APPENDIX A
SPECIES ACCOUNT: BLACK-TAILED PRAIRIE DOG

Black-tailed Prairie Dog (*Cynomis ludovicianus*)

Species Status

In 1998, two petitions were received by the U.S. Fish and Wildlife Service (USFWS) to list the black-tailed prairie dog (*Cynomis ludovicianus*) as threatened under the ESA of 1973, as amended (USFWS 1999). One petition, dated July 30, 1998 was from the National Wildlife Federation (NWF) and the second petition, dated August 26, 1998 was from the Biodiversity Legal Foundation, the Predator Project and Jon C. Sharps. In these petitions, several factors were listed as major threats to the long-term viability and conservation of this species. These included habitat loss, habitat fragmentation, disease, unregulated shooting and poisoning, and combinations of these, and other factors. In response to these petitions, in February 2000 the USFWS's 12-month finding was that the black-tailed prairie dog was warranted but precluded for listing under the ESA (USFWS 2000). The USFWS believed that a threatened listing was warranted. The black-tailed prairie dog was not listed at that time, however, as resources needed to complete the process were not available.

Description and Taxonomy

Prairie dogs are small, diurnal, burrowing rodents. Specifically, there are five species of prairie dog in North America, three of which are found in Colorado. The species found in Colorado are the black-tailed prairie dog, white-tailed prairie dog (*C. leucurus*) and Gunnison's prairie dog (*C. gunnisoni*). A subspecies of black-tailed prairie dog is sometimes mentioned (*Cynomys ludovicianus arizonensis*). Studies on evolutionary divergence, however, indicate that the black-tailed prairie dog is monotypic (USFWS 2000). Therefore, it is believed that the subspecies separation is not valid. Most skeletal and cranial measurements indicate that the black-tailed prairie dog is the largest species of prairie dog (Hollister 1916, Pizzimenti and Collier 1975). If one simply measures body mass during the breeding season, however, the white-tailed prairie dog is larger (Clark 1977, Hoogland 1995, Wright-Smith 1978).

The black-tailed prairie dog measures approximately 13-16 in and weighs 1-3 lbs when mature. Pelage color ranges from light tan to reddish brown above and whitish below with most individuals having a characteristic black-tipped tail. Summer pelage is short and relatively coarse and winter pelage is longer and more lax (Fitzgerald et al. 1994). Females are typically 10-15% smaller than males and have eight functioning mammae (Fitzgerald et al. 1994, Hoogland 1996). The dental formula is 1/1; 0/0; 2/1; 3/3; for a total of 22 teeth.

Historical and Current Distribution

Historically, the black-tailed prairie dog had the largest geographic range of all species of prairie dog, from extreme southern Saskatchewan through 11 states to extreme northern Mexico. Because no definitive historical account of the actual number of occupied acres of the black-tailed prairie dog exists, various individuals, organizations, and state and federal agencies have made estimates over the years. In its petition, the NWF stated that the black-tailed prairie dog once occupied as much as 100-200 million acres (USFWS 2000). Researchers estimate historic occupied habitat within this area for all five species of prairie dogs to be between 99-247 million acres (Mulhern and Knowles 1995, Miller et al. 1996). Anderson et al. (1986) estimated 104 million acres for all species of prairie dogs across their range in the early 1900's. Knowles (1998) estimated that the black-tailed prairie dog alone occupied between 79-111 million acres.

The black-tailed prairie dog currently exists in 10 of the 11 historically occupied states; it was extirpated from Arizona somewhere around 1932 (USFWS 2000). The USFWS 12-month finding estimated that the current occupied acreage within these 10 states is approximately 676,000 acres (USFWS 2000). Using the Bailey Eco-regions habitat model, the current estimated occupied acreage within these same 10 states is 1,093,000 acres (Luce 2003). These numbers represent only 1-6% of its original range (Fagerstone and Ramey 1995, Knowles 1995, Mulhern

and Knowles 1995, Barko 1997, Weurthner 1997, Knowles 1998, USFWS 2000). It is estimated that the black-tailed prairie dog historically inhabited approximately 20% of the shortgrass and midgrass prairies in Eastern Colorado (Laurenroth 1979) or approximately 4.6 million acres (Van Pelt 1999).

In its petition to the USFWS, the NWF estimated that the black-tailed prairie dog in Colorado occupied approximately 44,000 acres (Knowles 1998). In the 12-month finding, the USFWS estimated approximately 93,000 active occupied acres in Colorado (USFWS 2000). The Bailey Eco-region model estimated that Colorado had 255,773 acres of current suitable habitat (Luce 2003). In 1999, the CDNR contracted EDAW, Inc. to conduct a "Black-tailed Prairie Dog Study of Eastern Colorado" (EDAW 2000). After completing their work, EDAW (2000) reported an estimate of 214,570 active occupied acres of prairie dogs in eastern Colorado. The CDOW initiated a complete aerial survey of black-tailed prairie dog acres throughout its entire historic range within Colorado in the summer of 2001. This survey was accomplished using aerial survey techniques described by Sidle et al. (2001). Results of this survey indicate that Colorado currently has between 570,947 and 691,258 active black-tailed prairie dog occupied acres (White et al. 2003).

Life History and Habitat

Behavior

The black-tailed prairie dog is diurnal and active above ground throughout the entire year. Unlike white-tailed and Gunnison's prairie dogs, the black-tailed prairie dog does not hibernate. It does, however, enter periods of torpor. Torpor is defined by Wang (1989) as the facultative lowering of body temperature to levels below seasonal euthermic norms. This lowering of body temperature facilitates the conservation of energy and body water (Bakko et al. 1988, Wang 1989). It is believed that the black-tailed prairie dog enters torpor over multiple days in response to shortages of food and water, and extremely low ambient temperatures (Lehmer et al. 2001). Lehmer et al. (2001) found that separate colonies would enter torpor simultaneously, indicating that the response to stimuli for entering torpor occurred at a large scale.

The basic social group of the black-tailed prairie dog is called a coterie. Coteries are generally made of one adult male, two or three adult females, and their offspring (Garrett and Franklin 1988, Hoogland 1995). Larger coteries may contain two breeding males, or one male may sometimes control two smaller adjacent coteries. Several coteries make up a colony or town. Depending on the size of the town, topographic relief and geographic features of the landscape, portions of the town may segregate into units called wards.

The black-tailed prairie dog has a highly complex system of communication within and between coteries. Communication between animals involves tactile, visual, olfactory and auditory stimuli (Fitzgerald et al., 1994). The most commonly recognized vocalizations out of a total of 12 categorically different vocalizations of this species are its alarm bark and the jump-yip (Hoogland 1995). In addition to vocalizations within coteries, there are a number of amicable tactile interactions including play, grooming and mouth-to-mouth contact. However, when females are pregnant or lactating, they can be very hostile in their defense of natal burrows (burrows used for rearing offspring). This hostility between coterie members usually ends once juveniles come above ground (King 1955, Hoogland 1986). Interactions between different coteries can result in a territorial dispute that involves staring, flaring of the tail, bluff charges, tooth chattering, anal sniffing, and may include chasing and fighting (King 1955, Hoogland 1995).

Although prairie dogs are territorial, individuals will disperse to different coteries or even different colonies throughout their life. Dispersal is defined as the movement of an individual from the natal burrow to another location where it is expected to reproduce assuming it survives and finds mates. Intracolony (within colony) dispersal is common and involves mostly yearling males before they begin to reproduce (Garrett and Franklin 1988). Intercolony dispersal (between colonies) also occurs, but is less common and typically occurs in late spring (Garrett and Franklin

1988). The reason for this timing is generally based on: 1) peak growth of cool-season grasses affording dispersing prairie dogs good food and cover; and 2) the emergence of new litters from the natal burrows and subsequent peak colony densities.

Another reason for dispersal may be to minimize inbreeding between close genetic relatives (Dobson et al. 1997, Halpin 1987, Hoogland 1995). Garrett and Franklin (1983) and Hoogland (1982) found that females only bred with an unrelated male. In situations where genetically related males are the only males available in a coterie, related females may not breed at all. However, Hoogland (1995) states that, "…on the day of estrus, females sometimes leave the home coterie territory in search of breeding males from other territories. Therefore, dispersal is sometimes the only way prairie dogs can continue to breed."

Reproduction

The black-tailed prairie dog has only one estrous cycle and one litter per year. In Colorado, breeding generally occurs in late February or early March (Fitzgerald et al., 1994). Gestation lasts approximately 30 to 35 days with pups emerging from the burrow four to seven weeks after birth (Fitzgerald et al. 1994). Pups are fully weaned when they come above ground and generally weigh between three and five oz (Fitzgerald et al., 1994). Females generally have four to six pups per litter (Knowles and Knowles 1994, Hoogland 1995). According to Hoogland (1996), survivorship for female pups is usually 54% and for male pups is 47% during the first year after emergence. Crosby and Graham (1986) state that the post-weaning natural mortality rate is approximately 44% for sub-adults and pups (juveniles). Hoogland (1995) has documented that females in the wild may live up to eight years, but males never lived more than five years on his study sites.

Some research into fertility control as a means of limiting local population growth has been done. Limits to any fertility control used for prairie dogs include: 1) an oral bait must be provided as it is too economically prohibitive to capture and sterilize each prairie dog; 2) it cannot have any secondary hazards to non-target species that either eat the bait or the treated animals; and 3) to be used commercially, it must be registered with EPA (a very expensive process). Contraception of prairie dogs is not currently a viable or commercially available method to control local prairie dog populations.

Diethylstilbestrol (DES) is a synthetic estrogen used to reduce fertility in female animals. Garrett and Franklin (1983) showed that DES stopped all reproduction in the black-tailed prairie dog. A few problems were noted, however. First, DES was difficult to administer because it needed to be administered at a precise time during the breeding cycle. Secondly, it accumulated in the body tissues and posed a secondary hazard to predators. As a result, DES was never registered with EPA and probably never will be.

Ornitrol (DiazaCon) is a compound that has the same chemical structure as cholesterol (Miller and Fagerstone 2000). It prevents the formation of testosterone and progesterone and can last up to several months. The compound may have undesirable side effects on the animal's health because cholesterol is important for many body functions. In addition, it is not species specific. Ornitrol is slowly cleared from the system after ingestion (Fagerstone et al. 2002) so hazards to non-target species are not permanent and not as severe as those from DES.

Diet

The black-tailed prairie dog eats a variety of grasses, sedges and forbs. Grasses are typically its preferred food (Koford 1958, Tileston and Lechleitner 1966, Costello 1970, Summers and Linder 1978, Fagerstone 1979, Ursek 1984, Garrett and Franklin 1988, Clippinger 1989). The grasses most frequently consumed include: western wheatgrass (*Pascropyrum smithii*), blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) (Koford 1958, Tileston and Lechleitner 1966, Bonham and Lerwick 1976, Summers and Linder 1978, Fagerstone 1979). Other grasses that may be consumed include sand dropseed (*Sporobolus cryptandrus*), cheatgrass (*Bromus tectorum*), sixweeks fescue (*Vulpia octoflora*) and ring muhly (*Muhlenbergia*

torreyi) (Clippinger 1989). According to Uresk (1984), sedges (*Carex* spp.) may also compose up to 55-64% of prairie dog diets in late spring. Some forbs common in prairie dog diets include scarlet globemallow (*Sphaeralcea coccinea*) (up to 20-40% of their diet) and plains prickly pear (*Opuntia polyacantha*) (up to 58% of the winter diet) (Clippinger 1989).

The black-tailed prairie dog typically avoids sagebrush (*Artemisia tridentata*), threeawn (*Aristida purpurea*), horseweed (*Conyza canadensis*), diffuse knapweed (*Centaurea diffusa*), Mediterranean sage (*Salvia aethiopis*), buffalo bur (*Solanum rostratum*), inland salt grass (*Distichlis spicata*), tumblegrass (*Schedonnardus* spp.) and prairie dog weed or fetid marigold (*Dyssodia papposa*) (Hansen and Gold 1977, Koford 1958, Tileston and Lechleitner 1966, Summers and Linder 1978, Fagerstone 1979). On poorer habitats, the black-tailed prairie dog will consume bindweed (*Convolvulus arvensis*) and ragweed (*Ambrosia* spp.).

In some cases, grazing by prairie dogs can improve the plant nutritional quality through the constant clipping activity (Coppock et al. 1983, Krueger 1986, O'Meilia et al. 1982 and Whicker and Detling 1988). Clipping stimulates new growth, which often has higher protein content and greater digestibility than the more mature vegetative biomass (O'Meilia et al. 1982, Whicker and Detling 1988). In addition, Bonham and Lerwick (1976) found an increase in the total number of plant species and greater cover of perennial, grazing tolerant grasses such as buffalograss within prairie dog towns as opposed to surrounding areas in eastern Colorado. This increase in perennial grasses and forbs can be beneficial for livestock. Because of this, impacts to cattle may be minimal on good spring or summer range, when there is adequate soil moisture and precipitation to facilitate new vegetative growth. O'Meilia et al. (1982) believed that higher forage quality may compensate for reduced forage availability. In their study, they found no statistically significant difference between steer weight gains on pastures with and without prairie dogs.

The reduction in overall biomass resulting from clipping, however, may significantly and negatively affect cattle or native ungulates on winter ranges and pastures, or during drought years. Because prairie dogs have the ability to clip vegetation shorter than cattle and native ungulates can access, if no new growth occurs after initial clipping by prairie dogs, cattle may be unable to utilize the remaining forage.

Hansen and Gold (1977) stated, based on 35% dry matter content, an individual adult black-tailed prairie dog consumes approximately 3 oz of forage per day and 71.1 lbs per year. The amount of forage clipped or lost due to burrowing amounts to an additional 35.1 lbs per year. With regard to competition with cattle, there is approximately a 64% similarity index in forage preference between prairie dogs and cattle (Hansen and Gold 1977). Therefore, using the conversion factor of 19 lbs of forage-need to produce 1 lb of meat (Cook 1978), it is estimated that each prairie dog could result in a reduction of 3.58 lbs of meat production per year (Crosby and Graham 1986).

Habitat

The black-tailed prairie dog inhabits the short- and mixed-grass prairie grasslands located in the semi-arid Great Plains region of western North America. It desires habitats with vegetation shorter than 12 inches, which it will often clip to enhance visibility over the landscape (Turner 1979, Clippinger 1989, Coffeen and Pederson 1989, McDonald 1993, Fitzgerald et al. 1994, Hoogland 1995, Truett et al. 2001). Within this region, the black-tailed prairie dog usually prefers areas of less than 10% slope (Koford 1958, Tileston and Lechleitner 1966, Dalsted et al. 1981, Clippinger 1989, Truett et al. 2001). Hoogland (1995) states that the black-tailed prairie dog generally exists between elevations of 2,296 and 5,577 feet. Because it does not hibernate, as do the Gunnison's, white-tailed, and Utah prairie dog, which exist at elevations higher than 5,577 feet, it can only exist at elevations where foraging can continue throughout the winter.

Burrow Systems

Black-tailed prairie dog burrows are important for defense against predators and protection from inclement weather. Burrow entrances are typically 4-12 inches in diameter (Merriam 1902,

Sheets et al. 1971, King 1955), about 16-33 ft long and 6-10 ft deep. Typically, burrows have one or two entrances, but may have as many as six entrances (Sheets et al. 1971, Hoogland 1995).

There are three different types of burrow entrances. One type has no conspicuous mound and is typically found near the colony's periphery. These burrows are generally used only as escape cover to avoid predators or thermal cover to avoid midday heat (Hoogland 1996). The second type of entrance is wide, rounded and generally unstructured. These entrances are called dome craters (King 1955). The third type of entrance is a high, cone-like mound of dirt that resembles a volcano. This entrance is called a rim crater. Rim and dome craters may be used as: 1) cover from predators; 2) vantage points to scan for predators; 3) overnight cover; 4) cover for rearing young; 5) barriers to prevent flooding; and 6) facilitation for underground ventilation via Bernoulli's Principle (Vogel et al. 1973, Hoogland 1995).

Hoff (1998) and Apps et al. (2002) suggest that fine sand-loam soils with little gravel and good drainage are optimal for burrow systems. Treviño-Villarreal et al. (1997) state that the majority of the Mexican prairie dog (*Cynomys mexicanus*) colonies studied were found on silt-loam soils low in clay (less than 30%), medium in sand (approximately 50%), and medium to high in silt (greater than 70%). Burrows high in gravel may collapse and can impair the ability of burrowing animals to dig (Apps et al. 2002). Although the prairie dog may conduct exploratory diggings in rocky ground, these are not preferred sites and are typically abandoned (King 1955, Treviño-Villarreal et al. 1997).

Reasons for Decline

The USFWS 12-month finding (USFWS 2000) listed the major threats to the long-term viability and conservation of the black-tailed prairie dog in order of importance as:

1. Present or threatened destruction, modification, or curtailment of the species' habitat or range;
2. Overutilization for commercial, recreational, scientific, or educational purposes;
3. Disease or predation;
4. Inadequacy of existing regulatory mechanisms; and
5. Other natural or manmade factors affecting the species' continued existence.

1. Present or threatened destruction, modification, or curtailment of the species' habitat or range

The petitioners and the USFWS (2000) believe that habitat loss due to cropland conversion, urbanization, habitat modification and fragmentation have negatively affected populations of the black-tailed prairie dog across its range. The conversion of prairie habitat to cropland is asserted as being the most devastating loss. According to Laycock (1987), 104 million acres of the Great Plains were converted to cropland between 1880 and 1899. As of 1987, 57,700,000 acres of land in the Great Plains was still unplowed (Hexem and Krupa 1987), the loss of which would negatively impact the black-tailed prairie dog and other grassland species.

Urbanization has impacted fewer acres and likely will not cause the extinction of the black-tailed prairie dog in the future. The actual conversion or fragmentation, however, is permanent. According to the USFWS (2000), 42,500 acres of occupied habitat were present along the urban front range Corridor from Fort Collins to south Denver in 1994. By 1998, this acreage reportedly had already decreased by 8,000 acres (Knowles 1998)

2. Overutilization for commercial, recreational, scientific, or educational purposes

Shooting did not contribute as significantly to historical prairie dog declines as did habitat conversion and poisoning (Van Pelt 1999). All recreational hunting of the black-tailed prairie dog on public lands (state and federal) and all areas east of Interstate 25 is currently prohibited in

Colorado. Shooting of prairie dogs is still legal for private landowners and their agents to reduce damage to their properties.

3. Disease or predation

Sylvatic plague (*Yersinia pestis*) is not endemic to North America but was brought from China via ship to United States ports in 1899 (Dicke 1926, Link 1955). It was first recorded in wild rodents in San Francisco, California (Link 1955) and has extended eastward throughout the western, semiarid region of the United States (Barnes 1982). Sylvatic plague does not occur in the eastern part of the country. Of all of the factors that limit the abundance and distribution of prairie dogs, sylvatic plague is the only factor that is completely beyond human control and may continue to be the "wild card" in all management decisions and conservation strategies for the black-tailed prairie dog.

Epizootic hosts with little to no resistance to the disease, such as rock squirrels (*Spermophilus* spp.) and prairie dogs, are most often not responsible for the overall persistence of plague in the environment. Instead, plague breaks out when rock squirrels and prairie dogs are exposed to enzootic hosts (those species that have high resistance to the disease) such as deer mice (*Peromyscus maniculatus*) and kangaroo rats (*Dipodomys* spp.). The black-tailed prairie dog is highly susceptible to plague. Very few, if any, seem to have any immunity to plague at all regardless of health level. In addition, as populations increase, the greater densities of animals provide more opportunity for transmission of plague through the population (Barnes 1993, Cully and Williams 2001, Lomolino and Smith 2001). As population density increases, fleas have an easier time finding new hosts and pneumonic transmission can occur more frequently.

4. Inadequacy of existing regulatory mechanisms

Currently in Colorado, the black-tailed prairie dog is classified as a "destructive rodent pest" by the CDA (see Colorado Revised Statute (C.R.S.) 33-7-203) and as small game by the CDOW (see C.R.S. 33-1-102). The CDOW generally limits regulation of the black-tailed prairie dog to issues pertaining to hunting and relocation from one site to another. Relocations are authorized through a permit process and all recreational hunting of the black-tailed prairie dog on public lands (state and federal) and all areas east of Interstate 25 is prohibited. Shooting is still legal for private landowners and their agents to reduce damage to their properties, as is the use of various fumigants and toxicants. The CDA and EPA direct the types and manner in which fumigants and toxicants can be used.

The CDPHE also has jurisdiction over prairie dogs when issues of human health and safety are raised. This is most often with regard to suspected or confirmed outbreaks of sylvatic plague. State law (C.R.S. 35-7-203 (Senate Bill 99-111)) also provides that no person shall release prairie dogs into a county other than that from which they were taken unless such person has obtained prior approval of the CDOW and the BOCC of such receiving county. In addition, several Colorado counties and municipalities have localized ordinances and policies dictating how the black-tailed prairie dog is managed in the face of human conflict and urban development. Some ordinances or policies require that none be killed (e.g. City of Boulder Ordinance #7133 and municipal code section 6-1-12 and Town of Superior municipal code Article XXII Section 16-493). Other ordinances, general policies and recommendations call for good faith relocation efforts, or to make the prairie dogs available for either the ferret recovery program or other wildlife rehabilitation programs before the use of fumigants or toxicants is permitted (e.g. City of Thornton Ordinance #2628).

5. Other natural or manmade factors affecting the species' continued existence

Poisoning for control of prairie dogs and other ground squirrels has occurred to varying degrees since the late 1800's and early 1900's. Most commonly, prairie dogs were controlled to reduce competition for forage with domestic livestock and damage to agricultural crops such as alfalfa, grass hay and wheat. Beginning in 1915, the U.S. Federal Government began to assist landowners in control efforts throughout the Great Plains and the west. Between 1916 and 1920

an estimated 26 million hectares of prairie dog and ground squirrel habitat was poisoned (Bell 1921, Cook 1991).

From the 1920's to roughly 1972, a variety of toxicants was used in the control and/or eradication of prairie dogs and other ground squirrels. Although a variety of toxicants was used, none were used as widely as Compound 1080. This highly effective, but extremely toxic chemical was banned in 1972 (Fagerstone and Ramey 1995). Since then, a variety of new, more "environmentally friendly" chemicals have been developed to assist in the control of prairie dogs and other burrowing rodents. Common chemicals used today include 2 percent zinc phosphide poisoned oats and fumigants such as aluminum phosphide, magnesium phosphide and carbon monoxide gas cartridges.

Efforts to control prairie dogs in recent years have been far less than those experienced in the late teens and early twenties. Control activities, however, do continue. Today, not only do many livestock and agricultural producers continue to control prairie dogs on their properties, but a variety of new landowners are controlling prairie dogs as well. Urban and suburban landowners, developers, city and county land managers, and others are controlling prairie dogs that invade yards, occupy areas scheduled for development, damage school yards, cemeteries, parks and recreation areas, or simply inhabit areas not intended for prairie dogs and prairie dog conservation.

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