PRAIRIE DOG MANAGEMENT PLAN

FOR TOWN-OWNED PROPERTIES

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TOWN OF SUPERIOR
PRAIRIE DOG MANAGEMENT PLAN

FOR TOWN-OWNED PROPERTIES

14 March 2005

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1. INTRODUCTION

1.1. PURPOSE OF PLAN

In Colorado, the black-tailed prairie dog (*Cynomys ludovicianus*) is arguably one of the most controversial and challenging species of wildlife to manage. Along the Front Range of Colorado and within the Town of Superior (Town), a small minority of residents does not want to see a single prairie dog killed, no matter what the reason. On the other end of the spectrum is another small minority who urge eradication of all prairie dogs. In between are the majority of residents who support conservation of prairie dogs and prairie ecosystems, but understand the need to have either population control to keep numbers in balance with their ecosystem or prairie dog free areas in locations with conflicting land use.

The Town and its residents generally feel that prairie dogs along the urban Front Range often have tremendous social value, despite serving a limited ecological role in many cases. Although some Front Range populations (of which some are within Boulder and Jefferson Counties) are large and "remote" enough to provide for wintering or migrating raptors, nesting burrowing owls, foxes, coyotes, and badgers, many populations of prairie dogs along the Front Range are small, geographically isolated, and land-locked by urban development. These later populations perform little to no meaningful ecological function.

The Town developed this Prairie Dog Management Plan in order to:

1. Analyze the prairie dog colonies and their associated species both within the Town and how they relate to other open space lands on a landscape level (including Boulder, Jefferson, and Broomfield counties);
2. Determine the health of the colonies within the Town, identify conflicting land use activities and objectives (recreation, wetlands including Corp of Engineers requirements, riparian areas, other sensitive species); and
3. Develop specific management objectives and actions for individual parcels and/or land use types within the Town.

1.2. PREVIOUS POLICIES AND GUIDELINES

The Town did not have any prior policies or guidelines in place pertaining to prairie dogs on open space, parks or other Town-owned properties. The Town does have prairie dog management policies for private landowners using poison as a control to manage prairie dogs causing damage or new developments that impact prairie dogs.

1.3. OPEN SPACE AND PRAIRIE DOG MANAGEMENT PER SUPERIOR CODE

1.3.1. OPEN SPACE AND LAND USE

The Superior Land Use Code guides and regulates open space and conservation of high quality wildlife habitat such as riparian areas and corridors.

Sec. 16-5. Intent.

It is the intent of this Code to ensure the orderly, efficient and integrated development of the Town in a way that both promotes the health, safety and general welfare of its residents and that is compatible and protective of the natural environment. Specifically, the Town seeks to:

(8) Conserve open space, significant environmental features and integrate a high quality natural environment into the developed portions of the community.

Sec. 16-712. Town Center (Central Business District).

The Town Center (TC) is identified as a special area on the Community Framework and Land Use Plan map in the Comprehensive Plan. The TC is envisioned to be pedestrian-oriented as well as conveniently accessed by vehicular traffic. The TC is to serve as the focal point for the community and is to be developed in such a way so as to be unique and distinguish itself from other regional, commercial and mixed-use developments.

(1) Open space. Since the TC straddles Coal Creek, landscaping, recreation amenity development and other such allowed activities in the floodplain and drainageways need to incorporate protection of associated natural open space features, such as riparian habitat and wildlife habitat and corridors.

1.3.2. PRAIRIE DOG MANAGEMENT

The Superior Land Use Code guides and regulates prairie dog removal on sites slated for development. Before the commencement of grading or construction on a development site, prairie dogs inhabiting portions of the site within the limits of development are to be humanely relocated by the developer. The Town and the Colorado Division of Wildlife (CDOW) must approve such action.

Sec. 16-493. Removal of existing prairie dog colonies.

In the event there is a healthy, living prairie dog colony located on property to be developed prior to the time of excavation, grading or issuance of a building permit, whichever occurs

first, the developer shall relocate or otherwise remove such prairie dog colony as may be approved by the State Division of Wildlife and the Town prior to any excavation, grading or building on the property.

Relocation to a Colorado Division of Wildlife approved site shall occur in a manner that is safe and humane to the prairie dogs. The developer or property owner shall advise the Town in writing of its relocation plans prior to starting the relocation. (Ord. 98-O-18 §1, 1998; Ord. O-16 §§1, 2, 2003)

Property owners may remove prairie dogs from their property without approval from the Town as long as there is not an approved Final Development Plan or a building permit issued by the Town and poisons are not used in the removal. Regarding poisoning, the Superior Municipal Code regarding poisons and the destruction of pests was amended in 2002 to comply with the Colorado Department of Agriculture (CDOA) and to clarify the Code.

Sec. 10-86. Poisonous substances.

(a) It is unlawful for any person to put out, spread or distribute poison or any poisonous substance or material of any kind or nature whatsoever, for any purpose whatsoever, at any place or places outside of an occupied building within the Town, except as hereinafter provided in this Section.

(b) A permit is not required to poison insects or destructive animals such as wasps, grasshoppers, Norway rats or common house mice. A permit is required for all other domestic or wild animals, including but not limited to prairie dogs, rattlesnakes, birds, wild animals and wild birds.

The Town does not allow the use of firearms for killing prairie dogs or any other wildlife species unless under very controlled conditions and conducted by CDOW officers or Boulder County Sheriff's deputy.

1.4. Prairie Dog Management per Colorado Law

CRS § 33-1-102. Definitions.

(41) "Small game" means: Game birds, including grouse, ptarmigan, pheasant, quail, partridge, wild turkey, wild ducks, wild geese, sora and Virginia rails, coot, sandhill cranes, snipe, mergansers, band-

tailed pigeons, doves, and crow; game mammals, including cottontail rabbit, snowshoe hare, fox squirrel, pine squirrel, Abert's squirrel, jackrabbits, marmot, and prairie dogs; and all species of small mammals and birds that may be introduced or transplanted into this state for hunting or are classified as small game by the commission.

CRS § 35-7-203. Release of destructive rodent pests - definitions.

(1) No person shall release destructive rodent pests into a county unless such person has complied with all requirements for such release imposed by the wildlife commission and obtained both the prior approval of the commission and the prior approval, by resolution duly adopted, of the board of county commissioners of such county. A person need not obtain such prior approval before:

(a) Transporting destructive rodent pests through a county without releasing such destructive rodent pests; or

(b) Confining destructive rodent pests indoors or in cages or similar enclosures and using such destructive rodent pests for scientific purposes or as food for human or animal consumption; or

(c) Keeping destructive rodent pests indoors or in cages or similar enclosures as pets; or

(d) Releasing destructive rodent pests into the county in which such destructive rodent pests were originally taken into captivity.

(2) For purposes of this section, "destructive rodent pests" means one or more rodents, including but not limited to prairie dogs, ground squirrels, pocket gophers, jackrabbits, and rats, that pose a threat to agricultural, horticultural, or livestock concerns or to human health.

(3) The board of county commissioners of any county into which a person releases destructive rodent pests without the prior approval of such board may, at its discretion:

(a) Require the person who released the destructive rodent pests to eradicate the destructive rodent pests or remove the destructive rodent pests from the county; or

(b) Impose a fine upon the person who released the destructive rodent pests in an amount sufficient to compensate the county for the cost of eradicating the destructive rodent pests or removing the destructive rodent pests from the county.

The CDOW authorizes wild-to-wild relocations through a permit process as specified by the Colorado Wildlife Commission. All recreational hunting of black-tailed prairie dogs on public land (state and federal) and all areas west of Interstate 25 is prohibited. The CDOA directs the type and manner in which fumigants and toxicants are used to control prairie dogs.

1.5. CDC/FDA MONKEYPOX RESTRICTIONS

The Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) established new restrictions and modify existing restrictions on the import, capture, transport, sale, barter, exchange, distribution, and release of African rodents, prairie dogs, and certain other animals. This action was taken to prevent the spread of monkeypox, a communicable disease, in the United States. An exemption permit is required from the FDA and the CDOW for any activity that results in the transport of prairie dogs, alive or dead.

1.6. NOXIOUS WEED MANAGEMENT

The Colorado Noxious Weed Act (CRS § 35-5.5) requires all public and private landowners in the State of Colorado to control noxious weeds. It is unlawful to intentionally allow any noxious weed to grow without management, defined as any activity that prevents a plant from establishing, reproducing, or dispersing itself such that:

> The Colorado general assembly clearly recognizes the profound negative impacts of noxious weeds on the economic and environmental values of Colorado's private and public lands. Consequently, the assembly has placed all Colorado lands under the jurisdiction of local governments that have been delegated the responsibility and power to assure the management of state and locally designated noxious weeds.

2. Background on Black-tailed Prairie Dogs

2.1. Species Status

In 1998, the U.S. Fish and Wildlife Service (USFWS) received two petitions to list the black-tailed prairie dog as threatened under the Endangered Species Act of 1973, as amended (ESA) (USFWS 1999). Each petition listed several factors as major threats to the long-term viability and conservation of this species, which included habitat loss, habitat fragmentation, disease, unregulated shooting and poisoning. The USFWS stated that while listing the black-tailed prairie dog as a threatened species under the ESA may be warranted, it was precluded, as other species were in greater peril thereby tying up the financial resources necessary to complete the process (USFWS 2000). In August of 2004, however, the USFWS, after reviewing the best available scientific and commercial information, reached a determination that the black-tailed prairie dog did not meet the definition of threatened under ESA (USFWS 2004).

Regardless of the ESA status of black-tailed prairie dog, municipalities, counties, states, and federal entities have worked to develop conservation strategies for the black-tailed prairie dog within their jurisdictions. Many of these strategies try to address the conservation needs of prairie dogs and their grassland ecosystem without jeopardizing other wildlife species and habitats. Specifically, within the Town of Superior, conversion of native grasslands to urban development has altered the role and function of the shortgrass ecosystem. The colonies that do still exist within the Town, especially those on Town-owned properties, are isolated and support few, if any, associated species. Instead, the colonies, because they are not able to expand, have enabled bare soil (resulting in wind and water erosion), noxious weed infestation, and stream bank degradation to be prevalent on some Town-owned properties. Many prairie dog colonies within the Town are very small, isolated, out of balance with their ecosystems, and causing significant damage to some riparian and wetland ecosystems within the Town. Therefore, it was imperative to consider all of these ecosystems on a regional scale to determine the best management approach for prairie dog conservation on Town-owned properties. This consideration and analysis is discussed in detail in Sections 3 and 4.

2.2. Description and Taxonomy

Prairie dogs are small burrowing rodents who are aboveground during the day. Black-tailed prairie dogs are approximately 13-16 inches long and weigh 1-3 pounds. Most individuals are light tan with a whitish underside and have a characteristic black-tipped tail. Females are typically smaller than males and have eight mammae (Fitzgerald et al. 1994, Hoogland 1996).

2.3. LIFE HISTORY AND HABITAT

Black-tailed prairie dogs are active above ground during the day throughout the entire year. They do not hibernate, however, they will enter periods of torpor. The basic social or "family" group is called a coterie. Coteries generally consist of one adult male, two or three adult females, and their offspring (Garrett and Franklin 1988, Hoogland 1995). Several coteries make up a colony. Both within and between these coteries, black-tailed prairie dogs communicate through tactile, visual, olfactory, and auditory stimuli (Fitzgerald et al. 1994). Interactions between different coterie members may result in a territorial dispute involving staring, flaring of the tail, bluff charges, tooth chattering, anal sniffing, and chasing and fighting (King 1955, Hoogland 1995). Prairie dogs have only one litter consisting of generally 4 to 6 pups per year (Knowles and Knowles 1994, Hoogland 1995). Along the Front Range of Colorado, breeding generally occurs from mid-February to early March (Fitzgerald et al. 1994). Gestation lasts approximately 30 to 35 days and pups emerge from the burrow four to seven weeks after birth (Fitzgerald et al. 1994).

2.4. SPECIES ASSOCIATED WITH PRAIRIE DOGS

Kotliar et al. (1999) found that nine vertebrate species are dependent upon prairie dogs at least to a small degree. These species include the black-footed ferret (*Mustella nigripes*), mountain plover (*Charadrius montanus*), western burrowing owl (*Athene cunicularia hypugea*) ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), swift fox (*Vulpes velox*), horned lark (*Eremophila alpestris*), deer mouse (*Peromyscus maniculatus*), and grasshopper mouse (*Onychomys leucogaster*). While there are other species that may utilize prairie dog colonies, such as cottontail rabbits, badgers, prairie rattlesnakes, bald eagles, and tiger salamanders, there is no data available to support that they cannot survive without prairie dogs or their colonies. Most of the above species are not found within highly urbanized areas of the Front Range, such as the Town of Superior. Instead, because of their need for expansive prairie dog colonies and other attributes associated with rural areas, some or most of the species are found in the larger open spaces of Boulder and Jefferson Counties or Eastern Colorado.

3. EVALUATION OF SUPERIOR PARCELS

Roe Ecological Services, LLC conducted the prairie dog habitat and population evaluation in March and April 2004. Figure 1 shows the specific locations of each of the parcels described in this plan. Appendix A provides definitions for Open Space Classifications. Appendix B provides all soil information used in the evaluation of Town parcels as obtained from Moreland and Moreland (1975). Appendix C provides the prairie dog habitat suitability determinations as determined from the guidelines set forth by Roe and Roe (2003).

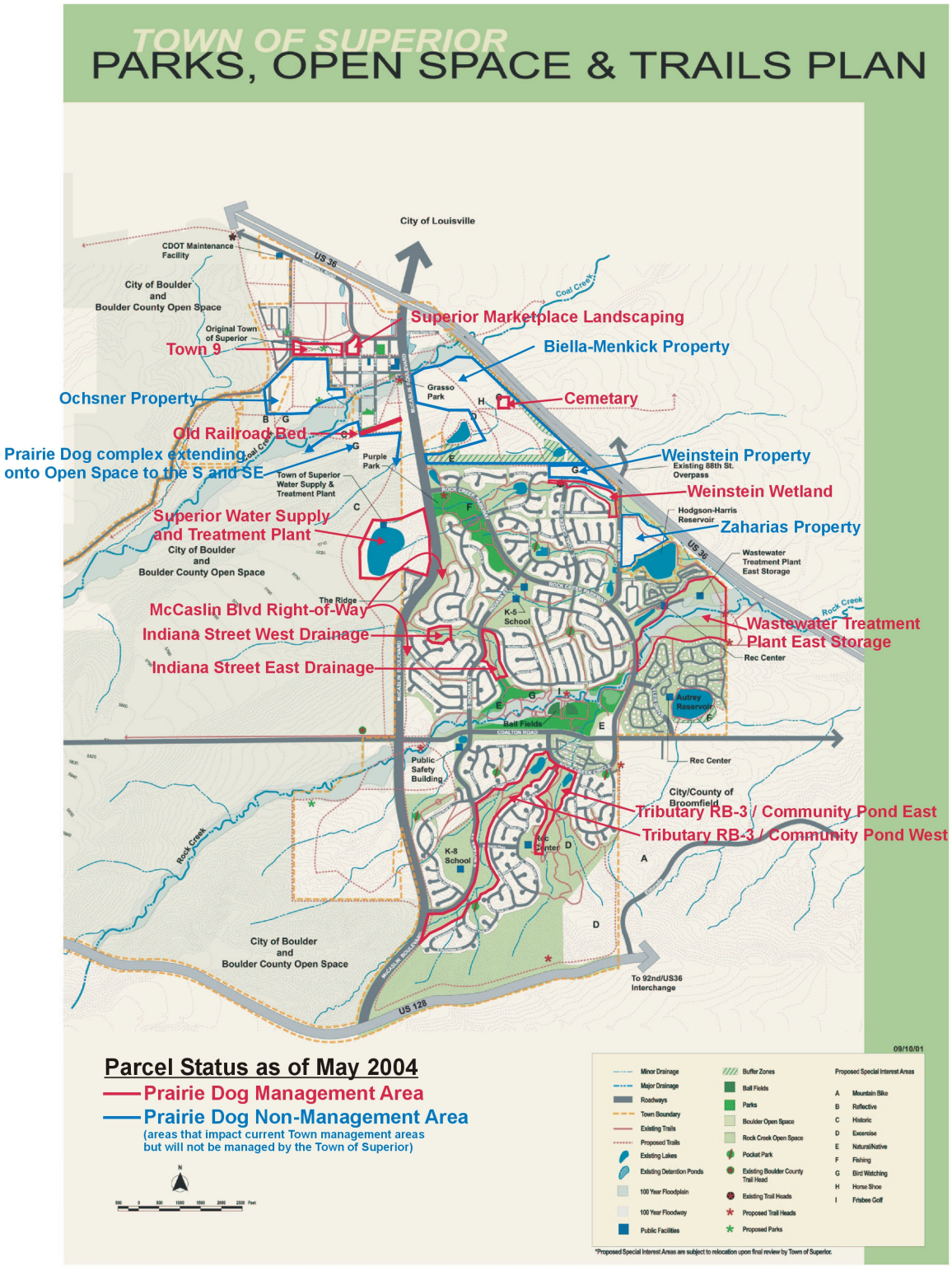

Figure 1. Map of the Town of Superior showing the specific locations of each Town parcel where management actions for prairie dogs are described in this plan.

3.1. TRIBUTARY RB-3 / COMMUNITY PONDS EAST AND WEST

3.1.1. SITE CHARACTERISTICS

Open Space Classification

Tributary RB-3 / Community Ponds East and West is an Aquatic and Riparian Natural Open Space.

Soils

The soil in this area is Samsil-Shingle complex (SeE).

Vegetation

The native vegetation in both drainages was historically shortgrass prairie. However, the upland areas are now at least 50% bare soil with the remainder being almost exclusively field bindweed (*Convolvulus arvensis*), diffuse knapweed (*Centaurea diffusa*), and pigweed (*Amaranthus* sp.) (Figure 2). Diffuse knapweed and field bindweed are state listed noxious weeds. The riparian/wetland/lowland areas of the East and West drainages of Tributary RB-3 and Community Ponds contain broad-leaf cattail (*Typha* latifolia), willow (*Salix* sp.), Nebraska sedge (*Carex nebrascensis*), and little bluestem (*Schizachyrium scoparium*). However, this vegetation is limited to a very tight perimeter around the Community Ponds and Tributaries.

Figure 2. Photos taken in March 2004 showing the size, location, and amount of bare soil and bindweed present on the prairie dog colonies within Tributary RB-3 / Community Ponds East and West.

Prairie Dogs

In Tributary RB-3 / Community Pond West, the colony exists from the edge of the housing developments on either side of the drainage (east and west) and from Rock Creek Circle on the north to just above Mt. Sopris Parkway on the south. The colony is approximately 17.5 acres in

size. In Tributary RB-3 / Community Pond East, the colony exists from the edge of the housing developments on either side of the drainage (east and west) and from Rock Creek Circle on the north to the Recreation Center on the south. The colony is approximately 15 acres in size. Each site is densely populated such that there are approximately 15 adult prairie dogs per acre.

Other Wildlife

Western Ecological Resource, Inc. (2002) during their survey of threatened and endangered species in the Superior area, did not survey this particular parcel. The only wildlife species known at this time to be marginally associated with the prairie dog colony are cottontail rabbits (*Sylvilagus* sp.), which were observed during the prairie dog habitat and population evaluation conducted for this management plan. Similarly, the only wildlife species known to be associated with the ponds/wetlands at this time are Red-winged blackbirds (*Agelaius phoeniceus*), House sparrows (*Passer domesticus*), a pair of Canada geese (*Branta canadensis*), and at least one lodge-building muskrat (*Ondatra zibethica*) (in Community Pond West) that were observed during the prairie dog habitat and population evaluation conducted for this management plan.

Regulatory Issues RE: Riparian Areas/Wetlands – Tributaries RB-3

According to the April 1997 Corp of Engineers 404 permit application and the May 1997 supplemental information for the Rock Creek development, approximately 640 linear feet of wetland channels are to be constructed and maintained within Tributary RB-3 West. The application states that, in order to maintain compliance with the 404 permit, if there is excessive sedimentation, the channel bottom must be excavated to restore original design grades and channel capacity. These excavated areas must then be revegetated with similar wetland grasses and plants. The remaining area of Tributary RB-3 West and the entirety of Tributary RB-3 East are to remain as natural drainageways where excessive erosion is to be mitigated and reseeded with native grasses. In addition, the upland areas associated with Tributary RB-3 East and West are considered green ways. Each green way includes a hard surface trail, which generally runs along the west side of the property.

Regulatory Issues RE: Riparian Areas/Wetlands – Community Ponds

According to the April 1997 Corp of Engineers 404 permit application and the May 1997 supplemental information for the Rock Creek development; Community Pond West is a 37.3 acre-foot water quality storage facility for stormwater runoff. Similarly, Community Pond East is a 29 acre-foot water quality storage facility for stormwater runoff. Around the perimeter of each

six-foot deep pool, wetland grasses and plants are to comprise the 20-foot-wide littoral zone. Before development of the ponds, there were no existing wetlands at either site. The wetlands and littoral zones were designed and developed to mitigate filled wetland areas within Rock Creek development.

In addition to serving as wetland mitigation sites, Community Ponds East and West (Figure 3) trap sediment to enhance the quality of stormwater runoff before it is discharged into Rock Creek. The permit application acknowledges that over time, sediments will accumulate in the ponds and will need to be dredged so the ponds can continue to function. Any wetland plants disturbed during the dredging must be replaced. Each pond also has a forebay area at the outfall of the drainageway. These forebay areas trap some sediment before it reaches the ponds and should be cleaned out periodically as they become filled with sediment.

Figure 3. Photos taken in March 2004 showing Community Ponds East and West (respectively).

3.1.2. HABITAT EVALUATION

As described in the 1997 application for the Corp of Engineers 404 permit, the ponds and associated tributaries are necessary to trap sediment and for the mitigation of wetlands that were disturbed elsewhere in the Rock Creek development. It is imperative that these ponds and channels remain functional and with as little erosion and sedimentation as possible. Frequent dredging and revegetation would not only be financially costly to the Town of Superior, but could also result in temporary or permanent disturbance for those species of wildlife utilizing the ponds, channels, and associated wetlands. This may or may not include state or federally listed or species of special concern such as the Preble's meadow jumping mouse (*Zapus hudsonicus preblei*), Northern Leopard Frog (*Rana pipiens*) and the common garter snake (*Thamnophis sirtalis*).

Unfortunately, long-term prairie dog conservation in these drainages is not conducive with maintaining low sedimentation rates. For one, the slope violates suitable long-term prairie dog habitat because it rises steeply from the ponds and tributaries (up to approximately 25 percent). As slope increases, the rate of surface erosion increases. Secondly, the properties of the soil complex produce rapid runoff with high erosion. Thirdly, the prairie dogs have so denuded the vegetation that generally the only plant growing within either colony is field bindweed.

Colorado lists field bindweed as a noxious weed. The presence of field bindweed is indicative of extreme overpopulation and lack of balance between prairie dogs and their ecosystem. Field bindweed is very competitive and because of the extreme amount of surface disturbance by the prairie dogs is able to outcompete native vegetation. By creating a mat of aboveground vines and leaves during the summer, field bindweed precludes most other plants from being able to obtain moisture or sunlight for growth. Vines often spread several feet away from the parent stem leaving large amounts of bare soil between each individual plant. Since field bindweed senesces in the fall, the site is nearly 100 percent bare soil until late spring. As a result, the area is left vulnerable to severe surface erosion by wind or precipitation run-off during this entire period. Erosion problems can also be exacerbated by the fact that from early fall through late spring, there is no useable aboveground forage. Prairie dogs dig up bindweed roots for sustenance (increasing soil disturbance), may eat or clip adjacent wetland/riparian vegetation, and/or migrate into adjacent backyards.

3.2. WASTEWATER TREATMENT PLANT EAST STORAGE

3.2.1. SITE CHARACTERISTICS

Open Space Classification

Wastewater Treatment Plant East Storage is an Aquatic and Wetland Natural Open Space.

Soils

The soil of the lowland/riparian area is Heldt clay (HeB). The upland area to the north consists of terrace escarpments (Te). The upland area to the south is Samsil-Shingle complex (SeE).

Vegetation

The riparian area of Rock Creek throughout the extent of this parcel is extremely degraded. There is a great deal of bank erosion and loss of vegetation structure (Figure 4). The vegetation consists of willows and plains cottonwood (*Populus deltoides*), which is very old and decadent. There is no recruitment of new cottonwood trees and very little if any willow regeneration (Figure 4). The alluvial area north and south of the riparian area consists primarily of field bindweed, pigweed, broom snakeweed (*Gutierrezia sarothrae*) and a high percentage of bare soil (Figure 5).

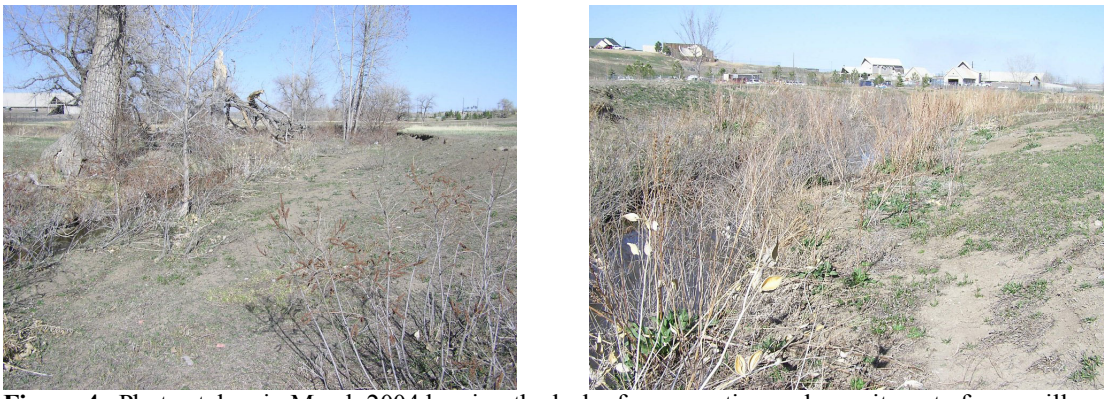

Figure 4. Photos taken in March 2004 howing the lack of regeneration and recruitment of new willows and cottonwoods along Rock Creek in the Wastewater Treatment Plant East Storage Area.

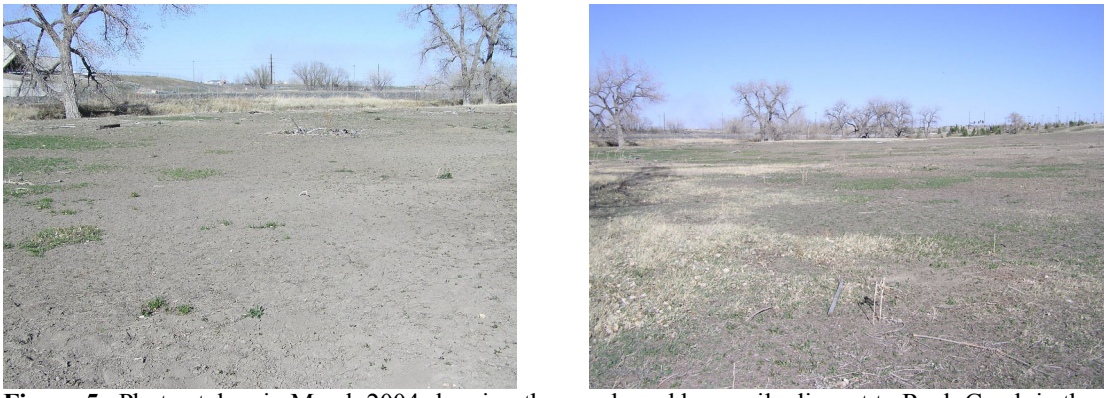

Figure 5. Photos taken in March 2004 showing the weeds and bare soil adjacent to Rock Creek in the Wastewater Treatment Plant East Storage Area.

Prairie Dogs

The prairie dog colony exists on both sides (north and south) of Rock Creek. The colony south of Rock Creek is approximately 18 acres in size and extends from the very edge of Rock Creek almost to the houses on the south. There are also prairie dogs immediately adjacent to the ponds / wetland areas on the south (Figure 6). The colony north of Rock Creek is approximately 8.5 acres. It extends from the very edge of Rock Creek, wraps around the treatment plant, and extends up the very steep slope on the north to the edge of the houses. The colony then drops back down the slope below the Saddlebrooke Community Center and continues west primarily south of the treatment plant access road (Figure 7). There are at least 15 adult prairie dogs per acre on each colony.

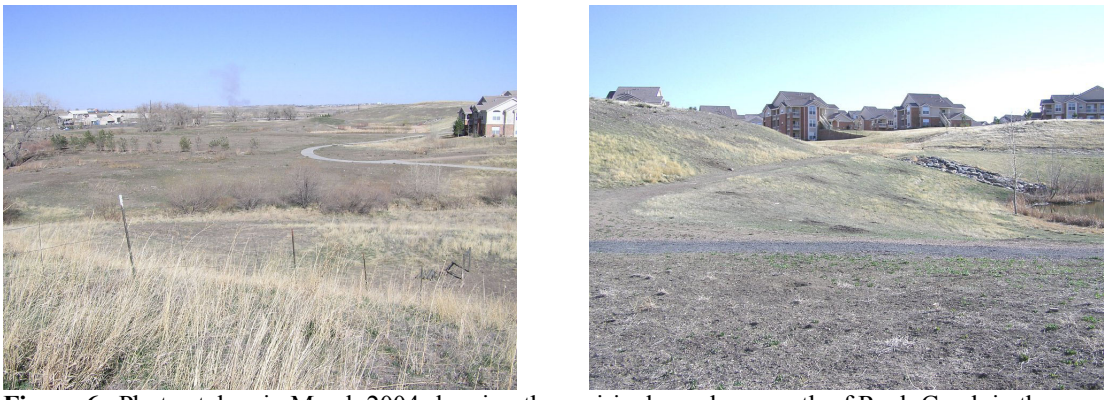

Figure 6. Photos taken in March 2004 showing the prairie dog colony south of Rock Creek in the Wastewater Treatment Plant East Storage Area.

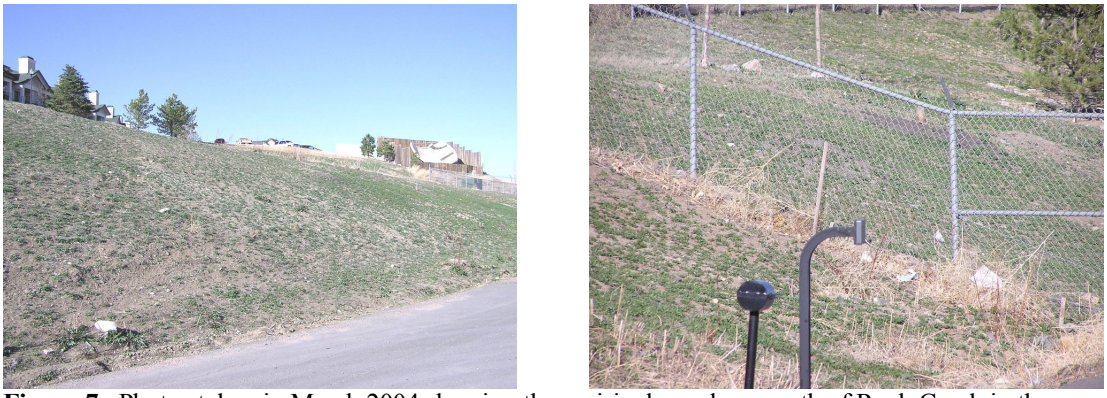

Figure 7. Photos taken in March 2004 showing the prairie dog colony north of Rock Creek in the Wastewater Treatment Plant East Storage Area.

Other Wildlife

Western Ecological Resource, Inc. (2002) did not survey this area for threatened and endangered species. The only wildlife species known at this time to be associated with the area are cottontail rabbits, Red-winged blackbirds, house sparrows, killdeer (*Charadrius vociferus*), various waterfowl, and a coyote (*Canis latrans*), which were observed during the prairie dog habitat and population evaluation conducted for this management plan.

Regulatory Issues RE: Rock Creek Stabilization

According to the April 1997 Corp of Engineers 404 permit application and the May 1997 supplemental information for the Rock Creek development, bank stabilization measures and check structures are scheduled to be completed on Rock Creek including the section flowing through the Wastewater Treatment Plant East Storage Area.

3.2.2. HABITAT EVALUATION

As described in the 1997 application for the Corp of Engineers 404 permit, Rock Creek is scheduled to undergo bank stabilization and check structures. The bank stabilization will include establishing vegetation that will prevent the bank from eroding. This stabilization is necessary due to the tremendous amount of bank erosion and undercutting currently occurring in the section flowing through the Wastewater Treatment Plant East Storage Area (Area). This has resulted in very poor water quality as evidenced by the amount of suspended sediment in Rock Creek within the Area as compared to the water just before it enters the Area to the west (Figure 8). In addition, streambank vegetation is either non-existent or extremely degraded. There does not appear to be any willow or cottonwood regeneration along most, if not all, of the section.

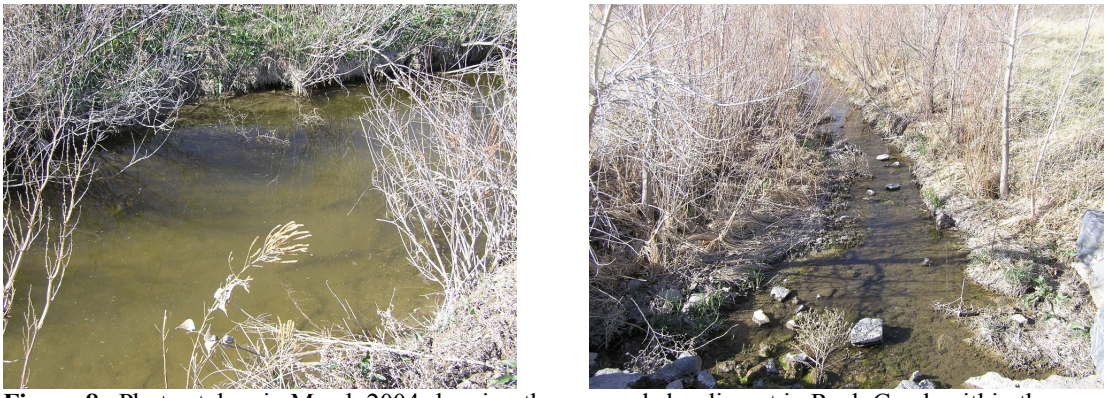

Figure 8. Photos taken in March 2004 showing the suspended sediment in Rock Creek within the Wastewater Treatment Plant East Storage Area as compared to the much clearer water just to the west of the Area (respectively).

Unfortunately, prairie dogs are a threat to the stabilization, recovery, and stability of Rock Creek in this Area through:

1. The constant clipping of riparian vegetation leading to the lack of recruitment and subsequent bank destabilization and undercutting;
2. Constant soil disturbance leading to surface erosion leading to water sedimentation; and
3. Overpopulation leading to extreme noxious weed infestation.

In addition to the problems of field bindweed addressed in the previous section, problems on this parcel also include the fact that the lowland soil is Heldt clay, which has slow permeability, medium to rapid runoff and a moderate erosion hazard. Furthermore, prairie dogs inhabiting the upland areas to the north and south are on extreme slopes (up to 25 percent) with soil types (terrace escarpments and Samsil-Shingle complex) that have very high erosion hazard. These upland areas are also generally very close to the adjacent housing developments. Prairie dogs are also impacting, or are threatening to negatively impact the structural integrity of the treatment plant ponds and underground electrical wiring.

None of the species observed during the prairie dog evaluation survey are dependent upon the prairie dog colony and likely would exist in similar numbers and distribution with a healthy riparian ecosystem. Likewise, because of the size and geographical location of the prairie dogs, the lack of raptor nests in any of the cottonwoods in this parcel along Rock Creek, it is unlikely that the colony is critical for raptor survival.

Furthermore, raptor species that would likely nest and or hunt on the site, such as Red-tailed Hawks and Swainson's Hawks, predominantly hunt smaller rodents, such as mice and voles, that are typically associated with healthy grassland and riparian areas, rather than prairie dogs.

3.3. WEINSTEIN WETLAND

3.3.1. SITE CHARACTERISTICS

Open Space Classification

The Weinstein Wetland is an Aquatic Natural Open Space.

Soils

The soil type of the riparian/wetland area is Kutch clay loam (KuD). The soil type of the upland area to the north consists of Nunn clay loam (NuB, NuC, and NuD).

Vegetation

The native vegetation of the upland areas to the north and south of the riparian/wetland, according to the soil survey information, was likely short or midgrass prairie. Due to the very high density of prairie dogs on the property to the north, this native vegetation has since been replaced almost completely on the north by field bindweed (Figure 9). On the south the vegetation is primarily Kentucky bluegrass (*Poa pratensis*), spruce (*Picea* spp.), and Ponderosa pine (*Pinus ponderosa*) (Figure 10). The wetland vegetation consists primarily of cattails (*Typha* sp.) (Figure 11).

Figure 9. Photos taken in March 2004 showing the prairie dog colony, field bindweed, and bare soil on the Weinstein Property north of the Weinstein Wetland.


Figure 10. Photos taken in March 2004 showing the area south of the Weinstein Wetland.


Figure 11. Photos taken in March 2004 showing the Weinstein Wetland.

Prairie Dogs

The prairie dogs within the Weinstein Wetlands property are scattered both along the east and west sides of the wetland area (less than two acres of prairie dogs) and are contiguous with the prairie dog colony to the north which sits on private land known as the Weinstein Property (approximately 15.3 acres). The Weinstein Property connects on the north side to the even larger (approximately 138 acres) prairie dog colony between McCaslin Boulevard on the west and US 36 on the east. There is also a large colony (approximately 38 acres) to the east across 88th Avenue.

Other Wildlife

According to Western Ecological Resource, Inc. (2002) bald eagles (*Haliaeetus leucocephalus*) have been observed foraging on the prairie dog colony to the north and east. Other wildlife observed during the prairie dog habitat and population evaluation conducted for this management plan, included Mallard ducks (*Anas platyrhynchos*) and Red-winged blackbirds.

3.3.2. HABITAT EVALUATION

Per Corp of Engineers 404 permit, the wetland is being created to trap sediment and for the mitigation of wetlands that were disturbed elsewhere in the Rock Creek development. It is imperative that this pond and upstream channel remain functional and with as little erosion and sedimentation as possible. Frequent dredging and revegetation would not only be financially costly to the Town of Superior, but could also result in temporary or permanent disturbance for those species of wildlife utilizing the ponds, channels, and associated wetlands.

Long-term prairie dog conservation immediately adjacent to the wetland and upstream channel is not conducive with maintaining low sedimentation rates and a healthy littoral zone. The establishment and long-term stability of the wetland is threatened by the prairie dogs through the previously discussed problems of:

1. The clipping of wetland vegetation;
2. Soil disturbance leading to surface erosion and subsequent to water sedimentation (exacerbated by the rapid runoff and high erosion hazard of the Kutch clay loam and Nunn clay loam soil types); and
3. Continued extreme noxious weed infestation.

3.4. INDIANA STREET WEST DRAINAGE

3.4.1. SITE CHARACTERISTICS

Open Space Classification

The Indiana Street West Drainage is a Natural Open Space Greenway.

Soils

The soil of this area consists of terrace escarpments (Te).

Vegetation

The upland in the area east and west of the prairie dogs in generally indicative of remnant shortgrass prairie and is composed of little bluestem, bluegrass (*Poa* sp.), smooth brome (*Bromus inermis*), blue grama (*Bouteloua gracilis*), Indian rice grass (*Achnatherum hymenoides*), prairie rose (*Rosa arkansana*), yucca (*Yucca glauca*), curlycup gumweed (*Grindelia squarrosa*), prickly pear (*Opuntia polyacantha*), and occasional Canada thistle (*Cirsium arvense*) and diffuse knapweed (Figure 12). Sporatic stands of willow and plains cottonwood comprise the vegetation of the lowland area (Figure 12). On the prairie dog colony, the vegetation consists of downy brome (*Bromus tectorum*), also a noxious weed, diffuse knapweed, yucca, prickly pear, field bindweed, fringed sage (*Artemisia frigida*), and moderate amounts of bare soil (Figure 13).

Figure 12. Photos taken in March 2004 showing the upland and lowland areas of the Indiana Street West Drainage.

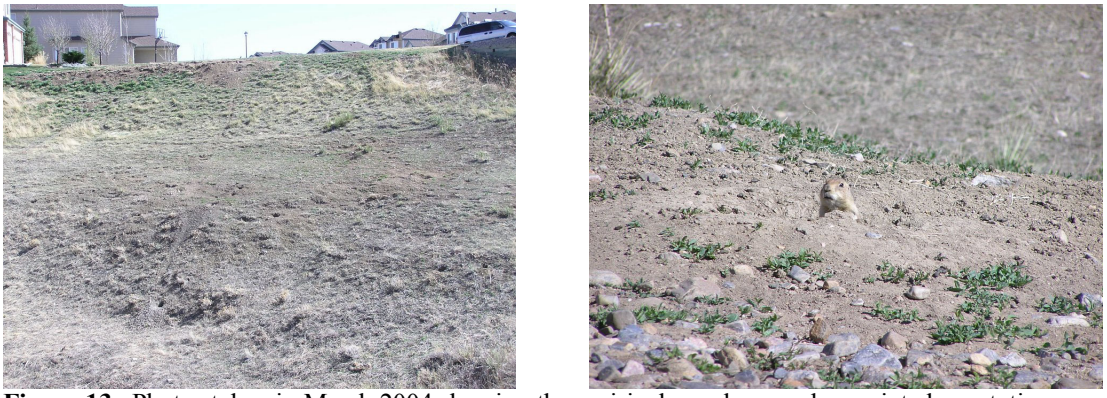

Figure 13. Photos taken in March 2004 showing the prairie dog colony and associated vegetation on south and north sides (respectively) of the Indiana Street West Drainage.

Prairie Dogs

Prairie dogs currently exist in approximately the middle third of the drainage (Figure 14). The acreage of the colony is estimated to be 1.5 acres on the north side and 1.8 acres on the south side. The density is estimated at approximately 8 - 10 prairie dogs per acre. Even though they are not of particularly high density and the bare soil is only moderate, the prairie dogs are exhibiting substantial digging/rooting behavior generally indicative of low-quality aboveground forage areas (have to dig for roots in order to receive adequate sustenance).

Figure 14. 2002 aerial photograph showing the approximate location and extent of the prairie dog colony in the Indiana Street West Drainage.

Other Wildlife

Western Ecological Resource, Inc. (2002) did not survey this area for threatened and endangered species. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan.

3.4.2. HABITAT EVALUATION

East and west of the prairie dog colony, the upland habitat is remnant shortgrass prairie with very few noxious weeds. Currently there is little to no erosion or impact to the drainage, low to moderate levels of bare soil, and only moderate noxious weed infestation within the prairie dog colony on either side of the drainage. However, the prairie dogs exist on moderately steep slopes which coupled with the soil type of terrace escarpments may lead to soil erosion into the drainage and possible undercutting of the banks of the drainage during heavy rain and/or flooding of the drainage. Furthermore, prairie dogs are immediately adjacent to the existing trail on the north side and encroaching on the houses on either side of the drainage. This could lead to health concerns and private property damage in the future.

The fact that the colony only exists in the middle third of the drainage allows a very beneficial buffer to the east and west along the drainage. The buffer keeps the prairie dogs from entering Indiana Street East Drainage (Section 3. 5.) and McCaslin Boulevard Right-of-Way (Section 3.11.). It is imperative that these two areas remain prairie dog free due to sensitive wetland species and incompatible land use objectives.

3.5. INDIANA STREET EAST DRAINAGE

3.5.1. SITE CHARACTERISTICS

Open Space Classification

The Indiana Street East Drainage is an Aquatic and Riparian Natural Open Space.

Soils

The soil of this area consists of terrace escarpments (Te).

Vegetation

The upland is composed of bluegrass, smooth brome, field bindweed, yucca, downy brome, broom snakeweed, curlycup gumweed, diffuse knapweed, and crested wheatgrass (*Agropyron cristatum*) (Figure 15). The lowland/riparian area is composed of eastern cottonwood (*Populus deltoides*), willow, cattails, sedge, rush (*Juncus* spp.), and prairie rose (Figure 15).

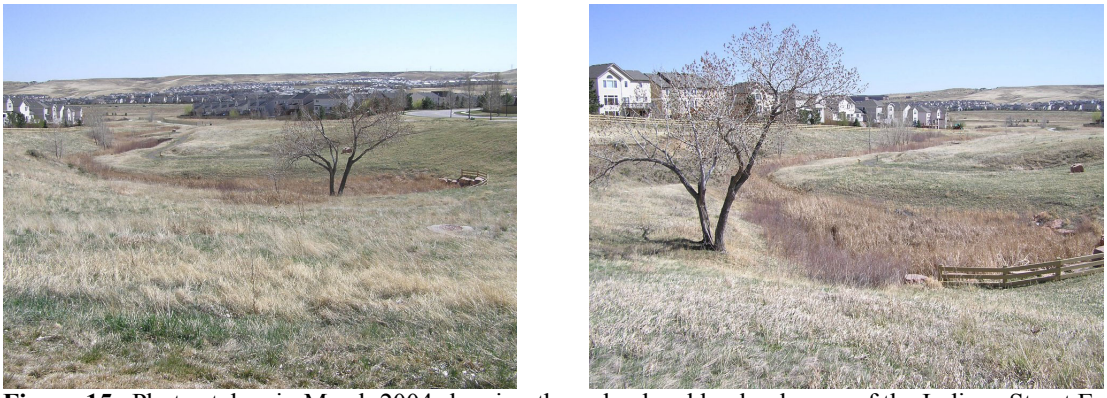

Figure 15. Photos taken in March 2004 showing the upland and lowland areas of the Indiana Street East Drainage.

Prairie Dogs

There are no prairie dogs in this drainage.

Other Wildlife

Western Ecological Resource, Inc. (2002) did not survey this area for threatened and endangered species. Red-winged blackbirds, Mallard ducks and the Northern Leopard Frogs a Colorado State Species of Concern were observed during the prairie dog habitat and population evaluation conducted for this management plan. Both adult frogs and numerous egg masses were observed in the drainage (Figure 16).

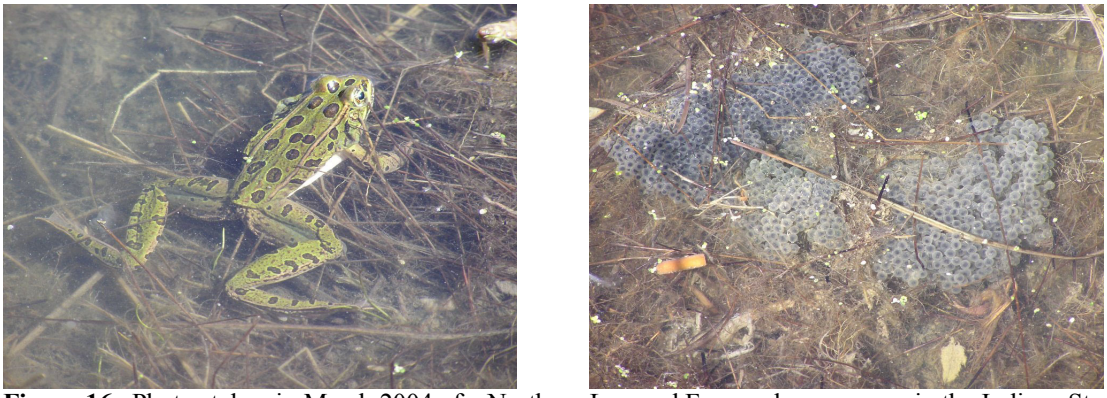

Figure 16. Photos taken in March 2004 of a Northern Leopard Frog and egg masses in the Indiana Street East Drainage.

3.5.2. HABITAT EVALUATION

The drainage provides habitat for the Northern Leopard Frog (frog), which is a State Species of Special Concern. The frog needs breeding ponds, fields in the summer, and over wintering ponds that do not freeze. Sedimentation, changes in water flow, or loss of the riparian and/or taller upland vegetation surrounding the ponds would likely result in the loss of this species within most, if not all, of the drainage.

3.6. CEMETERY

3.6.1. SITE CHARACTERISTICS

Open Space Classification

The Cemetery is a Natural Open Space/Historic Landmark.

Soils

The soil type of the cemetery is composed of Nunn clay loam (NuD).

Vegetation

The vegetation within the cemetery is generally composed of crested wheatgrass, field bindweed, diffuse knapweed, and various annuals.

Prairie Dogs

The Town built a very solid prairie dog exclosure around the cemetery to keep prairie dogs out of the cemetery to prevent them from burrowing in to historic gravesites. This enclosure not only aboveground, but also extends six feet down belowground. This should be a more than sufficient barrier to exclude prairie dogs from the site. However, because prairie dogs from the Biella-Menkick Property surround the cemetery on all sides, if anyone leaves the gate open for any extended period, prairie dogs and cottontails are able to enter. This results in those animals taking up residence within the exclosure and causing damage to the gravesites (Figure 17).

Figure 17. Photos taken in March 2004 of the Superior Cemetery showing prairie dog burrows in an around the gravesites.

Other Wildlife

Western Ecological Resource, Inc. (2002) did not survey this area for threatened and endangered species. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan. It is known, however, that cottontail rabbits have inhabited the cemetery in the past, if not currently.

3.6.2. HABITAT EVALUATION

Prairie dogs have caused damage to the gravesites in the past through their burrowing behavior, which unearthed remains and pieces of burial materials. Prairie dogs are therefore incompatible with the existing historic cemetery.

3.7. SUPERIOR WATER SUPPLY AND TREATMENT PLANT

3.7.1. SITE CHARACTERISTICS

Open Space Classification

The Superior Water Supply and Treatment Plant is not an open space or park.

Soils

The soil of this area consists of terrace escarpments (Te) and Valmont cobbly clay loam (VcC).

Vegetation

The predominant vegetation around the plant is Kentucky bluegrass.

Prairie Dogs

There are no prairie dogs currently on the site, but there is a colony just to the southwest on the Mayhoffer Open Space. These prairie dogs could immigrate onto the water supply and treatment plant property.

Other Wildlife

Western Ecological Resource, Inc. (2002) surveyed the area and did not identify any threatened or endangered species on the parcel. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan.

3.7.2. HABITAT EVALUATION

The habitat within the water supply and treatment plant is not suitable for prairie dog habitation. The extreme slope (greater than 25 percent in many locations) and the soil types are not conducive for stable burrow systems. Furthermore, prairie dogs within the water supply and treatment plant is not conducive with the needs of the treatment plant, which includes maintaining high water quality, low sedimentation rates, and the structural integrity of the pond. The prairie dogs through could threaten these need through:

1. Soil disturbance leading to surface erosion and subsequent to water sedimentation (exacerbated by the extreme slope around the plant as well as the moderate to rapid runoff and moderate to high erosion hazard of the soil);
2. Loss of the current vegetation buffer around the pond which helps to maintain water quality; and
3. Potential noxious weed infestation.

3.8. OLD RAILROAD BED

3.8.1. SITE CHARACTERISTICS

Open Space Classification

The old railroad bed is not an open space or park.

Soils

The soil type of the old railroad bed is Nunn clay loam (NuC).

Vegetation

There is very little vegetation on the site because it is an old railroad bed covered with crushed asphalt (Figure 18). The vegetation that does exist is on the north and south edge and is generally smooth brome, downy brome, field bindweed, and diffuse knapweed.

Figure 18. Photos taken in March 2004 of the old railroad bed.

Prairie Dogs

Two different colonies flank the old railroad bed on both the north and the south. To the north is a small colony (approximately 11 acres of approximately 10 prairie dogs per acre) on private land currently used for cattle. To the south is a very large colony (at least 10-15 prairie dogs per acre), which is part of the Mayhoffer complex owned by the City of Boulder and Boulder County (Figure 19). There are approximately 10 prairie dog burrows on the old railroad bed.

Other Wildlife

Western Ecological Resource, Inc. (2002) surveyed the area and did not identify any threatened or endangered species on the parcel. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan.

Figure 19. Photos taken in March 2004 of the prairie dog colony to the south of the old railroad bed.

3.8.2. HABITAT EVALUATION

The habitat of the old railroad bed is unsuitable prairie dog habitat. There is little to no vegetation, the soil at the surface is crushed asphalt, the prairie dogs on the northern edge of the old railroad bed parcel are crossing back and forth to the private property to the north to forage causing conflict with that landowner, and could compromise the integrity of the old railroad bed. The prairie dogs within this very narrow swath of property are serving no ecological or watchable wildlife purpose. Furthermore, the property is directly north of the very large and ecologically significant population of prairie dogs that connects to the greater Mayhoffer Open Space prairie dog complex. The prairie dogs entering the old railroad bed are those prairie dogs on the edge of the greater colony attempting to expand their territories. These prairie dogs are not critical for the health or sustainability of the greater complex or its ability to provide for associated species.

3.9. TOWN 9

3.9.1. SITE CHARACTERISTICS

Open Space Classification

The Town 9 is not currently an open space or park. After it is developed, it will be considered Developed Open Space/Park.

Soils

The soil types within the Town 9 include Valmont clay loam (VaB and VaC) and Valmont cobbly clay loam (VcE).

Vegetation

The site is composed of field bindweed, downy brome, smooth brome, yucca, crested wheatgrass, diffuse knapweed, Canada thistle, Russian thistle (*Salsola iberica*), prickly pear, bluegrass, prairie rose, blue grama, and western wheatgrass (*Pascopyrum smithii*). The weedier areas were those with greater prairie dog activity.

Prairie Dogs

The prairie dog colony is approximately 5.5 acres in size and is between 5 and 15 prairie dogs per acre. The majority of prairie dogs are on the western half of the property. There is a very extensive prairie dog colony across West Coal Creek Drive directly to the south (Figure 20).

Figure 20. Photos taken in March 2004 showing the Town 9, the prairie dog colony to the south, and West Coal Creek Drive between the two properties.

Other Wildlife

Western Ecological Resource, Inc. (2002) surveyed the area and did not identify any threatened or endangered species on the parcel. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan.

3.9.2. HABITAT EVALUATION

The habitat of the Town 9 is moderately suitable prairie dog habitat at this time. The lot still has remnant shortgrass prairie in spots; however, the proportion of weeds is high and will only continue to grow if the density of the colony is not reduced. Secondly, the soil types are both a clay loam, which is suitable for prairie dog burrowing, and a cobbly clay loam, which is unsuitable as burrowing can be difficult and unstable. However, the main issue is that this site is being evaluated for the possible development into a Town Park.

It is unlikely at this time, due to their proximity to the Superior Marketplace, that the population on the lot provides food or cover for any associated species. Therefore, the prairie dogs are serving only as watchable wildlife. There is, however, a very large and ecologically significant complex of prairie dogs directly to the south across the road on private land and also further south on the Mayhoffer Open Space. These populations not only serve as watchable wildlife, but also have high potential and ability to provide for associated species. The prairie dogs on the Town 9 are not critical for the health or sustainability of the greater complex and do not provide critical habitat or forage resources for associated species.

3.10. SUPERIOR MARKETPLACE LANDSCAPING

3.10.1. SITE CHARACTERISTICS

Open Space Classification

The Superior Marketplace Landscaping is Developed Open Space.

Soils

The soil types within the Superior Marketplace Landscaping include Valmont clay loam (VaB) and Nederland very cobbly sandy loam (NdD).

Vegetation

The lot south of the landscaping where the prairie dogs are originating is composed of knapweed, yucca, downy brome, and bluegrass. The landscaping is composed of Kentucky bluegrass, spruce, and ornamental shrubs.

Prairie Dogs

At the time of the prairie dog inventory, although there were burrows in the grass and beneath the trees, they were not active. However, there is a colony of approximately 20-30 animals on the one-acre lot south of the landscaping behind a silt fence (Figure 21).

Other Wildlife

Western Ecological Resource, Inc. (2002) did not survey this area for threatened and endangered species. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan.

Figure 21. Photos taken in March 2004 showing the Superior Marketplace Landscaping and the vacant lot to the south.

3.10.2. HABITAT EVALUATION

For the time being, there are no prairie dogs in the landscaping. This may be due in part to the silt fence barrier. However, prairie dogs have already breached the silt fence barrier (holes dug underneath it in several locations) so it is only marginally effective at excluding prairie dogs from the landscaping. The landscaping is also more suitable habitat for prairie dogs such that:

1. The vegetation of the lot is unsuitable for long-term prairie dog colony health as it is very weedy as opposed to the lush, higher protein grass of the landscaping;
2. The soil of the lot is very rocky (as opposed to the loamy soil that was brought in for the landscaping which is much easier to burrow in); and
3. The density of prairie dogs is currently quite high (which will only increase once the young of the year emerge in May/June).

The prairie dogs have caused damage to the landscaping in the past (and likely again in the future) through their burrowing behavior both in the grass and at the base of the trees. This will result in a loss of esthetics of the landscaping as well as the probable death of the vegetation adjacent to the burrows. Prairie dogs are incompatible with maintaining healthy and esthetically pleasing landscaping.

3.11. McCaslin Boulevard Right-of-way

3.11.1. SITE CHARACTERISTICS

Open Space Classification

The McCaslin Boulevard Right-of-Way is Developed Open Space/Greenway.

Soils

The soil types within the right-of-way include Nunn clay loam (NuC), terrace escarpments (Te) and Valmont cobbly clay loam (VcC).

Vegetation

The right-of way on the east side of McCaslin Boulevard south of Rock Creek Parkway to Coalton Road is Kentucky bluegrass and ornamental landscaping from the edge of McCaslin to the edge of the houses.

Prairie Dogs

There are no prairie dogs currently within right-of-way on the east side of McCaslin Boulevard. However, there is a very large complex of prairie dogs (part of the Mayhoffer Open Space complex) on the west side of McCaslin (Figure 22). Prairie dogs have not yet been migrating across McCaslin to the right-of-way on the east. However, as the Mayhoffer population continues to grow and expand, prairie dogs may immigrate onto the right-of-way. This immigration is expected to be slow given the moderate to high level of traffic on McCaslin each day.

Figure 22. Photos taken in March 2004 showing the McCaslin Boulevard Right-of-Way and the prairie dogs directly to the west on Mayhoffer Open Space.

Other Wildlife

Western Ecological Resource, Inc. (2002) did not survey this area for threatened and endangered species. No other wildlife species were observed during the prairie dog habitat and population evaluation conducted for this management plan.

3.11.2. HABITAT EVALUATION

The eastern portion of the McCaslin Boulevard Right-of-Way is unsuitable habitat and the existing aesthetic landscaping buffer land use between the road and the house is incompatible with prairie dogs. Prairie dogs, if permitted to remain within the east right-of-way, would significantly damage the landscaping (both physically and esthetically) and could negatively affect the adjacent private lots. If prairie dogs remained within the right-of-way, because of their proximity to houses and the well-traveled road, it is unlikely they would provide food or cover for any associated species. Therefore, the prairie dogs would merely serve as watchable wildlife.

There is, however, a very large and ecologically significant complex of prairie dogs directly across McCaslin Boulevard to the west on Mayhoffer Open Space. This complex not only serves as a watchable wildlife resource, but also has high potential and ability to provide for associated species. The prairie dogs that would enter the right-of-way would be immigrants attempting to expand into available resource areas. These prairie dogs are not critical for the health or sustainability of the greater complex or its ability to provide for associated species. In addition, the ability for Town residents to easily observe prairie dogs would not be compromised.

4. REGIONAL EVALUATION

4.1. REGIONAL PRAIRIE DOG CONSERVATION

Multiple populations of black-tailed prairie dogs exist throughout the region surrounding the Town. Populations range from less than one acre to several hundred acres in size. Depending on the size and location, these prairie dog colonies serve a variety of ecological and/or social roles. The larger, more rural populations of prairie dogs often serve as foraging sites for coyotes, fox, badgers, and a variety of hawks and eagles, as well as wildlife viewing opportunities. In some areas, these larger, more ecologically significant populations also provide nesting areas for Burrowing Owls. Within the more urbanized areas, however, the prairie dog colonies often serve a much more limited ecological role.

While not every prairie dog colony in the region is protected, Figure 23 shows those properties in the region surrounding the Town that are designated for prairie dog conservation. The properties shown are currently limited to those that are protected as of 26 July 2004 on city and county properties in the region. The acreage and number of properties may increase as the City of Westminster, Jefferson County, and Rocky Flats develop/finalize their respective prairie dog/shortgrass prairie management plans.

4.1.1. CITY OF BOULDER OPEN SPACE

According to the City of Boulder's prairie dog habitat conservation plan (City of Boulder Staff 1996), there are approximately 2,826.50 acres designated as Prairie Dog Habitat Conservation Areas (HCAs) in the region (1,100.29 of these acres are jointly owned with Boulder County). The City of Boulder defines an HCA as:

> An area which will be managed so that prairie dogs may undergo natural processes of expansion and decline and cause natural shifts in vegetation dominance and animal use… Prairie dogs will exist essentially undisturbed in a habitat conservation area insofar as it is legally or reasonably possible.

4.1.2. BOULDER COUNTY OPEN SPACE

According to Boulder County's Prairie Dog Habitat Element (Boulder County Staff 2002), as of 1999 there were approximately 2,633.00 acres designated HCAs in the region on Boulder County properties (1,100.29 of these acres are jointly owned with the City of Boulder). Boulder County defines an HCA as:

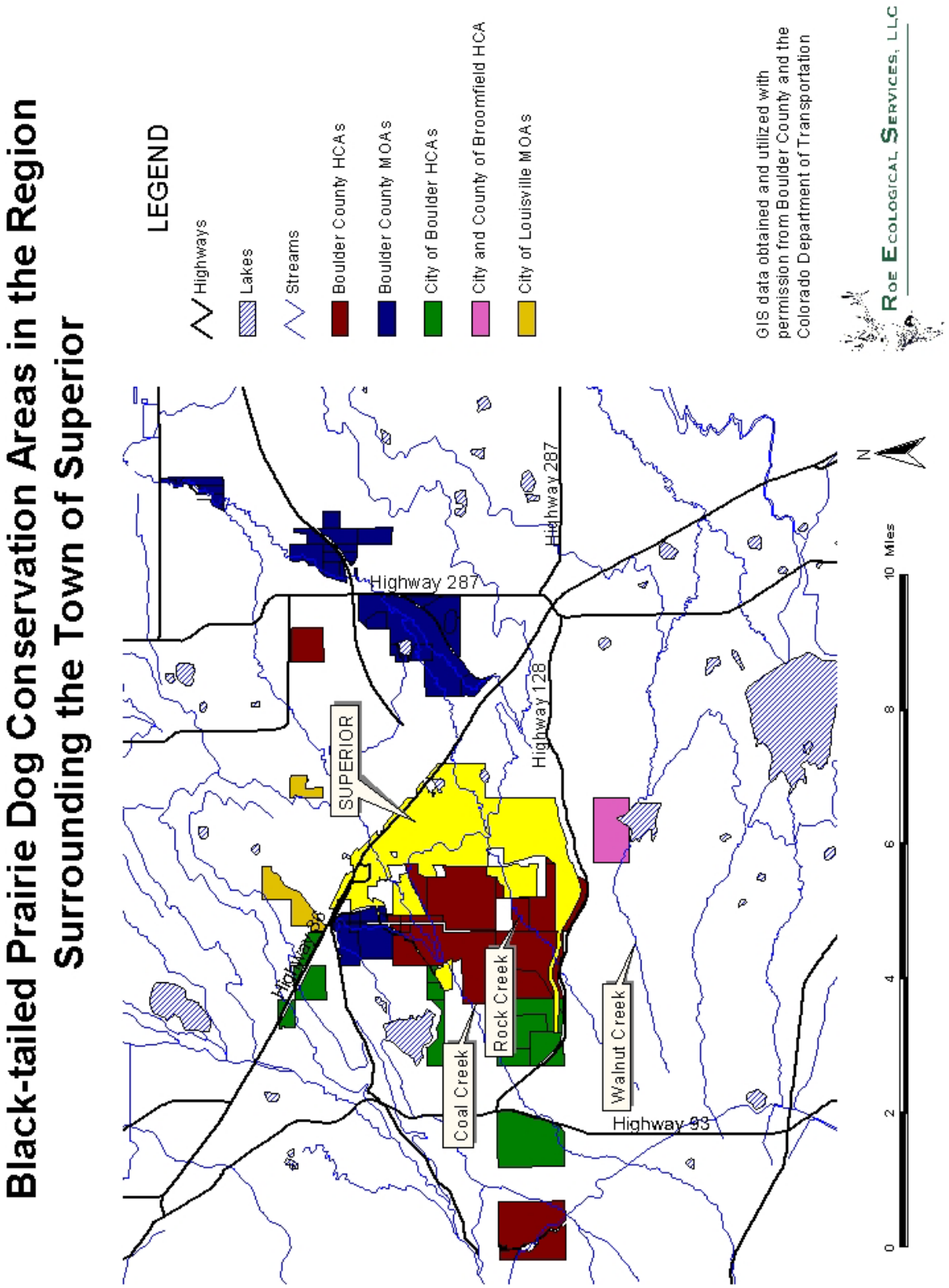

Figure 23. Map showing the black-tailed prairie dog conservation areas in the region surrounding the Town of Superior.

Habitat Conservation Areas form the foundation of the prairie dog preservation strategy. HCAs will ideally allow prairie dogs to function with minimal human intervention without causing or experiencing significant negative impacts to or from adjacent land uses. HCAs will be managed so that prairie dogs may undergo natural processes of expansion and decline and thus fulfill their ecological function as factors in the natural shifts in vegetation dominance and animal use… Prairie dogs will exist essentially undisturbed in an HCA to the extent it is ecologically, legally or reasonably possible.

According to Boulder County's Prairie Dog Habitat Element (Boulder County Staff 2002), as of 1999 there were 1,121.85 acres designated Multiple Objective Area (MOA) in the region on Boulder County properties. Boulder County defines a MOA as:

> Multiple-objective areas will allow prairie dogs to coexist with other uses, but they may not be the highest management priority. MOAs are important in the overall prairie dog management strategy as a complement to HCAs. Some MOAs will function as important links between HCAs throughout the county to maintain a viable metapopulation of prairie dogs. This is an important ecological consideration that will allow for reestablishment of colonies should they be decimated by plague… Examples of MOAs are properties with noxious weed or soil erosion problems, or properties that contain suitable habitat but are simply too small to allow the kind of hands off management afforded by an HCA.

4.1.3. CITY OF LOUISVILLE OPEN SPACE

According to the City of Louisville Open Space Master Plan (City of Louisville Staff 2004), there are 55 acres designated MOA in the region on City of Louisville properties. Forty-five of these acres on the Davidson Mesa Open Space are contiguous with City of Boulder's Galluchi Open Space (an HCA) to the northeast. The City of Louisville relies on Boulder County's definition of a MOA.

4.1.4. CITY AND COUNTY OF BROOMFIELD OPEN SPACE

According to the City and County of Broomfield Policies for Prairie Dog Conservation and Management (Broomfield Staff 2003), there are 124 acres designated for long-term prairie dog management in the region on the Great Western Reservoir Open Space owned by the City and County of Broomfield.

4.2. REGIONAL RIPARIAN EVALUATION

Several ecologically significant riparian corridors surround the Town to the northwest, west, southwest, and south (Figure 24) (see Appendix D for information regarding each Conservation Site). These include Boulder Creek, Coal Creek, Rock Creek, Walnut Creek, and Woman Creek, as well as their associated tributaries. Many of these corridors are protected to varying degrees by either Boulder City and/or County Open Space properties, or the Rocky Flats Environmental Technology Site (Figure 25). Individually and collectively, these corridors provide critical habitat for the Preble's meadow jumping mouse (Preble's) as well as valuable habitat for a variety of neo-tropical migratory songbirds and other wildlife.

Of particular interest to the Town are the Coal Creek and Rock Creek drainages. According to the Colorado Natural Heritage Program, the drainages of Coal Creek and Rock Creek are listed as having High to Very High biodiversity significance with much of the significance related to the presence of large breeding populations of Preble's. Conservation of these corridors for Preble's habitat is critical for the recovery of this species and general riparian health and biodiversity and as such, the drainages on either side of the Town are largely protected by Boulder City and County open space, parks, and conservation easements.

4.3. REGIONAL MID AND TALLGRASS PRAIRIE GRASSLAND EVALUATION

Several ecologically and historically significant mid and tallgrass prairie grassland remnants remain around the Town of Superior to the northwest to the west, southwest, and south (Figure 24). These remnants are not only unique to Colorado, but are unique globally as well. Because of the nature of these grasslands, wildlife species diversity is often much different than in surrounding areas, with several of the species found within these areas species of conservation concern. At least four species of rare and imperiled butterflies and six species of birds of special conservation concern utilize these areas. Butterflies include the Mottled Dusky Wing (*Erynnis martialis*), the Hops blue (*Celestrina* sp.), the Otto skipper (*Hesperia ottoe*), and the Arogos skipper (*Atrytone arogos*). Birds include the Brewer's sparrow (*Spizella brewerii*), Ferruginous hawk (*Buteo regalis*), Grasshopper Sparrow (*Ammodramus savannarum*), lark bunting (*Calamospiza melanocorys*), Loggerhead shrike (*Lanius ludovicianus*), and MacGillivray's warbler (*Opornis tolmiei*).

Of particular interest to the Town, these remnant grasslands extend almost to the western limits of the Town boundary. Even though the grasslands themselves may not necessarily extend through or beyond

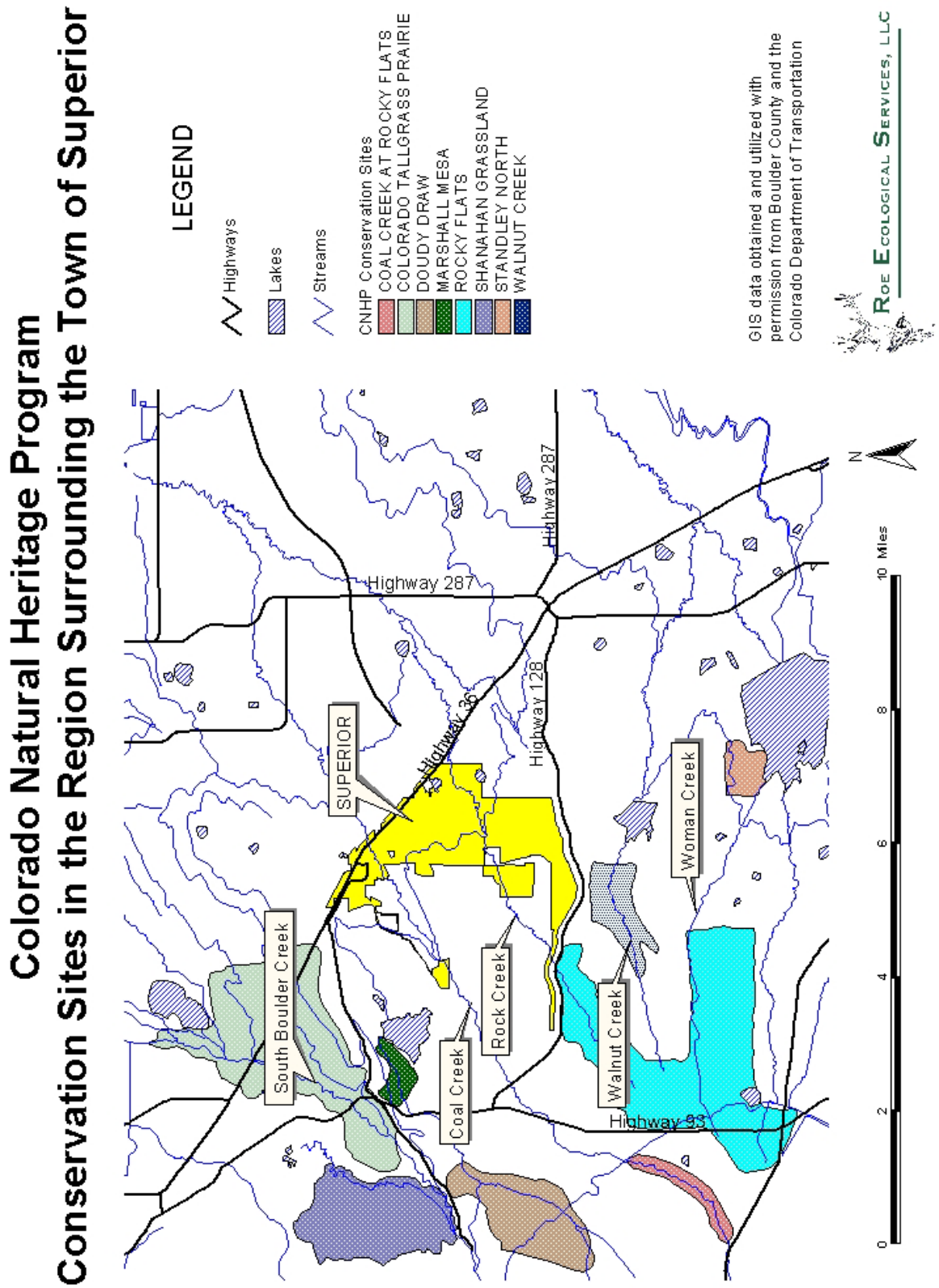

Figure 24. Map showing the conservation sites and significant riparian corridors in the region surrounding the Town of Superior as called out by the Colorado Natural Heritage Program.

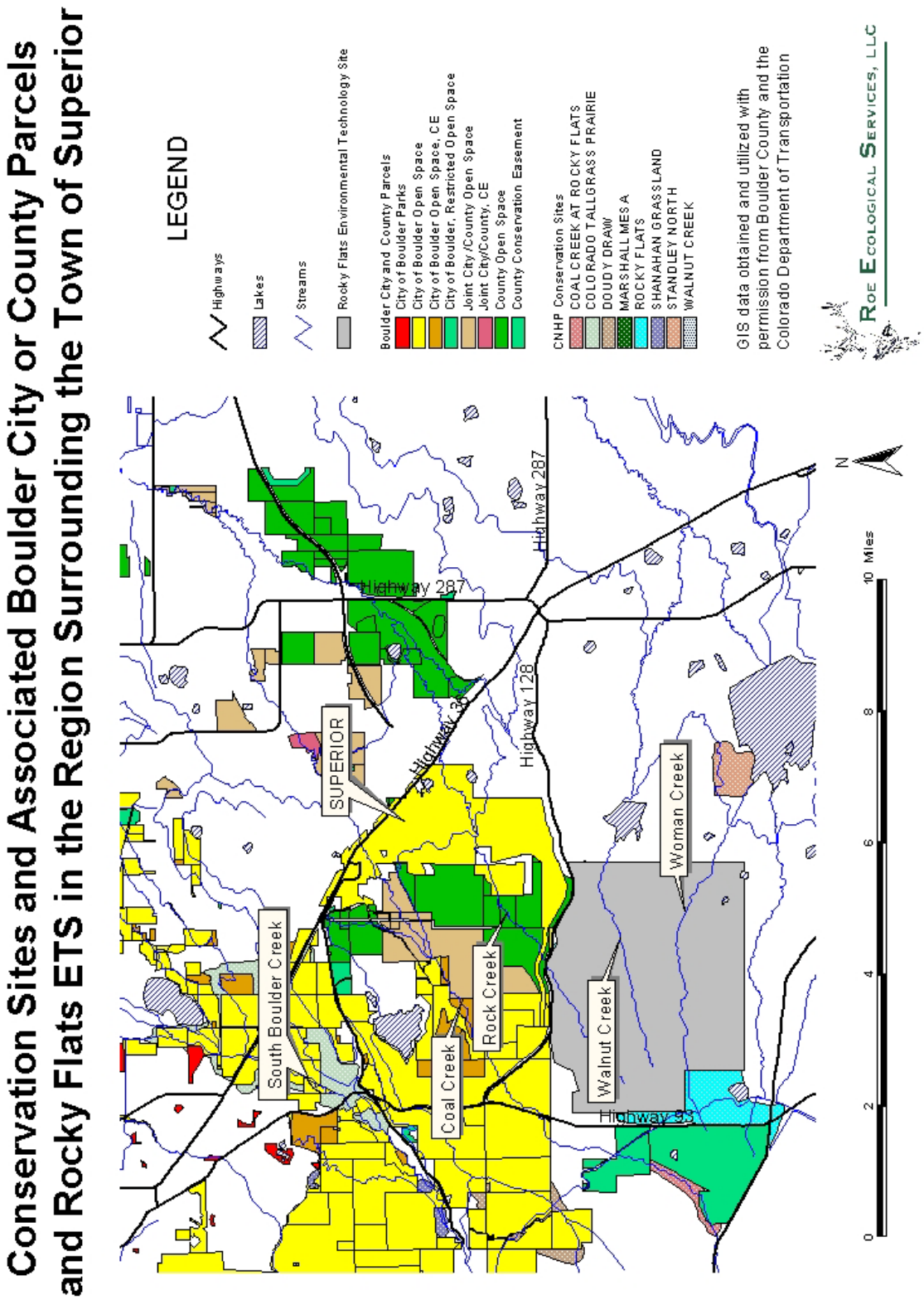

Figure 25. Map showing the conservation sites and significant riparian corridors in the region surrounding the Town of Superior overlaid with Boulder City and/or County properties and the Rocky Flats Environmental Technology Site.

the Town limits, because most of these grasslands have riparian corridors associated with them, connectivity of ecologically significant habitat between outside areas and within the Town of Superior for the above species may be possible. While most of these remnant grasslands are protected under Boulder City and/or County Open Space or the Rocky Flats Environmental Technology Site, additional habitat conservation, or reclamation of disturbed sites to mid and/or tallgrass prairie grasslands may serve to increase overall critical habitat for the species locally associated with that habitat type.

4.4. SUPERIOR'S ECOLOGICAL POTENTIAL WITHIN THE REGION

Given the roughly 5,660.06 acres of largely contiguous prairie dog habitat within the region surrounding the Town that are protected under HCAs and/or MOAs, the small number and size of the Town's prairie dog acreage can be considered insignificant across the overall landscape. The Town's prairie dog populations are highly fragmented and geographically isolated from other populations, provide habitat and forage resources for few, if any, associated species that are of special concern, reside on degraded habitats often within riparian corridors, and exist on sites that generally were not historical prairie dog habitat. All of these factors suggest that prairie dogs within the Town provide very little, if any, true ecological role, and generally provide only a watchable wildlife resource to Town residents and guests.

Conversely, however, many Town-owned properties are found along ecologically significant and conservationally important riparian corridors that provide critical habitat for a large variety of wildlife species of conservation concern. From Preble's meadow jumping mice to rare species of butterflies, the riparian corridors and adjacent uplands coursing through the Town could be ecologically significant and provide a meaningful contribution to regional riparian conservation efforts.

5. PRAIRIE DOG MANAGEMENT

5.1. GOAL STATEMENT AND OBJECTIVES

To provide prairie dog habitat conservation and viewing opportunities to as great an extent as possible while not causing undue conflict to adjacent landowners/land uses and resource damage though soil erosion, noxious weed infestation, or loss of riparian or wetland habitats.

Objectives

1. Establish at least one Prairie Dog Education Area (PEA) on Town-owned property.
2. As no property that would be suitable for perpetual and ecologically significant prairie dog conservation on Town-owned property, identify opportunities either within the Town boundaries or in partnership with other entities (municipalities, counties, and non-governmental organizations) in the region to purchase a property or conservation easement for use as a Shortgrass Prairie Conservation Area (SPCA).
3. Monitor and manage the populations of prairie dogs on the PEA(s) and SPCA(s) at prescribed levels (control needs defined by prescribed acreage, population, vegetation, or soil parameters).
4. Promptly remove prairie dogs from No Prairie Dog Areas (NPD).

5.2. LAND USE DESIGNATIONS

5.2.1. SHORTGRASS PRAIRIE CONSERVATION AREA (SPCA)

A Town-owned parcel (or a portion thereof) managed for continued prairie dog existence in a healthy shortgrass prairie ecosystem in order to ensure the perpetual conservation of ecosystem processes and the continued presence of associated species. Populations on these parcels will be frequently monitored and adaptively managed (control needs will be defined by prescribed acreage, population, vegetation, or soil parameters) to ensure that noxious weeds, soil erosion, and impacts to adjacent land owners/land uses are kept at an absolute minimum.

5.2.2. PRAIRIE DOG EDUCATION AREA (PEA)

A Town-owned parcel (or a portion thereof) managed for continued prairie dog existence to provide for educational and prairie dog viewing opportunities within the Town. These populations serve very little, if any, ecological purpose but serve to allow the residents of the Town an opportunity to view and enjoy prairie dogs. Populations on these parcels will be frequently monitored and adaptively managed (control needs will be defined by prescribed

acreage, population, vegetation, or soil parameters) to ensure that noxious weeds, soil erosion, potential for disease, and negative impacts to adjacent land owners/land uses are kept at an absolute minimum.

5.2.3. NO PRAIRIE DOG AREA (NPD)

A Town-owned parcel (or a portion thereof) that will exclude prairie dogs due to incompatible land use objectives. The Town will remove prairie dogs (themselves or through a qualified contractor) from these areas according to acceptable removal activities as defined in section 6.

5.2.4. UNCLASSIFIED AREA (UCA)

A Town-owned parcel (or a portion thereof) that is inappropriate for classification as a PEA or SPCA as its current land use may change in the future. This parcel is generally not suitable for prairie dogs; however, there are no current incompatible land use objectives either on the parcel or on adjacent properties, which would justify it as being an NPD at the present time. Population control may be employed as deemed necessary to ensure that noxious weeds, soil erosion, and impacts to adjacent land owners/land uses are maintained at an absolute minimum. Relocation is not permitted to these parcels for any reason.

5.3. PARCEL GUIDELINES

Land Use Designations were assigned and comprehensive guidelines developed for management of prairie dogs on individual Town parcels. For each parcel, consideration was given to the following:

1. Ecological significance of the parcel both within the Town and on a regional scale;
2. Priority of conflicting land uses for the Town and regionally; and
3. Ability of the parcel to provide an educational opportunity while not compromising other ecological, land use objectives, or causing conflict with adjacent private property.

Table 1 provides an overview of each parcel, its land use designation, and current management action.

Parcel	Current Occupied Acres	Estimated Adult Density per acre	Land Use Designation	Management Action
Tributary RB-3 / Community Pond East	15	At least 15	NPD	Complete Removal
Tributary RB-3 / Community Pond West	17.5	At least 15	NPD	Complete Removal
Wastewater Treatment Plant East Storage	18 acres south of Rock Creek 8.5 acres north of Rock Creek	At least 15 At least 15	NPD	Complete Removal
Weinstein Wetland	2	5 - 15	NPD	Complete Removal and Exclusion Barrier
Indiana Street West Drainage	3.3	8 - 10	PEA or possible future NPD if management needs dictate	Monitoring and Maintenance
Indiana Street East Drainage	0	0	NPD	Monitor and Remove if Present
Cemetery	1	1 - 5	NPD	Complete Removal
Superior Water Supply and Treatment Plant	0	0	NPD	None Unless Present in Future
Old Railroad Bed	< 0.5	10	NPD	Complete Removal and Exclusion Barrier
Town 9	5.5	5 - 15	UCA until park is developed NPD once park is developed	None Complete Removal
Superior Marketplace Landscaping	0 1 - south lot	0 At least 15	NPD	Monitor and Remove if Present
McCaslin Boulevard Right-of-Way	0	0	NPD	Monitor and Remove if Present

Table 1. Summary of the parcels, acreage, current occupied acres, land use designation, and management activity necessary to comply with land use designation.

5.3.1. TRIBUTARY RB-3 / COMMUNITY PONDS EAST AND WEST

Land Use Designation: NPD

Management Required: Complete removal of all prairie dogs from the parcel

The land use designation of NPD chosen for this property acknowledges the regulatory requirements imposed by Corp of Engineers, the importance of Community Pond and wetland/riparian preservation and enhancement to the local community and the region, and the responsibility to regulate noxious weeds and soil erosion.

Positive aspects of the NPD designation for this parcel are:

1. Negative impacts by prairie dogs to the wetland and surrounding upland vegetation and soils are eliminated if all prairie dogs are removed;
2. Wetland and upland vegetation can become permanently established and maintained with minimal effort and without continued expenditure;
3. Erosion leading to wetland sedimentation from the steep slopes can be significantly reduced if not eliminated;
4. Annual prairie dog monitoring, property maintenance, and mitigation expenditures stemming from prairie dog impacts are eliminated assuming prairie dogs are completely removed;
5. Gain of a valuable wildlife viewing opportunity (including bird watching, muskrat observations, amphibian encounters, etc.) will enhance and maintain biodiversity and help the Town reach its goal of becoming certified with the National Wildlife Federation's Backyard Wildlife Habitat Program; and
6. Lower likelihood of adjacent private property damage from wildlife.

Negative aspects of the NPD designation for this parcel are:

1. The removal of prairie dogs from this property requires a financial expenditure from the Town of Superior;
2. Removal of prairie dogs may eliminate a cover resource and prey base for area wildlife (albeit minimal); and
3. Loss of a local prairie dog viewing opportunity.

5.3.2. WASTEWATER TREATMENT PLANT EAST STORAGE

Land Use Designation: NPD

Management Required: Complete Removal of Prairie Dogs and Movement Barrier Installed North of Treatment Plant if Necessary

The land use designation of NPD chosen for this property acknowledges the regulatory requirements imposed by Corp of Engineers, the importance of Rock Creek and wetland/riparian preservation and enhancement to the local community and the region, and the responsibility to regulate noxious weeds and soil erosion.

Positive aspects of the NPD designation for this parcel are:

1. Negative impacts by prairie dogs to the treatment plant, Rock Creek, wetlands, and surrounding landowners can be eliminated if all prairie dogs are removed;
2. Wetland, riparian, and upland vegetation can become permanently established and maintained with minimal effort and without significant perpetual expenditure;
3. Erosion leading to wetland sedimentation, poor water quality in Rock Creek, and stream bank degradation of Rock Creek can be significantly reduced if not eliminated;
4. Annual prairie dog monitoring, property maintenance, and mitigation expenditures stemming from prairie dog impacts are eliminated assuming prairie dogs are completely removed and prairie dogs are prevented from reentering from the Zaharias property;
5. Enhanced opportunity to create and/or enhance valuable and necessary (on a regional scale) wetland, riparian, and upland areas, which will provide habitat for a much higher diversity of wildlife species as well as provide a rare valuable wildlife viewing opportunity which will help the Town reach its goal of becoming certified with the National Wildlife Federation's Backyard Wildlife Habitat Program; and
6. Lower likelihood of adjacent private property damage from wildlife.

Negative aspects of the NPD designation for this parcel are:

1. The removal of prairie dogs from this property requires a moderately significant financial expenditure from the Town of Superior;
2. Removal of prairie dogs may eliminate a cover resource and prey base for area wildlife (albeit minimal); and
3. Loss of a local prairie dog viewing/educational opportunity.

5.3.3. WEINSTEIN WETLAND

Land Use Designation: NPD

Management Required: Complete removal of all prairie dogs from the parcel and installation of a movement barrier

The land use designation of NPD chosen for this property acknowledges the regulatory requirements imposed by Corp of Engineers, the importance of wetland/riparian preservation and enhancement to the local community and the region, and the responsibility to regulate noxious weeds and soil erosion. There will be no loss of a prairie dog viewing opportunity as the prairie dogs and their associated wildlife on parcels to the north and west will not be affected by this land use designation and subsequent management activities.

Positive aspects of the NPD designation for this parcel are:

Negative impacts by prairie dogs to the wetland and surrounding upland vegetation and soils are eliminated if prairie dogs are removed and excluded with a movement barrier;

1. Wetland and upland vegetation can become permanently established and maintained with minimal effort and without continued expenditure;
2. Erosion leading to wetland sedimentation can be significantly reduced if not eliminated;
3. Annual prairie dog monitoring, property maintenance, and mitigation expenditures stemming from prairie dog impacts are eliminated assuming prairie dogs are completely removed;
4. Gain of a valuable wildlife viewing opportunity (including bird watching, amphibian encounters, etc.) will enhance and maintain biodiversity and help the Town reach its goal of becoming certified with the National Wildlife Federation's Backyard Wildlife Habitat Program; and
5. Lower likelihood of adjacent private property damage from wildlife.

Negative aspects of the NPD designation for this parcel are:

1. The removal of prairie dogs from this property will require a financial expenditure from the Town of Superior;
2. The movement barrier will stop the majority of movement onto the Weinstein Wetland; however, the barrier may require maintenance (periodic expenditure) and the prairie dogs that breach the barrier will have to be removed in as timely a manner as possible (periodic expenditure); and

3. Removal of prairie dogs may eliminate a cover resource and prey base for area wildlife (albeit very minimal).

5.3.4. INDIANA STREET WEST DRAINAGE

Land Use Designation: PEA

Management Required: Monitoring and population control if necessary

The PEA designation chosen for the Indiana Street West Drainage acknowledges the objective of maintaining at least one PEA on Town-owned property. Prairie dogs will be maintained in the Indiana Street West Drainage barring any excessive damage to soil, vegetation, other wildlife resources, and/or neighboring landowner conflicts. Excessive damage can be defined as, but is not limited to, decreased range condition, decreased wildlife diversity within the primary area occupied by prairie dogs, or any other affect on natural resources or ecological processes in the area deemed to be negative or undesirable. While management of this area will allow prairie dogs, the relocation of additional prairie dogs will not be permitted. If the population is removed for any reason (natural or management based), it will become a NPD and will not be permitted to be repopulated through relocation or natural immigration.

Annual monitoring of prairie dogs within this area is recommended to ensure the earliest identification of any excessive damage within prairie dog areas or emerging neighboring landowner conflicts. The following is a list of parameters by which the Town will manage the colony.

1. **Acreage:** The prairie dogs are permitted on a maximum acreage of 4.5 acres defined by Figure 26. This will ensure that the prairie dogs have minimal chance of entering the Indiana Street East Drainage and damaging the wetlands and riparian area or entering the McCaslin Boulevard Right-of-Way and damaging the landscaping.
2. **Density:** The prairie dogs will be managed < 10 adult prairie dogs per acre. This will help to ensure less impact to the vegetation and soil.
3. **Vegetation:** Noxious weeds are an absolute minimum (< 10 percent as determined through ocular estimation as described in Roe and Roe (2003)).
4. **Bare Soil/Erosion:** Bare soil must be < 40 percent at any time of the year and no visible signs of soil erosion (including, but not limited to cracks, sheeting of soil and water during rain events, or undercutting).

In the event that any of the above parameters are violated, population control or complete removal should be implemented depending on severity of violation and habitat degradation. Revegetation and erosion control structures should be implemented as necessary.

Interpretive Opportunity

To maximize visitor enjoyment and educational opportunities (given the property's designation as a PEA), an interpretive sign or a kiosk should be developed in the park on the northeast corner of the drainage. The sign or kiosk would inform visitors of the local geography of the region, area wildlife, and other valuable information concerning the conservation and management of prairie dogs in the region.

Figure 26. Aerial photograph showing the furthest allowable extent of the prairie dog colony in the Indiana Street West Drainage.

Positive aspects of the PEA designation for this parcel are:

1. Area residents and visitors to the parcel have an opportunity to view prairie dogs in close proximity;
2. Prairie dog habitat and viewing opportunity (including bird watching, amphibian encounters, etc.) will enhance and maintain biodiversity and help the Town reach its goal of becoming certified with the National Wildlife Federation's Backyard Wildlife Habitat Program; and
3. Provide an opportunity to inform the public, through the development of an interpretive sign or kiosk, about prairie dogs and the shortgrass prairie ecosystem within the Town and across the region.

Negative aspects of the PEA designation for this parcel are:

1. Annual financial expenditures may be necessary to provide for monitoring and periodic management activities;
2. Prairie dogs may adversely affect neighboring private lands; and
3. Prairie dogs will moderately easily be able to immigrate to the Indiana Street East Drainage and/or McCaslin Boulevard Right-of-Way where they could cause significant damage to those resources.

5.3.5. INDIANA STREET EAST DRAINAGE

Land Use Designation: NPD

Management Required: Monitoring and prompt removal of any immigrant prairie dogs

The land use designation of NPD chosen for this property acknowledges the importance of wetland/riparian preservation and enhancement to the local community and the region, and the valuable and highly sensitive habitat for the Northern Leopard Frog. Any loss in any one of the habitat needs of the frog could result in its loss in the drainage. The mere presence of this frog within the Town is commendable and demonstrates the Town's dedication toward maintaining biodiversity and valuable wildlife habitat.

5.3.6. CEMETERY

Land Use Designation: NPD

Management Required: Monitoring and prompt removal of any immigrant prairie dogs

The land use designation of NPD chosen for this parcel acknowledges the historical importance of the cemetery to the local community and the region. Given that a very substantial exclosure is already in place, future removal costs and numbers of prairie dogs is expected to be minimal.

Positive aspect of the NPD designation for this parcel is:

Negative impacts by prairie dogs to the cemetery and its historical gravesites are eliminated if prairie dogs are kept out of the cemetary.

Negative aspect of the NPD designation for this parcel is:

Annual financial expenditures may be necessary to provide for monitoring and periodic removal activities.

5.3.7. SUPERIOR WATER SUPPLY AND TREATMENT PLANT

Land Use Designation: NPD

Management Required: Monitoring and prompt removal of any immigrant prairie dogs

The land use designation of NPD chosen for this parcel acknowledges the incompatibility of the water supply and treatment plant with prairie dogs. There are no prairie dogs to be removed at this time, but monitoring should occur with prairie dogs removed should they immigrate onto the parcel.

Positive aspect of the NPD designation for this parcel is:

Removing the prairie dogs as they immigrate to the site eliminates potential negative impacts to the Town's water supply and wastewater treatment plant.

Negative aspect of the NPD designation for this parcel is:

Annual financial expenditures may be necessary to provide for monitoring and periodic removal activities.

5.3.8. OLD RAILROAD BED

Land Use Designation: NPD

Management Required: Complete removal of all prairie dogs from the parcel; installation of a movement barrier; monitoring; and prompt removal of any immigrant prairie dogs

The land use designation of NPD chosen for this parcel acknowledges the incompatibility of the old railroad bed with prairie dogs and attempts to reduce the amount of immigration from the open space to the south onto both the old railroad bed and the adjacent private property to the north. In addition to removing prairie dogs from the old railroad bed, a movement barrier will be erected on at least the south side of the old railroad bed.

Positive aspect of the NPD designation for this parcel is:

Negative impacts by prairie dogs to the old railroad bed and adjacent private property are eliminated or at least reduced if immigration is reduced from the open space parcel and prairie dogs are removed in a prompt manner from the old railroad bed.

Negative aspects of the NPD designation for this parcel are:

1. The removal of prairie dogs from this property will require a financial expenditure from the Town of Superior; and
2. The movement barrier will stop the majority of movement onto the old railroad bed and private property to the north; however, the barrier may require maintenance (periodic expenditure) and the prairie dogs that breach the barrier will have to be removed in as timely a manner as possible (periodic expenditure).

5.3.9. TOWN 9

Current Land Use Designation: UCA

Current Management Required: None

Prairie dogs on the parcel are not negatively impacting any private property, are not causing erosion which could damage another resource, and the noxious weed level is moderate. Therefore, at this time no active population management is required at this time. Noxious weeds will be monitored and either prairie dog or noxious weed control implemented if it is determined that the noxious weeds are negatively impacting any adjacent private land.

After Park Development Land Use Designation: NPD

After Park Development Management Required: Complete removal of all prairie dogs before any park development; installation of a movement barrier; and monitoring and prompt removal of any immigrant prairie dogs

Prairie dogs will be completely removed from the parcel before any development activities begin to ensure that no prairie dogs will be inhumanely harmed during the dirt movement and/or construction. The land use designation of NPD chosen for this parcel after park development acknowledges that a Town 9 is incompatible with prairie dogs. In addition, during park development, a movement barrier will be erected on all sides (currently south and east), which are across the road from active prairie dog colonies. The narrow roads themselves will not prevent prairie dogs from immigrating onto the Town 9 parcel.

Positive aspect of the NPD designation for this parcel is:

1. Negative impacts by prairie dogs to the landscaping are eliminated if prairie dogs are kept off of the park; and
2. Health concerns regarding children and pets in and around active prairie dog burrows within the park are eliminated.

Negative aspect of the NPD designation for this parcel is:

Annual financial expenditures may be necessary to provide for monitoring and periodic removal activities.

5.3.10. SUPERIOR MARKETPLACE LANDSCAPING

Land Use Designation: NPD

Management Required: Monitoring and Prompt Removal of any Immigrant Prairie Dogs

The land use designation of NPD chosen for this parcel acknowledges the incompatibility of landscaping with prairie dogs. There are no prairie dogs to be removed at this time, but monitoring should occur with prairie dogs removed should they immigrate onto the parcel.

Positive aspect of the NPD designation for this parcel is:

Negative impacts by prairie dogs to the landscaping are eliminated if prairie dogs are removed.

Negative aspect of the NPD designation for this parcel is:

Annual financial expenditures may be necessary to provide for monitoring and periodic removal activities.

5.3.11. MCCASLIN BOULEVARD RIGHT-OF-WAY

Land Use Designation: NPD

Management Required: Monitoring and Prompt Removal of any Immigrant Prairie Dogs

The land use designation of NPD chosen for this parcel acknowledges the incompatibility of landscaping with prairie dogs. There are no prairie dogs to be removed at this time, but monitoring should occur with prairie dogs removed should they immigrate onto the parcel.

Positive aspect of the NPD designation for this parcel is:

Negative impacts by prairie dogs to the landscaping are eliminated if prairie dogs are removed.

Negative aspect of the NPD designation for this parcel is:

Annual financial expenditures may be necessary to provide for monitoring and periodic removal activities.

5.4. PRIORITY MATRIX

The Priority Matrix (Table 2) provides an order for management priorities to guide future budgeting and personnel needs. The order is based on the level of negative impact the existing prairie dog colony is currently having on the parcel with the primary focus being on ecological or environmental factors.

Priority	Parcel	Soil Erosion and/or Sedimentation	Noxious Weeds	Private Property Damage	Known Associated Prairie Wildlife	Vital Riparian/ Wetland Habitat
1	Tributary RB-3 / Community Pond East	Y	Y	Possible in Future	1 0 Dependent	Y
2	Tributary RB-3 / Community Pond West	Y	Y	Possible in Future	1 0 Dependent	Y
3	Wastewater Treatment Plant East Storage	Y	Y	Possible in Future	2 0 Dependent	Y
4	Weinstein Wetland	Y	Y	N	N	Y
5	Cemetery	N	N	Y - HIGH	1 0 Dependent	N
6	Old railroad bed	N	Possible in Future	Y	N	N
Depends on Schedule	Proposed Town Park	N	Y	N	N	N
Monitor	Indiana Street West Drainage	Possible in Future	Possible in Future	Possible in Future	N	N
Monitor	Superior Water Supply and Treatment Plant	N	N	Possible in Future	N	N
Monitor	Indiana Street East Drainage	N	N	N	N	Y
Monitor	Superior Marketplace Landscaping	N	N	Y	N	N
Monitor	McCaslin Boulevard Right-of-Way	N	N	Possible in Future	N	N

Table 2. Priority matrix showing management priority for each parcel based on the level of negative impact the existing prairie dog colony is currently having on the parcel with the primary focus being on ecological or environmental factors.

6. Prairie Dog Monitoring & Removal Methodology

6.1. Monitoring

Annual population estimates give Town of Superior personnel the ability to evaluate the need for population control activities on a yearly basis. Qualified Town personnel or wildlife biologists knowledgeable in urban prairie dog population surveys will be responsible for the estimates. Surveys will be conducted each fall to ensure consistency. In years that population management activities are deemed necessary, control activities, when possible, will be conducted the following winter/spring (before the birthing season).

6.2. Human Control vs. Natural Predation

All of the Town parcels are small and relatively isolated within a highly urbanized environment. In the case of the need for population control or thinning, natural predation is unlikely to regulate prairie dog numbers. Likewise, habitat fragmentation, urbanization, and incompatible land use around the parcels have precluded prairie dogs from successfully expanding outward as numbers increased beyond vegetative and social carrying capacities. As a result, the populations have expanded beyond ecologically balanced densities. Often expansion of this sort results in increased levels of:

1. Bare soil and erosion;
2. Exotic and noxious weed diversity and abundance;
3. Potential for disease;
4. Territorial conflicts between individual prairie dogs;
5. Infanticide (prairie dogs themselves kill the young of the year); and
6. Human / prairie dog conflicts (prairie dogs in nearby backyards).

In instances where natural population control is ineffective in regulating prairie dog numbers within acceptable limits or within parcel objective, human induced control and removal methods should be employed.

6.3. Acceptable Removal Activities

In cases where prairie dogs need to be controlled (thinned or completely removed from a parcel or portion thereof), the following activities are presented below in order of preference on Town-owned properties:

1. Live, wild-to-wild relocation of the animal(s) if the following are satisfied:
    a. In cases where ≥ 60 prairie dogs are in need of removal, a suitable relocation site must be available that:
        1) Does not violate any other land use or wildlife objectives;
        2) Follows the latest scientifically accepted habitat suitability guidelines (currently Roe and Roe 2003);
        3) Can be promptly identified at the time of need without delay to the project; and
        4) Allows a Colorado Division of Wildlife and FDA relocation permit to be readily obtained without unreasonable delay.
    b. In cases where 11 – 59 prairie dogs are in need of removal, a suitable relocation site must be available that:
        1) Currently harbors an existing prairie dog population which is below site carrying capacity;
        2) Does not violate any other land use or wildlife objectives;
        3) Follows the latest scientifically accepted habitat suitability guidelines (currently Roe and Roe 2003);
        4) Can be promptly identified at the time of need without delay to the project; and
        5) Allows a Colorado Division of Wildlife and FDA relocation permit to be readily obtained without unreasonable delay.
2. Live removal and donation of the animal(s) to wildlife research or rehabilitation centers (such as black-footed ferret or raptor centers) is permitted if a suitable relocation site is not available.
3. Fumigation may be utilized for ≤ 10 prairie dogs if live removal and relocation or donation is not possible and/or this number remains after a good faith effort to remove the majority of prairie dogs from the property has been conducted.

6.4. LIVE REMOVAL TECHNIQUES

The live removal must be conducted via aboveground, humane, cage-type live traps. Flushing and vacuum extraction techniques include an unnecessary risk to the prairie dogs and non-target wildlife. Therefore, flushing and vacuum extraction is not considered humane and will not be utilized on Town-owned properties.

6.5. FUMIGATION TECHNIQUES

Poison baits (zinc phosphide or strychnine) are not permitted on Town-owned parcels. Fumigation by gas cartridge, tablet, or pellet (carbon dioxide, aluminum phosphide, etc…) is permitted.

6.6. WILDLIFE IMPACT SURVEYS

Before any removal effort, a wildlife impact survey must be conducted. Wildlife impact surveys should utilize current wildlife survey methodology including, but not limited to, track stations, spotlight scans, scat and/or track transects, and daytime visual scans/observations depending on species being surveyed. These surveys will help the Town assess the risks to non-target species of wildlife that may be affected by control activities. Non-target species such as ground squirrels, rock squirrels, cottontail rabbits, skunks, amphibians, lizards, and other state protected animals may be negatively impacted by certain management activities and/or control methods. It is important to identify those species and work towards mitigating any impacts through live relocation, avoidance, or by obtaining the proper State or Federal take permits.

6.6.1. LIVE TRAPPING – POPULATION THINNING OPERATIONS

Live trapping during thinning operations (the prairie dog colony and the associated burrows generally remain) does not require any additional pre-capture monitoring or wildlife surveys to assess for non-target species impact prior to trapping other than those required to satisfy existing and/or future U.S. Fish and Wildlife Service or State of Colorado requirements for sensitive, threatened, or endangered species (such as burrowing owls).

6.6.2. LIVE TRAPPING – COMPLETE REMOVAL

Because other species of wildlife can often be found within prairie dog burrows, if the prairie dogs are all to be removed from a site and the burrows destroyed, a non-target species presence / absence survey must be conducted. If non-target species are identified, a mitigation plan should be developed including such options as relocation and/or ways to avoid negatively impacting those species.

6.6.3. FUMIGATION

Because other species of wildlife can often be found within prairie dog burrows, if any prairie dog burrows are to be fumigated, a non-target species presence/absence survey must be conducted. If non-target species are identified, a mitigation plan should be developed including such options as relocation and/or ways to avoid negatively impacting those species.

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APPENDIX A - CURRENT OPEN SPACE DEFINITIONS

Natural Open Space:

- Comprehensive Plan- Undeveloped land that is secured for the protection of habitat for native animals and plants, for limited recreational use, and for the preservation of archeological and topographical significance. Three types of natural open space are:
    i. *Prairie*- flat or rolling tracts of land dominated by a variety of grasses and inhabited by numerous species of animals.
    ii. *Aquatic*- lakes, streams, ponds and wetlands providing habitat for a variety of plants and animals living in water or at the water's edge.
    iii. *Riparian*- land occurring along streams or ditches characterized by a variety of plant life, providing habitat, migratory corridors, and nesting and breeding sites for birds and mammals.

* *Natural buffers can consist of prairie, aquatic or riparian open space.*

- Land Use Code- Undeveloped land that is identified for the protection of habitat for native animals and plants, for limited recreational use and for the preservation of archeological and topographical significance. Three types of natural open space are defined below.
    i. *Prairie*- flat or rolling tracts of land providing habitat vital to a variety of grasses and numerous species of animals.
    ii. *Aquatic*- lakes streams, ponds and wetlands providing habitat for a variety of plants and animals living in water or at the water's edge.
    iii. *Riparian*- land occurring along streams or ditches characterized by a variety of plant life, providing habitat, migratory corridors and nesting and breeding sites for birds and animals.

Developed Open Space:

- Comprehensive Plan- Developed lands that can be used for any or all of the following purposes:
    i. *Parks*- public recreational areas that can include playgrounds, ball fields, rinks, picnic areas, etc.
    ii. *Landscaping around buildings or structures*- trees, shrubs, flowers, streams, and ponds that surround commercial, residential or public areas; urban shaping between or around municipalities or community service areas, and buffer zones between residential and nonresidential development. In these areas, indigenous and xeric landscape materials and

nursery stock are recommended, which provide food, shelter and nesting place for wildlife.

iii. *Trails*- constructed pathways for recreational use.

iv. *Berms*- large or small mounds of earth that may be landscaped to help alleviate site, sound and air pollution, as well as to create new habitat for birds and animals.

**Developed buffers can be greenbelts consisting of parks, landscape, trails or berms.*

- Land Use Code- Developed land that can be used for any or all of the following purposes:
    i. *Parks*- public recreational areas that can include playgrounds, ball fields, rinks, picnic areas and other similar uses.
    ii. *Landscaping around buildings or structures*- trees, shrubs, flowers, manmade streams and ponds that surround commercial, residential or public areas; urban shaping between or around municipalities or community service areas and buffer zones between residential and nonresidential development. In these areas, indigenous and xeric (low water use, drought-tolerant) landscape materials and nursery stock are recommended, which provide food nesting places for wildlife.
    iii. *Trials*- manmade pathways for recreational use.
    iv. *Berms*- large or small mounds of earth that may be landscaped to help alleviate visual, sound and air pollution, as well as to create new habitat for birds and animals.

Greenways:

Effectively tie park system and/or natural open space components together to form a continuous park and/or natural open space environment.

APPENDIX B - SOILS DEFINITIONS

Obtained from Price and Amen (1980)

HeB — **Heldt clay**
The slopes associated with this soil are 0 to 3 percent. This soil type has slow permeability and available water capacity is high. Runoff is medium to rapid and the erosion hazard is moderate. Typically this soil is used for cropland (irrigated and dryland) and pasture.

KuD — **Kutch clay loam**
This soil is moderately deep and well drained. Cobble or large rocks are often found on the surface. The slopes associated with this soil type are 3 to 9 percent. Runoff is rapid and the erosion hazard is high on this soil. Typically this soil is used for cropland (irrigated and dryland) and native pasture.

NdD — **Nederland very cobbly sandy loam**
This soil has many stones and cobble on the surface. Runoff is slow to medium and the erosion hazard is slight. Typically this soil is used for range or pasture.

NuB, NuC, and NuD — **Nunn clay loam**
This soil is deep and well drained. Cobble, large rocks, or gravel may be found on the surface. The slopes associated with this soil type are 1 to 9 percent. Runoff is slow to rapid depending on slope. Similarly, the erosion hazard is slight to extreme depending on slope. Permeability is slow to moderately slow. Typically this soil is used for cropland (irrigated and dryland) and native pasture.

SeE — **Samsil- Shingle complex**
The complex consists of about 40 percent Samsil clay and 40 percent Shingle soils. The slopes are 5 to 25 percent. The soils of this complex have slow to moderate permeability, available water capacity is low, runoff is rapid, and the erosion hazard is high.

Te — **Terrace escarpments**
This area has undifferentiated shallow soils with many cobbles and stones on the surface. Runoff is rapid, erosion hazard is high, and only limited moisture is available for plants because of the shallow soil.

VaB and VaC — **Valmont clay loam**
The soil profile includes about nine inches of clay loam at the surface and 6 inches of clay subsoil. Runoff is medium, erosion hazard is moderate, and fertility is medium. Typically this soil is used for cropland (irrigated and dryland) and native pasture.

VcC and VcE — **Valmont cobbly clay loam**
Valmont cobbly clay loam comprises the majority of the Mayhoffer Open Space (west of the Town). The soil profile is very cobbly (surface is about eight inches of cobbly clay loam, the subsoil is about 14 inches of cobbly clay loam or cobbly clay). Runoff is medium and the erosion hazard is slight to moderate.

APPENDIX C - PUBLISHED HABITAT SELECTION GUIDELINES FOR BLACK-TAILED PRAIRIE DOGS

Roe K.A. and C.M. Roe. 2003. Habitat selection guidelines for black-tailed prairie dog relocations. Wildlife Society Bulletin 31(4): 1246-1253.

From the Field

Habitat selection guidelines for black-tailed prairie dog relocations

Kelly A. Roe and Christopher M. Roe

Abstract In 1998, 2 petitions to list the black-tailed prairie dog (*Cynomys ludovicianus*) as threatened under the Endangered Species Act of 1973 were submitted to the United States Fish and Wildlife Service. The 12-month finding was that the black-tailed prairie dog was warranted but precluded for listing. In order to meet or maintain minimum conservation standards set forth in the Conservation Assessment and Strategy and the Multi-State Conservation Plan, which were developed in an effort to promote conservation and avoid the listing of the black-tailed prairie dog, some states may need to conduct live relocations. By conducting relocation efforts under the guidance of recent scientific information and best management practices, wildlife and range managers will be able to maximize retention, decrease impacts to the habitat and to other species of wildlife, minimize potential negative impacts to adjacent landowners, and increase tolerance among the public and the agricultural industry. Soil, vegetation, slope, elevation, previous use of the relocation site by prairie dogs, proximity of the site to existing prairie dogs, proximity of the site to neighboring properties, and natural dispersal barriers are important factors to consider when evaluating the suitability of a relocation site.

Key words black-tailed prairie dog, *Cynomys ludovicianus*, habitat selection, habitat suitability, relocation

In 1998, 2 petitions to list the black-tailed prairie dog (*Cynomys ludovicianus*) as threatened under the Endangered Species Act of 1973, as amended (ESA), were received by the United States Fish and Wildlife Service (USFWS) (USFWS 1999). These petitions listed several factors as major threats to the long-term viability and conservation of this species. The threats included habitat loss, habitat fragmentation, disease, and unregulated shooting and poisoning. The USFWS's 12-month finding was that the black-tailed prairie dog was warranted but precluded for listing under the ESA (USFWS 2000). As a result, the black-tailed prairie dog rose to the forefront of conservation initiatives in those states that make up its historical range.

The challenge to state and regional conservation efforts is that the black-tailed prairie dog can be one of the most controversial species of wildlife to manage. Populations of prairie dogs in rural portions of its range often influence the life-cycles of other species of wildlife; however, they are often viewed as "destructive rodent pests" by

agricultural and livestock producers. On the other end of the spectrum, prairie dogs within urban areas often serve limited ecological roles in many cases, but can have tremendous social value as valuable watchable-wildlife resources for urban residents.

In order to meet or maintain minimum conservation standards set forth in the Conservation Assessment and Strategy (Van Pelt 1999) and the Multi-State Conservation Plan (Luce 2003), which were developed to promote conservation and avoid the listing of the black-tailed prairie dog, some states may need to conduct live relocations. The purpose of relocation may be to ensure no net loss of prairie dog acreage in the face of development or agricultural activities, or to re-establish prairie dogs in areas where they were extirpated. By conducting relocation efforts under the guidance of recent scientific information and best management practices, wildlife and range managers will be able to maximize retention, decrease impacts to the habitat and other species of wildlife, minimize potential negative impacts to adjacent landowners, and increase tolerance by the public and agricultural industry.

Determination of habitat-suitability guidelines

Soil, vegetation, slope, elevation, previous use of the relocation site by prairie dogs, proximity of the site to existing prairie dogs, proximity of the site to neighboring properties, and natural dispersal barriers are important factors to consider when evaluating the suitability of a relocation site. Attention to these factors will help to ensure the overall success of a relocation effort. Success can be measured by the percentage of relocated prairie dogs that are retained on the site.

Currently, no comprehensive science-based habitat-selection guidelines exist to guide prairie dog relocation efforts. Therefore, we created these guidelines, based on current science and experience gained from prairie dog relocation efforts, in order to encourage consistent and science-based evaluation of suitable habitat for relocation efforts (Table 1). These guidelines represent the best information currently available, and provide the most comprehensive and straightforward approach for determining, and scientifically justifying, habitat and relocation-site suitability for prairie dog relocation efforts.

Soils

Soil type is extremely important to the success or failure of a relocation effort. Relocations attempted on soil types that are not conducive to burrowing and the development of burrow systems will not support prairie dogs and will not result in a successful relocation effort. Research indicates that sand and rocky or gravely soils are not acceptable for burrows (Sheets et al. 1971, Lewis et al. 1979, Turner 1979, Reading and Matchett 1997). Research on American badgers (*Taxidea taxus*), a species that can be closely associated with prairie dogs, indicated that soil types influenced the ability of both badgers and their prey to burrow (Apps et al. 2002). Fine sandy loams with little gravel and good drainage have been suggested as optimal conditions for burrows (Hoff 1998, Apps et al. 2002). Apps et al. (2002) reported that burrows higher in silt and clay may become highly saturated and collapse when wet. Gravelly soils can also be prone to collapse, even when dry, and high gravel content can also impair the ability of burrowing animals to dig (Apps et al. 2002). Treviño-Villarreal et al. (1997) found that the majority of colonies of Mexican prairie dogs (*Cynomys mexicanus*) studied were found on silt loam soils low in clay (generally <30%), medium in sand (~50%), and medium to high in silt (>70%). There was no gravel in any of the soil samples on these active colonies. Both Treviño-Villarreal et al. (1997) and King (1955) found that Mexican and black-tailed prairie dogs conducted exploratory diggings in rocky ground or loose soils; however, these were not favorable or preferred sites and should be avoided when selecting release sites.

In Boulder County, Colorado, several relocation attempts on soils classified as Valmont cobbly clay loam (Moreland and Moreland 1975) failed completely, or had extremely low retention rates despite the installation of artificial underground burrow structures (Boulder County Staff 2002). Boulder County believed that the soils were a factor in the failure of these relocations. Prairie dogs released onto areas of unsuitable soil structure are likely to disperse away from the relocation site, are likely to experience elevated risks of predation, and may disperse onto adjacent lands of higher quality. This dispersal may or may not be desirable, depending on neighboring land uses and landowner attitudes toward prairie dogs.

Soils on relocation sites should also be deep enough to allow protection from predators and

Table 1. Habitat-suitability guidelines for black-tailed prairie dogs used in determination of suitable relocation sites, attributes to which each guideline applies, and publications used to develop the suitability guidelines.

Suitability guidelines	Attributes: Habitat characteristic	Attributes: Praire dog biology and behavior	Attributes: Social and political characteristics	Source
1. The relocation site should have <40% bare soil.	X	X	X	
2. Sand and rocky or gravely soils (which includes particles ≤8 cm in diameter) are not acceptable for burrows.	X			Sheets et al. 1971, Dalsted et al. 1981, Reading and Matchett 1997, Apps et al. 2002
3. Release site soils should be loamy with little to no gravel, low in clay (<30%), medium in sand (~50%), and medium to high in silt (>70%) with good drainage.	X			Treviño-Villarreal et al. 1997, Apps et al. 2002
4. Soil should be ≥2.0 m deep.	X			Turner 1979, Dalsted et al. 1981, Coffeen and Pederson 1989, Hoogland 1995
5. Vegetation should be <30 cm high.	X	X		Turner 1979, Clippinger 1989, Fitzgerald et al. 1994, Hoogland 1995
6. Vegetation should be >25% total productive (is or will grow during its appropriate growing season) suitable vegetative cover relative to total basal cover.	X	X		Clippinger 1989
Slope should be <20% and preferably ≤10%.	X	X		Tileston and Lechleitner 1966, Dalsted et al. 1981, Clippinger 1989, Truett et al. 2001
8. Elevation should be <1,700 m.	X			Hoogland 1995
9. Preexisting holes are preferred sites.	X	X		Jacquart et al. 1986, McDonald 1993, Truett et al. 2001
10. If a population was extirpated by plague, relocation should not occur on that site for ≥1 year from the date of the outbreak.	X			Lechleitner et al. 1968, Fitzgerald 1970, Cully et al. 1997
11. Because of their highly territorial nature, if prairie dogs are to be relocated to existing towns, they should be placed in unoccupied burrows around the periphery of the colony and generally ≥46 m and up to 185–277 m from any active coteries.	X			Coffeen and Pederson 1989, McDonald 1993, Boulder County Staff 2002
12. Prairie dogs should not be relocated into an existing colony if it will increase the total population above carrying capacity for the property.	X	X		
13. Relocated populations should not occur for densities greater than 40 prairie dogs per ha.	X	X		O'Meilia et al. 1982, Crosby and Graham 1986, Archer et al. 1987, Clippinger 1989
14. There should be an approximately 1-mile distance between the relocation site and adjacent private property, or a structural barrier erected between the release site and private land.		X	X	Coffeen and Pederson 1989, U.S. Fish and Wildlife Service 1991

temperature extremes in winter and summer (Turner 1979, Dalsted et al. 1981). Hoogland (1995) reported that the average depth of prairie dog nest chambers was approximately 2.0 m. The average depth of frost layers along the Front Range and eastern Colorado is approximately 0.9 m; however, this depth may vary across the prairie dog's range. In addition, prairie dogs must be able to establish burrows above water tables and any bedrock or caliche layers. For example, Boulder County Staff (2002) recommend a minimum of approximately 2.4 m of suitable soil above the water table in the Boulder, Colorado area, and Coffeen and Pederson (1989) recommend at least 1.2 m of suitable soil over a caliche layer.

Vegetation height

Black-tailed prairie dogs prefer habitats with vegetation shorter than 30 cm, which they will often clip to enhance visibility of the landscape (Clippinger 1989, Coffeen and Pederson 1989, Fitzgerald et al. 1994, Hoogland 1995). On sites dominated by typical shortgrass prairie grasses, vegetation height may not be important due to the small stature of these grasses. However, on sites with mixed vegetation (including forbs, grasses, and shrubs), average vegetative height may be an important factor in the success of the relocation effort. In moist, highly productive years on mid- and mixed-grass grasslands, it is often necessary to mow the vegetation height to <25–30 cm before the relocation effort.

Suitable vegetative cover

We define suitable vegetative cover as the amount of quality forage on a site, whereas total canopy cover includes all of the vegetation on the site. Total canopy cover within prairie dog colonies generally ranges from 25–91%, depending on the grassland type and region in which the prairie dogs are located (Clippinger 1989). For example, vegetative cover measurements from short-grass prairie grasslands in northern Colorado ranged from 58–70% (Clippinger 1989). In contrast, suitable vegetative cover does not include dead vegetative matter, plants that are not likely to grow during that growing season (due to drought or other stress), or plants that the prairie dogs will not eat or will generally avoid (Table 2).

Table 2. Vegetation preferred by prairie dogs; many of these plants show moderate to high grazing tolerance and at least some nutritional benefit to wildlife, particularly prairie dogs.

Plant name	Season	Grazing tolerance	Forage value	Source
Western wheatgrass (*Pascopyrum smithii*)	Cool [a]	Moderate [b]	Good spring and winter forage [a]	Koford 1958, Tileston and Lechleitner 1966, Summers and Linder 1978, Fagerstone 1979
Blue grama (*Bouteloua gracilis*)	Warm [a]	High [a]	Good year round [a]	Koford 1958, Tileston and Lechleitner1966, Summers and Linder 1978, Fagerstone 1979
Buffalograss (*Buchloe dactyloides*)	Warm [a]	High [a]	Good year round [a]	Koford 1958, Tileston and Lechleitner1966, Summers and Linder, 1978, Fagerstone 1979
Sand dropseed (*Sporobolus cryptandrus*)	Warm [a]	High [a]	Fair to good [a]	Clippinger 1989
Cheatgrass (*Bromus tectorum*)	Cool [a]	High [a]	Fair to good [a]	Clippinger 1989
Sixweeks fescue (*Vulpia octoflora*)	Cool [a]	High—indicator of heavy grazing [a]	Good in early spring [a]	Clippinger 1989
Ring muhly (*Muhlenbergia torreyi*)	Warm [a]	High—indicator of poor rangeland [a]	Fair to good particularly in the spring [a]	Clippinger 1989
Sedges (*Carex* spp.)	Cool [a]		Fair to good particularly in the fall [a]	Uresk 1984
Scarlet globemallow (*Sphaeralcea coccinea*)	Warm [a]	High—increases with overgrazing [a]	Fair to excellent [a]	Clippinger 1989, Boulder County Staff 2002
Plains prickly pear (*Opuntia polyacantha*)		High—increases with overgrazing [c]		Koford 1958, Bonham and Lerwick 1976, Summers and Linder 1978, Fagerstone et al. 1981

[a] Stubbendieck et al. (1997).
[b] Everson (1966).
[c] Ross and Hunter (1976).

Prairie dogs typically avoid 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*) (Koford 1958, Hansen and Gold 1977, Summers and Linder 1978, Fagerstone 1979).

How to measure percent suitable vegetative cover. Percent suitable vegetative cover can be measured using a number of methods. For the purposes of these guidelines, we recommend that measurement be done using circular plots with ocular estimation. The only equipment needed for this method is a circle to delineate sample plots (e.g., a hula-hoop approximately 1.0 m in diameter, with a string approximately 0.5 m in length used as the radius of the circle).

Randomly distribute 10 1.0-m circular plots within each acre (0.407 hectares) of the overall relocation area. Measure and document the percentage of basal cover (i.e., the area of all of the viable plants in the circle at or near the ground surface) relative to the entire circular plot (100% – percentage of basal cover = percentage of bare soil). Next, measure and document the percentage of each type of vegetation (grass vs. forb vs. shrub) relative to the percentage of basal cover. Finally, measure and document the percentage of each type of suitable vegetation relative to the percentage of basal cover including cool-season grasses, warm-season grasses, and forbs. Include only those plants outlined in Table 2 unless it can be scientifically documented that additional vegetation is palatable, high in nutritive content, tolerant to grazing, and utilized by prairie dogs. The equation for percent suitable vegetative cover is:

Percent suitable vegetative cover =
Average percentage of suitable cool-season grasses across all plots
+ Average percentage of suitable warm-season grasses across all plots
+ Average percentage of suitable forbs across all plots

Slope

Black-tailed prairie dogs generally prefer slopes <10% (Koford 1958, Tileston and Lechleitner 1966, Dalsted et al. 1981, Clippinger 1989). While prairie dogs may inhabit slopes >20%, relocations and natural establishment on those areas should be discouraged in an effort to decrease soil erosion. One can ascertain slope from a clinometer or high-resolution topographic map.

Abandoned pre-existing burrow systems

Sites that show historical use by prairie dogs are preferred, especially if they contain abandoned and structurally sound natural burrows. According to Jacquart et al. (1986), and our experience, these pre-existing holes minimize dispersal of recently relocated prairie dogs. In addition, if pre-existing holes exist, there is a greater likelihood of suitable soils and vegetation (Truett et al. 2001). These holes may also provide adequate refugia from predators (Jacquart et al. 1986, McDonald 1993). One should not conduct a relocation on sites with natural, pre-existing burrows where prairie dogs were extirpated by plague for a minimum of one year from the date of the outbreak. Fleas (order Siphonaptera) infected with plague have been recovered from prairie dog burrows 3 months to 1 year after disappearance of the last prairie dog (Lechleitner et al. 1968, Fitzgerald 1970, Cully et al. 1997). If plague is not a potential problem, sites with pre-existing burrow systems are preferred over all other sites if other requirements are within acceptable levels.

If the site does not contain abandoned natural burrows, artificial systems should be installed to mimic natural burrows. These systems should include an underground nest chamber, a tunnel leading from the chamber to the surface, and a temporary above-ground retention structure to allow the prairie dogs to become acclimated to the site before final release (Truett et al. 2001). These structures are much more effective than augured holes. Prairie dogs released into augured holes seldom if ever stay in that location and utilize the augured holes regardless of whether or not above-ground retention structures were used (Lewis et al. 1979, Turner 1979, Jacquart et al. 1986, Truett and Savage 1998, Truett et al. 2001).

Proximity of existing prairie dogs

Black-tailed prairie dogs are highly social and territorial animals (Clippinger 1989, Hoogland 1995). Thus, evaluations of proposed relocation sites should take into account the presence or absence of existing prairie dog colonies at the site, the overall condition of the existing colony(ies), and the size or proportion of the existing population in relation to

the overall property and proposed relocation area. All of these factors may influence the suitability of the relocation site (Coffeen and Pederson 1989, McDonald 1993, Boulder County Staff 2002).

When relocating prairie dogs to existing towns, the animals should be placed in unoccupied burrows around the periphery of the colony (Coffeen and Pederson 1989, McDonald 1993). In addition, one should not release prairie dogs closer than approximately 46 m from any active coterie(s) (Boulder County Staff 2002) and should be monitored for aggressive interactions. Coffeen and Pederson (1989) suggest that if the pre-existing prairie dogs are highly aggressive toward the relocated prairie dogs, or if there are no unoccupied burrows, then the relocation site should be situated at least 185–277 m away from occupied areas. This distance is typically far enough to minimize territorial disputes between introduced and resident animals and yet close enough to provide the comfort of social grouping that black-tailed prairie dogs prefer.

Neighboring landowner concerns

Because of the controversial nature of prairie dog conservation and relocation efforts, extreme caution should be given when identifying potential relocation sites in proximity to adjacent private lands. Under natural dispersal conditions, prairie dogs can travel as far as 5.5 km, with an average distance of roughly 2.5 km (Garrett and Franklin 1988). After a relocation effort, prairie dogs can disperse several hundred meters or more away from the release site (C. M. Roe, Roe Ecological Services, LLC, unpublished data). Therefore, consideration should be given to the likelihood and ability of prairie dogs to disperse onto neighboring lands, and steps should be taken to minimize dispersal. The likelihood of dispersal often increases with the presence of an existing colony on the neighboring property, high-quality habitat (particularly if it is of higher quality than the relocation site), and ease of dispersal made possible by gentle topography, good visibility, and short distance. It has been suggested that in order to reduce the potential for neighboring landowner conflicts and concerns, relocation sites should be ≥1.6 km from neighboring properties (Coffeen and Pederson 1989, USFWS 1991).

If the distance is <1.6 km, a barrier should exist between the relocation site and the private land for at least the full extent of the entire relocation area. Preferred barriers are natural in function and appearance, such as tall, dense vegetation (Truett and Savage 1998), or topographical features that will either reduce the visibility or physically inhibit the dispersal between the introduced and resident populations (e.g., a steep rock face). However, if no natural barrier exists, artificial barriers can be constructed out of materials such as vinyl or wood to restrict visibility and movement. Because of a prairie dog's relatively low stature, visual barriers as short as 60 cm can be effective in reducing prairie dog dispersal into an area or beyond (Crosby and Graham 1986, Truett and Savage 1998, Boulder County Staff 2002).

Conclusion

Black-tailed prairie dog conservation efforts in the future may require the use of live relocations to meet conservation objectives in certain parts of the prairie dog's former range. Although still controversial and often highly contentious, properly conducted relocations on suitable habitats can be highly successful. When assessing the overall suitability of an area for a potential relocation effort, wildlife and natural resource managers should consider all the factors that affect the success of a relocation effort. These factors include, at a minimum, the biological needs of the prairie dog, consideration of the grassland habitat to which the prairie dogs are relocated, landowner concerns regarding the relocation, and how prairie dog behavior can affect all of the above. The development of these guidelines may help wildlife and natural resource managers conduct more scientifically defensible, and ultimately more successful and publicly acceptable, prairie dog relocations in the future. Under comprehensive science-based guidelines, prairie dog relocations may be a valuable tool for states to use in efforts to keep the black-tailed prairie dog from being listed under the Endangered Species Act.

Acknowledgments. We wish to thank Ray Sterner of the National Wildlife Research Center and the reviewers for the *Bulletin* for their excellent comments and editing assistance.

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Kelly A. Roe (left) received her B.S. in wildlife biology from Colorado State University in 1999. She is a senior wildlife biologist with Roe Ecological Services, LLC. A sizable portion of Kelly's time over the past four years has been focused on black-tailed prairie dog management, including physical prairie dog management activities such as live relocations, and experimental and observational studies regarding population estimation, coterie integrity post-relocation, and improvements to modern prairie dog relocation methodology. ***Christopher M. Roe*** (right) received his B.S. in wildlife biology from Colorado State University in 1999. He is also a senior wildlife biologist with Roe Ecological Services, LLC. Chris's experience and commitment to incorporating sound biological information to prairie dog management practices, and his professional reputation of providing the most appropriate management recommendations and actions to each project, earned him a place on the Colorado Grasslands Species Conservation Working Group.

APPENDIX D – REGIONAL CONSERVATION SITES

Obtained from the Colorado Natural Heritage Program

Coal Creek at Rocky Flats:

The Coal Creek at Rocky Flats Conservation Site lies southwest of the Town and is approximately 311 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B3: High Biodiversity Significance. The primary element of significance for this site is the breeding population of Preble's meadow jumping mice found throughout the Coal Creek riparian corridor.

Colorado Tallgrass Prairie:

The Colorado Tallgrass Prairie Conservation Site lies northwest of the Town and is approximately 3,100 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B2: Very High Biodiversity Significance. The primary elements of significance for this Site are based on the tallgrass prairie habitat and, according to the Colorado Natural Heritage Program Site Report, a "good occurrence of a globally imperiled species;" in this case, Ute Ladies' Tresses (*Spiranthes diluvialis*). In addition to Ute Ladies' Tresses, American Groundnut (*Apios americana*) and the Preble's meadow jumping mouse make this site additionally important. The site's ecological value is further demonstrated by the fact that 269 acres of the area is designated as a State Natural Area.

Doudy Draw:

The Doudy Draw Conservation Site lies west of the Town and is approximately 1,200 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B3: High Biodiversity Significance. The primary elements of significance for this site not only include Preble's meadow jumping mice, but also occurrences of Ute Ladies' Tresses and Mottled Dusky Wing (*Erynnis martialis*). In addition to these highly important plant species of conservation concern, occurrences of Dwarf Wild Indigo (*Amorpha nana*) and Prairie Violet (*Viola pedatifida*) can also be found. All being rare to uncommon plant species within the State of Colorado, the Doudy Draw Site is one where long-term conservation should be viewed as highly important.

Marshall Mesa:

The Marshall Mesa Conservation Site lies west of the Town and is approximately 215 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B3: High Biodiversity Significance. The primary elements of significance for this site are associated with the mixed-grass prairie/shrub habitats and include the Mottled Dusky Wing, the Otto skipper (*Hesperia ottoe*), and the Arogos skipper (*Atrytone arogos*). All three are species of conservation concern both here in Colorado and globally. Similar to several other Conservation Sites, the grassland/shrubland areas are critical to these species survival in this area.

Rocky Flats:

The Rocky Flats Conservation Site lies to the southwest of the Town and is approximately 3,800 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B2: Very High Biodiversity Significance. The ecological elements of significance for this site are the Preble's meadow jumping mouse and the xeric tallgrass prairie. Within the tallgrass prairie and associated habitat sections, several insect and avian species of high conservation concern have been recorded. These include two species of rare and imperiled butterflies, the Argos skipper and Hops blue (*Celestrina* sp.), and at least six bird species. These birds include the Brewer's sparrow (*Spizella brewerii*), Ferruginous hawk (*Buteo regalis*), Grasshopper Sparrow (*Ammodramus savannarum*), lark bunting (*Calamospiza melanocorys*), Loggerhead shrike (*Lanius ludovicianus*), and MacGillivray's warbler (Opornis tolmiei). Preble's meadow jumping mouse occurrences are considered very good throughout the Rock Creek riparian corridor of this site. As such, it is one of several highly important large populations of this species in Colorado. Because of the rarity of remnant tallgrass prairie habitats in Colorado (and the important wildlife species associated with it) and the important population of Preble's meadow jumping mouse, this area is considered highly significant ecologically and one where long-term conservation is critically important.

Shanahan Grassland:

The Shanahan Grassland Conservation Site lies west of the Town of Superior and is approximately 1,600 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B3: High Biodiversity Significance. The primary elements of significance for this site include an important wet meadow plant community and two species of uncommon butterflies, the Otto skipper and the Arogos skipper. Similar to the Rocky Flats Conservation Site, the Shanahan Grassland Conservation Site contains highly important remnant mesic tallgrass prairie habitat. Because of the rarity of this habitat type in Colorado (and the important wildlife species associated with it) this area is considered highly significant ecologically and one where long-term conservation is critically important.

Standley North:

The Standley North Conservation Site lies south of the Town and is approximately 280 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B5: General Biodiversity Interest. While not ranking as high as other Conservation Sites, the area provides habitat that helps support nesting and wintering bald eagles (*Haliaeetus leucocephalus*).

Walnut Creek:

The Walnut Creek Conservation Site lies south of the Town and is approximately 550 acres in size. The Colorado Natural Heritage Program lists this site as having a Biodiversity Significance Ranking of B5: General Biodiversity Interest. While not ranking as high as other Conservation Sites, the area supports a large population of Preble's meadow jumping mouse as well as other small and large mammals and migratory songbirds that are typically associated with riparian habitats. The Walnut Creek Conservation Site is another area of importance within the Rocky Flats area and one that should be conserved.