BLACK-TAILED PRAIRIE DOG

Cynomys ludovicianus

IN THE OFFICE OF ENDANGERED SPECIES
U.S. FISH AND WILDLIFE SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

Petition to the Secretary of Interior and the U.S. Fish and Wildlife Service to List the Black-tailed Prairie Dog as an Endangered or Threatened Species Under the Endangered Species Act, 16 U.S.C. § 1531 et Seq. *(1973 as amended), and to Designate Critical Habitat*

August 1, 2007

PETITIONERS

Forest Guardians
1536 Wynkoop St., Suite 302
Denver, CO 80202
303-573-4898

Biodiversity Conservation Alliance
P.O. Box 1512
Laramie, WY 82073
307-742-7978

Center for Native Ecosystems
1536 Wynkoop St., Suite 303
Denver, CO 80202
303-546-0214

Rocky Mountain Animal Defense
525 Arapahoe, Suite E4-335
Boulder, CO 80302
303-449-4422

Prepared by: Lauren McCain, Ph.D., (Forest Guardians)
Review and Assistance by: Nicole Rosmarino, Ph.D. (Forest Guardians); Richard Reading, Ph.D. (University of Denver); Jonathan Proctor, M.A. (Defenders of Wildlife); Jay Tutchton, J.D. (University of Denver Sturm College of Law); Lindsey Sterling Krank (Prairie Dog Coalition); Zoe Ghali, M.A.; Johanna Hamburger (Colorado State University); Jaclyn Lopez (University of Denver Sturm College of Law)

I. Introduction

Forest Guardians, Biodiversity Conservation Alliance, Center for Native Ecosystems, and Rocky Mountain Animal Defense hereby petition the Secretary of the Interior and the U.S. Fish and Wildlife Service ("USFWS" or "the Service") to issue a rule listing the black-tailed prairie dog (*Cynomys ludovicianus*) as Endangered or Threatened throughout its historic range (and portions thereof) in Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming and in Canada and Mexico under the Endangered Species Act (ESA. 16 U.S.C. § 1531 *et seq*. Our petition includes *Cynomys ludovicianus arizonensis*, which some consider a subspecies. If the Service believes that *arizonensis* is a distinct subspecies and population segment, then we additionally request this subspecies be listed as Threatened or Endangered throughout its historic range as well. We are also request that you designate Critical Habitat for the species. This petition is filed under 5 U.S.C. § 553(e), 16 U.S.C. § 1533(b)(3)(A) and 50 C.F.R. § 424.19 (1987), bestowing interested persons the right to petition for issuance of a rule.

On August 18, 2004 the USFWS issued a "not warranted" finding for the resubmitted petition to list the black-tailed prairie dog ("BTPD" or "prairie dog") as Threatened under the Endangered Species Act (69 FR 51217). Previously, the species was designated an ESA Candidate species. Responding to petitions from the National Wildlife Federation ("NWF") submitted July 30, 1998 (NWF 1998) and the Biodiversity Legal Foundation ("BLF"), Predator Project, and Jon C. Sharps submitted August 26, 1998 (BLF et al. 1998), the USFWS issued a "warranted but precluded" 12-Month Finding for the black-tailed prairie dog on February 4, 2000 (65 FR 5476). The USFWS rejected NWF's appeal for an emergency listing of the species but agreed that it deserved to be listed as a Threatened species, though higher priority actions precluded an immediate listing (65 FR 5476).

The USFWS erred in its 2004 Not Warranted Finding. The best scientific and commercial information available at the time of the finding supported listing the species. Subsequent to the 2004 Not Warranted Finding, additional information is available that further justifies an Endangered or Threatened designation for this species.

Despite the USFWS's 2004 decision to remove the black-tailed prairie dog from ESA candidacy, the species' status has not improved since 2000. In 2000, the Service believed there were 311,000 active hectares (768,000 acres) of BTPD colonies. In 2004, the Service believed there were 776,000 hectares (1,894,000 acres). Given the historic estimate of 40 million hectares (100 million acres), noted in both 2000 and 2004 Findings, the difference between a 99% population loss and a 98% loss is not significant. This prairie dog species is already extinct throughout a significant portion of its range and is in danger of extinction in all or a significant portion of its remaining habitat. The threats, found significant enough for the USFWS to determine the species deserved to be listed in 2000, did not diminish in the four intervening years between findings. If anything, new information suggests that several threats to the black-tailed prairie dog, including lethal control, sylvatic plague, shooting, and habitat loss, were more severe than believed in 2004 or have become more severe since 2004. What the USFWS concluded about the BTPD in 2000 is still very much true today:

> It might be assumed that the persistence of the black-tailed prairie dog as a species is secure because it is relatively abundant in absolute numbers when compared with many other species with smaller populations that are not thought to be vulnerable. Many wildlife species in North America that have experienced significant population declines remain viable, e.g., various game species such as the pronghorn (*Antilocapra*

americana). However, the black-tailed prairie dog is a highly social species that for the most part responds to major factors causing population reductions (e.g., plague and control) as a colony rather than on an individual basis. Additionally, inadequate regulatory mechanisms are in place for the black-tailed prairie dog as compared to game species. Therefore, populations may not be as viable as their absolute numbers might suggest. (65 FR 5476: 5486-5487).

II. Petitioners

Forest Guardians is a New Mexico non-profit corporation with offices in Santa Fe, New Mexico and Denver, Colorado. Forest Guardians has approximately 2,000 members. Forest Guardians' mission is to defend and restore the wildlands and wildlife of the greater American Southwest through fundamental reform of public policies and practices. Two of Forest Guardians' main endeavors are its Endangered Species Program and its Deserts and Grasslands Program. Forest Guardians has directed substantial resources toward the conservation of the black-tailed prairie dog. Members of Forest Guardians frequently use and enjoy the black-tailed prairie dog and its habitat for wildlife viewing, recreational, aesthetic, and scientific activities and will continue to do so. Forest Guardians and its members are particularly concerned with the conservation of the black-tailed prairie dog, the habitat on which it depends for its survival, and the ecosystems it creates and sustains.

Biodiversity Conservation Alliance ("BCA") is a Wyoming based non-profit organization dedicated to conserving and restoring biological diversity in the forests, rivers, and plains of the Rocky Mountain States. For years, BCA has expressed concern over declines in black-tailed prairie dog populations. BCA is also alarmed by declines in numerous prairie species, such as the swift fox, mountain plover, and black-footed ferret, whose continued existence is tied to that of the black-tailed prairie dog. BCA believes that prompt conservation efforts are needed to save these species as well as numerous other troubled species that are dependent upon the black-tailed prairie dog for their survival. BCA depends on full compliance with the ESA to protect its interests in conserving biological diversity generally, and the black-tailed prairie dog and its dependent species, specifically. BCA and its members derive scientific, aesthetic, and spiritual benefits from the black-tailed prairie dog's existence in the wild and from the ecosystem which the black-tailed prairie dog supports, and upon which it depends.

Center For Native Ecosystems ("CNE") is a nonprofit advocacy organization, based in Denver Colorado, dedicated to conserving and recovering native and naturally functioning ecosystems. CNE values the clean water, fresh air, sources of food and medicine, recreational opportunities and healthy communities that natural diversity provides. CNE, and its members, firmly believe that all species and their natural communities have the right to exist and thrive. CNE uses the best available science to forward its mission through participation in policy, administrative process, legal action, public outreach and organizing, and education. CNE's members enjoy scientific, aesthetic, and recreational benefits from the presence of the black-tailed prairie dog in its natural habitat. CNE members intend to continue enjoying the black-tailed prairie dog and its habitat for recreational, scientific, and aesthetic purposes.

Rocky Mountain Animal Defense ("RMAD") is a Colorado based non-profit organization. RMAD has been a leader in prairie dog advocacy on the state and local level on the Front Range of

Colorado since 1994. RMAD has engaged in public education and outreach, protests, legal actions, and participated in local and state policy-making on behalf of the black-tailed prairie dog and the ecosystem this species supports. RMAD plans to continue these activities in the future. RMAD and its members derive scientific, aesthetic, and spiritual benefits from the black-tailed prairie dog's existence in the wild and from the ecosystem which the black-tailed prairie dog supports, and upon which it depends.

III. Summary of ESA Listing Criteria Applicable to the Black-tailed Prairie Dog

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the black-tailed prairie dog as an Endangered or Threatened species are:

> 424.02(e) "Endangered species" means a species that is in danger of extinction throughout all or a significant portion of its range."…(k) "species" includes any species or subspecies that interbreeds when mature (16 U.S.C. 1532(6)).
>
> "Threatened species" means a species that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C § 1532(20)).
>
> 424.11(c) "A species shall be listed…because of any one or a combination of the following factors:
>
> 1. The present or threatened destruction, modification, or curtailment of habitat or range;
> 2. Overutilization for commercial, recreational, scientific, or educational purposes;
> 3. Disease or predation;
> 4. The inadequacy of existing regulatory mechanisms; and
> 5. Other natural or manmade factors affecting its continued existence."

The black-tailed prairie dog is already extinct in a significant portion of its historic range and in danger of extinction in its remaining range. All five of the factors set forth in 424.11(c) have resulted in the continued decline of the black-tailed prairie dog and are causing the species to face endangerment and extinction.

A. The Black-tailed Prairie Dog is Extinct in a Significant Portion of its Range and is in Danger of Extinction in its Remaining Range

The USFWS misinterpreted or overlooked information available before the August 2004 decision. For example, the USFWS argued in the 2004 Not Warranted Finding that new, more accurate surveys undertaken by several of the states between 2000-2004 indicated that black-tailed populations were actually higher than what was believed in 2000. In the 2000 Warranted But Precluded Finding, the USFWS estimated that 310,798 hectares (768,000 acres) of occupied habitat existed and reported a decline of 94-99% from historic knowledge of occupied habitat (USFWS 2000, citing Mulhern and Knowles 1995; Fagerstone and Ramey 1996; Barko 1997; Wuerthner 1997; and Knowles 1998). The 2004 Finding put the figure of remaining occupied habitat at 745,400

hectares (1,842,000 acres). The USFWS stated in its 2004 Finding, "This estimate of occupied habitat of black-tailed prairie dog has played a substantial role in this decision" (69 FR 51217: 51226). Both Findings accepted historic levels of occupied habitat of 56,656,040 hectares (104,000,000 acres) provided by Anderson et al. (1986) and the range of 40,063,914-99,957,442 hectares (99,000,000 – 247,000,000 acres) provided by Miller et al. (1996). Even using the most conservative historic occupied habitat estimate, the 2004 Finding demonstrated that **black-tailed prairie dog area has declined by 98% from historic levels**.

Additionally, some of the methods used to generate the new, higher occupied habitat estimate substantially over-estimated the area actually occupied by prairie dogs. For example, the 2004 Finding cited a study by Johnson et al. (2003) that put the 2003 total estimate of occupied black-tailed prairie dog habitat in New Mexico at 24,000 hectares (60,000 acres). The Finding noted that the researchers intended to conduct ground-truthing of the results, which were based on remote sensing photographic data. Ground-truthing revealed that the original analysis of digital photographs led to an overestimation of occupied area, and the researchers revised their 2003 estimate of occupied habitat in New Mexico to 16,188 hectares (40,000 acres) (Johnson et al. 2004). The 2000 Warranted But Precluded Finding described 16,000 hectares (39,000 acres) as New Mexico's occupied habitat estimate. The researchers issued their report with the more accurate but lower estimate on June 15, 2004—two months before the USFWS Not Warranted Finding came out.

In another case, the USFWS relied on aerial survey data provided by the Colorado Division of Wildlife (cited in the 2004 Finding as Pusateri, CDOW, in litt. 2002; Russell, CDOW, in litt. 2003) to describe Colorado's occupied area estimate at 256,000 hectares (631,000 acres). That is one-third of the total occupied habitat the USFWS reported in the 2004 Finding, 745,400 hectares (1,842,000 acres). Overestimation biases in this survey were brought to the USFWS's attention prior to the 2004 Finding; the Service noted in its 2004 Species Assessment and Listing Priority Assignment Form,

> Rosmarino (Forest Guardians et al., in litt. 2003b) disagreed with the Statewide estimate, suggesting that until vigorous ground-truthing is completed, estimates of occupied habitat for Colorado and other States must not be presumed accurate. The NWF also has expressed concerns regarding the CDOW estimate (Miller, NWF, in litt. 2004). Miller (2004) compared estimates of occupied habitat on National Grasslands (NG) from CDOW and USFS. Miller (2004) noted that at Comanche NG, USFS estimates were 58 percent of CDOW estimates and at Pawnee NG, USFS estimates were 68 percent of CDOW estimates. (p. 11)

Sterling Miller of the National Wildlife Federation, cited above, communicated his intention to USFWS before release of the 2004 Finding to conduct ground-truthing of sample areas to help field-verify the CDOW data. The published study confirmed substantial over-estimation in the Colorado survey (Miller et al. 2005).

The 2000 Warranted But Precluded Finding provided ample evidence that the species is already extinct in a significant portion of its range:

> We believe that significant range contractions have occurred in the southwestern portion of the species' historic range in Arizona, in western New Mexico and

> western Texas, and in the eastern portion of the species' historic range in Kansas, Nebraska, Oklahoma, South Dakota, and Texas in the eastern portion of the species' historic range. These range contractions represent approximately 20 percent of the species' original range. Only a few individuals, or none at all, remain in these areas.
>
> Approximately 37 percent of the species' potential habitat in the United States has been converted to cropland (Black-footed Ferret Recovery Foundation, in *litt.* 1999). This habitat loss is essentially permanent and not considered a range contraction in the usual sense occurring at the periphery of a species' range. Although the species will occupy abandoned tilled ground, these lands are generally unavailable for use by the species because the land is continuously disturbed and thus the habitat is lost permanently. (65 FR 5476: 5479)

The 2004 Finding did not dispute this information. Moreover, the loss of black-tailed prairie dog habitat and contraction of the species' range in Arizona, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, and Texas do not fully account for the 98% loss of occupied prairie dog area. The black-tailed prairie dog is absent from large areas throughout its historic and existing truncated range, occurring primarily in fragmented and isolated colonies.

Fragmentation of the few significant complexes of prairie dog colonies continues to worsen. Since 2000, three of only seven remaining large BTPD complexes were decimated: plague struck Pine Ridge Reservation's 40,500 hectares (100,000 acre) complex and eliminated the majority of prairie dogs; severe drought, overgrazing by livestock, and farming eliminated most of the Janos complex in Chihuahua; and plague struck Thunder Basin's complex, reducing it and other scattered colonies on this National Grassland by two thirds, from 8,683 hectares (21,456 acres) in 2001 to only 2,631 hectares (6,500 acres) in 2006. Of the other four, Rosebud and Cheyenne River Reservations' complexes have both experienced unknown levels of recent poisoning, Conata Basin is currently proposed for significant levels of poisoning as early as this October, and plague recently occurred on the Fort Belknap complex.

B. Summary of Listing Factors Applicable to the Black-tailed Prairie Dog

In the 2000 Warranted But Precluded Finding and in subsequent annual status reviews in 2001 and 2002, the USFWS rated listing factor 1 a moderate threat; factor 2 a low threat; factor 3 a moderate, imminent threat; factor 4 a moderate threat; and factor 5 a moderate threat (65 FR 5476; 66 FR 54808; 67 FR 40657). Then in its next substantive finding after 2002, the Service reversed itself in 2004 by determining that only factor 3—disease or predation: sylvatic plague—was a threat and downgraded this threat to low, non-imminent (69 FR 51217). In its justification for downgrading all of the threats that it previously believed to be significant, the Service stated:

> The magnitude and immediacy of the threat should be viewed pursuant to the definitions of the Act. To be considered a threat, a factor should be shown to play a significant role in the population dynamics of the species such that it is likely to become an endangered species within the foreseeable future throughout all or a significant portion of the range. None of the five listing factors as described in section 4(a) of the Act and further described at 50 CFR 424.11 rise to this level of threat. (69 FR 51217: 51226).

Neither the Endangered Species Act nor its supporting regulations actually define when a hazard constitutes a threat or provide a threshold for making such a determination. The Act only defines Endangered and Threatened as they apply to the species themselves; it does not define the threats. And, according to these definitions the BTPD clearly deserves to be listed as Threatened or Endangered throughout all of its historic range.

Though the USFWS acknowledged in the 2004 Not Warranted Finding that a Threatened species needed only to be at risk of being in Endangered in a **significant portion** of its range, the Service did not actually apply this definition in assessing the listing factors (threats) in its 2004 Finding on the BTPD. For example, the Service indicated that plague must be a threat rangewide to be a significantly high threat to reach the level where the BTPD would warrant listing. See the Service's statement below:

> In our 2000 12-month finding, we focused attention on a few large black-tailed prairie dog populations impacted by plague and extrapolated population losses at these sites across the species' entire range. Based on generally accepted conservation biology principles (Gilpin and Soule 1986; Hanski and Gilpin 1997; MacArthur and Wilson 1967; Miller *et al.* 1996; Shaffer 1981; Wilcove *et al.* 1986; and Wilcox and Murphy 1985), we presumed that smaller black-tailed prairie dog populations had been and would be similarly or more adversely impacted. An approximate 50 percent decline per decade was predicted for the foreseeable future. Much better information is now available. Given recent population estimates across a majority of the species' range, it appears the previously hypothesized projections were invalid. **While occupied habitat at specific large complexes may experience dramatic fluctuations due to plague epizootics, they do not appear to be influencing the species' range-wide persistence.** (69 FR 51217: 51223) [emphasis added]

It appears that the Service applied this rangewide standard in its assessment of all the listing factors as they affect the BTPD. Regarding urbanization, the Service stated, "In the 12-month finding, we noted that urbanization represents a locally substantial loss of occupied habitat, but in a range-wide context it is not significant (69 FR 51217: 51222). Regarding shooting, the Service state, "We are aware that recreational shooting can reduce black-tailed prairie dog population densities at specific sites, and acknowledge the possibility that extirpation may have occurred in isolated circumstances" (69 FR 51222). The Service acknowledged that chemical control has caused BTPD extinctions at "specific sites" and "extant and potentially significant local effects on some populations" (69 FR 51226). Yet, the Service determined habitat destruction, including urbanization, shooting, and chemical control not to be a threat to the species.

The local or site specific extinctions that the Service has acknowledged have occurred indicate that the black-tailed prairie dog has and is experiencing extinctions in significant portions of its range. Historically prairie dog populations fluctuated and colonies appeared and disappeared across the range. But, the BTPD's threats have led to a net loss of prairie dogs and their colonies and the best available science shows that this trend is continuing. The current evidence based on the best available science demonstrates that past and current local and regional extinctions demonstrate that the species warrants listing. As with all the major threats to the species: habitat loss, shooting, plague, and poisoning, and the lack of regulatory mechanisms to prevent these threats; it is the cumulative effect of localized extinctions across the species' range that puts the black-tailed prairie dog at risk of rangewide extinction and has already caused extinctions in significant portions of its

range. The FWS discounted the additive effects of these multiple threats to the black-tailed prairie dog in its annual assessments and in its decision to remove the species from ESA candidacy.

In the 2004 Not Warranted Finding, the USFWS set an arbitrary and inappropriately high threshold to evaluate threats to the BTPD. According to data the Service presented in this finding, the black-tailed prairie dog is absent from 98% of its historic range. The aggregate effects of habitat destruction, shooting, plague, insufficient regulatory mechanisms, and lethal control in addition to other lesser threats have caused this loss. These threats are occurring everywhere, even on public land and private conservation reserves, where we would expect them to have at least some protection from anthropogenic threats. A 98% loss clearly equates to extinction in a significant portion of the species' range. Wisely, the authors of the Act did not require that a species be on the very brink of immediate or imminent extinction to deserve listing and the protection ESA listing affords.

Additionally, the Service seemed to apply an unreasonably short time frame in which we should be able to predict the extinction of the BTPD in its assessment of threats. Again, a Threatened species is one that "is likely to become an endangered species **within the foreseeable future** throughout all or a significant portion of its range," as defined by the ESA. The "foreseeable future" criteria does not necessarily mean 10-20 years or even 50 years. It only took humans 100-150 years to decimate the black-tailed prairie dog population from several billion to a few million, removing it from at least 98% of its range. At that rate, it is very reasonable that we could see the extinction of the last 2% within the foreseeable future.

We have summarized the threats to the black-tailed prairie dog in the section immediately below. We have provided a comprehensive analysis of these threats in later sections of the petition. Our assessment demonstrates that the best available science supports listing the black-tailed prairie dog.

1. Factor 1: Habitat Destruction Threatens the Survival of Black-tailed Prairie Dogs

Large-scale conversion of native prairie grasslands to croplands catalyzed by the U.S. Homestead Acts, which may have permanently destroyed 37% of the black-tailed prairie dog's habitat, has slowed but the threat of grassland conversion is not over. The USFWS 2004 Finding for the black-tailed prairie dog determined that destruction, modification, or curtailment of habitat was no longer a threat: "We continue to conclude that present or threatened habitat destruction is not a threat to the species, although considerable effects due to this factor have occurred in the past" (69 FR 51217: 51222). This is a scientifically unsupported conclusion. Rampant oil and gas development across the West is destroying black-tailed prairie dog habitat. Urban expansion is destroying prairie dog habitat in places such as Billings, Montana and the Front Range of Colorado. The Colorado Division of Wildlife's 2002 black-tailed prairie dog survey found that some of the highest concentrations of prairie dogs existed in rapidly developing areas around and between Boulder and Fort Collins, Colorado (White et al. 2005). Much, if not most, of the habitat in this region will be destroyed by urbanization. A renewed and recent U.S. interest in ethanol, made with corn, as a vehicle fuel is increasing corn planting across the country, including the Great Plains states, within the range of the black-tailed prairie dog.

2. Listing Factor 2: Shooting is a Significant Threat to Black-tailed Prairie Dogs

The USFWS has never considered prairie dog shooting a significant threat to black-tailed prairie

dogs. In its 2004 Not Warranted Finding, the Fish and Wildlife Service utilized only a fraction of the available scientific information to make its assessment that "effects due to recreational shooting do not rise to the level of a threat pursuant to the definitions of the Act" (69 Fed. Reg. 51217: 51222). However, the culmination of scientific research on the subject demonstrates that prairie dog shooting has significant negative impacts to black-tailed prairie dog populations. Recreational shooting causes direct prairie dog mortality and population losses (Knowles 1988; Livieri 1999). A recent study by Pauli (2005) provided significant evidence that shooting causes detrimental behavioral changes, loss of reproductive capacity, diminished body condition, and higher stress levels in black-tailed prairie dogs. Shooting can also cause colony abandonment, changes in population structure, increased predation, unpredictable and colony-specific effects, decreased population density, decreased colony expansion rates, and habitat fragmentation (Knowles 1988; Miller et al. 1993; Reading et al. 1989; Irby and Vosburgh 1994; Vosburgh and Irby 1998; Keffer et al. 2001; Wyoming Cooperative Fish and Wildlife Research Unit 2001; Reeve and Vosburgh 2003; Reeve and Vosburgh 2006). The Colorado Wildlife Commission rescinded a state wildlife regulation that had banned shooting of black-tailed prairie dogs on public land on September 7, 2006. In 2007, the Montana State Legislature voted down a proposal to give the Montana Fish, Wildlife & Parks permanent authority to regulate prairie dog shooting. Thus, a rule that imposed seasonal shooting closures on state trust lands and portions of Phillips County will not apply after October 1, 2007. No limits on shooting exist in Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, Texas, and Wyoming. There is a ban on prairie dog shooting at Conata Basin in the Buffalo Gap National Grassland; otherwise, there are no shooting limits in South Dakota.

3. Listing Factor 3: Sylvatic Plague is Perhaps the Greatest Threat to Black-tailed Prairie Dog Persistence

In the 2000 Warranted But Precluded Finding and the 2001 and 2002 Candidate Notice of Reviews (CNORs) (66 FR 54808; 67 FR 40657) the USFWS argued that plague was a "moderate, imminent threat. " In its 2002 Candidate and Listing Priority Assignment Form, the Service claimed that, "…recent information suggests that black-tailed prairie dogs may not be as vulnerable to this disease in some situations as previously thought" (USFWS 2002: 3). Despite using most of the same information cited in the 2002 Assignment form and used to make the 2002 CNOR determination that plague remained a "moderate, imminent threat," the Service declared plague to be "not a significant threat" in the 2004 Not Warranted Finding.

The Service made the following claims in the 2004 Finding:

> Our previous conclusions regarding the perceived effects of plague on the persistence of the species have been altered by information indicating that—(1) High exposure doses of plague bacilli may be necessary for disease contraction in some individuals; (2) limited immune response has been observed in some individuals; (3) a population dynamic may have developed in low-density, isolated populations that contributes to the persistence of these populations; (4) the apparent ability of some sites to recover to pre-plague levels after a plague epizootic; and (5) approximately one-third of the species' historic range has not been affected by plague. Based on both the new information above and recent State-by-State range-wide estimates of occupied habitat that indicate species abundance, plague no longer appears to be as significant a threat as previously thought. (69 FR 51217: 51224)

Sylvatic plague, first found in black-tailed prairie dogs in the late 1940s, continues to decimate prairie dog populations, with mortality rates up to 100% of entire colonies. We respond to each of the USFWS's arguments, itemized above, in detail in the "Sylvatic Plague" section of this petition within our discussion of the significance of "Disease or Predation" as threats to the black-tailed prairie dog, but summarize our responses to these 5 claims below.

1. It is true that black-tailed prairie dogs have shown some variability in the amount of plague bacilli (*Yersinia pestis* bacterium) needed to infect individuals, but differences have only been found in tightly controlled laboratory conditions (Mencher et al. 2005).

2. Again, the USFWS used preliminary results from laboratory experiments to make this claim (69 FR 51217: 51223, citing Rocke, U.S. Geological Survey (USGS), pers. comm. 2002). The USFWS also cited preliminary data that 2 out of 65 prairie dogs sero-converted after exposure to plague on the Pawnee National Grassland (69 FR 51217: 51223, citing Antolin, Colorado State University, pers. comm. 2002). However, the final peer-reviewed publication of this study reported no evidence of plague anti-bodies in live prairie dogs captured from colonies that experienced die-offs from plague (Webb et al. 2006).

3. The USFWS cited Lomolino et al. (2003) to claim that "habitat fragmentation may benefit some prairie dog populations by protecting them from plague through isolation" (69 FR 51215: 51223). This is the 1 new piece of information the Service used to determine plague was not a threat to BTPDs. Based on prairie dog surveys conducted in the Oklahoma panhandle since 1966, the researchers found larger prairie dog colonies exhibit increased persistence compared with smaller colonies between 1967 and 1989 but that this trend reversed between 1989 and 1997. The researchers **speculated** that this might have been due to a plague event in the early 1990s. Far from labeling this an encouraging finding with regards to plague, Lomolino et al. (2003) concluded that their results are consistent with studies of "range collapse" of over 200 other imperiled species. Moreover, based on this and earlier research (Lomolino et al. 2001), the researchers observed an overall trend in prairie dog population decline regardless of the colony persistence dynamic. Of 281 colonies mapped in 1967, only 86 (31%) existed in 1989 and only 5 (2%) existed in 1999—an average loss of 8-9 colonies per year. The Service's claim implies that maintaining and increasing colony fragmentation is an appropriate mechanism to conserve the species. This response is antithetical to recovering and conserving the large complexes of prairie dogs needed to protect the species from extinction. Isolated colonies risk losing genetic diversity (Trudeau et al. 2004) and are more vulnerable to permanent extirpation from shooting, poisoning, and other threats. In fact Lomolino et al. (2003) recommended that both large complexes as well as isolated colonies be protected.

4. The USFWS used the example of a post-plague recovery on the Cimarron and Comanche National Grasslands after an epizootic in 1995-1996 to argue that colonies can recover to pre-plague levels after epizootics. However, plague struck the Comanche National Grassland in 2006, killing off 54.5% of the total Comanche population in just 1 year (Augustine et al. 2006). There are indications that this recent plague epizootic continues to spread across prairie dog colonies in and around the Comanche in 2007, as this petition is being written. Plague also caused die-offs on the Cimarron National Grassland in 2006, but to a lesser extent (Ibid.). Plague epizootics observed on the Comanche seem to follow a 10-year pattern (Tom Peters, Comanche National Grassland Supervisor, pers. comm. 2006). If this is true, the black-tailed prairie dog populations on the Comanche National Grassland may never reach levels that could be considered viable. They currently occupy only 3% of

the available suitable habitat on the Grassland, as defined by Comanche managers.

5. Once researchers believed that some sort of "plague line" existed that prevented plague from reaching epizootic levels in prairie dogs east of the 102nd meridian. This is the basis for the Service's implication that one-third of the black-tailed prairie dog range is protected from plague. Some researchers speculated that differences in climate, the mammalian community, or flea community deters plague in the eastern areas (Cully et al. 2006), but no one has identified with certainty the reasons why plague would not eventually spread to black-tailed prairie dogs in the eastern portion of the species' range. Indeed, recent evidence suggests that plague is spreading beyond its previous range. In September of 2004, plague was documented in a BTPD in Custer County, South Dakota. Then, in 2005, plague was confirmed at a large prairie dog town at the Pine Ridge/Oglala Indian Reservation, devastating a significant part of the complex (T. Ecoffey, biologist Pine Ridge, personal communication to USFWS 2006; Randy Gribel, biologist at Wall Ranger District, personal communication 2007). These findings are highly significant, as South Dakota at the time of the 2004 Not Warranted decision was thought to be free of plague. Plague in South Dakota could affect populations of the endangered black-footed ferret, which has been reintroduced in the Conata Basin, only 30 miles from one of the documented plague sites. Even if the eastern portion of the BTPD's range were somehow protected from plague, this is precisely the region where the Service has also determined that some of the most severe range contractions have occurred. Other than in South Dakota, no BTPD complexes exist in the area east of the 102nd meridian.

4. Listing Factor 4: Regulatory Mechanisms are Insufficient to Ensure the Survival and Recovery of the Black-tailed Prairie dog

Since the 2004 decision, several states have implemented policies to increase the methods available for poisoning black-tailed prairie dogs or have facilitated private landowner poisoning of prairie dogs. Colorado, Kansas, Nebraska, and Wyoming all approved 24(c) "Special Local Need" labels between 2004-2006 for registering Rozol for use on prairie dogs. Rozol had previously not been approved for use on prairie dogs in any state. Rozol is a bait-delivered poison with the active ingredient chlorophacinone, an anti-coagulant, which causes poisoned BTPDs to bleed to death. The Fish and Wildlife Service raised significant concerns about the use of Rozol to kill black-tailed prairie dogs because of impacts to nontarget wildlife, among other reasons (John Cochnar, Acting Field Supervisor, U.S. Fish and Wildlife Service Ecological Service Branch, Nebraska Field Office letter to Greg Ibach, Director, Nebraska Department of Agriculture, January 13, 2006). Colorado also approved the use of Kaput –D for killing prairie dogs, and Texas is in the process of approving Kaput -D (Colorado Department of Agriculture 2006; Heather Whitlaw, Texas Game, Fish and Parks, personal communication, 2007). On September 7, 2006 the Colorado Division of Wildlife approved use of devices that ignite a mixture of propane and oxygen to kill prairie dogs inside their burrows, and in November 2006, the Colorado Department of Agriculture issued an emergency rule to waive registration requirements for use of such devices. At least 7 out of 10 states with black-tailed prairie dogs have either enacted regulations to make it easier to kill BTPDs or rescinded regulations that promoted protection of the species since the 2004 Not Warranted Finding. The increase in regulations to promote poisoning, the lack of regulations to restrict shooting, and nearly non-existent regulations that would limit BTPD habitat loss confirm that regulatory mechanisms are inadequate to prevent the species from becoming extinct in all or a significant portion of its range. Quite the opposite, the current regulatory framework is likely to hasten the BTPD's plummet towards extinction.

5. Listing Factor 5: Lethal Control of Black-tailed Prairie Dogs is a Threat to Their Survival

Poisoning and other methods of lethal control remain significant threats to the species. Though black-tailed prairie dogs play an incredibly important role in prairie grassland ecosystems [this will be discussed in more detail below], they have long been considered agricultural pests. For over 100 years, the agricultural industry and the U.S. government worked together to eradicate prairie dogs. The deliberate eradication of prairie dogs is to blame for dramatic population declines, especially in the first half of the 20th Century. In 1923 alone, the government and agriculture industry representatives eliminated over 1.5 million hectares of black-tailed prairie dogs (Forrest and Luchsinger 2006). Poisoning abated somewhat after the 1930s only because there were fewer prairie dogs left to kill (ibid.).

The lethal control of prairie dogs at a substantial level continued after the USFWS's 2000 Warranted but Precluded Finding. However, the 2004 Not Warranted Finding declared chemical control and the synergistic effects of chemical control (along with all other threats) were not a threat. As stated in the Finding:

> We concluded that synergistic effects likely impact the species; however, we were unable to quantify those effects and consequently described the effects as not a threat due to a lack of information. (69 FR 51217: 51224)

While the Service invoked lack of information repeatedly in the 2004 Finding regarding multiple threats, lack of information is not a sufficient justification for dismissing likely severe threats, including poisoning, to a species from listing consideration. Moreover, the Service had many indications that poisoning and other prairie dog control methods would increase if the species was removed from the ESA Candidate list.

For example, South Dakota made the USFWS aware of its plan to exterminate significant populations of prairie dogs across the state. The Governor of South Dakota announced his "Emergency Interim Prairie Dog Control Program" plan publicly 1 day after the USFWS issued its Not Warranted Finding on August 12, 2004 (but prior to the publication of that finding in the Federal Register). According to a report entitled "South Dakota Prairie Dog Control," between 2004-2005, South Dakota poisoned about 9,816 hectares (24,255 acres) of prairie dogs on private land and about 47 hectares (115 acres) on state land (Smith 2007). At least 3,110 hectares (7,686 acres) of prairie dogs were poisoned on Forest Service land primarily within Conata Basin on the Buffalo Gap National Grassland in South Dakota (Ibid.)—home to the most productive black-footed ferret reintroduction site. Between 2005-2006, the state poisoned at least 5,959 hectares (14,725 acres) on private land and 486 hectares (1,200 acres) of state land, and the Forest Service poisoned over 3,440 hectares (8,500 acres) (Smith 2007). Additionally, the South Dakota Department of Agriculture sold 51,796 kilograms (113,950 pounds) of poisoned bait to private applicators (non-tribal). Between 2006 and February 22, 2007, South Dakota Game Fish and Parks Department poisoned 11,940 hectares (29,503 acres) on private land and 37 hectares (91 acres) on state public land. Information regarding the amount of poison sold to private applicators and prairie dogs poisoned on state park land for 2006-2007 was not included in the report. Another 4,709 hectares (11,635 acres) was poisoned on federal National Grasslands in South Dakota during the 2006-2007 reporting period.

The U.S. Forest Service chief rescinded a 2000 moratorium on poisoning black-tailed prairie dogs on National Forest System lands on February 12, 2004. On May 11, 2004, Region 2 Forester Rick Cables added guidance to aggressively control prairie dogs to appease landowners adjacent to National Forests and Grasslands with prairie dogs. The Nebraska National Forest has already conducted extensive poisoning on the Buffalo Gap (see above), Ogalala and Fort Pierre National Grasslands. The Pawnee National Grassland (in Colorado), the Little Missouri National Grassland (in North Dakota), and Thunder Basin National Grassland (in Wyoming) have all signaled their intent to increase prairie dog poisoning.

C. ESA Listing is the Only Way to Prevent Extinction of the Black-tailed Prairie Dog

After the NWF and BLF filed their black-tailed prairie dog ESA petitions in 1998, the 11 states within the range of the species formed a Conservation Team to coordinate prairie dog management actions and ultimately prevent the listing of the species. Representatives from the state wildlife agencies were the primary participants in the Prairie Dog Conservation Team. Nine of the 11 states signed a Memorandum of Understanding, finalized in February 2000, committing them to a multi-state management approach to conserving black-tailed prairie dogs. Colorado and North Dakota declined to sign the MOU (Luce 2003). The states prepared *The Black-tailed Prairie Dog Conservation Assessment and Strategy* in 1999 (Van Pelt 1999) and *A Multi-State Conservation Plan for the Black-tailed Prairie Dog, Cynomys ludovicianus, in the United States*, in 2002 (Luce 2003). The state signatories to the MOU promised to develop state black-tailed prairie dog management plans, reach minimum prairie dog habitat objectives, and improve state regulations to promote prairie dog conservation, among other actions. Colorado and North Dakota developed independent management plans and made commitments to conservation actions as well. While each state developed management plans, the extremely limited new protections that resulted are insufficient to ensure the long-term survival of the species. Further, the states have failed to make good on their most important commitments. And, as demonstrated by several of the examples provided above, some states are now backsliding on their promise to conserve the species and are taking more actions to harm black-tailed prairie dogs rather than protect them.

For the reasons outlined above and others, the black-tailed prairie dog should be listed as Endangered or Threatened under the ESA in 10 U.S. states, Mexico and Canada and Endangered in Arizona and also provided with critical habitat. Given the species' imperiled status and the failure of the states to recover and conserve this species, listing is the best and only way to prevent the extinction of the black-tailed prairie dog in significant portions of its range beyond the significant losses it has already experienced. Critical habitat for the species will better ensure its recovery and the re-establishment of prairie dog ecosystems.

IV. The Spirit and Purpose of the Endangered Species Act

The purposes of the ESA are two-fold, to conserve threatened and endangered species **and** the ecosystems on which they depend. The Act's Section 2 reads:

> The purposes of this chapter are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species…

See 16 U.S.C.A. § 1531(b). This is set forth as the very purpose of the ESA and our petition therefore goes to the very heart of this visionary law. The Act was specifically intended to prevent the extinction of species such as the black-tailed prairie dog, which now faces a high risk of extinction due to the combined threats of plague, habitat degradation and destruction, poisoning, recreational target shooting, and other human activities. The black-tailed prairie dog warrants ESA listing, and its protection would provide collateral benefits to associated species, and would implement the ecosystem protection purpose of the ESA (Rosmarino 2002). A U.S. Fish and Wildlife Service (USFWS) brochure issued in the 1990s advocated a multiple species approach to endangered species policy, with a focus on prairie dogs.

Moreover, the ecosystem protection dimension of the ESA's purpose was not anomalous or unintentional (Rosmarino 2002). Committee reports leading up to the passage of the Act in 1973 consistently endorsed the ecosystem protection goal. A July 1973 House Report commented that "the ecologists' shorthand phrase 'everything is connected to everything else' is nothing more than cold, hard fact" (H. Rep. 93-412: 6) and a Senate Report similarly indicated that species need to be protected due to their "vital biological services to maintain a 'balance of nature'" (Sen. Rep. 93-307: 2).

In the major subsequent amendments – in 1978, 1982, and 1988 – Congress and the Supreme Court have affirmed this ecosystem protection purpose. In 1978, when the Tellico Dam controversy erupted, pitting a three-inch species of perch against a $100-million dam, the Supreme Court ruled that a species' value is incalculable, in part, because of the "unforeseeable place such creatures may have in the chain of life on this planet" (*Tennessee Valley Authority v. Hiram Hill* (437 U.S. 153 (1978)), pp. 178-179). In short, given the possibility of species extinction causing ecosystem collapse and the likelihood that humans may not know about such consequences before they occur, the value of a species is incalculable and no costs should be spared in preventing its extinction (Rosmarino 2002).

In that same year, although under great pressure by economic interests to exclude "insignificant" species from the ESA's protections, Congress held firm to its commitment to prevent any species – charismatic or obscure – from being driven into extinction (16 U.S.C. § 1532(6)).[1] In large part, Congress made this choice because of the argument that all species play roles in their native ecosystems. Senate bill manager John Culver (D-IA) stated that all species should be protected due to their participation in a "seamless web of interdependency" (1978 Floor: 21287). Sen. John Chafee (R-RI) similarly articulated the purpose of the Act as two-fold, including ecosystem protection and the conservation of endangered species and argued that charismatic species could not be protected unless one safeguarded "the network of life upon which they depend" (1978 Floor: 21147).

In 1982, Congress chastised the Fish and Wildlife Service's (USFWS) discrimination against so-called "lower life forms," in listing decisions and was influenced, in part, by the argument that such discrimination was indefensible on ecological grounds. Scientists in the hearings leading up to the 1982 amendments vociferously criticized taxonomic discrimination, arguing that it violated Aldo Leopold's view that "To keep every cog and wheel is the first precaution of intelligent tinkering" (Leopold 1966: 190). The cogs and wheels of which Leopold spoke were species, and the implicit

[1]The only exception was for "a species of the Class *Insecta* determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man" (16 U.S.C. § 1532(6)).

machine of which they were a part (i.e., the subject of one's tinkering) was the ecosystem. Leopold was metaphorically rebuking the view that any species is insignificant, and his rebuke was made on ecosystemic grounds. Heeding Leopold's metaphor, House Subcommittee Chairman John Breaux (D-LA) explicitly lamented the loss of "'cogs and wheels' of the biological mechanism that sustains life on Earth" on the House Floor (1982 Floor: 12957).

In the most recent set of amendments to the ESA, in 1988, House Subcommittee chairman Gerry Studds (D-MA) endorsed the ecosystem protection purpose of the ESA by quoting John Muir, "'[w]henever we try to pick up anything by itself, we find it attached to everything in the universe.'"[2] Sen. John Chafee (R-RI) invoked the same sentiment in the Senate (1988 Floor: 18570-71).

Despite the ecosystem protection purpose of the ESA being a prominent part of the Act's legislative history, at no point has a congressperson questioned the validity of that purpose. Nor has the Act's purpose been altered, despite attempts to dilute it with human welfare concerns (Rosmarino 2002). Under the present terms of the Act, the ecosystem protection purpose could be served by listing keystone species.

USFWS has itself pledged to enforce the ESA in a way that maximizes ecosystem protection (USFWS 1997). We suggest that the protection of the black-tailed prairie dog, given the keystone status of this species, would effect such ecosystem-level protection. Our proposal is not an original one, but has in fact been promoted by conservation biologists and legal scholars as a method of obtaining ecosystem-level protection under the current terms of the Act (Noss 1991; Houch 1997; Miller et al. 1998/1999). And USFWS has itself acknowledged that protecting prairie dogs could protect whole ecosystems.

That prairie dogs perform keystone functions and are highly interactive species has been well-established by scientists (Kotliar et al. 1999; Kotliar 2000; Miller et al. 2000; Kotliar et al. 2006). The black-tailed prairie dog is a keystone species facing the severe and ongoing cumulative threats of poisoning, plague, shooting, and habitat destruction, alongside a lack of adequate regulatory mechanisms at the state level. Listing the black-tailed prairie dog under the ESA would thus further two primary purposes of the law – to prevent the extinction of native species and to protect the ecosystems on which they depend. USFWS should therefore promptly list the black-tailed prairie dog as a threatened or endangered species under the ESA.

V. Species Description

Unless otherwise indicated the following information is adapted from Hoogland (1995; 2001; and 2006a,b).

A. Taxonomy

The black-tailed prairie dog is a mammal and member of the Sciuridae, or ground squirrel family of rodents (Hollister 1916; Hall and Kelson 1959; Clark et al. 1971) and is one of five species in the genus (Clark et al. 1971). Prairie dogs probably diverged from the rest of the ground squirrels during

[2]John Muir's actual quote was "When we try to pick out anything by itself, we find it hitched to everything else in the universe" (Muir 1911: 91).

the late Pliocene or early Pleistocene, around 1.8 million years ago (Black 1963; Clark et al. 1971). The genus *Cynomys* is divided into two subgenera: *Cynomys* and *Leucocrossuromys* (Hollister 1916; Hall and Kelson 1959; Clark et al. 1971). Members of the subgenus *Cynomys* possess tails with black tips and include the black-tailed prairie dog and the Mexican prairie dog (Hollister 1916; Clark et al. 1971). The subgenus *Leucocrossuromys* includes the following species, which have white-tipped tails: the Utah prairie dog, the Gunnison's prairie dog, and the white-tailed prairie dog (Hollister 1916; Clark et al. 1971). See table below.

Table 1. Taxonomy of the Black-tailed Prairie Dog

The Black-tailed Prairie Dog
(adapted from Hoogland 2006 and Hafner 1984)

Order: Rodentia
Suborder: Protrogomorpha
Family: Sciuridae
Subfamily: Petauristinae
Genus: *Glaucomys* (flying squirrels)
Subfamily: Sciuridae
Tribe: Tamiini
Genus: *Tamias* and *Eutamias* (chipmunks)
Tribe: Sciurini
Genus: *Sciurus* and *Tamiasciurus* (tree squirrels)
Tribe: Marmotini
Subtribe: Marmotina
Genus: *Marmota* (marmots)
Subtribe: Spermophilina
Genus: *Spermophilus* and *Ammospermophilus* (ground squirrel)
Genus: *Cynomys* (prairie dogs)
Subgenus: *Cynomys*
Species: *ludovicianus* (black-tailed prairie dog)
Species: *mexicanus* (Mexican prairie dog)
Subgenus: *Leucocrossuromys*
Species: *gunnisoni* (Gunnison's prairie dog)
Species: *leucurus* (white-tailed prairie dog)
Species: *parvidens* (Utah prairie dog)

Though rare and declining, the black-tailed prairie dog is the most common and most wide-ranging of the 5 species. The Mexican and the Utah prairie dog are listed as endangered and threatened species, respectively, under the Endangered Species Act. See 50 C.F.R. § 17.11. Petitioners will focus on the status of the black-tailed prairie dog in this petition, and "prairie dog" will be used interchangeably with "black-tailed prairie dog" and "BTPD".

The black-tailed prairie dog is a monotypic species (Pizzimenti 1975). Some researchers have distinguished an Arizona subspecies (*C. ludovicianus arizonensis*) that was historically located in the Chihuahuan Desert of Arizona (now extirpated), southern New Mexico, western Texas, and Mexico (Hollister 1916; Koford 1958).

B. Biology

C. ludovicianus is the largest of the 5 subspecies, weighing from 70-100 kilograms (1-3 pounds) with a length of 35-43 centimeters (14-17 inches) from the tip of the nose to the tail. Pelage varies

but is generally brown on back and sides with a buffy underbelly and the characteristic black-tipped tail. BTPDs are diurnal and spend most of the day above ground (at least on sunny days) feeding, socializing, and maintaining their colonies. Colony maintenance includes clipping tall vegetation to get a clear view of predators and digging to preserve or expand their burrows. Unlike the Gunnison's, Mexican, and white-tailed prairie dogs, black-tailed prairie dogs do not hibernate. However, they can remain in their burrows for several weeks when there is deep snow.

Black-tailed prairie dogs live in "coteries"—territorial family groups that normally comprise 1 male and several related female adults along with juveniles. They reproduce slowly, which is a barrier to recovery. Unlike many other rodents, breeding females have just 1 litter per year. Litter sizes range from 1-8 pups at birth, but the average size at 6 weeks is 3. Primary natural causes of mortality include: predation, infanticide, and the inability to survive the winter. If they survive their first year, a male will average a 2-3 year lifespan and a female 4-5 years.

Coteries are aggregated in colonies or towns that could historically extend for 10s of kilometers in all directions. Colony densities vary seasonally (with highest densities in the spring when the pups first appear) and from year to year depending on forage availability, climatic conditions, predation, disease (particularly sylvatic plague), and anthropogenic threats including shooting and poisoning.

Coloniality has its costs and benefits. Prairie dogs share the responsibility for detecting predators, so everyone gets to spend more time eating. Prairie dogs have a sophisticated language that includes a wide variety of alarm calls to distinguish various predator types (Slobodchikoff et al. 1991; Placer and Slobodchikoff 2000). This enables individuals to determine the best response to avoid being eaten without using excessive energy. However, close proximity also facilitates the spread of disease by passing around fleas, ticks, and lice and spreading communicable diseases pneumatically. Large colonies tend to foster more aggressive behavior between individuals, resulting in injuries and sometimes death. Juveniles in large colonies are also more likely to succumb to infanticide by relatives, particularly lactating females.

Historically, large colony complexes were common throughout the species range with a mix of smaller and larger isolated colonies interspersed among large complexes. Thus, black-tailed prairie dog populations/colonies are distributed in "metapopulations," defined as aggregates, often shifting mosaics, of fluctuating or temporary populations linked together by migration (Hanski et al. 1996; McCullough 1996; Hanski and Simberoff 1997; Primack 1998). A complex consists of 2 or more colonies, where the colonies are no more than 7 kilometers (4 miles) apart to facilitate male dispersal. To maintain genetic diversity, yearling males disperse while females remain in their natal coterie for life. Male dispersal distances average 2-3 kilometers (1-2 miles), but they have been known to travel up to 6-10 kilometers (3.7-6.2 miles).

The colony complex system represents an important adaptation for species survival. It enables the repopulation of a colony whose inhabitants disappeared due a catastrophic event, via immigration from other nearby colonies. This is an example of a "rescue effect"—the ability of a healthy species population or subpopulation to rebound in the face of stochastic occurrences (Brown and Kodric-Brown 1977; Harrison 1991). Eradication programs and habitat destruction largely broke apart the colony complex aggregation pattern across the Great Plains and Chihuahuan Desert grasslands. Just a handful of these complexes remain today. Thus, black-tailed prairie dogs are extremely vulnerable to catastrophes because their colonies have become generally isolated and fragmented.

C. The Black-tailed Prairie Dog's Ecosystem Role: A Keystone or Highly Interactive Species

It is hard to overstate the importance of prairie dogs to the ecosystems of the short- and mixed-grass prairies. The role of prairie dogs as a keystone species is now well-established scientifically (Kotliar et al. 1999; Kotliar 2000; Miller et al. 2000). Prairie dogs probably qualify under multiple categories of keystone species—as prey and for their modification of habitat (Mills et al. 1993). The shortgrass prairie areas that prairie dogs inhabit should probably be considered ecosystems unto themselves.

Keystone species enrich ecosystem function uniquely and significantly through their activities, and their impact is larger than predicted relative to their biomass (Paine 1980; Terborgh 1988; Mills et al. 1993; Power et al. 1996; Kotliar et al. 1999; Miller et al. 1998/1999). Kotliar (2000: 1715). Prairie dogs are functionally unique; they perform roles within their ecosystem not performed by other species or processes. The scientific literature that supports the argument that prairie dogs fulfill all the requirement of keystone species is growing (Coppock et al. 1983a, b; Detling and Whicker 1988; 1993; Reading et al. 1989; Kotliar et al. 1997; 1999; Wuerthner 1997; American Society of Mammalogists 1998; Kotliar 2000, Miller et al. 2000).

Prairie dog activities and the changes made by these activities create a unique ecological system known as the "prairie dog ecosystem" (Clark et al. 1989; Miller et al. 1996). Over 200 vertebrate species have been observed on prairie dog colonies (Koford 1958; Tyler 1968; Campbell and Clark 1981, Clark et al. 1982; O'Meilia et al. 1982; Agnew et al. 1986; Reading et al. 1989a,b; Sharps and Uresk 1990; Mellink and Madrigal 1993; Hoogland 1995; Barko 1996; Manzano 1996; Ceballos and Pacheco 1997; Ceballos et al. 1999; Kotliar et al. 1999). Some of these species appear to depend on prairie dog colonies for their survival and many appear to benefit, at least seasonally or opportunistically, from their existence (Reading et al. 1989; Hoogland 1995; Manzano 1996; Ceballos et al. 1999; Kotliar et al. 1999).

Prairie dogs and other animals inhabiting prairie dog colonies represent a rich prey patch for a large number of predators (Reading et al. 1989; Miller et al. 1996; Plumpton and Anderson 1997; Berry et al. 1998; Kotliar et al. 1999). A variety of predators, including prairie rattlesnakes (*Crotalus viridis*), golden eagles (*Aquila chrysaetos*), great horned owls (*Bubo virginianus*), weasels (*Mustela frenata*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), and others, prey on prairie dogs and small mammals that have a higher abundance on prairie dog colonies (Agnew et al. 1986). Some predators, especially black-footed ferrets (*Mustela nigripes*), are completely dependent on prairie dogs (Clark 1989; Miller et al. 1996). Other species, such as badgers (*Taxidea taxus*), swift foxes (*Vulpes velox*), and ferruginous hawks (*Buteo regalis*), benefit substantially from the presence of prairie dogs as prey (Uresk and Sharps 1986; Sharps and Uresk 1990; Allison et al. 1995; Plumpton and Andersen 1997, 1998; Berry et al. 1998; Goodrich and Buskirk 1998).

The benefits of prairie dogs extend well beyond simply being food for predators (Reading et al. 1989; Ceballos et al. 1999; Kotliar et al. 1999). Prairie dogs also substantially alter their environment. Since prairie dogs excavate more burrows than they regularly utilize[3], they create hibernacula, dens,

[3]Despite the common belief that there are several prairie dogs per burrow entrance, there are actually several burrow entrances per prairie dog (Biggins et al. 1993; Hoogland 1995).

and nests for many animals, such as black-footed ferrets, swift fox, badgers, cottontails (*Sylvilagus* spp.), burrowing owls, shrews, other rodents, and several species of reptiles and amphibians (Reading et al. 1989; Sharps and Uresk 1990; Plumpton and Lutz 1993; Fitzgerald et al. 1994; Desmond et al. 1995; Kretzer and Cully 2001). These species and more also use the burrows as refugia from predators or temperature extremes. As a result, researchers have found that desert cottontails (*S. audonbonii*), thirteen-lined ground squirrels (*Spermophilis tridecemlineatus*), and northern grasshopper mice (*Onychomys leucogaster*) exist in higher numbers on prairie dog colonies than in surrounding grasslands (O'Meilia et al. 1982; Dano 1952 in Stapp 1998). Similarly, studies in Mexico found higher rodent species richness, density, and diversity, and higher avian species richness on prairie dog colonies compared with surrounding grasslands in Chihuahua, Mexico (Manzano 1996; Ceballos and Pacheco 1997; Ceballos et al. 1999). Most of the research to date has focused on birds and mammals with considerably less research on reptiles and amphibians (but see Kretzer and Cully 2001). Similarly, little is known about prairie invertebrates, yet the burrows in a prairie dog colony should offer habitat advantages to herptiles and invertebrates as well.

Prairie dogs also have a large effect on vegetation structure, productivity, nutrient cycling, and ecosystem processes (Coppock et al. 1983; Detling and Whicker 1988; Whicker and Detling 1993; Weltzin et al. 1997a; Stapp 1998). The activities of prairie dogs, especially their grazing and clipping of tall vegetation, result in changes in plant composition (Bonham and Lerwick 1976; Coppock et al. 1983, Detling and Whicker 1988; Whicker and Detling 1988a, b; 1993, Weltzin et al. 1997a; Detling 1998). In general, the vegetation on prairie dog colonies is characterized by lower biomass and a greater preponderance of annual forbs and short grasses compared to tall grasses and shrubs, but is higher in nitrogen content than vegetation from surrounding areas (Bonham and Lerwick 1976; Coppock et al. 1983, Weltzin et al. 1997a; Detling 1998). Prairie dogs negatively impact some plant species, reducing the prevalence and controlling the spread of taller grasses and several shrubs, such as mesquite (*Prosopis* spp.), sagebrush (*Artemisia* spp.), and longleaf jointfir (*Ephedra trifurca)* (Bonham and Lerwick 1976; Coppock et al. 1983; List 1997; Weltzin et al. 1997b). Ironically, prairie dogs are poisoned for livestock interests, but these shrubs reduce grass available for cattle, and mesquite makes roundups more difficult (Miller 1991; Weltzin et al. 1997b).

Prairie dog burrowing activities modify ecosystem processes such as water, mineral and nutrient cycling. Prairie dogs turn over approximately 225 kg of soil per burrow system, which translates to several tons of soil per hectare (Whicker and Detling 1993). By mixing in nutrient-rich urine and manure, prairie dog digging can change soil composition, chemistry, and microclimate, facilitate below-ground herbivory, increase porosity of soil to permit deeper penetration of precipitation, and increase the incorporation of organic materials into the soil (Ingham and Detling 1984; Whicker and Detling 1988 a,b; Munn 1993; Outwater 1996). As a result, prairie dog colonies support higher numbers of nematodes and higher levels of soil nitrogen (Ingham and Detling 1984, Detling 1998). All of these processes contribute to aboveground plants with a higher nutritional content, greater digestibility, and a larger live plant to dead plant ratio, creating favorable feeding habitat for other herbivores (Whicker and Detling 1993). Indeed, pronghorn and bison preferentially graze on prairie dog colonies (Coppock et al. 1983; Krueger 1986; Detling and Whicker 1993, Detling 1998). Foraging models predict that bison can gain weight faster by grazing on pastures with prairie dog colonies than on grasslands without prairie dogs (Vanderhyde 1985 in Whicker and Detling 1993).

Kotliar et al. (1999: 177) concluded that collectively these functions are large, not wholly duplicated by other species (either in form or extent), and that the loss of prairie dogs would lead to "substantial erosion of biological diversity and landscape heterogeneity across the prairie." They

concluded that the prairie dog therefore fulfills the definition of keystone species (see also Kotliar 2000). Through the structure, form, and function of their colonies, prairie dogs play a keystone role in the prairie, and the role is large. Existing evidence indicates prairie dogs (and other associated species) provide important prey to predators, and their grazing and burrowing activities modifies the environment in a manner beneficially used by other prairie organisms (Whicker and Detling 1993; Kotliar et al. 1999). Most importantly, those grazing and burrowing activities affect vegetative composition, vegetation quantity and quality, productivity, nutrient cycling, and soil quality (Bonham and Lerwick 1976; Coppock et al. 1983; Detling and Whicker 1988; Whicker and Detling 1988 a, b; 1993).

The loss of prairie dogs throughout their historic range brought the black-footed ferret close to extinction. The species depends on prairie dogs for up to 95% of its dietary needs. Despite over 20 years and millions of dollars of public funds spent to reintroduce and recover ferrets, the species remains unviable in the wild because prairie dog populations have not recovered to the level needed by the ferret.

Though less dependent on prairie dogs, swift foxes, ferruginous hawks, and golden eagles decline locally when prairie dog populations decline (Kotliar et al. 1999). Swift foxes and ferruginous hawks experienced rangewide declines over the last 100+ years as prairie dogs suffered eradication and plague. An ESA Candidate species between 1994-2001, swift foxes continue to be absent from a large portion of their range and depend on reintroduction programs for their recovery in several areas.

Because they are prairie dog associate species, the black-footed ferret, swift fox, ferruginous hawk, and golden eagle can help indicate when viable prairie dog populations have been reached. When populations of these and other prairie dog associate species recover to viable and healthy population levels across their historic range, we can use this as one indicator that prairie dogs have also recovered.

VI. Population Distribution, Abundance, and Trends

Virtually no one disputes that black-tailed prairie dog populations have declined significantly in the last 150 years. The U.S. Fish and Wildlife Service described the causes of this decline in its 2000 Warranted But Precluded Finding:

> Three major impacts have had a substantial influence on black-tailed prairie dog populations. The first major impact on the species was the initial conversion of prairie grasslands to cropland in the eastern portion of its range from approximately the 1880s-1920s. The conversion of native prairie to cropland likely reduced black-tailed prairie dog occupied habitat in the United States from about 80 million ac (32 million ha) to about 50 million ac (20 million ha) or less. The second major impact on the species was large-scale control efforts conducted from approximately 1918-1972 in efforts to reduce competition between prairie dogs and domestic livestock. Repeated control efforts likely reduced black-tailed prairie dog occupied habitat in the United States from about 50 million ac (20 million ha) to approximately 364,000 ac (147,000 ha) by 1961 (Bureau of Sport Fisheries and Wildlife 1961). Some limited recovery and subsequent declines have since occurred in these remnant populations.

> The third major impact on the species was the inadvertent introduction of an exotic disease from the Old World, sylvatic plague, into North American ecosystems in 1908, with the first recorded impacts on the black-tailed prairie dog in the 1940s. (65 FR 5476: 5486)

The Service's 2004 Not Warranted Finding did not dispute these facts. Though the USFWS determined that the black-tailed prairie dog no longer warranted listing under the Endangered Species Act, the scientific and commercial information used to make this 2004 decision actually builds a stronger case for listing the species as Threatened than removing it as an ESA Candidate.

The USFWS relied heavily on BTPD population data that the states within the species' range collected between 2000-2004. The Service argued these new data showed that black-tailed prairie dogs were more numerous than what was believed in 2000, when the Service issued its Warranted But Precluded Finding. The Service estimated that 311,000 hectares (768,000 acres) of BTPD occupied area existed in 2000 (65 FR 5476, p. 5479). As stated in the 2004 Finding:

> State agencies now estimate approximately 745,400 hectares (1,842,000 acres) of occupied habitat across 10 western States. This estimate of the occupied habitat of black-tailed prairie dog has played a substantial role in this decision. Previously, we focused attention on a few large black-tailed prairie dog populations impacted by plague and extrapolated population losses at these sites across the species' entire range. Based on the updated distribution, abundance, and trends data, it appears that these extrapolations were not correct. Dramatic fluctuations in the amount of black-tailed prairie dog occupied habitat at specific large complexes may occur due to plague epizootics or chemical control, but they do not appear to influence range-wide species persistence. (69 FR 51217, p. 51226)

However, the procedures used by some states to survey their populations provided figures that over-estimated the area occupied by BTPDs, the standard proxy measure for determining prairie dog populations. Standard methods for estimating prairie dog occupied area include aerial transect surveys and remote sensing data analysis. While most states used these methods, most did not test the accuracy of their data by field checking or receiving external validation. Thus, the surveys are inaccurate and not representative of the best available science. Yet, even with the inflated population data, these surveys still demonstrate that black-tailed prairie dog populations have declined by 99-98% across their historic range in the last 200 years, according the USFWS data.

Perhaps most importantly, very few areas within the remaining BTPD range can support black-footed ferrets, a prairie dog obligate species. Populations of other prairie dog associate species declined as prairie dog colonies disappeared over the last 2 centuries. Prairie dogs are keystone species. Other wildlife species depend on them for food, their burrows for shelter, and/or the vegetation clipping and other ecosystem-engineering prairie dogs do to create habitat. The imperilment of species such as the black-footed ferret along with the mountain plover, burrowing owl, swift fox, ferruginous hawk, and others serves as an additional indicator of the BTPD's decline and need to be listed along with the population numbers.

The USFWS's own distribution, abundance, and trend data used to make the 2004 Not Warranted determination clearly indicate that the BTPD deserves to be listed throughout its range in the United States and in Canada and Mexico. New information gathered since the 2004 Finding

further strengthens the case for listing the species. To summarize, cumulative scientific and other evidence demonstrates that:

1. **The black-tailed prairie dog is extinct in a significant portion of its range and is in danger of becoming extinct in significant portions of its remaining habitat.**

2. **Colonies are becoming more fragmented and isolated in the black-tailed prairie dog's remaining habitat.**

3. **Black-tailed prairie dog populations have declined to a minute percentage of their historic size.**

4. **The decline and imperilment of several prairie dog obligate and associate species demonstrate that black-tailed prairie dog populations have lost viability.**

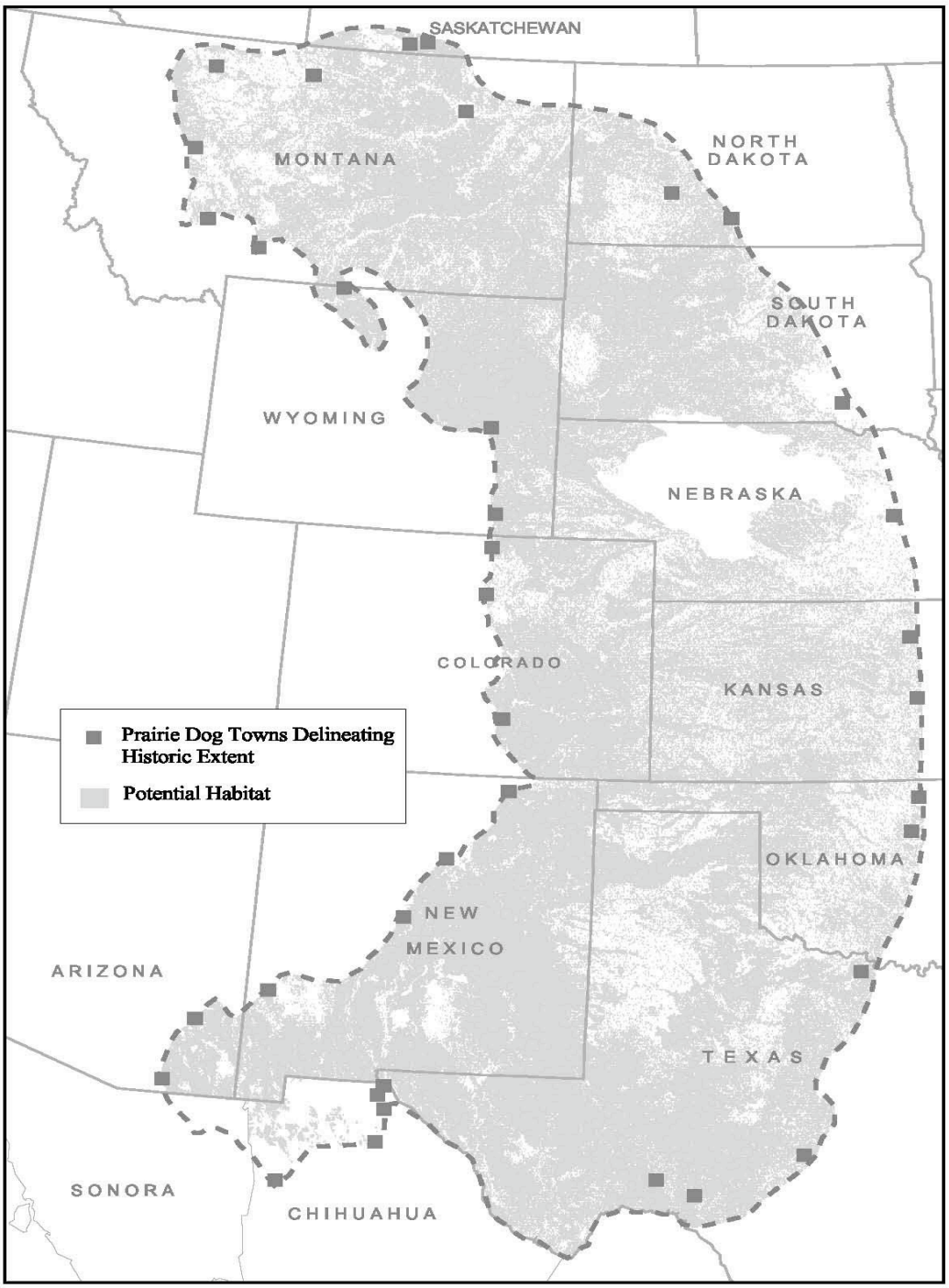
We examine these points in more detail below.

A. Historic Black-tailed Prairie Dog Distribution

The historic black-tailed prairie dog range included the short- and mid-grass prairie regions of the Great Plains of North America west of the 98th meridian and east of the Rocky Mountains. The range extended into the desert grassland areas of the Chihuahuan Desert in western-most Texas, southern New Mexico, southeastern Arizona, and northern Mexico. It extended from what is now southern Saskatchewan, Canada down into the states of Chihuahua and Sonora in northern Mexico. In the United States, the range included parts of Arizona, Kansas, Colorado, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming.

Scientists generally agree that the geographic range of the black-tailed prairie dog encompassed approximately 160,000,000 – 164,000,000 hectares (395,000,000 – 405,000,000 acres) in the 1800s (Hollister 1916; Hall 1981; Forrest 2005; Proctor et al. 2006). The USFWS used the figure of 162 million hectares (400 million acres) (69 FR 51217, p. 51221). Using the USFWS's figure for historic occupied habitat: 40,000,000 hectares (100,000,000 acres), that means that BTPD colonies covered about 25% of their original range.

Map 1. Historic Range of the Black-tailed Prairie Dog
(Proctor et al. 2006: 240)



Prior to large-scale human settlement of the Great Plains, BTPDs were distributed across their range in large complexes of multiple, proximal colonies interspersed with small complexes and isolated colonies. Based on our knowledge of the few remaining BTPD complexes, a complex is normally comprised of a few large colonies that provide the core for several smaller colonies assorted within the complex (Knowles et al 2002). This distribution pattern enables male dispersal to promote genetic diversity and prevent inbreeding—the key to maintaining healthy populations of prairie dogs across their range. Male black-tailed prairie dogs have been known to disperse as far as 9.6 kilometers (6 miles) (Milne 2004), but this distance is rare. Average dispersal distance is 2-3 kilometers (1.2-1.9 miles) (Roache et al. 2001; Milne 2004). Male dispersal is the mechanism that ensures the species' continued propagation.

Despite their relatively wide-ranging distribution across most of the Great Plains, BTPDs are not particularly adaptable. They require specific plant species for forage and a low plant community structure characteristic of the short- and mid-grass prairies to enable sighting predators. They normally do not establish colonies on slopes greater than 10%. Specific soil types are necessary to maintain their burrow structures. They require large open areas, free of visual obstructions in order to see predators. And, they need large numbers of individuals inhabiting a large number of complexes to assure genetic fitness.

As we mentioned above, four primary trends regarding the distribution of the BTPD support listing the species as Threatened are: 1) permanent losses of habitat have occurred due to range contraction and conversion of habitat to croplands and other land uses, 2) prairie dog colonies have become fragmented and isolated across the remaining range, 3) prairie dogs are at risk of becoming extinct in significant portions of their remaining habitat, and 4) several species that depend on BTPDs have become biologically imperiled. We discuss these trends and appropriate metrics of distribution below.

B. Historic Black-tailed Prairie dog Abundance

Except for small areas, black-tailed prairie dog abundance is currently estimated by using the surrogate measure of occupied area or habitat instead of estimating actual prairie dog numbers. It would be too time, labor, and cost intensive to count individual prairie dogs across their range using current available methods. Prairie dog colonies are measured, counted, and tallied to produce occupied area estimates. We discuss the complexities of assessing prairie dog abundance in order to discern population trends in more detail below.

Because no systematic surveys of prairie dog occupied habitat or other abundance measures occurred prior to Euroamerican settlement of the plains, we do not know how many BTPDs existed within their range historically. The estimates recorded during the settlement period did not benefit from modern scientific field methods. Not surprisingly, researchers who study prairie dogs are not in complete consensus about the most accurate historic estimate for the species. It is therefore best to use a range that includes an estimated historic minimum and maximum population size. The rough estimates we do have are sufficient to establish a baseline range for assessing population trends.

The USFWS used 40 million hectares (100 million acres) as the historic estimate of black-tailed prairie dog abundance (occupied habitat). The 2004 Finding stated:

> Historically as many as 40 million hectares (100 million acres) of occupied black-tailed prairie dog colonies occurred across a landscape of approximately 162 million hectares (400 million acres) of potential habitat (Black-footed Ferret Recovery Foundation, in litt. 1999a; Fagerstone and Ramey 1996; Knowles 1998; Seton 1953). (69 FR 51217, p. 51221)

Both the 2000 and 2004 USFWS Findings on the BTPD also accepted historic levels of occupied habitat of 56,656,040 hectares (104,000,000 acres) provided by Anderson et al. (1986) and the range of 40,063,914 – 99,957,442 hectares (99,000,000 – 247,000,000 acres) provided by Miller et al. (1996). These estimates came from a variety of sources, primarily government agents tasked with eradicating prairie dogs, but also from early naturalists' observations; reports by explorers, ranchers, and farmers; visible remnants of old colonies; and fossil evidence.

Most prairie dog researchers accept an historic occupied area of approximately 30,000,000 – 100,000,000 hectares (74,000,000 – 248,000,000 acres) (Nelson 1919; Anderson et al. 1986; Hoffmeister 1986; Vermiere et al. 2004; Forrest 2005; Proctor et al. 2006). However, there are a few dissenters.

For example, Vermeire et al. (2004) argued that even the estimate of 40 million hectares at the lower end of the range represents an overestimate because the area occupied by prairie dogs likely expanded due to livestock overgrazing of the Great Plains and drought, both occurring in the late 1800s. Overgrazing and drought can both encourage prairie dog expansion by either decreasing vegetation height, which enables easier expansion, or decreasing forage availability, which would force prairie dogs to expand to secure sufficient nutrients. Vermeire et al. (2004) concluded that the historic area occupied by BTPDs should be closer to 31,000,000 – 40,000,000 hectares (76,602,668 – 100,000,000 acres). Forrest (2005) countered that Vermeire et al. (2005) did not account for the 30 million bison (Lott 2002) grazing the plains before their epic historic slaughter. Forrest (2005) also used drought data (Easterling et al. 1996; Woodhouse and Overpeck 1998; Woodhouse and Brown 2001) to illustrate that drought occurring in the late 1800s was no more severe than droughts occurring between 1800-1920. Forrest stated:

> Simply put, drought during the period 1880 – 1900 was typically variable throughout the range of the prairie dog, but droughts during this period were not among the most widespread or severest of droughts known from the 1800s. Given a history of several thousand years of bison occupancy on the Great Plains (Lott 2002), it is unlikely that droughts in the late 1800s produced conditions for prairie dog expansion that were uniquely different from those produced historically. (Forrest 2005: 529)

Forrest (2005: 527) concluded:

> Occupancy estimates today for black-tailed prairie dogs range from 350,000 to 791,000 ha (USFWS 2004, Proctor et al. 2005). Even assuming that substantially fewer prairie dogs occurred historically (25 to 50 percent of Vermeire and colleagues' 31-million-ha estimate, for example) yields declines greater than 90 percent (assuming 8 million ha) or 95 percent (assuming 15 million ha). To any population ecologist, it is not overstating the case that impacts to prairie dogs have been profound, irrespective of what starting benchmark is used.

In a recent paper that also reviewed the Vermeire et al. (2004) argument, Miller et al. (in press) stated:

> [T]he relevant point is that the declining trends in prairie dog populations are clear. Using the U.S. Fish and Wildlife Service's (2004) current estimates for black-tailed prairie dogs, the prairie dog species with the greatest historical range, the declining population trend is clear whether there were once 40,000,000 ha, 30,000,000 ha, 20,000,000 ha, or 10,000,000 ha of that species. Respectively, these figures indicate declines of roughly 98%, 97%, 96%, or 92%.

Despite a wide-range of potential historic BTPD occupied area estimates, contemporary researchers have compiled and analyzed the myriad of historic information available to establish credible range. The USFWS's historic occupied area estimate of 40,000,000 hectares (98,800,000 acres) falls within the range and provides a sufficient basis for assessing black-tailed prairie dog population trends.

C. Estimating Current BTPD Distribution and Abundance and Assessing Population Trends

As our discussion above revealed, there are considerable challenges in determining an historic estimate for BTPD population size, as measured by occupied area. Nonetheless, we have sufficient data regarding historic prairie dog abundance to discern a baseline for assessing population trends. Despite major methodological and technological advances, estimating prairie dog abundance and distribution at the state- and rangewide scales remains difficult. Using the proxy of occupied area for abundance presents its own set of limitations. Current methods for measuring occupied habitat—aerial transect and remote sensing surveys—often result in significant overestimations. Choosing appropriate distribution metrics and population baselines can also be problematic. We discuss these issues in this section.

1. Limitations of Using Occupied Area/Habitat as Surrogate Measure of Abundance

Occupied area or habitat is inadequate as the standard proxy for population size. We request that the limitations of this measure be more fully considered by the USFWS. Occupied area is a very imprecise measure of abundance because prairie dog densities vary considerably. The Service acknowledged that prairie dog densities range from about "5 to 45 individuals per hectare (2 to 18 individuals per acre)" (69 FR 51217: 51218, USFWS citing Fagerstone and Ramey 1996; Hoogland 1995; King 1955; Koford 1958; Miller et al. 1996). This means that an estimate of occupied habitat could either overestimate or underestimated actual prairie dog population 9-fold. If we use the USFWS's 2004 occupied habitat estimate, the prairie dog population could be anywhere from 3.68 million to 33.16 million. The Service also acknowledged that prairie dog colony densities vary due to seasonal, regional, and climatic conditions as well as plague and chemical control.

However, we are concerned that the Service's 2004 Not Warranted decision did not take into account that increases in areas occupied by prairie dogs may actually signal the species' response to the stress of drought and livestock over-grazing, when less forage is available, and do not indicate population recovery. Prairie dog expansion in conditions of drought and/or over-grazing can give

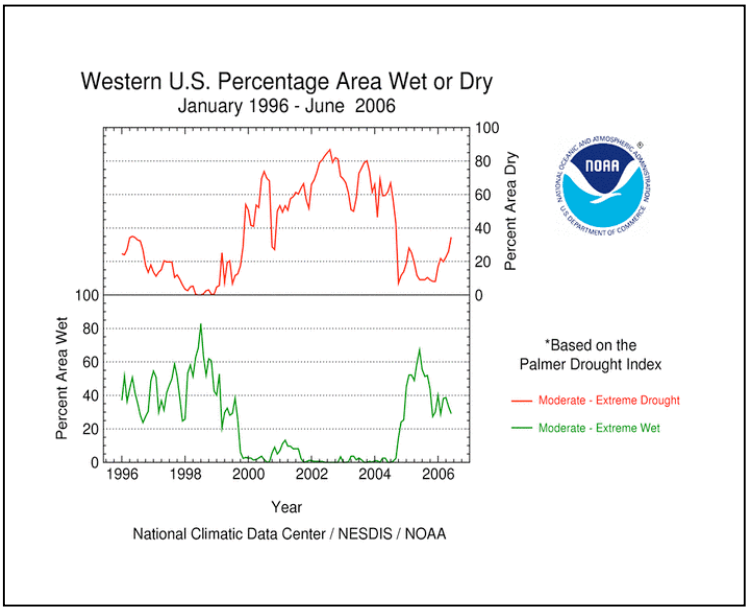
the false impression that populations are increasing when they are actually staying the same or declining. Prairie dogs living in areas with lower as opposed to higher forage availability exhibit slower growth rates in juveniles, delays in the onset of sexual maturity, smaller litter size, and lower survival rates (Garrett et al. 1982; Hoogland 2001). To date there has been little research on this topic. But, some researchers and government scientists have indicated that prairie dog colony expansion does not equate to population increases (R. Reading, Conservation Biology Director, Denver Zoological Foundation, personal communication 2007; U.S. Forest Service 2007). A 2007 recent "issues paper" entitled *USDA Forest Service Update March 2007: The Black-tailed Prairie Dog* stated:

> In 2004, acreage of black-tailed prairie dog colonies on National Forest System (NFS) lands totaled over 71,000 acres. This was a substantial increase over the nearly 48,000 acres recorded in 2002. Extended drought in much of the Great Plains has led to large expansions of prairie dog colonies, although not necessarily prairie dog populations. (US Forest Service 2007: 1)

The Forest Service paper also reported that BTPD populations on NFS lands had declined substantially by 2006 due to plague.

In a study comparing ferret use of the UL Bend National Wildlife Refuge in Montana and Conata Basin at the Buffalo Gap National Grassland in South Dakota, Jachowski (2007) found that black-tailed prairie dog densities vary over time within colonies depending on soil type and forage availability. Prairie dogs move to the perimeter of colonies when vegetative cover decreases in the central, core areas of their colonies. In a prairie dog colony there can be areas of high density and areas of complete inactivity. The implications of this study are that prairie dog densities decrease when less forage is available, such as during drought periods.

Graph 1. Recent Drought in the Western U.S.



Drought occurred throughout the black-tailed prairie dog range between 2000 and 2005 and longer in some places, such as South Dakota, with extreme drought conditions experienced range-wide during 2002-2003 (National Climate Data Center 2006). See graph below.

The timing coincided with state BTPD inventories that took place between 2000 and 2004, except for Montana. In its 2004 Finding, the USFWS stated that the Montana Department of Fish, Wildlife, and Parks reported that most prairie dog areas in

Montana were indicating habitat expansion (69 FR 51217: 51219, USFWS citing Hagener, MDFWP, in litt. 2003). Though the USFWS conveyed in its 2004 Finding that increases in estimated prairie dog acreage between 2000 and 2004 were not necessarily due to actual increases in occupied habitat but improved estimation methods, we would expect occupied area to have increased in regions that experienced drought, especially in the absence of plague, but that these expansions were not accompanied by population increases.

Though the most practical and widely accepted metric for estimating prairie dog abundance, reliance on occupied area as a surrogate for actual population size to draw conclusions on the BTPD's biological status has impeded prairie dog conservation in the last few years. As we stated above, the Service's belief that BTPD populations had increased since 1961 and that occupied area was larger in 2004 than 2000, weighed heavily in the decision to designate the species as "not warranted." With the removal of the BTPD from the ESA candidate list, most states with BTPDs interpreted the ruling as a sign that the species was stable if not increasing. Instead of following through with their pledges to conserve black-tailed prairie dogs, almost every state with BTPDs facilitated increased killing of the species. Increased prairie dog poisoning and shooting may very well be occurring on expanded though less dense, less populated, and less fit prairie dog colonies. Thus, the USFWS must consider these and other implications of continuing to use occupied area/habitat to assess prairie dog abundance.

Despite its substantial limitations as a measure of abundance, the occupied area estimate provided by the USFWS in its 2004 Not Warranted Finding tells us that BTPDs are absent from 98% of their range. This is a significant portion of their range by any standard and certainly must meet the ESA threshold for listing.

2. Selecting Appropriate Baselines to Determine Population Trends

Instead of using the best estimate of historic black-tailed prairie dog abundance, the USFWS used a 1961 estimate by the Bureau of Sport Fisheries and Wildlife (BSFW) as its baseline to assess population trends. The Service stated:

> We believe that the current Statewide estimates are likely more accurate than those provided in the 12-month finding, which were largely based on earlier data, extrapolation of partial surveys, telephone surveys, and desktop exercises. Collectively, the recent estimates represent the first broad benchmark of comparison for black-tailed prairie dog populations since the early 1960s (Bureau of Sport Fisheries and Wildlife (BSFW) 1961). (69 FR 51217, p. 51218)

The BSFW estimated that 147,000 hectares (364,000 acres) of occupied black-tailed prairie dog habitat existed in the United States in 1961. Using this figure, the Service argued that black-tailed prairie dog populations had actually increased to 745,400 hectares (1,842,000 acres) in the last 4+ decades instead of decreased over the last 2 centuries.

The BSFW estimate cannot be used as a benchmark to show a positive population trend to justify not listing the BTPD and removing it from the ESA Candidate list. The USFWS has made available a single 4-page document pertaining to this survey. The document includes a 1-page letter from the Acting Chief of the Predator and Rodent Control Branch of the BSFW ordering the

estimates from regional districts; a sample blank estimate table for the counties within each district; a letter to a Dale Combs of New Haven, Connecticut from the Chief of the BSFW Predator and Rodent Control Branch reporting the results; and a 1-page table reporting acreage estimates for each of the 4 U.S. species of prairie dog by state. There is nothing in this document that indicates the methods used to develop these estimates. We only know from the Acting Chief's letter that "mammal control and supervisors" will be making the estimates:

> District Agents are not expected to make personal projects of this inventory, since mammal control agents and supervisors should be able to make close estimates of infested acreages in their areas during the season. (BSFW 1961)

This direction not make the survey a "personal project," indicates that the BSFW did not spend much time on this survey. The results of this survey are simply not sufficient to make any determination about prairie dog abundance, especially for ESA decision-making purposes.

Additionally, there were tremendous eradication efforts leading up to the 1961 Bureau of Sports Fisheries and Wildlife Survey and continued poisoning in the 1960s. Neither strychnine nor Compound 1080 had been outlawed until 1972 and both were extremely effective in reducing BTPD acreage. In fact, the extremely high levels of rodent (and predator) control conducted in precisely the time period from which the USFWS proposes to draw a baseline inspired the Environmental Protection Agency (EPA) under President Nixon to restrict the use of these ecologically damaging toxicants. In addition, this issue inspired Congress to conduct joint hearings on predatory mammals and endangered species in 1972, which directly lead to the passage of the Endangered Species Act of 1973 (Rosmarino 2002).

In other words, the early 1960s likely represents an extremely low point for BTPD acreages, caused by threats such as poisoning and plague. We disagree with contrasting current acreages with the 1960s "rock bottom" status of this species. Such an exercise reveals nothing about whether current BTPD acreages and populations will ensure the survival of the species. Drawing an analogy with the Utah prairie dog, there were an estimated 3,300 Utah prairie dogs in 1972. There are now, perhaps, 8,000-10,000 adult individuals. While this is substantially higher than at the time of listing, the Utah prairie dog is by no means recovered and continues to endure serious declines. For the Utah prairie dog, 1972 was rock bottom and simply because the species is above rock bottom does not mean it is biologically secure.

More importantly, the black-tailed prairie dog warranted listing in 1961 if an ESA existed. The BTPD warranted listing in 1973 when the current ESA became law. Given that the 1961 BSFW survey indicates a BTPD recovery of a mere 1-2%, the species warrants listing today. The Service acknowledged that the BTPD has experienced a rangewide decline of at least 98% from its historic abundance. Because of the myriad of threats facing the species, described in more detail in subsequent sections of this petition, the species is not recovering to viable levels regardless of abundance in the early 1960s.

Many experts believe that black-tailed prairie dogs are continuing to decline, not increase (Knowles et al. 2002; Luce et al. 2006; Proctor et al. 2006; Miller et al. in press). A book chapter by Bob Luce, former chair of the Multi-State Prairie Dog Conservation Team, Rob Manes of the Wildlife Institute, and Bill Van Pelt, current chair of the Multi-State Prairie Dog Conservation Team—none proponents of prairie dog listing—stated:

> Regardless of designation, the inescapable conclusion is that prairie dog populations have declined sharply over the last 200 years, **are still declining today throughout much of the geographic range**, and need better conservation … . (Luce et al. 2006: 211)

If the USFWS is asking the public to reject the black-tailed prairie dogs estimate from the 2000 Warranted But Precluded Finding, the Service cannot expect us to accept the BSFW (1961) estimate. For its 2000 Finding, the Service used estimates from Knowles (1998) for occupied area estimates for Colorado, Kansas, Nebraska, New Mexico, Texas, and Wyoming; Sidle (US Forest Service, personal communication to the USFWS 1999) for North and South Dakota; Montana Department of Fish, Wildlife and Parks data from 1998 for its Montana estimate; and data from Lomolino (University of Oklahoma, USFWS in litt. 1998 reference) for Oklahoma's estimate (65 FR 5476: 5480-5482). To get his data, Knowles (1998) consulted with state and federal wildlife and public lands officials and other recent surveys, including his own (Hubbard and Schmitt 1984; Knowles 1995; Sager 1996; Paternoster 1997). John Sidle of the U.S. Forest Service used aerial transect surveys to estimate prairie dog acreage in North and South Dakota. The Montana Department of Fish, Wildlife and Parks commissioned Craig Knowles to conduct a prairie dog inventory that involved mapping all colonies in the state using GPS and GIS technologies. For Oklahoma, Mark Lomolino of the University of Oklahoma provided preliminary data from a comprehensive survey of know prairie dog colonies. For each state estimate provided in the 2000 Finding, we have more details about the methods used to develop the data than the 1961 BSFW survey. However, neither the 1961 nor the 2000 surveys and occupied area estimated provide sufficient baselines for determining BTPD population trends.

In the black-tailed prairie dog case, the historic baseline of 40 million hectares (100 million acres) already accepted by the USFWS or range of 30-100 million hectares (95-247 million acres) is the more appropriate baseline for assessing population trends, given the lack of information regarding the BSFW survey. The historic estimate, though rough, comes from a variety of sources and is accepted by a range of prairie dog experts.

3. Barriers to Large-scale Estimations of Occupied Area

In many areas, prairie dog colonies are sufficiently small and sparse to allow land managers to actually measure and map total area. All of the National Grasslands currently map their colonies, measuring each one using Global Positioning System (GPS) and Geographical Information Systems (GIS) technologies. However, at the statewide scale this approach may be impractical, though Montana did map all of its BTPD colonies in 1998. With the exception of Montana, all states within the BTPD range attempted to estimate statewide prairie dog occupied area. We are concerned that some methods used to generate the new, higher occupied habitat estimates substantially over-estimated the area actually occupied by prairie dogs and have not been adjusted to reflect inaccuracies. The states must develop standardized methods and protocols that improve the accuracy of population surveys. We cannot accept any kind of trend extrapolation or meta-analysis of the existing state data. We examine the New Mexico and Colorado surveys to reveal some of the problems with the state prairie dog surveys and emphasize the importance of testing the accuracy of survey data, particularly using field verification (i.e., field checking, ground-truthing).

a. Example 1: The New Mexico Remote Sensing Survey

The 2004 Finding cited a study by Johnson et al. (2003) that put the 2003 total estimate of occupied black-tailed prairie dog habitat in New Mexico at 24,000 hectares (60,000 acres). The Finding noted that the researchers intended to conduct ground-truthing of the results, which were based on remote sensing photographic data. Ground-truthing revealed that the original analysis of digital photographs overestimated occupied area by over 33%, and the researchers revised their 2003 estimate of occupied habitat in New Mexico to 16,188 hectares (40,000 acres) (Johnson et al. 2004). The 2000 Warranted But Precluded Finding described 16,000 hectares (39,000 acres) as New Mexico's occupied habitat estimate. The researchers issued their report with the more accurate but lower estimate on June 15, 2004—**two months before** the USFWS Not Warranted Finding came out, but the Finding does not include New Mexico's revised estimate.

Johnson et al. (2004) identified several reasons for the high error rate from the estimate based solely on the remote sensing analysis. The researchers stated:

> Of the 81 ground-truthed sites, predictions for 19 (23.5%) sites proved erroneous, either as false negatives (i.e., questionable designation, when the site was either an active or inactive BTPD town), or as false positives (i.e., town designation, when the site was not). (Johnson et al. 2004: 9)

Misinterpreting dots on the photos as prairie dog mounds when they were actually caused by human, cattle, or other disturbances other than prairie dogs was the researchers' most common cause of error. They mistook ant mounds for prairie dog burrows in 3 of the 19 sites determined to be erroneous. The researchers misidentified towns in smaller sites more often than larger sites, and had the highest error rate in regions with the fewest colonies. The New Mexico survey demonstrates why ground-truthing is essential to test the accuracy of prairie dog occupied area estimates and make adjustments to improve the accuracy of estimates. Kristine Johnson, lead researcher for the New Mexico survey, later confirmed that field verification is necessary to reduce error when conducting remote sensing surveys (K. Johnson, Director, Natural Heritage New Mexico, personal communication, 2007)

b. Example 2: The Colorado Aerial Transect Survey

In 2003, when the Colorado Division of Wildlife released the results of an aerial transect inventory of black-tailed prairie dog colonies in the state, some prairie dog experts became concerned that the methods used produced a substantial overestimation of the actual area occupied by active prairie dog colonies. The CDOW survey estimated that 256,000 hectares (631,000 acres) of active prairie dog area occurred in the state (White et al. 2005). Earlier estimates put Colorado's BTPD population at 17,800 hectares (43,985 acres) in 1998 (Knowles 1998) and 86,740 hectares (214,339 acres) in 2000 (EDAW 2000). White et al. (2005) made no attempt to verify the accuracy of their findings and delayed the release of their data for independent verification for over 2 years (Miller et al. 2005).

The USFWS used the 2003 CDOW estimate as the official Colorado BTPD population total for the 2004 Not Warranted Finding (cited in the 2004 Finding as Pusateri, CDOW, in litt. 2002; Russell, CDOW, in litt. 2003). That is one-third of the total occupied habitat that the USFWS reported in the 2004 Finding for the entire remaining BTPD range: 745,400 hectares (1,842,000

acres). Colorado's estimate was approximately 65% higher than the state with the 2nd largest reported BTPD population estimate: South Dakota with 165,000 hectares (407, 000 acres) of occupied habitat in 2004 (69 FR 51217). Prior to 2004, South Dakota was plague-free and is the only state to have a self-sustaining population of black-footed ferrets (Conata Basin) and 4 other ferret reintroduction sites. All known Colorado BTPD populations of significant size have experienced recurring plague epizootics for decades.

On the five large areas of federal lands in Colorado that have been accurately mapped using a GPS (Pawnee and Comanche National Grasslands, Rocky Mountain Arsenal NWR, Fort Carson and Pueblo Chemical Depot), prairie dogs occupy between 0.3-0.7% of the total landscape. This should be contrasted with the aerial survey (which estimates that 2% of eastern Colorado is occupied by prairie dogs) and the conclusion that unprotected private lands, including cropland, contain three to six times the area occupied on federal protected lands. County estimates range up to 8.3% – a greater percentage than is found even in areas with the best remaining prairie dog complexes in the country. In addition, some 87% of the 631,000 were in rural areas in eastern Colorado (CNR 2002). The Division of Wildlife has itself pointed out that rural colonies tend to have low-densities of BTPDs, due to routine poisoning and shooting by landowners (Weber 2001).

Colorado's *Conservation Plan for Grassland Species in Colorado* (Colorado Division of Wildlife and Colorado Grassland Species Working Group 2003: 14) cited the 2003 CDOW survey data in reporting that the state had 18 BTPD colony complexes over 2,000 hectares (5,000 acres). See the map from the CDOW Grassland Plan below.

Map 2. Colorado Black-tailed Prairie dog Complexes Derived from White et al. (2005) Data
(from *Conservation Plan for Grassland Species* Colorado Division of Wildlife and Colorado Grassland Species Working Group 2003: 18)

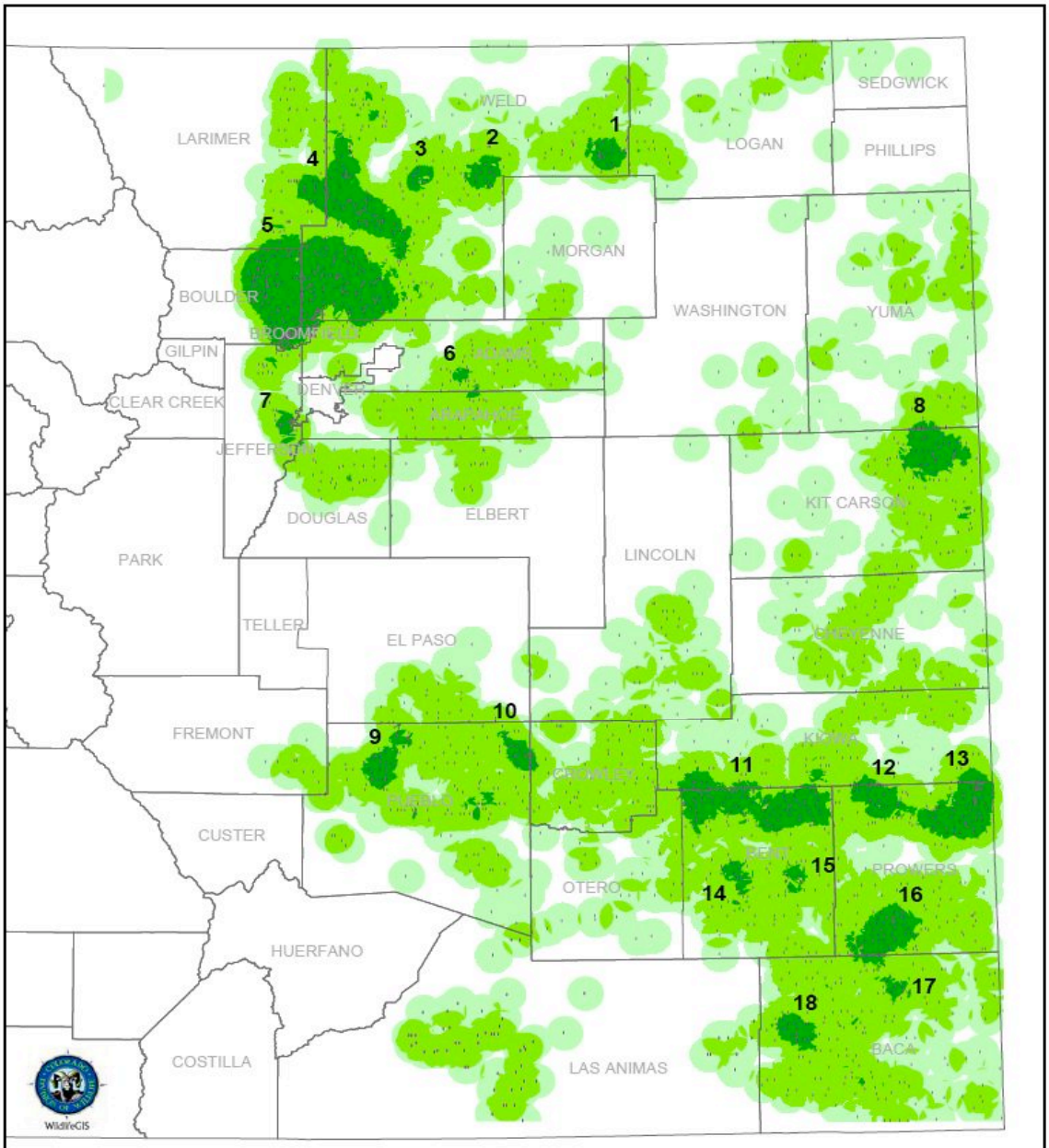


Figure 3: Black-tailed Prairie Dog complexes defined by densities of Prairie dog colonies on Colorado's eastern plains.

- Density >10 colonies/150Sq.Km.
- Density 3 - 10 colonies/150Sq.Km.
- Density 1 - 2 colonies/150Sq.Km.
- Observed Prairie Dog Colony

Number of colonies in complexes where Area > 5,000 acres and Density > 10 colonies/150SqKm:

1:	17 Colonies	10:	14 Colonies
2:	16 Colonies	11:	86 Colonies
3:	9 Colonies	12:	22 Colonies
4:	89 Colonies	13:	61 Colonies
5:	127 Colonies	14:	9 Colonies
6:	1 Colony	15:	5 Colonies
7:	6 Colonies	16:	39 Colonies
8:	38 Colonies	17:	4 Colonies
9:	24 Colonies	18:	17 Colonies

The USFWS repeated this colony complex number in its 2004 Finding. Eighteen is significantly more complexes than the combined total of colony complexes in all the states believed to have sufficient complexes to support black-footed ferrets. These states: Montana, South Dakota, Wyoming, and Chihuahua, Mexico reported 3, 4, 1, and 1, respectively, complexes greater than 2,000 hectares (5,000 acres). It is difficult to believe that Colorado has 18 such previously unreported complexes, given the diligence at which the USFWS's Black-footed Ferret Recovery Program has searched for BFF reintroduction sites throughout the entire BTPD range. The USFWS 2000 Warranted But Precluded Finding for the BTPD stated:

> Lockhart (U.S. Fish and Wildlife Service, in litt. 1998) reported that the recovery program for the black-footed ferret has identified on an ongoing basis since the 1980's those large prairie dog complexes potentially useful for reintroduction of the ferret. Both black-tailed and other prairie dog species are considered. One necessary criteria [*sic*] for these sites is that they contain approximately 10,000 acres (4,000 hectares) of prairie dog occupied habitat. In the late 1980's, the Black-footed Ferret Interstate Coordinating Committee identified dozens of potential sites that may have qualified as suitable for ferret. However, by 1994 only 16 sites were identified and by 1998 this number was reduced to 10 sites (7 being black-tailed prairie dog sites). (65 FR 5476: 5480)

Though the 18 complexes that Colorado identified are smaller than the 4,000 hectare standard for the ferret program in 1989, the recovery program has been searching for smaller sub-complex sites that are up to 20% less than the earlier standard since 1991 (Biggins et al. 2006). An evaluation of potential BFF reintroduction sites published in 2006 used the 2000 EDAW survey, not the 2003 CDOW survey to identify potential ferret sites in Colorado (Luce 2006). Bob Luce explained later that he chose to use the EDAW data instead of the White et al. (2005) data because he knew that the White et al. (2005) survey was controversial, so he opted for the more conservative data (B. Luce, personal communication, email, 2007).

More importantly, colony complex locations, sizes, and densities cannot be derived from the White et al. (2005) data, as CDOW did in its grasslands conservation plan. The survey methodology used was a mere sampling of colonies to estimate a total area for the state. The study did not measure colony size or proximity (R. Reading, Conservation Biology Director, Denver Zoological Foundation, personal communication, 2007). Thus, mapping actual colony complexes by size and location in the state was an inappropriate use of the Colorado survey data, and the information is incorrect.

Moreover, Colorado is ranked by independent scientists behind other states in terms of area within the historic BTPD range and potential BTPD habitat. See the tables below.

Table 2. State Comparison of Area within the Historic Range of the Black-tailed Prairie Dog

RANK	STATE	AREA IN HISTORIC RANGE (hectares)	AREA IN HISTORIC RANGE (acres)
1	Texas	33,813,200	83,554,237
2	Montana	24,540,000	60,639,661
3	New Mexico	20,036,400	49,511,023
4	Nebraska	16,787,300	41,482,322
5	Kansas	14,740,800	36,425,310
6	South Dakota	13,460,900	33,262,608
7	**Colorado**	**11,513,300**	**28,449,984**
8	Oklahoma	9,239,100	22,830,313
9	Wyoming	8,501,300	21,007,170
10	North Dakota	5,266,700	13,014,299
11	Arizona	1,796,400	4,439,001

(data from Proctor et al. 2006)

Table 3. State Comparison of Black-tailed Prairie Dog Potential Habitat

RANK	STATE	POTENTIAL HABITAT (hectares)	POTENTIAL HABITAT (acres)
1	Texas	22,857,200	56,481,371
2	New Mexico	16,040,600	39,637,186
3	Montana	13,958,100	34,491,216
4	South Dakota	8,140,200	20,114,872
5	**Colorado**	**8,016,100**	**19,808,214**
6	Kansas	7,156,900	17,685,085
11	Wyoming	7,006,700	17,313,933
7	Nebraska	4,655,000	11,502,756
8	Oklahoma	4,293,700	10,609,964
9	North Dakota	2,651,500	6,551,999
10	Arizona	1,379,800	3,409,560

(data from Proctor et al. 2006)

While these comparisons do not invalidate the Colorado White et al. (2005) survey, they indicate that the survey procedures for data collection and analysis must be assessed more closely.

Miller et al. (2005) conducted field verification of the CDOW/White et al. (2005) BTPD survey for a small sample of transects surveyed by White et al. (2005). The authors stated that, "Our fieldwork demonstrated that the estimate by White et al. (2005) was based on data with substantial errors as well as overestimation biases that will be repeated if protocols are not modified for future surveys" (p.1444). Miller et al. (2005: 1444) summarized their findings:

- 25.4% of the total length of the colony intercepts we examined was incorrectly classified as being a prairie dog colony (these segments had no prairie dog burrows of any age)
- 50.3% of the length of examined intercepts fell on currently inactive colonies or portions of colonies (vacant burrows but no living prairie dogs)
- 24.3% fell on active prairie dog colonies with signs of living prairie dogs at our examinations 2 years after the survey reported by White et al. (2005)
- in Bent and Kiowa counties, where plague (*Yertsina pestus*) [*sic*] and poisoning were active, we examined 36.9 km of reported active prairie dog intercepts and subjectively classified only 1.6% as active at normal-appearing prairie dog densities

White et al. (2005) counted all prairie dog colonies with any evidence of activity as "active." Miller et al. (2005) criticized this approach because it would count as active colonies that were sparsely populated or even mostly inactive, a common result of plague, poisoning, or shooting. Miller et al. (2005: 1448) suggested a modification of this approach:

> [W]e recommend a more ecologically meaningful definition of what constitutes an active colony. A colony sparsely inhabited by prairie dogs likely does not fulfill its ecological function (Kotliar 2000, Miller and Reading 2005 [2006]). We do not believe meaningful estimates of prairie dog abundance are possible if intercepts many

> kilometers long include large areas with only inactive burrows. The Wyoming Game and Fish Department currently classifies colonies as "healthy" only if >50% of the colony shows signs of living prairie dogs and as "human-modified" if <50% shows such signs (M. Grenier, Wyoming Game and Fish Department, personal communication). All colonies in our study and most colonies in Wyoming clearly were either much more or much less than this 50% threshold, so this classification was not difficult to make (M. Grenier, Wyoming Game and Fish Department, unpublished data). We recommend such an approach for future surveys using aerial transect techniques for prairie dogs.

Miller et al. (2005) pointed out that in some cases, intercepts counted as active, occupied area violated the White et al. (2005) protocol because they were counted as active when prairie dogs occurred only on 1 side of the intercept; the protocol directed that both sides must be active to be counted.

White et al. (2005) based their survey on methods described in Sidle et al. (2001) for conducting prairie dog aerial transect surveys. This is a generally accepted method for estimating occupied area on a large-scale. Miller et al. (2005: 1444) cautioned that, "Accuracy of data collected, however, depends on the protocol used, observer rigor in following the protocol, and observer ability to correctly identify and classify prairie dog colonies." They also indicated that recent plague and poisoning—both occurring in Colorado at the time of the CDOW survey—could also lead to over-counting of occupied area. Sidle et al (2001) used their method to survey colonies in the Northern Plains. Most of the colonies they surveyed occurred on public and tribal lands, where poisoning was not occurring, and in areas where plague was not prevalent: North Dakota, South Dakota, and Nebraska, though the survey also included Wyoming. And, as discussed in the North Dakota section below, ground-truthing of Sidle's survey results has substantiated that aerial survey method, used alone, can lead to significant over-estimation of occupied BTPD acreage.

Miller et al. (2005: 1450) concluded:

> We believe credible estimates of prairie dog abundance in Colorado cannot be made using the aerial survey technique reported by White et al. (2005) until the issues we identified are addressed. During future surveys some of the problems and errors we found could be avoided or quantified by conducting replicate surveys in selected counties or using ground examinations of reported intercepts. The misclassification errors and protocol violations we found likely would have been detected if CDOW had conducted independent, replicate surveys using different observers. Knowledge that such re-surveys would be conducted also might encourage observers to be more rigorous in applying established protocols. Problems associated with not differentiating between inactive and portions of colonies and with classifying low-density activity as equivalent to normal activity, however, will not be resolved until survey protocols are modified.

Colorado modified its protocol for estimating BTPD occupied area in the state in 2006 (Colorado Division of Wildlife 2006), a tacit admission that its earlier protocol was inadequate. The protocol now includes ground-truthing, among other modifications. This protocol was used to estimate prairie dog occupancy in the summer of 2006, but CDOW has not yet released these data to the public (Eric O'Dell, Colorado Division of Wildlife, personal communication, 2007). The USFWS

must address the critique of the White et al. (2005) survey by Miller et al. (2005) and evaluate these new data in the review of this petition and development of new finding on the BTPD.

Potential overestimation in the Colorado survey was brought to the USFWS's attention prior to the 2004 Not Warranted Finding; the Service noted in its 2004 Species Assessment and Listing Priority Assignment Form:

> Rosmarino (Forest Guardians et al., in litt. 2003b) disagreed with the Statewide estimate, suggesting that until vigorous ground-truthing is completed, estimates of occupied habitat for Colorado and other States must not be presumed accurate. The NWF also has expressed concerns regarding the CDOW estimate (Miller, NWF, in litt. 2004). Miller (2004) compared estimates of occupied habitat on National Grasslands (NG) from CDOW and USFS. Miller (2004) noted that at Comanche NG, USFS estimates were 58 percent of CDOW estimates and at Pawnee NG, USFS estimates were 68 percent of CDOW estimates. (USFWS 2004: 11)

Sterling Miller of the National Wildlife Federation, cited above, communicated his intention to USFWS before release of the 2004 Finding to conduct ground-truthing of sample areas to help field-verify the CDOW data. As described above, Miller's published study confirmed substantial over-estimation bias in the Colorado survey (Miller et al. 2005). The USFWS did not address concerns about the 2003 Colorado survey accuracy in its 2004 Not Warranted Finding, but used the Colorado data without qualifications or adjustments, despite Colorado's estimates being wildly incongruous with prairie dog distribution knowledge amassed over twenty years of effort related to the ferret recovery program. The Service responded to concerns about the Colorado survey in its 2004:

> If the Statewide numbers are actually 58 or 68 percent of the estimate, this is still substantially higher than most previous Statewide estimates. Discrepancies may be related to protocol violations or limitations in the ability to differentiate between active and inactive colonies. Limited ground-truthing of 2002 CDOW estimate was recently undertaken by the NWF (Miller, NWF, in litt. 2004), but due to limitations in the study design, a correction factor will not be presented. Despite known or suspected limitations, this inventory represents the best scientific and commercial data available. (USFWS 2004: 11)

The limitations of the Colorado survey were definitely known and not merely suspected in 2004 by the USFWS. Given this knowledge, the Service should have rejected the 2003 CDOW data and used the EDAW (2000) survey, qualified their use in the 2004 Finding by acknowledging that they were not accurate, or adjusted the Colorado occupied area figure by providing a range of official estimates or averaging the most recent state estimates, listed above. Because the Colorado estimate made up over 30% of the official total range-wide estimate for 2004, this survey was likely a significant factor in the Service's not warranted decision.

c. Current State Survey Data are Unreliable

Until there are reliable current area estimates or actual population estimates for the states that have not conducted vigorous ground-truthing the estimates provided by the states must not be presumed as accurate. Methods must at a minimum distinguish between 1) inactive versus active colonies; and 2) low-density versus high-density populations. It is premature to conclude that BTPD

acreages have steadily risen over the past decades given the problems with survey data. Certainly, the extensive BTPD extermination efforts in the 1980s and current control activities counter the perception that BTPDs have been on a steady upswing.

KANSAS

The Kansas Black-Tailed Prairie Dog Conservation and Management Plan includes, as Appendix III, a brief report by J.S. Pontius (2002) that estimates BTPD acreage in Kansas to be 52,609 hectares (130,521 (± 17,023) acres), based on aerial transects flown in four quadrants within Kansas (22 – 33 transects flown per quadrant) (Kansas Black-tailed Prairie Dog Working Group 2002). The USFWS used this figure for the 2004 Not Warranted Finding. However, this study did not incorporate field verification of aerial surveys. Ground truthing was deemed "entirely too difficult" (see Kansas Plan, p. 11) because most of the land inhabited by BTPDs in Kansas is privately owned. Rather than conduct ground truthing on a sample of transects, an undisclosed number of the aerial transects were reflown for the purpose of comparing the results of different observers. An estimate of inter-observer accuracy is not provided in the Plan. Also cited in the Plan are other relatively recent (late 1980s and early 1990s) studies, which produced estimates of 25,025 – 46,542 acres of BTPDs (see references cited in Plan).

MONTANA

Montana Fish, Wildlife and Parks continues to estimate 90,000 acres of BTPDs statewide (including 28,000 acres on tribal lands) (Puchniak, MDFWP, personal communication - email, 2007). This was the official estimate in the 2004 Finding. This estimate is an increase from the 1998 estimate of 66,000 acres, but the increase is not supported by data. The 1998 estimate comes from actual mapping all of the colonies in the state (FaunaWest Wildlife Consultants 1998) that were previously located and measured in a search for black-footed ferrets (Campbell 1989). Plague is widespread in Montana, and epizootics have caused prairie dog die-offs in several regions around the state in the last few years. For example, an additional 6,000 prairie dog occupied acres were found on the Crow Reservation (Montana prairie dog working group 2000), but a 2002 plague event may have eliminated most of this additional acreage. Until new towns are mapped and shown to be occupied, the previous estimate of 66,000 acres is a more accurate statewide estimate (including tribal lands) than 90,000 acres. In addition, plague and illegal poisoning on public lands have contributed to local losses not reflected in this total.

NEBRASKA

The USFWS used an estimate provided by the Nebraska Game and Parks Department of 55,000 hectares (137,000 acres) for the 2004 Finding (USFWS citing Fritz, Nebraska Game and Parks Department, personal communication, 2004). Fritz indicated that the state followed a methodology similar to Colorado's. We described the extensive problems with that survey above, including verification of the results via field-testing. Fritz communicated to the USFWS in 2004 that the Nebraska Game and Parks Board of Commissioners suspended additional work to conserve BTPDs, including ground-truthing of the survey results. Previous Nebraska estimates included a survey by the University of Nebraska-Lincoln reporting prairie dogs inhabit between 27,000 and 44,000 acres, versus the previous estimate of 65,000 and 80,000 acres. In 2001, the Nebraska Game and Parks Commission (NGPC) reported the existence of 4 large black-tailed prairie dog complexes (acreage: 2,865; 16,014; 3,708; and 2,108 acres) of prairie dog colonies. These complexes contained

between 8 and 35 colonies. In each complex between 75% and 100% of colonies underwent control in the early 2000s (NGPC 2001a: 9-10). Therefore, prairie dog density within these few complexes is probably low, making it questionable as to whether the acreage estimates are an accurate reflection of BTPD abundance in Nebraska, or whether these complexes could support black-footed ferret reintroductions in the near future.

NORTH DAKOTA

For North Dakota's 2004 Finding estimate of 8,000 hectares (20,000 acres), the USFWS used a figure based on field verification (Knowles 2003) of the 2001 aerial survey data developed by Sidle et al. (2001) (cited by the USFWS as McKenna, North Dakota Game and Fish Department, in litt. 2003). Knowles' 2003 estimate included: 4,188 hectares (10,348 acres) in 379 colonies on private, Forest Service and state land; 405 hectares (1,000 acres) in Theodore Roosevelt National Park; and an estimated 6,000 acres in 137 colonies on Standing Rock Reservation and 4 colonies on Ft. Berthoud Reservation. Knowles ground-truthed prairie dog town references from the Prairie Dog Shooters Guide, data from BTPDs mapped during antelope trend counts, previously known colony data, and an aerial survey. He checked 600 previously known colonies and found that 400 were still active. The previous state estimate by Sidle et al. (2001) indicated that active BTPD colonies cover 13,990 ± 2,160 hectares (34,570 ± 5,338 acres). Inactive colonies covered an additional 2,780 ± 1,120 hectares (6,870 ± 2,768 acres), or 19.9% of the total (active and inactive) colony area. The relatively large discrepancy between the Knowles ground-truthed estimate and the Sidle aerial survey estimate should add caution to accepting the accuracy of the aerial survey estimates in this and other states prior to ground-truthing at least a portion of the aerial survey data. In November 2006, Craig Knowles reported to the Montana Prairie Dog Working Group that through his 2006 mapping efforts in North Dakota he found that about half the colonies previously mapped had been poisoned, including the largest colony of 182 hectares (450 acres) (Montana Prairie Dog Working Group 2006: 7).

OKLAHOMA

The USFWS set the Oklahoma BTPD occupied area estimate at 26,000 hectares (64,000 acres) based on Julianne Hoagland's communication of the results of an aerial survey (cited by USFW as Hoagland, Oklahoma Department of Wildlife Conservation, personal communication, 2003). Hoagland also communicated that the state was to begin field verification of the estimate in March 2003. The USFWS failed to include this information in the 2004 Finding and failed to include reference to a follow-up letter received from Greg Duffy that provided an interim report of the ground verification results. The letter stated, "To date, 496 towns, occupying 38,7140 acres, have been confirmed active in 50% of the Oklahoma panhandle" (G. Duffy, Director, Oklahoma Department of Wildlife Conservation, letter to USFWS dated November 26, 2003). The USFWS's Administrative Record on the BTPD contains no record of follow-up with the Oklahoma Department of Wildlife Conservation to receive the final results of the ground-truthing effort. Surveys since 1989 have focused only on the panhandle region of the state.

An earlier survey by Lomolino and Smith (2001) indicated that the majority of current prairie dog acreage is now in the panhandle region of the state (Cimarron, Texas, and Beaver Counties). However, over the past decade, prairie dog acreage in these three counties has experienced the largest absolute declines. Lomolino and Smith (2001) further estimate that, in 1998 (the time of their survey), prairie dog acreage represented approximately 1% of the BTPD's historic range in

Oklahoma. In the body of the state, these authors estimate that the BTPD currently covers 0.003% of available land surface. In the three panhandle counties, the estimates are 0.156%, 0.165%, and 0.159% for Beaver, Texas, and Cimarron Counties, respectively. In contrast, historically, BTPDs are estimated to have covered 3.9% of the available land surface within the historic range of the species statewide. In addition to the decline in total BTPD acreage in Oklahoma, the mean size of prairie dog towns has decreased substantially from 1989 to 1998 (Lomolino and Smith 2001). These authors suggest that the declines in the past decade in BTPD acreage cannot be attributed solely to plague outbreaks.

TEXAS

The USFWS reported Texas' BTPD estimate to be 72,000 hectares (178,000 acres) (USFWS citing Holdstock, Texas Parks and Wildlife Department, in litt., 2003). The Texas data were derived from analyses of digital ortho-photo quadrangles and ground-truthing. On March 23, 2005, John Young of the Texas Parks and Wildlife Department reported that the best estimate of BTPD occupied area for 2004-2005 was 46,539 hectares (115,000 acres). However, it is unclear from Young's letter the extent of the new Texas estimate. The last rangewide estimate for Texas occurred during the 1970s when Cheatheam (1977) found prairie dogs in 89 of the 108 counties of the original Texas BTPD extent (Bailey 1905).

There have likely been low and high peaks in prairie dog acreages at the state and regional levels over the past few decades that have not been discerned due to the lack of systematic surveys. Now that the states are beginning to take survey efforts more seriously, the potential exists to precisely describe population *trends* across time. However, we are at the beginning of that process, not the end. We therefore disagree with the USFWS's supposition that we can reliably depict population trends from the 1960s onward.

4. Measuring Distribution

In the 2004 Not Warranted Finding, the USFWS tried to quantify BTPD population distribution in 2 ways. First, the Service tallied colony complexes >2,000 hectares (>5,000 acres) and those >400 hectares (>1,000 acres) by state, as reported by state wildlife officials and others. Second, it assessed whether states had black-tailed prairie dogs in more than 75% of counties within the historic BTPD range. A state with BTPDs in more than 75% of its relevant counties apparently had sufficient prairie dog distribution, according to the USFWS. We agree that an assessment of large colony complexes per state is vital, but the county percentage metric as used by the Service is problematic for several reasons.

According to the 2004 Finding, all states except Arizona had BTPDs in 75% of their counties. To make this assertion for Kansas, Nebraska, New Mexico, Oklahoma, Texas, and Wyoming, the USFWS relied on a 2002 letter to Pete Gober of the USFWS from Bob Luce, the Interstate Coordinator of the interstate/inter-agency Prairie Dog Conservation Team (cited as Luce, Prairie Dog Conservation Team Interstate Coordinator, in litt. 2002c). First, Luce clearly stated in his letter that Nebraska did not have black-tailed prairie dogs in 75% of its counties within the historic range (see p. 2). Second, it is not at all clear from Luce's letter how this information was obtained.

Encouraging prairie dog recovery in all counties within the historic range of the black-tailed prairie dog is an appropriate goal for the states. But the 75% threshold for determining sufficient

distribution is meaningless. It certainly was not an adequate basis for the BTPD not warranted decision. For example, only 1 small prairie dog colony per county could occur in 75% of a state's counties and the Service could still consider this sufficient distribution.

D. Black-tailed Prairie Dog Population Trends

1. The Black-tailed Prairie Dog has become Extinct in a Significant Portion of its Range and is in Danger of becoming Extinct in Significant Portions of its Remaining Range

According to the USFWS, at least 20% of the BTPD's historic range has been lost due to range contraction (65 FR 5476, p. 5479). Range contractions have occurred in the southwestern and eastern portions of the species' range.

The black-tailed prairie dog is nearly extinct within the Chihuahuan Desert region of its historic range. The species is extinct from Arizona. In New Mexico, BTPDs are nearly extinct from their entire historic range west of the Pecos River.[4] They are also nearly extinct in Sonora, Mexico and the Chihuahuan Desert region of western Texas. Range contractions have also occurred in western Texas. The Service stated in its 2004 Finding,

> Range contractions have occurred in the southwestern portion of the species' range in Arizona, western New Mexico, and western Texas through conversion of grasslands to desert shrub lands (Pidgeon *et al.* 2001). (69 FR 51217, p. 51218)

Until recently, BTPD populations near Janos, Mexico in the state of Chihuahua were considered one of the largest, if not the largest, complexes in all of North America. However, drought, livestock overgrazing, and farming caused the loss of most of the prairie dogs in the region in recent years (more details on this below).

Oakes (2000) confirmed that the loss of prairie dogs, and suitable habitat for prairie dogs, from Arizona and southwest New Mexico was due to poisoning. Oakes concluded that the black-tailed prairie dogs subspecies in the Chihuahuan Desert ecoregion (*Cynomys ludovicianus arizonensis*) is particularly vulnerable to habitat loss due to poisoning and other factors because the region is more vulnerable to erosion than the BTPD range within the Great Plains prairie grasslands.[5] Oakes' (2000) data demonstrated that prairie dog poisoning and the loss of prairie dogs from her study area in Arizona and New Mexico caused the shift from grasslands to shrublands. Oakes' research showed that prairie dog poisoning, in isolation from other threats to the species, can cause significant—and permanent—population losses in significant portions of the species' range.

Knowles et al. (2002: 243-244) described range contractions in Montana and North Dakota.

---

[4] A few private landowners have reintroduced prairie dogs onto private reserves in BTPD habitat west of the Pecos River in New Mexico. For example, Ted Turner's Armendaris and Ladder Ranches near Truth or Consequences, New Mexico support reintroduced BTPDs at 24 hectares (60 acres) and 16 hectares (40 acres), respectively, in 2005 (Joe Truett, Senior Biologist, Turner Endangered Species Fund, email to Pete Gober, USFWS, February 6, 2005). They have also been reintroduced on the Gray Ranch.

[5]The USFWS does not consider the *arizonensis* subspecies a distinct population segment.

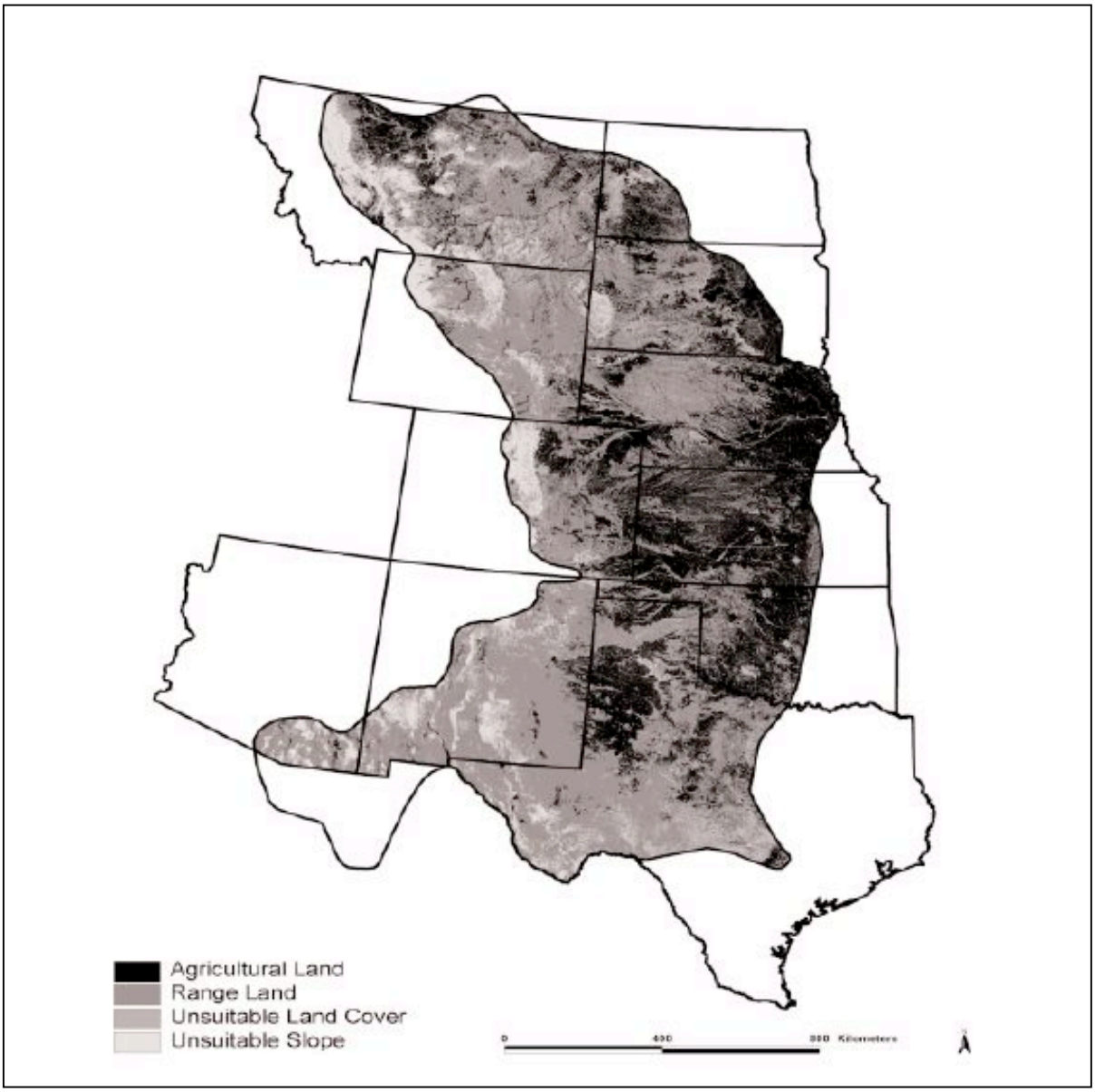
> In North Dakota, Bailey (1926) noted that black-tailed prairie dogs occurred along the Missouri River bottomlands from the Standing Rock Reservation to the confluence of the Yellowstone River near Montana. This same area today does not have any prairie dogs (Knowles et al. 2002). Moreover, prairie dogs have been virtually eliminated from a large agricultural area in the central portion of their range distribution in North Dakota. Prairie dog distribution in North Dakota is now limited to the Little Missouri River corridor, and the Standing Rock Indian Reservation and adjacent areas north of the Reservation.
>
> In Montana, prairie dogs have been greatly reduced on the northern and western portions of their range. For example, Coues (1875) described the prairie dog as common when crossing northern Montana between the Milk River and the Canadian border. This same area today contains only about a dozen colonies. A similar situation exists in the western range distribution of prairie dogs in Montana. From Shelby south to Whitehall, less than 20 prairie dog colonies remain. Cooper (1868 and 1869) described prairie dog colonies along the Missouri River from Fort Benton to the Dearborn River, while the Lewis and Clark Expedition reported prairie dogs along the Jefferson River near Whitehall (DeVoto 1953). Now prairie dogs are entirely gone from these areas of the Missouri River and Jefferson Rivers. Additionally, Stuart (1902) on his trip down the Yellowstone River to the Bighorn River used the words "many" and "plenty" to describe prairie dogs. Today there are only 5 known colonies in this same reach of the River, and another 5 colonies are known to exist on the Yellowstone River bottomlands from the Bighorn River to the Missouri River (FaunaWest 1998). As in North Dakota, the best prairie dog habitat in Montana is now used for agricultural croplands.

Both the Service's 2000 Warranted But Precluded Finding and the 2004 Not Warranted Finding cited GIS data from the Black-footed Ferret Recovery Foundation to conclude that 37% of BTPD historic range has been converted to cropland (65 FR 5476: 5479; 69 FR 51217: 51221). The 2000 Finding attributed this loss to just the U.S. historic range and added,

> This habitat loss is essentially permanent and not considered a range contraction in the usual sense occurring at the periphery of a species' range. Although the species will occupy abandoned tilled ground, these lands are generally unavailable for use by the species because the land is continuously disturbed and thus the habitat is lost permanently. (65 FR 5476: 5479)

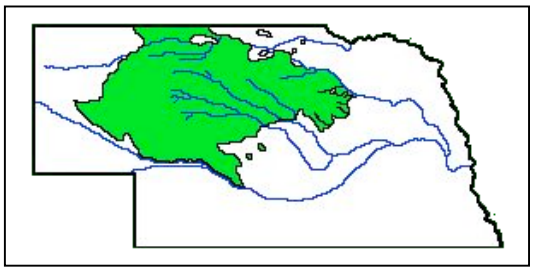
Proctor et al. (2006) also conducted a GIS analysis to determine that 37,600,000 hectares (92,900,000 acres)—33%—of the entire BTPD historic range has been converted to cropland.

Map 3. Agricultural Lands within Historic Black-tailed Prairie Dog Range*
(Source: Luce 2003: 53, Appendix G: Suitable Black-tailed Prairie Dog Habitat (Rangeland) in the U.S. in 2002)



* Note: In this map the Nebraska Sandhills—a large, 5,076,400 square hectare (19,600 square mile) region in central-west Nebraska appears as if it might be suitable BTPD habitat. See map below. This is unsuitable BTPD habitat and devoid of prairie dogs because the sandy soil types would not support prairie dog burrows.

Map 4. The Nebraska Sandhills



Permanent loss of habitat due to conversion of native grassland to cropland continues to occur in Chihuahua, Mexico (List 2006; Manzano-Fischer et al. 2006; A. Davidson, Instituto de Ecología Universidad Nacional Autónoma de México, personal communication, 2007). Additionally, the demand for corn-based ethanol is increasing land put in production for crops throughout the US, including the Great Plains.

In its 2004 Not Warranted Finding, the USFWS argued that BTPD population losses due to destruction or modification of the species' habitat were not significant. The Service completely ignored the range contractions and habitat losses that have already occurred in its decision—losses that the Service acknowledges have occurred. With the 33-37% loss of the species habitat to cropland and the other range contractions that have occurred in Arizona, Montana, New Mexico, North Dakota, Texas, and the state of Sonora in Mexico plus urbanization is significant BTPD habitat across the range and especially along Colorado's Front Range, the black-tailed prairie dog is likely extinct from possibly 40-50% if not more of its former range. This equates to a significant portion of the species' range by any standard. Moreover, the species is threatened with extinction in its remaining habitat.

2. Black-tailed Prairie Dog Populations have Declined to a Minute Percentage of their Historic Size

Again, the Service argued in the 2004 Not Warranted Finding that significantly more prairie dogs existed than they believed in 2000, when it issued its Warranted But Precluded Finding. Given the Service's estimate of 311,000 hectares (768,000 acres) of occupied area in 2000 and 745,400 hectares (1,842,000 acres) in 2000 compared to the Service's historic estimate of 40 million hectares (100 million acres), the difference in prairie dog decline in occupied area is >99% in 2000 and >98% in 2004. In the historic context, this is not a significant difference. The table below provides a state and country comparison of population losses to emphasize that using the lower or higher historic and current occupied area estimates make little difference in determining the overall population trend. The data show overwhelmingly that black-tailed prairie dog populations declined dramatically over the last 100-150 years and are largely absent from a significant portion of their historic range.

Table 4. Black-tailed Prairie Dog Occupied Habitat in North America

ENTITY	AREA WITHIN HISTORIC RANGE*	HISTORIC OCCUPIED AREA ESTIMATE**	USFWS 2000 FINDING ESTIMATE	USFWS 2004 FINDING ESTIMATE	% OF REMAINING OCCUPIED AREA
Arizona	**1,796,400 – 3,446,598** 4,439,001 – 8,516,730	**263,046 – 278,000** 650,000 – 686,953	**0**	**0**	**0**
Colorado	**11,513,300 – 13,415,977** 28,449,984 – 33,151,600	**1,214,057 – 2,832,799** 3,000,000 – 7,000,000	**43,000** 93,000	**255,357** 631,000	**1.33 – 21**
Kansas	**14,740,800 – 15,433,254** 36,425,310 – 38,136,400	**809,371 – 1,011,714** 1,976,843 – 2,500,000	**17,000** 42,000	**52,609** 130,000	**1.68 – 6.5**
Montana	**24,540,000 – 26,766,070** 60,639,661 – 66,140,400	**595,293 – 2,428,114** 1,470,277 – 6,000,000	**26,000** 65,000	**36,422** 90,000	**1.08 – 6.1**
Nebraska	**16,787,300 – 18,906,630** 41,482,322 – 46,719,300	**2,428,114** 6,000,000	**24,000** 60,000	**55,442** 137,000	**.10 – 2.3**
New Mexico	**20,036,400 – 21,787,708** 49,511,023 – 53,838,600	**2,687,113 – 3,480,000** 6,640,000 – 8,599,267	**16,000** 39,000	**24,281 (16,187)^** 60,000 (40,000)^	**.45 – .61**
North Dakota	**5,266,700 – 4,596,177** 13,014,299 – 11,357,400	**809,371** 2,000,000	**10,000** 25,000	**10,117** 25,000	**1.25**
Oklahoma	**9,239,100 – 10,056,398** 22,830,313 – 24,849,900	**384,451** 950,000	**3,600** 9,000	**25,900** 64,000	**.95 – 6.74**
South Dakota	**13,460,900 – 14,178,769** 33,262,608 – 35,036,500	**711,033** 1,757,000	**60,000** 147,000	**164,707** 407,000	**8.37 – 23.17**
Texas	**33,813,200 – 37,655,230** 83,554,237 – 93,048,100	**23,471,767** 58,000,000	**29,000** 71,000	**72,034** 178,000	**.12 – .31**
Wyoming	**8,501,300 – 15,116,749** 21,007,170 – 37,354,300	**6,474,970** 16,000,000	**51,000** 125,000	**50,586** 125,000	**.78**
Canada	**854,800** 2,112,257	**6,070** 15,000	**800** 2,000	**1,048** 2,589	**13.33 – 17.27**
Mexico	**3,796,100** 9,380,367	**560,085** 1,384,000	**36,000** 90,000	**19,830** 49,000	**3.54 – 6.50**
US Total	**159,695,400 – 181,359,560** 394,615,928 – 448,149,230	**31,964,000 – 43,502,493** 78,984,764 – 107,497,000	**279,600** 676,000	**745,431** 1,842,000	**.63 – 2.3**
North America	**164,346,300 – 181,359,560** 406,108,552 – 448,149,230	**31,964,000 – 44,068,648** 99,867,000 – 108,896,000	**316,400** 768,000	**775,782** 1,893,589	**.71 – 2.40**

Hectare measures in bold font.

* Source: USFWS 2000 BTPD Finding, Proctor et al. 2006

** Source: USFWS 2000 BTPD Finding, USFWS 2004 BTPD Finding, Proctor et al. 2006

^ Revised estimate from New Mexico in parentheses.

The USFWS's contention that the BTPD deserved listing at 1% of its former population size in 2000 and then was sufficiently recovered to not warrant listing at 2% of its former population size in 2004 has no basis in science. Given the Service's own contention that black-tailed prairie dogs are absent from 98% of their original range and the other facts and figures cited above, the species clearly warrants listing under the ESA. Furthermore, As Knowles et al. (2002) and Miller et al. (in press) emphasize, a compelling indicator of BTPD population decline is the fact that insufficient numbers of prairie dogs and prairie dog colony complexes exist to support sustainable populations of other species that depend on them. In particular, the near extinction of the black-footed ferret—a species that depends completely on prairie dogs and their colonies—and the ability of the USFWS's black-footed ferret recovery program to achieve only a percentage of its goal of 10 self-sustaining BFF populations is a major indicator that prairie dogs have declined to the point of functional extinction. We examine this issue more thoroughly below.

3. In the Black-tailed Prairie Dog's Remaining Habitat, the Species Exists in Fragmented and Isolated Remnants.

The USFWS acknowledges that the black-tailed prairie dog is now absent from 98% of its historic range. Instead of its natural distribution pattern of a mix of many large complexes, small colonies, and isolated complexes assorted across 18-25% of its available range, the species exists in minute remnant patches across its range. Though the Service reported that the BTPD population was somewhere between 3 million and 33 million animals dispersed on 745,400 hectares (1.8 million acres), large numbers of prairie dogs in absolute terms does not mean that the species is viable. As stated by Knowles et al. (2002: 221):

> Since prairie dogs are a highly colonial species, the reduction in size and number of colonies represents a reduction in distribution even though geographic range distribution has not decreased proportionately to the reduction in numbers. Although the black-tailed prairie dog still occurs over a vast region and numbers in the millions, its colonial characteristics make it vulnerable to impacts identified in the five [ESA] listing criteria.

The combination of habitat destruction, poisoning, shooting, and plague caused the breakup of large black-tailed prairie dog colony complexes and the fragmentation and isolation of colonies. These threats have also caused colonies to become smaller (Proctor et al. 2006; Lomolino and Smith 2001; Lomolino et al. 2003). Thus, the North American black-tailed prairie dog population has not only declined but these **threats have completely altered the species' population dynamic by breaking down the colony complex distribution pattern across its range**. The fragmentation of a species' population into small, isolated sub-units is a—perhaps **the**—major indicator that the species is moving toward extinction (MacArthur and Wilson 1967; Shaffer 1981; Wilcox and Murphy 1985; Gilpin and Soulé 1986; Wilcove et al. 1986; Clark 1989). The loss of the colony complex system throughout all but a few pockets of the remaining BTPD range and continued fragmentation, isolation, and shrinkage of black-tailed prairie dog colonies indicate that the species has entered what conservation biologists call an "extinction vortex" a threshold where fragmentation perpetuates fragmentation and the populations loses resiliency (Gilpin and Soule 1986).

Additionally, because prairie dogs have relatively low reproductive rates, they are particularly sensitive to extinction forces. As confirmed by Miller and Cully (2001: 891-892):

> Interspecific comparisons based on field studies of reproductive biology of 3 species of prairie dogs are presented by Hoogland (2001). Hoogland's studies demonstrate that prairie dogs have lower intrinsic rates of increase and are consequently more vulnerable to colony extinction than are most rodents.

The USFWS acknowledges that BTPD habitat fragmentation and isolation has occurred. However, the Service discounted the hazard of population and habitat fragmentation to the black-tailed prairie dog in its 2004 Not Warranted Finding, disregarding time-tested principles of wildlife and conservation biology.

a. Population Fragmentation Accelerates the Extinction Process

Combined threats of habitat loss, shooting, poisoning, and plague have resulted in the fragmentation and isolation of remnant prairie dog towns. These small, isolated towns are more susceptible to local extirpation by factors such as poisoning and sylvatic plague (Barnes 1993; Miller et al. 1994; 1996; Mulhern and Knowles 1995; Wuerthner 1997; Wagner 2002). This threat was discussed for black-tailed prairie dogs by Miller et al. (1994: 678),

> As a result of the poisoning programs, the few remaining prairie dog colonies are smaller and more isolated. These fragmented colonies are more susceptible to extirpation, particularly by sylvatic plague (*Yersinia pestis*). Yet some individuals argue that prairie dog populations are safe because prairie dogs can still be found throughout a geographical region between Canada and Mexico. That analysis masks the severity of habitat fragmentation.

There is a substantial body of literature on the risks that small, isolated and fragmented populations face (Gilpin and Soulé 1986; Lande 1987), including environmental and demographic stochasticity (Caswell 1989; Goodman 1987; Mode and Jacobson 1987; Lande 1993), Allee effects (Allee et al. 1949), extinction due to demographic fluctuation, environmental stochasticity, inbreeding and random drifts in gene frequencies (Charlesworth and Charlesworth 1987, Soule 1987), and reduced chance for recolonization after a population is extirpated (Wagner 2002).

Brussard and Gilpin (1989) and Miller et al. (1996) note the critical role played by stochastic processes in the survival of small populations. There are three types of these processes:

> (l) populational or demographic uncertainty,
> (2) environmental uncertainty, and
> (3) genetic uncertainty (Brussard and Gilpin 1989: 37).

The first type of stochastic process, demographic factors, comprises the following:

- random variation in sex ratios,
- age of first reproduction,
- number of offspring,
- distribution of offspring over the lifetime of an individual, and
- age at death (Brussard and Gilpin 1989: 37).

Hoogland's (2001) finding that black-tailed prairie dogs reproduce slowly, as a result of delayed reproduction, production of only one litter per year, and relatively small average size of litters, indicates that the fecundity of this species is naturally relatively low. Populations that are already small may decline further if sex ratios fluctuate and mates are not available. These kinds of small shifts in population dynamics may extirpate small colonies.

The second type of stochastic process, uncertain environmental factors, involves, for prairie dogs, the presence or absence of pandemic diseases, fire, drought, and flooding. The most ominous environmental factor for prairie dogs is the sylvatic plague, to which prairie dogs have almost no natural immunity (Barnes 1993; Cully 1993). The isolation of prairie dog colonies does not provide them with insurance against sylvatic plague. While isolated BTPD colonies have contracted plague

(e.g., Fitzgerald 1970), the more isolated the colony, the less chance the colony will be recolonized following a plague outbreak (Wagner 2002).

The third type of stochastic process, genetic uncertainty, includes a reduction of variation through genetic drift and inbreeding (Brussard and Gilpin 1989). In addition, in an analysis of population reduction and genetic variability in black-tailed prairie dogs, Daley (1992: 219) concluded that:

> In cases of more severe colony isolation, the effects of population control would probably be more noticeable, because genetic variability lost during bottlenecks would be less likely to be replaced through immigration.

Specifying the conditions for such immigration, Daley suggested that successful immigration is probably impacted by dynamics such as the distance between colonies and fluctuations in population density. Isolation would therefore inhibit successful immigration and would consequently have negative ramifications on genetic variability. This finding coincides with observations on habitat fragmentation. Two consequences of fragmentation reported by Wilcox and Murphy (1985) are 1) the loss of sources of immigration; and 2) the obstruction of recolonization and genetic exchange.

In addition, Hoogland (1982) finds that black-tailed prairie dogs avoid extreme inbreeding through several mechanisms: 1) young males leave their natal coterie before breeding, while females remain; 2) adult males leave their breeding coteries before their daughters mature; 3) young females are less likely to come into estrus with their fathers present in the coterie; and 4) estrous females avoid mating with their fathers, sons, or brothers.

These mechanisms, however, can be distilled down to two dynamics: male dispersal and female avoidance. The first of these dynamics underscores the importance of unfettered migration by prairie dogs to ensure genetic variability. With hindered dispersal of males, a sophisticated scheme for avoiding extreme inbreeding may be destroyed. This importance of male migration to prevent inbreeding has been reported elsewhere (Foltz and Hoogland 1983). In terms of the second dynamic, female avoidance, Hoogland (1982: 1641) states,

> Even when individuals avoid mating with close genetic relatives such as parents, offspring, and siblings, inbreeding coefficients can be high if populations are small and isolated...

It is therefore clear that small, isolated prairie dog populations are more vulnerable to inbreeding.

The dynamics involved in these stochastic factors indicate that the surest route for maintaining viability of small populations is to encourage these populations to increase in size or increase connectivity so that small populations interact and form a metapopulation. In addition, any BTPD complexes with relatively large populations should be protected, whether on private or public land.

In yet another way, prairie dog viability depends on naturally occurring sizes of prairie dog colonies and complexes. Prairie dogs are colonial species, and one of the benefits of increased colony size is less time devoted to predator detection. Hoogland (1979) traced the relationship between prairie dog alertness and colony size, and found that relationship to be a negative one, with prairie dogs in larger colonies able to spend a smaller portion of their time on predator detection.

Spending less time being on the alert for predators leaves more time for activities such as feeding and breeding. Alternatively, the very small sizes of BTPD colonies at present impose more constraints on prairie dog activity.

The fragmentation and loss of prairie dog habitat described above also affects those species associated with prairie dog colonies. As discussed above, the black-tailed prairie dog, like other prairie dogs, is a keystone species. Its continued decline therefore has ecosystemic repercussions. Its listing as Endangered or Threatened under the ESA would therefore bring collateral protections to other native species.

It is clear that the destruction of habitat and impact of isolation and fragmentation represents a biological threat to the biological integrity of the BTPD and the ecosystem this species supports. An adequate manner in which to counteract this threat is to list the petitioned species as Endangered or Threatened under the ESA.

b. Evidence of BTPD Habitat and Population Fragmentation

Evidence of habitat fragmentation, population and colony isolation, and colony shrinkage come from the research and testimonials of prairie dog experts who have studied prairie dogs and documented their population declines in the field. Miller et al. (1994: 678) blame historic eradication programs for the isolation and shrinkage of colonies:

> As a result of the poisoning programs, the few remaining prairie dog colonies are smaller and more isolated. These fragmented colonies are more susceptible to extirpation, particularly by sylvatic plague *(Yersinia pestis*). Yet some individuals argue that prairie dog populations are safe because prairie dogs can still be found throughout a geographical region between Canada and Mexico. That analysis masks the severity of habitat fragmentation. Fragmented habitat jeopardizes populations by several avenues: (1) demographic units are eliminated, reduced, or subdivided, increasing the probability of extinction by other means such as disease, genetic problems, demographic events, or natural catastrophes; (2) sources of immigration are lost; and (3) habitat alteration between occupied colonies obstructs recolonization or genetic exchange (Wilcox & Murphy 1985). As a result of these factors, the risk of extinction from habitat disruption is not linearly proportional to the reduction of habitat, but in fact may increase disproportionately (Wilcox & Murphy 1985; Wilcove et al. 1986).

Based on historic records from scientists and government agents, before the large-scale human settlement of the Great Plains, large colonies and colony complexes occurred throughout the BTPD range—they were the norm not anomalies. Colonies of over 20,000 hectares (49,000 acres) were common, and colonies over 2,000,000 hectares (4,900,000 million acres) were also known to exist (Knowles et al. 2002; Proctor et al. 2006). Historical records indicate that colonies spanning 32-48 kilometers (20-30 miles) were also common (Merriam 1902; Bailey 1905; Nelson 1918). Early documented observations by scientists and government agents demonstrate that large colonies occurred in the northern-, southern-, eastern-, and western-most regions of the historic BTPD range and in the shortgrass, mid-grass, and desert grassland habitat. Below is a list of documented large colonies from historic records by state (see also Knowles et al. 2002: 231-237).

ARIZONA

"[I]n southeastern Arizona, Mearns reported in 1907 (cited in Hoffmeister 1986) that burrows of prairie dogs were scattered for miles over the plains south of the Pinaleno range or Sierra Bonito" (Knowles et al. 2002: 231). Oakes (2000: 125-138) provided an extensive report of historic records of large colonies in Arizona, where BTPDs are now extinct. For most of these colonies, specific sizes are not known, but Oakes did find some specific area reports. For Cochise County, Oakes (2002) found reports of: 10,117 hectares (25,000 acres) of "dogtowns" in the Hereford District of Sand Pedro Valley and Boquillas; a 12,432 hectare (30,720 acre) colony stretching between the San Simon Valley and Chiracahua Mountains; a 121 hectare (300 acre) colony in Bernardino near Indian Creek; and a 1.6 kilometer (1 mile) wide colony in the Galleta Flats, White Water Creek. In Graham County, Oakes (2002) listed: a 2,590 hectare (6,400 acre) colony on the Hooker, Kennedy, and the Eureka Springs Cattle Companies ranches and a 6,345 hectare (15,680 acre) colony on the Johnson and Cook, Monk Brothers, Wilson Mills, and H.L. Ranges ranches. The historic estimate for total black-tailed prairie dog occupied area in Arizona was 263,046 hectares (650,000 acres) (Van Pelt 1998, in litt. reference to the USFWS).

KANSAS

Merriam (1902) described a 77,700-hectare (300-square mile) colony in Logan County, Kansas. Mead (1898: 2) noted, "Prairie dogs were innumerable. The divide between Saline and Solomon [Rivers] in Ellsworth County and west was a continuous dog town for miles." This single prairie dog colony was 25,091 hectares about 30% larger than the entire BTPD prairie dog area estimate documented in the USFWS 2004 Not Warranted Finding, which was 52,609 hectares (130,000 acres).

MONTANA

Messiter (1890) documented a 48-64 kilometer (30-40 miles) long colony between the Milk and Missouri Rivers in the north-central region of the state (cited in Knowles et al. 2002). At the time of Great Plains settlement, southeastern Montana had several complexes over 16 kilometers (10 miles), and some over 9,216 square kilometers (5,727 square miles) (Flath and Clark 1986).

NEW MEXICO

Oakes (2000) found reports of many large colonies in southwest New Mexico, including specific acreage reports for a few of these colonies. Doña Ana County records included: colonies on the Jornada Experimental range of 1,416-1,619 hectares (3,500-4,000 acres), 2,851 hectares (7,045 acres), and 17 colonies from 4-188 hectares (10-464 acres); 405 hectares (1,000 acres) south of the Jornada Experimental Range; additional reports on or near the Jornada Experimental Range of 11,534 hectares (28,500 acres); 2,226 hectares (5,500 acres) on the south end of the San Andres Mountains; and 263 hectares (650 acres) southeast of Las Cruces. In Hidalgo County, 1 of 38 colony reports included a specific area; a colony near the Animas Mountain was 607 hectares (1,500 acres). All of these colonies are gone now. Our research did not find reports of large complexes in eastern New Mexico historically.

OKLAHOMA

"[A] virtually continuous prairie dog colony in tall grass prairie stretched from Kingfisher Creek to Fort Reno, Oklahoma, a distance of 35 km according to Lewis and Hassien (1973) who cited Strong (1960)" (Knowles et al. 2002: 232). Lomolino and Smith (2001) have documented BTPD colony isolation and shrinkage in the Oklahoma Panhandle:

> Prairie dog towns in this region now represent only 1% of presettlement estimates and continue to decline in total acreage because of advanced agricultural practices, systematic control measures, and outbreaks of plague. Further, <1% of the area now occupied by prairie dog towns .10 ha occurs within protected locations. As the total coverage of towns has declined, mean size of towns has decreased, and towns have become increasingly more isolated. Persistence of towns between 1989 and 1997 was highest for the largest and most isolated towns, even in regions that were not known to be influenced by plague. (937)

In a later paper, Smith and Lomolino (2004) stated:

> Our recent surveys of towns in Oklahoma have also documented declines within the past 10–15 years (Lomolino and Smith 2001). In the Panhandle alone, areal coverage of prairie dog towns during this period has been reduced by almost 45%. The remaining towns are becoming increasingly smaller, fragmented, and more isolated. (593-594)

SOUTH DAKOTA

According to Knowles et al. (2002: 232):

> On the Grand River National Grassland in northwestern South Dakota, an elderly rancher (L. Lyon, pers. commun.) reported to us in May 2002 that his grandfather talked about a prairie dog colony between Faith and Newell that required three days to cross on horseback in one direction and two days to cross on horseback in the other direction. He specifically stated that "this was before there were towns and stuff like that."

According to Rose (1973: 1), "Many old timers speak of prairie dog towns occurring for 15-20 miles (24-32 kilometers) along the major drainages. Remnants of the old towns may still be observed along the Bad River between Philip and Fort Pierre." Rose also noted reports of large numbers of prairie dogs spanning 240 kilometers (150 miles) between Faith and Rapid City.

TEXAS

C. Hart Merriam famously described the existence of a 6,474,970-hectare (25,000-square mile) colony in Texas in his 1902 report "The Prairie Dog of the Great Plains" (Merriam 1902). Bailey (1905) also documented this colony. It does not exist today (Knowles et al. 2002). "Another large colony was reported between the North and South Wichita Rivers in what is now King and Knox Counties, Texas (Halloran 1972)" (Knowles et al. 2002: 231). The USFWS gave the official estimate of BTPD area as 72,034 hectares (178,000 acres)—a fraction of the size of that 6.5 million hectare

colony measured in 1902.

WYOMING

Knowles et al. (2002: 232) reported that, "Anderson et al. (1986) cited Day and Nelson (1929) for a prairie dog colony that was 160 km long."

MEXICO

Knowles et al. (2002: 240-241) used the decline of a major colony complex in Chihuahua, Mexico as a recent example to described how the destruction of complexes likely occurred historically:

> In northern Mexico, Ceballos et al. (1993) and List et al. (1997) provided information on a large prairie dog colony complex prior to prairie dog control and agricultural land conversion. In 1986, the main colony was 34,000 ha while the entire complex contained 55,000 ha of prairie dog colonies. During the past decade, cattle ranching and conversion of grasslands to irrigated agricultural croplands has resulted in the fragmentation of this complex. The main 34,000-ha colony has been broken into smaller colonies, and many of the smaller satellite colonies have been exterminated. This process of fragmenting large colonies into smaller colonies, and then working to exterminate the smaller colonies, was probably used in the past to break up large prairie dog complexes in the United States. This complex in northern Mexico was probably the best contemporary example of how prairie dog colony complex might have looked prior to settlement of the Great Plains.

Until recently the Janos/Nuevo Casas Grandes Prairie Dog complex was unrivaled as the largest prairie dog complex in North America, of any prairie dog species (Manzano-Fischer 2006). However, the severe drought conditions of 2002-2005 along with over-grazing and conversion of habitat to farmland have caused dramatic prairie dog habitat and population declines in the last several years. Over-grazing is the biggest threat to the complex (A. Davidson, Instituto de Ecología Universidad Nacional Autónoma de México, personal communication, 2007). The complex shrunk from 55,178 hectares (136,348 acres), when it was first mapped (Ceballos 1993), to 19,949 hectares (49,295 acres) in 2000 when it was re-mapped (Marce 2001). The complex was down to 14,797 hectares (36,564 acres) when mapped in 2005 (J. Pacheco, unpublished data). However, the current measure includes 5,000 hectares (12,355 acres) of prairie dog colony that had been undiscovered when Ceballos (1993) originally mapped the complex but was believed to have existed at that time (A. Davidson, Instituto de Ecología Universidad Nacional Autónoma de México, personal communication, 2007). The largest colony in the complex, called El Cuervo, declined from 15,000 hectares (xxx acres) in 2001 to 8,000 hectares (xxx acres) in 2005. Density is also measured at the complex. In 1988 there were 25 prairie dogs per hectare, in 2001 7 prairie dogs per hectare, and 2005 4 per hectare.

U.S. PUBLIC LANDS

U.S. Federal Government lands provide the best opportunity for restoring and protecting large prairie dog complexes because one of their mandates is to protect native wildlife. Unfortunately, prairie dog area remaining on these lands reflects the fragmentation that has occurred rangewide.

The U.S. Forest Service (USFS) had about 28,800 hectares (71,200 acres) of occupied prairie dog habitat in 2004, which totals only about 2% of the available habitat on Forest Service lands within the black-tailed prairie dog range (Sidle et al. 2006). Of the Bureau of Land Management's 4,000,000 hectares (10,000,000 acres) of land within the BTPD range, only about 19,800 hectares (49,000 acres) is occupied by BTPDs, which is less than 1% of the BLM's property (Sidle et al. 2006). The National Park Service had approximately 2,800 hectares (6,900 acres) of occupied habitat in 2004, but only 2% of Park Service land within the species' range is occupied. The USFWS's National Wildlife Refuges contained about 3,700 hectares (9,100 acres) in 2004, of which the UL Bend and Charles M. Russell Refuges made up more than half of the—2,600 hectares (6,400 acres) of BTPDs in total.

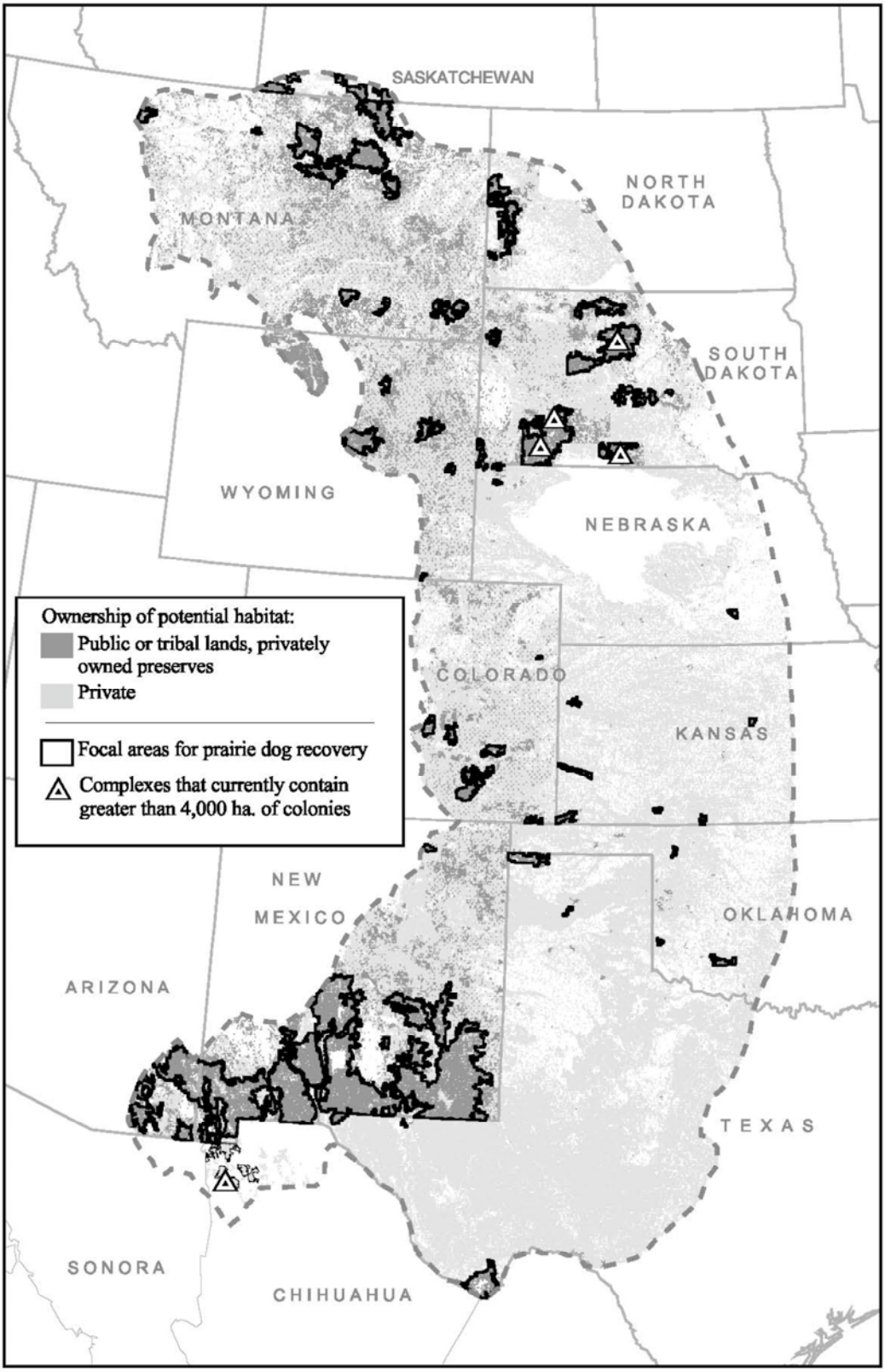
c. Intact, Unfragmented, Large Complexes are Disappearing

The plowing of the prairie and prairie dog eradication that started in the late 1800s fragmented almost all of the large colony cores of complexes that existed prior to human settlement, making the smaller colonies more vulnerable to elimination. Poisoning, habitat destruction, shooting, and plague are continuing the process of breaking up large colonies. Very few complexes exist today, and those remaining are disproportionately distributed across the range. The Service identified 7 significant complexes in its 2000 Warranted but Precluded Finding:

> A significant portion of existing black-tailed prairie dog occupied habitat rangewide occurs in a few large complexes. Using current estimates of occupied habitat for the species and information about the size of the seven large remaining prairie dog complexes from the Service's black-footed ferret recovery program, it may be determined that 36 percent of the remaining occupied habitat for the species in North America occurs in seven complexes larger than 10,000 acres (4,000 hectares). These complexes include—Buffalo Gap National Grassland, Conata Basin, South Dakota (approximately 15,000 acres/6,000 hectares); Cheyenne River Sioux Tribe Reservation, South Dakota (approximately 45,000 acres/18,000 hectares); Fort Belknap Reservation, Montana (approximately 15,000 acres/6,000 hectares); Janos Nuevo Casas Grandes, Mexico (approximately 90,000 acres/36,000 hectares); Pine Ridge Reservation, South Dakota (approximately 20,000 acres/8,000 hectares); Rosebud Sioux Tribe Reservation, South Dakota (approximately 70,000 acres/28,000 hectares); and Thunder Basin National Grassland, Wyoming (approximately 20,000 acres/8,000 hectares). The potential vulnerability of these complexes to control efforts or plague is notable. (65 FR 5476: 5487)

Proctor et al. (2006) identified 5 colony complexes with more than 4,000 hectares (9,884 acres) of BTPDs. See map below.

Map 5. Remaining Black-tailed Colony Complexes >4,000 hectares (9,884 acres)



Additionally, these few complexes are all experiencing significant threats right now. According to the USFWS 2004 Not Warranted Finding, only 4 states within the BTPD historic range reported having complexes greater than 2,000 hectares (5,000 acres): Colorado reported 18 complexes, Montana reported 3, South Dakota reported 4, and Wyoming reported 1. The Finding reported 1 such complex in Mexico. Montana's 3 reported complexes occur on the Crow and Fort Belknap Indian Reservations and on the Charles M. Russell National Wildlife Refuge. All 3 complexes have been reduced by plague epizootics experienced since 2004 (Jerry Kaiser, Bureau of Indian Affairs cited in Montana Prairie Dog Working Group 2006). South Dakota's complexes have been documented on the Pine Ridge/Ogalala Indian, Rosebud, and Cheyenne River Indian Reservations, and the Buffalo Gap National Grassland. Plague struck Pine Ridge Reservation's complex and wiped out the majority of prairie dogs. Rosebud and Cheyenne River Reservations' complexes have both experienced unknown levels of recent poisoning, and Conata Basin was extensively poisoned in 2004-2006 and is currently proposed for significant levels of poisoning as early as October 2007. Plague also caused significant die-offs on Thunder Basin's complex, reducing it and other scattered colonies on this National Grassland by two-thirds, from 8,683 hectares (21,456 acres) in 2001 to only 2,630 hectares (6,500 acres) in 2006. Thunder Basin is now developing a prairie dog management plan that will likely include poisoning. The Service reported in its 2004 Finding that the BTPD complex near Janos, Mexico was declining, and as we discussed above drought, overgrazing, and farming have drastically reduced the size of this complex (List 2006; A. Davidson, Instituto de Ecología Universidad Nacional Autónoma de México, personal communication, 2007).

Colorado must be removed from this list completely. The CDOW's 2003 *Conservation Plan for Grassland Species in Colorado* (Colorado Division of Wildlife and Colorado Grassland Species Working Group 2003) reported this 18 complex figure (see page 14 of the Plan) and cited an aerial survey by White et al. (2003) as its source. The White et al. (2003) data was supposed to have been included as an appendix in Colorado's Grassland Plan, but the CDOW has not made this appendix available to the public, as of this writing some four years later. The aerial survey was eventually published as White et al. (2005). This article made no mention of the alleged 18 complexes and no mention of prairie dog complexes occurring in Colorado at all. The methods used by the authors did not measure colony size, and thus could not provide any assessment of colony complexes in the state (White et al. 2005). We discuss problems with the Colorado survey in more detail below. Despite repeated requests from Petitioners and others, the Colorado Division of Wildlife will not provide locations of their purported 18 complexes >2,000 hectares (Proctor, personal communication, 2007). There is no evidence that 18 complexes of BTPDs of significant size occur in Colorado.

The USFWS dismissed poisoning as a threat to BTPDs in its 2004 Not Warranted Finding and claimed that prairie dog colonies can recover from poisoning. However, repeated poisoning can eliminate large areas from a region permanently. Poisoning is blamed for the extinction of prairie dogs in Arizona and southwest New Mexico (Alexander 1932; Oakes 2000; Forrest and Luchsinger 2006). And poisoning can lead to fragmentation as described by Forrest and Luchsinger (2006: 124):

> Repeated poisoning also can lead to the decline of prairie dogs in another, more subtle way. In Kansas, for example, the total area inhabited by prairie dog colonies declined by 19% between 1977 and 1991, but the number of colonies increased by 28% (Vanderhoof and Robel 1992). Plague was absent throughout most of Kansas in the 1980s and continues to be absent today …, so the decline in area inhabited by prairie dogs probably resulted mostly from poisoning. The pattern observed in Kansas is **classic fragmentation: large colonies broken up into more**

> **numerous, more isolated, smaller colonies. Fragmentation of this type increases the probability of local extinctions**, because small, isolated colonies are vulnerable to random environmental variation, genetic drift, and inbreeding (Wilcox and Murphy 1985; Miller et al. 1996; Lomolino and Smith 2003; …). As colonies disappear, the probability of extinction for remaining colonies increases because immigration—and hence the arrival of both new genetic variation and potential mates who are not close kin—becomes more unlikely as intercolonial distance increases (Garrett and Franklin 1988; …) [emphasis added]

As we document in more detail in our below discussion of plague, plague also causes fragmentation:

> In Montana, for example, plague reduced the cumulative area inhabited by prairie dogs by about 50% between 1986 and 1998. If this trend continues, plague might reduce the area inhabited to prairie dogs to less than 10% of current estimates over the next 30 years, and the remaining colonies will be small and isolated (USFWS 2000a). (Luce et al. 2006, p. 211).

High levels of fragmentation have occurred on public lands, the most promising places for conserving and recovering large BTPD complexes. According to Sidle et al. (2006: 230, emphasis added), "Prairie dog colonies on federal lands in general, and on national grasslands **in particular**, are fragmented …, and thus more prone to extinction … ."

The loss of large complexes and colonies and the dramatic loss of prairie dog areas across the range provide evidence that significant fragmentation of BTPD habitat and populations.

d. The USFWS's Treatment of Habitat Fragmentation in the 2004 Finding

In the 2000 Warranted But Precluded Finding, the USFWS seemed to understand the important implications of habitat fragmentation and the isolation of BTPD populations. For example, the 2000 Finding stated:

> North American grasslands have suffered among the most extensive fragmentation and transformation of any biome on the continent (Groombridge 1992). More fragmented, more isolated, and less connected populations usually have higher extinction rates (Clark 1989, Gilpin and Soule 1986, MacArthur and Wilson 1967, Shaffer 1981, Wilcove et al. 1986, Wilcox and Murphy 1985). List et al. (1997) suggested that fragmented black-tailed prairie dog colonies in Mexico were prone to extirpation. Miller et al. (1996) described existing prairie dog populations as small, disjunct, and geographically isolated. Dispersal has been limited by barriers created by human development that preclude immigration or emigration. Fragmentation and extirpation of small, isolated colonies will result in the loss of additional genotypes, as occurred with the complete extirpation of the species in portions of the eastern and southwestern areas of its historic range. Lost genetic diversity will inherently be detrimental to the long-term survival of the species. (65 FR 5476: 5483-5484)

The 2000 Finding again emphasized the point:

> Extant populations of black-tailed prairie dogs may or may not be large enough to be resilient to ongoing or future environmental challenges and related potential declines. Quammen (1996) provided examples of species that were abundant, but suddenly became very rare. For example, he reported that the passenger pigeon (*Ectopistes migratorius*) numbered in the billions around 1810 and in the low millions by the 1880s, yet was extinct in the wild by 1900. Habitat destruction and over-harvesting depressed passenger pigeon numbers to a few million, a level too low for a highly social and colonial species to function (Halliday 1980). The black-tailed prairie dog numbered in the billions around 1900, exists as a few million at present, and appears to be declining in a significant portion of its range. The advantages of sociality (e.g., breeding, feeding, predator defense) may no longer offset its modern disadvantages (e.g., vulnerability to an exotic disease and control efforts). Accordingly, **the vulnerability of the black-tailed prairie dog to population reductions is likely related less to its absolute numbers than to the number of colonies in which it exists, their size, their geospatial relationship, existing barriers to immigration and emigration, and ultimately the number and nature of the remaining direct threats to the species.** (65 FR 5476: 5487) [emphasis added]

However in its 2004 Not Warranted Finding, the Service discounted the significance of fragmentation and isolation and even claimed that these trends benefit prairie dogs. The 2004 Finding stated:

> In our 2000 12-month finding, we focused attention on a few large black-tailed prairie dog populations impacted by plague and extrapolated population losses at these sites across the species' entire range. Based on generally accepted conservation biology principles (Gilpin and Soule 1986; Hanski and Gilpin 1997; MacArthur and Wilson 1967; Miller *et al.* 1996; Shaffer 1981; Wilcove *et al.* 1986; and Wilcox and Murphy 1985), we presumed that smaller black-tailed prairie dog populations had been and would be similarly or more adversely impacted. An approximate 50 percent decline per decade was predicted for the foreseeable future. Much better information is now available. Given recent population estimates across a majority of the species' range, it appears the previously hypothesized projections were invalid. While occupied habitat at specific large complexes may experience dramatic fluctuations due to plague epizootics, they do not appear to be influencing the species' range-wide persistence. (69 FR 51217: 51223)

Below is another example from the 2004 Finding where the Service argued that habitat fragmentation and population isolation is good for the species:

> Gilpin (University of California, in litt. 2001) considered habitat fragmentation, which decreases colony and metapopulation size, a serious threat that could impact future viability of the black-tailed prairie dog. However, Luce (Prairie Dog Conservation Team Interstate Coordinator, in litt. 2002c) suggested that fragmentation of habitat and scattered distribution may have isolated black-tailed prairie dog populations and prevented plague from impacting them. He noted that it

> is important to recognize the presence and value of "small, remnant populations." (69 FR 51217: 51222)

In this case, the Service used a brief letter from the interstate Prairie Dog Conservation Team (the express goal of which was to prevent ESA listing for the BTPD), to challenge the expertise of Michael Gilpin (whose analysis was solicited by USFWS), who is a recognized authority on the extinction process and risk of fragmentation to species and has written several peer-reviewed papers on the subject and books on conservation biology. The Service also cited Lomolino et al. (2003), which we mentioned earlier and discuss in more detail in the disease section of this petition. The Service stated:

> Lomolino *et al.* (2003) postulated that habitat fragmentation may benefit some prairie dog populations by protecting them from plague through isolation. Historically, black-tailed prairie dogs were typically found in large complexes that consisted of many colonies that were close enough to each other to allow frequent dispersal between colonies. Currently, due to a combination of factors including habitat fragmentation, plague, and poisoning, many prairie dogs exist in much smaller complexes or in isolated colonies where the possibility for interchange is reduced. Smaller populations also may be protected by limiting exposure via direct animal-to-animal contact (Cully and Williams 2001, Roach *et al.* 2001). Influences other than plague likely will still adversely affect small black-tailed prairie dog populations, but they have not been demonstrated to be as serious as plague. (69 FR 51217: 51223)

In an earlier paper by 2 of the 3 authors of Lomolino et al. (2003), Lomolino and Smith (2001) stated unequivocally that isolation is not likely to benefit prairie dogs. Lomolino and Smith (2001: 942-943) stated:

> The relatively high persistence for the most isolated populations in our study is consistent with the general patterns in range collapse observed for endangered species (Channell and Lomolino 2000a, 2000b; Lomolino and Channell 1995, 1998). **These isolated populations are not necessarily more resistant to anthropogenic extinction forces or to plague** (an exotic disease introduced to North America by humans—Cully 2001). [emphasis added]

The USFWS completely ignored the Lomolino and Smith (2001) article in the 2004 Finding. The researchers provided a detailed explanation of how their research findings support the conception that the fragmentation and isolation of prairie dog habitat and populations is following the same pattern that has led and is leading other species to extinction. The following explanation emphasizes this point:

> The anthropogenic decline in the geographic range of the black-tailed prairie dog, an ecological dominant of the Great Plains throughout much of the Pleistocene and early Holocene, has a geographic signature much like that of deforestation and other forms of fragmentation (Laurance and Bierregaard 1997; Lomolino and Perault 2000, 2001; Perault and Lomolino 2000). Concurrent with the decline in total aerial extent of these native ecosystems, remnant patches became both smaller and more isolated from each other. The likely effect of these biogeographic dynamics, whether fragmentation of old-growth forests or prairie dog towns, will likely be an overall

> decline in persistence of the entire metapopulation (Hanski and Gilpin 1997; M. Gilpin, in litt.). A relatively small number of populations, including those in some of the most isolated regions of the species' range, may persist through the 21st century. However, if isolation of remnant towns continues to increase, recolonization rates may decline to levels too low to compensate for local extinctions. Just as important, because diversity is directly correlated with area for nearly all types of ecosystems (Brown and Lomolino 1998; MacArthur et al. 1972; Rosenzweig 1995), regional and global diversity of native grasslands will experience substantial declines well before the last prairie dog town becomes extinct. Such declines in biological diversity are ongoing and evidenced by the documented declines of many town associates including burrowing owls (*Speotyto cunicularia*), ferruginous hawks (*Buteo regalis*), mountain plovers (*Charadrius montanus*), and swift fox (*Vulpes velox*—Barko 1994; Butts 1973; Desmond et al. 1995; Knopf 1996; Knowles et al. 1982; Miller et al. 1994) and the near extinction of black-footed ferrets (*Mustela nigripes*—Seal et al. 1989). For many of these species, town size may be just as important as town isolation or the total area of towns within a region (Lomolino et al. 2001). (Lomolino and Smith 2001: 942)

Given the vast scientific literature on the perils of habitat fragmentation for species, the unequivocal evidence that BTPD populations are severely isolated and their habitat fragmented, and the studies that confirm that the related trends of losing BTPD colony complexes and increasing habitat fragmentation mirror extinctions patterns of other species, the USFWS's contention that habitat fragmentation and colony isolation is not a threat to BTPDs is incorrect. The Service must reassess and revise its interpretations of the impacts of habitat fragmentation and population isolation in finding on this petition.

4. The Decline and Imperilment of Several Prairie Dog Obligate and Associate Species Demonstrate that Black-tailed Prairie Dog Populations are Not Viable

The threats against black-tailed prairie dogs reverberate throughout the prairie dog ecosystem. The black-tailed prairie dog is a keystone species that creates and sustains habitat for a myriad of associated wildlife, serves as a prey base for many raptors and mammalian predators, and provides a range of other ecological services that promote ecosystem health (Kotliar et al. 1999; Kotliar 2000; Miller et al. 2000; Kotliar et al. 2006). As prairie dogs decline, so too do the birds, herptiles, carnivores, and insects, that benefit from, and in some cases require, the keystone functions performed by the BTPD. As we discussed above, the Endangered Species Act was intended to protect whole ecosystems. Listing the black-tailed prairie dog would help fulfill the original intent of the Act.

Though the Endangered Species Act was intended to protect whole ecosystems, not just single species, we understand that the USFWS currently does not weigh the importance of keystone species, such as the black-tailed prairie dog, to other declining and/or listed species in its listing decisions. However, because several other species are so closely associated with prairie dogs, particularly the black-footed ferret (BFF), the population trends of these species are important indicators of prairie dog population health.

These indicators show that black-tailed prairie dogs are at risk of extinction in a significant portion of their remaining range and are already extinct in significant portions of their larger historic

range. Fortunately, they likely have the potential to recover in several areas of their existing and former range. Using the decline and recovery of species tied to the prairie dog as a reference for prairie dog viability has a strong basis in ecology and conservation biology. In the face of our knowledge about the importance of the prairie dog to other species, sole reliance population numbers to determine whether or not they deserve ESA listing fails to consider all of the best available data. The decline of black-footed ferrets demonstrates that BTPD populations have declined to the point where they require listing under the ESA. We recommend that the USFWS use the recovery of the black-footed ferret as a science-based indicator for determining when the BTPD has recovered sufficiently to no longer need ESA protection.

The black-footed ferret is a prairie dog obligate species; it is completely dependent on prairie dogs for food and their burrows for shelter. The near extinction of the BFF is a consequence of the dramatic decline of all 3 prairie dog species associated with the ferret (Clark 1989; Miller et al. 1996). Ferrets feed almost exclusively on prairie dogs. A ferret family (1/2 of 1 male, a female and her kits) in the wild needs approximately 762 – 2,000 prairie dogs per year (Klebanoff et al. 1991; Biggins et al. 1993). Based on studies at Conata Basin, South Dakota, BFFs exhibit territoriality (Jachowski 2007). Likely due to lower prairie dog densities during drought periods and higher densities during wet periods, ferret home ranges expand and contract. Female home ranges during wet years averaged 32 hectares (80 acres) (Livieri 2007) and increased to 66 hectares (162 acres) during drought (Jachowski 2007). Male home ranges are larger and averaged 123 hectares (304 acres) during drought (Jachowski 2007). Because of these factors, black-footed ferrets require large, high-density complexes of prairie dog colonies for their survival. Prairie dog colonies **are** BFF habitat; ferrets are rarely found off colonies.

The ferret's historic range covered the historic range of the BTPD as well as those of the Gunnison's and white-tailed prairie dogs (Miller et al. 1996). Historically, black-tailed prairie dog colonies hosted over 84% of the black-footed ferret population (Ernst et al. 2006).

In the last 200 years, the BFF population dropped from 500,000 – 1,000,000 (Anderson et al. 1986) to 18 in 1985 (Miller et al. 1996). The black-footed ferret is considered the 11th rarest mammal in the world and is one of the most endangered mammals in North America. It was among the first species listed under the U.S. Endangered Species Act of 1973 and was listed as Endangered under the Endangered Species Preservation Act of 1966 and the Endangered Species Act of 1969, the precursors to the current ESA. The species now depends completely on captive breeding and reintroduction for its survival in the wild.

USFWS began releasing ferrets into designated sites in the wild in 1991. The 1988 Black-footed Ferret Recovery Plan goals included establishing 1,500 breeding pairs in 10 sites distributed across the historic range (USFWS 1988). Initially, BFF researchers believed that active prairie dog colony complexes of at least 4,500 hectares (10,000 acres) were needed to reestablish ferrets to a given site (Forrest et al. 1988). However, the lack of available sites forced the BFF Recovery Team to revise its habitat models to allow for ferret releases as smaller sites.

Of the 14 current reintroduction sites, 10 are located on black-tailed prairie dog colony complexes. The BTPD ferret sites are listed in the table below.

Table 4. Black-footed Ferret Reintroduction Sites on Black-tailed Prairie Dog Complexes

REINTRODUCTION SITE	YEAR OF FIRST RELEASE
UL Bend & Charles M. Russell National Wildlife Refuges, Montana	1994
Badlands National Park, South Dakota	1994
Conata Basin – Buffalo Gap National Grassland, South Dakota	1996
Fort Belknap Reservation, Montana	1997
Cheyenne River Sioux Tribe, South Dakota	2000
40-Complex – Bureau of Land Management (Malta Field Office)/Private Land, Montana	2001
Janos/Neuvo Casas Grandes – Chihuahua, Mexico	2001
Rosebud Sioux Reservation, South Dakota	2003
Lower Brule Sioux Tribe, South Dakota	2006
Wind Cave National Park	2007

Of these 10 sites, only Conata Basin has what is considered a self-sustaining population of BFFs. It is the only site to have produced more ferrets than were originally reintroduced. As of 2006, 100 breeding pairs existed at Conata Basin of the total 250 breeding pairs known to exist among all the reintroduction sites combined, including Conata Basin. The Cheyenne River site had 112 adults in 2006 from a total of 189 released, but cannot be considered self-sustaining. The Lower Brule and Wind Cave sites are too new to evaluate, but both are smaller than the initial criterion of 4,500 hectares (10,000 acres). The other 6 sites are fairing poorly. Though fatal diseases in ferrets, particularly distemper and plague, have hindered the recovery effort, the lack of sufficient reintroduction sites—large, high-density prairie dog complexes—is the primary reason for the failure to reach Recovery Plan goals.

The complete loss of black-footed ferrets to the BTPD historic range and the failure of all but 1 BFF recovery site is a clear indicator that the BTPD has suffered considerable losses in significant portions of its range, and thus, the species warrants listing. And, it is reasonable to use black-footed ferret recovery as an indicator of prairie dog recovery. Some of the leading prairie dog and ferret researchers in North America advocate this approach (Miller and Reading 2006; Miller et al. in press). Miller and Reading (2006: 249) stated:

> USFWS has run out of sites suitable for the reintroduction of black-footed ferrets, and consequently has missed the time frame and goals outlined in the recovery plan for ferrets (USFWS 1998a). Lack of prairie dogs is the reason. Setting low goals for the conservation of prairie dogs impedes the recovery of ferrets. On the other hand, protecting enough prairie dogs so that they can sustain viable populations of ferrets would indicate that the prairie dog is recovering its ecological function.

In a forthcoming article currently in the *Journal of Wildlife Management*, 11 prairie dog experts endorsed tying prairie dog recovery with ferret recovery (Miller et al. in press). The authors stated:

> If conservation is the goal, should we manage prairie dogs to perform their evolutionary and ecological function on the grasslands, or should we manage them as museum pieces to assure limited taxonomic representation (Miller et al. 2000, Soulé et al. 2005)? If we want them to exert their ecological function, then to think that the endangered black-footed ferrets can be recovered without increasing the habitat upon which they depend is poor logic. If society wishes to restore prairie dogs to their functional role on America's grasslands, we recommend using black-footed ferret recovery as a benchmark. Recovering ferrets requires large complexes (i.e., each several thousands of hectares in extent) of prairie dogs distributed throughout

> their former range (US Fish and Wildlife Service 1988, Miller et al. 1996, Miller and Reading 2006). Except for South Dakota, ferrets have not established self-sustaining populations at reintroduction sites, primarily due to lack of sufficiently dense and populous prairie dog complexes (Miller and Reading 2006). Thus, ferret recovery requires restoring prairie dogs in much larger complexes and in more areas than presently exist; a politically difficult task. (Miller et al. in press)

Congress intended that ESA listing decisions should be protected from politics. Because prairie dog conservation is so steeped in controversy and politics, the ESA is the only tool that has a chance of rising above the political fray.

IX. Listing Factors: Threats to the Black-tailed Prairie Dog

As we mentioned above and examine below in more detail, the black-tailed prairie dog qualifies for listing under all 5 ESA listing factors. The survival of the species is threatened most significantly by plague, deliberate extermination, habitat destruction, and shooting. However, other dangers pose additional risks and can exacerbate the primary threats. These include the pet trade, diseases such as tularemia and monkeypox, negative attitudes and misperceptions about prairie dogs, and state prairie dog "conservation" that in many cases will actually serve as barriers to BTPD recovery. We assess the threats to black-tailed prairie dog survival below.

A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

In the 2004 Not Warranted Finding, the USFWS reasoned in part that, because habitat conversion was not occurring at a rate comparable to early in the 20th century, this habitat loss (primarily from rangeland to cropland) was not a threat. Today, black-tailed habitat is being damaged and destroyed by oil and gas exploration and extraction, urban sprawl, vegetation changes due to fire suppression and livestock over-grazing, and a resurgence of habitat conversion to cropland due to increased demand for corn-based ethanol fuel. Habitat destruction represents a threat to prairie dog populations in many areas within their range.

1. Conversion of Native Prairie Habitat to Cropland

As the 2000 Warranted But Precluded Finding and the 2004 Not Warranted Finding acknowledge, the conversion of prairie and Chihuahuan desert grasslands to cropland in the 1800s with the passage of the Homestead Act of 1862 destroyed significant amounts of BTPD habitat. Both Findings cited GIS data from the Black-footed Ferret Recovery Foundation to conclude that 37% of BTPD historic range has been converted to cropland (65 FR 5476: 5479; 69 FR 51217: 51221). The 2000 Finding attributed this loss to just the U.S. historic range and added,

> This habitat loss is essentially permanent and not considered a range contraction in the usual sense occurring at the periphery of a species' range. Although the species will occupy abandoned tilled ground, these lands are generally unavailable for use by the species because the land is continuously disturbed and thus the habitat is lost permanently. (65 FR 5476: 5479)

Proctor et al. (2006) also conducted a GIS analysis to determine that 37,600,000 hectares (92,900,000 acres)—33%—of the entire BTPD historic range has been converted to cropland. The Service's 2000 12-Month Finding quantified habitat losses due to agricultural conversion and assigned percentages of lost habitat based on comparisons of potential habitat (USFWS 2000). See table below for these figures.

Table 5. Lost BTPD Habitat Due to Historic Cropland Conversion

STATE	TOTAL RANGE hectares (acres)	CROPS IN RANGE hectares (acres)	POTENTIAL HABITAT hectares (acres)	% OF HABITAT LOST TO CROPS
Arizona	3,446,598 (8,516,730)	139,965 (345,862)	2,825,334 (6,981,553)	5
Colorado	13,415,977 (33,151,600)	4,694,880 (11,601,300)	11,016,802 (27,223,110)	43
Kansas	15,433,254 (38,136,400)	11,266,180 (27,839,336)	15,182,255 (37,516,169)	74
Montana	26,766,070 (66,140,400)	6,410,782 (15,841,388)	21,584,919 (53,337,496)	30
Nebraska	18,906,630 (46,719,300)	10,351,428 (25,578,936)	18,253,542 (45,105,484)	57
New Mexico	21,787,708 (53,838,600)	1,026,579 (2,536,731)	18,109,680 (44,749,995)	6
North Dakota	4,596,177 (11,357,400)	2,350,617 (5,808,501)	4,452,813 (11,003,140)	53
Oklahoma	10,056,398 (24,849,900)	6,456,048 (15,953,241)	9,358,004 (23,124,132)	69
South Dakota	14,178,769 (35,036,500)	5,634,004 (13,921,928)	12,971,750 (32,053,892)	43
Texas	37,655,230 (93,048,100)	9,533,599 (23,558,038)	33,797,654 (83,515,822)	28
Wyoming	15,116,749 (37,354,300)	1,407,106 (3,477,034)	11,707,339 (28,929,464)	12
US Total	**181,359,560 (448,149,230)**	**59,271,188 (146,462,295)**	**159,260,092 (393,540,257)**	**37**

However, the Service failed to recognize to continued cumulative effects this loss is having on the species. The "sod busting" in the Great Plains during the late 1800s and early 1900s caused significant habitat fragmentation and population isolation, especially in the eastern portion of the BTPD historic range. The states of Kansas, Nebraska, Oklahoma, and Texas reported no BTPD complexes over 2,000 hectares (5,000 acres) to the USFWS. Kansas and Nebraska each reported 1 complex over 400 hectares (1,000 acres); Texas and Oklahoma have none. Because of the loss of habitat that occurred 100 years ago, prairie dogs in the eastern areas remain vulnerable to stochastic events caused by threats such as shooting and poisoning due to their isolation. Ironically, these areas are the few throughout the BTPD range that have not experienced significant plague events.

Permanent loss of habitat due to conversion of native grassland to cropland continues to occur in Chihuahua, Mexico. This is having a significant negative impact on the Janos/Nuevo Casas Grandes complex, once considered the largest BTPD complex in the world (List 2006; Manzano-Fischer 2006; (A. Davidson, Instituto de Ecología Universidad Nacional Autónoma de México, personal communication, 2007).

Tilling of native prairie grasslands within the BTPD range is likely increasing due to the demand for corn-based ethanol as vehicle fuel. Corn production increased by approximately 34% from 2005 to 2006 in the U.S. (Quaid 2006). Though not all of it occurred within the BTPD range, the increased demand for corn is impacting and will likely lead to the conversion of more existing and potential BTPD habitat and occupied area. For example, demand and production is increasing

significantly in Nebraska, the third largest producer of ethanol in the US. (Hamel et al. 2006). Also, Colorado is increasing its corn acreage by 25% in 2007 (Raabe 2007).

The Conservation Reserve Program (CRP) offers a way for farmers to take cropland out of production without losing all income by allowing cropland to be replanted with grass, and the farmers are paid an annual fee. The National Resource Conservation Service (NRCS) under the USDA runs the program. Unfortunately, CRP lands do not make good prairie dog habitat because the NRCS does not promote the planting of typical shortgrass prairie species, such as blue grama or buffalo grass. Instead, taller structure grasses dominate CRP lands creating barriers to prairie dog expansion and recovery instead of habitat. Thus, when lands are taken out of crop and put into CRP this does not create a net gain in BTPD habitat. The 2000 USFWS 12-Month Administrative Finding on the Black-tailed Prairie Dog noted some of the problems with the CRP program for prairie dogs:

> Stutzman (1989) reported that in five counties in north-central Montana, 56,000 acres (23,000 hectares) of native prairie were converted to cropland between 1987 and 1989, despite the CRP. Lesica (1995) noted that in the past 10 years there has been a small decline in the amount of cropland in Montana, due mainly to the CRP. However, the author also believes that the CRP has encouraged the loss of native prairie in Montana. The CRP allowed operators to break up native prairie and put it into crops at the same time that they have enrolled cropland in CRP. More land was put back into grass than was broken, but less than 6 percent of CRP land in Montana was planted to native species. Knowles et al. (1996) noted in Montana that *Agropyron cristatum* (crested wheatgrass) was the most common species planted on lands enrolled in the CRP, with a resultant loss in grassland biodiversity. Grass species established on most CRP lands would not likely be conducive for occupancy by black-tailed prairie dogs. (USFWS 2000: 50)

There have been proposals to modify the CRP program to make enrolled lands more suitable for native shortgrass prairie wildlife, including BTPDs. However, the USDA estimates that at least 7 million acres of CRP land will be put into corn production in the next few years (The Kiplinger Agriculture Letter 2006). In areas of the Great Plains too dry for corn, CRP land may be reallocated to other crops to compensate for lost acreages due to reallocation of land to corn in other areas (Wisner 2007). When reviewing this petition, the USFWS must further investigate and consider the increase habitat loss to corn production as well as the removal of land from the CRP program in its decision to list the BTPD as Threatened.

Overall, the continued losses of prairie dog habitat due to conversion to cropland should still be considered a significant threat across multiple states, even if rates of conversion are lower than historically. Certainly, the lower rate of conversion to cropland is due to the much smaller base of high-quality, arable rangeland to convert. With a combination of habitat losses and degradation due to ongoing municipal and cropland conversion; plague; habitat fragmentation and isolation; shooting; and poisoning, FWS should have found this threat to be high magnitude and imminent.

2. Urbanization

The loss of prairie dog colonies and potential habitat to urbanization continues to be a threat to BTPDS, especially in the Front Range of Colorado. Our organizations have sent the USFWS

substantial evidence of this threat in annual comments for the BTPD's candidate status review reports. (See Forest Guardians et al. 2000, 2001, 2002, and 2003 in the Administrative Record to review this evidence.) In its 2004 Not Warranted Finding the Service stated:

> We acknowledge that urbanization is an ongoing factor in habitat loss along the Front Range. In the 12-month finding, we noted that urbanization represents a locally substantial loss of occupied habitat, but in a range-wide context it is not significant. We continue to believe that, given population estimates in Colorado and elsewhere, urbanization cannot be considered a threat at present or in the foreseeable future, either in Colorado or rangewide. (69 FR 51217: 51222)

As discussed above, we dispute the accuracy of the Colorado BTPD census used in the 2004 Finding (White et al. 2005; cited in the 2004 Finding as (cited in the 2004 Finding as Pusateri, CDOW, in litt. 2002; Russell, CDOW, in litt. 2003). If the USFWS insists on using these Colorado Division of Wildlife data, it must acknowledge that urbanization is a threat to significant areas of BTPD colonies and potential habitat. Again, the Colorado data showed that Colorado's BTPD occupied habitat constituted 1/3 of the total occupied area for all of North America. Plus, the Service used information provided in Colorado's *Conservation Plan for Grassland Species* based on the survey to assert that the state had 18 colony complexes over 2,000 hectares (5,000 acres). At least 4 of these supposed complexes exist in the most urbanized and rapidly developing regions in the whole BTPD range. See map below and discussion on the next page.

The map below comes directly from Colorado's 2003 *Conservation Plan for Grassland Species*. As can be determined from the map legend, the areas with the darkest green color saturation denote the highest density of colonies, and Colorado has defined them as complexes >2,000 hectares (>5,000 acres). Notice complex #4 near, if not surrounding Fort Collins and Loveland; complex #6 near if not surrounding some major towns along the Front Range including Boulder, Longmont, and Northglenn; complex #7 near, if not surrounding Littleton and Lakewood; and complex #9 near, if not surrounding Pueblo. According to the CDOW's figures in the legend, these complexes contain 246 colonies of the 584 colonies within the 18 complexes, which is 42% of the colonies identified within these large complexes. Because of the pace of urbanization in these areas, the loss of many if not most of these colonies to poisoning and bulldozing is inevitable without additional policy protections. The communities along Colorado's Front Range have not shown the political will to protect the prairie dogs within their jurisdictions. It is very likely that these areas have already suffered significant prairie dog losses since 2004.

Map 6: Colorado Black-tailed Prairie dog Complexes Derived from White et al. (2005) Data.
(from *Conservation Plan for Grassland Species* Colorado Division of Wildlife and Colorado Grassland Species Working Group 2003: 18)

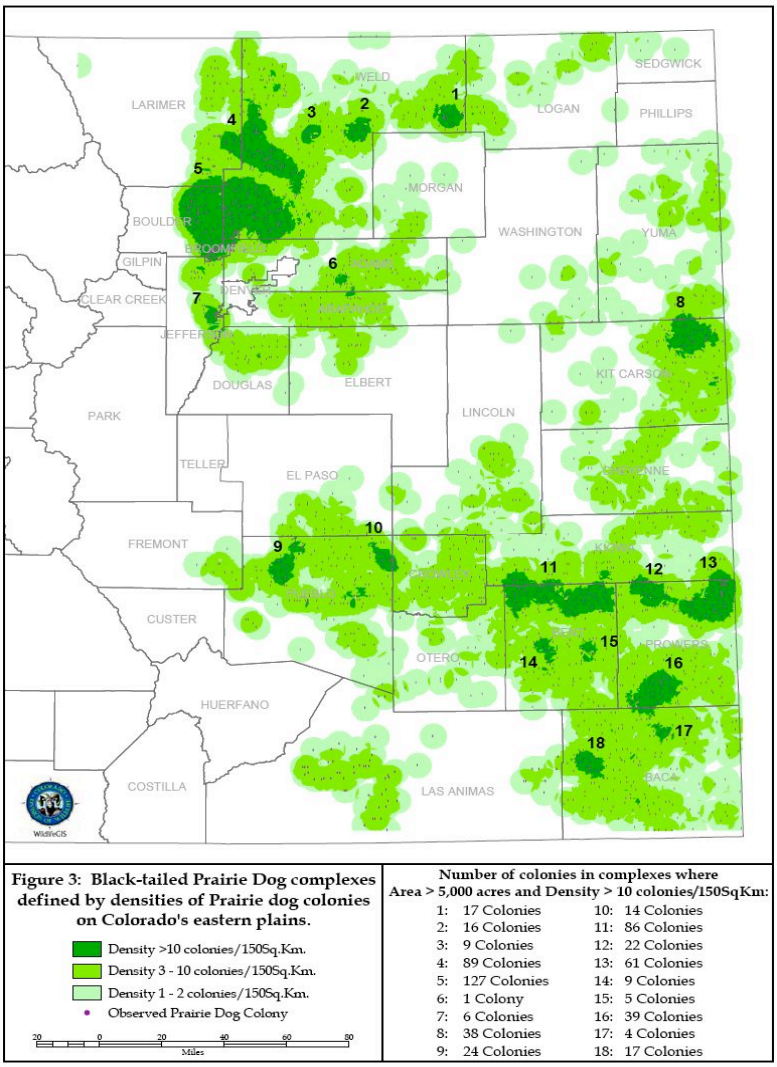


Figure 3: Black-tailed Prairie Dog complexes defined by densities of Prairie dog colonies on Colorado's eastern plains.

Density >10 colonies/150Sq.Km.
Density 3 - 10 colonies/150Sq.Km.
Density 1 - 2 colonies/150Sq.Km.
Observed Prairie Dog Colony

20 0 20 40 60 80
Miles

Number of colonies in complexes where Area > 5,000 acres and Density > 10 colonies/150SqKm:

1:	17 Colonies	10:	14 Colonies
2:	16 Colonies	11:	86 Colonies
3:	9 Colonies	12:	22 Colonies
4:	89 Colonies	13:	61 Colonies
5:	127 Colonies	14:	9 Colonies
6:	1 Colony	15:	5 Colonies
7:	6 Colonies	16:	39 Colonies
8:	38 Colonies	17:	4 Colonies
9:	24 Colonies	18:	17 Colonies

3. Oil, Gas, and Mineral Extraction

The West, including the remaining black-tailed prairie dog range, has experienced an unprecedented increase in oil and gas extraction and mining, particularly for coal and uranium, on private and public lands. These activities cause BTPD direct mortality, stress and behavioral changes, habitat degradation and loss, and increased fragmentation of prairie dog populations. The 2004 Not Warranted Finding for the BTPD did not mention the threat of drilling and mining to prairie dogs and their habitat. The USFWS must examine this threat in its decision to list the BTPD. We summarize the harms and provide evidence of increased oil, gas, and mining activities in BTPD habitat below.

Black-tailed prairie dog habitat damage and destruction occur at all phases of exploration, development, production, and remediation processes. The damage to prairie dog habitat by oil, gas, and mineral extraction are detailed in Center for Native Ecosystems et al. (2002)[6] *Petition to List the White-tailed Prairie Dog Under the Endangered Species Act*. We summarize these below.

- Fragmentation and loss of prairie dog habitat;
- Human disturbance of prairie dogs, including increased wildlife harassment, as well as general disturbance from human presence;
- Road construction, which increases potential for road mortality and shooting;
- New powerlines may increase perching opportunities for raptors, potentially increasing predation on prairie dogs;
- Crushing, burying, and degradation of vegetation;
- Noxious weed proliferation;
- Reduction in forage quality;
- Loud noises (including continuous din from compressor stations), which can lead to increased stress among prairie dogs;
- Soil compaction, with negative impacts on prairie dog burrows;
- Direct mortality from heavy equipment; and
- Contamination or degradation of habitat through wastewater generated by coal-bed methane extraction (Center for Native Ecosystems et al. 2002).

Oil and gas leasing, and the resultant exploration and development, have significant environmental impacts. Seismic exploration activities may crush large swaths of vegetation, compact soils, bury vegetation, decrease nitrogen fixation activity, introduce noxious weeds, increase soil erosion by wind and water as well as fragment habitat, undermine burrow structures, and increase prairie dog stress levels (Boyle and Connaughton 2002). Oil and gas exploration and development entails constructing a network of roads, pipelines, compressor stations, pads, and associated waste pits along with the wells across the landscape, which then requires maintenance for as long as they are operational. Throughout the life of a field, disturbance by human-associated structures, noise, pollution (including fuel, oil, brine, and toxic chemicals), and produced waters will permeate the landscape. Mining also results in long-term degradation and loss of habitat, habitat fragmentation, construction of roads that increase prairie dog mortality through roadkills and increased recreational shooting opportunities, increased human presence, and the production of waste material.

[6] *See* Forthcoming Attachment: Center for Native Ecosystems 2002, from which we relied for the following analysis. Full citations may be found in this attached document.

Construction and maintenance of this network results in traffic, noise, and air pollution that can alter black-tailed prairie dog habitat. The construction and presence of roads and associated development facilities fragment black-tailed prairie dog habitat, disturb black-tailed prairie dogs, and potentially displace their populations. Road densities may be as high as 4-5 miles of road for each square mile of oil and gas development, depending on the area. Road construction fragments habitat and increases road mortality and shooter access to prairie dogs. In addition, new powerlines create additional raptor perches and increase predation.

Waste products contaminate habitat (Clarren 1999). Surface and groundwater resources may be affected by the contamination of water supplies with oil and gas drilling mixtures used to facilitate the production of the energy resource. Compressor stations and well pumps release pollutants into the air (Clifford 2001).

The compressor stations associated with oil and gas production make a tremendous amount of noise, potentially disrupting black-tailed prairie dogs (Clifford 2001). There are several noise-related studies that suggest that sound and/or stress associated with seismic exploration could directly impact prairie dogs (Nash et al. 1970; Bondello 1976; Brattstrom and Bondello 1979; Heffner et al. 1994). And because prairie dogs communicate vocally (Slobodchikoff et al. 1991; Placer and Slobodchikoff 2000), loud noises likely significantly impact their ability to warn each other or predators and other hazards.

Extensive oil and gas development underway and/or planned for the Powder River Basin in Montana and Wyoming; Otero Mesa in New Mexico; Raton Basin in Colorado; the Great Plains National Grasslands, and other areas are also likely to chisel away at remaining BTPD acreage (both occupied and potential). The Cimarron, Comanche, Kiowa, Pawnee, and Rita Blanca National Grasslands have all ramped up their oil and gas leasing programs in the last several years. BTPDs in the northern Great Plains now confront a new threat to their habitat: coal bed methane development, particularly in the Powder River Basin.[7] The potential threat to BTPD habitat is extremely high-magnitude. Alarmingly, while BTPDs are within the Powder River Basin project area, the BLM did not cite them as a species that might be adversely affected by the project. The threat from coal bed methane is significant on the Thunder Basin and Little Missouri National Grasslands.

A proposed uranium mine, for example, threatens the Pawnee National Grassland, and uranium mining is predicted to increase in the west in the next several years. The USFWS must examine the potential impact of uranium and other mineral extraction in and around BTPD habitat.

4. Habitat Loss Caused by Loss of Prairie Dogs

Shooting, plague, and poisoning (all discussed in more detail below) not only cause direct mortality to prairie dogs but also can lead to degraded or lost prairie dog habitat and decreased grassland productivity (Weltzin 1997b; Oakes 2000). Prairie dogs create their own habitat by digging burrows and clipping vegetation, and their colonies require constant maintenance. Burrows in the absence of prairie dogs will eventually collapse. The 2000 USFWS 12-Month Finding believed habitat loss due to burrow deterioration was a moderate threat and described this problem:

[7]We direct FWS to the full discussion on environmental impacts of coal bed methane contained in the appeal of the Grasslands Plans Revision by Biodiversity Conservation alliance et al. dated January 30, 2003 in forthcoming attachment.

> Physical habitat changes may limit population recovery where control, sylvatic plague, or other factors have removed black-tailed prairie dogs. Once the species no longer inhabits an area, the deterioration of its burrows may preclude recolonization, especially where light grazing pressure or mesic conditions do not favor the expansion of colonies. Prairie dog burrows can be used and maintained by many generations of animals, depending on burrow longevity due to local soil type. Once underground burrows collapse due to the effects of weathering and age, the species is less likely to reoccupy them and reestablish itself in an area. The collective effort of several generations in developing a burrow complex is not easily duplicated by a pioneering individual from another colony. Black-tailed prairie dogs seldom disperse further than 3 miles (5 kilometers) and generally migrate to another colony or the perimeter of their natal colony rather than establish a new colony (Garrett and Franklin 1988, Hoogland 1995). This phenomenon was evident at the Rocky Mountain Arsenal National Wildlife Refuge in Colorado where reintroduced black-tailed prairie dogs reestablished themselves quickly where intact burrows constructed by previous prairie dog populations (extirpated by sylvatic plague) had not deteriorated. However, prairie dogs established themselves slowly and with much less success where burrows had deteriorated (Seery, U.S. Fish and Wildlife Service, pers. comm. 1998). (USFWS 2000: 53)

The USFWS did not mention this problem in the 2004 Not Warranted Finding. However, the Service must consider the effects of shooting, plague, and poisoning on habitat as well as their direct effects on population numbers.

5. Livestock Grazing, Fire Suppression, and Weeds

A century of fire suppression and overgrazing has significantly altered the vegetation of the West. Livestock grazing can lead to the proliferation of noxious weeds (Jones 2001) and woody plants, which negatively impacts prairie dog habitat. Grazing by livestock can aid the spread and establishment of alien and invasive species in three ways: 1) dispersing seeds in hair/wool, dung, and hooves (Evans and Young 1975; Smith and Nowak 1990; Trent et al. 1994; Knapp 1996; Young and Allen 1997); 2) opening up habitat for weedy species; and 3) reducing competition from native species by eating them (Fleischner 1994).

Cattle grazing can compound the above impacts by creating warmer and drier soil microclimates, through soil compaction and loss of plant, microbiotic crust and litter cover. The resulting warmer, drier microclimate reduces the competitive vigor of many native grasses (Piemeissal 1951; Archer and Smeins 1991), thus further increasing viability of aggressive exotics. A multitude of studies have found increased densities, cover or biomass of exotic plant species in grazed versus ungrazed sites (Green and Kaufman 1995; Drut 1994; Harper et al. 1996). Kitchen and Hall (1996) found that spring grazing by sheep resulted in higher percent cover of exotic annuals, and favored halogeton and cheatgrass (*Bromus tectorum*) expansion. Grazing can reduce leaf area to the point where native plants cannot complete photosynthesis, or can prevent native plants from reaching reproductive maturity (Knapp 1996). Annual noxious weeds, such as cheatgrass, have a competitive advantage over native plants in overgrazed environments.

Fire suppression and overgrazing both favor the proliferation of woody plants. This occurs through succession in areas where natural fire disturbance regimes have been suppressed, and because livestock usually find woody plants to be less palatable than grasses and forbs. In many cases these plants are palatable to prairie dogs, but if shrubs such as sagebrush achieve a certain density, black-tailed prairie dogs may no longer be able to inhabit an area. Black-tailed prairie dogs may abandon areas where shrub cover becomes too dense for forbs to persist. They also may retreat from areas that have become dominated by pinyon and juniper woodlands. Decadent woody shrub stands and pinyon–juniper, mesquite, juniper and other brush encroachment result in the loss of black-tailed prairie dog habitat.

In the black-tailed prairie dog's historic range in the U.S., large-scale desertification has taken place, wherein grasslands dominated by perennial grasses are transformed into desert scrub, dominated by brush and annual forbs and grasses (e.g., Bahre 1995; Whitford 1997; de Soyza et al. 1998). Consider Bahre's (1995: 230-231) description of the changes that have occurred in the Southwest's desert grasslands:

> In the 1850s and 1860s...the grasslands were open and largely free of brush. Grass was plentiful, the streams and rivers dissecting the grasslands were in parts unchanneled and lined with galleria forests and marshes..., wildfires were common, and antelope (*Antilocapra americana*), prairie dog (*Cynomys ludovicianus*), and Mexican wolf (*Canis lupus baileyi*) were abundant. Today, the landscape is different. The native grasses have declined, and in many areas nonnative species have replaced them; wildfires are rare; erosion is commonplace; and several grassland predators and herbivores have been eliminated. Probably the two most dramatic changes in the grasslands are the extensive increases in woody shrubs and trees and the landscape fragmentation resulting from localized urban and rural settlements.

Indeed, within the Chihuahuan desert, black grama was the dominant habitat type prior to European settlement, but has since undergone substantial reduction and fragmentation (Pidgeon et al. 2001). This transformation has been brought about largely because of livestock grazing. Bahre (1995) and Bock and Bock (2000) emphasize the importance of the 1891-1893 drought, combined with peak stocking rates of cattle and sheep, in accelerating the degradation of southwestern grasslands. State Bock and Bock (2000: 6), "This one event marked the time when the prehistoric high plains of southern Arizona were lost forever from our view." Other authors (e.g., Frederickson et al. 1998), reference livestock ranching during drought years in 1886, 1891-1894, and 1901-1904, which left rangelands severely overgrazed in parts of New Mexico.

An extensive body of literature documents livestock grazing's causation or facilitation of brush encroachment and consequent desertification of southwestern grasslands (Walker et al. 1981; Brown and Archer 1987; Bahre 1995; McPherson 1995; Le Houérou 1996; Weltzin et al. 1997; Frederickson et al. 1998; Valone and Kelt 1999; Kerley and Whitford 2000; Drewa and Havstad 2001; Pidgeon et al. 2001; Whitford et al. 2001). Of particular concern are the degradation and transformation of black grama (*Bouteloua eripoda*) grasslands, which provide high quality habitat for BTPDs and birds in the Chihuahuan desert and have been substantially reduced over the past century (Henry 1995; 1996; Pidgeon et al. 2001).

In addition, livestock grazing causes brush encroachment through diminishing fine fuels and facilitating the spread of some noxious weeds, which disrupts southwestern fire ecology. U.S.

southwestern desert grasslands were once characterized by frequent fires (every 7-10 years) that typically ignited in late June-early July, just prior to the summer rainy season from July-September (Drewa and Havstad 2001). With reduced fine fuels due to livestock grazing, fire's role in maintaining grasslands by reducing brush has consequently been compromised (Bahre 1991; 1995; McPherson 1995; Muldavin et al. 1998; Valone and Kelt 1999; Bock and Bock 2000; Drewa and Havstad 2001).[8]

The livestock industry and other opponents of prairie dog protection often claim that it is the prairie dogs not the livestock that spread exotic weeds. However, a recent study in Science by Parker et al. (2006) found that native herbivores, such as prairie dogs and bison, suppress exotic plants and historically provide biotic resistance to non-native plant invasions, but exotic herbivores, such as cattle and sheep, facilitate the spread and increase abundance of non-native invasive plant species. The authors stated:

> Our analyses suggest that anthropogenic alteration of herbivore communities has facilitated exotic plant invasions. When Europeans initially colonized North and South America, Australia, and New Zealand, they largely extirpated native bison, elk, kangaroos, prairie dogs, moas, and tortoises and replaced them with introduced cattle, pigs, horses, sheep, goats, rabbits, and other exotic herbivores from Eurasia (12, 24, 26). Thus, a source of biotic resistance to plant invasions (native herbivores, …) was replaced with species that promote further invasions (exotic herbivores, …). Consequently, exotic generalist herbivores decimated naïve, New World plants and paved the way for invasions of Old World plants that were adapted to these herbivores (25, 27). Thus, exotic plants may thrive not by escaping their native enemies, but by following them. These findings have considerable implications for ecosystem conservation, suggesting that eradication of exotic herbivores and restoration of native generalist herbivores could mitigate exotic plant invasions and avoid problems associated with introductions of nonnative herbivores for biocontrol (28). (Parker et al. 2006: 1460, citing Simberloff et al. 1999; Crosby 1986; Crawley et al. 1996; Mack et al. 1982; Louda et al. 1997)

A copious literature exists about the potential effects of prairie dogs on livestock forage. Very few studies have looked at the negative impacts of domestic livestock, particularly cattle, to prairie dogs. Cattle are assumed to benefit prairie dogs because prairie dogs and bison coexisted on the Great Plains for millennia. But, the replacement of native, free-ranging bison with exotic, pasture-enclosed livestock, particularly cattle, has significantly altered the vegetative communities of the West. Like cattle in many areas of the plains, bison intensively grazed areas, mowing down vegetation to enable prairie dogs to expand their colonies. Free-roaming bison had the option of moving on to better pastures when they needed more forage, except during times of extreme drought. Cattle often overgraze the same pasture each year. Overgrazing is also assumed to benefit prairie dogs because their colonies tend to expand in places with overgrazing as well as drought conditions. It is not at all clear that prairie dog colony expansion signals population health. Areas that have been overgrazed by livestock may have less available forage. Colony expansion may be a response to the lack of forage available. It is unclear when intensive grazing ceases to be beneficial to prairie dogs. More research is needed in this area, and listing the BTPD would help make more

[8]See Forthcoming Appendix (Aplomado Falcon Petition) for further information and full citations for much of this section.

funds available for this kind of research. Prairie dogs also may appear to compete with livestock in areas that are overstocked and will thus be vulnerable to poisoning.

6. Conclusion

Documented losses of existing and potential habitat demonstrate that conversion of rangeland to cropland; urbanization; oil, gas, and mineral extraction; loss of prairie dogs; livestock grazing; fire suppression; and weed infestations are dangerously shrinking the amount of habitat available for BTPD protection and recovery and are further fragmenting and isolating remnant prairie dog populations. Alongside shooting, poisoning, and plague, habitat destruction cumulates in high-magnitude, imminent threats to BTPD survival. According to the USFWS, black-tailed prairie dogs are absent from 98% of their range and they are at risk of extinction or becoming endangered in the foreseeable future. This dire situation has come about in large part due to the past and ongoing destruction of their habitat.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

1. The Threat of Prairie Dog Shooting

In response to the 1998 listing petitions, the USFWS has never considered the recreational shooting a significant threat to black-tailed prairie dogs (FWS 2000; FWS 2001; FWS 2002; FWS 2004a; FWS 2004b). The Fish and Wildlife Service's Warranted But Precluded Finding on the Black-tailed Prairie Dog determined that recreational shooting was a low magnitude threat but imminent, "because it is ongoing"(USFWS 2000: 81). As the Service stated in the 2000 Finding:

> Recreational (sport or varmint) shooting is impacting black-tailed prairie dog populations in some local areas. At present, the Service does not believe that this factor is responsible for significant rangewide declines in the species' population; however, **it may be important locally**. (65 FR 5476: 5483) [emphasis added]

As with plague, poisoning, and habitat loss, it is the cumulative effect of localized extinctions across the species' range that puts the black-tailed prairie dog at risk of range-wide extinction and has already caused extinctions in significant portions of its range. The FWS discounted the additive effects of these multiple threats to the black-tailed prairie dog in its annual assessments and in its decision to remove the species from ESA candidacy.

We dispute the USFWS's conclusion that shooting is not a threat to prairie dogs on three bases: 1) we can now document the extirpation of prairie dogs from the shooting threat alone; 2) the massive loss of individual prairie dogs from shooting intersects with other threats against the species; and 3) in other documents the USFWS recognized that shooting may prove to be a threat to black-tailed prairie dog colonies. The agency's position on shooting lacks a scientific basis. There is no sound reason to categorically dismiss shooting as a threat to BTPDs.

In its 2004 Not Warranted Finding, the Fish and Wildlife Service utilized only a fraction of the available scientific information to make its assessment that "effects due to recreational shooting do not rise to the level of a threat pursuant to the definitions of the Act" (69 Fed. Reg. 51217: 51222). Again, the Endangered Species Act does not specifically define threat or provide a threat threshold. Scientific research on prairie dog shooting demonstrates that shooting has significant negative

impacts to black-tailed prairie dog populations. Recreational shooting causes direct prairie dog mortality and population losses. Shooting also causes behavioral changes, loss of reproductive capacity, diminished body condition, higher stress levels, emigration, changes in population structure, increased predation, unpredictable and colony-specific effects, decreased population density, decreased colony expansion rates, and habitat fragmentation. Moreover, prairie dog shooting has increased across the remaining range of the black-tailed prairie dog, and shooting technology is increasing—allowing individual shooters to kill more prairie dogs at longer distances. These effects can all contribute to population decline and the loss of prairie dogs across significant portions of their range.

Before the removal of the black-tailed prairie dog from the ESA candidate list, some state and federal agencies had reduced or banned shooting on some public lands. Thunder Basin National Grassland imposed a shooting ban, as did Phillips County, Montana, site of a black-footed ferret reintroduction (Reeve and Vosburgh 2006). The state of Colorado issued regulations in 2001 that completely outlawed prairie dog shooting on all public lands throughout almost the entire black-tailed range in the state. However, federal agencies have relaxed shooting bans in on several BLM and Forest Service lands. Colorado relinquished its ban in September 2006, opting instead for a shooting season (see Regulatory Mechanisms section of this petition).

Below we describe the multiple impacts of shooting to black-tailed prairie dogs. We demonstrate that this factor is indeed a significant threat that, when taken together with the threats, can cause extinctions across significant portions of the species' range.

Entire colonies can potentially be eliminated from shooting pressure (Knowles 1988; Livieri 1999). Small colonies may be particularly vulnerable to negative impacts from shooting (Knowles 1988; Knowles 2002 citing J. Capodice, personal communication).

Data demonstrate that prairie dog shooting can kill a significant number of prairie dogs. In their study of shooting on BLM and USFWS lands in Montana, shooters averaged 200 kills in 2-3 days (Vosburgh and Irby 1998). . Reeve and Vosburgh (2006) summarized state figures documenting number of prairie dogs killed per year. They stated, "the cumulative number of victims can be substantial" (p. 142). Nebraska reported 301,000 individuals killed in 1998 and 356,000 in 1999 (Fritz 2001). South Dakota documented 1,186,272 shot in 2000 (South Dakota Prairie Dog Working Group 2001). In 2000, shooters killed 57,848 prairie dogs on the Rosebud Reservation (Reeve and Vosburgh citing Rosebud Sioux Department of Game, Fish, and Parks unpublished data). Gigliotti (2001) reported a single-year kill rate of 1.5 million prairie dogs on non-tribal lands in South Dakota. Shooters killed an average of 14,200 prairie dogs each year between 1993-2001 on the Lower Brule Sioux Reservation (Reeve and Vosburgh 2006 citing Lower Brule Sioux Tribe 2002).

Craig Knowles (1988) studied controlled shooting study on two colonies in the Charles M. Russell National Wildlife Refuge in Montana. Colonies were along a dirt road less than 3 km from a 247-acre colony, so immigration complicated results. Nevertheless, after a total of 40.3 hours of shooting over two years, there was a 74% decline in the number of adults at colony A. After a total of 42.5 hours of shooting over two years, there was a 100% decline in the number of adults at colony B. Only one juvenile prairie dog survived the shooting study. In this study, shooting was the identified source of prairie dog declines: "Both treated colonies showed strong population recovery trends in 1980 in the absence of shooting" (p. 54). The study suggested that shooting might lead to

direct extirpation: "In the case of the smaller colony, shooting appeared capable of removing all prairie dogs." (p. 54)

In addition, Knowles (1988: 55) suggested that shooting might decrease prairie dog populations to the point where they are extremely susceptible to extirpation from stochastic events:

> In another small colony on the Refuge, 12 prairie dogs were removed by shooting in the spring of 1975. The three remaining prairie dogs were eliminated by natural causes by late fall of that year. This colony site had not been re-colonized by 1984 (year of last survey). Lewis et al. (1979) thought 10 to 20 prairie dogs were needed to start a colony. Possibly the reduction of prairie dogs below a certain threshold number may have a negative population consequence (Allee's Principle, Allee et al. 1949) because fewer prairie dogs are available to watch for predators (Hoogland 1981) and keep the vegetation clipped around burrows.

Livieri (1999) modeled population responses to shooting at the Buffalo Gap National Grassland. The starting population estimate was 105,035 prairie dogs. The model assumed that prairie dog population growth would be logistic. In this analysis, shooting caused population declines: "At the [Buffalo Gap National Grassland] in 1998, it was estimated that the prairie dog population was reduced by as much as 75% by recreational shooting (USFWS 1998)" (unnumbered page). In addition, shooting may cause extirpation: "Harvest levels of 50% would cause a precipitous decline from the current population size and 75% would cause the population to go extinct within 40 years" (unnumbered page).

Reeve and Vosburgh (2003) also modeled prairie dog population response to shooting.

> But if the harvest exceeds some maximum yield level and continues over time, the population will eventually decline to zero. Figure 3 shows that an annual harvest of 75 animals or fewer can be sustained by a population initially of 1000 with Rmax=2.00. When 79 animals are harvested annually, the population declines toward zero. The maximum sustained yield is approximately 77 animals and any annual harvest [less than or equal to sign] 77 stabilizes the population at some level less than the carrying capacity. But constant harvesting at excessive levels >77 animals first reduces population size and then reduces the population growth rate with eventual extinction (Caughley and Sinclair 1994, Akcakaya et al. 1999). (Reeve and Vosburgh 2003: 10-11).

These authors later state, "Constant numbers harvested each year, if slightly too high, will lead to extinction"; and "An annual quota of 75, applied to 100 simulations of a population with demographic variability however, produces no such population stability (Figure 5). In fact, the Leslie matrix model (Akcakaya et al 1999) predicts an 11% chance that the population will become extinct within a 15-year period" (Reeve and Vosburgh 2003: 16).

Though the Fish and Wildlife Service claims that colonies that experience even heavy shooting can recover, this is not guaranteed. Knowles (1988) found that his research sites that experienced intensive shooting demonstrated declines of over 75% two years after the shooting occurred. Pauli (2005) stated, "conceivably, prolonged shooting results in additive mortality rates and disrupts populations processes, resulting in continually declining populations" (p. 4). Conditions must be

right for prairie dogs to repopulate a colony that has experienced a high level or complete mortality after shooting (this goes for poisoning or plague as well). Without prairie dogs continually maintaining their burrows and clipping down vegetation, burrows can collapse and vegetation can grow tall—impeding recolonization.

Reeve and Vosburgh (2006) noted that juveniles are more vulnerable to recreational shooting than adults. Keffer et al. (2001) found that young prairie dogs comprised 53% of the shooting victims though they made up only 35% of the population on a colony that experienced 10% shooting mortality.

In addition, prairie dog dispersal takes place in late spring (Knowles 1985; Garrett and Franklin 1981). Even without shooting pressure, there is a low survival rate of dispersing males (Garrett and Franklin 1981; Hoogland 2001). The negative impacts of shooting on prairie dog migration may therefore be considerable.

Shooting pressure decreases reproductive capacity. Jonathan Pauli conducted one of the most recent studies of prairie dog shooting (Pauli 2005). Pauli systematically had 30% of the prairie dogs at five colonies shot, and then compared the results to a control group of five untreated colonies. Shot colonies showed a 50% reduction in pregnancy rates and a 76% decline in reproductive output. This study documented mechanisms for several additive impacts of shooting. Stockrahm and Seabloom (1998) also reported a significant difference in productivity between females on colonies that experienced shooting and those that did not. Their analysis of placental scars on yearling females revealed that 90% on un-shot colonies tried to reproduce but only 32% attempted reproduction on colony sites in North Dakota that experienced shooting for over 20 years.

Adult females have experienced a higher rate of mortality than males on shot colonies (Vosburgh and Irby 1998; Keffer et al. 2001; Reeve and Vosburgh 2006). Though Pauli (2005) found that adult males were most susceptible to shooting on his treated colonies, male populations were more likely to rebound while females experienced lower population densities for longer (see below). A female-bias in shooting victims would reduce colony reproduction rates. Even though male dispersal is important for reproduction, because 1 male can impregnate multiple females a loss of females in a colony would have a greater immediate impact on reproduction.

Spring is one of the most popular times of the year for recreational shooting and also a very vulnerable time for prairie dogs. Pregnant and lactating females are at risk between March and May, and thus, shooters can kill off two generations at once (Knowles 1988; Reeve and Vosburgh 2006).

Prairie dog shooting significantly reduces prairie dog population densities (USFWS 1998a, b; Pauli 2005). On colonies treated with shooting, Pauli's (2005) data show juvenile densities dropped by 75% 10 months after shooting and female densities decreased by 40% and stayed lower compared to the control colonies of un-shot prairie dogs. Irby and Vosburgh (1994) found that prairie dog shooters prefer higher densities of prairie dogs. This causes shooters to spread the pressure of their activity depending on population density, causing uniformity in prairie dog populations across colonies. Biologically, such uniformity is destabilizing to prairie dog populations.

Studies also report that shooting may decrease colony expansion rates (Miller et al. 1993; Reading et al. 1989). One study revealed that a colony in Montana had a 15% annual expansion rate when prairie dogs were not hunted, contrasted with a 3% expansion rate when they were (Miller et

al. 1993). This dramatic decrease in rates of expansion represents decreased migration, which constitutes human interference with an integral population dynamic in prairie dogs: prairie dog dispersal.

Biologist with the Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands, Brian Cox, speculated that black-tailed prairie dog colonies on the Cimarron National Grassland exhibited significantly lower expansion rates than the Comanche's Carrizo Unit after the 1995/1996 plague epizootic because of different shooting policies (B. Cox, pers. comm. May, 2007). These Grasslands are in close proximity—with the Comanche near the southeastern border of Colorado and the Cimarron just across the border at Kansas' southwest edge. They experience similar weather and other conditions. In 2001, the Colorado Division of Wildlife banned black-tailed prairie dog shooting on public lands east of I25, including the Comanche National Grassland, while Cimarron managers encouraged shooting and even provided prairie dog colony maps on their website specifically for shooters.

In addition to direct mortality and the other effects documented in Pauli's work, mass emigration is a potential result of shooting pressure. Keffer et al. (2000) found that after they shot 22% of the black-tailed prairie dogs on one colony as part of a controlled shooting study, 69% (212 individuals) of the remaining prairie dogs left the colony.

Shooting also alters prairie dog behavior. For instance, Irby and Vosburgh (1994) found that even light shooting has a significant effect on prairie dog behavior, with 42% of prairie dogs retreating to the burrows on a lightly shot colony, contrasted with a 22% retreat rate on unshot colonies, and 55% retreat rate on heavily shot colonies. Similar findings were also reported by Keffer et al. (2001). Pauli (2005) found that alert behavior was eight times higher on shot colonies after treatment, and foraging declined by 66% on shot colonies after treatment. Resting behavior also decreased. Alert behavior remained higher in the prairie dogs in the treated colonies than among the control group one year after shooting. Pauli noted, "prairie dogs increased behaviors that reduced their vulnerability to shooting at the expense of usual fitness-enhancing activities" (p. 24).

A novel aspect of Pauli's (2005) research was to compare the body conditions, stress levels, and flea loads of prairie dogs living in treated (shot) colonies to those that experienced no shooting. Using a body condition index proposed by Krebs and Singleton (1993) and recommended for use in sciurids (Wirsing 2002), Pauli divided body mass by hind foot length. He found that body conditions of prairie dogs in the treated colonies were reduced and 35% different than the control colony prairie dogs after shooting. One year later, the treated colony prairie dogs improved but body condition remained 17% lower than the untreated colony prairie dogs. Juvenile prairie dogs on the shot colonies demonstrated an 80% increase in corticosterone levels (a measure of stress) compared to the control group juveniles. Pauli concluded,

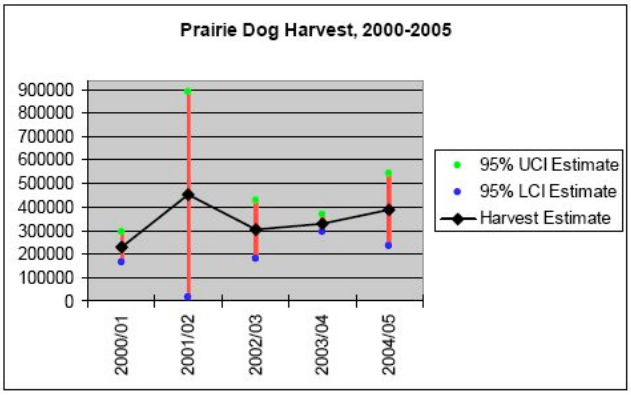
> Decreased body condition and increased stress-levels have important implications for prairie dog survival and reproduction. Despite the adaptive role of corticosterone in managing short-term stressors, chronically high levels can lead to reproductive failure, suppression of the immune system, and poor body condition (Sapolsky 1992). (Pauli 2005: 27)

Of great significance given the grave threat of plague to prairie dogs, prairie dogs on the treatment colonies had significantly more fleas than control group prairie dogs in Pauli's study. The

number of fleas per prairie dog doubled on the shot colonies after shooting and remained higher than the control group one year later. Flea infestations on the treatment colonies increased to 66% while they declined to 19% on control group colonies after shooting took place.

There are indications that prairie dog shooting has been increasing, although few states collect data on prairie dog shooting. In North Dakota, prairie dog shooters from outside the state went from 163 in 1989 to 1,326 in 2001 (Reeve and Vosburgh 2006 citing S. Hagen, North Dakota Game and Fish Department, Bismarck, North Dakota, pers. comm. 2003). The Colorado Division of Wildlife's Harvest Information Program (HIP) provides data on the number of prairie dogs shot in Colorado (Colorado Division of Wildlife 2007). The HIP estimates do not distinguish between the different species of prairie dogs. In total, HIP estimated that 388,714 (±154,520) prairie dogs were shot by 4,346 small game license-holders during 49,599 hunter-days for the 2004-2005 season. These data under-report shooting because HIP reporting is voluntary, and many shooters to not bother to report their kills. One way to gauge shooting pressure on BTPDs is by examining HIP data for those counties within the range of the BTPD in CO. The total take of prairie dogs in the range of the BTPD in Colorado from shooting in 2004-2005 was 265,000, not including Las Animas County. Eight counties are experiencing BTPD take >10,000 prairie dogs. Many of these are BTPD strongholds and shooting in the state should therefore be cause for concern. It is clear that shooting continues to be a threat to BTPDs in the state and appears to be, in fact, an increasing threat.

Graph 2. Colorado BTPD Shooting Trends.



These data are undoubtedly flawed, as indicated by the wide confidence interval. Moreover, multiple species of prairie dogs are found in the same counties. For example, Las Animas, Douglas, El Paso, and Jefferson counties ware within the range of both the Gunnison's prairie dog and BTPD. However, the shooting statistics do provide an approximate gauge of the magnitude of the shooting threat to prairie dogs in the state.

While the number of shooters is increasing, so is the technology that allows shooters to kill more prairie dogs. As stated by Reeve and Vosburgh (2006: 124):

> Today's shooters typically bring a variety of rifles, telescopes, rangefinders, shooting benches, and reloading equipment … . Shooting prairie dogs at long distances entitles membership in the 500-Yard Club, sponsored by Varmint Hunter magazine. Some marksmen have been successful from 1,350 meters (1,500 yards).

Knowles and Vosburgh (2001: 7) concluded, "Shooting can impact prairie dog populations and …it is just a matter of the number of hours of shooting effort expended on a colony in relation to the size of the colony that determines the level of impact."

Scientific research conducted over the last several decades has and continues to demonstrate that shooting is a threat to prairie dog survival. Prairie dogs make highly visible targets. As with plague, the colonial nature of prairie dogs makes them more vulnerable to shooting. Pauli (2005: 32) noted,

> With regard to costs, coloniality facilitates the transmission of parasites and disease. Shooting appears to raise levels of infestation with fleas, an important disease vector, so that costs of coloniality and shooting appear to be multiplicative. Likewise, coloniality causes all animals to be disturbed by a single intrusion; shooting raises this disturbance level so that many animals do not feed, remain belowground, or otherwise forego foraging opportunities. Under most circumstances, access to mature male mates is not limiting to female prairie dogs, but shooting selectively removed adult males, so that female access to competent mates was apparently limited. This may have contributed to reproductive near-collapse the summer after shooting. Thus, although prairie dogs share similar characteristics to other hunted small-bodied mammals, their coloniality makes them particularly sensitive to human hunting.

The USFWS must take into account this information showing that shooting is a significant and increasing threat to BTPDs.

2. The Pet Trade

With the possible exception of an injured or confiscated animal, prairie dogs should not be taken in as household pets. As we have argued here, there are too few of them in the wild. However, prairie dogs are popular pets in the United States and especially in Europe and Japan. While not as severe a threat as habitat destruction, shooting, plague, or poisoning in terms of reducing the abundance of BTPDs in the wild, it is an additional and unnecessary hindrance to prairie dog conservation. Wild prairie dogs from Texas had been one of the primary sources for the pet trade along with South Dakota. As Lon Kightlinger, MSPH, Ph.D., State Epidemiologist, South Dakota Department of Health, stated in an email to Jennifer G. Wright of CDC (June 11, 2003), "As you might know there is a mini-industry here in SD [South Dakota] in PD [prairie dog] trade and lots of tourists come to see the PD towns."

With the monkeypox outbreak in pet prairie dogs in Illinois and other states, the Centers for Disease Control and Prevention and the U.S. Food and Drug administration clamped down on the trade in prairie dogs. Texas banned its prairie dog pet trade completely. However, the risk of a pet prairie dog that is infected with an exotic disease being released into the wild must be considered a possible and potentially catastrophic risk to BTPDs.

C. Disease or Predation

Based on our analysis of information available at the time of the 2004 Not Warranted Finding for the black-tailed prairie dog and new information available since the finding, we determined that predation is not a significant threat to the survival of the species. . However, sylvatic plague is a severe and imminent threat in a significant portion of the species' range. We discuss these listing factors below.

1. Predation

Predation is not a threat to the survival of the black-tailed prairie dog. But, we are gravely concerned about the decline of some of the species' natural predators and have discussed this above.

2. Disease

a. Sylvatic Plague

The vulnerability of prairie dogs to plague and the devastating effects that plague has on populations should warrant listing of the species, in isolation of other listing factors. Plague is caused by the bacterium *Yersinia pestis* and is carried by fleas, the primary plague vector. It can kill up to 100 percent of the prairie dogs in a colony and spread quickly across the landscape to infect other colonies (Miles et al. 1952; Barnes 1993; Cully and Williams 2001). Cully and Williams (2001: 895) summarize some of the impacts of plague to prairie dogs:

> Some of the important consequences of plague in prairie dogs are local extirpation of colonies, reduced colony size, increased variance in local population sizes, and increased distances between colonies…The impacts of plague reduce the effectiveness of dispersal in demographic rescue among colonies and increase the probability of extinction of entire complexes.

Because plague first occurred in North America only in the last hundred years and within the black-tailed prairie dog range only about 60 years ago (Ecke and Johnson 1952; Miles et al. 1952; Cully et al. 2000), black-tailed prairie dog populations have not evolved adaptations to the disease that allow them to withstand recurring epizootics. At the time of this petition, genetic immunity to plague, though possible, had not been confirmed in prairie dogs in the lab or the wild. Prophylactic measures, such as insecticide treatment of burrows and vaccination, which might reduce mortality, are not available for large-scale application. The following sections refute the USFWS's 2004 argument that black-tailed prairie dog "populations are not as vulnerable to the disease as previously thought" (69 Fed. Reg. 51217: 51222).

i. Response to the 2004 Not Warranted Finding Claims about Plague

The USFWS argued sylvatic plague was a "moderate and imminent" threat to BTPDs in the 2000 Warranted But Precluded Finding, the 2001 Candidate Notice of Review (66 FR 54808), and the 2002 Candidate Notice of Review (67 FR 40657). The USFWS issued its 2003 Candidate Notice of Review in 2004 and did not assign a threat level to plague in that notice. But, in the 2004 Not Warranted Finding the USFWS did an about-face and downgraded the threat level of sylvatic plague to "no longer a threat" (69 Fed. Reg. 51217: 51224). The Service justified downgrading the threat with the claim: "recent information indicates that the populations are not as vulnerable to the disease as previously thought" (Ibid. 51222). As stated in the Finding:

> Our previous conclusions regarding the perceived effects of plague on the persistence of the species have been altered by information indicating that – (1) high exposure doses of plague bacilli may be necessary for disease contraction in some individuals, (2) limited immune response has been observed in some individuals, (3) a population dynamic may have developed in low-density, isolated populations that contributes to the persistence of these populations, (4) the apparent ability of some sites to recover to pre-plague levels after a plague epizootic; and (5) approximately one-third of the species' historic range has not been affected by plague. Based on both the new information above and recent State-by-State range-wide estimates of

> occupied habitat that indicate species abundance, plague no longer appears to be as significant a threat as previously thought. We predict that plague will continue to influence black-tailed prairie dog population dynamics to a degree. However, we now conclude that plague in combination with other factors is not likely to cause the black-tailed prairie dog to become an endangered species within the foreseeable future (69 Fed. Reg. 51217, 51224).

Despite these assertions, sylvatic plague continues to be a significant threat to the survival of black-tailed prairie dogs. The collected evidence available in 2004 does not support the Service's conclusions about plague, listed above. Additionally, new research since 2004 continues to indicate that plague is and will remain a threat to black-tailed prairie dogs. Overall, plague continues to have mortality rates close to 100% in infected colonies; this claim continues to be echoed in the most recent plague research (Collinge et al. 2005; Antolin et al. 2006; Holmes et al. 2006). The certainty of plague continuing to be a major threat to BTPD survival and the uncertainties about recovery success and potential resistance to plague underscore the need for a precautionary approach. Black-tailed prairie dogs need federal ESA protection while plague research continues. We rebut the USFWS arguments that plague is not a threat to BTPDs in turn.

(1) HIGH EXPOSURE DOSES OF PLAGUE BACILLI MAY BE NECESSARY FOR DISEASE CONTRACTION IN SOME INDIVIDUALS.

Black-tailed prairie dogs have shown some variability in the amount of plague bacilli (*Yersina pestis* bacterium) needed to infect individuals. Two BTPDs survived what researchers consider to be high levels of bacteria (up to 130,000 Colony Forming Units) injected in one laboratory experiment (Mencher et al. 2004; see below). This does not support the implication—made more explicitly in claim (2) below—that some BTPDs are resistant to plague. Furthermore, variability in plague bacilli dose levels that prairie dogs receive in the wild during epizootics has not been studied. The USFWS argument does not change the fact that plague continues to decimate colonies in what is now over 66% of the species' range and that many affected areas cannot recover populations due to recurring epizootics. In Phillips County, Montana, the black-footed ferret reintroduction is in jeopardy because the complex of prairie dog colonies continues to decline due to recurrent plague outbreaks.

In its 2004 Not Warranted Finding, the USFWS cited notes from a discussion between Pete Gober, with USFWS Ecological Services Branch and lead Service biologist in charge of the BTPD, and Tonie Rocke, an epidemiologist with the U.S. Geological Survey's National Wildlife Health Center, to support the claim (1) above. The 2004 Finding stated,

> Single or even multiple flea bites do not always have a high enough dose for infection to occur (Rocke, USGS, pers. comm. 2002). In contrast, if plague is spread pneumonically from animal to animal, a much larger dose is transferred than from a flea bite. (69 FR 51217: 51223)

Gober's notes from his discussion with Rocke stated,

> Tonie has been working with USFWS for several years to develop additional vaccines for distemper and plague for use with black-footed ferrets, both in captivity and in the wild. More recently she has investigated the possibility of an oral bait delivered plague vaccine to prairie dogs. She has challenged btpds from SD [South

> Dakota] to try to establish a LD (Lethal Dose) 50, but has found that subcutaneous injections that mimic flea bite doses of plague bacterium have not provided her with a clear measure. Some btpd test subjects have been exposed to high numbers of plague bacterium (two survived 125,000 cfu, Colony Forming Units), but did not contract the disease… yet some died from 12 cfu… She wonders if btpds from SD could be different in genetic resistance to plague than those in other areas… since SD has not seen plague in its btpds. She also wonders if flea bite doses may not be sufficient to cause contraction of plague in most cases for btpds, but that when they do… then the very social nature of btpds allows for rapid and widespread fatal transmission through a colony via pneumonic transmission where thousands of plague bacterium could be transferred via repeated "kissing". Accordingly, dense btpd populations may be more vulnerable from a population standpoint than are very low density populations that are isolated (see Lomolino J. Mamm. Report for Oklahoma). Also, this might explain the phenomena of pockets of prairie dog survivors amidst an epizootic where most individuals die… but not all. Perhaps these animals are separated by some barrier, physical or social or other, which keeps them from being exposed to pneumonic transmission of high plague doses even though they may be exposed to low doses via flea bites… if they are of the genotype to resist relatively low cfu doses. **All of this remains unclear.** Accordingly, the vulnerability of the btpd populations to plague should be considered to be moderate. (Gober 2002) [emphasis added]

This is the only piece of evidence that the USFWS used to support claim (1)—preliminary and very limited data from one laboratory experiment. Moreover, Rocke merely provided speculations to the USFWS regarding what her data might mean, and she was very clear about that. Moreover, Rocke, a plague expert, recommends considering plague a "moderate" threat. The data presented by the USFWS in the 2004 Finding are insufficient to support claim (1).

Nonetheless, we do not dispute the claim that some BTPDs may require higher doses of plague bacilli than most prairie dogs to contract the disease. The apparent ability of some prairie dogs to survive epizootics has long suggested variation among BTPDs in their susceptibility to plague. However, this could be due to behavioral differences among individuals, health at the time of exposure, the presence and abundance of other vectors (such as deer mice), and a wide variety of other variables. It could also be due to the stochastic nature of disease epidemics.

The finding Rocke discussed with Gober (above) was peer-reviewed and published as part of a study about the efficacy of a plague vaccine (Mencher et al. 2004). The authors stated, "We were surprised that two unvaccinated animals survived a challenge with 130,000 CFU…" (p. 5504). These data come from a highly controlled laboratory experiment, not from a study of prairie dogs in the wild. The study did not test whether the two highly-tolerant prairie dogs survived plague challenges beyond 130,000 CFU. The Mencher et al. (2004) study, though encouraging, does not indicate whether prairie dogs can or regularly do receive high doses (>130,000 CFU) in the wild. The study indicates, however, that most prairie dogs are likely to die with a much smaller dose of plague bacilli. Fifteen of the 17 unvaccinated control group prairie dogs—88%—died when injected with the bacilli.

(2) LIMITED IMMUNE RESPONSE HAS BEEN OBSERVED IN SOME INDIVIDUALS.

Despite some promising research indicating the possibility that a few black-tailed prairie dogs may display some resistance to plague, **no study to date has confirmed genetically-based immunity to *Y. pestis* in BTPDs**. Moreover, such knowledge has not removed the threat of plague to the species. The USFWS stated in the 2004 Not Warranted Finding,

> Recent laboratory research indicates that at low levels of exposure a small percentage of black-tailed prairie dogs show some immune response to plague (Rocke, U.S. Geological Survey (USGS), pers. comm. 2002) … (69 FR 51217: 51223)

Again, the USFWS used preliminary results from laboratory experiments to make claim (2). The Service again used the notes from Rocke's conversation with Pete Gober (69 FR 51217: 51223, citing Rocke, U.S. Geological Survey (USGS), pers. comm. 2002). The Mencher et al. (2004) study—the published results from Rocke's experiment—discussed above found that the 2 prairie dogs who survived the 130,000 CFU challenge developed plague antibodies—an indicator of resistance. The researchers stated,

> We were surprised that two unvaccinated animals survived challenge with 130,000 CFU and believe that this suggests that innate resistance to *Y. pestis* may occur in some prairie dogs. The nature of this resistance is unknown. Interestingly, the two control animals that survived challenge developed high antibody titers to V antigen (2,560 and 10,240) but not to F1 (<50 and 100). (p. 5504)

The study merely suggests, and makes clear that it does not prove, some level of genetic resistance of these prairie dogs to plague.

The USFWS also cited preliminary data that 2 out of 65 prairie dogs developed plague antibodies after exposure to plague on the Pawnee National Grassland (69 FR 51217: 51223, citing Antolin, Colorado State University, pers. comm. 2002). The citation comes from a phone call between Michael Antolin of Colorado State University and the Centers for Disease Control and prevention (CDC). The sum of Gober's notes from the phone call are repeated below:

> M. Antolin noted to Pete Gober that the Center for Disease Control reports results of 2 black-tailed prairie dogs (out of 65 sampled) that sero-converted from plague exposure at Pawnee National Grasslands, CO. Antolin hypothesized that likely the low level of exposure to plague permitted this response; rather than high level exposure which would probably have caused mortality.

The USFWS inappropriately used this hypothesis from Antolin to support its claim that some BTPDs exhibit immunity to plague. The 2 Pawnee prairie dogs noted above were never recaptured, and thus it is unknown whether they survived or not (M. Antolin, Professor and Assistant Chair Department of Biology, Colorado State University, personal communication, June 21, 2007). Recent peer-reviewed publications from Antolin's Pawnee National Grassland studies reported no evidence of plague anti-bodies in live prairie dogs captured from colonies that experienced die-offs from plague (Stapp et al. 2004; Antolin et al. 2006; Webb et al. 2006). In fact, one of Antolin's papers published in 2006—two years after the USFWS 2004 Not Warranted Finding—explicitly stated that no living prairie dogs from the Pawnee studies demonstrated an immune response:

> …whether Black-tailed prairie dogs have the ability to adapt to plague, **which is their most persistent threat**, remains to be determined. Generally, plague utterly decimates prairie dog towns. In our own studies, we observe what appear to be survivors on plagued towns, but to date no animals among the hundreds we trapped alive and tested show evidence of exposure or infection (via tests for antibodies). (Antolin et al. 2006: 873) [emphasis added]

In this case the USFWS relied on hypothetical evidence that were strongly contradicted by a peer-reviewed study.

A recent paper by Pauli et al. (2006) showed that some black-tailed prairie dogs might survive exposure, at least initially, to plague while others succumb to the disease in the wild. A plague epizootic occurred on one of the experimental prairie dog colonies Jonathan Pauli used for his prairie dog shooting study around Thunder Basin National Grassland in Wyoming (see Section X.B.1 on "Prairie Dog Shooting" for more about this research). The epizootic presented an opportunity to study the dynamic of plague survivorship in the wild. Researchers detected plague in June 2004 and by the beginning of July 2004 the juvenile prairie dog population declined by 96% and adults by 95%. Of the survivors, 1 of 8 juveniles and 8 of 9 adults exhibited plague antibodies, signifying that these 9 prairie dogs had been exposed to *Y. pestis*. Therefore these initial survivors did not avoid exposure. The study design ensured that the survivors were not post-plague migrants to the colony. Again, these data provide some hope for the possibility that some prairie dogs may harbor resistance to plague. However, the findings must be taken with extreme caution and not used to make policy decisions about the continued risk of plague to BTPDs. The Pauli et al. (2006) study included no follow up; the researchers do not know if the prairie dogs that developed antibodies actually survived plague exposure beyond July 2004 (J. Pauli, Graduate Assistant, Department of Zoology & Physiology, University of Wyoming, personal communication, June 14, 2007). Importantly, the study provides another piece of evidence that plague can kill close to 100% of prairie dogs in a colony, essentially wiping out whole colonies completely.

The researchers cited above all claimed that their findings suggest that some BTPDs might convey some resistance or even immunity to the disease. Though these hypotheses are completely appropriate based on the data, we must emphasize that **the possibility of genetic resistance to plague in black-tailed prairie dogs remains speculative**. It is not appropriate for the USFWS to use these hypotheses as factual data to justify not listing the black-tailed prairie dog. A 2006 publication by three well-known plague researchers contended, "Evidence that prairie dogs have begun to evolve resistance is minimal, so **we should assume that plague will continue to ravage colonies**" (Cully et al. 2006: 167) [emphasis added].

(3) A POPULATION DYNAMIC MAY HAVE DEVELOPED IN LOW-DENSITY, ISOLATED POPULATIONS THAT CONTRIBUTES TO THE PERSISTENCE OF THESE POPULATIONS.

The USFWS made the following argument to support claim (3) that isolated, low-density black-tailed prairie dogs colonies might be advantaged over larger, high-density colonies vis-à-vis sylvatic plague. While there is some evidence that more isolated colonies may be less susceptible to plague than less isolated colonies, using this as an argument that plague is not a threat to BTPDs defies logic as well as the principles of conservation biology.

The Service made variations of this argument in several places in the Finding, for example:

> It has been suggested that the responses of black-tailed prairie dog populations to plague may vary based on their population density (Cully, USGS, pers. comm. 2002). The likelihood of plague transmission in prairie dogs from flea bites versus pneumonically from other prairie dogs already infected is unknown, but is being investigated. It may be that survival of some individuals in low-density or isolated populations is facilitated by the necessity of high exposure rates for individuals to contract the disease. Single or even multiple flea bites do not always have a high enough dose for infection to occur (Rocke, USGS, pers. comm. 2002). In contrast, if plague is spread pneumonically from animal to animal, a much larger dose is transferred than from a flea bite. In such situations, the impact on a large, densely populated complex could be substantial. A population dynamic may have developed that somewhat protects low density, isolated black-tailed prairie dog populations from extirpation, even with infected fleas resident in the habitat of surviving prairie dogs.
>
> Lomolino *et al.* (2003) postulated that habitat fragmentation may benefit some prairie dog populations by protecting them from plague through isolation. Historically, black-tailed prairie dogs were typically found in large complexes that consisted of many colonies that were close enough to each other to allow frequent dispersal between colonies. Currently, due to a combination of factors including habitat fragmentation, plague, and poisoning, many prairie dogs exist in much smaller complexes or in isolated colonies where the possibility for interchange is reduced. Smaller populations also may be protected by limiting exposure via direct animal-to-animal contact (Cully and Williams 2001, Roach *et al.* 2001). Influences other than plague likely will still adversely affect small black-tailed prairie dog populations, but they have not been demonstrated to be as serious as plague. (69 FR 51217: 51223)

The Service has repeated its pattern of substituting speculative hypotheses for actual scientific evidence to justify not listing the black-tailed prairie dog. Jack Cully's personal communication to the USFWS stressed that his comments were to be qualified and not taken as conclusive evidence. Pete Gober's notes from his conversation with Cully are included below:

> Jack believes that the responses of btpd populations to plague likely varies [*sic*] based on their density on the landscape. Perhaps, data from the Rocky Mountain Arsenal (near Denver CO) that indicate precipitous declines due to plague epizootics are an accurate pattern for other similarly situated populations (high altitude, very dry climate, high densities of occupancy on the landscape), but the pattern for some populations farther to the east such as the Cimarron and Comanche Nat. Grasslands may be quite different, i.e. relatively stable overall, but significant changes in some specific towns over time, but the resiliency of the species providing an overall population equilibrium in terms of total acreage occupied… but at a low density. (The pattern even farther east may be different from both of these situations, e.g. plague may not extend its presence into the eastern portions of the btpd range if it has not done so by now… which a [*sic*] conditional hypothesis offered by other researchers.) BUT Jack believes that density dependence is the main factor, not necessarily location per se. He suggests qualifying any statements related to these

> issues inasmuch as conclusive information is not available given the limited amount of time that these phenomena have observed [*sic*] and the many confounding variables, e.g. previous land use changes, control, drought. (Gober 2002)

The Service has similarly misused the Lomolino et al. (2003) study by inferring the authors' findings could be generalized across the BTPD range in direct contradiction to the authors' warning against generalizing their findings beyond their region; see below:

> We will not, however, speculate or over-generalize to other regions or other time periods because the dynamics of extinction forces may well vary geographically and with time. Moreover, we emphasize that while town persistence was significantly influenced by town characteristics (size and isolation), the predictive power of the models was far from perfect. Numerous small towns persisted, while some of the largest towns did not, regardless of their proximity to other towns. It is likely that the qualitative changes in the relationship between town persistence and isolation during plague and non-plague years also compromises [*sic*] the predictive power of these models. (Lomolino et al. 2003: 119)

Far from labeling their research findings as encouraging with regards to plague, Lomolino et al. (2003) concluded that their results were consistent with studies of "range collapse" of over 200 other imperiled species. Based on prairie dog surveys conducted in the Oklahoma panhandle since 1966, the Lomolino et al. (2003) found larger prairie dog colonies exhibit increased persistence compared with smaller colonies between 1967 and 1989 but that this trend reversed between 1989 and 1997. The researchers **speculated** that this might have been due to a plague event in the early 1990s. Moreover, based on this and earlier research (Lomolino et al. 2001), the researchers observed an overall trend in prairie dog population decline regardless of the colony persistence dynamic. Of 281 colonies mapped in 1967, only 86 (31%) existed in 1989 and only 5 (2%) existed in 1999—an average loss of 8-9 colonies per year. Lomolino et al. (2003: 116-118) discussed the implications of their findings:

> Patterns of town persistence over the two periods (1967–1989; 1989–1997) were similar in that persistence increased with town area during both periods. However, whereas town persistence was positively correlated with coverage of other towns within the adjacent landscape during the initial period, the pattern was reversed during the more recent period. That is, whereas town persistence from 1967 to 1989 may have been enhanced by immigrations from nearby populations (i.e. rescue effects; Brown and Kodric-Brown, 1977; Hanski, 1999), it was the most isolated towns that tended to persist during more recent periods. This qualitative change in the geographic variation of town persistence suggests a fundamental change in the nature of extinction forces during the past two or three decades. It appears that while town dynamics during the initial period were consistent with island biogeography and metapopulations theories, **more recent events have reduced the potential for rescue effects and have disrupted metapopulations structure such that proximity to other towns is no longer an asset, but may well have become a liability**.

Clearly, the researchers have not made an argument that isolated colonies are necessarily better off than larger colony complexes or close-proximity colonies, as the USFWS implied in its 2004 Finding.

Isolated prairie dog colonies are not necessarily protected from plague. Isolation may prevent transmission of plague and flea carriers from prairie dogs and other rodents on other colonies because of distance. However, other mammals that travel long distances, such as coyotes, swift foxes, and domestic dogs, can infect isolated colonies by transporting infected fleas to them. Once an isolated colony experiences a large or complete die-off, permanent extinction of the colony is much more likely than for a colonies that are within male dispersal distances of other colonies.

The USFWS claim that plague is less of a risk to black-tailed prairie dogs because some isolated colonies may be protected from plague implies that maintaining and increasing colony fragmentation is an appropriate mechanism to conserve the species. This response is antithetical to recovering and conserving the large complexes of prairie dogs needed to protect the species from extinction, and it further contradicts basic, time-tested concepts of conservation biology.

We know that small populations are vulnerable to permanent extinction from other threats, including habitat destruction, extermination, and shooting. The change from larger, less isolated colonies to small, isolated colonies may not be an adaptation to plague and may have an impact on the ecology of BTPDs and their ability to recover from plague epizootics. Smaller, more isolated colonies may be less susceptible to plague (Cully and Williams 2001). But, Cully et al. (2006: 163) point out, "Today's population structure is almost certainly not an evolved response to combat plague, however—but rather is the inevitable consequence of poisoning, loss of habitat, and plague itself."

The USFWS acknowledged research by Trudeau (2002) demonstrating that colonies exposed to plague had significantly reduced heterozygosity, or genetic diversity, which can lead to inbreeding depression and inability to adapt to environmental change. These findings were peer-reviewed and published later as Trudeau et al. (2004). The Service chose to add speculative comments from the author to its 2004 Not Warranted Finding:

> However, the author also noted that "even though a significant reduction in heterozygosity was observed in plagued colonies, gene flow may balance the effects of the sylvatic plague by reintroducing levels of variation in genetically depauperate post-plague colonies. * * * Given time, gene flow should erase the effects of plague on genetic variability assuming that colonies receive an adequate number of migrants to reintroduce genetic variability and population size is stable following recovery." (69 FR 51217: 51223)

Though an appropriate hypothesis by the author, it is overly optimistic for the USFWS to predict this outcome for BTPDs—especially since it requires immigration from other colonies, which is becoming increasingly less likely as colonies become more isolated because of plague.

Persistence of the BTPD in plague areas may depend on recolonization after local extinction, according to Antolin et al. (2002). The degree to which genetic flow can occur is, however, limited by the distance that prairie dogs will disperse. Knowles (1985) found that BTPDs disperse no more than 10 km from their natal colonies, therefore towns separated by more than this distance may not

recover from plague epizootics. Most BTPD migration, however, appears to occur at distances less than 5 kilometers (3.1 miles) (Antolin, et al. 2006) Additionally, the dispersal of BTPDs can be affected by anthropogenic and natural barriers. Unrestricted colonies have been shown to have increased dispersal rates as local food availability decreases (Garret and Franklin, 1988). However, in studies in Phillips County, Montana and Boulder County, Colorado, it was found that barriers such as roads, rivers, and lakes can limit BTPD dispersal (Johnson and Collinge 2004; Collinge et al. 2005). The long-term implications of this finding are not clear. Reduced dispersal may lead to increased density in colonies. Dense colonies have been shown to be more susceptible to plague outbreaks. Should plague epizootics occur, however, recolonization and recovery of isolated colonies may be limited.

If anything, the argument posed by the USFWS is an argument that supports listing. While further research is needed in this area, it appears that the conservation of genetic diversity and BTPD populations in plague areas will depend on the preservation of large and small colonies and the continued dispersal between these colonies. In fact, Lomolino et al. (2003) recommended a strategy that protects both large prairie dog complexes and isolated colonies:

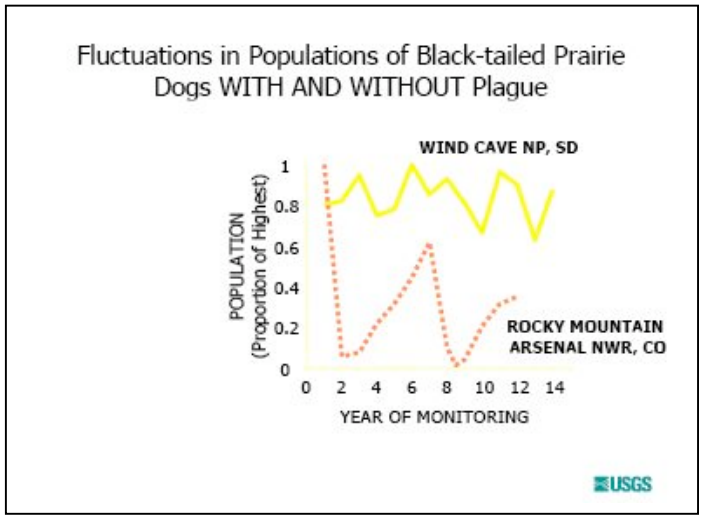
> We recommend adaptive management and a mixed strategy for the development of prairie reserves which should include networks (clusters) of relatively large reserves, along with large but isolated reserves across the species' native range. (p. 111)

Given the failure of the states and other federal agencies within the BTPD range to recover and protect the species, listing is the best and likely only way that this strategy could be successful.

(4) THE APPARENT ABILITY OF SOME SITES TO RECOVER TO PRE-PLAGUE LEVELS AFTER A PLAGUE EPIZOOTIC.

In its 2004 Not Warranted Finding, the USFWS made the following claim about plague: "Recent data indicate that, in some portions of the species' range, some colonies recover and may approach pre-plague population levels following plague epizootics" (69 Fed. Reg. 51217: 51223). The FWS used the example of a post-plague recovery on the Cimarron and Comanche National Grasslands after an epizootic in 1995-1996 to support claim (4). There are at least 3 problems with this argument. First, a plague epizootic that began in 2006 caused (and may be continuing to cause) significant die-offs of the Cimarron and Comanche National Grasslands' BTPD populations, which threatens their recovery. Second, the "pre-plague" populations levels on the Cimarron and Comanche National Grasslands were far below what could be considered viable; at 3% of potential habitat on the Grasslands, this is not a sufficient benchmark for "recovery." Third, significant recovery is not occurring in other areas affected by plague.

Graph 3.



Though some recovery can occur after a plague epizootic, the tendency is for plague to return before a colony has time to fully recovery. Several areas that have experienced repeated epizootics are showing a trend of population attrition over the course of several outbreaks. For example, see the graph to the left that compares prairie dog population trends in an area affected by plague and another that has not been affected (graph from: D. Biggins, USGS. 2005 presentation: Effects of Plague on Prairie Dog Populations).

Plague hit the Comanche National Grassland in 2006, killing off 54.5% of the total Comanche population in just 1 year (Augustine et al. 2006). There are indications the recent plague epizootic is continuing to spread across prairie dog colonies in and/or around the Comanche in 2007, as this petition is being written. Plague also caused die-offs on the Cimarron National Grassland in 2006, but to a lesser—but still significant—extent.

Plague epizootics observed on the Comanche seem to follow a 10-year pattern (Tom Peters, Comanche National Grassland Supervisor, personal communication 2006). If this is true, the black-tailed prairie dog populations on the Comanche National Grassland may not ever reach levels that could be considered viable. They currently occupy only 3% of the available habitat on the Grassland.

Similar to the Comanche and Cimarron National Grasslands, plague epizootics have been recurring cyclical events in areas across the black-tailed prairie dog's range. The USFWS noted in the 2004 Finding that plague had been documented in,

> Bent County, Fort Carson, Piñon Canyon, and Rocky Mountain Arsenal in Colorado; Crow and Fort Belknap Reservations in Montana; Kiowa NG and Rita Blanca NG in Texas and Oklahoma; and Thunder Basin NG in Wyoming. (69 FR 51217: 51223)

In addition, BTPD colonies at the Kiowa, Pawnee, Rita Blanca National Grasslands; BLM lands in Montana, Colorado's Front Range, and the Charles M. Russell National Wildlife Refuge in Montana have all suffered repeated plague epizootics. All of these areas have experienced epizootics since the 2004 Finding was published.

(5) APPROXIMATELY ONE-THIRD OF THE SPECIES' HISTORIC RANGE HAS NOT BEEN AFFECTED BY PLAGUE.

The 2004 Not Warranted Finding stated,

> Plague is currently limited to the western two-thirds of the black-tailed prairie dog

> range (perhaps due to some unknown ecological limitations) (Barnes 1993). Black-tailed prairie dog habitat in all of Montana, Wyoming, Colorado, New Mexico, and Arizona is impacted by plague. Portions of western North Dakota, Nebraska, Kansas, Oklahoma, and Texas have records of plague in black-tailed prairie dogs. Black-tailed prairie dog habitat in the eastern portions of these same States and all of South Dakota are free of plague. (69 FR 51215: 51222)

This claim is wrong for two reasons: 1) there are few if any prairie dogs left in the eastern portions of North Dakota, Nebraska, Kansas, Oklahoma, and Texas because of habitat conversion to farmland; and 2) South Dakota is no longer plague free.

One month after the USFWS released its 2004 Finding plague was documented in a black-tailed prairie dog in Custer County, South Dakota. In 2005, plague was confirmed at a large prairie dog town at the Pine Ridge/Oglala Indian Reservation (Ecoffey 2006 email to Pete Gober, June 2, 2006). According to a USFS biologist, plague led to at least a 25% reduction in the population of this colony (Randy Gribel, biologist at Wall Ranger District, personal communication 2007). These findings are highly significant, as South Dakota at the time of the 2004 Not Warranted decision was thought to be free of plague. Additionally, plague in South Dakota is threatening some of the largest black-tailed prairie dog complexes that remain today—the crown jewels of the prairie dog ecosystem.

Once researchers believed that some sort of "plague line" existed that prevented plague from reaching epizootic levels in prairie dog colonies east of the 102nd meridian. This belief is the basis for the Service's implication that one-third of the black-tailed prairie dog's range was somehow protected from plague. Some researchers speculated that differences in climate, the mammalian community, or flea community deterred plague in the eastern areas (Cully et al. 2006), but no one had identified reasons why plague would not eventually spread to black-tailed prairie dogs in the eastern portion of the species' range. Research by Stenseth et al. (2006) demonstrated that climate plays a role in the relative prevalence of plague. Their studies in Central Asia suggest that climate change will create conditions more favorable to plague. This is likely true in North America as well. With an increase in wetter springs and warmer summers there may be an increased threat from plague (Parmenter et al. 1999; Enscore et al. 2002).

There is no guarantee that whatever held plague back from the eastern range of the BTPD will continue to persist. It may only be a matter of time before epizootics occur throughout the current black-tailed prairie dog range.

ii. New Information about Plague

Researchers have published a range of new information about plague since the USFWS issued its 2004 Finding. None of it indicates that plague will not remain a severe threat to prairie dog survival for the near-term and long into the foreseeable future. (We will provide many of these documents as a forthcoming attachment to this petition to make them available to the Secretary and the UFWS.)

b. Other Diseases in Prairie Dogs

Thus far, no disease besides sylvatic plague threatens the survival of black-tailed prairie dogs on a rangewide basis. However, others, particularly tularemia and monkeypox must be discussed

because prairie dogs are known to be susceptible to them. Surveillance of prairie dogs in the wild and in captivity must provide early warning to detect epizootics of other diseases such as tularemia or monkeypox. Because many people keep prairie dogs as pets in the U.S. and around the world there is a risk that pet prairie dogs could transmit diseases to wild populations if they are released or escape (see more about the threat of the pet trade to BTPDs in Section X.B.2 on "Overutilization for Commercial, Recreational, Scientific, or Educational Purposes"). Cases of monkeypox that affected several captive pet species, including prairie dogs, and humans in 2003 should serve as a reminder that officials must be vigilant and protect native wildlife from accidental infections of exotic diseases.

i. Tularemia

Tularemia (*Bacteria tularense*) is another bacterial infection that causes mortality in prairie dogs. In North America, most cases of tularemia are caused by *Francisella tularensis* subsp. *tularensis*. It spreads primarily via ticks and affects mostly rabbits and rodents, though it has been documented in over 150 wild species (Thorne 1982; La Regina et al. 1986; Avashia 2004; Long et al. 2006). Lice, mites, and mosquitoes can also transmit tularemia. The disease can be quite virulent causing septicemia and death with as little as 10 organisms (Phalen 2004). Though believed to be rare in prairie dogs (Barnes 1993), a few outbreaks have been reported in BTPDs.

In 2002, 250 out of approximately 3,600 prairie dogs died of tularemia after being captured in the wild from South Dakota and transported to a pet distributor in Texas (Avashia 2004; Phalen 2004). According to Phalen (2004):

> By the time that shipments were stopped, animals had been shipped to Arkansas, Florida, Illinois, Michigan, Mississippi, Nevada, Ohio, Texas, Washington, and West Virginia. Additionally, they had been exported to Belgium, The Czech Republic, Japan, The Netherlands, and Thailand. Significant numbers of additional tularemia-related deaths in prairie dogs were documented in the Czech Republic and Texas. (p. 105, citing Centers for Disease Control 2002).

Centers for Disease Control and Prevention (CDC) killed all of the prairie dogs found at the Texas facility whether they appeared sick or healthy (Avashia 2004). At least 22 people were believed exposed to the disease, and 1 person who worked at the Texas facility tested positive for *F. tularensis* titers and experienced symptoms. In its report of this tularemia outbreak, the CDC described poor conditions at the facility that helped spread the disease and could have resulted in infected animals escaping into the wild:

> In mid-July 2002, a die-off began among wild-caught, black-tailed prairie dogs (*Cynomys ludovicianus*) (Figure 1) at a commercial exotic pet distributorship in Texas (facility A). [Figure 1 not included]
> …
> Investigation of facility A on August 2 indicated a variety of exotic species crowded within a 2,500 square foot building. We found 163 remaining prairie dogs in four groups: sick and dying prairie dogs (bin 1), healthy-appearing prairie dogs (bin 2 and cages), prairie dog carcasses (frozen), and escaped prairie dogs roaming free around the facility. The bins were metal, uncovered, 2.5 feet tall and 5 feet in diameter, with 50–100 prairie dogs per bin. In addition, several other exotic animals were found

roaming free or dead. (Avashia 2004: 483-484)

Long et al. (2006) reported another tularemia outbreak in BTPD colony at a city park in South Dakota (citing E.S. Williams, Wyoming State Veterinary Laboratory, personal communication, 2002).

ii. Monkeypox

Monkeypox is a virus that resembles smallpox. In April 2003, at least 200 prairie dogs were exposed to monkeypox at an Illinois pet distributor after African dormice, striped mice, and Gambian rats infected with the diseases arrived from a distributor in Texas (Phalen 2004). The Texas distributor originally received 800 small mammals, mostly rodents, from Ghana as part of the "pocket pet" trade. The Illinois facility shipped the prairie dogs to 7 U.S. states. Several people who bought prairie dogs from suppliers served by the Illinois distributor became infected with monkeypox. Veterinarians and their staffs who treated the infected animals also contracted the disease. By the end of June and the last reported human case, 35 people were confirmed and another 35 were suspected of contracting monkeypox from prairie dogs. Several prairie dogs died from monkeypox and some recovered from the disease. Symptoms in prairie dogs include "pyrexia [fever], cough, conjunctivitis, swollen lymph nodes, and the development of cutaneous pox-like lesions," (Phalen 2004: 107).

Though monkeypox has not been detected in any wild prairie dogs, the possibility that it could be introduced to the wild populations exists. As Tonie Rocke, from the National Wildlife Health Center communicated to Pete Gober of USFWS (June 23, 2003):

> We are also concerned that monkey pox might be accidentally or intentionally released into wild rodent populations – in fact we will be trapping around premises with infected prairie dogs this week. ….
>
> One interesting fact emerged from all this – I found out there is a thriving prairie dog colony near Madison [WI]. How do you suppose it got there?

The monkeypox outbreak highlighted the dangers of the prairie dog pet trade to wild prairie dogs. The release of an infected pet prairie dog into a wild prairie dog population could be catastrophic. The CDC and U.S. Food and Drug Administration implemented regulations to prevent other monkeypox outbreaks in the U.S. that involved restricting trade in African rodents and barring release of these and prairie dogs to the wild.

> Accordingly, pursuant to 42 CFR 71.32(b), CDC is implementing an immediate embargo on the importation of all rodents from Africa (Order *Rodentia*). In addition, CDC and the Food and Drug Administration, pursuant to 42 CFR 70.2 and 21 CFR 1240.30, are prohibiting the transportation or offering for transportation in interstate commerce, or the sale, offering for sale, or offering for any other type of commercial or public distribution, including release into the environment of prairie dogs and the following rodents from Africa: tree squirrels (*Heliosciurus* sp.), rope squirrels (*Funisciurus* sp.), dormice (*Graphiurus* sp.), Gambian giant pouched rats (*Cricetomys* sp.), brush-tailed porcupines (*Atherurus* sp.), and striped mice (*Hybomys* sp.). States can

> elect to enact measures to prohibit the importation, sale, distribution, or display of animals that could result in transmission of infectious agents (*9,10*).[9]

Unfortunately, the illegal trade of exotic and native wild animals is thriving. Though the new regulations will likely help prevent the possible introduction to monkeypox and other exotic diseases into wild prairie dog populations, this is still a risk—likely of low probability but with high negative consequences. We support the need for regulations to prevent the trade in prairie dogs However, these regulations may be a double-edged sword as they may be a barrier to prairie dog recovery through relocation.

D. Inadequacy of Existing Regulatory Mechanisms

The USFWS 2000 Warranted But Precluded Finding on the Black-tailed Prairie Dog determined that the inadequacy of existing regulatory mechanisms was a moderate threat to the species. As stated in the 2000 Finding, "(t)he Service believes that inadequate regulatory mechanisms are a contributing factor affecting overall black-tailed prairie dog populations" (USFWS 2000: 62). However, the 2004 Not Warranted Finding declared regulatory mechanisms to be irrelevant to the black-tailed prairie dog since the Service determined that there were no significant threats to the species. In the 2004 Finding the Service declared,

> We have found disease to be a low-level, non-imminent threat, chemical control not to be a threat, and recreational shooting not to be a threat. Given that these issues have not been identified as threats, there is no immediate need to consider whether efforts to regulate them are adequate. (69 FR 51217: 51224)

In this petition, we have already demonstrated that habitat destruction, disease (sylvatic plague), and shooting are significant threats to the black-tailed prairie dog. In the next section discussing the threat of "other natural or man-made factors affecting the species' continued existence," we demonstrate that chemical control is a significant threat to the species. In addition, habitat destruction and the pet trade are also threats to the species that must be mitigated though regulatory action.

In 2004, the USFWS provided the following justification for determining that federal, tribal, state, and local regulatory mechanisms were either sufficient to prevent listing or did not threaten the black-tailed prairie dog:

> During the past few years some States and Tribes have made substantial progress in initiating management efforts for the black-tailed prairie dog, including completing surveys to provide more accurate estimates of occupied habitat, drafting management plans, enacting laws that change the status of the species from pest to a designation that recognizes the need for management, establishing regulations that allow for better management of recreational shooting, and setting future goals for occupied habitat that will address population management needs for disease and other threats. While these efforts are important to black-tailed prairie dog management, the distribution, abundance, and trends data indicate that inadequate

[9] http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5223a1.htm]

> regulatory mechanisms are not limiting black-tailed prairie dog populations at present, nor are they likely to within the foreseeable future. Therefore, we now conclude that these concerns do not rise to the level of a threat. (69 FR 51217: 51224)

USFWS's determination is scientifically unsupported. The analysis comparing historic and current BTPD occupied habitat presented earlier in this petition illustrated that prairie dogs are at risk of extinction in all or a significant portion of their range and are already extinct in a significant portion of their range. According to the Service's own data from the 2004 Not Warranted Finding, BTPDs are currently absent from 98% of their historic range.

Regulations that govern or influence prairie dog poisoning, shooting, habitat protection or destruction, the pet trade, and the extent of plague, among other threats, are absolutely significant factors that will help determine whether prairie dogs will be recovered and protected or whether they will disappear. Based on our extensive assessment of regulatory mechanisms, most of the regulations that promoted prairie dog conservation enacted after 1998[10] were rescinded or weakened. Regulations enacted since 2004 overwhelmingly promote more prairie dog killing than conservation. Federal agencies enacted at least 7 regulatory mechanisms after 1998 that directly helped conservation BTPDs but rescinded 4 of these since the beginning of 2004. Colorado, Montana, South Dakota, and Texas enacted at least 6 regulatory mechanisms in total since 1998 that helped conserve BTPDs, but have withdrawn or weakened 3 of these. Thus, only 7 regulatory mechanisms enacted since 1998 remain that help conserve prairie dogs. However, the states and federal government have enacted at least 17 regulations that have either promoted more shooting or eradication of prairie dogs or have created barriers to prairie dog conservation. Significantly, the states that purportedly have the most prairie dogs and most colony complexes have passed the most regulations to help kill them and hasten the species' extinction. The tables below summarize regulatory mechanisms enacted since 1998.

[10] The National Wildlife Federation and Biodiversity Legal Foundation et al. submitted their BTPD ESA listing petitions in 1998.

Table 6. Regulatory Mechanisms Enacted since 1998 that Promote Prairie Dog Conservation and Recovery
[Shaded indicates regulation rescinded or weakened]

Federal Level	
Forest Service	Moratorium on poisoning BTPDs in Regions 1, 2, & 3 during USFWS status review period—May 27, 1999 (G. Manning, Acting Deputy Director of the National Forest System, letter 1999) [rescinded: February 12, 2004]
Forest Service	Extension of BTPD poisoning moratorium for indefinite period—July 26, 2000 (G. Manning, Acting Deputy Director of the National Forest System, letter 2000) [rescinded: February 12, 2004]
Forest Service	In 2000, USFS designated the BTPD a "Sensitive Species" and "Management Indicator Species" on National Forest System lands within the BTPD range (current provisions: Forest Service Manual 2670.22, 2005 and Forest Service Manual 2670.32, 2005)
Forest Service (Buffalo Gap National Grassland)	The Conata Basin in Buffalo Gap National Grassland, South Dakota, is closed to prairie dog shooting year-round. This does not include private or tribal lands. (Order RO. WD-97-01, Occupancy and Use Regulations) [rescinded November 2004]
Forest Service (Thunder Basin National Grassland)	Shooting closure on 29,352 hectares (72,500 acres) to protect a future black-footed ferret reintroduction site (Order Number 2002-01)
Bureau of Land Management (Montana)	Shooting closure on 1,300 acres in south Phillips County, MT to benefit black-footed ferret recovery March 1, 2006 through February 28, 2008 [rescinded]
CDC and Food and Drug Administration (FDA)	On November 4 2003, the issued a joint "Interim Final Rule" banning the capture of wild prairie dogs and the trade in prairie dogs within states as well as between states in response to monkeypox outbreak in 2003. FDA (21 CFR Parts 16 & 1240); CDC (42 CFR Part 71)
State Level	
Colorado	The Colorado Division of Wildlife banned recreational shooting of black-tailed prairie dogs in 2001. However, the Attorney General's office interpreted the regulation to where it applied only to federal lands. [rescinded in September 2006]
Montana	The Legislature passed HB 492 (87-5-101, MCA et seq.), giving prairie dog dual status as "nongame wildlife in need of management" and a "vertebrate pest," which allowed the state wildlife agency to manage the species for the first time (effective May 1, 2001). [sunsets on October 1, 2007]
Montana	Fish, Wildlife and Parks implemented the "Biennial Rule"—a seasonal shooting closure on public lands from March 1 to May 31 each year, and a year round closure in south Phillips County black-footed ferret area in 2003. [ends October 1, 2007 when "nongame wildlife" law sunsets]
South Dakota	In 2001, the legislature passed Senate Bill 64 changing the designation of the prairie dog from "pest" to a "Species of Management Concern."
South Dakota	Game, Fish and Parks set seasonal closures from March 1 to June 14 on shooting of black-tailed prairie dogs on federal public lands in 2001.
Texas	Parks and Wildlife banned the collection of prairie dogs for the pet trade (couldn't find the date).

Table 7. Regulatory Mechanisms Enacted since 1998 that Increase Threats to Prairie Dogs

Federal Level	
Forest Service (Nebraska National Forest)	Final EIS and Record of Decision for its Nebraska National Forest Prairie Dog Management Plan Amendment to the LRMP on August 3, 2005 (70 FR 50297)—allowed significant poisoning of BTPDs within "boundary management zones" on all of the units within the Forest.
Forest Service (Pawnee National Grassland)	Record of Decision on October 13, 2006 to implement the new Prairie Dog Management Plan Amendment to the LRMP—puts a cap of 3,441 hectares (8,500 acres) allowed to be occupied by BTPDs, poisoning allowed once cap is exceeded.
Bureau of Land Management	Notice Rescinding Oct. 18, 1999 shooting closure in S. Phillips County, MT (67 FR 56299) September 3, 2002 (40-Complex)
APHIS	ROD on NNF PDOG Plan Amendment (LRMP) (70 FR 71079) Nov. 25, 2005
State Level	
Colorado	In 1999, Colorado SB111 (C.R.S. 35-7-203) required that county commissioners approve prairie dog relocations into their counties, even on private land. The law has been a major barrier to prairie dog recovery in the state.
Colorado	In 2001, the Colorado State Land Board approved a regulation to enforce a Colorado statute that requires state school land livestock grazing permittees to poison prairie dogs on state school trust lands leased by the permittee (C.R.S. § 36-1-118; State of Colorado Board of Land Commissioners, Policy No. 2001-0, Board Order No. 2001-52)
Colorado	Colorado substituted complete ban on recreational shooting of black-tailed prairie dogs with a seasonal closure from March 1 through June 15 in September 2006 (Colorado Wildlife Regulations, Chapter 3, Article 1, #302.2.a,b).
Colorado	The Colorado Wildlife Commission approved use of the Rodenator, an apparatus that ignites propane and oxygen, and similar devices to kill prairie dogs in September 2006 (Colorado Wildlife Regulations, Chapter 3, Article 1, #302.B.6).
Colorado	The Colorado Department of Agriculture enacted an emergency rule to exempt the Rodenator, which ignite propane and oxygen in prairie dog burrows, from registration rules in November 2006 (8 CCR 1203-1.20.8 Administration and Enforcement of the Pesticide Act (2007)).
Colorado	The Department of Agriculture enabled a "Special Local Need" label for the use of the poison Rozol (labels: EPA SLN No. CO-060009, EPA Reg. No. 7173-244, EPA Est No. 7173-WI-1) and approved the use of the poison Kaput –D in November 2006.
Kansas	Kansas approved the use of Rozol for via a 24(c) Special Local Need Supplemental Label (EPA Reg. No. 7173-184 and EPA SLN No. KS-040004) on March 17, 2004.
Nebraska	Approved a 24(c) Special Local Need label to allow the use of Rozol to exterminate prairie dogs that will be effective on October 1, 2007 (EPA SLN # NE-060001).
South Dakota	On August 13, 2004, Governor Mike Rounds issued an "Emergency Interim Prairie Dog Control Program,"
South Dakota	The state approved a Special Local Need extension label in 2005 that allows use of zinc phosphide from February 1 – March 1.
South Dakota	State support of prairie dog poisoning: SDCL 34A-8-7 in part states, "The secretaries [of Agriculture and Game, Fish, and Parks] shall establish and conduct control programs at state expense on private lands that are encroached upon by prairie dogs from contiguous public lands."
South Dakota	Prairie dog control program by the Secretary of Game, Fish and Parks (SDCL 40-36.3.1)
South Dakota	The South Dakota legislature passed … requiring landowners to poison prairie dogs on private land for a distance of one mile at the request of any neighbor (date). Very few acres are further than one mile from a property boundary in South Dakota.
Wyoming	Rozol approved (EPA SLN No. WY-060004, EPA Registration No. 7173-184, and EPA Est No. 7173-WI-1)

The rest of this section provides a more detailed analysis of the state, federal, tribal, and local regulatory mechanisms and related policies that are detrimental to black-tailed prairie dogs, with particular emphasis on those enacted in 2004 and after. Because state and other management plans

are not specifically regulatory mechanisms in that they don't trigger actual policy action, we do not address them in detail here but examine such plans in the next section as factors "affecting the species' continued existence." However, no state or federal agency has enacted any regulatory mechanisms that promote the conservation and recovery of BTPDs since the Service issued its 2004 Not Warranted finding.

1. State Regulations

ARIZONA

The state enacted no new regulations regarding black-tailed prairie dogs.

COLORADO

Colorado enacted several regulations antagonistic to prairie dog conservation since 2004. In September 2006, the Colorado Wildlife Commission rescinded a complete ban on shooting black-tailed prairie dogs on public land. The ban has been replaced by a shooting season on public land from June 15 though February 28; there is no seasonal closure on shooting prairie dogs on private land (Colorado Wildlife Regulations, Chapter 3, Article 1, #302.2.a,b). The Commission also approved use of the Rodenator, an apparatus that ignites propane and oxygen, and similar devices to kill prairie dogs in September 2006. The new regulations state:

> Except as prohibited by federal, state, and local statutes or regulations, toxicants or handheld devices designed to deliver into burrows and then ignite a mixture of propane and oxygen, or similar combination of explosive gases, may be used by a person, or a person's agent, to take Richardson's ground squirrel, rock squirrel, thirteen-lined ground squirrel, pocket gopher, marmots, black-tailed, white-tailed, and Gunnison prairie dogs where necessary to control damage on land owned by them. (Colorado Wildlife Regulations, Chapter 3, Article 1, #302.B.6)

Subsequently, in November 2006, the Colorado Department of Agriculture enacted an emergency rule to exempt such contraptions, which ignite propane and oxygen in prairie dog burrows, from registration rules (8 CCR 1203-1.20.8 Administration and Enforcement of the Pesticide Act (2007)). Also in November 2006, the Colorado Department of Agriculture enabled a "Special Local Need" label for the use of the poison Rozol (labels: EPA SLN No. CO-060009, EPA Reg. No. 7173-244, EPA Est No. 7173-WI-1) and approved the use of the poison Kaput –D. Neither toxicant had previously been approved for exterminating prairie dogs.

The Colorado state and county governments have long been hostile to prairie dogs, which is reflected in several state regulatory mechanisms and other policies. The Colorado Department of Agriculture continues to designate prairie dogs as "Destructive Rodent Pests." The Colorado State Land Board enforces a statute that requires state school land livestock grazing permittees to poison prairie dogs on land leased by the permittee (C.R.S. § 36-1-118; see also State of Colorado Board of Land Commissioners, Policy No. 2001-0, Board Order No. 2001-52).

In 1999, Colorado's governor signed into law a bill that required the approval of county commissioners before prairie dog relocators could move prairie dogs into the county under the commissioners' jurisdiction. The statute even applied to private land (C.R.S. 35-7-203). This added

another major barrier to recovering and conserving prairie dogs via relocation onto the Colorado Division of Wildlife's already onerous licensing and permitting process for prairie dog relocators and individual relocations.

KANSAS

Local Kansas governments enforce antiquated state poisoning statutes that threaten prairie dog populations within the state. At least 2 state laws authorize townships and counties to force private landowners to poison prairie dogs at the landowner's expense (KSA 80-1201, 1901 and KSA 80-1203, 1903). As stated in the Kansas Black-tailed Prairie Dog Conservation and Management Plan, "(t)hese 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) (Kansas Black-tailed Prairie Dog Working Group 2002: 7). Kansas approved the use of Rozol for prairie dogs via a 24(c) Special Local Need Supplemental Label (EPA Reg. No. 7173-184 and EPA SLN No. KS-040004) on March 17, 2004.

MONTANA

While the Montana legislature passed a law giving the BTPD temporary designation as "Nongame wildlife in need of management" (87-5-101, MCA et seq.), which provided the prairie dog dual status as "nongame" and a "vertebrate pest," the statute had a sunset clause and the legislature chose not to renew the designation in 2007. Thus, the BTPD will have singular status as a pest, and the Montana Department of Fish, Wildlife & Parks will no longer have regulatory authority over the species after October 1, 2007 (A. Puchniak, Montana Department of Fish, Wildlife & Parks, personal communication, 2007). After October 1, 2007, prairie dogs will have 1 designation: "Vertebrate Pest" under the Department of Agriculture (7-22-22, MCA *et seq.*). Additionally, the "Biennial Rule" that provided some local closures on shooting will also be revoked. Prior to this upcoming revocation, public lands were closed to prairie dog shooting during the months of March, April, and May of 2006 and 2007. The Rule also established a year-round shooting closure in black-footed ferret reintroduction areas, which applies from March 1, 2006 through February 28, 2008 (Montana Fish, Wildlife & Parks, Legislative Proposal Form, 2007, pg 16).

NEBRASKA

Nebraska recently approved a 24(c) Special Local Need label to allow the use of Rozol to exterminate prairie dogs that will be effective on October 1, 2007 (EPA SLN # NE-060001).

NEW MEXICO

Approval for the use of Rozol under a Special Local Need label to kill prairie dogs in New Mexico is pending (Thomas Schmit, regional director of sales for Liphatech [Rozol manufacturer], personal communication, June 7, 2007). The state has a statute mandating prairie dog poisoning on private land. It states:

> In case any owner of land infested by prairie does shall fail, after written notice from the state rodent inspector served upon such owner in person or mailed to his last known post-office address, to destroy the prairie dogs in such infested areas or to enter into a cooperative agreement as provided by the preceding section to have the

> same destroyed, or in case the owner is unknown to the county assessor, it shall be the duty of the state rodent inspector, or some member of the cooperative force designated by him, and such inspector or member of said force is hereby authorized, to enter upon said lands and to destroy the prairie dogs therein at the expense of the owner of said lands; which expense shall be a lien upon said lands; provided, that such expense chargeable to the owner or against land of unknown owners shall not exceed ten cents [($.10)] per acre for the infested areas; provided further, that in case any tract of land not exceeding one hundred and sixty acres actually owned and occupied as a home by a citizen of this state is infested with prairie dogs and such owner can show to the satisfaction of the state rodent inspector or assistant in charge of the work that he or she is financially unable to pay the cost of destroying the prairie dogs therein, such cost shall be borne by the state and paid out of the rodent pest repression fund. (NM Predatory Wild Animals and Rodent Pests Chapter 77, Article 15, Section 5)

NORTH DAKOTA

Based on our research, the state of North Dakota has enacted no new regulatory mechanisms regarding black-tailed prairie dogs.

SOUTH DAKOTA

Only 1 state, South Dakota, passed legislation, Senate Bill 64, to rescind its "pest" designation for the prairie dog. It did this in 2001 and designated the prairie dog a "species of management concern." The state legislature created a new designation "predator/varmint" to address "species of concern" it also wants to kill. Of all states, South Dakota has been the most overtly aggressive in its poisoning of prairie dogs since 2004 (see "Lethal Control" section below), rendering the pest designation change insignificant. In November of 2004 and in cooperation with the U.S. Forest Service, the GFP Commission removed the shooting closure from the Conata Basin. (South Dakota Black-Tailed Prairie Dog Conservation and Management Plan, 2005). The lack of adequate regulatory mechanisms in this state are particularly important as South Dakota has the lowest extent of plague and is considered one of the last remaining strongholds for the species.

TEXAS

The Texas Department of Agriculture sells zinc phosphide and phostoxin for prairie dog extermination. The agency is in the process of approving Kaput –D for use on prairie dogs. According to Thomas Schmidt of the company Liphatech, Rozol is also being used to kill prairie dogs in Texas (Thomas Schmit, regional director of sales for Liphatech [Rozol manufacturer], personal communication, June 7, 2007). Texas had granted permits to capture and export prairie dogs for the pet trade until 2003, when a monkeypox epidemic in pet prairie dogs catalyzed a temporary national ban on relocating prairie dogs. The state has subsequently banned the capture of prairie dogs for the pet trade. Texas has not promulgated any protective policies since the 2000 Warranted But Precluded finding.

WYOMING

Wyoming approved a 24(c) special need label for Rozol (EPA SLN No. WY-060004, EPA

Registration No. 7173-184, and EPA Est No. 7173-WI-1) for use on prairie dogs. The Wyoming Weed and Pest Control Act of 1973 allows counties to control prairie dogs on private land if damage has been documented to neighboring landowners.

2. Federal Government

FOREST SERVICE

The agency's record on promulgating regulatory mechanisms to promote black-tailed prairie dog recovery and protection on these lands is mixed to poor. The improved regulatory mechanisms that were implemented on National Forest System lands since the 2000 Warranted but Precluded Finding have been and continue to be eroded. Renewed annual poisoning efforts, new and significant poisoning proposals, ongoing unregulated shooting, increasing oil and gas development and lack of response to plague events exacerbate this backslide. On balance, the USFS's existing regulatory mechanisms are not adequate to ensure the viability of prairie dogs on National Forest System lands. Current regulatory mechanisms aggregated across the National Forests and Grasslands within the BTPD range will contribute to the loss of prairie dogs in significant portions of their range.

Because the USFWS determined in its 2004 Not Warranted Finding that black-tailed prairie dogs faced no significant threats, the Finding included no references to Forest Service regulatory mechanisms pertaining to BTPDs. This petition demonstrates that BTPDs face the threats of habitat destruction, shooting, poisoning, and plague on National Forest System lands. Therefore, Forest Service regulatory mechanisms are highly relevant to the BTPD's survival. Though the 2004 Finding is silent on Forest Service regulatory mechanisms, the 2004 USFWS BTPD Candidate Assessment and Listing Priority Assignment Form provides some information about Forest Service policies toward the Petitioned species. The Candidate Assessment stated,

> A letter from the Forest Service Washington Office to Regional Foresters in the involved Forest Service Regions, (Furnish, USFS, in litt. 2000) further described additional USFS efforts to enhance conservation of the species including – (1) establishing shooting restrictions to assist in black-footed ferret recovery in portions of Buffalo Gap and Thunder Basin NG where the majority of occupied habitat on USFS lands exists; (2) designating the black-tailed prairie dog as a Sensitive Species and a Management Indicator Species; (3) amending Grassland Plans to increase occupied habitat; and (4) initiating monitoring. (p. 32)

The mechanisms outlined in the 2004 Candidate Assessment fall short in several ways. (1) The "Sensitive Species" and "Management Indicator Species" ("MIS") designations establish some guidelines for monitoring and conserving BTPDs via the Forest Service Directives. In most cases, however, individual Forests and Grasslands directors or officials have not taken the actions necessary to assure species viability. (2) The Nebraska National Forest, Pawnee National Grassland and Thunder Basin National Grassland have taken or are taking the extraordinary step of amending their Land and Resource Management Plans (LRMPS) to develop "prairie dog management plans" that allow or even mandate dramatically increased poisoning of prairie dog colonies in areas previously protected from poisoning. Both the completed Pawnee Grassland and Nebraska Forest amendments set arbitrary limits on BTPD occupied habitat and mandate poisoning. Though in the planning stages, the Thunder Basin Grassland plan amendment is headed in that direction as well.

The Little Missouri National Grassland has also signaled its intent to follow this precedent. (3) Establishing shooting restrictions on portions of 2 out of at least 16 National Forest System units within the range of the BTPD does very little to reduce the threat of shooting. (4) Monitoring trends in occupied habitat is important but this does nothing to protect and recover the species on the ground, especially when monitoring results in poisoning prairie dogs that have exceeded artificial quotas set by prairie dog management plan amendments to LRMPs. (5) We discuss these problems with the Forest Service's current regulatory mechanisms along with others in more detail below.

The BTPD is designated a USFS "Sensitive Species" and "Management Indicator Species" on National Forest System lands within the BTPD range. These designations do not provide protection adequate to preclude the need for listing. The Forest Service outlined directives for managing "Sensitive Species" in Chapter 2670 of the Forest Service Manual. The following are objectives for "Sensitive Species" in the Manual:

> 1. Develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.
> 2. Maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands.
> 3. Develop and implement management objectives for populations and/or habitat of sensitive species. (Forest Service Manual 2670.22, 2005)

Specific policies outlined in the directives state that the USFS must:

> 1. Assist states in achieving their goals for conservation of endemic species.
> 2. Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation, to determine their potential effect on sensitive species.
> 3. Avoid or minimize impacts to species whose viability has been identified as a concern.
> 4. Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. (The line officer, with project approval authority, makes the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward federal listing.)
> 5. Establish management objectives in cooperation with the states when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for federal candidate species, in cooperation with the FWS or NOAA Fisheries and the states. (Forest Service Manual 2670.32, 2005)

Continuing to allow BTPD shooting, poisoning, and oil and gas development on BTPD habitat and limiting prairie dog recovery by setting maximum occupied habitat quotas on USFS lands runs counter to the objectives and policies set for "Sensitive Species" in the directives.

An MIS designation, though important, does not require any conservation action on the part of the Forest Service, only monitoring. The National Forest Management Act (NFMA) regulations lay out requirements for MIS species:

> Population trends of the management indicator species will be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with State fish and wildlife agencies, to the extent practicable. (36 CFR 219.19(a)(6))

The National Forests and Grasslands within the BTPD range appear to be complying with this requirement.

The Forest Service is in the process of revising its management planning regulations under NFMA (36 CFR 219.10). The result of this effort will affect how Sensitive Species are managed on National Forest System lands. This should be of great concern to the Fish and Wildlife Service with regard to black-tailed prairie dogs. New planning regulations issued by the George W. Bush administration in 2005 eliminated a long-held mandate to ensure species viability on USFS lands.

The Cimarron and Comanche National Grasslands in USFS Region 2 and the Black Kettle, Kiowa, and Rita Blanca National Grasslands in Region 3 were all undergoing management planning revision under the 2005 regulations when federal court judge Phyllis Hamilton declared them illegal on March 30, 2007 (*Citizens for Better Forestry et al. v. U. S. Department of Agriculture,* Case no. 05-1144 PJH, and *Defenders of Wildlife et al. v. U. S. Department of Agriculture*, Case no. 04-4512 PJH, March 30, 2007). She enjoined the Forest Service from using the 2005 regulations until they comply with the law. However, Judge Hamilton ruled that the 2005 regulations were only in procedural not substantive violation of the law. The Forest Service did not conduct an Environmental Impact Statement before promulgating the regulations. We expect that the Forest Service will conduct an EIS to promulgate the same regulations enacted in 2005. If so, species viability will not be a requirement for land and resource management plans. Additionally, the Forest Service will be accountable to no objectives or standards in LRMPs.

Under this scenario, the USFWS will have a greater role to plan in ensuring species survival of species on public USFS land as well as private lands. Because the "Sensitive Species" designation will be meaningless under LRMPs developed under the new planning regulations, ESA listing will be the only way to protect imperiled species, including the black-tailed prairie dog, on USFS lands.

One of the biggest blows to black-tailed prairie dog populations on public land occurred when the Forest Service rescinded a ban on poisoning prairie dogs across National Forest System lands (Manning 2004). On May 27, 1999 Acting Deputy Director of the National Forest System Gloria Manning issued a letter to the Regional Foresters of Region 1, 2, and 3 that declared the poisoning moratorium during the BTPD status review period leading up to the 12-Month Finding. The letter stated in part,

> During the period the Fish and Wildlife Service conducts its status review, field units shall not poison black-tailed prairie dogs on National Forest System lands unless one of two extremely rare situations exist. First, where poisoning is the only reasonable alternative to ameliorate immediate human health or safety concerns, or second, where it can be clearly demonstrated that poisoning is necessary to treat a plague-infested prairie dog town that poses an immediate threat to an existing plague-free black-footed ferret reintroduction site. Careful review and approval of any such proposal by the Regional Forest will be required. (Manning 1999)

After the USFWS issued its Warranted But Precluded Finding on February 4, 2000, Manning drafted a July 26, 2000 letter to the Regional Foresters extending the poisoning moratorium (Manning 2000). This policy effectively eliminated BTPD poisoning on the National Forests and Grasslands within the species' range. Manning withdrew the moratorium on February 12, 2004. Her letter stated,

> We have reviewed our July 26, 2000 policy letter regarding control of the black-tailed prairie dog under certain circumstances on National Forest System (NFS) lands. A purpose of the letter was to support conservation of this newly-designated candidate and sensitive species. Along with efforts by states to develop and implement state conservation plans for this species, and other private, organization and federal efforts, these actions also were intended to help prevent a need to list this species under the Endangered Species Act (ESA). …
>
> The prairie dog's status on NFS land has not significantly changed since the warranted finding, and much close resource coordination and prairie dog habitat protection and management is being done, including support for black-footed ferret recovery efforts. With July 2002 Records of Decision, most of the prairie dog control restriction direction given in the July 26, 2000 letter was incorporated as standards into the revised Land and Resource Management Plans (LRMP's) for the Nebraska NF, Thunder Basin NG and Dakota Prairie NG. These LRMP's govern management of lands that support over 70% of prairie dog colonies on NFS lands, and represent a much higher "regulatory mechanism" than does the 2000 letter. Many of the LRMP's also emphasize the importance of considering the various state prairie dog management plans, which some states currently are developing. (Manning 2004)

The protection from poisoning BTPDs enjoyed on National Forest System lands was short-lived.

Despite the LRMPs that offered protection for prairie dogs, Forest Service personnel planned poisoning campaigns once Manning lifted the moratorium and the USFWS issued its 2004 Not Warranted Finding. In collaboration with the USDA Animal and Plant Health Inspection Service, the Nebraska National Forest communicated its intent to violate its 2002 LRMP the day following the USFWS August 2004 ruling on the BTPD by poisoning several thousand acres of prairie dogs on the Buffalo Gap National Grassland, in clear violation of its own LRMP. The actions of Nebraska National Forest and other Forest and Grassland units that plan to poison prairie dogs are examined below.

NEBRASKA NATIONAL FOREST

On August 12, 2004, simultaneously with the release of the USFWS's Not Warranted Finding on the BTPD, the Forest Service in conjunction with the USFWS; the USDA Animal and Plant Health Inspection Service (APHIS); the South Dakota Department of Game, Fish and Parks; and the South Dakota Department of Agriculture forwarded a document called the "South Dakota Prairie Dog Management 2004-05 Inter-Agency Action-Plan" to Governor Rounds of South Dakota. The cover letter indicated the Action Plan "coordinates control efforts among affected Federal and state agencies …" and it calls "for an integrated set of activities including mapping, trapping, shooting, and chemical control actions on both public and private land." Under the express terms of this

plan, "APHIS will proceed with short-term control on USFS lands" starting on October 1, 2004, and the "Forest Service will develop a forest plan amendment to provide longer term flexibility for prairie dog management" and "modify the Forest Supervisor's order regarding prairie dog shooting in Conata Basin by November 15, 2004." In this Plan, the federal agencies committed themselves to beginning a poisoning campaign on public land that will cover a one-mile buffer zone along the borders of private lands. Additionally, the Action Plan committed USFS to eliminating the restrictions on recreational shooting in the Conata Basin. To do this, USFS must rescind the Forest Supervisor's order limiting the shooting of prairie dogs on USFS lands. The plan included poisoning at least 3,239 hectares (8,000 acres) of BTPDs on the Buffalo Gap National Grassland.

Though implementing the South Dakota Action Plan represented a major federal action with significant cumulative effects to the human environment, the Forest Service was prepared to move ahead without conducting an Environmental Impact Statement or Environmental Assessment. Conservation organizations (including petitioners Forest Guardians, Biodiversity Conservation Alliance, and Center for Native Ecosystems) sued for a Temporary Restraining Order to prevent prairie dog poisoning and violations of the ESA, the National Environmental Policy Act, and NFMA. The poisoning would affect the Endangered black-footed ferret recovery program on Conata Basin within the Buffalo Gap National Grassland. A settlement between the government agencies and conservation organizations resulted in limits on the proposed poisoning and a pledge by the Forest Service to develop a prairie dog management plan under an EIS prior to any other future poisoning.

The Forest Service issued a Final EIS and Record of Decision for its Nebraska National Forest Prairie Dog Management Plan amendment to the LRMP on August 3, 2005. Among other provisions, the prairie dog plan allowed significant poisoning within "boundary management zones" on all of the units within the Forest. With the decision in place, the Forest Service poisoned 3,110 hectares (7,686 acres) of prairie dogs between 2004-2005, 3,440 hectares (8,500 acres) between 2005-2006, and 4,709 hectares (11,635 acres) between 2006 and February 22, 2007 on Forest Service lands in South Dakota (Smith 2007).

Up to this point, poisoning on Nebraska National Forest lands has been confined to the ½ mile or ¼ mile "boundary management zones" on federal lands that are adjacent to private lands. But the Forest Service released another draft EIS on June 8, 2007 proposing to amend its LRMP yet again to allow poisoning anywhere, even into core areas of public land, and even within areas currently occupied by black-footed ferrets. Under all alternatives (except the "no action" alternative), arbitrary caps on allowable prairie dog acreage would be set for each geographic area, and poisoning would be required upon exceeding these caps. Three of the four alternatives that include caps would significantly impact prairie dog populations in Conata Basin to the point that black-footed ferret viability standards would not be met. Because Conata Basin is the main target of this plan, and because Conata Basin is home to 27,000 acres of prairie dogs, this planning effort is concrete evidence that the USFS is incapable and/or uninterested in implementing and maintaining adequate regulatory mechanisms to promote viable BTPD populations on these public lands.

The Nebraska National Forest also conceded to the state by lifting a prairie dog shooting ban on Conata Basin.

DAKOTA PRAIRIE GRASSLANDS

On July 14, 2006 the McKenzie Ranger District of the Little Missouri National Grassland issued a notice of its intent to prepare an Environmental Assessment (EA) to allow prairie dog extermination. On March 6, 2007 the Medora Ranger District followed suit with a similar notice. Although neither plan has yet been finalized or implemented, both propose poisoning of significant percentages of remaining prairie dogs. The McKenzie plan would poison close to 20% percent of remaining prairie dogs (F.V. Guzman, McKenzie District Ranger, Dakota Prairie Grasslands, letter: Black-tailed Prairie Dog Management Proposal, July 14, 2006).

PAWNEE NATIONAL GRASSLAND

Poisoning has not occurred on the Pawnee since the 1960s. That is about to change. Pawnee National Grasslands Supervisor, Steven Currey, signed a Record of Decision on October 13, 2006 to implement the new Prairie Dog Management Plan for the Grassland. The Plan puts a cap of 3,441 hectares (8,500 acres) allowed to be occupied on the Pawnee. At most, prairie dog acreage on the Pawnee will never be allowed to exceed 4.4% of this National Grassland's landscape. If this cap is exceeded, Grassland managers will allow poisoning of "surplus" prairie dogs. Due to recurring plague events, however, the population cannot be expected to approach this upper limit without active protection and restoration, which is not a part of the plan. But the most significant threat from this new plan is the new limit on prairie dogs **per livestock grazing allotment**. Prairie dogs will be poisoned in any allotment in which they exceed arbitrary limits; several allotments' limits are set at zero, making a significant portion of this grassland "off limits" to this native wildlife species. Even though prairie dog numbers are expected to remain far below the 8,500-acre upper limit, they will still be poisoned regularly due to these extreme new rules. Additionally, the Plan also allows for poisoning of prairie dogs on the Grassland if adjacent landowners complain that prairie dogs are moving from public to private land.

THUNDER BASIN NATIONAL GRASSLAND

On March 13, 2007, Thunder Basin National Grassland announced its intent to develop a LRMP amendment for a prairie dog management plan (72 FR 11323). In its request for scoping comments on the plan, the Grassland stated its intent to,

> Develop a project-level and site-specific implementation strategy to manage prairie dogs using the full suite of management tools to maintain viable populations to support black-footed ferret reintroduction and populations of other associated species while reducing unwanted colonization of prairie dogs on adjoining lands along national grassland boundaries. (72 FR 11323 p. 11323; Thunder Basin National Grassland 2007: 1)

The Federal Register notice and the scoping announcement indicate that the Grassland is more concerned with enabling lethal control of prairie dogs than managing for viability. The Grassland intends to shrink the area closed to prairie dog shooting and eradicate significant areas of prairie dogs. In describing proposed methods to manage prairie dogs, the emphasis is on control not conservation:

> Methods for implementing the proposed actions include a suite of non-lethal and lethal management tools such as: Rodenticide, limited shooting, landownership adjustment, third-party solutions, financial incentives, conservation agreements, conservation easements, live-trapping, reduced livestock grazing to create visual barriers, and physical barriers. (72 FR 11323 p. 11323; Thunder Basin National Grassland 2007: 1)

Once again, the existing regulatory mechanisms will be weakened significantly. Arbitrary caps on allowable area occupied by prairie dogs are proposed, even within the designated black-footed ferret reintroduction area. Several existing prairie dog colonies are marked for eradication, and new prairie dog colonies will be poisoned unless they are within the areas and acreages deemed allowable by the new plan amendment.

Shooting is prohibited year-round on 29,352 hectares (72,500 acres) to protect a future black-footed ferret reintroduction site on the 226,688-hectare (560,158-acre) Thunder Basin National Grassland. Forest Supervisor Mary Peterson signed the closure order on March 22, 2002 (Order Number 2002-01). Wyoming shooting regulations (see above) apply to the rest of the Grassland. The recently proposed amendment to the LRMP, however, would reduce the acreage where shooting is prohibited and craft new boundaries that would make it more difficult for shooters to recognize closure areas.

COMANCHE AND PAWNEE NATIONAL GRASSLANDS (COLORADO)

In September 2006, the Colorado Wildlife Commission rescinded a complete ban on recreational shooting of black-tailed prairie dogs east of Interstate 25 (see above). The ban took effect September 1, 2001. Though it broadly covered all public and private land, in actuality, the state Attorney General's office interpreted the regulation so narrowly that it only applied to federal lands. Private landowners could shoot prairie dogs if they believed the animals were causing damage to their property; this did not need to be confirmed by a wildlife official. Thus, the only BTPDs protected from shooting by this regulation were those that inhabited Comanche or Pawnee National Grassland or small parcels of other federal lands in Colorado's eastern plains. However, for 5 years the Comanche and Pawnee Grasslands stood out as the only public land entities where shooting prairie dogs was completely prohibited. This was an excellent precedent. In a step backward, the Wildlife Commission replaced the ban with a shooting season on public land from June 15 though February 28, with no seasonal closure on shooting prairie dogs on private land (Colorado Wildlife Regulations, Chapter 3, Article 1, #302.2.a,b).

CIMARRON NATIONAL GRASSLAND (KANSAS)

Cimarron National Grassland officials encourage prairie dog shooting in accordance with Kansas state regulations. The Forest Service maintains a web page on the Cimarron website that is devoted to prairie dog shooting: http://www.fs.fed.us/r2/psicc/cim/prairie_dog.shtml (accessed May 30, 2007). The website includes the following statement:

> On the Cimarron National Grassland, there is a little over 5,600 acres of black-tailed prairie dog colonies open for shooting. A map is provided of some of the larger colonies in which shooters are encouraged to target. Some of these problem colonies

are encroaching on private lands in which shooting is highly encouraged, however all colonies are legal to shoot.

The site includes maps of black-tailed prairie dog colonies to guide shooters: http://www.fs.fed.us/r2/psicc/cim/images/pdog_shoot_map.jpg (accessed May 30, 2007).

BUREAU OF LAND MANAGEMENT, PARK SERVICE, AND USFWS NATIONAL REFUGES

Of all the public lands in the U.S., only the National Wildlife Refuges protect prairie dogs from shooting and poisoning. Even the Park Service is authorized to conduct prairie dog poisoning. For example, Wind Cave National Park's prairie dog management plan mandates poisoning if occupied area exceeds 1,200 hectares (3,000 acres). The Bureau of Land Management directed its field offices to conserve prairie dogs, but little concrete regulatory action has occurred. The Bureau briefly banned shooting in the "40-Complex," a large BTPD complex in Phillips County, Montana that has been a black-footed ferret reintroduction site. However, the ban has since been lifted.

3. Regulatory Mechanisms Pertaining to Oil and Gas Development on Federal Lands

The Bush Administration has consistently supported and implemented policies that promote increases in oil and gas drilling in the Rocky Mountain region, including in proposed wilderness areas. A series of Bush Administration directives, known as "instruction memoranda" have been sent to BLM officials indicating that high priority is to be given to developing oil and gas reserves on public lands in the West. One such memorandum, issued in February 2004, "in effect required BLM state directors to issue leases on demand to the oil and gas industry."

Despite administration claims that too much federal land is closed to drilling, a 2003 government report stated that 85% of federal oil and 88% of natural gas resources in the Rocky Mountain region were available for leasing and development.[11] A surplus of approved drilling permits actually indicates that too much federal land has been opened to drilling. According to a report produced by The Wilderness Society, 25,000 drilling permits have been approved by BLM, yet industry has drilled about 19,000 new wells, resulting in a surplus of more than 6,000 drilling permits.[12]

BTPDs on both Forest Service and BLM land are vulnerable to impacts from oil and gas development. Harms include increased roads, which increase access to prairie dog colonies by shooters; noxious weed proliferation from disturbance for new wellpads, pipelines, and roads; disturbance to prairie dogs and potential hearing loss from seismic exploration and other oil and gas activities.[13] Oil and gas leasing is increasing on national grasslands, to the detriment of black-tailed prairie dogs and their habitat.

As noted in the above table, the Cibola National Forest proposed in May 2007 to lease all currently unleased lands on the Kiowa, McClellan Creek, and Black Kettle (Lake Marvin unit)

---

[11]Available at: http://www.wilderness.org/Library/Documents/AbuseOfTrust.cfm#fnxxx.

[12]"Drilling in the Rocky Mountains? Not so Fast! An Assessment of Surplus Drilling Permits & Leases on Federal Public Lands." 2004. The Wilderness Society. 15 April. Accessed on July 13, 2007. Available at: http://www.wilderness.org/Library/Documents/upload/Drilling-in-the-Rocky-Mountains-Not-so-Fast-An-Assessment-of-Surplus-Drilling-Permits-Leases-on-Federal-Public-Lands.pdf.

[13]For a full discussion on the impacts of oil and gas drilling to prairie dogs, see Center for Native Ecosystems. 2002. "Petition to List the White-tailed Prairie Dog under the Endangered Species Act."

National Grasslands.[14] While the proposed lease stipulations include a No Surface Occupancy requirement within BTPD colonies on the Kiowa National Grassland, this is only a proposed stipulation and includes a provision for exceptions to be made at the discretion of the Grasslands Authorized Officer.[15] In addition, this stipulation fails to provide protection for unoccupied BTPD habitat on the Black Kettle.

There is inadequate analysis on the impacts of oil and gas prior to leasing. After leases are issued and wells are proposed, both the BLM and Forest Service claim they lack the authority to interfere with a lessee's right to develop their lease.[16] New well approval often takes the form of categorical exclusions (CEs) from the National Environmental Policy Act rather than full environmental assessments with public comment periods and a range of alternatives.

Section 390 The Energy Policy Act of 2005 created five categorical exclusions for oil and gas activities from NEPA. They are as follows:

1. Individual surface disturbances of less than five (5) acres so long as the total surface disturbance on the lease is not greater than 150 acres and site-specific analysis in a document prepared pursuant to NEPA has been previously completed.
2. Drilling an oil and gas location or well pad at a site at which drilling has occurred within five (5) years prior to the date of spudding the well.
3. Drilling an oil or gas well within a developed field for which an approved land use plan or any environmental document prepared pursuant to NEPA analyzed drilling as a reasonably foreseeable activity, so long as such plan or document was approved within five (5) years prior to the date of spudding the well.
4. Placement of a pipeline in an approved right-of-way corridor, so long as the corridor was approved within five (5) years prior to the date of placement of the pipeline.
5. Maintenance of a minor activity, other than any construction or major renovation [of] a building or facility.[17]

Federal land managing agencies have implemented this CE guidance with zeal. For example, the New Mexico State Director of the BLM announced in October 2005 that 35 additional staff were being hired to speed well approvals in two field offices, one of which (Carlsbad) is in the BTPD's range in the state.[18] Regarding the increased use of categorical exclusions, BLM State Director Linda Rundell stated: "The premise is to provide one-stop-shopping to make the whole APD process smoother" and to "help us as far as getting our permits out quicker."[19]

The lack of safeguards for BTPDs from oil and gas activities on BLM land threatens the species

[14]See USFS public notice from Keith Baker, Cibola National Forest NEPA Coordinator, dated May 10, 2007, including the "Grasslands Oil and Gas Leasing Analysis."
[15]*Id.* at p. 11.
[16]See Coalition for Otero Mesa. 2006. "Hollow Promises in Our Land of Enchantment: Why the Bureau of Land Management Can't be Trusted to Protect Otero Mesa." Report issued August 2006. Available at: http://www.wilderness.org/Library/Documents/upload/HollowPromises_OteroMesaBLM.pdf.
[17]See BLM EPAct brochure Forthcoming Appendix.
[18]Soussan, Tania. 2005. "Offices to Help Speed Oil, Gas Permits." *Albuquerque Journal* October 4, 2005.
[19]*Id.*

in those states where BTPDs are located on BLM surface lands that overlay substantial fossil fuel reserves. These include New Mexico, Montana, and Wyoming. For example, BLM lands on Otero Mesa, located in southcentral New Mexico and in the Powder River Basin in Montana and Wyoming contain important prairie dog populations. Yet, the BLM approved a drilling plan for Otero Mesa which would significantly escalate the threat to BTPDs in this important tract of Chihuahuan Desert grassland.[20] BLM failed to consider the BTPD as a species that would be adversely affected by the Powder River Basin drilling plans.

The trend of more CEs is also apparent on National Grasslands with BTPDs. Review of the most recent Schedule of Proposed Actions (SOPA) for the Comanche and Cimarron National Grasslands indicated six oil and gas wells would be categorically excluded on the Cimarron in the quarter July-September 2007 alone.[21] The SOPA for this same timeframe indicated ten CEs for oil and gas projects on the Black Kettle National Grassland and two for the Kiowa and Rita Blanca National Grasslands.[22]

Largely because of the lack of meaningful environmental analysis at the leasing and drilling stages, various wildlife—including the BTPD—are not adequately protected from the impacts of oil and gas. Moreover, even when federal agencies have stipulated protections for wildlife, there have been numerous instances of these agencies granting exemptions to oil and gas operators, allowing them to drill in ecologically sensitive areas while endangering the survival of rare wildlife.[23]

USFS and BLM regulatory mechanisms, including Sensitive Species and Management Indicator Species designations, are failing to provide protection for BTPDs from the impacts of oil and gas. We have discussed elsewhere in this petition new USFS regulations that eliminate the legal strength of the MIS designation by removing the requirement that the viability of species be ensured. In addition, when conservation groups have cited the BLM handbook prohibition on the agency's approval of activities that will increase the need to list candidate species in challenges of oil and gas leasing,[24] BLM has generally dismissed those challenges. Both of these federal land managing agencies have shown their refusal to provide adequate regulatory protections to the BTPD from oil and gas while it remains an unlisted species.

E. Other Natural or Man-Made Factors Affecting the Species' Continued Existence

1. Hatred of and Misconceptions about Prairie Dogs

Intolerance of prairie dogs by the livestock industry, policy makers, and government agents is one of the most significant threats to the survival of BTPDs. Hatred of this essential keystone species is driving the current trend of increasing eradication. Livestock ranchers, who hold considerable political power especially in the West, view prairie dogs as pests (Reading et al. 1999; Jones 2000; Fox-Parrish 2002; McCain et al. 2002). Even government wildlife managers demonstrate intolerance to prairie dogs and often believe inaccurate information about them (see Reading et al.

---

[20] *Id.*

[21] See http://www.fs.fed.us/sopa/components/reports/sopa-110212-2007-07.pdf.

[22] See http://www.fs.fed.us/sopa/components/reports/sopa-110303-2007-07.pdf.

[23] See "Hollow Promises."

[24] BLM Manual 6840.06 states, "BLM shall carry out management, consistent with the principles of multiple use, for the conservation of candidate species and their habitats and shall ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as threatened/endangered."

2006 for a survey of government land and wildlife managers about their attitudes and knowledge regarding prairie dogs, attached). These "wildlife experts" distribute inaccurate information to the public in the form of public land management plans, management advice to landowners, among other means.

The agricultural industry has put considerable pressure on elected officials to increase the methods and public financial assistance available to eradicate prairie dogs. These officials have in turn put considerable pressure on public lands and wildlife managers, including the USFWS, to eradicate prairie dogs on public lands and halt initiatives to protect them. Since the USFWS removed the black-tailed prairie dog from the ESA candidate list in 2004, state leaders have shown their biases against prairie dog protection and recovery. They are not making good on their promises to help conserve BTPDs. Colorado, Kansas, Montana, Nebraska, South Dakota, and Wyoming have all passed regulations that promote more prairie dog poisoning, for example, since August 2004. New Mexico and Texas have regulations pending that, if enacted, will promote more prairie dog poisoning. Given the opposition to prairie dog conservation by local and state leaders, ESA listing is the only way to conserve and recovery the species.

Except for a small contingent of scientists and conservationists, prairie dog protection does not have strong support among the general public despite the animals' ecological importance (Reading et al. 1999; Lamb and Cline 2003). Even The Nature Conservancy, a professed conservation organization, poisons prairie dogs on properties it owns and leases (N. Golden, USFWS, email, September 28, 2006 [AR-135]). Several public opinion surveys conducted in the last few years have documented negative prairie dog attitudes among sectors of the public and indifference to prairie dogs by the general public. For example, a 1998 study found that 78% of western Kansas residents thought of prairie dogs as pests, and only 18% saw them as important ecologically (Lee and Henderson 1989). Unfortunately those who have more direct experience with prairie dogs, particularly ranchers and farmers, tend to hold negative attitudes about them (Zinn and Andelt 1999; Lamb et al. 2001). Findings from a survey conducted in Montana showed that 97% of ranchers wanted prairie dog populations reduced (Reading and Kellert 1993). Lamb et al. (2006: 110) summarized why ranchers dislike prairie dogs:

- Prairie dogs are symbols of poor land stewardship.
- Management of prairie dogs might lead to a loss of control over public and private grazing lands.
- Conservation of wildlife, especially for species protected by the Endangered Species Act, might lead to restrictions on ranching operations.
- Conservation of prairie dogs poses a threat to rural western lifestyles (Reading and Kellert 1993; Reading et al. 1999, 2002).

This intolerance is driven largely by misperceptions about the effects prairie dogs have on the landscape. Livestock ranchers tend to believe that prairie dogs compete with cattle for forage, that prairie dog burrows pose a significant hazard to their livestock, and that prairie dogs generally threaten their livelihood (Krueger 1988; Probasco 1988; Field and Hansen 1989; Lee and Henderson 1989). A recent review of the extensive literature on cattle and prairie dog competition, prairie dog effects on vegetation and soils, and cost/benefit assessments of poisoning prairie dogs illustrates that the existence of prairie dogs does not harm livestock operations when they are appropriately managed (see Miller et al. in press for this literature review, attached). Except for rare cases, prairie

dogs actually increase the productivity of grasslands by preventing the encroachment of weeds and other undesirable plant species (Weltzin 1979b; Oakes 2000).

See the table below of a sampling of recent statements about prairie dogs that reflect negative attitudes and intolerance of the species. Note that the list of speakers includes elected officials.

Table 8: A Sampling of Negative Statements about Prairie Dogs

STATEMENT	SPEAKER/AUTHOR	SOURCE
I have my license, and I'm waiting to blast every one of those rodents out of existence that survive the poison.	Evalina Murphy, Rapid City	(Murphy 2004)
They're a pain in the butt, a menace, they just poke holes all over, I don't want nothing to do with prairie dogs; they create more problems than I got bills.	Wiggins, Colorado farmer Ralph Beauprez	(Meadow 2003)
I have property in the southern Black Hills and in Fall River County and work hard to conserve the land for cattle, elk, deer, antelope, turkey, grouse, etc., but prairie dogs are too destructive to the land.	Leonard Wood, Pringle, SD	(Wood 2004)
They can be compared to the grasshoppers which plagued the state in the 1800s and later. Prairie dogs need to be controlled by all methods available.	Leonard Wood, Pringle, SD	(Wood 2004)
They don't do any good out here and can ruin your farm if you let them. The city slickers just don't understand that, but the prairie dogs are nothing but pests.	M. Foerster, Farmer, Lubbock, TX	(Limn 2002)
. . . these animals, with their vast colonies of burrows that denude the prairie of grazing and pose significant injury risk to livestock, do represent real problems for ranchers.	Bozeman Chronicle Editor (2001) Bozeman, MT.	Bozeman Chronicle Editor (2001)
Long before Lewis and Clark first discovered the "barking dogs" in 1804, drought and prairie dogs were the scourge of the prairies. And they still are.	B. Ross (2001), former range conservationist for the U.S. Soil Conservation Service	B. Ross (2001)
. . . prairie dogs multiple like mice, expand their territories and devastate any range they occupy. The State Prairie Dog Park -- . . . a monument to stupidity -- is a prime example of land devastation by prairie dogs.	B. Ross (2001), former range conservationist for the U.S. Soil Conservation Service	B. Ross (2001)
We find it hard to believe in the state of Montana that some folks would find the prairie dog to be an endangered species.	G. Jergeson, State Senator Chinook, MT	(Johnson 2001).
The proposed threatened listing of the black-tailed prairie dog does not address the devastation caused by prairie dogs, nor does it offer an effective solution....Since when does a species which causes such environmental destruction and still numbers in the millions deserve Endangered Species protection?	Kent Lebsack, Rancher & Exec. V.P. of the Colorado Cattleman's Association (CCA) Del Norte, CO	(Preston 1998)
I know of no good that they do...They tear up your ground, and the new weeds come in...If these prairie dogs are not allowed to be controlled, somebody is going to have to pay us for the grass that they eat and the damage they do.	Richard Peterson, Rancher, Haigle, NE	(Anderson 1998)
Prairie dogs are "threatening the quality of life in western South Dakota"	Tom Daschle, U.S. Senator, South Dakota	(Harden 2004, A03)
These animals are a serious hazard to agriculture and potentially human health, because of the danger of a cowboy's horse stepping into one of these holes and breaking a leg. They eat grass, nub it down to nothing, which takes food away from livestock. And during droughts, like this summer, they can actually kill the plant.	Texas State Senator Teel Bivins	(Lyman 1999:10)
Prairie dogs can be more destructive to the environment than a hazardous waste incinerator	Colorado State Senator Mark Hillman	(Lloyd 1999)

Despite the large variety of studies that demonstrate eradicating prairie dogs costs more than accepting prairie dogs on one's land as a part of doing business, intolerance of prairie dogs has led some rural communities to take what seems like irrational actions against them. The extent to which some state and local governments have gone to eradicate prairie dogs reflects this intolerance. We explore this in the section below.

2. Lethal Control

The USFWS's 2004 decision to remove the black-tailed prairie dog from the ESA candidate list in August 2006 and find it "not warranted" for listing catalyzed a dramatic increase in BTPD eradication across the species' remaining range. The majority of states with BTPDs has supported more poisoning or has made it easier for people to kill prairie dogs. Four states recently approved the use of Rozol for prairie dogs—a poison that has significant impacts on non-target wildlife, for example, and 2 other states are in the process of approving Rozol. The Forest Service acted on the 2004 suspension of its moratorium on poisoning prairie dogs by poisoning prairie dogs and planning eradication campaigns on some of the largest prairie dog complexes in North America. The Bureau of Land management has allowed more poisoning on lands it manages. South Dakota, along with the Forest Service personnel operating in the state, have waged an all-out war on prairie dogs that started the day after the USFWS's announcement of the Not Warranted Finding. These actions unequivocally demonstrate that the states and the federal agencies with significant populations of BTPDs are not serious about their commitments to conserve the species and that ESA listing is the best option if we have any hope to recover black-tailed prairie dogs.

Underscoring the need for listing is the USFWS's complicity in the surge in poisoning and other methods of lethal control. The Service presented extensive information in the 2004 Not Warranted Finding indicating the BTPD poisoning was increasing. Yet it determined chemical control to BTPDs was not a threat. As stated in the Finding:

> We concluded that synergistic effects likely impact the species; however, we were unable to quantify those effects and consequently described the effects as not a threat due to a lack of information. (69 FR 51217: 51224)

Lack of information is not a sufficient justification for eliminating a likely severe threat to a species from consideration in an ESA listing decision. Moreover, the Service had much less information regarding the extent of poisoning about poisoning when it determined that poisoning was a moderate threat in 2000 (65 FR 5476). The Service knew that illegal poisoning was occurring. The Service knew long before announcing its BTPD Not Warranted Finding that South Dakota was about to support a massive poisoning campaign across the state on private and public lands, because the Service was a signatory to this plan: the "Emergency Interim Prairie Dog Control Program."

Despite its knowledge of increased poisoning before its "not warranted" decision and the certainty of considerably more poisoning after the decision, the Service asserted in the Finding, "Many current control efforts are small-scale, privately funded and privately directed efforts. The result is localized effects without significant impacts on population dynamics range wide" (69 FR 51217: 51225). Prairie dog poisoning is now occurring on a large scale with significant government assistance. Moreover, as it did throughout the Finding, the Service infers that the lethal control of BTPDs must impact the species on the range-wide scale. In assessing the threat of lethal control, the Service disregarded the ESA threshold that a species need only demonstrate vulnerability to

extinction in a "significant portion of its range" to warrant listing. According to the information presented and claims made by the Service in its 2004 Finding, the black-tailed prairie dog already meets this threshold; for example, the Service stated:

> It is possible that population densities may have been reduced on some lands due to chemical control. Additionally, black-tailed prairie dogs may have been extirpated from some specific sites. Although we acknowledge extant and potentially significant local effects on some populations, based on the new information above and recent State-by- State range-wide estimates of occupied habitat, we now conclude that impacts on the black-tailed prairie dog due to chemical control are not a threat to the extent that the species could become endangered in the foreseeable future. (69 FR 51226)

In the remainder of this section, we demonstrate that prairie dog eradication has already caused the species to become extinct in significant portions of its range and that lethal control is increasing across most, if not all of its remaining range.

a. Lethal Control of Black-tailed Prairie Dogs Caused the Species to Become Extinct in Significant Portions of its Range

The deliberate eradication of prairie dogs is to blame for dramatic black-tailed prairie dog population declines, especially in the first half of the 20th Century. In 1923 alone, the government and agriculture industry representatives eliminated over 1.5 million hectares (3.7 acres) of black-tailed prairie dogs (Forrest and Luchsinger 2006). Poisoning abated somewhat after the 1930s only because there were fewer prairie dogs left to kill. (For more on the history of government-sponsored prairie dog eradication efforts see Oakes 2000; Knowles et al. 2002; Forrest and Luchsinger 2006.) Government-sponsored and privately-funded eradication that has occurred since the early 1900s caused the fragmentation of BTPD habitat to where the species exists only in scattered islands throughout most of its remaining range. The species is now more vulnerable to extinction, especially because of plague.

Government and private landowner eradication efforts caused the extinction of the BTPD in Arizona, nearly all of New Mexico west of the Pecos River, in parts of western Texas, and Sonora, Mexico (Oakes 2000). The extirpation of the species in these areas demonstrates that chemical control can indeed cause the extinction of black-tailed prairie dogs in vast areas—certainly very significant portions of the species' range. Using Bureau of Biological Survey data, Oakes (2000) estimated that poisoners killed 2,428,114 hectares (6,000,000 acres) of BTPDs in Arizona and New Mexico by 1916—long before plague entered the species' range. Oakes (2000: 272) said of her research:

> This study demonstrates that the philosophy of total extirpation of prairie dogs has always guided prairie dog policy, regardless of the most fundamental principles of genetic, ecological and species conservation. The prairie dog has declined in New Mexico as a direct result of government-sponsored "rodent control" programs, not plague, sport hunting or habitat destruction.

Equally pertinent, Oakes' research found that the loss of prairie dogs to Arizona and southwest New Mexico resulted in losses of grasses and forbs and increases in woody shrubs and increased

erosion—diminishing the value of this region for prairie dog habitat, but ironically, also for cattle pasture.

Knowles et al. (2002) also described permanent BTPD range contractions in Montana and North Dakota caused by eradication. The loss of prairie dog populations in these areas was described above in more detail.

The extirpation of black-tailed prairie dogs in Arizona, southwestern New Mexico, and western Texas alone justifies the listing of BTPDs as Threatened or Endangered. Decades of lethal control broke large complexes and removed the species from significant areas throughout its range. Eradication of prairie dogs almost caused the extinction of the black-footed ferret. The historic loss of BTPDs to lethal control and their failure to recover illustrates that lethal control is a significant threat to the species.

b. Eradication Levels are Significant and Increasing Across the Species Range

Though the USFWS was unable to quantify the occupied area of BTPDs poisoned per state, tribe, and federal land unit, the available information was sufficient to indicate that poisoning remained substantial during the BTPD's candidacy period and was likely to increase if the species were to be removed from the candidate list. If the BTPD were listed, the USFWS would have more leverage to influence policy changes vis-à-vis APHIS, the Environmental Protection Agency, and state agencies, including requiring more comprehensive and specific reporting on the use of toxicants on prairie dogs.

As we reported above, on February 12, 2004 the U.S. Forest Service rescinded its moratorium on black-tailed prairie dog poisoning on National Forest System lands that had been in place since 1999. This action opened the door to poisoning on colonies across the Great Plains National Grasslands and Forests within the remaining BTPD range. Then on May 11, 2004, Forest Supervisor, Rick Cables issued guidance to USFS Region 2 offices directing prairie dog control on public lands to minimize adjacent landowner conflicts. The Service knew that the result of these actions would be the poisoning of significant prairie dog areas on the Buffalo Gap National Grassland, at a minimum.

The USFWS failed to include or reference information it received from state government officials on the extent of poisoning and indications that poisoning was increasing in these states – including the use of illegal toxicants. For example: In a letter to Pete Gober of USFWS dated November 12, 2003, Michael McKenna Chief of the Conservation and Communications Division of the North Dakota Game and Fish Department provided the annual state update including state BTPD survey data and other information. McKenna wrote:

> Our survey indicated that poisoning was occurring on state, federal, and private land. Twenty-two percent of towns visited in the Little Missouri Complex showed signs of poisoning and 41% of towns in the Standing Rock Complex did as well. The most common method appears to be grain baits treated with either zinc phosphide or strychnine. … Strychnine is not registered for killing prairie dogs and is intended to be used below ground when used to kill other rodents. According to the North Dakota Department of Agriculture, 4166 pounds of poison containing .5% strychnine was sold throughout the state last year. It is not known how much of this

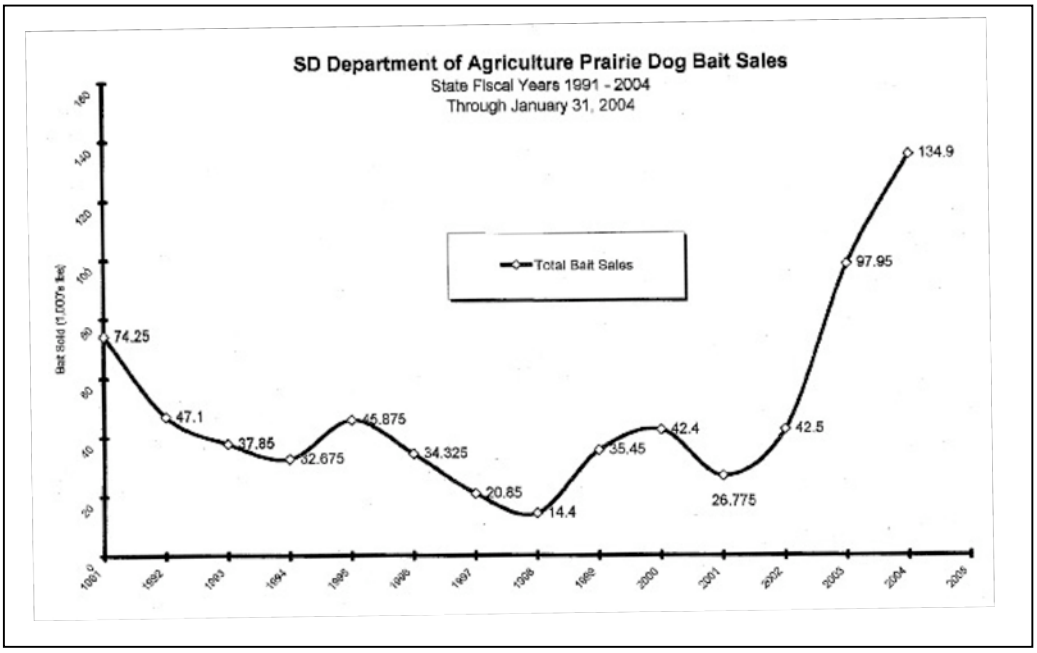
> amount was used in an illegal manner, but we are very concerned about the improper use of strychnine for BTPDs and how it may impact nontarget species.

In Nebraska's annual report to USFWS, Nebraska Game and Parks Commission staffmember, Michael Fritz reported to Pete Gober on December 10, 2002. The USFWS cited Fritz's letter in the 2004 Finding but failed to adequately consider the significance of Fritz's linkage of illegal poisoning to the loss of colonies:

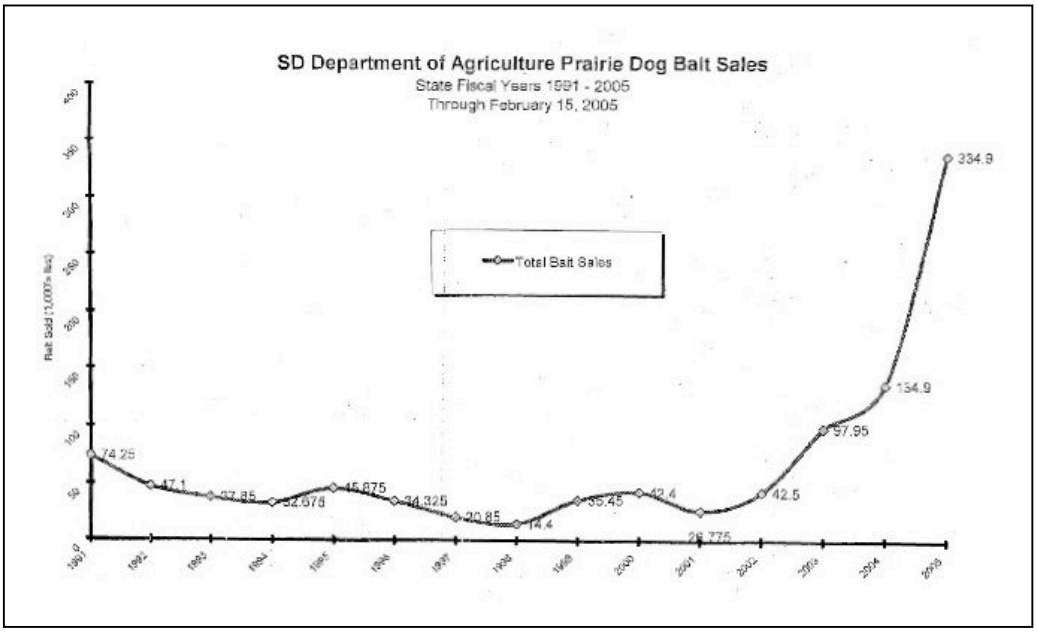
> The Commission staff has received numerous reports that the level of legal and illegal control by landowners has increased over the last two years and that it is ongoing. Many of these reports state that colonies known to be extant just several years ago are now inactive or converted to other land uses. It is also being reported that where past control activities simply were to reduce population numbers, control now focuses on the extirpation of the colony. These reports come from many sources including conservationists, shooters, federal agency personnel, and from landowners themselves. This information is anecdotal and can not [*sic*] be documented or quantified and therefore the actually [*sic*] impact to colonies is not known. However, this type and level of control, combined with shooting pressure, could be a significant factor in accounting for the fact that the towns ground verified in the UN-L study only 45% were active. (cited by USFWS as Fritz, NGPC, in litt. 2002)

Also, USFWS cited a communication by John Hobbs of APHIS/WE in Nebraska reporting that Wildlife Service used or supervised the use of 7,343 kilograms (16,189 pounds) of zinc phosphide in 2002. The Service did not disclose in the Finding that Hobbs also reported that Wildlife Services used gas cartridges and 7,017 aluminum phosphide tablets to poison close to 11,000 acres of BTPDs (that does not include lands poisoned independently by private landowners) and sold, distributed, or demonstrated an additional 680 kilograms (1,500 pounds) of zinc phosphide and 3,500 aluminum phosphide. (cited by USFWS as Hobbs, APHIS, personal communication, 2002). South Dakota provided a graph to the USFWS from its March 11, 2004 Interagency Animal Damage Control meeting that showed an increase of zinc phosphide bait sales from 1991 – January 31, 2004. See graphs below.

Graph 4. 2004 Zinc Phosphide Bait Sales in South Dakota Reported to USFWS



Graph 5. 2005 Zinc Phosphide Bait Sales in South Dakota Reported to the USFWS



Though some of this information is anecdotal and lacks specificity, it provides additional evidence that poisoning was significant and on the rise before the Service issued its 2004 Finding. In several places in the Finding the Service has used anecdotal, preliminary, and unverified information to make other claims—especially the claim that plague is not a threat to prairie dogs.

The states, and local governments, and federal agencies, particularly the Forest Service, enabled and supported increased prairie dog control in several ways after the Service issued its Not Warranted Finding.

The Governor of South Dakota announced his "Emergency Interim Prairie Dog Control Program" plan publicly 1 day after the FWS announced its Not Warranted decision on August 12, 2004, even before the notice was published in the Federal Register on August 18. According to a report entitled "South Dakota Prairie Dog Control," between 2004-2005, South Dakota poisoned about 9,816 hectares (24,255 acres) of prairie dogs on private land and about 47 hectares (115 acres) on state land (Smith 2007). Between 2005-2006, the state poisoned at least 5,959 hectares (14,725 acres) on private land and 486 hectares (1,200 acres) of state, and the Forest Service poisoned over 3,440 hectares (8,500 acres) (Smith 2007). Additionally, the South Dakota Department of Agriculture sold 51,796 kilograms (113,950 pounds) of poisoned bait to private applicators (non-tribal). Between 2006 and February 22, 2007, South Dakota Game Fish and Parks Department poisoned 11,940 hectares (29,503 acres) on private land and 37 hectares (91 acres) on state public land. Information regarding the amount of poison sold to private applicators and prairie dogs poisoned on state park land for 2006-2007 was not included in the report.

The South Dakota Department of Agriculture sells its own mixture of zinc phosphide bait, "the only bait that does not require notification of the U.S. Fish & Wildlife Service prior to application when using used to control prairie dogs" (Pesticide Applicator Newsletter, Issue 33: 4). According to the Department of Agriculture, 5,000 public entities and 18,000 private entities had applicator licenses and were thus licensed to poison prairie dogs in the state in 2007. The Game, Fish, and Parks will poison prairie dogs at no cost to the landowner, if the landowner believes prairie dogs have moved on to their property from adjacent public land (Smith 2007). According to a meeting report by Smith (2007):

> The Department of Game, Fish and Parks will provide "technical assistance" to landowners in controlling large rodent colonies. Rodent infested lands, 65 hectares (160 acres) or larger in size, will qualify for assistance from our field personnel. This will include equipment and manpower to supervise in both pre-bait and bait application. Landowners will be responsible for cost of bait material and will be required to do the bait application. (p. 5)

The state approved a Special Local Need extension label in 2005 that allows use of zinc phosphide from February 1 – March 1.

Colorado, Kansas, Nebraska, and Wyoming all approved 24(c) labels under FIFRA to enable the use of Rozol to kill prairie dogs. Colorado also approved the use of the Rodenator in 2006. The USFWS has received reports of illegal poisoning of prairie dogs throughout North Dakota with strychnine and RamikGreen.

The Texas Department of Agriculture sells zinc phosphide and phostoxin for prairie dog extermination. The agency is in the process of approving Kaput –D for use on prairie dogs. According to Thomas Schmidt of the company Liphatech, Rozol is also being used to kill prairie dogs in Texas (Thomas Schmit, regional director of sales for Liphatech [Rozol manufacturer], personal communication, June 7, 2007)

County and municipal governments often exercise considerable control over prairie dog eradication. Many counties throughout the BTPD remaining range have undertaken considerable effort and expense to eradicate prairie dogs in the last few years. Because there are hundreds of counties within the BTPD range, we focused our research on a sampling of counties in Colorado. Policies enacted and actions taken by local governments in Colorado may reflect what is going on in other local jurisdictions around the BTPD range.

Several Colorado counties and municipalities have taken significant actions in recent years to eradicate prairie dogs. The USFWS's July 7, 2004 BTPD Candidate Species Assessment provided the following information:

> Six counties have resolutions requiring 0.25-mile buffers of chemical control around prairie dog towns. One county has a $15,000 per day fine for not controlling prairie dogs (Luce, Prairie Dog Conservation Team Interstate Coordinator, in litt. 2002b). (p. 24)

Luce's letter cited in the quote did not identify the six counties. In 2005, Prowers County, Colorado—home to some of the largest concentrations of prairie dogs in the state—began financially subsidizing landowners for poisoning prairie dogs on their private land. Baca County provides grants to private landowners who request assistance in poisoning prairie dogs on their property. For the 2007 fiscal year, $20,000 was earmarked for the purpose of eradicating prairie dogs (Baca County Commissioner's Office personal communication, 2007). In 2006, the Logan County Commissioner authorized a rebate program that covers the private use of the poisons Rozol and Kaput on prairie dogs. This program ran from November 1, 2006 until March 15, 2007, and marked the first time in 11 years that the county had provided assistance to private landowners to kill prairie dogs. The county spent $5,000 on this program (R. Bueller, Director of Weed and Pest Control Division for Logan County, personal communication, 2007). Yuma County officials assist willing landowners in poisoning prairie dogs on their property. Between 2003-2006 Yuma County officials have assisted in the poisoning of 3,116 hectares (7,700 acres) within the county. Broomfield County kills prairie dogs annually in residential buffer zones and on private land.

In 2004 the City of Boulder was forced by the State of Colorado to repeal its ban on prairie dog poisoning ban because it inhibited pesticide applicators from working in the City limits of Boulder. In 2006, the City of Boulder reinstated lethal control as an option for prairie dog management and adopted a plan that allowed the killing of up to 809 hectares (2000 acres) of prairie dogs in the near term. As a result, 47 hectares (115 acres) were poisoned in 2006 in addition to the 8-40 hectares (20-100 acres) that are poisoned annually at the dams near the drinking water supply treatment plant. Several additional policies and practices of the City of Boulder further inhibit prairie dog preservation. The City of Boulder's Grasslands Management Plan states that prairie dogs should occupy no more than 28% of any area at any year. Given that Boulder is arguably one of the most wildlife-friendly towns within the BTPD range, these recent actions do not bode well for the black-tailed prairie dogs residing in other towns and counties.

The City of Fort Collins also permits the poisoning of prairie dogs. The city gassed 792 hectares (1,958 acres) of prairie dogs in 2006 and 902-1,805 hectares (2,230-4,460 acres) in 2007. The City of Longmont has followed a similar path by adopting a plan in 2007 to implement lethal control on 23% of their prairie dog colonies. Pursuant to this plan, 483-1,217 hectares (1,193-3,007 acres) are slated for poisoning over the next few years. In 2006, even before this plan was implemented, Longmont poisoned 183 hectares (453 acres).

Additionally, the Kansas BTPD Working Group noted in the Kansas Black-tailed Prairie Dog Conservation Plan:

> 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). (p. 7)

Recently Logan County, Kansas county commissioners invoked the states mandatory poisoning laws from the early 1900s to force private landowners to poison prairie dogs against their will (Corn 2006). The targeted area includes the largest known complex in the state over 2,428 hectares (6,000 acres). Fearing reprisals by the county commissioners and local landowners, The Nature Conservancy poisoned an undisclosed number of prairie dogs with Rozol on its own land in Logan County and neighboring lands. The Fish and Wildlife Service documented the death of a badger from Rozol poisoning on TNC property due to this eradication effort (N. Golden, USFWS, email, September 28, 2006).

Now that the Forest Service has re-opened the National Grasslands and Forests to prairie dog poisoning, several public Forests and Grasslands have poisoned or plan to poison thousands of hectares/acres of BTPD colonies. Between 2004-2005, at least 3,110 hectares (7,686 acres) were poisoned primarily within Conata Basin on the Buffalo Gap National Grassland in South Dakota (Ibid.)—home to the most productive black-footed ferret reintroduction site. Between 2005-2006, the state poisoned at least 5,959 hectares (14,725 acres) on private land and 486 hectares (1,200 acres) of state, and the Forest Service poisoned over 3,440 hectares (8,500 acres) (Smith 2007). There were 4,709 hectares (11,635 acres) poisoned on federal National Grasslands in South Dakota during the 2006-2007 reporting period. The Pawnee National Grassland (in Colorado), the Little Missouri National Grassland (in North Dakota), and Thunder Basin National Grassland (in Wyoming) have all signaled their intent to increase prairie dog poisoning. The Nebraska National Forest issued a Draft Environmental Impact Statement in May signaling its intent to control even more prairie dogs on its land, including core areas of the BFF reintroduction site in Conata Basin.

3. Drought

Between 2002 and 2005 and in some places longer, much of the Western United States faced drought conditions of a severity that has not been witnessed in decades. Throughout the Rocky Mountains and the Great Plains, precipitation levels were exceptionally low, with devastating consequences for native vegetation and wildlife. According to the National Drought Mitigation

Center at the University of Nebraska at Lincoln, as of January 28, 2003, much of the shortgrass prairie is endured severe, extreme, and exceptional drought conditions.[25]

Drought can negatively impact prairie dogs. In 2002, drought was suspected of reducing black-tailed prairie dog populations on the Charles M. Russell National Wildlife Refuge (Johnson 2002). In addition, meeting notes indicated that Francie Pusateri of CDOW reported at the September 2002 Prairie Dog Conservation Team meeting that prairie dog pups did not survive in the wild in 2002, likely due to drought (Meeting notes read: "Pusatori [*sic*]: drought – pups this year didn't survive in wild with mothers"). Drought is in part blamed for the death of prairie dogs in Mexico (List 2006).

Prairie dogs have endured drought for millennia. Indeed, the arid and semi-arid areas that prairie dogs inhabit feature drought as a normal occurrence. Moreover, black-tailed prairie dogs evolved with heavy ungulate grazing. While recognizing drought as a natural phenomenon (likely heightened by global climate change), the increased stress on prairie dogs during drought is likely exacerbated by the many threats to prairie dogs recognized by USFWS and described above by petitioners.

One concern is that the mistaken perception of ranchers that prairie dogs are deleterious for rangeland health was affirmed during drought and resulted in increased lethal control of BTPDs that is still in full swing. Prairie dogs expand or contract in response to the previous year's precipitation. As the Service knows, after a drier year, BTPDs generally expand in order to obtain sufficient forage. We suspect that, in times of drought, the scarcity of forage may encourage ranchers to lethally control prairie dogs in a futile attempt to prolong livestock grazing on a forage-depleted landscape.

4. Climate Change

Human-caused climate change may lead to the increased frequency and intensity of drought and flooding (Houghton et al. 1996). Hannah et al. (2002) summarized some of the effects of climate change as "changing rainfall patterns, declining water balances, increased extreme climate events, and changes in oscillations such as El Niño" (p. 264). Climate change may contribute to noxious weed invasion. Increases in noxious weeds are to be expected with increased temperatures (McCarty 2001). Alward et al. (1999) found that exotic forb density was positively correlated with minimum spring temperatures. Climate change may thus affect black-tailed prairie dogs indirectly by degrading forage quality. McCarty (2001) wrote, "Ongoing climate change is an additional source of stress for species already threatened by local and global environmental changes, increasing the risk of extinction" (p. 325). Climate change may exacerbate the effects of habitat fragmentation, for example (McCarty 2001). Although the effects of climate change on black-tailed prairie dogs are dwarfed by plague and by other anthropogenic threats such as shooting, poisoning, and habitat conversion, it is possible that climate change will compound the impacts of these other threats.

VII. Requested Designation and Critical Habitat

Forest Guardians, Biodiversity Conservation Alliance, Center for Native Ecosystems, and Rocky Mountain Animal Defense hereby petition the Secretary of Interior to list the black-tailed prairie dog (*Cynomys ludovicianus*) as Endangered or Threatened throughout its historic range (and portions

[25]See http://www.drought.unl.edu/dm/monitor.html, visited January 31, 2003.

thereof) in Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming and in Canada and Mexico under the ESA. Our petition includes (*Cynomys ludovicianus arizonensis*), which some consider a subspecies. If the Service believes that *arizonensis* is a distinct subspecies and population segment, then we additionally request this subspecies be listed as Threatened or Endangered throughout its historic range as well. This listing action is warranted, given historical and continued declines in black-tailed prairie dog populations and acreages occupied by this species. The black-tailed prairie dog is threatened by all five of the factors that the USFWS must consider in assessing whether a species qualifies for listing under the Endangered Species Act. As such, we request expeditious listing of the BTPD as a Threatened or Endangered Species under the ESA throughout its historic range in the United States, Canada, and Mexico, and portions of the range. This petition requests that critical habitat be designated for the black-tailed prairie dog concurrent with final ESA listing.

VIII. Literature Cited

Petitioners hereby incorporate by reference every document cited in this petition and/or cited in the References below.

Agnew, W., D. W. Uresk, and R. M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. Journal of Range Management. 39: 135-139.

Agnew, W., D. W. Uresk, and R. M. Hansen. 1988. Arthropod consumption by small mammals on prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. Pages 81-87 in Eighth Great Plains wildlife damage control workshop proceedings. USDA Forest Service General Technical Report RM-154. 231 pp.

Akcakaya, H. R., M. A. Burgman, and L. R. Ginzburg. 1999. Applied population ecology principles and computer exercises using RAMAS® EcoLab 2.0. Sinauer Associates, Inc. Suderland, Massachusetts.

Alexander, A. M. 1932. Control, not extermination of Cynomys ludovicianus arizonensis. Journal of Mammals. 13(2): 302.

Allee, W. C., A. E. Emerson, O. Park, T. Park, and K. P. Schmidt. 1949. Principles of Animal Ecology. Philadelphia: Saunders. 837 pp.

Allison, P. S., A. W. Leary, and M. J. Bechard. 1995. Observations of wintering ferruginous hawks (*Buteo regalis*) feeding on prairie dogs (*Cynomys ludovicianus*) in the Texas panhandle. Texas Journal of Science. 47(3): 235-237.

Alward, R. D., J. K. Detling, and D. G. Milchunas. 1999. Grassland vegetation changes and nocturnal global warming. Science. 283: 229-231.

American Society of Mammalogists. 1998. Resolution on the decline of prairie dogs and the grassland ecosystem in North America. 6-10 June, Blacksburg, VA.

Anderson, S. H. and E. S. Williams. 1997. Plague in a complex of white-tailed prairie dogs and associated small mammals in Wyoming. Journal of Wildlife Disease 33(4): 720-732.

Anderson, E., S. C. Forrest, T. W. Clark, and L. Richardson. 1986. Paleobiology, biogeography, and systematics of the black-footed ferret, *Mustela nigripes* (Audubon and Bachman), 1851. Great Basin Naturalist Memoirs. 8: 11-62.

Antolin, M., P. Gober, B. Luce, D. Biggins, W. Van Pelt, D. Seery, M. Lockhart and M. Ball. 2002. The influence of sylvatic plague on North American wildlife at the landscape level, with special emphasis on black-footed ferret and prairie dog conservation. Trans. of the North American Wildlife and Natural Resources Conf. 67 : 105-127.

Antolin, M. F., L. T. Savage, and R. J. Eisen. 2006. Landscape features influence genetic structure of black-tailed prairie dogs (*Cynomys ludovicianus*). Landscape Ecology. 21: 867-875.

Augustine, D., G. Mason, and A. Chappell. 2006. 2006 Annual Report: Summary of black-tailed prairie dog distribution on the Cimarron and Comanche National Grasslands. U.S. Forest Service, Comanche and Cimarron National Grasslands. October.

Avashia, S. B., J. M. Petersen, C. M. Lindley, M. E. Schriefer, K. L. Gage, M. Cetron, T. A. DeMarcus, D. K. Kim, J. Buck, J. A. Montenieri, J. L. Lowell, M. F. Antolin, M. Y. Kosoy, L. G. Carter, M. C. Chu, K. A. Hendricks, D. T. Dennis, and J. L. Kool. 2004. First Reported Prairie Dog–to-Human Tularemia Transmission, Texas, 2002. Emerging Infectious Diseases. 10(3): 483-486.

Bailey, V. 1905. Biological survey of Texas. U. S. Department of Agriculture, Bureau of Biological Survey. North American Fauna No. 25. Washington, DC. pp. 89-92.

Bailey V. 1926. Biological survey of North Dakota. North American Fauna. 53: 1-412.

Barko, V. A. 1996. Effect of the black-tailed prairie dog on avifaunal composition in southern shortgrass prairie. MS thesis. Oklahoma State University, Stillwater, OK.

Barko, V. A. 1997. History of policies concerning the black-tailed prairie dog: a review. Proceedings of Oklahoma Academy of Science. 77: 27-33.

Barnes, A. 1993. A review of plague and it relevance to prairie dog populations and the black-footed ferret. Management of Prairie Dog Complexes for the Reintroduction of the Black-footed Ferret. J. Oldemeyer, D. E. Biggins, B. J. Miller, and R. Crete (eds.) USFWS Biological Report 13. pp. 28-37.

Berry, M. E., C. E. Bock, and S. L. Haire. 1998. Abundance of diurnal raptors on open space grasslands in an urbanized landscape. Condor. 100(4): 601-608.

Biggins, D. E., Miller, B. J., Hanebury, L. R., Oakleaf, B., Farmer, A. H., Crete, R., and Dood, A., 1993, A technique for evaluating black-footed ferret habitat, *in* Oldemeyer, J. L., Biggins, D. E., Miller, B. J., and Crete, R., eds., Management of prairie dog complexes for the

reintroduction of the black-footed ferret: Washington, D. C., U. S. Fish and Wildlife Service, Biological Report 13. pp. 73–88.

Biggins, D. E., B. J. Miller, T. W. Clark, and R. P. Reading. 2006. Restoration of an endangered species: The black-footed ferret. M. A. Groom, G. K. Meffe, and C. R. Carroll, (Eds.) Principles of Conservation Biology, 3rd Edition. Sinauer Associates, Sunderland, Massachusetts, USA. pp. 581-585

Biodiversity Legal Foundation, the Predator Project, and J. C. Sharps. 1998. Petition to list the black-tailed prairie dog. Submitted to the US Fish and Wildlife Service. August 26.

Black, C. C. 1963 A review of the North American Tertiary Sciuridae. Bulletin of the Museum of Comparative Zoology. 130(3): 109-248.

Bondello, M. C. 1976. The effects of high intensity motorcycle sounds on the acoustical sensitivity of the desert iguana, *Dipsosaurus dorsalis*. Master's thesis. California State University, Fullerton.

Bonham, C. D., and A. Lerwick. 1976. Vegetation changes induced by prairie dogs on shortgrass range. Journal of Range Management. 29: 221-225.

Boyle, S., and L. Connaughton. 2002. Yellow Cat Swath 2-D Geophysical Project: current and potential ecological impacts. 10 April 2002. Bio-Logic Environmental, Montrose. 38 pp.

Bozeman Chronicle Editor. 2001. Will prairie dog be next anti-ESA poster child? November 11, 2001.

Brattstrom, B. H., and M. C. Bondello. 1979. The effects of dune buggy sounds on the telencephalic auditory evoked response in the Mojave fringe-toed lizard, *Uma scoparia*. Unpublished report to U. S. Bureau of Land Management, California Desert Program. Contract CA-060-CT7-2737. U. S. Bureau of Land Management, California Desert Program, Riverside. 31 pp.

Brussard, P. F., and M. E. Gilpin. 1989. Demographic and genetic problems of small populations. *In* U. S. Seal, E. T. Thorne, M. A. Bogan, and S. H. Anderson, (eds.) Conservation biology and the black-footed ferret. Yale University Press, New Haven. 302 pp.

Bureau of Sport Fisheries and Wildlife. 1961. 1961 prairie dog inventory. Unpublished report. Washington, D.C.

Campbell, T. M. 1989. Prairie dog colony location surveys and black-footed ferret searches in Montana. The Prairie Dog Ecosystem: Managing for Biological Diversity. Montana BLM Wildlife Technical Bulletin #2. pp. 1-12.

Campbell, T. M. and T. W. Clark. 1981. Colony characteristics and vertebrate associates of white-tailed and black-tailed prairie dogs in Wyoming. American Midland Naturalist. 105: 269-76.

Ceballos, G. and J. Pacheco. 1997. The relationship of prairie dogs and regional biodiversity in Mexico. Seventh International Theriological Congress, Acapulco, Mexico (Abs.). pp. 52.

Ceballos, G., J. Pacheco, and R. List. 1999. Influence of prairie dogs (*Cynomys ludovicianus*) on habitat heterogeneity and mammalian diversity in Mexico. Journal of Arid Environments. 41: 161-172.

Center for Native Ecosystems. 2002. "Petition to list the white-tailed prairie dog under the Endangered Species Act. " Submitted to the U. S. Fish and Wildlife Service July 11, 2002.

Centers for Disease Control. 2002. Public health dispatch: Outbreak of tularemia among commercially distributed prairie dogs, 2002. Morbidity and Mortality Weekly Review. 51: 688-699.

Cheatheam, L. K. 1977. Density and distribution of the black-tailed prairie dog in Texas. The Texas Journal of Science. 24: 33-40.

Clark, T. W., 1989, Conservation biology of the black-footed ferret, *Mustela nigripes*: Philadelphia, Wildlife Preservation Trust International, Special Scientific Report No. 3. 175 p.

Clark, T. W., D. Hinckley, and T. Rich (eds.). 1989. The prairie dog ecosystem: Managing for biological diversity. Montana BLM Wildlife Technical Bulletin No. 2.

Clark, T. W., T. M. Campbell, D. G. Socha, and D. E. Casey. 1982. Prairie dog colony attributes and associated vertebrate species. Great Basin Naturalist. 42: 572-82.

Clark, T. W., R. S. Hoffmann, and C. F. Nadler. 1971. *Cynomys leucurus*. Mammalian Species 7: 1-4.

Clarren, R. 1999. Oil wells in my backyard? High Country News. 15 March 1999.

Clifford, H. 2001. Wyoming's powder keg. High Country News. 5 November 2001.

Collinge, S. K., W. C. Johnson, C. Ray, R. Matchett, J. Grensten, J. F. Cully, Jr., K. L. Gage, M. Y. Kosoy, J. E. Loye, and A. P. Martin. 2005a. Testing the generality of a trophic-cascade model for plague. EcoHealth 2: 102-112.

Collinge, S. K., W. C. Johnson, C. Ray, R. Matchett, J. Grensten, J. F. Cully, Jr., K. L. Gage, M. Y. Kosoy, J. E. Loye, and A. P. Martin. 2005b. Landscape structure and plague occurrence in black-tailed prairie dogs on grasslands of the western USA. Landscape Ecology 20: 941-955.

Colorado Division of Wildlife. 2007. 2002-2005 Small Game Harvest Survey Statistics. www. wildlife. state. co. us.

Colorado Division of Wildlife. 2006. Black-tailed Prairie Dog Aerial Survey Protocol.

Colorado Division of Wildlife and Colorado Grassland Species Working Group. 2003. Conservation Plan for Grassland Species.

Conservation Plan for Grassland Species. Colorado Division of Wildlife and Colorado Grassland Species Working Group 2003: 18.

Cooper, J. G. 1868. The fauna of Montana Territory. American Naturalist. 2: 528-538, 596-600.

Cooper, J. G. 1869. Notes on the fauna of the upper Missouri. American Naturalist. 3: 294-299.

Coppock, D. L., J. K. Detling, J. E. Ellis, and M. I. Dyer. 1983a. Plant-herbivore interactions in a North American mixed-grass prairie. I. Effects of black-tailed prairie dogs on intraseasonal aboveground plant biomass and nutrient dynamics and plant species diversity. Oecologia. 56: 1-9.

Coppock, D. L., J. K. Detling, J. E. Ellis, and M. I. Dyer. 1983b. Plant-herbivore interactions in a North American mixed-grass prairie: II. Responses of bison to modification of vegetation by prairie dogs. Oecologia. 56: 10-15.

Corn, Mike. 2006. County starts to poison prairie dogs. Hays Daily News. November 21.

Coues, E. 1875. The prairie gopher. American Naturalist. 9: 75-78.

Crawley, M. J, P. H. Harvey, A. Purvis. 1996. Comparative ecology of the native and alien floras of the British Isles. Philosophical Transactions: Biological Sciences. 351(1345): 1251-1259.

Crosby, A. W. 1986. Ecological Imperialism: The Biological Expansion of Europe, 900-1900. Cambridge Univ. Press,Cambridge, UK.

Cully, J. F., D. E. Biggins, and D. B. Seery. 2006. Conservation of prairie dogs in areas with plague. Conservation of the Black-Tailed Prairie Dog. J. L. Hoogland (ed.). Washington: Island Press. pp. 157-168.

Cully, J. F., Jr., and E. S. Williams. 2001. Interspecific comparisons of sylvatic plague in prairie dogs. Journal of Mammalogy. 82(4): 894-905.

Cully, J. F., Jr., L. G. Carter, and K. L. Gage. 2000. New records of sylvatic plague in Kansas. Journal of Wildlife Diseases. 36(2): 389-392.

Cunha, B. E. 2004. Monkeypox in the United States: an occupational health look at the first cases. American Association of Occupational Health Nurses. 52(4): 164-8.

Dano, L. 1952. Cottontail rabbit (Sylvilagus audubonii baileyi) populations in relation to prairie dog (Cynomys ludovicianus ludovicianus) towns. M.S. thesis, Colorado State University, Fort Collins, CO.

Day, A. M., and A. P. Nelson. 1929. Wildlife conservation and control in Wyoming under the leadership of the United States Biological Survey. Cooperative Publication of the U. S. Biological Survey, Wyoming State Game and Fish Department, Wyoming State Extension Service, and State Department of Agriculture. Wyoming State Hist. Res. Publ. 36 pp.

Desmond, M. J., J. A. Savidge, and T. F. Seibert. 1995. Spatial patterns of burrowing owls (*Speotyto cunicularia*) nests within black-tailed prairie dog (*Cynomys ludovicianus*) towns. Canadian Journal of Zoology. 73: 1375-1379.

Detling, J. K. 1998. Mammalian herbivores: Ecosystem-level effects in two grassland national parks. Wildlife Society Bulleting. 26: 438-448.

Detling, J. K. and A. D. Whicker. 1988. A control of ecosystem processes by prairie dogs and other grassland herbivores. Proceedings of the eighth Great Plains wildlife damage control workshop. Rapid City SD: U. S. Forest Service. pp. 23-29.

DeVoto, B. ed. 1953. The journals of Lewis and Clark. Houghton Mifflin, Boston, MA. 504 pp.

Ernst, A. E., A. L. Clark, and D. R. Gober. 2006. A Habitat-based Technique To Allocate Black-footed Ferret Recovery Among Jurisdictional Entities. Recovery of the black-footed ferret—progress and continuing challenges. Roelle, J. E., Miller, B. J., Godbey, J. L., and Biggins, D. E., (eds.), U. S. Geological Survey Scientific Investigations Report 2005–5293. Pp. 89-96.

Easterling D. R., Karl T. R.,Mason E. H., Hughes P. Y., Bowman D. P., Daniels R. C., Boden T. A., eds. 1996. United States Historical Climatology Network (U.S. HCN) Monthly Temperature and Precipitation Data. Oak Ridge, TN: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory. ORNL/CDIAC-87, NDP-019/R3.

Ecke, D. H. and C. W. Johnson. 1952. Plague in Colorado and Texas. Public Health Monograph. No. 6 (Part I). Federal Security Agency: Public Health Service. Washington, DC: U.S. Government Printing Office.

EDAW. 2000. Black-tailed prairie dog study of eastern Colorado. Prepared for Colorado Department of Natural Resources. October 27, 2000.

Enscore, R., B. Biggerstaff, T. Brown, R. Fulgham, P. Reynolds, D. Engelthaler, C., R. Parmenter, J. Montenieri, J. Cheek, R. Grinnell, P. Ettestad and, K. Gage. 2002. Modeling relationships between climate and the frequency of human plague cases in the southwestern United States, 1960 - 1997. Her. 1. Trop. Med. Hyg. 66(2): I86 - 196.

Environmental Protection Agency. 1971. Effects of noise on wildlife and other animals. Prepared by Memphis State University under Contract 68-04-0024. 31 December 1971. Environmental Protection Agency, Washington, D. C.

Evans, R. A., and J. A. Young. 1984. Microsite requirements for downy brome infestation and control on sagebrush rangelands. Weed Science 32, Supplement 1: 13-17.

Fagerstone, K. H., and C. A. Ramey. 1996. Rodents and lagomorphs. Rangeland Wildlife. P. R. Krausman (ed.). The Society for Range Management. pp. 83-132.

FaunaWest Wildlife Consultants. 1998. Status of the Black-tailed and White-tailed Prairie Dog in Montana, Prepared for Montana Department of Fish, Wildlife and Parks. October 26. 16 pp.

Field, L. B., and E. Hansen. 1989. The landowner's view of wildlife damage control techniques and agency programs. USDA Forest Service General Technical Report RM-171: 20-23.

Fitzgerald, J. P. 1993. The ecology of plague in Gunnison's prairie dogs and suggestions for the recovery of black-footed ferrets. Pp. 50-59 *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 the reintroduction of the black-footed ferret. Biological Report 13. July 1993. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D. C. 96 pp.

Fitzgerald, J. P., Meaney, C. A., and Armstrong, D. M., 1994, Mammals of Colorado: Niwot, Denver Museum of Natural History and University Press of Colorado, 467 p.

Flath, D. L. and T. W. Clark. 1986. Historic status of black-footed ferret habitat in Montana. Great Basin Naturalist Memoirs. 8: 63-71.

Foreman, D. 1962. The normal reproductive cycle of the female prairie dog and the effects of light. The Anatomical Record 142: 391-405.

Forrest, S. C., Biggins, D. E., Richardson, L., Clark, T. W., Campbell, T. M., III, Fagerstone, K. A., and Thorne, E. T., 1988, Population attributes for the black-footed ferret (*Mustela nigripes*) at Meeteetse, Wyoming, 1981–1985: Journal of Mammalogy, v. 69, p. 261–273.

Forrest S. 2005. Getting the story right: A response to Vermeire and colleages. BioScience 55: 526-530.

Forrest, S. C. and J. C. Luchsinger. 2006. Past and current chemical control of prairie dogs. Conservation of the Black-Tailed Prairie Dog. J. L. Hoogland (ed.). Washington: Island Press. pp. 115-128.

Garrett, M. G., Hoogland, J. L., and Franklin, W. L., 1982, Demographic differences between an old and a new colony of black-tailed prairie dogs (*Cynomys ludovicianus*): American Midland Naturalist, v. 108, p. 51–59.

Garrett, M. G., and W. L. Franklin. 1988. Behavioral ecology of dispersal in the black-tailed prairie dog. J. Mamm. 69: 236-250.

Gigliotti, L. 2001. Prairie Dog Shooting in South Dakota. Unpublished Report. Pierre, SD: South Dakota Game, Fish and Parks.

Gilpin, M. E., and Soulé, M. E. 1986. "Minimum viable populations: processes of species extinction. " In Soulé, M. E. (ed.), Conservation Biology: the Science of Scarcity and Diversity. Pp. 19-34. Sinauer Associates, Sunderland, Massachusetts.

Goodrich, J. M. and S. W. Buskirk. 1998. Spacing and ecology of North American badgers (*Taxidae taxus*) in a prairie-dog (*Cynomys leucurus*) complex. Journal of Mammalogy. 79: 171-179.

Grant, J. H. 1995. Dispersal, activity, and behavior of white-tailed prairie dogs. M. S. thesis, Department of Zoology and Physiology, University of Wyoming, Laramie. 138 pp.

Groves, C. R., and Clark, T. W., 1986, Determining minimum population size for recovery of the black-footed ferret: Great Basin Naturalist Memoirs No. 8, p. 150–159.

Hafner, D. J. 1984. Evolutionary relationships of the neararctic sciuridae. The Biology of Ground-Dwelling Squirrels. J. O. Murie and G. R. Michener (eds.) Lincoln, NE: University of Nebraska Press.

Hall, E. R. . 1981. The mammals of North America (2d ed.): New York, John Wiley, 1,181 p.

Hall, Raymond E., and Kelson. 1959. Mammals of North America. Ronald Press. New York. 31 March.

Halloran, A. F. 1972. The black-tailed prairie dog: Yesterday and today. Great Plains J. 11: 138-144.

Hannah, L, G. F. Midgley, T. Lovejoy, W. J. Bond, M. Bush, J. C. Lovett, D. Scott, and F. I. Woodward. 2002. Conservation of biodiversity in a changing climate. Conservation Biology 16(1): 264-268.

Harden, B. 2004. Prairie Dog Pops Up In S. D. Senate Race: Daschle, Foe Spar Over Rodent's Future. Washington Post, October 10, 2004, p. A03.

Heffner, R. S., H. E. Heffner, C. Contos, and D. Kearns. 1994. Hearing in prairie dogs: transition between surface and subterranean rodents. Hearing Research 73: 185-189.

Hoffmeister, D. F. 1986. Mammals of Arizona. Arizona Game and Fish Dept. and Univ. of Arizona Press, Tucson. 276 pp.

Hollister, N. 1916. A systematic account of the prairie-dogs. North American Fauna 40: 5-36.

Holmes, B. E., K. R. Foresman, and M. R. Matchett. 2006. No evidence of persistent Yersina pestis infection at prairie dog colonies in north-central Montana. Journal of Wildlife Diseases. 42(1): 164-1699.

Holmgren, M. 2002. Exotic herbivores as drivers of plant invasion and switch to ecosystem alternative states. Biological Invasions 4(1-2): 25-33.

Hoogland, J. L. 1995. The black-tailed prairie dog: social life of a burrowing mammal. University of Chicago Press. Chicago, IL.

Hoogland, J. L. 2001. Black-tailed, Gunnison's, and Utah prairie dogs reproduce slowly. Journal of Mammalogy 82(4): 917-927.

Hoogland, J. L (ed.). 2006. Conservation of the black-tailed prairie dog. Island Press, Washington D. C., USA.

Hoogland, J. L. 1979a. Aggression, ectoparasitism, and other possible cost of prairie dog (Sciuridae, *Cynomys* spp.) coloniality. Behaviour 69(1-2): 1-35.

Hoogland, J. L. 1979b. The effect of colony size on individual alertness of prairie dogs (Sciuridae: *Cynomys* spp.). Animal Behavior 27: 394-407.

Hoogland, J. L. 1981a. The evolution of coloniality in white-tailed and black-tailed prairie dogs (Sciuridae: *Cynomys leucurus* and *C. ludovicianus*). Ecology 62(1): 252-272.

Hoogland, J. L. 1981b. Nepotism and cooperative breeding in the black-tailed prairie dog (Sciuridae: *Cynomys ludovicianus*). Pp. ????? *in* R. D. Alexander and D. W. Tinkle, eds. Natural selection and social behavior: recent research and new theory. Chiron Press, New York. 532 pp.

Houghton, J. T., L. G. Meira Filho, B. A. Callander, N. Harris, A. Kattenberg, and K. Maskell, eds. 1996. Climate change 1995: the science of climate change. Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge. 572 pp.

Hubbard, J. P., and Schmitt, C. G., 1984, The black-footed ferret in New Mexico: Santa Fe, N. Mex., Bureau of Land Management, 118 p.

Ingham, R. E. and J. K. Detling. 1984. Plant-herbivore interactions in a North American mixed-grass prairie. III. Soil nematode populations and root biomass on Cynomys ludovicianus colonies and adjacent uncolonized areas. Oecologia. 63: 307-313.

Irby, L. R. and T. C. Vosburgh. 1994. Impacts of Recreational Shooting on Prairie Dog Colonies. Manuscript.

Jachowski, D. C. 2007. Resource Selection by Black-Footed Ferrets in Relation to the Spatial Distribution of Prairie Dogs. Masters Thesis. University of Missouri-Columbia.

Johnson, C. 2001. Senate passes prairie dog bill. Billings Gazette, March 29, 2001.

Johnson, K., L. Pierce, and T. Neville. 2004. Field Verification of Black-tailed Prairie Dog Remote Sensing Survey in New Mexico (Final Report). New Mexico: Natural Heritage New Mexico and Biology Department, University of New Mexico. NMNHP Publication No. 04-GTR-61. June 15.

Johnson, K., T. Neville, and L. Pierce. 2003. Remote Sensing Survey of Black-tailed Prairie Dog Towns in the Historical New Mexico Range. New Mexico: Natural Heritage New Mexico and Biology Department, University of New Mexico. NMNHP Publication No. 03-GTR-248. February 28.

Johnson, W. C. and S. K Collinge. 2004. Landscape effects on black-tailed prairie dog colonies. Biol. Conserv. 115: 487-497.

Jones, Allison. 2001. "Review and analysis of cattle grazing effects in the arid west, with implications for BLM grazing management in southern Utah. " Report submitted to the Southern Utah Landscape Restoration Project, February 2001.

Kansas Black-tailed Prairie Dog Working Group. 2002. Kansas Black-tailed Prairie Dog Conservation and Management Plan. July.

Klebanoff, A., Steven Minta, Alan Hastings, Tim W. Clark. 1991. Age-dependent predation model of black-footed ferrets and prairie dogs. IAM Journal on Applied Mathematics. 51(4): 1053-1073.

Keffer, K., K. Gordon, and S. Anderson. 2000. Effects of recreational shooting on behavior of black-tailed prairie dogs. 2000 progress report. Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie. 15 pp.

Kildaw, S. D. 1995. The effect of group size manipulations on the foraging behavior of black-tailed prairie dogs. Behavioral Ecology 6(4): 353-358.

King, J. A. 1955. Social behavior, social organization, and population dynamics in a black-tailed prairie dog town in the Black Hills of South Dakota. Contrib. Lab. Vert. Biol. University of Michigan. Ann Arbor, Michigan. 123 pp.

Knapp, P. A. 1996. Cheatgrass (*Bromus tectorum* L) dominance in the Great Basin Desert: history, persistence, and influences to human activities. Global Environmental Change 6(1): 37-52.

Knowles, C. J. 1985. Observations on prairie dog dispersal in Montana. Prairie Naturalist. 17(1): 33-40.

Knowles, C. J. 1988. An evaluation of shooting and habitat alteration for control of black-tailed prairie dogs. Eighth Great Plains wildlife damage control workshop proceedings. D. W. Uresk, G. L.

Knowles, C. J. 1998. Availability of black-tailed prairie dog habitat for black-footed ferret recovery. U. S. Fish and Wildlife Service. Unpublished report. 12 pp.

Knowles, C. J. 2002. Status of white-tailed and Gunnison's prairie dogs. National Wildlife Federation, Missoula, MT and Environmental Defense, Washington, DC.

Knowles, C. J. 2003. Status of the black-tailed prairie dog in North Dakota. 54 pp.

Knowles, C. J., and T. C. Vosburgh. 2001. An evaluation of the impacts of recreational shooting on black-tailed prairie dogs. Draft manuscript prepared for Montana Department of Fish, Wildlife and Parks and Monatan Department of Natural Resources and Conservation. March 27.

Knowles, C. J., J. D. Proctor, and S. C. Forrest. 2002. Black-tailed prairie dog abundance and distribution in the Great Plains based on historic and contemporary information. Great Plains Research 12: 219-254.

Koford, C. B. 1958. Prairie dogs, whitefaces, and blue grama. Wildlife Monograph No. 3. 78 pp.

Kotliar, N. B. 2000. Application of the new keystone-species concept to prairie dogs: How well does it work? Conservation. Biology. 15: 1715-1721.

Kotliar, N. B., B. W. Baker, A. D. Whicker, and G. Plumb. 1999. A critical review of assumptions about the prairie dog as a keystone species. Environmental Management. 24: 177-192.

Kotliar, N. B., B. W. Baker, and A. D. Whicker. 1997. Are prairie dogs a keystone species. Seventh International Theriological Congress, Acapulco, Mexico (Abstract). pp. 183.

Kotliar, N. B., B. Miller, R. P. Reading, and T. W. Clark. 2006. The prairie dog as a keystone species. Pages 53-64 *in* J. L. Hoogland, editor. Conservation of the black-tailed prairie dog. Island Press, Washington, D. C., USA.

Krebs, C. J. and G. R. Singleton. 1993. Indices of condition for small mammals. Australian Journal of Zoology 41: 317-323.

Kretzer, J. E and J. F. Cully. 2001. Effects of Black-Tailed Prairie Dogs on Reptiles and Amphibians in Kansas Shortgrass Prairie. The Southwestern Naturalist, Vol. 46, No. 2 (Jun., 2001), pp. 171-177

Krueger, K. 1986. Feeding relationships among bison, pronghorn, and prairie dogs: an experimental analysis. Ecology. 67(3): 760-770.

Krueger, K. 1988. Prairie dog overpopulation: Value judgment or ecological reality? USDA Forest Service General Technical Report RM-154: 39-45.

La Regina, M., J. Lonigro, and M. Wallace. 1986. *Francisell tularensis* infection in captive, wild caught prairie dogs. Laboratory Animal Science. 36: 178-180.

Lacy, R. C., and Clark, T. W., 1989, Genetic variability in black-footed ferret populations—past, present, and future, *in* Seal, U. S., Thorne, E. T., Bogan, M. A., and Anderson, S. H., eds., Conservation biology and the black-footed ferret: New Haven, Conn., Yale University Press, p. 83–103.

Lamb, B. L., K. Cline, A. Brinson, N. Sexton, and P. D. Ponds. 2001. Citizen knowledge of and attitudes toward black-tailed prairie dogs. Completion Report. Midcontinental Ecological Science Center, Fort Collins, Colorado. USGS Open-File Report. 01-471.

Lamb, B. L. & Cline, K. (2003). Public knowledge and perceptions of Black-tailed Prairie Dogs. Human Dimensions of Wildlife, 8,127-143.

Lamb, B. L., R. P. Reading, and W. F. Andelt. 2006. Attitudes and perceptions about prairie dogs. Conservation of the Black-tailed Prairie Dog: Saving North America's Western Grasslands. J. L. Hoogland (ed.). Washington: Island Press.

Lee, C, D. and F. R. Henderson. 1989. Kansas Attitudes on Prairie Dog Control. U. S. For. Serv. Gen. Tech. Rep. ; RM-171. p. 162-165. WR 217.

Leopold, A. 1966. A Sand County Almanac. New York: Ballantine Books. P. 190.

Lewis, J. C., and Hassien, F. 1973. Status of Prairie Dogs and Surveys for Black-footed Ferrets in Oklahoma. Proceedings of the Black-footed Ferret and Prairie Dog Workshop (Linder, R. L., and Hillman, C. N., Eds.), South Dakota State Univ., Brookings, SD. pp. 60-75.

Limn, I. 2002. Lubbock digs into prairie dog problem: Killing dispute shows how much the rodents are loved and hated. American-Statesman, Saturday, July 13, 2002

List, R. 1997. Ecology of kit fox (*Vulpes macrotis*) and coyote (*Canis latrans*) and the conservation of the prairie dog ecosystem in northern Mexico. Ph. D. dissertation, University of Oxford. Oxford, UK.

List, R. 2006. An update on conservation in the Janos-Casas Grandes area. USDA Forest Service Proceedings RMRS-P-40: 125.

Livieri, T. M. 1999. Harvest strategies for sustaining fluctuating black-tailed prairie dog (Cynomys ludovicianus) populations. University of Wisconsin, Stevens Point. 6 pp. Manuscript.

Livieri, T. L. 2007. Estimates of black-footed ferret population viability and spatial requirements. Final report to U. S. Forest Service, Prairie Wildlife Research, Fort Collins, Colorado.

Lloyd, J. 1999. Oh give me a home, where the prairie dogs can roam. Christian Science Monitor. February 24, 1999.

Lomolino, M. V. and G. A. Smith. 2001. Dynamic biogeography of prairie dog (Cynomys ludovicianus) towns near the edge of their range. Journal of Mammalogy 82 (4): 937-945.

Lomolino, M. V., G. A. Smith, and V. Vidal. 2003. Long-term persistence of prairie dog towns: insights for designing networks of prairie reserves. Biological Conservation. 115: 111-120.

Long, D., K. Bly-Honness, J. C. Truett, and D. B. Serry. 2006. Establishment of new prairie dog colonies by translocation. Conservation of the Black-Tailed Prairie Dog: Saving North America's Western Grasslands. J. L. Hoogland (ed.). Washington: Island Press. pp. pp. 188-209.

Louda, S.M., D. Kendall, J. Connor, D. Simberloff. 1997. Ecological effects of an insect introduced for the biological control of weeds. Science 277(5329): 1088-1090.

Lott, D. F. 2002. American bison: A natural history. University of California Press, Berkeley, California, USA.

Lower Brule Sioux Tribe. 2002. Black-tailed Prairie Dog Management Plan. Lower Brule Sioux Department of Wildlife, Fish, and Recreation. Lower Brule, South Dakota.

Luce, R. J. 2003. A Multi-State Conservation Plan For The Black-tailed Prairie Dog, Cynomys ludovicianus, in the United States – an addendum to the Black-tailed Prairie Dog Conservation Assessment and Strategy, November 3, 1999.

Luce, R. J. 2006. Areas where habitat characteristics could be evaluated to identify potential black-footed ferret reintroduction sites and develop conservation partnerships. Recovery of the black-footed ferret—progress and continuing challenges. Roelle, J. E., Miller, B. J., Godbey,

J. L., and Biggins, D. E., eds., U. S. Geological Survey Scientific Investigations Report 2005–5293. pp. 69-88.

Luce, R. J., R. Manes, and B. Van Pelt. 2006. A multi-state plan to conserve prairie dogs. Conservation of prairie dogs in areas with plague. Conservation of the Black-Tailed Prairie Dog. J. L. Hoogland (ed.). Washington: Island Press. pp. 210-217.

Lyman, R. 1999. Government weighs protections for prairie dogs. New York Times. January 12, 1999, p. A10.

MacArthur, R. H. and E. O. Wilson. 1967. The theory of island biogeography. Princeton University Press, Princeton, New Jersey.

Mack, R.N., and J.N. Thompson. 1982. Evolution in steppe with few large, hooved mammals. American Naturalist. 119:757-773.

Manzano, P. 1996. Avian communities associated with prairie dog towns in northwestern Mexico. M. S. thesis. University of Oxford, Oxford, UK.

Manzano-Fischer, P., R. List, G. Ceballos, and J-L. E. Cartron. 2006. Avian diversity in a priority area for conservation in North America: the Janos-Casas Grandes Prairie Dog Complex and adjacent habitats in northwestern Mexico. Biodiversity and Conservation. 15: 3801–3825.

Marcé, E. 2001. Distribución y fragmentación de las colonias de perros llaneros de cola negra (*Cynomys ludovicianus*) en el noroeste de Chihuahua, México. Bachelor's Thesis. Universidad Nacional Autónoma de México, México D. F.

McCarty, J. P. 2001. Ecological consequences of recent climate change. Conservation Biology 15(2): 320-331.

Mead, J. H. 1898. Some natural history notes of 1859. Kansas Academy of Science. 280-281.

Meadow, J. B. 2003. Farmers buffaloed by pet prairie dogs. Rocky Mountain News. June 24, 2003.

Mellink, E., and H. Madrigal. 1993. Ecology of Mexican prairie dogs (*Cynomys mexicanus*) in El Manantial, northeastern Mexico. Journal of Mammalogy 74: 631-635.

Mencher, J. S., S. R. Smith, T. D. Powell, D. T. Stinchcomb, J. E. Osorio, and T. E. Rocke. 2004. Protection of black-tailed prairie dogs (*Cynomys ludovicianus*) against plague after voluntary consumption of baits containing recombinant raccoon poxvirus vaccine. Infection and Immunity. 72(9): 5502-5505.

Merriam, C. J. 1902. The prairie dog of the Great Plains. Pages 257-270 In USDA Yearbook 1901. U. S. Department of Agriculture, Washington, D. C., USA.

Miles, V. I., M. J. Wilcomb, Jr., and J. V. Irons. 1952. Rodent plague in the Texas South Plains 1947-49, with ecological considerations. Public Health Monograph. No. 6 (Part II). Federal Security Agency: Public Health Service. Washington, DC: U. S. Government Printing Office.

Miller, B., Biggins, D. E., and R. Crete. 1993. Workshop Summary. in Proceedings of the Symposium on the Management of Prairie Dog Complexes for the Reintroduction of the Black-footed Ferret. John L. Oldemeyer, Dean E. Biggins, and Brian J. Miller. (Eds.) Washington, DC: USFWS.

Miller, B J., and R. P. Reading. 2006. A proposal for more effective conservation of prairie dogs. Pages 248-260 *in* J. L. Hoogland, editor. Conservation of the black-tailed prairie dog. Island Press, Washington, D. C., USA.

Miller, B., G. Ceballos and R. P. Reading. 1994. The prairie dog and biotic diversity. Conservation Biology. 8: 677-681.

Miller, B., R. Reading, J. Hoogland, T. Clark, G. Ceballos, R. List, S. Forrest, L. Hanebury, P. Manzano, J. Pacheco, and D. Uresk. 2000. The role of prairie dogs as keystone species: Response to Stapp. Conservation Biology. 14: 318-321.

Miller, B., R. Reading, J. Strittholt, C. Carroll, R. Noss, M Soulé, O. Sánchez, J. Terborgh, D. Brightsmith, T. Cheeseman, and D. Foreman. 1998/99. Focal species in design of reserve networks. Wild Earth. 8(4): 81-92.

Miller, B., R. P. Reading, and S. Forrest. 1996. Prairie Night: Black-Footed Ferrets and the Recovery of Endangered Species. Washington: Smithsonian Institution Press.

Miller, B. J., R. P. Reading, D. E. Biggins, J. K. Detling, S. C. Forrest, J. L. Hoogland, J. Javersak, S. D. Miller, J. Proctor, J. Truett, D. W. Uresk. In press. Prairie dogs: An ecological review and current biopolitics. Journal of Wildlife Management.

Miller, J. A. 1991. Research updates. BioScience. 41: 750-753.

Miller, S. 2002. Norton: Science to seal dogs' fate. Rapid City Journal, August 17, 2002.

Miller, S. 2004. Prairie dogs munch more than cattle: Research shows prairie dogs and cattle are competing for forage. Rapid City Journal: June 27, 2004.

Miller, S. D., R. P. Reading, B. Haskins, D. Stern. 2005. Overestimation bias in estimate of black-tailed prairie dog abundance in Colorado. Wildlife Society Bulletin. 33(4): 1444–1451.

Miller, S. D., and J. F. Cully, Jr. 2001. Conservation of black-tailed prairie dogs (*Cynomys ludovicianus*). Journal of Mammalogy 82: 889–893.

Mills, L. S., M. E. Soulé, and D. F. Doak. 1993. The history and current status of the keystone species concept. BioScience. 43: 219-224.

Milne, S. A. 2004. Population Ecology and Expansion Dynamics of Black-tailed Prairie Dogs in Western North Dakota. M. S. Thesis. University of North Dakota.

Montana Prairie Dog Working Group. 2000. Working draft conservation plan for black-tailed and white-tailed prairie dogs in Montana. Montana Fish, Wildl. & Parks, Helena. 9/12/00. 49 pages.

Montana Prairie Dog Working Group. 2001. Conservation plan for black-tailed and white-tailed prairie dogs in Montana. 64 pp.

Montana Prairie Dog Working Group. 2006. Meeting Record: November 1-2. Billings, Montana.

Muir, J. 1911. "My First Summer in the Sierra" in The Wilderness Journeys (published in 1996 by Canongate Classics).

Mulhern, D., and C. Knowles. 1995. Black-tailed prairie dog status and future conservation planning. U. S. Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-GTR-298. Fort Collins, CO. pp. 19-29.

Munn, L. C. 1993. Effects of prairie dogs on physical and chemical properties of soils. Management of prairie dog complexes for the reintroduction of the black-footed ferret. J. L. Oldemeyer, D. E. Biggins, and B. J. Miller (Eds.). Washington, DC: US Department of the Interior. pp. 11-17.

Murphy, E. 2004. Mad or an idiot. Rapid City Journal. Letters to the Editor, October 2, 2004.

National Wildlife Federation. 1998. Petition to list the black-tailed prairie dog. Submitted to the US Fish and Wildlife Service. July 30.

Nebraska Game and Parks Commission. 2001. Nebraska Conservation Plan for the Black-tailed Prairie Dog (Draft). Nebraska Game and Parks Commission. Lincoln, Nebraska. July.

Nebraska Game and Parks Commission. 2001. Nebraska conservation plan for the black-tailed prairie dog. 19 pp.

Nelson, Edward W. 1918. Smaller mammals of North America. Natl. Geog. Mag. 33(5): 371-493.

Nelson, E. W. 1919. Annual report of Chief of Bureau of Biological Survey. Pages 275-298 in USDA Ann. Rept. Dept. Agric. for year ended June 1919.

Noss R. F. 1991. Landscape connectivity: different functions at different scales. In: Landscape Linkages and Biodiversity, pp. 27–39. Edited by Hudson W. E. Island Press, Washington DC, USA.

Oakes, C. L. 2000. History and consequences of keystone mammal eradication in the desert grasslands. The Arizona black-tailed prairie dog (*Cynomys ludovicianus arizonensis*). Ph. D. Dissertation, Univ. Texas, Austin. 392 pp.

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.

Oostermeijer, J. G. B., R. G. M. Altenburg, and H. C. M. Den Nijs. 1995. Effects of outcrossing distance and selfing on fitness components in the rare *Gentiana pneumonanthe* (Gentianaceae). Acta Botanica Neerlandica 44: 257-268.

Outwater, A. 1996. Water: A natural history. Basic Books, New York, NY.

Paine, R. T. 1980. Food webs: Linkage, interaction strength and community infrastructure. Journal of Animal Ecology. 49: 667-685.

Parker, J. D., D. E. Burkepile, and M. E. Hay. 2006. Opposing effects of native and exotic herbivores on plant invasions. Science. 311: 1459-1561.

Parmenter, R., E. Yadav, C. Parmenter, P. Ettestad and K. Gage. 1999. Incidence of plague associated with increased winter-spring precipitation in New Mexico. Arner. J . Trop. Med. Hyg. 61(5) : 814- 821.

Paternoster, T. 1997. A survey of active black-tailed prairie dog (*Cynomys ludovicianus*) colonies in Curry and Roosevelt Counties, New Mexico. Eastern New Mexico University, Natural History Museum. 16 pp.

Pauli, J. N. 2005. Ecological Studies of the Black-tailed Prairie Dog (*Cynomys ludovicianus*): Implications for Biology and Conservation. M. S. Thesis. Department of Zoology and Physiology, University of Wyoming.

Pauli, J. N., S. W. Buskirk, E. S. Williams, and W. H. Edwards. 2006. A plague epizootic in the black-tailed prairie dog (Cynomys ludovicianus). Journal of Wildlife Diseases. 42(1): 74-80.

Perry, B. 2000. USDA Forest Service, Wall South Dakota. Personal Communication. [as cited in Reeve and Vosburgh 2003].

Petersson, B. 1985. Extinction on an isolated population of the middle-spotted woodpecker *Dendrocopus medins* in Sweden and its relation to genome theories on extinctions. Biological Conservation 32: 335-353.

Phalen, D. 2004. Prairie dogs: vectors and victims. Seminars in Avian and Exotic Pet Medicine. 13(2): 105-107.

Pidgeon, A. M., N. E. Mathews, R. Benoit, and E. V. Nordheim. 2001. Response of avian communities to historic habitat change in the northern Chihuahuan Desert. Conservation Biology 15(6): 1772-1788.

Pizzimenti, J. J. 1975. Evolution of the prairie dog genus *Cynomys*. Occasional Papers of the Museum of Natural History, The University of Kansas, Lawrence Kansas. 39: 1-73.

Placer, J., and C. N. Slobodchikoff. 2000. "A fuzzy-neural system for identification of species-specific alarm calls of Gunnison's prairie dogs. " Behavioural Processes 52(2000): 1-9.

Plumpton, D. L. and D. E. Andersen. 1997. Habitat use and time budgeting by wintering ferruginous hawks. The Condor. 99: 888-893.

Plumpton, D. L. and D. E. Andersen. 1998. Anthropogenic effects on winter behavior of ferruginous hawks. Journal of Wildlife Management. 62: 340-346.

Plumpton, D. L. and R. S. Lutz. 1993. Nesting habitat use by burrowing owls in Colorado. Journal of Raptor Research. 27: 175-179.

Power, M. E., D. Tilman, J. A. Estes, B. A. Menge, W. J. Bond, L. S. Mills, G. Daily, J. C. Castilla, J. Lubchenco, and R. T. Paine. 1996. Challenges in the quest for keystones. BioScience. 466: 9-20.

Preston, D. 1998 Agricultural Briefs (column). The Pueblo Chiefton. August 5, 1998.

Probasco, G. 1988. Involving the public in prairie dog management on the Nebraska National Forest. USDA Forest Service General Technical Report RM-154: 113-114.

Proctor, J., B. Haskins, and S. C. Forrest. 2006. Focal areas for conservation of prairie dogs and the grassland ecosystem. Conservation of the Black-tailed Prairie Dog: Saving North America's Western Grasslands. J. L. Hoogland, ed., Washington: Island Press. pp.

Quaid, L. 2006. Ethanol boosts corn production by 34 percent. Washington Post. May 12.

Raabe, Steve. 2007. The newest cash crop: ethanol Colorado farmers plan to plant more acreage in corn than any year since the '30s to take advantage of the alternative-fuel boom. The Denver Post. 8 April. Lexis Nexis Academic. Accessed July 2, 2007.

Reading, R. P. and S. R. Kellert. 1993. Attitudes toward a proposed black-footed ferret (*Mustela nigripes*) reintroduction. Conservation Biology. 7: 569-580.

Reading, R. P., B. J. Miller, and S. R. Kellert. 1999. Values and attitudes toward prairie dogs. Anthrozoös. 12: 43-52.

Reading, R. P., T. W. Clark, L. A. McCain, and B. J. Miller. 2002. Black-tailed prairie dog conservation: A new approach for a 21st century challenge. Endangered Species Update. 19: 162-170.

Reeve, A. F. and T. C. Vosburgh. 2003. Second draft – chapter 10 – recreational shooting. Unpublished manuscript. Black-footed ferret recovery foundation and PIC Technologies, Inc., Laramie. 26pp.

Reeve, A. F. and T. C. Vosburgh. 2006. Recreational shooting of prairie dogs. Conservation of prairie dogs in areas with plague. Conservation of the Black-Tailed Prairie Dog. J. L. Hoogland (ed.). Washington: Island Press. pp. 139-156.

Reeve, A. F. and T. C. Vosburgh. Undated Manuscript. Effects of Recreational Shooting on Prairie Dogs as Black-footed Ferret Habitat.

Roach, J. L., P. Stapp, B. Van Horne, and M. F. Antolin. 2001. Genetic structure of a metapopulation of black-tailed prairie dogs. Journal of Mammalogy 82(4): 946-959.

Rosmarino, N. J. 2002. Endangered Species Act Under Fire: Controversies, Science, Values, and the Law. Ph. D. Dissertation, University of Colorado at Boulder. 497 pp.

Ross, B. 2001. Don't let prairie dogs run out farmers. Bozeman Chronicle, September 23, 2001.

Sager, Lawry. 1996. "A 1996 survey of black-tailed prairie dogs (Cynomys ludovicianus) in northeastern New Mexico. " Reported submitted to the New Mexico Department of Game and Fish. Contract #96-516. 61.

Schemske, D. W., and R. Lande. 1985. The evolution of self-fertilization and inbreeding depression in plants. II. Emperical observations. Evolution 39: 41-52.

Schenbeck, and R. Cefkin (Eds.). USDA Forest Service General Technical Report RM-154. Rapid City, South Dakota. April 28-30, 1987. pp. 53-56.

Seton, E. 1953 (reprint from 1929). Lives of Game Animals, Volume IV - Part I Rodents, etc. Charles T. Branford Company. Boston, Massachusetts. pp. 275-298.

Shaffer, M. L. 1981. Minimum population size for species conservation. BioScience 31(2): 131-134.

Sharps, J. C. and D. W. Uresk. 1990. Ecological review of black-tailed prairie dogs and associated species in western South Dakota. Great Basin Naturalist. 50: 339-345.

Sidle, J. G., D. H. Johnson, and B. R. Euliss. 2001. Estimated areal extent of black-tailed prairie dog colonies in the northern Great Plains. Journal of Mammalogy 82 (4): 928-936.

Simberloff, Daniel, and Betsy Von Holle. 1999. Positive interactions of nonindigenous species: invasional meltdown? Biological Invasions 1(1): 21-34.

Smith, A. 2007. South Dakota Prairie Dog Control (Meeting Report). Interagency ADC Meeting. Wall, SD. February 22.

Smith, G. and M. Lomolino. 2004. Black-tailed prairie dogs and the structure of avian communities on the shortgrass plains. Oecologia, Volume 138, Number 4, March 2004, pp. 592-602(11).

Smith, S. D. and R. S. Nowak. 1990. "Ecophtsiology of plants in the intermountain lowlands. " In Plant biology of the Basin and Range Eds. C. B. Osmand et al. Springer Verlag, Berlin, Germany.

South Dakota Prairie Dog Working Group. 2001. South Dakota Black-tailed Prairie Dog Management Plan (Draft 2). Pierre, SD: South Dakota Department of Game, Fish, and Parks. October.

Stapp, P. 1998. A reevaluation of the role of prairie dogs in the Great Plains grasslands. Conservation Biology. 12: 1253-1259.

Stapp, P., M. F. Antolin, and M. Ball. 2004. Patterns of extinction in prairie dog metapopulations: plague outbreaks follow El Nino events. Frontiers Ecol. Environ. 2(5): 235-240.

Stenseth, N. C., N. I. Samia, H. Viljugrein, K. L. Kausrud, M. Begon, S. Davis, H. Leirs, V. M. Dubyanskiy, J. Esper, V. S. Ageyev, N. L. Klassovskiy, S. B. Pole, and K-S. Chan. 2006. Plague dynamics are driven by climate variation. Proceedings of the National Academy of Sciences. 103(35): 13110-13115.

Stockrahm, D. M. B. and R. W. Seabloom. 1998. Comparative reproductive performance of black-tailed prairie dog populations in North Dakota. Journal of Mammalogy. 69: 160-164.

Stuart, J. 1902. The Yellowstone expedition of 1863. Contributions to the Historical Soc. Montana. Vol. 1, 2nd ed. Independent Publishing Company, Helena, MT 162-179.

Terborgh, J. 1988. The big things that run the world -- a sequel to E. O. Wilson. Conservation Biology. 2: 402-403.

Thorne, E. T. 1982. Tularemia. Diseases of Wildlife in Wyoming. E. T. Thorne, N. Kingston, W. R. Jolley, and R. C. Bergstrom (eds.). Cheyenne, WY: Wyoming Game and Fish Department.

Trent, J. D., Young, J. A. and R. R. Blank. 1994. "Potential role of soil microorganisms in medusahead invasion. " In Proceedings Ecology and Management of Annual Grasslands Eds. S. B. Monsen and S. G. kitchen. USDA Forest Service Intermtn. Res. Sta. Gen. Tech. Rep. INT-GTR-313.

Trudeau, K. M., H. B. Britten, and M. Restani. 2004. Sylvatic plague reduces genetic variability in black-tailed prairie dogs. Journal of Wildlife Diseases. 40(2): 205-211.

Trudeau, K. M. 2002. Effects of sylvatic plague and geographic isolation on genetic variability in black-tailed prairie dogs (*Cynomys ludovicianus*) in north-central Montana. M.S. Thesis. University of South Dakota. 55 pp.

Tyler, J. D. 1968. Distribution and vertebrate associates of the black-tailed prairie dog in Oklahoma. Ph.D. Thesis. University of Oklahoma. Norman, Oklahoma. 85 pp.

U.S. Fish and Wildlife Service. 1997. Making the ESA work better: Implementing the 10 point plan…and beyond.

U.S. Fish and Wildlife Service. 1988. Black-footed ferret recovery plan: Denver, Colo., U. S. Fish and Wildlife Service, 154 p.

U.S. Fish and Wildlife Service. 1989. Black-footed ferret search activities, northwest Colorado and Northeast Utah: Golden, Colo., U. S. Fish and Wildlife Service, 49 p.

U.S. Fish and Wildlife Service (USFWS). 2000. 12-Month Administrative Finding, Black-tailed Prairie Dog. February 4.

U.S. Fish and Wildlife Service. 2002. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

U.S. Fish and Wildlife Service (USFWS). 2004. Candidate Assignment and Listing Assessment for the Black-tailed Prairie Dog.

U.S. Forest Service. 2007. USDA Forest Service Update March 2007: The Black-tailed Prairie Dog.

Uresk, D. W. and J. C. Sharps. 1986. Denning habitat and diet of the swift fox in western South Dakota. Great Basin Naturalist. 46: 249-253.

U.S. DOI, BLM, Wyoming. 2001. Sensitive species policy and list, Instruction Memorandum No. WY-2001-040.

Van Pelt, W. E. 1999. The black-tailed prairie dog conservation assessment and strategy. Arizona Game and Fish Department, Phoenix, Arizona. 55 pp.

Vanderhye, A. V. R. 1985. Interspecific nutritional facilitation: Do bison benefit from feeding on prairie dog towns? M.S. thesis. Colorado State University, Fort Collins, CO.

Vermeire, L. T., R. K. Heitschmidt, P. S Johnson, and B. F. Sowell. 2004. The prairie dog story: Do we have it right? BioScience 54: 689-695.

Vosburgh, T. C. and L. R. Irby. 1998. Effects of recreational shooting on prairie dog colonies. Journal of Wildlife Management. 62(1): 363-372.

Webb, C. T., C. P. Brooks, K. L. Gage, and M. F. Antolin. 2006. Classic flea-borne transmission does not drive plague epizootics in prairie dogs. Proceedings of the National Academy of Sciences U S A. 103(16): 6236-6241.

Weltzin, J. F., S. L. Dowhower, and R. K. Heitschmidt. 1997a. Prairie dog effects on plant community structure in southern mixed-grass prairie. Southwestern Naturalist. 42: 251-258.

Weltzin, J. F., S. Archer, and R. K. Heitschmidt. 1997b. Small-mammal regulation of vegetation structure in a temperate savanna. Ecology. 78(3): 751-763.

Whicker, A. and J. K. Detling. 1993. Control of grassland ecosystem processes by prairie dogs. Management of prairie dog complexes for the reintroduction of the black-footed ferret. J. L. Oldemeyer, D. E. Biggins, and B. J. Miller (Eds.). Washington, DC: U.S. Department of the Interior, pp. 18-27.

Whicker, A. D. and J. K. Detling. 1988a. Ecological consequences of prairie dog disturbances. BioScience. 38: 778-785.

Whicker, A. D. and J. K. Detling. 1988b. Modification of vegetation structure and ecosystem processes by North American grassland mammals. Plant form and vegetation structure: Adaptation, plasticity and relation to herbivory. J. J. A. Werger, P. J. M. van der Aart, H. J.

During, and J. T. A. Verhoeven (Eds.). SPB Academic Publishing, the Hague, the Netherlands. pp. 301-316.

White, G. C., J. R. Dennis, and F. M. Pusateri. 2005. Area of black-tailed prairie dog colonies in eastern Colorado. Wildlife Society Bulletin. 33: 265-272.

Wilcove, D. S., C. H. McLellan, and A. P. Dobson. 1986. Chapter 11, Habitat Fragmentation in the Temperate Zone. In Conservation Biology, the Science of Scarcity and Diversity, M. E. Soule, ed. pp. 237-255.

Wilcox, B. A., and D. D. Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. The American Naturalist 125: 879-87.

Wirsing, A. J., T. D. Steury, and D. L. Murray. 2002. Relationship between body condition and vulnerability to predation in red squirrels and snowshoe hares. Journal of Mammalogy. 83: 707-715.

Wisner, Robert. 2007. Ethanol demand: growth and implications for grain producers. Integrated Crop Management. IC-498 (1) pp. 31-33. 12 February.

Wood, L. 2004. Like grasshoppers. Rapid City Journal. Letters to the Editor, September 26, 2004.

Woodhouse C. A., Brown P. M. 2001. Tree-ring evidence for Great Plains drought. Tree-Ring Research. 59: 89–103.

Woodhouse C. A., Overpeck J. T. 1998. 2000 years of drought variability in the central United States. Bulletin of the American Meteorological Society. 79: 2693–2714.

Wuerthner, G. 1997. Viewpoint: The black-tailed prairie dog—headed for extinction? Journal of Range Management. 50: 459-466.

Wyoming Cooperative Fish and Wildlife Research Unit. 2001. Secondary effects of prairie dog shooting on TBNG raptor populations: summary of preliminary results from summer 2001. Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming, Laramie.

Wyoming Game and Fish Commission. 2001. Draft 10/1/2001, Wyoming Game and Fish Commission, Chapter 52, nongame wildlife. Wyoming Game and Fish Department, Cheyenne. 21 pp.

Zinn, H. C., & Andelt, W. F. (1999). Attitudes of Fort Collins, Colorado residents toward prairie dogs. Wildlife Society Bulletin. 27: 1098–1106.