°41′11″N, 100°14′18″W, 24.8 ha (1996), 1 ha (1999), 0.09 km; 40, Tokio–Primavera–Nueva Primavera (1996), Nueva Primavera (1999), 24°37′01″N, 100°11′17″W, 442 ha (1996), 802 ha (1999), 4.2 km; 41, El Rucio, 24°41′25″N, 100°26′37″W, 67.5 ha (1996), 13 ha (1999), 16.39 km; 42, El Salero, 24°28′50″N, 100°16′27″W, 598 ha (1996), 410 ha (1999), 5.41 km; 43, Rancho Las Fuentes (1996), Salinas del Refugio (1999), 24°29′33″N, 100°20′29″W, 51 ha (1996), 43 ha (1999), 4.25 km; 44, Refugio de Ibarra, 24°27′47″N, 100°23′34″W, 570 ha (1996), 272 ha (1996), 4.25 km.

San Luis Potosí.—45, Loma Güera (1996), Palma de Lobos (1999), 24°24′54″N, 100°46′01″W, 12.5 ha (1996), 46 ha (1999), 4.22 km; 46, San Benito 2 (1996), San Benito (1999), 24°19′38″N, 100°43′49″W, 19.3 ha (1996), 5 ha (1999), 3.33 km; 47, Palos Altos (1996), El Salado 4 (1999), 24°16′17″N, 100°47′34″W, 71.5 ha (1996), 27 ha (1999), 4.22 km; 48, San Benito 1 (1996), El Salado 7 (1999), 24°18′23″N, 100°47′36″W, 11.3 ha (1996), 7 ha (1999), 3 km; 49, Salado 1, 24°16′17″N, 100°47′34″W, 4.8 ha (1996), 2 ha (1999), 2.76 km; 50, Pasta Tanque López 2 (1996), Salado (1999), 24°22′25″N, 100°46′49″W, 14.4 ha (1996), 38 ha (1999), 2.52 km; 51, Pasta Tanque de López 1 (1996), Tanque de López (1999), 24°16′05″N, 100°40′23″W, 35 ha (1996), 40 ha (1999), 2.52 km; 52, El Gallo B (1996), El Gallo 1 (1999), 24°12′34″N, 100°54′38″W, 105 ha (1996), 50 ha (1999), 0.70 km; 53, El Gallo A (1996), El Gallo (1999), 24°11′55″N, 100°54′15″W, 32 ha (1996), 10 ha (1999), 0.7 km; 54, El Manantial-Santa Ana B (1996), El Manantial (1999), 24°09′19″N, 100°55′42″W, 388 ha (1996), 325 ha (1999), 5.2 km.

Inactive colonies

Coahuila.—Artecillas 4, 16 ha (1996); Las Ratas, 23 ha (1996); Puerto Rosario, 25 ha (1996); Jaramé, 173 ha (1996); Jaramé 2, 5.3 ha (1996); El Castillo, 30 ha (1996).

Nuevo León.—Tokio–Santo Domingo, 22 ha (1996); San Urdet, 276 ha (1996); El Tokio 3, 12 ha (1996); Rancho Nuevo, 110 ha (1996); Raíces 2, 164 ha (1996); Raíces 1, 333 ha (1996); Raíces–Tokio, 299 ha (1996); El Porvenir, 39 ha (1996).

San Luis Potosí.—Santa Ana C, 13.5 ha (1996); Vía Este, 1.5 ha (1996); Vía Oeste, 42 ha (1996); La Tureba 1, 31.5 ha (1996); La Tureba 3, 42 ha (1996); Salado 2, 40 ha (1996); Salado 3, 52.5 ha (1996); El Saltillero, 35 ha (1996).