

# Status and Distribution of Chihuahuan Desert Grasslands in the United States and Mexico

(invited paper)

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Grasslands comprise a small part of the Chihuahuan Desert but are vital to the biological diversity of the ecoregion. Characteristic grasses of the Chihuahuan Desert are tobosa (*Pleuraphis mutica*) and black grama (*Bouteloua eriopoda*) but other common species include alkali sacaton (*Sporobolus airoides*), big alkali sacaton (*S. wrightii*), mesa dropseed (*S. flexuosus*), blue grama (*B. gracilis*), sideoats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), slender grama (*B. filiformis*), chino grama (*B. brevista*), spruce top grama (*B. chondrosioides*), bush muhly (*Muhlenbergia porteri*), several three awns (*Aristida* spp.), and fluff grass (*Dasyochloa pulchella*) (Johnson 1974, Dinerstein et al. 2000). Many of the sites discussed in this paper and in greater detail in Dinerstein et al. (2000), contain large, contiguous tracts of grassland that support critical ecological processes, numerous endemic species and high plant and animal diversity.

Chihuahuan Desert grasslands were formerly characterized by extensive areas of tobosa and black grama with blue grama dominating at higher elevations. However, grassland areas throughout the Chihuahuan Desert are undergoing large-scale transformation from grass-dominated to shrub-dominated systems (Buffington and Herbel 1965, Weltzin et al 1997). The encroachment of native shrubs, including honey mesquite (*Prosopis glandulosa*), creosote (*Larrea tridentata*), and ephedra (*Ephedra* spp.), into former open grassland have been attributed to a variety of factors including climate change, over grazing, fire suppression, distribution of shrub seeds by domestic livestock, and removal of native herbivores (Herbel et al. 1972, Nielson 1986, Schlesinger et al. 1990). Such desertification typically results in the formation of coppice dunes, reduced grass cover, and increased heterogeneity in resource distribution (Nielson 1986), seriously compromising the integrity of the system.

A review of information collected from experts at the 1997 Biological Assessment Workshop of the Chihuahuan Desert indicates that there are still many high quality grasslands within the ecoregion. World Wildlife Fund (WWF) and others hosted this workshop to identify

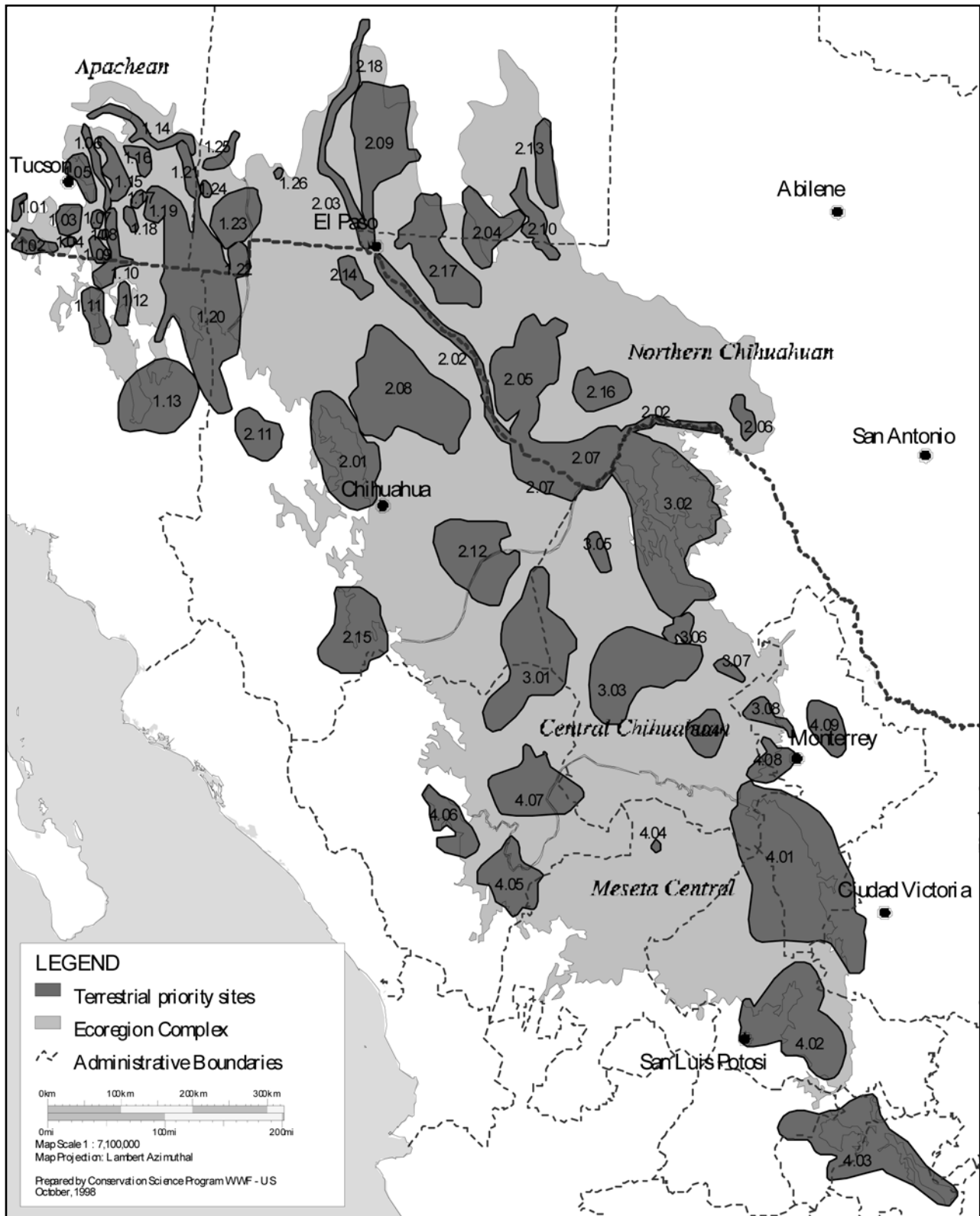
high biodiversity sites in the Chihuahuan Desert, defined by WWF (Dinerstein et al. 2000) as covering 629,000 km<sup>2</sup> (Figure 1). Of the 61 terrestrial sites nominated by experts at the workshop, 14 of these areas are characterized fully or partly by significant amounts of grassland. In this paper we have estimated the amount of grassland in each of these 14 priority conservation sites (Table 1) based on the workshop results and our field experience.

Extant grasslands comprise just 10% of the entire ecoregion. However, they cover nearly 6,000,000 hectares, 23% of the 268,000 km<sup>2</sup> area of the workshop's 61 priority conservation sites. If the full complement of species, habitats, and processes of the Chihuahuan Desert are to be conserved, grassland management and protection strategies must be developed. This paper summarizes some of the findings of that workshop specifically related to the distribution and status of Chihuahuan Desert grasslands. Figure 1, adapted from Dinerstein et al. (2000), presents a map of the Chihuahuan Desert with numbered priority sites for conservation. Numbered sites that represent grasslands correspond to the site descriptions in this paper discussed below.

## **Priority Grassland Sites within the Chihuahuan Desert**

*Appleton-Whittell Research Ranch Sanctuary and Canelo Hills (1.08)*—The grasslands within this 62-km<sup>2</sup> region are located in southeast Arizona and are a mixture of private, federal, and state lands. These grasslands are dominated by blue and hairy grama and big alkali sacaton. The 20,149-ha Audubon research ranch is located within this area. These grasslands have not been grazed since 1969.

*Big Hatchet–Alamo Hueco Mountains (1.22)*—This area is located in southwest New Mexico along the U.S./Mexico border, owned and managed by the Bureau of Land Management. It contains low, mid, and high elevation grasslands. Degraded low-elevation grasslands now consist of creosote and fluff grass. Mid-elevation grasslands contain grama grasses, tobosa interspersed with



**Figure 1.** Priority sites for conservation in the Chihuahuan Desert identified by the World Wildlife Fund.

**Table 1.** Priority Grassland Sites for Conservation in the Chihuahuan Desert.

Map #	Priority Site Name	Total Area of Site in Km <sup>2</sup>	% Grassland	Total Area Grassland in Km <sup>2</sup>
1.08	Appleton-Whittell	62	100	62
1.19	Sulphur Springs Valley	621	65	403
1.20	Chiricahua-Peloncillo-Sierra Madre Complex	19,156	50	9,578
1.22	Big Hatchets-Alamo Hueco Complex	1,022	60	613
1.24	Lordsburg Playa	209	70	146
2.01	Sierra del Nido	9,827	40	3,390
2.05	Davis-Chinati Mts.	8,643	50	4,321
2.08	Chihuahuan Grasslands	15,889	80	12,711
2.09	Tularosa Basin	10,101	50	5,050
2.12	La Perla	9,069	80	7,255
2.13	Mescalero Dunes	2,297	60	1,378
2.16	Marathon Basin	3,130	80	2,504
4.01	Altiplano Mexicano Nordoriental	60,000	20	12,000
		140,026		59,411

mesquite shrublands. High-elevation lands primarily support grama grasses interspersed with beargrass (*Nolina microcarpa*), silktassel (*Garrya wrightii*), whitethorn acacia (*Acacia constricta*), Palmer agave (*Agave palm-eri*), and other grass species such as *Muhlenbergia* sp., sprangletop (*Diplachne dubia*), and threeawns (*Aristida* sp). Within this area 40,250 ha are managed as an Area of Critical Environmental Concern (ACEC).

*Sulphur Springs Valley Grassland (1.19)* – This is a 621 km<sup>2</sup> area in southeast Arizona that is private and state owned. The eastern portion of the valley contains high quality semi-desert grama grasslands. The western portion of the valley is degraded and now heavily shrub encroached. Lehman’s love grass, an aggressive exotic, has invaded much of the grasslands in this area. High numbers of sandhill cranes winter here as do mountain plovers.

*Chiricahua-Peloncillo-Sierra Madre Complex (1.20)* – This vast area (19,156 km<sup>2</sup>) along the United States/Mexico border is a mixture of private and federal ownership. The grasslands of the Animas Valley of southwest New Mexico extend south into northern Chihuahua, Mexico. Dominant grassland species include blue grama, black grama, tobosa, and big alkalai staccato. This grassland area has been recognized for its importance to biological diversity. It contains one of the largest remaining black-tailed prairie dog complexes in North America and the only complex in Mexico.

*Lordsburg Playa (1.24)* – This 209-km<sup>2</sup> area in western New Mexico consists of private, state, and federal lands. The closed basin with seasonal playas is surrounded by now degraded semi-desert grasslands. It is a saline habitat and dominated by alkali sacaton and endemic Griffiths’ saltbush (*A. torreyi griffithsii*) and other saltbush species. It is an important migratory stopover site for shorebirds including many grassland-adapted species, such as long-billed curlew.

*Sierra del Nido (2.01)* – The grasslands in this site comprise about 40% of the area and are Plains and Great Basin community types. The area is a mixture of ejido lands, Mennonite colonies, and private ranches. Portions of this area are heavily agricultural and fragmented, but extensive tracts of grass remain. This area contains important higher elevation grama grasslands for migratory and overwintering grassland passerines and the white-sided jackrabbit (*Lepus calottis*).

*Davis-Chinati Mountains Complex (2.05)* – The grasslands within this site cover a high mesa that spans between the two mountain ranges and are known as the Marfa Grasslands. Blue and sideoats grama are dominant species. The area is home to a large herd of pronghorn antelope, and until the early 1990s hosted a breeding population of mountain plover. High numbers of grassland birds winter here as well as breeding populations of western meadowlarks, lesser nighthawks, and Cassin’s sparrow.

*The North-Central Chihuahua Grasslands (2.08)* – This is a large area (15,889 km<sup>2</sup>), generally considered high quality intact grasslands. This is probably the best example of Chihuahuan Desert grasslands remaining, dominated primarily by blue and black grama, large swales of tobosa and areas of sacaton. Land ownership is a mixture of ejido and private ranches. In general, private ranches have lower intensity grazing and a rotational system while ejido lands are heavily and continuously grazed. This area is important for migratory and resident grassland birds including the aplomado falcon (*Falco femoralis*). It is also important for pronghorn antelope (*Antilocapra americana*), white-sided jackrabbit, and the kit fox (*Vulpes macrotis*).

*Tularosa Basin (2.09)* – This priority site contains the Organ, Franklin, and San Andres Mountains, the northern Jornada, and the Tularosa Basin as well. A number of large patches of grassland persist within the Tularosa

Basin, in particular lowland grasslands of mesa dropseed, big alkali sacaton, tobosa, and grama grasses interspersed with scrublands. This basin is entirely federally owned (U.S. Department of Defense and U.S. National Park Service) and has not been grazed by livestock for 50 years. It is home to many sensitive grassland species and aquatic species associated with seasonal playas. The northern Jornada supports semi-desert grasslands west of the San Andres Mountains. The elevation is slightly higher than the Tularosa basin. This area is dominated by blue grama and sacaton but also contains black, hairy, and sideoats grama and New Mexico needle grass (*Stipa neomexicana*). Banana and soap tree yucca are also interspersed throughout the region.

*La Perla (2.12)* – While many portions of this 9,069-km<sup>2</sup> tract of grassland and Chihuahuan Desert scrub are highly degraded and dominated by seasonal playas, some portions are intact and are dominated by grama grasses, tobosa, and sacaton. The southern Chihuahua area is important for breeding and overwintering grassland birds and white sided jackrabbit. It is one of just two areas in Mexico with populations of pronghorn antelope

*Mescalero Sands (2.13)* – This area on the eastern edge of the Chihuahuan Desert is dominated by plains grasses such as sand bluestem (*Andropogon hallii*) and little bluestem (*Schizachyrium scoparium*). As a transition from desert to plains it contains several endemic species, such as the sand dune lizard (*Sceloporus graciosus arenicolous*), and two crickets, *Ammobamentes mescalero* and *Stenopelmatus mescalero*. This area of sandy soils and large dunes is managed primarily by the U.S. Bureau of Land Management.

*Marathon Basin (2.16)* – The high quality grasslands of this basin in West Texas are home to scattered prairie dog colonies and are important for breeding populations of burrowing owls.

*Sierra Blanca (2.17)* – This extensive tract of land in southeast New Mexico and west Texas falls under a combination of private, state, and federal ownership. There are few roads and settlements within this semi-desert grassland primarily composed of blue, black, and sideoats grama, tobosa, curly mesquitegrass, three-awns, soap tree yucca, cholla (*Opuntia imbricata*), mesquite, and creosote bush. This site contains large intact grasslands including Fort Bliss' McGregor range, a high quality, ungrazed grama grassland. Grassland condition throughout this region ranges from excellent to poor (grassland areas with heavy shrub encroachment). Within the area known as Otero Mesa, black-tailed prairie dogs and pronghorn antelope occur.

*Altiplano Mexicano Nordoriental (4.01)* – This extremely large conservation site is located in northeast Mexico at the southeast edge of the Chihuahuan Desert. The western valley of this region is dominated by

gypsum grasslands, mainly grama grasses, fluff grass, sacaton, and three awns. Mainly under ejido ownership, this land has been fragmented by extensive agriculture and degraded by overgrazing. The western valley is home to the Mexican prairie dog (*Cynomys mexicanus*), an endangered species endemic to the region. Most remaining open grasslands in this area are occupied by the Mexican prairie dog. This range of this species has contracted significantly, and the majority of the population is now found in the states of Coahuila and Nuevo Leon. Remaining colonies are highly fragmented. This area is also home to a disjunct breeding population of mountain plovers (*Charadrius montanus*) and many sensitive species of grassland birds including Botteri's sparrows (*Aimophila botterii*) and the endemic Worthen's sparrow (*Spizella wortheni*). This region also contains many endemic grass species.

## Acknowledgments

The majority of the information presented in this paper was obtained from "Ecoregion-Based Conservation in the Chihuahuan Desert: A Biological Assessment," a product of a priority setting workshop for the Chihuahuan Desert Ecoregion hosted by the World Wildlife Fund and others in 1997. We thank all of the participants, whose extensive knowledge of the Chihuahuan Desert made the workshop a success and the publication an important reference.

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# Evaluación del Estado y Distribución de los Pastizales del Desierto Chihuahuense en los Estados Unidos y México

(resumen)

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**Jennifer Atchley Montoya** *World Wildlife Fund, Chihuahuan Desert Ecoregion*

Los pastizales del Desierto Chihuahuense comprenden una pequeña parte del Desierto Chihuahuense pero son esenciales para la diversidad biológica de la ecoregión. Muchos de los sitios que se discuten en este trabajo y en mayor detalle en Dinerstein et al. (2000), contienen segmentos de pastizal grandes y contiguos que dan soporte a procesos ecológicos críticos, tienen alto endemismo y sustentan una alta diversidad de plantas y animales.

Gran parte de las áreas de pastizal a través del Desierto Chihuahuense están sufriendo una transformación a gran escala, de un sistema dominado por gramíneas a un sistema dominado por arbustos (Buffington and Herbel 1965, Weltzin et al. 1997). Un gran número de factores han influido en el avance de arbustos nativos en áreas de pastizal abierto. Esos factores incluyen cambio climático, sobrepastoreo, supresión de incendios naturales, distribución de semillas de arbustos por el ganado y la remoción de herbívoros nativos (Herbel et al. 1972, Nielson 1986, Schlesinger et al. 1990). Este proceso de desertificación que resulta en formación de dunas, reducción de la cobertura por gramíneas e incremento en la heterogeneidad de la distribución de recursos (Nielson 1986), compromete seriamente la integridad del sistema.

Aún persisten áreas extensas de pastizal a través del Desierto Chihuahuense, con los pastizales más intactos localizados en Chihuahua, México. También hay pastizales semidesérticos que permanecen intactos en México y Estados Unidos, en áreas de mayor precipitación. De acuerdo a la World Wildlife Fund (WWF) existen sitios de alta diversidad en el Desierto Chihuahuense que abarcan 629,000 km<sup>2</sup> (Figura 1). De 61 sitios nominados por expertos, 14 están caracterizados total o parcialmente por ser pastizales (Tabla 1).

## **Sitios de pastizal prioritarios dentro del Desierto Chihuahuense**

*Rancho y Santuario de Investigación Appleton-Whittell y Canelo Hills* (1.08) – Los pastizales dentro de esta

región de 62 km<sup>2</sup> se localizan en el sureste de Arizona. Se componen de tierras privadas, federales y estatales que no se han usado para pastoreo desde 1969.

*Big Hatchet-Montañas Alamo Hueco* (1.22) – Esta región se localiza en el suroeste de Nuevo México, a lo largo de la frontera con México. Contiene pastizales a baja, media y alta elevación. Dentro del área, 40,250 hectáreas se administran como un Área de Interés Ambiental Crítico (Area of Critical Environmental Concern - ACEC).

*Pastizal del Valle de Sulphur Springs* (1.19) – Esta área de 621 km<sup>2</sup> en el sureste de Arizona es propiedad privada y estatal. El este del valle contiene pastizal semidesértico de alta calidad, mientras el oeste está degradado e invadido por arbusto.

*Complejo Chiricahua-Peloncillo-Sierra Madre* (1.20) – Esta es un área vasta a lo largo de la frontera entre México y los Estados Unidos que mezcla tierras privadas y federales, y contiene importantes pastizales desérticos relativamente intactos. Ha sido reconocida por su importancia a la diversidad biológica y contiene uno de los últimos complejos grandes de perros llaneros de cola negra en Norteamérica y el único complejo en México. Esta región contiene la segunda diversidad biológica más alta en todo México.

*Lordsburg Playa* (1.24) – Esta área de 209 km<sup>2</sup> en el oeste de Nuevo México consiste de tierras privadas, estatales y federales. El área es una cuenca cerrada, con playas temporales, rodeada por pastizales semidesérticos degradados. Es un sitio importante para aves costeras migratorias.

*Sierra del Nido* (2.01) – Este Pastizal se localiza en la punta noroeste de la Ecoregión del Desierto Chihuahuense y constituye una mezcla de ejidos, colonias Menonitas y ranchos privados. Los pastizales de tipo Pradera y Gran Cuenca comprenden aproximadamente 40% del área. Además contiene pastizales a mayor altura importantes para aves migratorias e invernales.

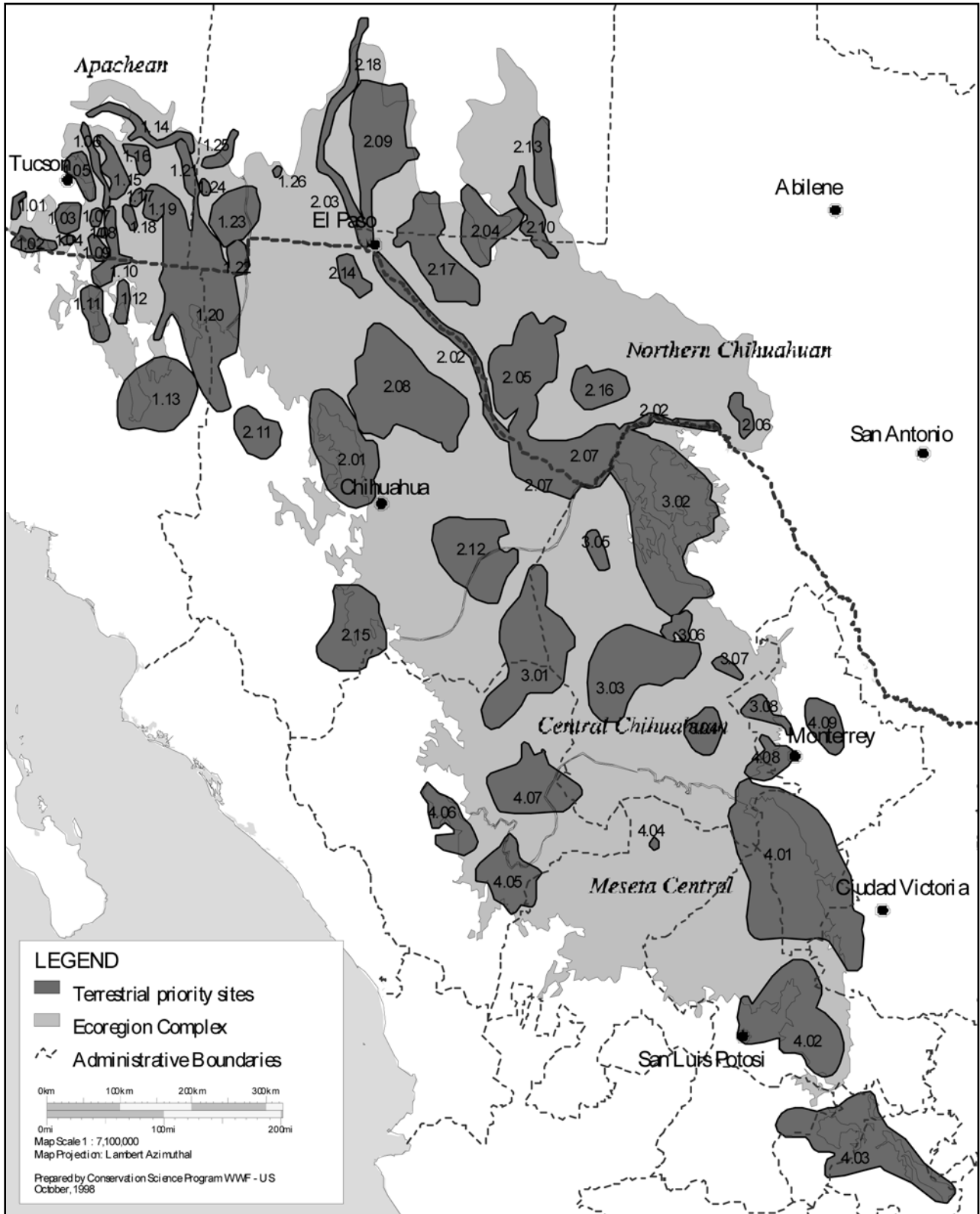


Figura 1. Sitios prioritarios para la conservación en el Desierto Chihuahuense identificados por World Wildlife Fund.

**Tabla 1.** Sitios de pastizal prioritarios para la conservación en el Desierto Chihuahuense.

Map #	Priority Site Name	Total Area of Site in Km <sup>2</sup>	% Grassland	Total Area Grassland in Km <sup>2</sup>
1.08	Appleton-Whittell	62	100	62
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4.01	Altiplano Mexicano Nordoriental	60,000	20	12,000
		140,026		59,411

*Complejo Montañoso Davis- Chinati (2.05)* – Los pastizales dentro de este sitio cubren un mesa alta que se extiende entre dos macizos montañosos conocidos como los Pastizales Marfa. Esta área es refugio de diversas especies de mamíferos y aves.

*Pastizales del Norte-Centro de Chihuahua (2.08)* – Esta es un área grande de pastizal intacto de alta calidad, y quizá el mejor ejemplo de pastizal del Desierto Chihuahuense. La tierra es una mezcla de ejidos y ranchos privados. Estos últimos practican pastoreo de baja intensidad y un sistema rotatorio. El área es importante para aves de pastizal migratorias y residentes.

*Cuenca de Tularosa (2.09)* – Esta región mide 10,000 km<sup>2</sup>. Contiene los mejores pastizales en la cuenca de Tularosa y la Jornada norte. La cuenca es propiedad federal y no se ha usado para pastizaje en 50 años. Sustenta muchas especies de pastizal y acuáticas. La Jornada norte sustenta pastizales semidesérticos a una elevación ligeramente más alta que la cuenca de Tularosa.

*La Perla (2.12)* – Área de 9,069 km<sup>2</sup> de pastizal y arbusto chihuahuense, de propiedad privada y ejidal. Contiene un segmento de pastizal relativamente intacto en el sur de Chihuahua y el norte de Durango. Es importante para aves de pastizal en gestación o migrando por invierno, liebres y antílopes.

*Dunas Mescalero (2.13)* – Esta área de suelos arenosos y grandes dunas es manejada principalmente por el U.S. Bureau of Land Management.

*Cuenca de Maratón (2.16)* – Esta área de 2,130 km<sup>2</sup> de pastizales en el oeste de Texas es propiedad de the Nature Conservancy. El área contiene pastizales intactos y constituye un importante hábitat de invierno para aves de pastizal migratorias.

*Sierra Blanca (2.17)* – Esta área de 7,418 km<sup>2</sup> es una combinación de tierras privadas, federales y estatales, y es principalmente semidesértica. Las condiciones del pastizaje en esta región van de excelente a deficiente.

*Altiplano Mexicano Nordoriental (4.01)* – Esta área de 60,000 km<sup>2</sup> se localiza en el noreste de México. El área se compone principalmente de ejidos que la han fragmentado mediante agricultura extensiva y la han degradado mediante pastoreo excesivo. El valle occidental es hogar del perro llanero mexicano, una especie en peligro, endémica a la región. El área también es hogar para muchas especies de aves de pastizal, y contiene muchas especies endémicas de pasto.

## Agradecimientos

La mayor parte de la información presentada en este trabajo fue obtenida de “Ecoregion-Based Conservation in the Chihuahuan Desert: A Biological Assessment,” un producto emanado de un taller prioritario para la Ecoregion Desierto Chihuahuense promovido por la World Wildlife Fund y otros en 1997. Agradecemos a todos los participantes cuyos extensivos conocimientos sobre el Desierto Chihuahuense hicieron que el taller fuera exitoso y la publicación una referencia importante.

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