

KANSAS BLACK-TAILED PRAIRIE DOG CONSERVATION
& MANAGEMENT PLAN



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Overview of the Conservation and Management Plan

The Kansas Black-Tailed Prairie Dog Conservation and Management Plan is designed to minimize and potentially eliminate the current threat to prairie dog populations as listed in the US FWS 12-month finding published in the Federal Register (Feb 4, 2000: Vol. 65, No. 24). The five threats are as follow:

1. Present or threatened destruction, modification, or curtailment of its habitat or range.
2. Over utilization for commercial, recreational, scientific, or educational purposes.
3. Disease or predation.
4. Inadequacy of existing regulatory mechanisms.
5. Other natural or manmade factors affecting its continued existence including Control (Poisoning) and Habitat Fragmentation.

Summary of the Threats

1. **Habitat loss:** Population declines related to loss of black-tailed prairie dog habitat across its range can be traced to conversion of prairie grassland to farmland, urbanization, habitat conversion (conversion of grassland and savanna to shrubs), vegetative succession and fragmentation. The Service's 12-month finding rated habitat loss as a moderate threat.
2. **Over-utilization / Unregulated Shooting:** Over-utilization for recreational purposes is primarily related to shooting. Shooting contributes to population fragmentation and reduction in colony productivity and health, causes some loss of non target species and may preclude or delay recovery of colonies reduced by other factors such as Sylvatic plague. Shooting can significantly impact colonies in areas where shooting is intense or persistent over an entire year. Prairie dog shooting was uncontrolled in all 11 states within the range in 1998. The Service rated shooting as a low threat in the 12-month finding.
3. **Plague:** Bubonic plague, referred to as Sylvatic plague in wild animals, is the major disease affecting black-tailed prairie dogs and has the potential to decimate complete colonies or complexes within one season. There is currently no treatment for plague in prairie dogs or a known preventative measure that is effective. Plague was rated as a moderate threat in the 12-month finding.
4. **Inadequate Regulatory Mechanisms – Pest Status and Unregulated Poisoning:** The black-tailed prairie dog was classified as a pest by all states within its historic range at the time the listing petition was filed in 1998. Some state statutes required eradication and all states permitted uncontrolled take in 1998. The major federal land management agencies, Bureau of Land Management, and Forest service, manage prairie dogs to meet multiple –use objectives, and allowed poisoning before the black-tailed prairie dog was added to the candidate species list.
5. **Other Natural or Manmade Factors:** Extensive poisoning was conducted throughout most of the black-tailed prairie dog's range from 1912 to 1972 in order to reduce forage competition between prairie dogs and domestic livestock.. Control by poisoning occurs at a lesser but significant rate today. Currently, USDA, APHIS – Wildlife Services is the primary federal agency contributing to prairie dog control through assistance to private landowners and direct control programs. In some states county weed and pest districts, state departments of agriculture, and state extension service provide financial or extension assistance to landowners for control of prairie dogs. Control by poisoning was rated as a moderate threat in the 12-month finding.

Description

The black-tailed prairie dog (*Cynomys ludovicianus*) is a diurnal, burrowing rodent, almost 15 inches in length, including a 2-inch, black-tipped tail. It is yellowish buff in color and weighs up to three pounds.

Life History

Black-tailed prairie dogs are highly social animals. They live in colonies or towns, which cover from one acre to thousands of acres of grassland habitat typically in short or mid-grass prairies. A family group, or coterie, is made up of an adult male, one to four breeding females and their offspring younger than two years of age. With the emergence of young, coterie can number as many as 40 individuals (Hoogland 1996). Black-tailed prairie dogs are active all year long, but during extremely cold weather will remain underground for several consecutive days.

Black-tailed prairie dogs become sexually mature in the second February or March following birth (Hoogland 1995). Breeding season varies with latitude. It starts in January in the southern parts of its range and continues into April in the northern part (Hoogland 1996). They normally have one litter per year and litter sizes range from one to eight young. However, due to mortalities, on the average, only three individuals survive and come above ground. Pups emerge at about 41 days and will stay with their natal coterie for a minimum of two years (Hoogland 1996). Prairie dogs have been documented to live up to eight years in the wild (Foster and Hygnstrom 1990).

Black-tailed prairie dogs are herbivores and feed on a variety of vegetation including grasses and forbs (Koford 1958), and to a lesser extent seeds and insects (Foster and Hygnstrom 1990). Short-grass species commonly eaten by prairie dogs include buffalo grass (*Buchloe dactyloides*) and blue grama (*Bouteloua gracilis*). Estimates suggest that it takes 256 prairie dogs to eat as much as one cow eats in one month (Koford 1958). Grasses and other vegetation are clipped close to the ground to allow for a greater range of sight. The digging actions of prairie dogs contribute to enhancing soil structure, water filtration, and forb growth.

Prairie dogs and their colonies are used by a wide variety of wildlife species. A number of species prey on prairie dogs, and in the case of the black-footed ferret (*Mustela nigripes*), have become very specialized in killing this communal rodent (Koford 1958). Because the black-tailed prairie dog influences ecosystem functions through its activities in unique and significant ways, it is considered by some as a keystone species of the short-grass prairies.

However, the same activities some consider a necessity to the grassland ecosystem, others consider a nuisance. In a study by Conover and Decker (1991), prairie dogs, and their activities were identified by some as causing the worst damage by any wildlife species in their state and contribute hundreds of thousands of dollars worth of damage to agriculture crops, earthen dams, airports, and golf courses annually. In addition to damages, prairie dog species can be a health hazard. Cases of human death due to plague contracted from handling Gunnison's prairie dog (*Cynomys gunnisoni*) have been documented in Arizona (ADHS 1993).

Historical Status

The first description of the prairie dog in Kansas occurred in 1806-07 by Pike and he designated it by its Native American name, Wishtonwish. In 1859, J.R. Mead (1899) indicated that prairie dogs were innumerable; the divide between the Saline and Solomon rivers in Ellsworth County (north-central Kansas) and west was continuous prairie dog towns for miles. Lantz (1903) reported that sixty-eight counties in Kansas were occupied with prairie dogs. Lantz used a landowner survey to approximate occupied acreage. Results indicated that 1,224,855 acres were occupied by prairie dogs, which he rounded off to two million acres to account for non-respondents in the survey questionnaire. The historic range of the prairie dog in Kansas included the western two-thirds of the state, west of the tallgrass prairie of the Flint Hills.

Legislative action directed at extermination of prairie dogs in Kansas was initiated in 1901 (Lantz 1903). The decline of the black-tailed prairie dog was largely due to poisoning efforts (Smith 1958). Changes in land use practices after settlement of western Kansas by Europeans also contributed to abrupt declines in populations of the prairie dog. Nearly two-thirds of the 33 million acres of range and pasture land within the geographic ranges of the prairie dog in Kansas was converted to cropland and other uses after settlement by Europeans. Because prairie dogs prefer deep, relatively level soils, much of this agricultural development probably occurred in areas inhabited by prairie dogs, with resultant destruction or fragmentation of many of the larger colonies (Choate 1982).

The number of prairie dogs in Kansas declined following the onset of the extermination efforts but seems to have remained fairly stable since the earliest known account by Smith (1958). In 1956, Smith (1958) indicated that there was a total of 57,045 acres of prairie dog towns remaining in Kansas, a large decrease from the 2 million acres reported by Lantz in 1903. Starting in 1973 Kansas Department of Wildlife and Parks (KDWP) requested from the Soil Conservation Service (SCS) agents and the Department's Wildlife Conservation Officers (WCO) current distribution and abundance of prairie dog colonies throughout their historical range in Kansas. The surveys conducted in 1973, 1977, and 1989 indicated that there were approximately 35,395 acres, 57,432 acres, and 25,025 acres of prairie dog towns each year respectively (Henderson and Little 1973, KS Dept. of Wildl. and Parks, unpubl. data). However, Powell (1992) evaluated the reliability of the opinion survey in 1989 by using Agriculture Stabilization and Conservation Service (ASCS) crop evaluation color slides. Although only eight counties were compared (Clark, Decatur, Ford, Gray, Hamilton, Meade, Norton, and Scott) he reported an overall underestimate of 57% in the opinion survey with a wide array of under and over reporting depending on counties and level of participation. Information from SCS and WCO survey respondents also indicated that most areas were not ground truthed and responses differed from SCS and WCO employees. Estimated acreage between individuals mapping the same colonies also varied greatly. Based on Powell's report (1992) the 1989 statewide SCS opinion survey estimate could thus be more accurately evaluated to be 44,222 acres. Similarly, Lee and Henderson (1988) evaluated the size of prairie dog colonies in eight selected counties. They used the 1986 Department of Property Valuation aerial photographs for Barber, Cheyenne, Gray, Hamilton, Meade, Morton, Rooks, and Wallace counties. An estimated 10,929 acres were determined to be active colonies with a balance of 4,323 acres not active (71.6% active colonies based on ground truthing). The estimates of Lee and Henderson (1988) were comparable to those provided by Powell and approximately twice the acreage reported in the 1989 SCS Opinion Survey. Finally, Vanderhoof and Robel (1992, 1994) used 1991-1992 ASCS crop evaluation slides to evaluate the distribution and abundance of prairie dog colonies for most of the historical range (62 counties). They determined that approximately 46,542 acres of short and mid-grass prairies were occupied by prairie dog colonies in Kansas.

The use of aerial photography was shown by three separate authors in Kansas (Lee and Henderson 1989; Powell 1992; Vanderhoof and Robel 1992, 1994) to provide more reliable and accurate estimates than the opinion survey of SCS and WCO. The population of prairie dogs in Kansas seemed to have oscillated slightly but remained relatively constant since the 1956 estimates.

State Status

The black-tailed prairie dog is classified as *wildlife* in Kansas (KSA 32-701). A hunting license is required to hunt them (KSA 32-919). Kansas also specifies legal equipment and taking methods (KAR 115-20-2). The season is open all year with no limit on number of prairie dogs taken. Through these regulations the Kansas Department of Wildlife and Parks has the authority to regulate hunting of the black-tailed prairie dog.

In 1901 and 1903, the Kansas legislature passed laws (KSA 80-1201, 1203) authorizing townships to conduct prairie dog eradication programs. These laws also provided funds for the Kansas State Agricultural College to hire a field agent to direct and conduct experiments for the purpose of destroying prairie dogs and gophers (Lantz 1903). In recent years some counties have invoked "Home Rule" to take over authority for prairie dog control from the townships and impose mandatory control requirements on landowners. In most instances, the landowner is first given the opportunity to control prairie dogs on his or her land and if he or she fails to do so it is done by the county at the landowners' expense (Lee and Henderson 1989). A prairie dog control permit (KAR 115-16-2) is required to use any poisonous gas or smoke to control prairie dogs, except toxicants labeled and registered for above ground use. Each permit needs to be approved by the Secretary of the Kansas Department of Wildlife and Parks and the Extension Specialist in wildlife damage control. Persons offering their services in controlling prairie dogs with pesticides including baits and fumigants on a commercial basis must have a pesticide business license and commercial applicator certification.

Present Situation

Historically grazing of rangelands was done by many species of animals. Following settlement most ranchers did not want cattle to compete for forage and so attempted to remove prairie dogs from their rangeland. The black-tailed prairie dog diet is variable (Fagerstone 1982) and the degree of dietary competition between cattle and prairie dogs can be high with the majority of plants eaten by prairie dogs also eaten by cattle (Taylor and Loftfield 1924, Koford 1958). However, some studies have also shown that prairie dogs increase the productivity of grasslands under some circumstances and do not negatively impact cattle (Bonham and Lerwick 1976, O'Meilia et al. 1982, Detling and Whicker 1987). More recent accounts have indicted that prairie dogs feed selectively, so 80% of the biomass they ingest may come from plant parts not highly used by cattle (Crocker-Bedford 1976). Also, competition might be minimized by beneficial effects that cattle obtain from plants growing in prairie dog colonies because of increases in plant digestibility and nitrogen content (Coppock et al. 1983) during certain times of the year. However the conditions under which competition is minimized and the factors that may influence such competition are not well known.

Threats to the continued existence of the black-tailed prairie dog are still present. Grassland is still being converted to cropland, although at a much slower rate than in the early 1900's. Most of the grassland suitable for farming with present techniques have already been converted to cropland. Habitat loss to urban development does not appear to be an immediate threat in the very sparsely populated areas of western Kansas. Sylvatic plague is an important factor in the reduction of black-tailed prairie dog populations in some states. Lantz (1903) investigated the use of contagious diseases for control of prairie dogs and reported that diseases had killed off prairie dogs over large areas of Kansas at intervals. Plague has since been documented in southwestern Kansas (Cully 1993). Its extent or impact in other areas of Kansas is unknown. Plague also was identified in mammals and fleas in western Kansas in the 1940's and 1950's, but has not been reported from the state since that time. There have been no human plague cases in Kansas with the result that little plague surveillance has occurred there since 1950. It is likely that plague has been present but not recorded (Culley et al 2000).

Possibly, many threats to prairie dog populations could be minimized or potentially eliminated. However without the support of the local communities and ranchers, it will not be possible to achieve a reasonable conservation goal that both addresses the need to protect prairie dogs as well as control them when necessary in situations where they become too abundant. The following goals and objectives have been established by a group of representatives both from agricultural/landowner interests and from wildlife/environmental interests to address prairie dog conservation in Kansas. Our hope is that the implementation of this plan will prevent the need for future federal listing of the black-tailed prairie dog under the Endangered Species Act (ESA).

Goal

The Goal of the Plan is to maintain biologically viable populations of black-tailed prairie dogs at selected sites across the historical range in Kansas. Seven objectives were determined to be necessary to achieve this goal.

Statement

The Kansas Black-Tailed Prairie Dog Working Group (KS PDWG) recognizes prairie dogs and their habitat as valuable, important, and desired components of the grassland ecosystem, while also recognizing the economic and political realities that control of the species will be necessary in many instances.

Objectives

1. Establish a Statewide Prairie Dog Working Group and Conservation Strategy
2. Determine and monitor species distribution and status
3. Establish regulatory protection
4. Identify, maintain, and promote existing and additional suitable prairie dog habitats
5. Education and Outreach
6. Identify, prioritize, and implement research needs
7. Implementation of State Conservation Strategy

Strategies to Meet Objectives

Objective 1. Establish a Statewide Prairie Dog Working Group and Conservation Strategy

1.1 Public meetings

Public meetings were hosted to inform landowners and other interested parties about the new federal status of prairie dogs. Current and historical background about prairie dog population in Kansas was provided. Information was also provided about the Interstate Prairie Dog Workgroup and the need to develop a statewide prairie dog workgroup. These public meetings were held in Hutchinson, Garden City, and Goodland in March of 2000.

1.2 Statewide Prairie Dog Working Group

The Kansas Department of Wildlife and Parks initiated the development of a Statewide Prairie Dog Workgroup composed of representatives from both agricultural/landowner interests and wildlife/environmental interests. Representatives from various organizations, encompassing both stakeholder types, were requested to voluntarily participate in the workgroup and work toward the development of a mutually acceptable approach to conserve prairie dogs in Kansas in order to preclude listing under the ESA. The list of names and affiliation of members of the workgroup can be found in appendix.

1.3 Kansas Conservation Strategy

- **Maintain at least current acreage of 130,000 acres of Black – Tailed Prairie Dogs in Kansas**
- **Maintain distribution of Black-Tailed Prairie Dogs over 80% of historic range (west of Flint Hills) in Kansas.**
- **Maintain 1 complex greater than 5000 acres**
- **Maintain 10% of acres in complexes of greater than 1000 acres**
- **10 year goal of increasing Black tailed Prairie Dog acreage to 150,000 acres (1% of suitable land) by 2012 if appropriate landowner incentive programs are developed at the federal level.**

Objective 2. Determine the current status and population trend of prairie dogs in Kansas, and establish a long-term monitoring protocol.

2.1 Inventory Prairie Dog Populations over the entire Kansas historical range

Kansas Department of Wildlife and Parks cooperated with the Interstate Prairie dog group to determine the most efficient, reliable, comparable (to other states, not to previously published literature necessarily), and cost effective manner of inventorying prairie dog's over the species historical range in Kansas.

An aerial survey was conducted to evaluate the distribution and abundance of prairie dogs in Kansas throughout their historical range. The counties surveyed were the same as those surveyed in previous efforts using opinion surveys or ASCS crop evaluation slides. The aerial survey also provides colony acreage estimates for the state. Random ground truthing was attempted in January, February and March of 2001 to determine activity levels of colonies as well as to determine accuracy of aerial survey acreage estimates. Ground truthing was determined to be entirely too difficult and time consuming to obtain permission to do this work due to the majority of land inhabited by prairie dogs being privately owned. Aerial truthing was done by re-flying a portion of the transects to compare results of observers. Results of the survey can be found in the Appendix.

2.2 Population Monitoring Protocol.

The Black-Tailed Prairie Dog population estimate survey in Kansas will be updated every three years. It is anticipated that an aerial survey similar to the one completed in the spring of 2001 will be completed in 2004, 2007, and 2010 to monitor any changes in population, density, complex size and location, and distribution in Kansas.

Objective 3. Establish regulatory protection

3.1 Propose legislative and regulatory changes that are consistent with the goals of this strategy.

The legal classification and management policies for black-tailed prairie dogs are consistent and reflect the value of the species and associated ecosystem among state agencies. Currently the black-tailed prairie dog is classified as *wildlife* in Kansas (KSA 32-701). Although it may be referred to as a pest, there are no laws in Kansas legally classifying it as a pest.

Current laws and regulations concerning prairie dog management and control in Kansas have been evaluated and changes recommended. Changes in the legal status of prairie dogs would facilitate the implementation of management measures necessary to achieve appropriate conservation of black-tailed prairie dogs and other associated species.

- Hunting, take and season lengths have been evaluated and no change is recommended at this time. KDWP has ample regulatory authority to set season dates and harvest limits. Hunting, take and season lengths will be reevaluated in 2004, 2007, and 2010 after completion of surveys to protect over harvest of prairie dogs in the state. Questions have also been added to the small game harvest survey to document the amount and portion of the state where shooting takes place. Hunting may bring extra-unforeseen revenues to landowners as has been documented in other states.
- Commercial harvest of live prairie dogs, i.e. pet commerce, is not recommended at this time. Therefore, no changes are recommended to the state regulation regarding commercialization of some wildlife species. These regulations will be reviewed at least every three years to address changes in the population level of prairie dogs or to address new concerns.
- The use of pesticides for prairie dog control will be reevaluated at least every three years. The effectiveness of products currently recommended and their impact on other wildlife will be evaluated. Changes in methods will be recommended based on these outcomes and on new better products reaching the market.
- Statute change recommendations to existing legislation, which currently mandates prairie dog eradication in many cases, were drafted and a bill, HB 2470 - Regarding options for the control of prairie dogs, was submitted to the 2001 Kansas Legislature jointly by the Dept. of Agriculture and the Dept. of Wildlife and Parks. The focus of proposed changes would make conservation and/or control of prairie dogs voluntary for landowners, providing more flexibility in management decisions and removing the threat of mandatory eradication. More work is needed in developing this legislation before voting on the measure, and the Kansas Workgroup will continue to be involved in this effort.

Objective 4. Identify, maintain, and promote existing and additional suitable prairie dog habitats.

4.1 Identify suitable prairie dog habitat.

The amount of suitable habitat existing in Kansas has been determined in conjunction with the 11 state conservation team from GIS layers developed from Bailey's Eco-Region maps. This shows about 15 million acres of land suitable for prairie dogs in Kansas, to meet the state goal of 1% of suitable land this would translate to a 10 year goal of 150,000 acres. This map is included in the appendix.

Landownership pattern is available in a GIS stewardship layer that includes both specific public ownership (Bureau of Reclamation, Department of Defense, USFWS, National Grasslands, and KDWP) and private ownership. Private ownership will not be broken down to any further specifics. This map is included in the appendix.

4.2. Identification of Prairie dog complexes.

Based on the best information available and survey information compiled under this strategy (see 4.1), locations of black-tailed prairie dog complexes have been determined. Complexes are defined by previously published information and by agreement by the Black-tailed Prairie Dog Interstate Conservation Team as the number of colonies that are adjacent to each other within a 7 km (4.3 mile) radius. Complexes have been identified on both public and private lands. This map is included in the appendix.

4.3. Development and maintenance of complexes.

The use of education and outreach programs highlighted in this strategy will play a major role in the development and maintenance of complexes.

Development of management incentives for prairie dog conservation on private lands would most likely provide the best means to maintain or increase prairie dog acreage in Kansas. Priorities for funding will be placed in areas where complexes already exist or may potentially be developed. Existing programs may need modifications and/or new programs may be developed to provide incentives for landowners. At this time Kansas will evaluate any potential program that is developed on a national basis but is unlikely to be in the financial situation to develop a state based program.

- Proactively contact private landowners in areas that have had complexes determined or areas that have been determined suitable for complex development. This approach would more likely be successful if incentive programs are available for landowners that are acceptable to them.
- Investigate the possibility of developing a statewide Candidate Conservation Agreement with Assurances (CCAA).

Objective 5. Education and Outreach

5.1 Develop and implement education and outreach programs

Programs should focus on the black-tailed prairie dog ecology, economic value and constraints, and related human health issues. Programs will also be developed within a global prairie ecosystem overview encompassing other wildlife species and their ecological needs, particularly those associated with prairie dog towns.

- Identify target audiences and determine how best to reach each one.
- Prepare general and targeted information and educational materials. These may include but are not restricted to trade newsletters, pamphlets, news releases, magazine articles, group presentations, special prairie dog web page, other educational programs, and public meetings.
- Review materials prepared by other states within the interstate group and, when appropriate, request permission to use them.
- Prepare well-written and accurate information to be made easily available to private landowners, which informs them of options available for their voluntarily assisting in conservation and management initiatives.
- Advertise widely and vocally the fact that pro-prairie dog actions on private lands under this plan will be completely voluntary and can possibly prevent the necessity of listing of prairie dog under the ESA.
- Assist individuals and wildlife cooperatives in developing educational materials and programs that promote both ecotourism and an understanding of the potential economic value of prairie dogs, associated species, and prairie conservation and management.
- Identify an official spokes-person for the KS PDWG in order to send out a consistent message. The Kansas Department of Wildlife and Parks has been designated as the center point for major issue coverage as required.
- Address human health risk concerns related to plague in prairie dogs by developing and distributing a fact sheet.

Objective 6. Identify, prioritize, and implement research needs

6.1 Identify important research needs for the state of Kansas

Research projects are currently being implemented in various states across the prairie dog range. It is therefore important to coordinate with the Interstate Prairie Dog Workgroup when developing and implementing research projects, to ensure comparable information is acquired and to prevent unnecessary duplication of projects. It may however be necessary to implement some projects in various parts of the prairie dog range to ensure adequate coverage of the various conditions encountered and to address sociological concerns. Projects will be implemented based on available funding and source of expertise. The following is a list of high priority projects for the state of Kansas. The top priority item is determined to be prairie dog effects on livestock. The second highest priority is to determine the extent of plague in Kansas. This project is currently funded and already underway.

- a. Grazing practices - Long term study.
 - i. Determine livestock gains on land with and without the presence of prairie dogs, especially in the short-grass region.
 - ii. Examine the impact of prairie dog presence on assessed valuation and land values.
 - iii. Identify grazing practices that are most compatible and profitable on lands containing prairie dogs.
 - iv. Examine flora and fauna responses to livestock grazing in the presence of prairie dogs.
- b. Plague - Long term study.
 - i. Determine distribution of plague in Kansas.
 - ii. Examine factors limiting the geographical distribution of plague.
 - iii. Develop monitoring system for the presence of plague in Kansas.
- c. Control measures - Short term study.
 - i. Develop and or test non-lethal measures to contain prairie dogs at a site and prevent expansion (vegetative buffer strips, fences, etc.) into unwanted areas.
 - ii. Effects of recreational shooting on prairie dog populations.
- d. Evaluate existing data on prairie dog populations in Kansas for information on distribution, abundance, and population trends.
- e. Economic analysis of recreational shooting and wildlife viewing.
- f. Other research topics as needed.

Objective 7. Implementation

A feasible administrative structure must be determined and funding for implementing the conservation management plan will be developed through the KDWP budget process. As funding allows different levels of the plan will be implemented. An annual evaluation of each objective of this plan will be conducted by the Kansas Prairie Dog Working Group. The plan may be amended as needed and distributed accordingly.

The number 1 priority at current time is for continued monitoring and evaluation of the population in Kansas.

Priority I

- Survey and monitor black-tailed prairie dogs populations in Kansas.
- Identify black-tailed prairie dog complexes in Kansas.
- Work to amend prairie dog eradication statutes, to allow more management options for landowners

Priority II

- Develop a plague monitoring survey in Kansas (most likely a coyote blood test to determine presence or absence of plague antibodies)

Priority III

- Develop Statewide CCAA

Priority IV

- Implement research projects
- Develop information and outreach programs

PriorityV

- National Landowner Incentive Program (If developed, Implementation will increase priority)

Literature cited

- Bonham, C.D., and A. Lerwick. 1976. Vegetation changes induced by prairie dogs on shortgrass range. *Journal of Range Management* 29:221-225.
- Choate, J.R., E.K. Boggess, and F.R. Henderson. 1982. History and status of the black-footed ferret in Kansas. *Transactions of the Kansas Academy of Science* 85:121-132.
- Conover, M.R. and D.J. Decker. 1991. Wildlife damage to crops: perceptions of agricultural and wildlife professionals in 1957 and 1987. *Wildl. Soc. Bull.* 19(1) 46-52.
- Copock, D.L., J.K. Ellis, and M.L. Dyer. 1983. Plant-herbivore interactions in a North American mixed grass prairie. *Oecologia* 56:10-15.
- Crocker-Bedford, D.C. 1976. Food interactions between Utah prairie dogs and cattle. Thesis, Utah State University, Logan.
- Cully, J.F. 1993. Plague, prairie dogs, and black-footed ferrets. Pages 38-49 in J.L. Oldemeyer, D.E. Biggins, B.J. Miller, and R. Crete, eds. *Proceedings of the Symposium on the Management of prairie dog complexes for reintroduction of the black-footed ferret*. U.S. Fish and Wildlife Service, Biological Report 13.
- Cully, J.F., Jr, L.G. Carter, and K.L. Gage. 2000. New Records of Plague in Kansas. *Journal of Wildlife Diseases* 36:389-392
- Detling, J.K. and A.D. Whicker. 1987. Control of ecosystem processes by prairie dogs and other grassland herbivores. *Proceedings of the Great Plains Wildlife Damage Control Workshop* 8:23-29.
- Fagerstone, K.A. 1982. A review of prairie dog diet and its variability among animals and colonies. *Proceedings of the Great Plains Wildlife Damage Control Workshop* 5:178-184.
- Foster, N.S. and S.E. Hygnstrom. 1990. *Prairie dogs and their ecosystem*. University of Nebraska, Lincoln. Dept. of Forestry, Fisheries and Wildlife. 8 pp.
- Henderson, F.R., and R.J. Little. 1973. Status of the black-footed ferret and black-tailed prairie dog in Kansas. Pages 34-40 in *Proceedings of the Black-footed Ferret and Prairie Dog Workshop*, Rapid City, South Dakota.
- Hoogland, J.L. 1995. *The black-tailed prairie dog: social life of a burrowing mammal*. University of Chicago Press, Chicago, Illinois. 557 pp.
- Koford, C.B. 1958. Prairie dogs, white faces and blue grama. *Wildlife Monographs* 3:1-78.
- Lantz, D.E. 1903. Destroying prairie dogs and pocket gophers. *Kansas State Experimental Station Bulletin* 116:147-163.

- Lee, C.D., and F.R. Henderson. 1988. Prairie dog populations in Kansas. Unpublished report to KDWP. Kansas St. Univ. Ext. Animal Sci., Manhattan. 27pp.
- Lee, C.D., and F.R. Henderson. 1989. Kansas attitudes in prairie dog control. Ninth Great Plains Wildlife Damage Control Workshop, Fort Collins, Colorado, April 18-20,1989. Pp.162-165.
- Mead, J.R. 1899. Some natural-history notes of 1859. Transactions of the Kansas Academy of Science 16:280-281.
- O'Meilia, M.E., F.L. Knopf, and J.C. Lewis. 1982. Some consequences of competition between prairie dogs and beef cattle. Journal of Range Management 35:580-585.
- Powell, K.L. 1992. Prairie dog distribution, habitat characteristics, and population monitoring in Kansas: implications for black-footed ferret recovery. Thesis, Kansas State University, Manhattan, Kansas.
- Smith, R.E. 1958. Natural history of the prairie dog in Kansas. Museum of Natural History and State Biological Survey of Kansas. University of Kansas. Miscellaneous Publication 16.
- Taylor, W.P. and J.V.G. Loftfield. 1924. Damage to range grasses by Zuni prairie dog. U.S. Department of Agriculture Bulletin 1227.
- Vanderhoof, J.L., and R.J. Robel. 1992. Numbers and extent of black-tailed prairie dog towns in western Kansas. Final Report. Kansas State University, Manhattan, Kansas.
- Vanderhoof, J.L., and R.J. Robel. 1994. Numbers and extent of black-tailed prairie dog towns in Kansas. Transactions of the Kansas Academy of Science 97:36-43.

APPENDIX I

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APPENDIX II

Bailey's Ecoregions

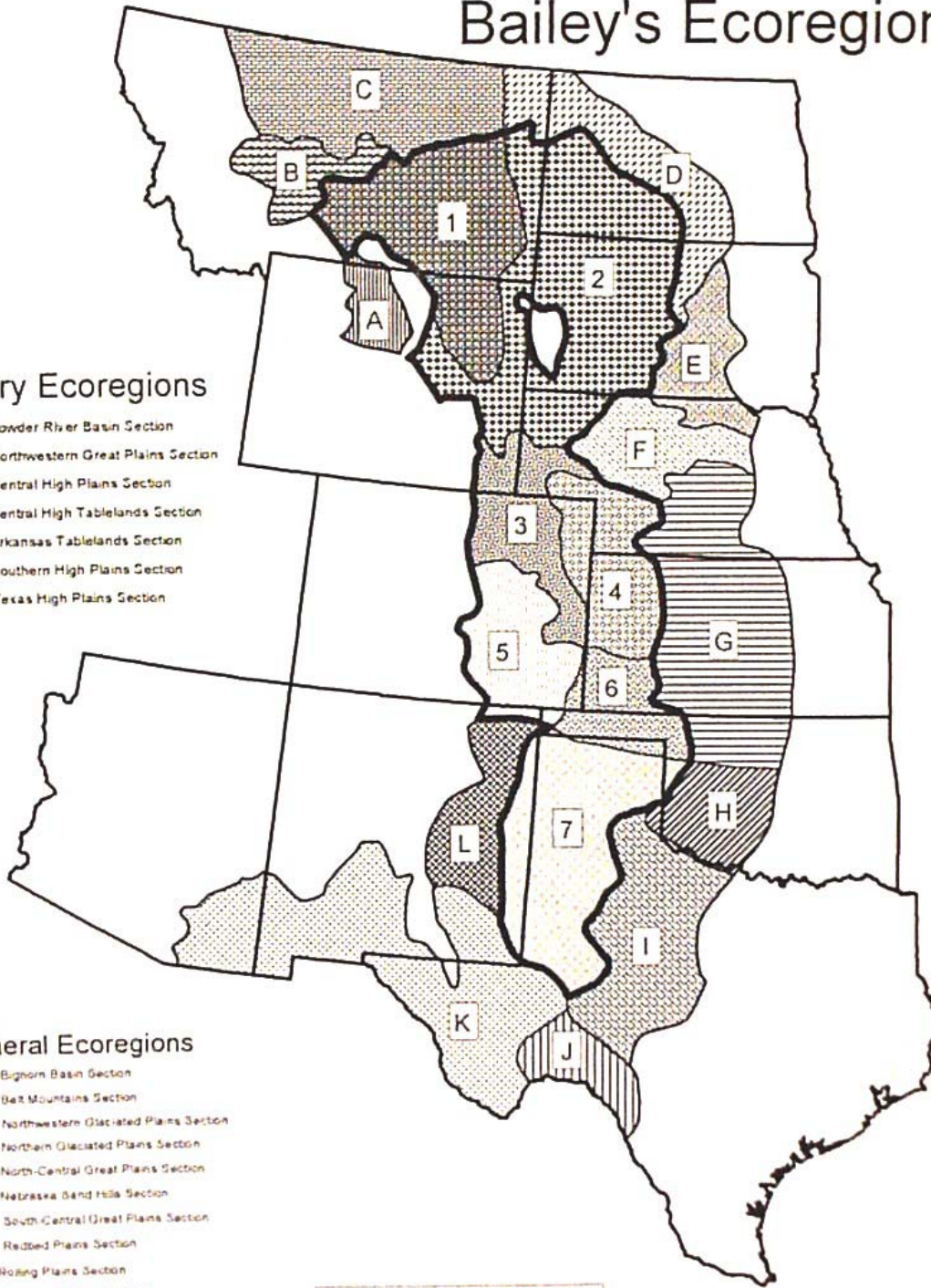
Primary Ecoregions

- 1. Powder River Basin Section
- 2. Northwestern Great Plains Section
- 3. Central High Plains Section
- 4. Central High Tablelands Section
- 5. Arkansas Tablelands Section
- 6. Southern High Plains Section
- 7. Texas High Plains Section

Peripheral Ecoregions

- A. Big Horn Basin Section
- B. Bak Mountains Section
- C. Northwestern Glaciated Plains Section
- D. Northern Glaciated Plains Section
- E. North-Central Great Plains Section
- F. Nebraska Sand Hills Section
- G. South-Central Great Plains Section
- H. Redbed Plains Section
- I. Rolling Plains Section
- J. Stockton Plateau Section
- K. Basin and Range Section
- L. Pecos Valley Section

* Solid Areas Calculated at a Ranking of 1.0%
 Stippled Areas Considered Peripheral Areas,
 Calculated at a Ranking of 0.1%
 Unshaded Areas Considered Outside BTPD Range



Bailey, R.G., P.E. Avers, T. King, and W.H. Michael, editors. 1994. Ecoregions and subregions of the United States. Colored Map (1:7,500,000) with supplementary table of map unit descriptions compiled and edited by W.H. Michael and R.G. Bailey. U.S. Forest Service, Washington, D.C., USA.



APPENDIX III

ESTIMATES OF ACREAGE AND NUMBER OF BLACK-TAILED PRAIRIE DOG TOWNS IN WESTERN KANSAS

submitted to Mike Mitchener, Kansas Department of Wildlife and Parks, January 18, 2002

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1. ESTIMATES OF ACREAGE AND NUMBER OF PRAIRIE DOG TOWNS IN WESTERN KANSAS

The object of this report is to provide (1) an estimate of the acreage covered by black-tailed prairie dog towns in western Kansas, and (2) provide acreage estimate standard error and confidence limits on (1) for the Kansas Department of Wildlife and Parks (KDWP). In addition to the required items above, included in this report are acreage estimates per survey "quadrant", corresponding estimates related to the number of black-tailed prairie dog towns, and an analysis of the association between acreages and numbers of prairie dog towns. An additional analysis of the association between observer sighted acreages and line intercept measurements of prairie dog towns will be forthcoming separate from this report.

- (a) **SAMPLING DESIGN AND DATA COLLECTION:** A brief description of the sampling design and data collection relevant to estimation is given. Data are supplied by KDWP. Four quadrants, encompassing the area of western Kansas, were surveyed aerially for black-tailed prairie dog towns using systematically placed north-south oriented strip transects. Acreages and numbers of prairie dog towns were visually measured by observers in planes flying over the strip transects. Assuming that the spatial pattern of prairie dog towns is random with respect to the systematically laid out transects, estimation is based on simple random sampling within each quadrant (Thompson, 1992).
- (b) **ESTIMATION METHODOLOGY:** The basic estimation strategy is to compute an average proportional area covered by prairie dog towns in each quadrant and multiply this average by the number of acres in the quadrant. The four quadrants (labeled by h) are considered as four independent strata. The number of strip transects available, N_h , and the number of transects flown (sample sizes, n_h) are in Table 1. Areas covered by strip transects are not the same for all transects, so because larger transect areas could conceivably result in larger observed acreages of prairie dog towns, the observed acreage of prairie dog towns on each transect is scaled by the acreage of the strip transect. Estimated total acreage is weighted based on N_h per estimation under a stratified random sampling design. Note that Sidle et. al.'s estimation approach is similar, but they ignored the finite population aspects in estimation.

Table 1: Sample sizes and numbers of transects available per quadrant.

quadrant	numbers of available transects	sample sizes
northeast	112	23
northwest	108	27
southeast	128	22
southwest	132	33

In some detail, the estimation approach, following stratified random sampling (Thompson, 1992), is:

- i. Let $y_{ih} = a_{ih}/b_{ih}$ be the proportion of transect i in quadrant h that is covered by prairie dog towns using the acreage of prairie dog towns, a_{ih} , and the acreage of the strip transect, b_{ih} . The mean proportion of land per transect covered in quadrant h is $\bar{y}_h = \frac{1}{n_h} \sum_{i=1}^{n_h} y_{ih}$, where n_h is the sample size in quadrant h .
- ii. The estimated total acreage covered by prairie dog towns in quadrant h is $\hat{y}_h = A_h \bar{y}_h$, where A_h is the land acreage of quadrant h .
- iii. The standard error estimator of \hat{y}_h is $s.e.(\hat{y}_h) = \sqrt{A_h^2 \left(\frac{N_h - n_h}{N_h} \right) \left(\frac{s_h^2}{n_h} \right)}$, where the data variance estimator is $s_h^2 = \sum_{i=1}^{n_h} (y_{ih} - \bar{y}_h)^2 / (n_h - 1)$.
- iv. The estimated total acreage covered by prairie dog towns is $\hat{y} = A \bar{y}_{st}$, where $\bar{y}_{st} = \sum_{h=1}^4 \frac{N_h}{N} \bar{y}_h$ ($N = \sum_{i=1}^4 N_h$) and the standard error of \hat{y} is $s.e.(\hat{y}) = \sqrt{A^2 Var(\bar{y}_{st})}$.
- v. 90% normal confidence limits are computed as $\hat{y}_h \pm 1.645 s.e.(\hat{y}_h)$ and $\hat{y} \pm 1.645 s.e.(\hat{y})$.
- vi. Estimates of \bar{y}_h , \bar{y}_{st} , and their standard errors were computed using Proc Descript of SUDAAN (Shah, et. al., 1996).
- vii. Estimates of the number of prairie dog towns were computed similarly to estimates of acreages.

- (c) ESTIMATES: Estimated acreages covered by black-tailed prairie dog towns per quadrant and total (Table 2) and estimated number of prairie dog towns per quadrant and total (Table 3) are listed. Note that the estimates for total acreages and numbers are not simple sums of the four quadrant acreages or numbers estimates because of the stratified weighting, N_h/N .

Table 2: Estimates of acreage of western Kansas covered by prairie dog towns by quadrant.

quadrant	acreage of quadrant	estimated acreage covered by prairie dog towns	standard error of estimated acreage	ratio of std. error to estimated acreage	90% confidence limits
northeast	8,177,280	5,741	1,636	.29	(3,050; 8,431)
northwest	7,048,320	59,615	10,798	.18	(41,852; 77,378)
southeast	8,467,840	15,420	2,625	.17	(11,102; 19,738)
southwest	8,040,320	45,637	9,447	.21	(30,096; 61,178)
TOTAL	31,733,760	130,521	17,073		(102,436; 158,606)

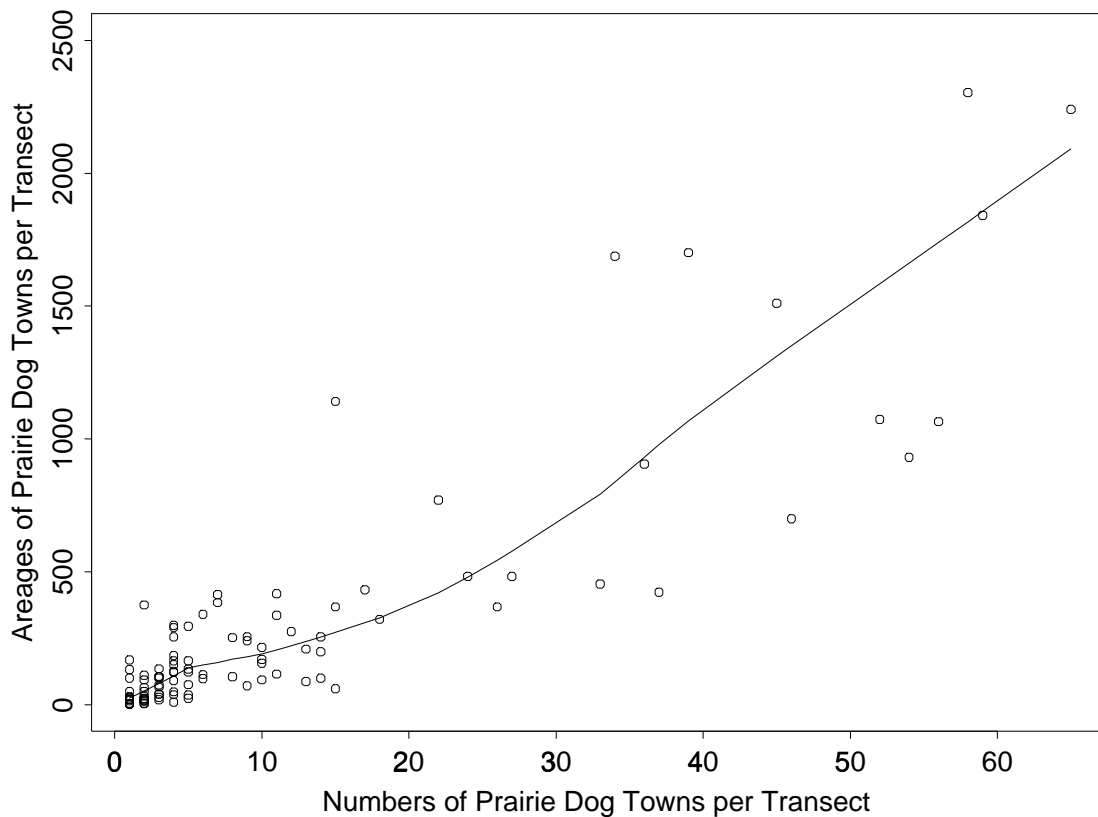
Table 3: Estimates of the number of prairie dog towns in western Kansas by quadrant.

quadrant	acreage of quadrant	estimated number of prairie dog towns	standard error of estimated number	ratio of std. error to estimated number	90% confidence limits
northeast	8,177,280	360	49	.14	(281; 440)
northwest	7,048,320	2,819	325	.12	(2,285; 3,353)
southeast	8,467,840	425	59	.14	(328; 522)
southwest	8,040,320	1,182	233	.20	(799; 1,564)
TOTAL	31,733,760	4,887	476		(4,104; 5,670)

2. ASSOCIATION BETWEEN TRANSECT ACREAGES AND NUMBERS OF PRAIRIE DOG TOWNS

Figure 1 displays the data relationship between the numbers and observed acreages of black-tailed prairie dog towns per transect. A trend line (lowess smoother) indicates an association trend between numbers and acreages. Although one would probably assume that as the numbers of towns increase so would acreages, the plot indicates that this increase can reasonably be described as approximately linear. Spearman's correlation coefficient for the association of the numbers and acreages of towns is .82, with a corresponding p-value $< .001$ for the null hypothesis that the actual correlation is less than or equal to zero (ie., the one-tail alternative hypothesis is that the actual correlation is greater than zero).

Figure 1: Scatterplot of acreages and numbers of prairie dog towns per transect.

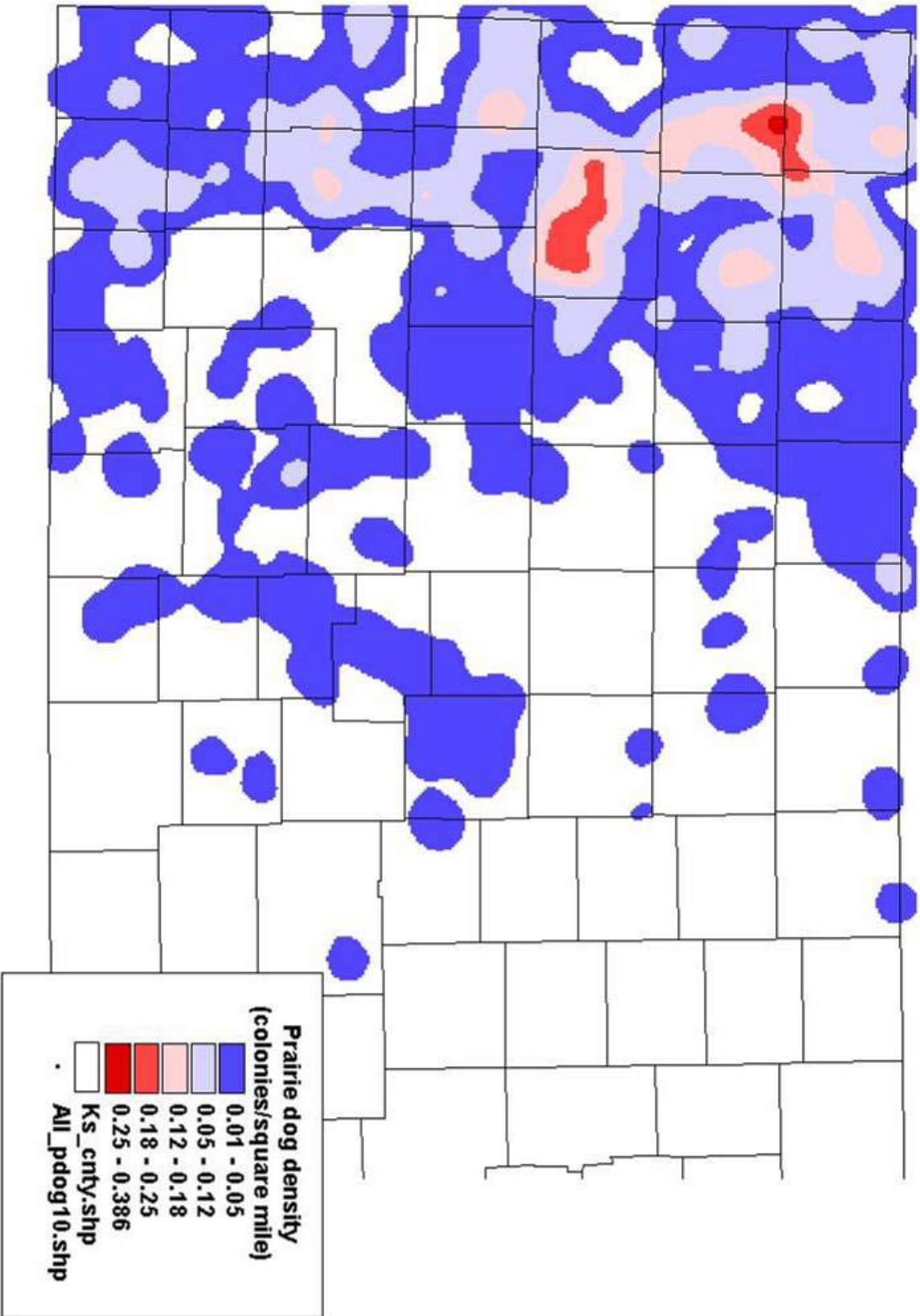


3. REFERENCES

- Shah, B. V., Barnwell, B. B., and Bieler, G. S. 1996. SUDAAN User's Manual, Release 7.0. Research Triangle Park.
- Sidle, J. G., Johnson, D. H., and Euliss, B. R. Estimated areal extent of black-tailed prairie dog colonies in the northern great plains. Draft Report.
- Thompson, S. K. 1992. Sampling. John Wiley & Sons.

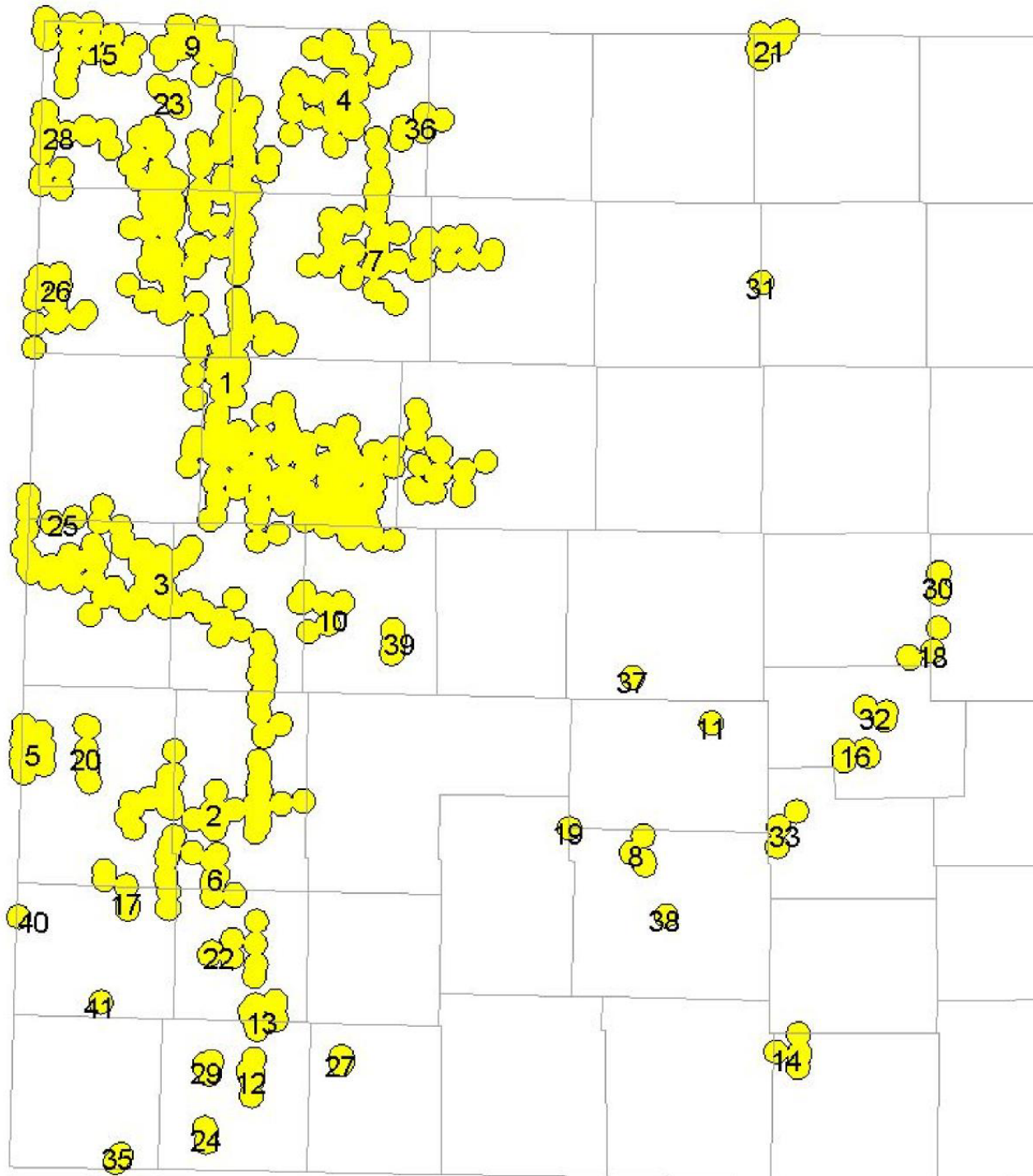
APPENDIX IV

Prairie Dog Density



APPENDIX V

Prairie Dog Complexes and Associated Colony Area



This graphic and associated table relate the total area of prairie dog colonies contained within each complex. For clarity, only the forty largest are shown in yellow. Colony areas should be regarded as a minimum area occupied because acreage estimates were obtained from transect lines four mile apart, and therefore do not represent complete coverage of the area.

<u>Complex Number</u>	<u>Acres of Pdog Colonies in Complex</u>
1	8697
2	2726
3	2039
4	1106
5	1044
6	988
7	747
8	478
9	431
10	413
11	355
12	323
13	282
14	270
15	260
16	230
17	210
18	205
19	200
20	198
21	196
22	196
23	179
24	175
25	174
26	169
27	165
28	155
29	155
30	151
31	147
32	145
33	142
34	140
35	140
36	136
37	135
38	132
39	130
40	130