

Urban and Suburban Black-Tailed Prairie Dog Colony Management Handbook



Prairie Dog Coalition

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Prairie Dog Coalition

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Urban and Suburban Black-Tailed Prairie Dog Colony Management Handbook

This handbook provides information about the black-tailed prairie dog (generally referred to as “prairie dog” in this text) in the urban and suburban environment. It is intended for use by open space staff, developers, urban planners, citizens who have or would like to have colonies on their land, as well as anyone interested in learning more about prairie dogs. This is a working document; watch for periodic updates.

1. INTRODUCTION

• **The Prairie Dog is a Keystone Species**

The prairie dog is a “keystone” species of the prairie ecosystem. More than 100 species, including ferruginous hawks, burrowing owls, snakes, and the swift fox, benefit from prairie dogs or the habitat they create and maintain. Some species, notably the endangered black-footed ferret, are dependent upon prairie dogs for survival.¹ The foraging and digging activities of prairie dogs helps alter the vegetation community, change soil chemistry, increase plant species diversity and abundance, increase nutritional value of some plants, and provide nesting habitat, shelter, or food for associated species.² Survival of the prairie dog is critical to the continued existence of the prairie ecosystem—one of the most endangered ecosystems in the world.³

To make real progress in conservation of the prairie dog and the prairie ecosystem, it is imperative that we recognize the important role that prairie dogs play in this ecosystem and to see these animals as sentient creatures, rather than as pests.

The growing human population throughout much of the prairie dog’s historic range has fragmented what was once contiguous prairie dog habitat. As a result, urban and suburban residents, as well as the rural community, must learn to coexist with prairie dogs if we intend to preserve the species. Many exterminations take place because of the perpetuation of prairie dog myths and half-truths: prairie dogs spread disease, they breed prolifically, they cannot coexist with human populations, they compete with cattle for forage, and livestock suffer broken legs from stepping in prairie dog burrows.

Prairie dogs and cattle only forage for 4–6% of the same plants for food.⁴ Both cattle and native ungulates of the Great Plains (e.g. American bison and pronghorn) prefer to graze on or near prairie dog towns because of the greater nutritional value of plants impacted by prairie dog foraging.⁵ Other myths will be addressed in subsequent sections of this handbook.

• **Biological, Ecological and Social Factors that Affect Prairie Dogs**

Prairie Dogs (*Cynomys ludovicianus*) are members of the squirrel family (Sciuridae). The genus *Cynomys* is divided into two sub-genera:

Cynomys – comprised of the **black-tailed** and Mexican prairie dog;

Leucocrossuromys – comprised of the white-tailed, Gunnison’s and Utah prairie dog.

The black-tailed prairie dog has a distinctive black tip at the end of its tail. The average weight for adult prairie dogs is 1.6 lbs, however, males can weigh up to 3.1 lbs., whereas females may

weigh as little as 1.1 lbs. after their offspring emerge from the natal burrow near the end of lactation.

Black-tailed prairie dogs live in short- and mixed-grass prairies at altitudes of 2,300–5,600 feet (sometimes higher; see section 2: Habitat Requirements; Altitude). Figure 1 shows the distribution of prairie dogs by geographic area. Prairie dogs are diurnal (active during the day), eating and foraging for food from dawn until dusk. Unlike white-tailed, Gunnison's, and Utah prairie dogs, black-tailed and Mexican prairie dogs do not hibernate and may be seen above ground at any time of year. However, black-tails may remain underground for several weeks at a time during severe winter weather.⁶ In a well-established colony, prairie dogs spend 33–50% of their time watching for predators. Through vigilance and the use of alarm calls to alert group members to danger, prairie dogs can be quite successful in avoiding predation by hawks, black-footed ferrets, badgers, coyotes, foxes, and snakes.

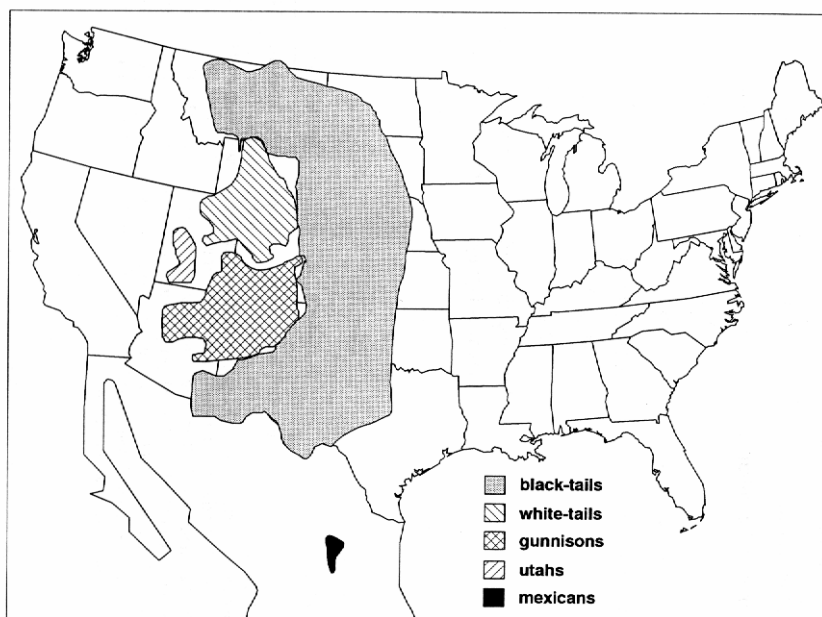


Fig. 1. Geographic distribution of the five species of prairie dogs. Because their ranges do not overlap, biologists can determine the species of prairie dog from locality alone.

Males and females usually reach sexual maturity at two years of age, though some may breed (often unsuccessfully) as yearlings and others delay sexual maturation until age three. Prairie dogs mate once per year in February or March, during which time a female is only receptive for four to five hours. Gestation lasts approximately 35 days. After about 41 days of lactation, pups appear for the first time outside of the natal burrow in May or June. Under ideal conditions, a female may produce one litter per year with three pups on average. However, the effects of disease, predation, and infanticide tend to reduce average litter size to approximately two pups by their first winter. Moreover, fewer than 60% of young weaned survive their first year.⁷ It is indeed a myth that prairie dogs are prolific breeders.

Prairie dogs live in territorial polygynous (males breed with multiple females) families called coteries, which are usually made up of one adult breeding male, three to four adult females, and several juveniles (young-of-the-year) and yearlings or sub-adults. Coterie members share a common burrow system and use burrows for sleeping, rearing young, and escaping from predators. Mature female prairie dogs occupy a single coterie for life. If they are not visited by a genetically-suitable male during breeding season, they will not give birth that year. Research shows that some females never find a proper suitor and will never have pups; as the years

progress, the entire coterie will become extinct.

A number of contiguous coterie make up a colony—often called a “town”—of prairie dogs. Black-tailed prairie dogs are among the most social members of the squirrel family. Both males and females within a coterie use a variety of vocalizations to interact and to warn each other of approaching predators. Prairie dogs cooperate and compete in a variety of complex ways both within and between coterie, similar to patterns of sociality displayed by baboons, vervet monkeys, and other highly social animals.

Historically, it was not uncommon for a single prairie dog colony to contain tens of thousands of individuals and cover thousands of acres of land. Only 100 years ago prairie dogs are thought to have numbered over 5 billion throughout their range in western North America. This abundance, common in the heyday of the bison, is increasingly rare today because of the ongoing attempts to eradicate prairie dogs by bulldozing (burying them alive in their burrows), shooting and poisoning. Loss of prairie dog habitat to cropland or urban development combined with the effects of eradication programs and disease threatened prairie dogs with extinction by the 1970s.⁸

• **Urban/Suburban Prairie Dog Colony Profile**

Presently, the black-tailed prairie dog inhabits only 1–3% of its historic range and is now at risk of becoming extinct. The Utah, Gunnison’s, white-tailed, and Mexican prairie dogs are faced with the same threat.

In most urban and suburban environments, land planning for prairie ecosystems and prairie dog conservation is non-existent. As a result, already small colonies become further fragmented and isolated by commercial building, residential housing developments and roads. The areas left for prairie dogs generally lack vegetative quality and do not allow for the natural dispersal patterns of prairie dogs.

Frequently, prairie dogs are viewed as a nuisance in these smaller colonies when they expand or disperse in search of food or new habitat, as they have for tens of thousands of years. Many are bulldozed, poisoned or killed by traffic as a result of communities that fail to plan for their conservation. Prairie dogs may not be able to survive on these isolated patches of land long-term if movement between colonies is significantly reduced. As a result, urban development and traditional views of prairie dogs as pests have become the primary threat to prairie dogs in the urban/suburban community.

There may be relatively few associated or dependent prairie species present in most urban/suburban prairie dog ecosystems along Colorado’s Front Range. Nevertheless, these colonies still support migrating birds, mammals and reptiles that are adapted to the unique habitat created by prairie dogs.

2. HABITAT REQUIREMENTS

- **Acres and Density Necessary for Optimal Colony Survival**

Up to 25 prairie dogs per acre⁹ may be optimal for colony survival in large, open grassland areas, although the Colorado Division of Wildlife recommends 10 prairie dogs per acre in urban settings. Scientific studies are required to determine how much land prairie dogs need not only to survive in the short-term, but also to thrive in the long-term.

Complete isolation—such that dispersing prairie dogs are rarely successful in moving between colonies—may be detrimental to smaller colonies. Such small, isolated colonies may succumb to problems associated with reduced genetic diversity. To minimize the detrimental effects, connectivity, i.e. corridors, between colonies is essential.¹⁰

Urban/suburban colonies are likely to be isolated, with no room for expansion and no other nearby colonies to which individuals can disperse. In addition, natural predation may be absent or reduced in urban and suburban areas. These factors may contribute to the expansion of prairie dogs onto adjacent property where they are not wanted. Long-term survival may not be possible in these fragmented and isolated conditions.

The State of Illinois is involved in a project to reestablish wildlife corridors along highways.¹¹ The corridors will allow the migration of many native species of wildlife, and will also be used to reestablish native plant species. Colorado is investigating similar open space management practices and Boulder County is exploring the benefits of wildlife corridors within their county.

- **Location**

Prairie dogs prefer open habitat with unobscured views and vegetation height of 12 cm (4.75 in) or lower.¹² This allows them to detect predators from a distance and results in more effective predator avoidance. They tend to stay within visual range of their burrows because running into a burrow is their only means of protecting themselves from predators.¹³ Flood plains are unacceptable habitat because prairie dogs cannot survive in wetlands or areas with high water tables, where burrows would flood. Areas with native short-grass vegetation and room for colony expansion are ideal.¹⁴

Prairie dogs do use floodplains as primary dispersal corridors. In a study of thirteen colonies, conducted in the Central Plains and Pawnee National Grasslands, prairie dog colonies were typically in low-lying areas, such as swales and broad lowland drainages where vegetation was primarily blue grama and buffalograss. Dispersal most likely occurred along low-lying dry creek drainages connecting isolated colonies.¹⁵ Urban/suburban planners could design a similar system that preserves these floodplain areas as natural dispersal corridors between colonies for prairie dogs.¹⁶

Urban/suburban colonies require additional considerations. For example, the colony needs to be adjacent to a larger piece of land (10 acres or more); and the ratio of prairie dogs per acre must be sufficient to sustain the colony. A colony may not be able to survive on land surrounded by buildings and roads, and containing sparse vegetation.

- **Required Soil Structure and Slope**

Prairie dogs can burrow in many soil types, but well-drained sites with sandy loam or loam clay are best. Shallow, sandy soils are not suitable.¹⁷ The soil must be dry and compactable so the burrows will not collapse.¹⁸

Prairie dogs prefer slopes less than 6%. Steeper slopes erode more quickly, weakening or collapsing the burrow structure, obstruct the views necessary in scanning for predators, and interfere with proper ventilation from entrance to exit burrows.

Colorado Division of Wildlife representatives, grassland biologists, and prairie dog relocators are able to determine suitable prairie dog habitat by examining the soils, vegetation and slope of the proposed area.

- **Altitude – Maximum and Ideal**

Prairie dogs along the Front Range of Colorado survive at elevations below 6,500 feet. Above 6,500 feet, they compete with Richardson's ground squirrels and other burrowing mammals. In addition, prairie dogs will succumb to the harsh conditions of winters at higher altitudes¹⁹. Although some colonies do exist at altitudes over 6,500 feet, there are frequent die-offs during harsh winters because, unlike Gunnison's and Utah prairie dogs, black-tailed prairie dogs do not hibernate.

Weather Factors

Weather patterns, and precipitation in particular, can affect the size of colonies primarily by influencing reproduction through food availability. For example, prairie dog litter sizes in Montana are positively correlated with precipitation in the previous summer. In this way, coterries, and entire colonies, may be larger after particularly wet summers and may shrink during years of drought.²⁰

In addition, colder weather and snow during breeding season may result in reduced reproduction.²¹

Prairie dogs have evolved to withstand the arid conditions of the Great Plains, which support the short grass prairie. Areas of predictable rainfall support mid- and mixed-grass biomes, and are avoided by prairie dogs because of the greater risk of predation in taller vegetation that can obscure their vision.²²

- **Revegetation**

Denuded Colonies

Most urban/suburban lands were previously used for agricultural or ranching practices that have altered native vegetation and soils. Typically, these lands are left unused while pending development approval. In the interim, they are invaded by non-native weeds or contain remnants of introduced pasture grasses such as smooth brome, crested wheat and cheat grasses that cannot sustain the impacts of prairie dogs.

During the thousands of years before the introduction of the plow and the cow, prairie dogs relied upon nutrient rich blue grama and buffalograsses with root systems that grow 10-14' below the soil surface. These native grasses evolved with the other plants and animals in the prairie ecosystem, and adapted to the grazing and burrowing activity of prairie dogs, as well as the arid conditions of the grassland biome with its cyclical droughts.

Prairie dogs migrated over immense areas of prairie, allowing the grasses to withstand and recover from grazing and burrowing. Very few large areas of prairie remain in the Front Range today. Because of development and the increasing value of land, prairie dog colonies are forced to exist in ever-smaller areas. With the constant pressure of grazing and burrowing, the areas become denuded and may never be able to recover because it takes years for native grasses to reestablish root systems.

In areas of dense colonization it may be impossible to revegetate with grasses because the prairie dogs will destroy them before they can establish their root system. An alternative to planting grasses is to plant bushes and shrubs that are over three feet tall. These plants have a chance of establishing themselves because prairie dogs do not "trim" or graze on vegetation that is over three feet tall. While the taller plants cannot be used for forage by the prairie dogs, they are effective in reducing erosion, deterring dispersing prairie dogs, providing wind and snow barriers, and offering a more attractive landscape.

Guidelines for Revegetation

Areas that are not occupied by prairie dogs, or contain small, fragmented colonies, can be revegetated with native grasses. Fall and spring plantings of wheat and barley are two of the most successful methods of restoring vegetation to denuded areas.²³

Buffalograss and blue grama are warm season grasses that come to life in late spring. Properly timed seed planting is critical. Planting in late fall may cause a false germination that will die with the first hard freeze. Instead, these seeds should be planted in early spring, as soon as the ground can be worked. A no-till drill is recommended for planting the seeds. Use twice the recommended amount of seed if revegetating an active colony. The drill can go directly over burrows with no harm to the prairie dogs. Note: Use buffalograss seed that has been primed for speed germination.

When new shrubs, trees or flowers are introduced into denuded colonies it is important to plant them in a way that avoids conflict with coteries. This can be accomplished by planting in areas that do not contain the tell-tale "prairie dog paths" from burrow to burrow. Protect the base of the plant by wrapping it with protective material (made for this purpose and available in most garden shops) or placing plastic tubing around the bottom three feet of the trunk until it is established, usually one to three years.

The following plants have adapted to the arid climate of the west and require little or no water once established:

- **Trees** – plains cottonwood, hackberry and ash
- **Shrubs** – Rocky Mountain maple, mountain mahogany, New Mexican privet, three leaf sumac, woods rose, American plum, native chokecherry, rabbit brush, fringed sage
- **Flowers** – Rocky Mountain bee pant (wild cleome), yarrow, blanket flower, prairie coneflower, fleabane, Rocky Mountain penstemon, yucca and prickly pear cactus.

For additional information regarding native vegetation, see [The Native Plant Revegetation Guide for Colorado](#), produced by the Colorado Natural Areas Program. This comprehensive guide may be obtained from the office of Colorado State Parks for a nominal charge or can be directly accessed at the following website:

www.parks.state.co.us/cnap/Revegetation_Guide/Reveg_index.html

• Diet

Prairie dogs are primarily herbivores. Their diet consists of plants including wheat grass, fescue grass, blue grass, grama grass, little wild barley, prickly pear cactus leaves and fruits, saltbrush leaves, scarlet globemallow fruits, and sagebrush leaves. Prairie dogs occasionally consume invertebrates such as grasshoppers and noctuid (moth) larvae.

Supplemental Feeding

In some situations there may not be enough food to sustain a colony. This may be the case if the vegetation has been scraped off (usually by grading, prior to development), or the colony cannot expand (e.g., bounded on all sides by roads). For colonies persisting in unsuitable habitat, supplemental feeding may be appropriate as a temporary solution to keep prairie dogs from starving.

However, this should only be attempted as short-term maintenance until the habitat is improved or the colony is relocated. Long-term supplemental feeding may artificially increase prairie dog densities beyond the carrying capacity of the habitat. In addition supplemental feeding is not comprised of native vegetation and could result in health problems to the animals.

Prior to providing food for the colony, the property owner's permission must be obtained.

Supplemental feeding will attract birds and other animals to the area and may have negative effects on prairie dogs, such as increased competition for food with other species.

Newly relocated colonies have a greater likelihood of successful establishment if they receive supplemental feeding for a short time.

Place food at the mouth of each burrow in the colony. When feeding grain, offer one cup per burrow. When feeding vegetables, offer several leaves, one ear of corn, three small carrots, or four pieces of apple. It is not necessary to offer all varieties at once. For example, an adequate feeding will contain one cup of oats, one ear of corn, and four leaves of kale. Generally, this is a sufficient amount of food for three days.

YES, OK to feed to prairie dogs.²⁴

- whole oats—available at feed stores for approx. \$10 for 50 lbs.
- grass hay or Timothy hay—available at feed stores for approximately \$6 for 2 lbs. Alfalfa hay is too rich for prairie dogs' digestive systems.
- corn-on-the-cob—may be shucked or not, since some experts suggest that the task of shucking is stimulating to prairie dogs.
- apples—cut into slices with seeds removed.



- carrots
- lettuce, such as Romaine or leaf (Avoid spinach because it negatively affects prairie dogs' digestion.)
- overripe bananas—must be peeled
- commercial guinea pig or rabbit food

NO, NOT OK feed to prairie dogs – can harm them!²⁵

- straw, alfalfa, spinach, onions, sweet peas
- eggplant or other nightshade vegetables (like potatoes, tomatoes or peppers)
- high protein foods like cat food
- white flour products

Prairie dogs should not become dependent on supplemental feeding – they are wild animals. The Colorado Division of Wildlife strongly recommends against feeding any wildlife.

As an alternative to prolonged supplemental feeding, another short-term solution for sustaining colonies with little or no vegetation is to seed a fast-growing grain such as domesticated wheat, barley or oats. With soil moisture (via natural precipitation or irrigation), the seeds should sprout in two to three weeks. While this is not a long-term solution, it will help sustain prairie dogs for several years.

- **Noxious Weeds and Their Removal In and Around Colonies**

Knapweed, Mediterranean sage and sapweed are invasive weeds found in prairie dog colonies in Colorado. If herbicides are the only means of reducing the presence of weeds on a colony (or potential relocation site), Roundup and Sythe are recommended as safe for use in prairie dog colonies. They are most effective if applied when the plant is in bloom.²⁶ Other herbicides, like Trimec, should not be used because they do not break down in the soil.²⁷

Another approach for weed control is to be vigilant about mowing or picking flowering weed-heads. This method will eventually weaken the weeds and reduce reliance upon the use of toxic chemicals to control them. These weeds should not be allowed to pollinate and distribute seeds.

Revegetating the area with native grasses, in addition to removing weeds, provides a comprehensive approach to restoring the land. Once established, the native plants and grasses will effectively compete for water and nutrients with the non-native invasive weeds. The natural control of unwanted vegetation will allow a balanced ecosystem to return.²⁸



3. POPULATION MANAGEMENT

In relatively undeveloped areas, prairie dog colonies may occupy essentially the same physical area for several years. Yearlings and adults (especially males) may disperse into adjacent coterie or may move to other colonies, occasionally as far as five kilometers (three miles). In contrast, urban and suburban colonies are usually fragmented and isolated, and their only options for dispersal are to move to the turf grass areas of businesses or residences. Dispersal generally occurs from May through July, which coincides with peak landscaping periods, and results in human-wildlife conflict. The outcome is often removal of the entire colony.

Prairie dog populations can be controlled through the use of barriers, relocation, or control of reproduction.

The use of barriers as a means of managing populations is addressed in the next section. In summary, effective barriers employ physical and visual elements. They include fencing and vegetation, an approach that produces short-term and long-term deterrents to dispersal and migration.

Relocation may be an effective method of colony management. Relocation is practiced for several reasons, all of which are contained in a later section of this document. As a management tool, portions of a colony can be trapped and moved to more appropriate habitat. The remaining portion of the colony will have a larger area in which to forage and expand. Relocating a quadrant of prairie dogs from a colony that is over populated requires more research, because the long-term impact to both parts of the colony is not yet understood.²⁹

Fertility control—such as sterilization or the use of immunocontraceptives—has not been effective in controlling prairie dog populations. In addition, immunocontraception and other means of fertility control is a controversial technique for a variety of reasons. Future research in this area may result in an alternative to lethal control when other, less invasive, non-lethal techniques are not feasible and prairie dog populations exceed levels perceived to be socially acceptable. Research should include a determination of the effectiveness of the agent or method to be used, the most effective way to treat animals in the target population, the number of individuals that must be treated to stabilize the population, and the residual effects of genetic stability within colonies.

- **Optimal Density and Density Determination**

The number of burrow entrances can be used to estimate prairie dog population. To approximate the population in a colony, count the number of burrows and multiply by two. In early summer while pup numbers are high, multiply by three.

The Colorado Division of Wildlife uses two methods to determine optimal density for relocation. The first method simply suggests a maximum of 10 prairie dogs per acre on a release site. During periods of drought, the maximum number may be decreased to allow more vegetation per animal. The second method recommends the same amount of acreage in the release site as exists in the original habitat (in cases where habitats are similar and the colony is not already near or above carrying capacity).

- **Human Factors**

In the urban/suburban environment, poisoning or bulldozing prior to development are now the primary sources of mortality in prairie dogs. Outbreaks of plague eliminate colonies. New development claims 10 acres of prairie habitat per hour.³⁰ Until the State provides direction, developers and municipalities will continue to kill prairie dogs.

Another source of mortality in the urban setting is the automobile. During spring and summer, when prairie dog dispersal peaks, animals attempt to cross roads in an effort to leave their colony. Although no research exists that determines the most effective method of lessening this cause of mortality, barriers almost certainly would save the lives of many dispersers. Erecting vinyl fencing, coupled with drought-tolerant bushes and shrubs would serve multiple purposes: erosion control, wind and snow breaks, a more attractive landscape, and a deterrent to dispersing prairie dogs—an encouragement to seek alternative dispersal routes.

In addition to ongoing habitat destruction due to urban development, prairie dogs in urban/suburban areas face an additional threat in the form of direct disturbance by humans and pets. Prairie dogs are wild animals. For the sake of both prairie dog protection and human safety, residents living near prairie dog colonies should learn to give prairie dogs and prairie dog habitat the same consideration and respect afforded other wildlife. Specifically, residents should be discouraged from intruding on prairie dog colonies by walking through them or by letting their pets do so. It has proven difficult to minimize human and domestic animal contacts with prairie dogs. Many people insist on letting dogs run free in areas where prairie dogs live, even when signs are posted telling them to keep dogs on leashes.³¹ In some areas, additional means of educating the public may be required, for example, warnings and tickets by local officers.



4. **BARRIERS**

• **Controlling Prairie Dog Dispersal**

While no barrier system is 100% effective in containing prairie dogs, a properly installed and maintained barrier will discourage prairie dogs from dispersing into areas where they are not wanted.

Prairie dogs are visually oriented animals that have a strong need to keep their burrow entrances in sight at all times. Short grasses and open habitat allow prairie dogs to see predators from greater distances and therefore avoid predation, while taller grasses and vegetation thwart their movement. This knowledge has led to innovative barrier systems designed to contain prairie dogs. Two of the most important points about barrier design are:

1. **there should be no light penetration** along the bottom of the barrier
2. **the barrier should not split up family groups** (coteries) as it is difficult, if not impossible, to contain prairie dogs from dispersing through already established underground tunnel systems. If necessary, coteries can be relocated to the area farthest from the proposed barrier prior to installation.

Most barriers employ both **physical** and **visual elements**. Three common visual barriers are vinyl fencing, privacy fencing and vegetative shrubs or grasses.

Fencing

Vinyl Barriers

Vinyl barriers contain prairie dogs by obstructing their line of sight. If prairie dogs cannot see beyond the barrier they will not attempt to pass through it. Because vinyl is effective for only five years, it should to be used in conjunction with more permanent vegetative barriers (see below) that will eventually replace the vinyl. The vinyl must be opaque, stabilized in the ground, able to withstand severe weather conditions, and installed ahead of prairie dog colony expansion.³² Additionally, poultry wire mesh must be installed on the prairie dog side of the barrier and then lip up 6 inches onto the vinyl barrier to discourage prairie dogs from chewing through the bottom of the vinyl barrier.

Vinyl barrier fencing comes in rolls 300 feet long and 3 feet wide, with grommets every 3 feet along the top and bottom of the vinyl. For details on manufacturers and installation of this barrier contact the Prairie Dog Coalition:

telephone 303.449.4422 web site www.prairiedogcoalition.org

Privacy Fencing

Wood-slatted privacy fencing, at least 3 feet high, can be installed as a visual barrier between a prairie dog colony and an adjacent development. After the fence is installed, secure lawn-edging strips into the soil along the bottom of the fence. The strips should be wide enough to extend up onto the bottom of the fencing to prevent any light penetration. On the prairie dog side of the barrier, secure a 6-foot wide horizontal strip of 1-inch poultry wire mesh. Secure the perimeter of the poultry mesh into the ground using landscape staples every 3 feet (If the prairie dogs can burrow under a small area of unsecured mesh, they probably will). Extend the poultry mesh 6 inches up onto the back of the fencing (on the "prairie dog side"). If desired, cover the mesh with native grass seeds such as blue grama and buffalograss to add visual appeal and to help control weeds.³³

Vegetative Barriers

Historically prairie dogs roamed vast areas of the grasslands. The vegetation consisted primarily of short grasses (blue grama and buffalograss) and the taller mixed grasses (western wheat and switchgrass). Ungulates (hooved mammals such as the American Bison) kept the taller grasses clipped, which allowed prairie dogs to migrate onto the short grass and mixed grass prairie. Tall grasses could be introduced to restrict prairie dog movement from unwanted areas. Following is a brief discussion of drought-tolerant native grasses and shrubs that can be used to establish effective barriers.³⁴

Grasses

Fast-growing tall perennial grasses such as western wheat and switchgrass can be used to keep colonies from expanding. Plant these grasses in close rows that will produce a dense, self-maintaining barrier.³⁵

Shrubs

Shrubs should be used in conjunction with vinyl barrier fencing to create a more permanent vegetative barrier that is aesthetically pleasing and provides food and shelter for wildlife and predators. Shrub rows should incorporate a variety of different plant species (taking into account the availability of water and soil composition) to provide the diversity that will endure cycles of weather and disease.

For the shrub row, plant in separate rows offset from one another, tall green rabbitbrush and dwarf blue rabbitbrush as the foundation plants. Next, plant woods rose, alpine currant, Rocky Mountain maple, mountain mahogany, New Mexican privet, three leaf sumac, American plum, and native chokecherry.

In open areas or as natural boundaries, plant Rocky Mountain juniper, woods rose, tall green rabbitbrush and dwarf green rabbitbrush. These plants are drought-tolerant and require no water after they become established (two years).

In urban scapes where water is typically available, particularly run off from turf grasses, consider planting juniper shrubs (attaining a height and width of 3 feet) and Japanese barberry. Neither plant is native, but their ability to attain high density within two years makes them effective barrier plants. Urban designers and developers who consider incorporating native plants in their landscaping design should be cognizant that these plants require far less water than the plants typically found in Kentucky Blue grass landscape themes (over watering may kill them).

All shrub rows should be weed matted with a breathable weed barrier fabric. This fabric keeps weed growth down and retains moisture for the feeder roots of the plants.

Trees

Recommended trees are plains cottonwood, peachleaf willow, hackberry, Patmore ashes, and Marshall ashes. After the tree is planted and staked, cuff the trunk of the tree with flexible irrigation pipe. Place fabric weed mat around the base of the tree, followed by 3-foot wide pieces of 1-inch poultry wire mesh at the base of the tree. To avoid trunk girdling, leave a large enough square in the middle of the pattern for future trunk growth. Secure with landscape staples and then mulch around the base of the tree.

5. PLAGUE AND DISEASE

The bubonic plague, so named in human cases, is referred to as sylvatic plague in prairie dogs. An outbreak of sylvatic plague can destroy an entire colony within a few days. The disease seems to “roll” through colonies. One half of the colony may be seen to be inactive while the other half is still active. Immediately report such an occurrence to the Colorado Department of Health (303.692.2035) and then take proactive measures to have the entire colony dusted to halt the spread of the disease to existing healthy prairie dogs. Prairie dog colonies that have died of plague or other disease can be re-colonized after a minimum one-year waiting period.

• People, Prairie Dogs and the Plague³⁶

Fears of humans contracting the plague from prairie dogs are exaggerated and are generally used as an excuse for extermination. Of the 42 plague cases in Colorado since 1957, only six were directly linked to prairie dogs and, of those six, only one was fatal.

According to the Colorado Department of Health, “If precautions are taken, the probability of an individual contracting plague, even in an active plague area, is quite low.”

Dozens of volunteers have spent years of direct contact with prairie dogs during flushing and relocation efforts. The Colorado Division of Wildlife requires dusting for fleas in burrows prior to prairie dog relocation. Relocators are professionals who are aware of the potential diseases present in prairie dog colonies. Contact the World Health Organization for more information: www.who.int/emc-documents/plague/shocdscsredc992c.html

The Asian flea that carries the plague is host-specific and requires a continuous warm-blooded source to survive; it only leaves that host after death. The plague is transmitted to people through flea bite and direct contact with infected animals. Seventy-six species of mammals carry plague, but it is primarily a disease of rodents and squirrels, not the prairie dog. Rock squirrels are the most significant plague hosts in Colorado and have been involved in most human cases of plague.

The most common means of human infection is from cats and dogs, who can contract plague by catching and eating infected animals or by being bitten by infected fleas.

When a colony becomes infected with plague, 99.5% of the prairie dogs will die in a short period of time. This statistic tackles another myth about prairie dogs carrying plague. The flea requires a continuous blood source to survive and because prairie dogs only breed once per year and rapidly succumb to the disease once infected, they are considered an amplifier host, not the primary host for this disease.

In humans, the incubation period is usually two to six days and the indications of infection are evidenced by flu-like symptoms and fever. Plague in humans can be treated successfully with antibiotics if it is diagnosed early in its course.

Control and Prevention of Fleas

Employing prairie dog population control, such as poisoning, is not recommended by the Colorado Department of Public Health and Environment. Eradication of prairie dogs as an attempt to minimize infection by the Asian flea only releases fleas into the environment, causing additional risk to humans and domestic pets. Visit the Colorado Department of Public Health and Environment’s web site at: www.cdphe.state.co.us for more information.

Dusting with insecticide powder in burrows is effective in controlling plague-carrying fleas in relatively small high-human-use areas.

It is important to avoid contact with all sick and dead prairie dogs, rabbits and mice. Evidence of a colony die-off should be reported to local or state health departments. Contact the Colorado Department of Public Health and Environment at 303.692.2035.

Keep cats and dogs out of prairie dog colonies to further reduce the low number of human cases of plague linked to prairie dogs.

- **Dusting for Fleas**

Dusting around burrow entrances and exits is an effective way of controlling fleas. The Colorado Division of Wildlife recommends that two weeks or more be allowed between dusting and releasing new prairie dogs into natural burrows.

Although dusting colonies with Delta Dust provides protection from fleas for six months, it is important to note that small insect-eating birds, including burrowing owls, may be effected by secondary poisoning and succumb to the effects of the flea powder.

Because birds and canines are immune to plague, they can carry the bacteria with no symptoms, making it difficult to track or predict the onset of plague in prairie dog colonies.³⁷

Local governments should apply Delta Dust to colonies within 15' of any trail.

- **Public Education and Plague Prevention**

It may be helpful to post information at trailheads reminding the public that open space natural areas are meant for wildlife, not domestic pets. People should restrain dogs in open space natural areas by keeping them on trails and on a leash. If allowed to run free, dogs could transport fleas from one colony to another resulting in multiple plague outbreaks and risk to human health.³⁸

Newspapers, radio and TV help raise awareness regarding plague and its prevention, but in areas directly adjacent to colonies it might be necessary to go door-to-door and hand out flyers. One on one outreach is more time consuming, but the results may warrant it.

- **Administering Antibiotics**

Antibiotics are available to treat prairie dogs. Antibiotics are usually given orally in liquid form. It may be possible to develop a method to treat an entire colony of infected prairie dogs with antibiotics. Currently, it is not feasible to treat a large number of prairie dogs in this manner.

6. ECOSYSTEM ISSUES

- **Native Short Grass Prairie Ecosystem**

The best way to preserve prairie dogs and their habitat in Colorado is to allow them to stay on the land they occupy, especially if it is land surrounded by or adjacent to open space. With urban and suburban colonies, development and sprawl are a constant threat. Until humans learn to co-exist with wildlife, relocation may be the only way to protect them.

Natural vegetative barriers as well as vinyl barriers and fences can contain prairie dogs and keep them from dispersing. These same barriers can also keep people and domestic animals out of prairie dog habitat. The City of Boulder, Colorado is experimenting with this concept by building wood-slatted privacy fences around ball fields, including gates with latches and signs advising people to stay out of wildlife habitat. The prairie dogs are allowed to occupy their open area while the fence discourages people and domestic animals from entering the open area.

Prairie restoration is an effective way to encourage the reintroduction of many native wildlife species, and to create an area for the reestablishment of prairie dog colonies. One of the biggest obstacles to prairie dog relocation efforts today is the lack of viable prairie habitat in which to place them.

An important step in prairie restoration is to determine the current soil type and condition. These factors will determine the kinds of native plants and grasses that are suitable for the area. The Rocky Mountain Arsenal has valuable information on their website that details which plants and grasses thrive in different soil types www.army.mil/ntdocs/refuge/refqfrm.html. The Arsenal has one of the most successful local prairie restoration projects to date and they are continually developing and updating their strategies, thus making them one of the most valuable resources on this topic.³⁹



- **Raptor Perches**

Predators, along with food limitation, disease, and parasites, act as natural limiting factors that constrain the size and distribution of prairie dog colonies. A balanced prairie ecosystem that includes raptors (aerial predators) can be facilitated by installing perches for predatory birds.

Colorado has a diverse and magnificent population of raptor species, many of which rely on prairie dogs for food. Some of these birds can be encouraged to enter and remain in an area by building raptor perches. Manufactured perches take the place of the dead or dying trees that these large raptors would normally use. Raptor perches can help maintain ecosystem diversity in an area where a prairie dog colony has been relocated or reestablished.

Care should be taken in determining whether raptor perches are suitable in a given area. For example, perches could be detrimental to wildlife that you may not want to control, such as burrowing owls, since raptors sometimes prey on burrowing owls. In addition, some raptors, such as ferruginous hawks, do not require perches.⁴⁰ Wildlife biologists should be consulted before installing raptor perches.

Large sites are needed to facilitate predation within prairie dog colonies. Small sites may not be capable of supporting a diverse predator population and raptors should not be encouraged on relocated colonies for at least the first two years.

For a diagram and instructions on building raptor bird perches, visit:
www.inhs.uiuc.edu/~kenr/birdperchinstruct.html or write to:

Kenneth R. Robertson
Center for Biodiversity
Illinois Natural History Survey
607 East Peabody Drive
Champaign, IL 61820.

7. RELOCATION

Often prairie dog relocation is the only solution that will protect a colony.

Some Colorado Front Range cities and counties charge \$300+ per prairie dog to relocate, while private Relocators listed here charge \$30—\$100 per prairie dog to relocate.

Another difference between government and private relocators is in estimated survival rates of the prairie dogs they relocate. City and county officials estimate that 30—50% of relocated prairie dogs survive the first few months after release. Most private organizations believe their survival rates to be 50—95%. Part of the difference may be due to relocation and release methods. The amount of time spent attending the release site may account for some of the difference also.

• Relocation Permit Application

To relocate prairie dogs, a permit (available at no cost) is required from the Colorado Division of Wildlife (CDOW), 6060 Broadway, Denver, CO 80216 (303.297.1192). The process can take more than 30 days and requires the applicant to identify:

- the relocation site
- the process through which the prairie dogs will be relocated
- the relocation company or organization.

Contact one of the following prairie dog *Relocation organizations to begin the process.

• Relocation Sites / Land

Colorado state statutes (SB 99-111) prohibit the transfer of prairie dogs across county lines without the prior approval of the county commissioners of the receiving county. Developers and anyone trying to relocate prairie dogs should approach public and private landowners in the applicable Colorado county to search for relocation sites, review their existing property holdings, or purchase land within that county.

Prairie dog colonies that have died out due to plague or other disease can be re-colonized after a one-year waiting period.

Contact CDOW for suitable prairie dog relocation site guidelines. Some CDOW representatives, prairie ecosystem biologists, as well as most prairie dog relocators are able to determine suitable prairie dog habitat by visiting the site and examining soils, vegetation, and the slope of the proposed area.

• Timing of Relocation

Once a prairie dog relocation site is identified, a relocation permit must be obtained. The application process can take from several weeks to months if CDOW requires adjacent landowners be notified and agree to the proposed relocation.

Prairie dogs can be relocated year-round, except from mid-February to mid-May when newborn pups are too small to be moved.

• *Prairie Dog Relocators

Definitions:

- TRAP – a wire trap with food inside to catch prairie dogs. Trapping is less stressful on the prairie dogs when relocating, and preferable when time allows.
- FLUSH – the use of water and soap suds hosed down a burrow to bring the prairie dogs up.
- AUGER – to dig a 4' long by 9" diameter hole that becomes the prairie dogs' new burrow.
- TRENCH – to dig a 4-5' deep by 12" wide trench, into which a human-made nest box and 4" drainage piping are placed, that becomes the prairie dogs' new burrow.



Barriers & Relocation – Prairie Dog Management Consulting

Judy Enderle **303-466-6879** judyenderle@earthlink.net
303-359-4167, cell

Pam Wanek **303-280-1620** wanek@aaahawk.com

Pam Wanek and Judy Enderle consult with clients who need help with prairie dog management techniques. They relocate prairie dogs using the live-trap method if a release site is identified.

- Barriers and buffer zones are important in managing colonies in urban areas.
- Solutions designed to complement existing landscaping requirements.
- Native vegetation introduced whenever possible.
- Barriers can contain prairie dogs who would have a tendency to disperse, and enhance the appearance of the surrounding area.
- Utilize volunteers, which helps keep relocation costs low.

Enviro-Zone

Scott Harvey **303-735-0406** harveysd@colorado.edu
(emergency pager 303-851-0419)

Enviro-Zone specializes in protecting the natural environment, uses trapping and flushing to relocate prairie dogs, and has been doing relocations for 5 years.

- Relocates all year, except March through May, when young are dependent.
- Extensive experience relocating prairie dogs throughout the Front Range –Boulder, Fort Collins, and for the Stapleton Redevelopment Area.

Prairie Dog Action

Deb Jones **303-439-9264** Notestodj@aol.com
Kathy Dawson **303-520-0924**

A non-profit organization that relocates prairie dogs by flushing and trapping.

- Able to relocate small and larger prairie dog colonies.

- Relocates all year, except March through June, when young are dependent.
- Owner/developer must cover relocation costs, labor is volunteer.
- Uses volunteers, which helps keep relocation costs low.

Prairie Dog Specialists

Kathy Boucher 303-277-1455 pdspecialists@qwest.net

Becky Deck 720-981-9107 www.geocities.com/pdspecialists

A non-profit (pending) organization, that relocates prairie dogs by flushing only.

- Focus is on smaller relocation projects, 1-5 acres, or 50 prairie dogs or fewer.
- Flush materials, water tank and dish soap, must be provided by the owner/developer. This type of removal limits relocation to June through October.
- Utilizes volunteers, which helps keep relocation costs low.

The Wild Places

Susan Miller 303-540-0554, pager

Diane Forrest 303-581-9672

A non-profit organization that has been relocating prairie dogs for over 7 years by flushing and trapping.

- Relocates all year, except from mid-February to about mid-May.
- Prairie dogs are taken to a holding facility where their health is checked to increase chances for survival at a receiving site—survival of prairie dogs relocated by this organization is believed to be as high as 95%.
- Also removes prairie dogs trapped in homes, garages etc.
- Employs a person licensed in the rehabilitation of injured animals.

WARNING: Exterminators

There are organizations and companies that claim to be “relocators,” but often kill the prairie dogs. Whether an individual is issued a permit to actually relocate or to exterminate prairie dogs, the Colorado Division of Wildlife refers to such permits as “relocation permits.” Below are questions to ask of a potential relocater to determine whether or not they are humanely relocating the prairie dogs:

- What is the method of capture and what is the casualty rate?
- Where are the prairie dogs taken?
- Are the prairie dogs donated to black-footed ferret program? How is this done?
- Are prairie dogs euthanized? How is this done?

Dog Gone (Gay Balfour and Dave Honaker) uses vacuuming and flushing to remove the prairie dogs from their burrows. The prairie dogs, along with protected Colorado wildlife (snakes, rabbits, mice, salamanders, etc.), soil and rocks, are sucked from their burrows at a high velocity up a tube, at the end of which they hit the inside of a truck. Some animals are killed instantly and, of those that live, some are badly injured. The survivors are used as food for black-footed ferret reintroduction programs or raptor rehabilitation programs.

Wildlife Property Management, LLC (Christopher Roe and Kelly Hollenbeck, Wildlife Biologists). Wildlife Property Management will relocate to property of the landowner’s choice or supply the captured prairie dogs to the black-footed ferret program or a raptor foundation to be used as food.

8. FREQUENTLY ASKED QUESTIONS

1. Is the prairie dog really a threatened species?

According to research conducted by the US Fish and Wildlife Service, the black-tailed prairie dog is listed as a “threatened but precluded species.” Under the Endangered Species Act (ESA), the black-tailed prairie dog warrants listing as threatened, but due to lack of funding for the more than 70 species waiting to be listed, others species take priority. The ESA does not take into consideration whether a species is a keystone species. Many people believe that prairie dogs are still abundant throughout the West. This may be because prairie dogs live in well-defined towns; some people may also misidentify ground squirrels as prairie dogs. According to the Journal of Mammology, 2001, “In terms of the role of the prairie dog in maintaining the biodiversity of prairie ecosystems, the prairie dog may be as functionally extinct as the bison.”⁴¹

2. Are urban prairie dog colonies self-sustaining, i.e. able to continue living in their current habitat with no outside assistance from humans?

That question is difficult to answer, but in a general sense, they are not. These prairie dogs have been far removed from a natural environment, which makes prairie dog management in urban/suburban colonies a very controversial issue.

Without a means of dispersing and migrating, the growing number of individuals will denude the area and face starvation. Without a method of sharing genes from other colonies, individuals in the colony will not continue to evolve and stay healthy. Without corridors for predators to take the sick and weak, the colony weakens.

Natural limits on prairie dogs living in urban/suburban areas may be altered in various ways. In some cases, prairie dogs in these areas may be more greatly affected by disease, predation, food limitation, etc. if, for example, available habitat provides only poor-quality food for prairie dogs but ample cover and perches for raptors. In other cases, the effects of these natural population regulation factors may be decreased.

3. How do we keep prairie dog populations in check so they do not expand beyond their biological and socially acceptable carrying capacity?

Again, this question has a lot to do with the environment in which they are currently living. Many urban/suburban colonies are isolated and fragmented which means that other species such as the ferret, badger, coyote, fox, and weasel are unable to control the population naturally. In the future, we may need to consider relocating sectors from large or densely populated colonies into areas that have recently experienced a die-off due to plague. It may even be possible to create a system in which prairie dogs can be relocated back into large protected acreage on our Great Plains and National Grasslands.

4. Why are urban/suburban prairie dog colonies important?

These colonies are important for multiple reasons. If we remove this species entirely from the urban environment, then we fail to educate the public regarding their importance as a keystone species of the prairie. Also, these fragmented colonies may be an important reserve to recolonize larger colonies that have succumbed to plague. Finally, these colonies support large migrating raptor populations that depend on the prairie dog for winter survival. As prairie habitat is increasingly developed for urban uses, pockets of remaining habitat adjacent to developed land may become vitally important to the preservation of many prairie species.

5. What can I do to protect prairie dogs in my community?

The first step is to find out if your local politicians have adopted a land use plan that incorporates prairie dog preservation. The second issue is funding a program that allows for mitigation banking to protect prairie dogs in the path of development, and for management and acquisition of lands for prairie dog protection. For example, Jefferson County Open Space (in Colorado) has created a non-profit 501 (c) (3) organization that allows tax-deductible donations from private individuals and corporations to acquire and maintain open space and critical wildlife habitat.



9. REFERENCE SOURCES

Native Grasses

Arkansas Valley Seeds, Inc.
433 Hwy 66
Longmont, Colorado 80504
970.535.4481 telephone
Multiple metro area locations.

Pawnee Buttes Seed, Inc.
P.O. Box 100
Greeley, Colorado 80632

303.356.7002 telephone
303.356.7263 facsimile
www.pawneebuttessseed.com

Sharp Brother Seed Co.
101 East 4th Street
Greeley, Colorado 80631
303.356.4710 telephone
303.356.1267 facsimile

Western Native Seed
P.O. Box 1463
Salida, Colorado 81201
719.539.1071 telephone
719.539.6755 facsimile
westernnativeseed.com

Native Shrubs

Bitterroot Restorations, Inc.
445 Quast Lane
Corvallis, Montana 59828
406.961.4991 telephone
406.961.4626 facsimile
www.revegetation.com

Colorado State Forest
Service
Colorado State University
Foothills Campus # 1060
Fort Collins, Colorado 80523
970.491.8429 telephone
970.491.8250 facsimile

c.eyers@lamar.colostate.edu
[http://www.colostate.edu/
Depts/CSFS/CSFSnur.html](http://www.colostate.edu/Depts/CSFS/CSFSnur.html)

Lawyers Nursery, Inc.
950 Highway 200 West
Plains, Montana 59859-9706
800.551.9875 telephone
406.826.5700 facsimile
www.lawyernsy.com

Lincoln – Oakes Nurseries
P.O. Box 1601
Bismark, North Dakota 58502

701.223.8575 telephone
701.223.1291 facsimile
www.lincolnoakes.com

Little Valley Wholesale
Nursery
13022 East 136th Avenue
Brighton, CO 80601-7281
888.659.3015 telephone
303.659.6886 facsimile
www.lvwn.com

One call “Call Before you Dig” 800.922.1987

Seed Drills

Agco Corporation
4205 River Green Parkway
Dulth, Georgia 30096
770.813.9200
www.agcocorp.com

Great Plains Mfg, Inc.
1525 East North Street
P.O. Box 5060
Salina, Kansas 67402-5060
785.823.3276 telephone
785.822.5600 facsimile
www.greatplainsmfg.com

Truax Company, Inc.
3609 Vera Cruz Ave. North
Minneapolis, MN 55422
612.537.6639 telephone
612.537.8353 facsimile
www.truaxcomp.com

Barrier Information

Weed barrier fabric and staples:
Shaw Fabrics, P.O. Box 1288, Wellington, CO 80549-1288 or website at www.shawfabrics.com

Vinyl Barrier:
Wyco Fence, 7212 WCR 4, Brighton, CO 80601, telephone 303-654-9906

General Information

Prairie Dog Coalition
2525 Arapahoe Rd, #E4 527
Boulder, CO 80302
303.449.4422 telephone
www.prairiedogcoalition.org

Native Plant Revegetation Guide for Colorado
Colorado Natural Areas Program
www.parks.state.co.us/cnap/Revegetation_Guide/Reveg_index.html

THIS IS NOT ALL ENCLUSIVE AND OTHER VENDORS MAY BE AVAILABLE TO SUPPLY LIKE ITEMS

10. ENDNOTES

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- ¹ Kotliar et al. 1999; Kotliar 2000.
- ² Whicker and Detling 1988; Miller et al. 1994.
- ³ National Wildlife Federation.
- ⁴ Personal interview with Dr. Brian Miller, Denver Zoo.
- ⁵ Kruegar 1986; Knowles 1986.
- ⁶ John L. Hoogland, The Black-Tailed Prairie Dog, Social Life of a Burrowing Mammal (Chicago: University of Chicago Press, 1995).
- ⁷ Hoogland 1995, 2001.
- ⁸ Hoogland.
- ⁹ Person interview with Mark Brennan, Boulder County Parks and Open Sapce, October 2001.
- ¹⁰ Personal interview with Michael Kinsey, former Curator of Mammals, Denver Zoo, December 2001.
- ¹¹ Center for Biodiversity, Illinois Natural History Survey, www.inhs.uiuc.edu.
- ¹² Truett et al. 2001.
- ¹³ Personal interview with Cindy Owsley, Boulder County Fairgrounds, November 2001.
- ¹⁴ Interview with Brennan.
- ¹⁵ Journal of Mammology, 82(4):946-948, 2001. Genetic Structure of a Metapopulation of Black-tailed Prairie Dogs, Jennifer L. Roach, Paul Tapp, Beatrice Van Horne, and Michael F. Antolin.
- ¹⁶ Personal interview with Pam Wanek, Barrier and Relocation Specialist, October 2001.
- ¹⁷ Truett et al. 2001.
- ¹⁸ Interview with Brennan.
- ¹⁹ Personal interview with David Buckner, ESCO Associates, Inc., October 2001.
- ²⁰ Hoogland, page 107, referencing Knowles (1987).
- ²¹ Hoogland.
- ²² Interview with Buckner.
- ²³ Interview with Buckner.
- ²⁴ Interview with Rebecca Fischer, Director Prairie Dog Rescue of New England, 2001.
- ²⁵ Interview with Fischer.
- ²⁶ Personal interview with George Brinkmann, Horticulturist, October 2001.
- ²⁷ Personal interview with Pam Wanek, Barrier and Relocation Specialist, and Brinkmann, October 2001.
- ²⁸ Interview with Owsley.
- ²⁹ Interview with Pam Wanek.
- ³⁰ CoPIRG web site www.copirg.org.
- ³¹ Interview with Brennan.
- ³² Interviews with Brennan, Owsley.
- ³³ Personal interview with Pam Wanek, Barrier and Relocation Specialist, 2002.
- ³⁴ Interview with Wanek, 2002.
- ³⁵ Interview with Brennan.
- ³⁶ Rocky Mountain Animal Defense, "Fact Sheet: People, Prairie Dogs and the Plague"
- ³⁷ Interview with Wanek, 2001.
- ³⁸ Interview with Brennan.
- ³⁹ Interview with Brennan.
- ⁴⁰ Interview with Brennan.
- ⁴¹ Journal of Mammology 82 (4) :p889, 2001. CONSERVATION OF BLACK-TAILED PRAIRIE DOGS, M. Gilpin, personal communication.