FORT COLLINS NATURAL AREAS PROGRAM

WILDLIFE MANAGEMENT GUIDELINES

March 15, 2007

City of Fort Collins Natural Areas Program

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Natural Areas Wildlife Management Guidelines

March 15, 2007

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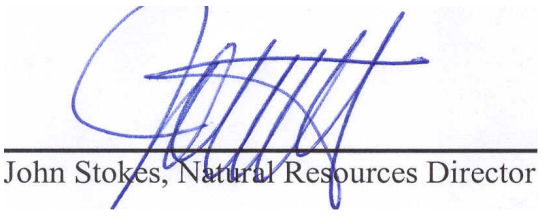
Memorandum of Adoption
The Natural Areas Wildlife Management Guidelines was administratively adopted by the Natural Resources Director on March 15, 2007.



John Stokes, Natural Resources Director

3/19/07
Date

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Executive Summary

Over the past decade, the City of Fort Collins Natural Areas Program has begun to manage a growing number of local and regional natural areas. In 2006 that acreage grew to more than 31,000 acres. These lands include relatively small, isolated natural areas within the urban setting, a collection of foothills sites just to the west of town, a series of natural areas along the Poudre River, and two large regional natural areas: Bobcat Ridge and Soapstone Prairie.

As the natural areas system has grown, so has the complexity of management issues. In turn, increasingly sophisticated management approaches are needed. Therefore, these wildlife management guidelines are intended to guide natural areas staff in the development and implementation of system-wide and site-specific wildlife management strategies that advance ecosystem health, reflect community values, and that are pragmatic and fiscally responsible.

This document provides wildlife management guidelines for City-managed natural areas in both the urban and rural setting, however, certain topics apply primarily to urban natural areas (ie. prairie dog management) while other issues are more relevant to the regional natural areas (ie. native species recovery). These guidelines apply only to lands managed by the Natural Areas Program. They do not apply to private lands, other City of Fort Collins managed lands, or conservation easements held by the Natural Areas Program. They also are superseded by federal and state wildlife law, as well as the Fort Collins Municipal and Land Use Code.

These guidelines are intended to:

- Provide a framework to guide wildlife management decisions on City natural areas.
- Provide a framework for managing wildlife and wildlife habitat within the context of the overarching goal of promoting and enhancing ecosystem health and sustainability.
- Replace the City's 1998 Prairie Dog Policy for City Natural Areas with new, administratively adopted guidelines for urban prairie dog and prairie dog habitat management.
- Maintain consistency in management direction between natural areas while also providing flexibility for site-based decision making.
- Provide guidance on the management of human – wildlife conflicts.
- Explore long-term conservation issues related to the species recovery efforts at Soapstone Prairie Natural Area.
- Articulate clear management guidelines for native wildlife species.
- Provide direction for the control of invasive species.

Chapters 2 and 3 provide a regulatory and legal framework for wildlife management and management of protected species. Chapter 4 describes the overarching program objective of

managing wildlife and wildlife habitat to promote and enhance ecosystem health and sustainability. This critical objective is woven throughout the remainder of the management guidelines in chapters that address native species management (chapter 5), urban prairie dog management (chapter 6), native species recovery in regional natural areas (chapter 7), non-native species management (chapter 9), and habitat protection and enhancement in chapter eleven.

One consequence of an ecosystem health framework for wildlife management will be the designation of suitable habitat (primarily for prairie dogs) in an effort to balance overall ecosystem health (in a fragmented urban area) with health and sustainability of individual wildlife species. To achieve this balance, critical ecosystem thresholds or trigger points specific to urban natural areas that will act as a feedback mechanism to drive management decisions will be identified to determine whether or not resource objectives are being met. When they are not being met, management intervention will be warranted in order to prevent loss of ecosystem health, sustainability, and diversity.

Chapters 8 (Wildlife and Human Conflicts) and 10 (Management and Control of Wildlife Diseases) address issues that potentially affect natural area visitors or homeowners adjacent to natural areas. The guidelines are intended to first ensure public safety and wellness while also promoting wildlife conservation.

The final sections of these wildlife management guidelines address issues related to wildlife inventory, monitoring and research needs. As the level of wildlife management becomes increasingly sophisticated, additional information will be required to best steward both wildlife and wildlife habitat.

Chapter 1: Scope & Purpose

Why wildlife management guidelines?

The city of Fort Collins, Colorado, is situated at the base of the Rocky Mountain foothills where the short-grass prairies of the Great Plains rise to meet the shrublands and forests of the Rocky Mountains. By virtue of geography the area has a naturally diverse ecosystem including features such as short and mixed-grass prairies, wetlands, and riparian forests associated with the Cache La Poudre River, as well as the shrublands and forests of the foothills and beyond. The blend of these ecosystems in this transition area between the plains and the Rocky Mountains support an abundance and diversity of native wildlife that are enjoyed throughout the community.

Superimposed on the landforms of the Fort Collins area is the geography of the built environment that grades from a dense urban core to rural and ex-urban development to the north and west, with a small areas of rural landscape between neighboring communities to the south and east (Loveland, Windsor, and Wellington). The presence of humans in this landscape for approximately 11,000 years has strongly influenced, and continues to influence, the type, abundance, and diversity of wildlife in any given area of the greater Fort Collins. In addition to the enjoyment of wildlife by the citizens of Fort Collins, the close proximity of people and wildlife periodically results in situations that cause land managers to consider or take management action.

These wildlife management guidelines are an effort to help guide City of Fort Collins Natural Areas staff develop and implement system-wide and site-specific wildlife management strategies that support ecosystem health, that reflect community values, and that are pragmatic and fiscally responsible.

Therefore, this document is intended to:

- provide a framework to guide wildlife management decisions on City natural areas.
- help maintain consistency in management direction among natural areas while also providing flexibility for site-based decision making.
- provide guidance on the management of human – wildlife conflicts.
- articulate clear wildlife management guidelines for City natural areas.
- guide both short and long-term management actions for the conservation of wildlife species and their habitats on City natural areas.
- provide new management direction for the management of prairie dogs and prairie dog habitat.
- describe the ecosystem management model and overall objective of promoting and enhancing ecosystem health.

Geographic Scope

These guidelines apply only to lands managed by the Natural Areas Program. They do not apply to other City of Fort Collins managed lands or conservation easements held by the Natural Areas Program. The City's natural area system is comprised of 31,000 acres of protected open space and undeveloped lands within the city limit and beyond. Natural Areas range from small

undeveloped acreages of land in a highly urbanized setting to regional natural areas outside city limits that are several thousands of acres and more. This document provides wildlife management guidelines for City-managed Natural Areas in both the urban and rural setting.

The urban and rural setting differ vastly in some aspects that affect wildlife and their habitat. The city owns two regional properties; Bobcat Ridge and Soapstone Prairie Natural Areas. Both of these properties are considerably larger than most of the urban natural areas (they are 2,604 and 18,721 acres respectively) and the adjacent lands are not urbanized. As will be discussed in chapter 4, fragmented ecosystems have reduced resilience and resistance to disturbances. Wildlife are also affected greatly by fragmentation as the mosaic of habitat types, cover types, food resources decrease and the human interface increases. Consequently, wildlife management decisions may vary depending on the setting.

This document provides a set of guidelines for managing wildlife in both the rural and urban setting; however, because these are guidelines and not policies, each situation will be assessed individually to determine the most appropriate management action given local constraints or opportunities. Furthermore, a few topics addressed herein refer specifically to only the urban or regional setting. Chapter 6 describes past, current and future management of prairie dogs. Unless specifically stated, this chapter is providing a management approach exclusively for prairie dogs inhabiting the urban properties. Prairie dog management in regional properties will be determined by each respective management plan. Finally, chapter 7 addresses opportunities for native species reintroductions. These opportunities exist primarily at Soapstone Prairie Natural Area.

Application of Wildlife Management Guidelines

These wildlife management guidelines are intended to direct management of habitat and wildlife on city-owned, publicly managed lands only. These guidelines <u>do not</u>:

- Serve as policy or management direction for privately-owned lands, lands held in conservation easement by the Natural Areas Program, or other City of Fort Collins managed lands.

- Supersede or conflict with current City of Fort Collins Land Use Code or wildlife regulations promulgated by the Fort Collins Municipal Code.

- Supersede or conflict in any way with federal or state law related to wildlife or any policy direction set forth by the Colorado Division of Wildlife.

- <u>Supersede site management plans that deal with specific wildlife issues</u>. Instead, these guidelines help inform those management plans.

Natural Areas Program Mission Statement

The mission of the City of Fort Collins Natural Areas Program is to protect and enhance lands with existing or potential natural areas values, lands that serve as community separators, agricultural lands, and lands with scenic values. Protection of natural habitats and features is the

highest priority, while providing opportunities for education and appropriate recreation for the Fort Collins' community.

Wildlife Management Vision Statement
The City of Fort Collins Natural Areas Program will strive to conserve a diversity of self-sustaining native wildlife populations on City natural areas that are harmonious with the surrounding environment and compatible with ecological resources.

Principles of Wildlife Management on City Natural Areas
The generalized principles listed below provide a framework upon which specific wildlife management activities will be based:

1. The Natural Areas Program will use the best available science in understanding and managing wildlife and their habitats.

2. The Natural Areas Program will consider and balance environmental, economic, and social sustainability principles in managing wildlife and wildlife habitat.

3. The Natural Areas Program will clearly articulate the standards and protocols for managing situations where conflicts arise between wildlife and the public when the situation lies beyond the jurisdiction of the State of Colorado.

4. The Natural Areas Program will establish wildlife management guidelines that proactively reduce human/wildlife conflicts, reflect overall community values, and sustain ecological integrity. The program will manage wildlife for overall habitat health (including vegetative communities and their associated wildlife) rather than management at a single species level.

5. The Natural Areas Program will strive to conduct long-term management practices that emphasize alternatives to lethal control of native wildlife.

6. The Natural Areas Program will rank strategies based on their contribution to ecological viability, sustainability, and biological diversity, as well as their relative costs.

7. The Natural Areas Program will inventory natural areas in the City with the greatest potential for conservation success of various species.

8. The Natural Areas Program will have the Land Conservation and Stewardship Board review these Wildlife Management Guidelines every five to seven years. In addition, staff will report to the Land Conservation Stewardship Board on wildlife management activities every six months.

The following chapters include a review of the existing regulatory framework as well as management guidelines specific to wildlife groupings. Goals for species reintroduction and monitoring also are provided.

Chapter 2: Regulatory Environment & Framework

Wildlife management occurs within a larger context of local state and federal laws. The Colorado Statute 33-1-101(2) states "wildlife within this state not lawfully acquired and held by private ownership is declared to be the property of the state." Thus, management of wildlife in the state of Colorado is the jurisdiction of the Wildlife commission and the Colorado Division of Wildlife. Furthermore, certain federal laws passed in conjunction with the Endangered Species Act and the Migratory Birds Act governs management of specific wildlife and their habitat.

The guidelines recommended herein are subordinate not only to state and federal laws, but also to City and County jurisdiction. Within the Program, specific site management plans guide the wildlife management for each site; however, this document provides greater details than those provided in the management plans. Therefore this document will frequently serve as the primary set of guidelines for many decisions regarding wildlife management.

Existing Policies, Guidelines and Plans in the City of Fort Collins

Wildlife on City of Fort Collins natural areas are primarily managed through policies, guidelines, and management plans established by the Natural Areas Program since its inception in 1992. This document greatly expands and updates the wildlife components of the 2001 General Management Guidelines. In addition this document replaces the 1998 Prairie Dog Policy.

Current City Document	Adopted By	Year
Land Conservation and Stewardship Master Plan (*Replaced 1992 Natural Areas Policy Plan)*	City Council	2004
General Management Guidelines for Natural Areas and Agricultural Lands Managed by the City of Fort Collins Natural Resources Department (*Replaced 1994 Guidelines*)	NR Director	2001
Fossil Creek Natural Areas Management Plan (*11 sites*)	NR Director	2005
Bobcat Ridge Natural Area Management Plan	NR Director	2005
Cache la Poudre River Natural Areas Management Plan (*17 sites*)	NR Director	2002
Foothills Natural Areas Management Plan (*4 sites; currently being updated*)	NR Director	1997
Prairie Dog Policy for City Natural Areas	City Council	1998

Table 2.1 Existing policies, guidelines and plans in the City of Fort Collins.

Fort Collins City Municipal Code

The Natural Areas Program must adhere to City Code when managing wildlife on city property, whether or not the property is within city limits. Chapter 4 of the City Code, *Animals and Insects*, primarily addresses domestic animals and bees, and is not particularly relevant to

wildlife management on city natural areas. However, four sections of Chapter 4 dealing with poison, trapping, and wild birds are relevant.

Section 4-119. Use of poison restricted.
Prohibits the poisoning of any animal, with the exception of pest rodents, such as mice, rats, and voles with poisons approved for such use by U.S. Environmental Protection Agency. Only fumigants can be used to destroy prairie dogs and other burrowing rodents, and only by persons licensed by the State of Colorado.

Section 4-120. Trapping restricted.
Restricts trapping of wild animals to live trapping in a manner required by the Humane Society and the Colorado Division of Wildlife (CDOW), with the exception that rodent snap traps can be used on private property and emergency trapping (lethal or non-lethal) can be used under the direction of CDOW for animals of imminent threat to persons or causing serious damage to property.

Section 4-156. Wild bird refuge created.
Established Fort Collins as a wild bird sanctuary in 1986; urges all persons to protect wild birds and encourages their propagation and refuge within the City Limits.

Section 4-157. Killing or capturing wild birds restricted.
Makes it unlawful to kill, injure, or capture any wild bird or injure the nest, eggs, or young of any bird. The Chief of Police and CDOW can authorize permits for birds that are a nuisance or health hazard. Permits can also be obtained to capture birds for research purposes.

City of Fort Collins Land Use Code & Buffer Zones (Article 3, Section 3.4.1)
The City of Fort Collins Land Use Code, which regulates private land development, also governs major construction and improvement projects (parking lots, building or other facility) on natural areas within the city limits. Article 3, Section 3.4.1, of the Land Use Code applies to Natural Habitats and Features. Projects are required to follow standards that preserve or enhance the ecological character, function, and wildlife use of the natural habitat or feature. The Code also requires projects to minimize or adequately mitigate foreseeable impacts of the development.

Buffer zone standards within the Land Use Code provide guidance for not only site development on natural areas, but also management activities (e.g., prairie burning) that could potentially disturb wildlife at a critical time (e.g., denning, nesting). Although trails can be constructed within buffer zones of streams, prairie dog colonies, and wildlife concentration areas, trails are required to be compatible with the ecological character and wildlife use of the habitat, with mitigation measures utilized to minimize foreseeable impacts whenever possible. Below is a list of natural habitats and features with established (regulated) buffer zones.

Natural Habitat or Feature	Buffer Zone Standard
Isolated Areas:	
o Irrigation ditches that serve as wildlife corridors	50 feet
o Isolated patches of native grassland or shrubland	50 feet
o Isolated patches of native upland or riparian forest	50 feet
o Woodlots/farmstead windbreaks	25 feet
o Naturalized irrigation ponds	50 feet
o Naturalized storm drainage channels/detention ponds	50 feet
o Lakes or reservoirs	100 feet
o Wetlands < 1/3 acre in size	50 feet
o Wetlands > 1/3 acre in size, without significant use by waterfowl and/or shorebirds	100 feet
o Wetlands > 1/3 acre in size with significant use by waterfowl and/or shorebirds	300 feet
Stream Corridors (buffer distance from the top the bank):	
o Boxelder Creek	100 feet
o Cache la Poudre River in downtown (College to Lincoln Avenue)	200 feet
o Cache la Poudre River outside downtown	300 feet
o Cooper Slough	300 feet
o Dry Creek	100 feet
o Fossil Creek and Tributaries	100 feet
o Spring Creek	100 feet
Special Habitat Features/Resources of Special Concern:	
o Bald eagle communal feeding sites	660 feet
o Bald eagle communal roost sites	1,320 feet
o Bald eagle nest sites	2,640 feet
o Winter raptor concentration areas	300 feet
o Great blue heron colonial nest sites	825 feet
o Migratory waterfowl concentration areas	300 feet
o Nesting waterfowl concentration areas	300 feet
o Migratory shorebird concentration areas	300 feet
o Nesting shorebird concentration areas	300 feet
o Migratory songbird concentration areas	300 feet
o Locations of Preble's meadow jumping mouse	300 feet
o Locations of fox, coyote and badger dens	50 feet
o Locations of rare butterfly species	Site analysis
o Locations of rare, threatened or endangered plant species	Site analysis
o Locations of geological or paleontological sites of special interest	Site analysis

Larimer County

Any development of a major public improvement on a natural area outside of the city limits requires review by the Larimer County Planning Department, including their environmental planner who may require an ecological study and/or mitigation for impacts. The County uses the Wildlife and Plant Communities of State and National Importance data base established by the Colorado Natural Heritage Program as the initial indication of the existence of a protected species on a site. All new development projects with potential impacts to critical wildlife species or habitat are referred to the Colorado Division of Wildlife.

Larimer County plans to develop specific standards for habitat and species protection in the future, based on the priorities established in a more detailed habitat mapping project. Four criteria have been selected as the basis for determining habitat priorities: (1) rare vegetation types; (2) areas known to contain rare and threatened species; (3) areas supporting an unusually large number of species; and (4) areas providing habitat for species of importance to the people of Larimer County, including areas that are moderately to highly impacted by development, known migration corridors, pronghorn concentration areas, mule deer winter concentration areas, elk severe winter range, duck winter range, bighorn sheep lambing areas, mule deer migration corridors, and elk migration corridors. These standards would apply only to new development, but like the City's buffer standards, may be useful also for guiding wildlife management activities on natural areas outside of the city limits.

State of Colorado

Native terrestrial wildlife in Colorado is classified by the Colorado Division of Wildlife as big game, small game, waterfowl, furbearers, or non-game. Fish are likewise classified as game or non-game species.

Currently, the City of Fort Collins does not allow recreational hunting on any of its properties, but this may be allowed in the future on regional natural areas (i.e., Bobcat Ridge, Soapstone Prairie). The City currently does have the ability to use hunting as a management tool on any natural area in the form of a controlled hunt by CDOW staff if mandated by the State and approved by the Chief of Police. This could occur for situations of disease control (e.g., chronic wasting disease in ungulates) or overpopulation (e.g., large deer populations seriously over browsing habitat). Since the inception of the Natural Areas Program in 1992, no controlled hunts have been used to manage wildlife; however, the CDOW did trap and euthanize some deer along the Poudre River in 2002 that tested positive for chronic wasting disease. Any use of hunting for management or recreation would comply with Colorado Division of Wildlife hunting regulations and City of Fort Collins Municipal Code.

Fishing on any City-owned land also must comply with Colorado Division of Wildlife fishing regulations. Fishing can be prohibited from a lake or pond owned by the City. Currently, fishing is allowed on 22 lakes and ponds, totaling 250 surface water acres on 9 City natural areas. Harvesting non-native carp (*Cyprinus carpio*) by bow hunting for either management or recreation is prohibited and would require a special use permit by the Chief of Police and the Colorado Division of Wildlife. Although use of this technique has been deliberated, to date, it has not been used as a management tool to control carp populations.

The Natural Areas Program is required to obtain a Colorado Division of Wildlife permit whenever there is a need to capture or kill any species of wildlife on any of its properties for any purpose, including management or research. By CDOW definition, wildlife includes all vertebrates, mollusks, and crayfish. No permit is necessary for the capture or killing of other types of invertebrates, such as insects. A CDOW permit is also necessary if a wildlife den, nest, or a nest's eggs are destroyed or if wildlife is harassed. However, a permit is not required in the instance where wildlife dens or nests are removed to prevent damage to property (such as the removal of a beaver den to prevent flooding of structures).

Federal

Endangered Species Act

The Endangered Species Act provides protection to species in imminent danger of extinction throughout all or a significant portion of its range or likely to become endangered in the foreseeable future. Regulations under the Endangered Species Act prohibit direct physical harm to a listed species, including harassing, wounding, or killing. These regulations also prohibit actions that result in indirect harm by impairing essential functions such as breeding, feeding, or sheltering (denning, roosting, etc.).

City of Fort Collins natural areas currently support two animal species that fall under the Endangered Species Regulations: bald eagle and Preble's meadow jumping mouse. Extra care must be taken to not impact these two species by any wildlife management actions taken by the City. Another three species have been observed on rare occasion during migration over the last 20 years, requiring special consideration in management actions only if their numbers and occurrence would greatly increase: brown pelican, piping plover, and least tern.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act protects all native birds and their active nests. The Act prohibits harming a native bird or destroying an active nest, including eggs or young. Nest destruction includes activities that cause abandonment of a nest that leads to mortality of eggs or young. However, it does not prohibit destroying an inactive nest. From a practical standpoint, the law is generally enforced for species of special interest (e.g., hawks, eagles, owls, wading birds, colonial nesting birds, declining populations of songbirds), but technically the statute applies to all native species. To the extent practicable, care must be taken in all wildlife management actions to not disturb or destroy active nests of any native bird species.

Chapter 3: Protected Wildlife Species Management

Located on the boundary between the Rocky Mountains and the Great Plains, Fort Collins has a semi-arid climate with an average precipitation of less than 15 inches. Prior to settlement, the Fort Collins area was characterized by shortgrass prairies with scattered trees and shrubs along watercourses, and sparse ponderosa pine forests in the foothills. Wetlands were primarily confined to the Cache la Poudre River and other stream corridors.

A greater variety of wildlife habitats are present today than before European settlement due to land changes from farming and urbanization, including water transportation, reservoir construction, gravel mining, and urban forest plantings. This greater diversity of habitat has resulted in an increased diversity of wildlife species. In addition, the development of a riparian forest along the Platte River through the Great Plains has provided a corridor for the movement of forest birds and other wildlife across grasslands that have historically served as an ecological barrier to dispersal.

Located where two major ecological regions merge--the Great Plains and the Rocky Mountains--the Fort Collins area continues to be an important migratory corridor for raptors, songbirds, and butterflies. As wetlands have increased along the Front Range, so has the value of Fort Collins for migratory waterfowl, shorebirds, and other wetland bird species. Riparian forests along the Poudre River and other stream corridors in Colorado are recognized by many as one of the more diverse ecosystems in the United States.

As of January 2006, 347 species of birds have been recorded in the Fort Collins area (Table 3.1). The Fort Collins City Limits and Growth Management Area (GMA) encompass approximately 48,000 acres within its geographic range. By comparison, our city's bird species diversity is higher than much larger protected areas within Colorado and elsewhere.

Location	# Acres	# Bird Species
Fort Collins City Limits and GMA	~48,000	347
Yellowstone National Park	2.2 million	311
Everglades National Park	1.5 million	310
Pawnee National Grassland	193,060	301
Rocky Mountain National Park	265,726	280
Acadia National Park	35,000	273
Mesa Verde National Park	52,122	186
Bryce Canyon National Park	35,835	171
Isle Royale National Park	571,790	168
Denali National Park	6 million	163

Table 3.1. Comparison of bird diversity in the Fort Collin's region with that in national parks and grasslands. Sourced from National Park websites.

The City of Fort Collins has a more than 30-year history of protecting local wildlife. In 1986, City Code established limitations on the possession and feeding of various wildlife species, use of poisons, trapping, and hunting. That same year, Fort Collins was declared a "Wild Bird Sanctuary." City Code stated: "All persons are urged to protect the wild birds and encourage their propagation and refuge within such sanctuary."

In 1974, the City first recognized the value of natural areas with the adoption of the "Open Space Plan." Protection of fish and wildlife habitat was among the criteria used to identify priority areas. A number of plans and policies followed further providing measures to protect significant natural areas, both on City and privately-owned lands. In 1992, the City of Fort Collins adopted the "Natural Areas Policy Plan." Important wildlife habitat areas, animal species of special concern, and important use areas or concentration sites were identified. The goal of 12 policies established in the plan was to "preserve and protect natural areas within Fort Collins and the Urban Growth Area *[now known as Growth Management Area]* to provide habitat essential to the conservation of plants, animals, and their associated ecosystems..."

Protection of community separator lands, outside of the Fort Collins Growth Management Area, began in 1995, with adoption of the "Plan for the Region between Fort Collins & Loveland," followed by the "Northern Colorado Community Separator Study" in 1999 and "The Fort-Collins Timnath-Windsor Community Separator Study" in 2003. In 2004, the City of Fort Collins adopted the "Land Conservation and Stewardship Master Plan," which expanded the goal of natural areas protection to regional sites beyond the community separators. Sixteen Conservation Focus Areas were identified, which included five local focus areas (all but one addressed in the 1992 Natural Areas Policy Plan), four community separator focus areas (all addressed in previous plans), and seven new regional focus areas.

The City of Fort Collins Natural Areas Program currently manages 41 natural areas within local and community separator focus areas, totaling approximately 10,000 acres, as well as 2 regional natural areas, totaling over 21,000 acres. The Program continues to put a high priority on the protection and management of important wildlife habitat for groups of species (e.g., raptors, migratory songbirds, wetland birds, short-grass prairie species, cavity nesting birds, migratory butterflies, shorebirds, migratory waterfowl and other wetland birds).

The Natural Areas Program maintains a list of wildlife species of concern, identified by State and Federal agencies that are known to occur on City natural areas, or have the potential to be re-introduced to a City-owned site. The list includes those identified by the Colorado Natural Heritage Program, the Colorado Division of Wildlife, the U.S. Fish and Wildlife Service, and the U.S. Forest Service. The latter is included because one of the City's regional natural areas, Bobcat Ridge, has 160 acres of in holdings and is adjacent to Forest Service property (Roosevelt National Forest). While a few species occur only rarely and are not in need of any special management action, protection of most of the species of concern can be enhanced through various potential management actions.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Birds				
Species	**CNHP Ranking***	**State/Federal Status***	**Known Natural Areas Occurrence**	**Potential Management Action**
Barrow's goldeneye (*Bucephela islandica*)	G5; S2B		Rare visitor to local natural areas in winter.	None needed.
Plains sharp-tailed grouse (*Tympanuchus phasianellus jamesii*)	G4T4; S1	SE	Currently not known to occur, but potential to re-introduce to regional natural area (Soapstone Prairie).	Protect and enhance potential nesting sites on Soapstone Prairie Natural Area; potentially work with Colorado Division of Wildlife to re-introduce.
American white pelican (*Pelicanus erythrorhynchos*)	G3; S1B		Very common on local natural areas during migration; non-breeding individuals common in summer; no colonial nest sites in vicinity.	Protect important feeding and resting areas.
Brown pelican (*Pelicanus occidentalis*)		FLE	Very rare occurrence in state; one recorded at Fossil Creek Reservoir in 2005.	None needed.
Snowy egret (*Egretta thula*)	G5; S2B		Occasional visitor to local natural areas during migration and in summer.	Protect seasonal, shallow wetlands (feeding, resting areas).
White-faced ibis (*Plegadis chihi*)	G5; S2B		Occasional visitor to local natural areas during migration and in summer.	Protect seasonal, shallow wetlands (feeding, resting areas).
Bald eagle (*Haliaeetus leucocephalus*)	G5; S1B, S3N	ST/FLT	Common on local areas, (uncommon on regional natural areas) in winter, feeding on prairie dogs, waterfowl, and fish; one nest site in vicinity, but not on City property.	Protect important feeding, roosting, and nesting sites.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Birds				
Species	**CNHP Ranking***	**State/Federal Status***	**Known Natural Areas Occurrence**	**Potential Management Action**
Northern goshawk (*Accipeter gentilis*)	G5; S3B	FSS	Occasional visitor to local and regional natural areas during migration and in winter.	None needed.
Ferruginous hawk (*Buteo regalis*)	G4; S3B, S4N	SSC/FSS	Common on local natural areas in winter, feeding on prairie dogs, rabbits, and hares; nests at regional natural area (Soapstone Prairie).	Protect important feeding, roosting, and nesting sites.
American peregrine falcon (*Falco peregrinus anatum*)	G4T3; S2B	SSC/FSS	Occasional visitor to local natural areas during migration; probable nest site at regional natural areas (Soapstone Prairie).	Identify and protect existing and potential nest sites (cliffs) at regional natural areas.
Prairie falcon (*Falco mexicanus*)	G5; S4B, S4N		Common visitor to local natural areas during migration and winter; nests at regional natural area (Soapstone Prairie).	Identify and protect existing and potential nest sites (cliff ledges) at regional natural areas.
Greater sandhill crane (*Grus canadensis tabida*)	G5T4; S2B, S4N	SC	Possible very uncommon visitor to local natural areas; records do not indicate subspecies.	None needed.
Western snowy plover (*Charadrius alexandrinus nivosus*)	G4T3; S1B	SC	Rare visitor to local natural areas during migration and summer.	Protect seasonal, shallow wetlands and alkali flats (feeding, resting areas).
Piping plover (*Charadrius melodius*)	G3; S1B	ST/FLT	Rare visitor to local natural areas during migration and summer.	Protect seasonal, shallow wetlands and alkali flats (feeding, resting areas).
Mountain plover (*Charadrius montanus*)	G2; S2B, SZN	SSC/FSS	Known to nest at regional natural area (Soapstone Prairie; known to nest at adjacent Meadow Springs Ranch owned by the City of Fort Collins Utilities).	Protect shortgrass prairie nest sites on Soapstone Prairie Natural Area.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Birds				
Species	**CNHP Ranking***	**State/Federal Status***	**Known Natural Areas Occurrence**	**Potential Management Action**
Black-necked stilt (*Himantopus mexicanus*)	G5; S3B		Occasional visitor to a few local natural areas during migration; known to have nested at site of current Fossil Creek Park in the late 1980's.	Protect feeding areas (shallow marshes and lake shorelines) and potential nesting (mudflats) areas.
Willet (*Catoptrophorus semipalmatus*)	G5; S1B		Occasional visitor to a few local natural areas.	Protect seasonal, shallow wetlands (feeding, resting areas).
Long-billed curlew (*Numenius americanus*)	G5; S2B	SSC/FSS	Occasional visitor to a few local natural areas.	Protect large, dry grasslands (feeding, resting areas).
Wilson's phalarope (*Phalaropus tricolor*)	G5; S4B, S4N		Fairly common in several local natural areas during migration, sometimes in summer.	Protect seasonal, shallow wetlands and pond/lake shallow shorelines (feeding, resting areas).
Forester's tern (*Sterna forsteri*)	G5; S2B, S4N		Fairly common in several local natural areas during migration, sometimes in summer.	Protect larger cattail marshes with open water (feeding, resting areas; potential nest sites).
Least tern (*Sterna antillarum*)	G4; S1B	SE/FLE	Rare visitor to local natural areas during migration.	Protect wetlands and pond/lake shallow shorelines (feeding, resting areas).
Northern pygmy-owl (*Glaucidium gnoma*)	G5; S3B		Rare visitor to local natural areas during winter; known to occur at regional natural area (Bobcat Ridge) and may nest on the site.	Protect known nest sites from disturbance.
Burrowing owl (*Athene cunicularia*)	G4; S4B	ST/FSS	Usually, several pairs successfully nest annually at prairie dog colonies on local natural areas; potential for nesting on regional natural areas in active or abandoned prairie dog colonies.	Protect local and regional prairie dogs colonies, and limit human disturbance.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Birds				
Species	**CNHP Ranking***	**State/Federal Status***	**Known Natural Areas Occurrence**	**Potential Management Action**
Short-eared owl (*Asio flammeus*)	G5; S2B	FSS	Occasional visitor during winter at local natural areas; could potentially nest at regional natural area (Soapstone Prairie).	Determine nesting status at Soapstone Prairie Natural Area and protect potential nest sites.
Lewis's woodpecker (*Melanerpes lewis*)	G5; S4	FSS	Rare nesting in local natural areas, likely also rare nesting in regional natural areas.	Identify and protect nest sites (groves of tall trees in open country).
Willow flycatcher (*Empidonax traillii*)	G5; S4		Common during migration.	Protect important migratory songbird habitat (wooded riparian areas).
Veery (*Catharus fuscescens*)	G5; S3B		Uncommon during migration.	None needed unless local nesting would occur.
Curve-billed thrasher (*Toxostoma curvirostre*)	G5; S3		Very rare occurrence in Fort Collins; first recorded in 2005.	None needed.
Ovenbird (*Seiurus aurocapillus*)	G5; S2B		Common, but often overlooked, during migration; not known to nest locally.	None needed.
Cassin's sparrow *(Aimophila cassinii*)	G5; S4B		Uncommon during migration and in summer in local natural areas; rather nomadic, occurrence highly variable; not known to nest in local natural areas.	Protect large, brushy grasslands (feeding and nesting sites).
McCown's longspur (*Calcarius mccownii*)	G4; S2B	FSS	Known to nest at regional natural area (Soapstone Prairie); not recorded from local natural areas during migration.	Protect nest sites (shorter grass or no grass).
White-winged crossbill (*Loxia leucoptera*)	G5; S1B		Uncommon in local and regional natural areas in winter.	None needed.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Mammals				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Fringed myotis (*Myotis thysanodes*)	G4G5; S3		Known to occur in local natural areas; likely also in regional natural areas (especially, Bobcat Ridge).	Protect any known maternity colonies (usually caves, rock crevices) and winter roosts; highly negatively impacted by human disturbance, especially in the nursery and hibernaculum.
Townsend's big-eared bat (*Crynorhinus townsendii pallescens)*	G4T4; S2	SSC/FSS	Known to occur on Bobcat Ridge, possibly forages in foothill natural areas.	Protect any known maternity colonies (usually caves, rock crevices, tunnels) and winter roosts; highly negatively impacted by human disturbance, especially in the nursery and hibernaculum.
Black-tailed prairie dog (*Cynomys ludovicianus*)	G3G4; S4	SSC/FSS	Common in local and regional natural areas.	Protect large colonies of 50 acres or more; restore shortgrass prairie on suitable old pasture or cropland sites of at least 50 acres.
Northern pocket gopher (*Thomomys talpoides agrestis*)	G5T3; S3		Not recorded yet, but could occur on local or regional natural area; small mammal surveys are limited on natural areas. Subspecies *macrotis*, a Colorado Species of Concern not likely to occur.	Protect habitat (various riparian types) should mammal be trapped on a natural area in the future.
Preble's meadow jumping mouse (*Zapus hudsonius preblei*)	G5T2; S1	ST/FLT	Known to occur on one regional natural area; doubtful that mouse is present in any local natural area.	Protect area where mouse trapped at regional natural area (Bobcat Ridge) and any future known sites.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Mammals				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Gray wolf (*Canis lupus*)		SE/FLE, FSS	Could potentially establish at regional natural area (Soapstone Prairie) in the future; wolves re-introduced to Yellowstone have been found in Colorado and in Wyoming at Colorado border.	Protect individuals and den sites from disturbance if found to occur in the future on Soapstone Prairie Natural Area.
Swift fox (*Vulpes velox*)	G3; S3	SSC/FSS	Occurs on regional natural area (Soapstone Prairie).	Protect den sites from human disturbance.
Black-footed ferret (*Mustela nigripes*)	G1; S1 (re-introduced populations)	SE/FLE	Currently not known to occur, but potential to re-introduce to regional natural area (Soapstone Prairie) in the future if prairie dog colonies are sufficiently large to support ferrets.	Determine target acreage for prairie dog colonies at Soapstone Prairie Natural Area. Work with U.S. Fish & Wildlife Ferret Reintroduction Program.
River otter (*Lontra canadensis*)		ST	Rare visitor to local natural areas over the last 30 years--only a few observations (most recent in mid-1990's); 2 sited at Cottonwood Hollow in 2006; Colorado Division of Wildlife was active in re-introducing the animal in 1970's.	None needed unless pair would establish a den site.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Amphibians and Reptiles				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Northern leopard frog (*Rana pipiens*)	G5; S3	SSC/FSS	Known to occur in several local natural areas in the 1980's, but not reported in last 15 years.	Protect any populations discovered in local or regional natural areas.
Painted turtle (*Chrysemys picta*)	G5; S5		Common in local natural areas.	Protect ponds used by painted turtles; provide turtle resting logs for habitat.
Short-horned lizard (*Phrynosoma hernandesi*)	G5; S5		Common in local (foothills, Fossil Creek drainage) and regional natural areas.	Protect native shortgrass prairie and foothills habitat with abundant ant colonies (primary food source).

Fishes				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Brassy minnow (*Hybognathus hankinsoni*)		ST	Rare in local (Poudre River) and regional (Soapstone Prairie) natural areas.	Protect habitat (cooler flowing water or ponds with sand or gravel bottoms).
Common shiner (*Luxilus cornutus*)		ST	Rare in local (Poudre River) natural areas.	Protect habitat (cool, clear water with gravel substrates and over-hanging riparian shrubs and trees); species is very intolerant of siltation.
Mountain whitefish (*Prosopium williamsoni*)	G5; S3		Introduced to local natural areas for sport fishing; not native to area.	None needed.

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Fishes				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Iowa darter (*Etheostoma exile*)		SSC	Rare in local natural areas (Poudre drainage); Colorado is on the southwestern edge of this species range.	Protect habitat (Clear, sluggishly vegetated streams and weedy portions of glacial lakes, marshes, and ponds).

Invertebrates				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Backswimmer (*Notonecta unifasciata*)	GNR; S1		Known to occur on a local natural area (Cathy Fromme Prairie).	Protect shallow ponds and streams from impacts.
Arogos skipper (*Atrytone arogos*)	G3G4; S2		Known to occur in local (foothills) natural areas.	Protect habitat (relatively undisturbed prairies; larval host plant, usually big bluestem; variety of nectar plants–native and non-native).
Moss's elfin (*Callophrys mossii schryveri*)	G4T3; S2S3		Known to occur on a regional natural area (Bobcat Ridge).	Protect habitat (lower foothills canyons containing larval host plant--stonecrop [*Sedum* spp.]).
Hops blue (*Celastrina humulus*)	G2G3; S2		Occurs in local (foothills) natural areas.	Protect habitat (foothill canyons and ravines, usually associated with patches of hops).
Martial duskywing or Mottled dusky wing (*Erynnis martialis*)	G3G4; S2S3		Occurs in local (Poudre River) natural areas.	Protect habitat (open woodland or brushy fields and prairie hills with New Jersey tea populations –larval host plants).

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Invertebrates				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Two-spotted skipper (*Euphyes bimacula*)	G4; S2		Occurs in local (Poudre River and Fossil Creek drainages) natural areas.	Protect habitat (marshes, wet streamsides, wet sedge meadows; larval host plants are sedges [*Carex* spp.]; nectar plants include blue flag and milkweed).
Ottoe skipper (*Hesperia ottoe*)	G3G4; S2	FSS	Occurs in local (Poudre River and foothills) natural areas.	Protect habitat (native tallgrass prairie remnants; larval host plants include little bluestem; nectar plants include a variety of native and non-native species).
Crossline skipper (*Polites origines*)	G5; S3		Occurs in local (Poudre River and foothills) natural areas.	Protect habitat (open grassy areas including prairies hills, old fields, forest openings; larval host plants include little bluestem and other native grasses; wide variety of nectar flowers).
Rhesus skipper (*Polites rhesus*)	G4; S2S3		Occurs in local (foothills) natural areas.	Protect habitat (native shortgrass and mixed-grass prairie; larval host plant is blue grama; nectar flowers include milkvetch).
Smokey-eyed brown (*Satyrodes eurydice*)	G5T3T4; S1		Occurs in local (Poudre River) natural areas.	Protect habitat (open sedge meadows, freshwater marshes, slow-moving streams; larval host plants are various sedges [*Carex* spp.]; sap, bird droppings, and occasionally flower nectar are adult foods).

Table 3.2 Wildlife Species of Concern in City of Fort Collins Natural Areas (*See Appendix B for Key to CNHP Ranking and Status)

Invertebrates				
Species	**CNHP Ranking**	**State/Federal Status**	**Known Natural Areas Occurrence**	**Potential Management Action**
Regal fritillary *(Speyeria idalia)*	G3; S1	FSS	Occurs in local (foothills) natural areas.	Protect habitat (remnant tallgrass prairie and other open sites including damp meadows, marshes, and wet fields; larval host plants are violets; a variety of native and non-native nectar plants).

Chapter 4: Ecosystem Health: An Ecological Framework for Wildlife Management

Introduction

The mission of the Natural Areas Program is "*to protect and enhance lands with existing or potential natural areas values"*. The Land Conservation and Stewardship Master Plan (2004) guides the program with a long-range vision, policy and specific goals and states that efforts will "*emphasize managing for sustainability of native plant and animal communities*" and strive to "*maintain a dynamic equilibrium*".

The sustainability of native plant and animal communities is the overarching framework that describes the objectives of promoting the health of the ecosystem's components (plant and animal communities, soil, water, etc.) and ensures the sustainability and interaction of each of the components. Formal recognition of this concept largely led to the paradigm of "ecosystem management" which emerged more than two decades ago as a holistic approach to land, water, vegetation, and wildlife management.

As the management of wildlife habitat is guided by the model of ecosystem management, we use this chapter to provide a foundation upon which guidelines (spelled out in this wildlife management document) are synchronous with advancing the objective of promoting and enhancing ecosystem health. To do this, it will be necessary to monitor ecosystem indicators over time to understand change, variability within the ecosystem, and to establish ecological thresholds that cannot be exceeded. Finally, this approach must take into consideration the parameters and stresses unique to natural areas in an urban setting, such that the influences of local contemporary stresses are incorporated into decision making.

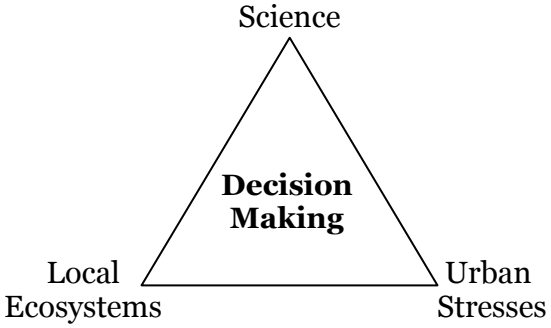

Figure 4.1 A graphical depiction of the ecosystem management model applied to the urban natural area to guide wildlife management.

This framework will serve as a model to evaluate the effects of wildlife use and management on habitats in both urban and regional natural areas. It is believed this model can apply to the monitoring of a variety of issues common to land management agencies. These include the effects of prairie dog grazing, cattle grazing, ungulate browsing, wildlife species reintroductions, noxious weed infestations, rare plant conservation and habitat modification through weed control

or other manipulations. Management of recreational opportunities and the effects on wildlife, or potential ensuing conflicts may also be the subject of monitoring programs.

Ecosystem Health

Ecosystem health is the degree to which the integrity of processes, functions, and interactions between soil, vegetation, wildlife, water, and air quality are balanced or sustained. Three attributes or criteria are suggested (Bestelmeyer et al., 2005) in order to assess ecosystem health and include:

1. Soil or site stability
2. Hydrologic function
3. Integrity of the biotic community

The Natural Areas program will conduct a combination of formal and informal habitat health monitoring of key attributes to understand current conditions, system variability, and how those factors measure against established thresholds. Thresholds that are in some way threatened to be exceeded will trigger management action in order maintain or improve ecosystem health. In the following paragraphs we will define this terminology.

Natural Range of Variability (System Variability)

All wildlife habitat exhibits a natural range of variability due to environmental factors. Climatic factors in turn modify seasonal and regional climate that affect hydrology, drought, nutrient cycling, disturbance events (such as fire, flood, etc.). The response to these climatic factors is expressed through vegetation production, pattern and composition of plant communities, as well as surface and subsurface water availability. On-going monitoring of habitat resources, especially vegetation, is critical to understand the range of variability in the ecosystem and to identify when natural variability is exceeded due to environmental disturbance or a combination of disturbances.

One concept unique to urban natural areas and the natural range of variability for those habitats is the idea that certain ecosystem stressors in the urban environment compromise a habitat's resistance and resilience to disturbance factors. Those urban stressors include:

- *Unique species composition*

Urban natural areas are exposed to a large number of non-native flora and fauna species. Of greatest concern is the presence of non-native plant species that can rapidly establish on bare soil and out-compete native species. Following a disturbance, the establishment of non-native plants can drastically change plant community composition and over time reduce the species richness of native plants.

- *Alternate water use and distribution*

Human occupation of the Front Range has altered natural flows of water through irrigation, municipal use, storage and impervious cover. As a result, natural areas may be drier or wetter than average. An example of a system that may be drier than average is the riparian zone of a river situated below a dam. The control of flows by dam managers causes a reduction in peak spring flows. Wetter than normal conditions often exist adjacent to non-porous surfaces (like

asphalt) where higher levels of precipitation runoff is carried onto narrow bands of soil along the non-porous area.

- *Fragmentation; loss of spatial variability and resilience*

An ecosystem is said to be "fragmented" when it exists as a relatively small piece of native habitat and is surrounded by barriers to ecosystem function (migration, dispersal, etc.) such as urban development or agricultural land. Native wildlife are believed to be most affected by fragmentation when the ratio of habitat perimeter to habitat area is high (this increases the wildlife's exposure to human disturbance which by virtue reduces habitat size). Notably, it is often the predatory species that are most sensitive and consequently the natural population checks for some prey species are missing.

To reiterate, each of these urban stressors can compromise resilience and resistance to habitat disturbance. Therefore, a large contiguous habitat may recover from a certain disturbance, while a small, isolated piece of land will not recover from the same disturbance because of a combination of factors that pushes the system across a threshold into a degraded state.

Thresholds and Management Action

As discussed above, under normal conditions wildlife habitats will exist within a natural range of variability in a single vegetation state. However, if there are significant modifications to the habitat through environmental disturbance (drought, overgrazing, fire, flood, etc.) or human manipulation, the system may be modified to a condition from which it cannot recover without human intervention. When this change occurs it may be referred to as crossing a threshold. Recovery of the system without significant inputs of either time (geologic time) or energy (human intervention) may not be possible. Specifically to wildlife habitat, system thresholds are crossed when:

- The system undergoes significant and persistent changes to plant community and soil processes in response to particular management or natural factors (definition #1) (*after* Bestelmeyer et. al., 2004), or;

- The system undergoes irreversible changes in one or more primary ecological processes such that the system must be actively (human intervention) restored before a return to a previous state is possible (definition #2) (*after* Westoby et. al., 1989).

Disturbance may be due to natural environmental influences or the result of management action. Often it may be a catalyst for positive change such as a new (or preferred) wildlife habitat type characterized by native species and/or species diversity. Of greater concern is an event where a threshold is crossed and the system moves toward an irreversible, unacceptable, or degraded state. One of the most common transitions modern land managers are faced with is loss of plant cover due to weed infestations, overgrazing, surface disturbance, incompatible use and drought. A critical and irreversible threshold will be crossed when the decrease in plant cover results in a loss of soil integrity (Figure 4.2).

Healthy ecosystems are often considered as having resistance and resilience to a disturbance. However, if two factors coincidentally affect the system (such as high intensity fire followed by heavy and persistent rains) this can cause the system to cross a threshold. Furthermore, when ecosystem health is compromised either resistance or resilience may be low and consequently the system will transition across an irreversible threshold into a degraded or unacceptable state.

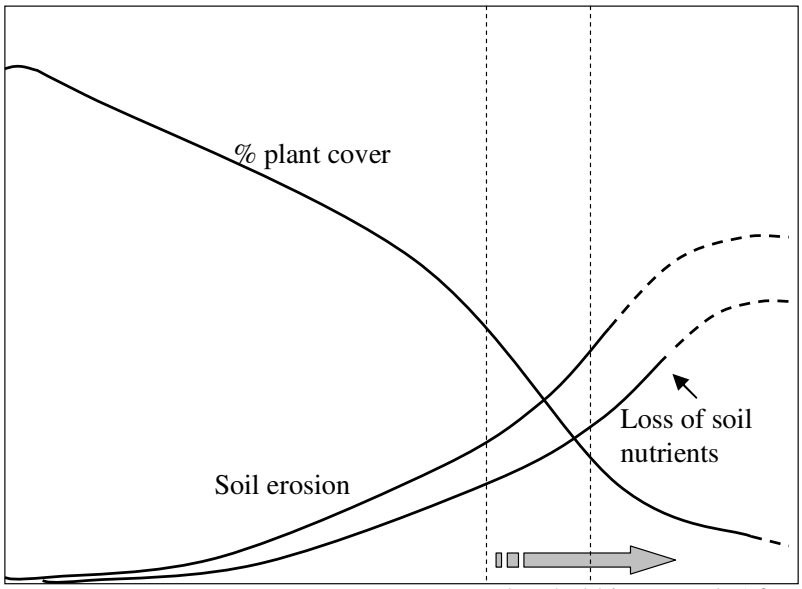

Figure 4.2 Showing the theoretical relationship between decreasing plant cover and increasing soil erosion, based on the Revised Universal Soil Loss Equation (U.S.D.A., 2004).

When applying this model of habitat thresholds and management triggers it will be necessary to identify which indicators will be monitored for change and ecosystem health. A combination of qualitative and quantitative measures may be used to determine if wildlife influences on the habitat are not exceeding thresholds of ecosystem health. Evidence may come from;

1. measuring components of the system such as plant cover, species diversity or water depth;
2. monitoring attributes such as biotic integrity population dynamics, soil quality and stability, and hydrologic function, or;
3. soliciting expertise from scientists, land owners, and other natural resource managers.

When indicator data suggests site conditions are approaching a threshold beyond natural system variability, wildlife and habitat management will then be addressed to determine what management actions are necessary. Thus, further degradation can be halted and the timely intervention may be made to minimize the level of management action.

Adaptive Management

Adaptive management is the concept that the effectiveness of habitat management actions is routinely evaluated through monitoring or experimentation to determine if resource objectives are being met. It is an on-going iterative process by which management actions are evaluated and "adaptations" made to better ensure resource objectives are met. Thus, adaptive management fosters effective decision making, efficient resource allocation, and provides a framework for achieving resource objectives.

Conclusion

In conclusion, to the extent practicable, natural area managers will strive to retain the types and ranges of natural variation in ecosystems and habitats, within ecological, social, and economic constraints imposed in part by virtue of managing public land (*after* Meffe et. al., 2002). Likewise, all wildlife management decisions are guided by the principal of maintaining and improving the health of the ecosystem on natural area properties.

One consequence of this ecosystem health framework for wildlife management will be the necessity to designate suitable habitat to balance overall conservation of ecosystem health with individual wildlife species. In practice, habitat management can be guided by the following system:

1) habitat managed specifically for a certain wildlife species;
2) habitat managed specifically as a buffer zone for that species, or;
3) habitat managed specifically for a healthy ecosystem (which may require keeping the focus species completely off those acres).

Identification of critical thresholds or trigger points will drive decisions on whether or not resource objectives have been met, and when management action is warranted in order to prevent loss of ecosystem integrity.

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Chapter 5: Native Wildlife Species Management

The City of Fort Collins primarily manages native wildlife on natural areas through the protection of natural habitats and features, and enhancing habitat for targeted groups of wildlife. The Natural Areas Program tries to maintain a diversity of habitat within the urban environment, while protecting key habitats that may be limited, or otherwise in need of protection, on the Front Range of Colorado.

Over the last 20 years, various groups of wildlife have been recognized as important or of special concern at the local, regional, State, or Federal level. These include animals listed as endangered, threatened, or species of concern by the Colorado Division of Wildlife (CDOW) and U.S. Fish and Wildlife Service, as well as groups of wildlife that have key concentration or breeding areas in Fort Collins, as identified by the CDOW and other local wildlife professionals.

Site management plans for natural areas contain specific goals and strategies for managing various groups of wildlife species when sufficient habitat occurs, or can be restored, on a particular natural area. The following is a summary of the groups of wildlife given special consideration in management plans, and general management strategies that have been, or will be, used to protect and enhance native wildlife.

Mammals

The diversity of Fort Collins' natural areas supports several species of mammals. While many use city natural areas for the entirety of their life history, other mammalian species may only utilize these lands as a portion of the normal home range of activities. Management of mammalian species is largely accomplished by providing a structurally diverse habitat of sufficiently large scale. These large scale habitat mosaics are necessary to provide for a diverse mammalian species assemblage representing all trophic levels including top predators. In areas where habitat consists of smaller, fragmented blocks, efforts will focus on providing movement and habitat corridors to re-connect blocks of habitat.

Large Predators

Mountain lion and black bear occasionally use urban natural areas and are common on regional natural areas. These animals generally utilize home ranges that vary in size within and between years, but overall tend to be several square miles in size (Currier, 1983; Lariviere, 2001). Most natural areas are smaller than typical home ranges of these species; however, management efforts can provide safe and effective movement corridors that connect smaller habitat blocks or connect a natural area to a larger contiguous block on the edge of Fort Collins. These connections can be linear habitats or the modification of a barrier that prohibits safe movement between habitat blocks.

Mesopredators

Several mid-size predators utilize natural areas, for example coyote, raccoon, badger, skunk, and red fox. As with larger predators, natural areas may only play a small role in the life history of these animals. Most common management activities will focus on den site protection and on providing safe movement corridors.

General Strategies for Management of Mammalian Predators on Natural Areas

- Create habitat mosaics to attract a diverse assemblage of species representing all trophic levels.
- Identify movement corridors connecting habitats and conserve through easement, acquisition, or by structural modification (i.e. culvert placement, fence removal, habitat plantings).
- Identify and protect den sites.
- Minimize interaction with domestic animals by prohibiting dogs off leash; in areas of highest conservation value or where a species of conservation concern occurs, prohibit dogs.
- Install wildlife proof trash receptacles.
- On an as-needed basis install signs notifying the public of the possible presence of larger predators (bears, mountain lion).
- Possibility of seasonal closures in known critical habitat.

Bats

Bats are a group of species that have received a large amount of interest in recent years from the conservation community due to population declines in many of these species. Declines can be attributed to habitat loss, pesticide exposure, and direct mortality. A second factor that contributes to declines are basic life history traits such as many bats give birth once annually, have low birth rates, do not reproduce until one year of age, and are long lived. Given these traits, bats require high adult survival rates to offset low reproduction rates (O'Shea and Bogan, 2003).

Also, large regional populations may be found at relatively few locations such as a roost site or hibernacula. Impacts to regionally important locations that increase adult mortality can contribute to population declines.

Several species of bats are known to occur within and around the Fort Collins area (see Table5.1 below). Efforts will be made to conserve habitat supporting roosts or other concentration points for bats. Also, when applicable, artificial bat houses will be used to provide alternative roost locations.

Common Name	**Scientific Name**
Long-eared myotis	*Myotis evotis*
Little brown myotis	*Myotis lucifugus*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Hoary bat	*Lasiurus cinereus*
Silver-haired bat	*Lasionycteris noctivagans*
Big brown bat	*Eptesicus fuscus*
Townsend's big-eared bat	*Corynorhinus townsendii*
Eastern red bat	*Lasiurus borealis*

Table 5.1 Bats known to occur in the Fort Collins area.

General Strategies for Management of Bats on Natural Areas

- Preserve and protect trees, cliffs, and other locations known to support bat roosts.
- Create habitat mosaics to attract a diverse assemblage of species.
- Maintain buffer distances between active roosts and management activities.
- Install and maintain bat houses when applicable to attract bats to natural areas.

Big Game (Elk, Mule deer, Pronghorn)

Elk, mule deer, white-tailed deer, or pronghorn are known to occur on most of our natural areas. As discussed elsewhere, movement patterns generally include habitat outside of the natural areas and little can be done to influence the abundance of this species. However, movement corridors can be established and maintained for these species. In some cases, important habitat areas will remain free of development and interaction with people. Overall, the goal of the Natural Areas Program is to conserve habitat for these species and to provide safe and effective movement corridors between habitat patches.

Hunting It is illegal to discharge a firearm within the Fort Collins' City limits and therefore no hunting will be allowed on any of the local natural areas. Hunting as a management strategy and as a recreational opportunity in the regional natural areas will be determined on a site-by-site, case-by-case basis and will be evaluated based on wildlife population objectives, the maintenance of public safety, and the opportunity to provide a sustainable high-quality experience in nature. Site specific management plans for Bobcat Ridge Natural Area and Soapstone Prairie Natural Area will address this issue.

General Strategies for Management of Big Game on Natural Areas

- Identify movement corridors connecting habitats and conserve through easement, acquisition, or by structural modification (i.e. culvert placement, fence removal).
- Modify existing fences as needed to allow for passage of elk, deer, and pronghorn.
- Remove fence that is no longer needed to manage the property.
- Provide hunting opportunities when necessary to manage population densities and/or for recreation and when hunting can be conducted in a safe and effective manner. Hunting opportunities will be developed in consultation with the Colorado Division of Wildlife.
- Conserve critical habitat areas by limiting public use spatially or temporally.
- Minimize interactions with domestic dogs by prohibiting dogs from areas of highest conservation value for these species. In other areas, maintain dogs on leash regulations.

Birds

The Fort Collins community has been committed to the protection of birds since 1986 when the city was declared a "Wild Bird Sanctuary." Located where two major ecological regions merge and containing a wide variety of habitats, Fort Collins supports a diverse assemblage of resident, migrant, and wintering bird species. Some areas, now protected as natural areas, have been

known as "birding hot spots" at the state level for decades. It is the goal of the Natural Areas Program to continue to protect these sensitive areas to ensure that they provide critical habitat for generations to come.

Raptors

In addition to prairie dog colonies, large raptors within Fort Collins inhabit larger expanses of lake shores, grasslands, wetland areas, riparian woods, and foothills forests where birds can feed with the least amount of disturbance. Northern harriers rely heavily on wetland areas, but feed on a variety of prey, including upland rodents. Several raptor species are only in Fort Collins during spring through late summer, including ospreys that rely exclusively on open water habitats for their food base of fish and Swainson's hawks who feed primarily in larger grasslands on small rodents. Smaller raptors such as the American kestrel and sharp-shinned hawk are more adapted to the urban environment and can inhabit smaller natural areas.

Protection of active raptor nests from human disturbance is critical for most species of raptors. Protection of trees that support large raptor nests is necessary throughout the year. Large raptors will return to the same tree to nest year after year. The presence of mature trees also enhances areas used as feeding sites by raptors. Whether feeding on field mice or waterfowl, birds of prey use perch sites to scan areas for small rodents or birds, and often return to these same perches to consume captured prey. Several of the smaller raptors, including American kestrel and eastern screech owl, are cavity-nesters. On regional natural areas, cliffs are important nest sites for a variety of species, including prairie falcon, red-tailed hawk, golden eagle, and great horned owl.

Although barbed wire fencing is a hazard to numerous species of wildlife, raptors are particularly vulnerable to injury or death caused by impacting barbed wire fencing as they come down on prey in taller grasses near fence lines. Each year, the Rocky Mountain Raptor Program receives birds that have been injured by barbed wire fencing--some to the extent that they must be euthanized.

General Strategies for Management of Raptors on Natural Areas

- Focus on maintaining prairie dog colonies of at least 50 contiguous acres for large raptor feeding areas and burrowing owl nest sites.
- Restore large areas of abandoned cropland along the Fossil Creek drainage to native prairie to provide future sites for prairie dog establishment.
- Maintain buffer distances between active nests and management activities.
- Retain dead snags in old cottonwoods in riparian areas for cavity-nesting birds unless snags create a human or property safety hazard.
- Preserve and protect all trees and cliffs known to support raptor nests.
- Actively plant recruitment cottonwoods along reservoirs and waterways where stands are becoming decadent in order to provide future nest and perch sites.
- Plant replacement trees in areas on grassland sites if nesting trees are becoming decadent due to change in water regime (e.g., loss of irrigation water).
- Remove barbed wire fencing or replace with wood fencing wherever possible.
- Where fencing is completely removed, retain some wooden posts for raptor perch sites.
- Permit release of rehabilitated raptors on suitable sites as appropriate.

wetland birds (grouped together here as "Waterbirds"). Certain waterbird species can also be indicators of the health of a particular wetland.

Waterbirds can be found in nearly any habitat containing open water within Fort Collins. However, individual species use varies highly among habitat types. Important features to consider when rating habitat quality for waterbirds include (1) amount, quality, and seasonal duration of open water; (2) shoreline vegetation and shoreline configuration; (3) availability of invertebrate and vertebrate food base; (4) amount and quality of habitat for nesting or cover; and (5) proximity to human disturbances. Although many resident, year-round populations of waterbirds, such as mallard, Canada goose, and red-winged blackbird, are extremely tolerant to human disturbance, most migratory and wintering populations are extremely sensitive to disturbance.

Key production areas for ducks, according to the CDOW, include most of the lakes, the Poudre River, and wetlands adjacent to the river. The Poudre River south of Mulberry is considered the main concentration area for wintering ducks.

During spring migration, ducks and shorebirds frequently use local wetlands that only have open water for a few weeks. Populations of aquatic insects and other invertebrates within these areas can be extremely high, providing a rich source of protein necessary for subsequent egg production.

One of the best examples of high quality waterbird habitat in Fort Collins is Riverbend Ponds Natural Area. This natural area consists of a variety of habitats including open water ponds and lakes, extensive cattail areas, and woody riparian forests and shrublands.

The Fossil Creek Wetlands/Reservoir area is another key wetland area, particularly for migratory species and wintering waterfowl. Over 90 waterbird species have been recorded from that complex of wetlands over the last 15 years, some of which have been extremely rare sightings for Colorado. The complex was designated as a statewide Important Bird Area (IBA) in 2001 by the National Audubon Society.

Protection of colonial nest sites for waterbirds has been of prime concern for decades. Fort Collins has had several heronries occupied by great blue herons that have been lost due to die-off of cottonwood stands and human disturbance. Heron nesting is traditional and the birds will not easily occupy a new site should the old site be destroyed, even if destruction is of natural causes, such as the advancing age of cottonwoods. Green heron nesting has been of interest for local birders as well. Green herons are on the eastern edge of their range in Colorado. Fort Collins is one of the few places in the state where the birds are known to nest. The American white pelican, formerly a Colorado Species of Concern, does not nest in the Fort Collins area, but is now common from spring through early fall. Ponds and lakes provide key habitat for adults during migration and non-breeding individuals throughout the summer.

Siberian elm, Russian olive, and saltcedar are exotic wetland pest trees and tree-size shrubs that threaten the integrity of wetland habitats throughout the Fort Collins area. All are well established along the Poudre River and other stream courses, impacting waterbird habitats on

many sites. Purple loosestrife, a perennial flower native to Europe and Asia, has decimated wetlands in the eastern U.S. and was beginning to spread to Colorado wetlands in the 1980's. Fortunately, the City took a very aggressive stand on purple loosestrife eradication in the 1990's so it has not become a problem locally by impacting habitat for waterbirds.

Trash and other man-made debris in natural areas can potentially impact and injure many wildlife species, although waterbirds are particularly vulnerable because trash is carried down waterways and accumulates where birds feed, nest, and raise their young. Injury or death of adults and young can result from ingesting or becoming entangled in debris.

General Strategies for Management of Waterbirds on Natural Areas

- Where possible, reshape banks of man-made ponds, lakes, and ditches to restore more natural contours and promote the establishment of wetland plants.
- When designing new trails and if feasible when relocating or improving existing trails, provide a buffer between critical wetland habitats for migratory, wintering, and nesting waterbirds to human disturbance areas.
- Protect colonial nesting sites from human disturbance (including maintenance and management activities) during the nesting season.
- Control Siberian elm, Russian olive, Chinese Elm and saltcedar in key wetlands used by waterbirds. Also prevent establishment of purple loosestrife.
- Remove trash and debris from stream courses; keep culverts under roadways and trails free of debris to maintain water flow.

Grassland Birds

City natural areas provide highly variable grassland habitat from weedy fields left over from past agricultural uses, to shortgrass prairie mixed with exotic grasses, to large expanses of native shortgrass prairie and native foothills grasslands. In the immediate Fort Collins area, most grasslands have been severely impacted by man's activities, including overgrazing by domestic animals and crop cultivation. There are some natural areas along Fossil Creek and the foothills that do have grasslands with a more diverse assemblage of native grasses and forbs among the exotic grasses and weeds (e.g., Colina Mariposa, Cathy Fromme Prairie, Coyote Ridge, and Pineridge), but, in general, grasslands on local natural areas are dominated by exotic plant species and are not very diverse in terms of bird populations. The further from the center of Fort Collins, the more likely that grassland habitats are composed of a higher diversity of native plant species and, thus, support more diverse populations of grassland birds throughout the year. Soapstone Prairie Natural Area contains the largest native grassland acreage and most diverse populations of grassland bird species in the City's natural areas system.

Plains and foothills grasslands along the Front Range of Colorado are two of the most severely altered ecosystems in the region due to conversion of lands to agriculture uses, and are difficult to restore due to the prevalence of non-native grasses and weeds that have been a part of the landscape for over a 100 years. Remnant native grassland patches occur in areas that have been difficult to plow and not attractive for livestock grazing. Seasonal grazing, periodic fire, and drought are natural processes that sustain native grasslands.

General Strategies for Management of Grassland Birds on Natural Areas

- Use prescribed burns, grazing, and other tools to mimic the natural disturbance regime needed to maintain a natural diversity of grasses and reduce weed infestations through Integrated Pest Management (IPM) methods including herbicide, hand pulling, mowing, and possibly biological control.
- Work with Poudre Fire Authority to control wildfire in a manner that minimizes impacts related to fire suppression (e.g., digging firelines, excessive vehicle travel, etc.).
- Remove barbed wire fencing or replace with wood fencing where possible.

Riparian Songbirds

Riparian songbirds include a variety of migrant, nesting, resident, and wintering species. Along with wetland habitats, riparian areas are known for their high wildlife values, particularly in the semi-arid West where water is not abundant. Over 70% of the riparian habitat in the U.S. has been altered; natural riparian communities now make up less than 2% of the land in the U.S. Historically, the largest and most extensive riparian forests in the Fort Collins area were found along the Poudre River. Although still true today, man-made aquatic habitats such as ditches, lakes, and ponds also provide conditions for establishment of riparian vegetation throughout the City.

Important features to consider when rating habitat quality for riparian songbirds include (1) vertical structural diversity in forest habitats; (2) patchiness, or the clumped nature of vegetation (particularly in shrub and forest habitats); (3) biomass, as well as vegetation richness; (4) variety of major vegetation types; (5) proximity to open water; and (6) amount and quality of habitat for nesting or cover.

Perhaps the most important challenge in enhancing habitat for riparian songbirds is the long-term maintenance of the riparian forest community along the Poudre River. The river's natural flow patterns have been greatly altered by diversions for irrigation and upstream reservoirs since the early 1900's. Establishment of native riparian forests is dependent on periodic high flood events that create sand and gravel bars. Seedlings of cottonwoods and willows will not grow with the low-light conditions of established stands. As the cottonwood forest along the Poudre River ages, it will not be replaced without these flood events, or without efforts to plant sapling cottonwoods.

Even on smaller drainages within the City, restoration of natural hydrology is likely to be limited due to concerns over flooding of private property. However, on larger, regional natural areas there may be opportunities to restore natural, smaller drainages such as those that have been altered to create ponded areas for livestock grazing.

Establishment of exotic trees and shrubs (e.g., Siberian elm, Russian olive, saltcedar, crack willow) along the river and in other riparian areas prevent the establishment of native, beneficial plant species. Non-native and invasive species such as Canada thistle, spurge, and smooth brome, further impact the plant community and food value for the riparian songbirds. Most

riparian songbirds rely heavily on insects during all or part of the year. Native cottonwoods and willows carry a much higher insect load than non-native trees and shrubs.

General Strategies for Management of Riparian Songbirds on Natural Areas

- Maintain and enhance habitat quality of riparian woodlands along small drainages through restoration of natural hydrology.
- Continue to protect large cottonwoods from beaver damage.
- Repair bank erosion.
- Re-contour gravel pond edges where appropriate to improve riparian habitat.
- Control Siberian elm, Russian olive, saltcedar, and noxious weeds in riparian areas to enhance the value of the habitat for songbirds.
- Maintain dead snags in old cottonwoods in riparian areas for cavity-nesting species (e.g., chickadees, house wrens) unless they create a human or property safety hazard.
- Leave downed wood in place to provide feeding areas and habitat.
- Minimize human disturbance to migratory and nesting songbirds by leaving a buffer area between trails and key riparian areas.

Foothills Forest and Shrubland Birds

The City of Fort Collins currently manages six natural areas that contain foothills ponderosa pine forests: four local natural areas (Coyote Ridge, Pineridge, Maxwell, and Reservoir Ridge) and two regional natural areas (Bobcat Ridge and Soapstone Prairie). These sites and two sites on Fossil Creek with high ridges (Cathy Fromme Prairie and Colina Mariposa) also contain foothills shrub habitat.

Local foothills forest and shrubland habitat support unique bird species, such as the spotted towhee and yellow-breasted chat, greatly increasing the diversity of wildlife that can be seen in the immediate Fort Collins area. Foothills sites have been extremely popular birding areas for decades, as well as heavily-used biking and hiking sites. Efforts over the last 10 years to improve the foothills trail system by closing off and revegetating social trails have also helped to improve the habitat for birds by reducing the areas of disturbance and increasing the habitat value.

On regional sites, bird monitoring on Bobcat Ridge Natural Area has also indicated a high diversity of foothills bird species is present, including some species considered rare or unusual for this location near Masonville. Special care must be taken to limit human disturbance of canyons and draws where bird concentration is particularly high.

Forest and shrubland bird populations can be severely impacted by catastrophic forest fire, such as occurred on Bobcat Ridge in 2000. Most of the trees were killed by the severe crown fire of the Bobcat Gulch Fire, even those in usually protected steep drainages and north-facing slopes. Much of the understory was consumed by the fire, or lost to erosion following denudation. Regeneration may also have been suppressed by emergence of early successional weeds. Future fire management (prescribed fire) needs to be included in an overall restoration plan for the site to prevent future catastrophic fires.

General Guidelines for the Conservation of Foothills Forest and Shrubland Birds on Natural Areas

- Design and maintain trail systems to limit development of social trails. Close and restore social trails that develop.
- Enhance habitat value and native character of forests through restoration efforts designed to eradicate weeds and maintain the system through periodic natural disturbance.
- In areas previously impacted by severe fires (e.g., Bobcat Ridge), stabilize eroding soils, prevent the introduction and spread of invasive weeds, and prevent further catastrophic fire from post-fire fuel buildups.
- Leave downed wood in place to provide feeding areas and habitat. In some cases, removal may be needed to open up areas for establishment of new trees, understory shrubs and grasses, or to pursue weed control.
- Encourage research to determine utilization of burned areas by flickers and other woodpeckers, nuthatch, and similar species for cavity nesting, feeding, etc.
- Enhance habitat value and native character of foothills shrublands by restoring the native grass and forbs component through aggressive weed control or active grassland restoration.

Amphibians and Reptiles

The diversity of Fort Collins' Natural Areas supports several species of amphibians and reptiles, collectively termed herptiles (See Appendix C). Management of this group of species is largely accomplished by providing structurally diverse terrestrial and aquatic habitats of sufficient scale and juxtaposition. Specific actions that can occur include conservation and management of wetlands and ponds that serve as breeding pools, identification and conservation of dispersal corridors, ensuring good water quality by maintaining protective vegetative buffers around water bodies when possible, and providing interpretive material to educate the public on the value and importance of this segment of our native fauna. Also, large regional populations may be found at relatively few locations such as a breeding sites or hibernacula. Impacts to regionally important locations that increase mortality rates can contribute to population declines. Efforts will be made to identify and conserve these important habitat features.

General Management Strategies for Amphibians on Natural Areas

- Create habitat mosaics to attract a diverse assemblage of species representing all trophic levels.
- Identify movement and dispersal corridors connecting habitats and conserve through easement, acquisition, or by structural modification (i.e. culvert placement, fence removal).
- Identification and conservation of breeding sites and hibernacula.
- Manage for permanent and temporary water pools within terrestrial environments. Consider providing supplemental water during breeding season.
- Avoid mowing or use of pesticides near water sources. If mowing cannot be avoided, blades will be set at a height of 8" or greater.
- When possible, establish a grass buffer (minimum of 100') surrounding water bodies.
- Identify and protect small pools and ponds that serve as breeding sites.
- Remove trash and debris from stream courses.
- Close eroded banks from use by fisherman or install fishing steps.
- Stabilize eroding stream banks with native plantings or seedings.
- Reshape and recontour stream banks and pond banks to restore natural conditions that will promote the establishment of wetland plants.
- Create broad, shallow littoral zones or back waters when ponds are developed or recontoured.
- Minimize stocking of introduced predatory fish into natural areas ponds and lakes.
- Create fishless ponds and wetlands when possible.
- Prevent or limit cattle grazing near streams on regional natural areas.

Fish

About half the species of fishes on City natural areas are non-native species, primarily introduced to local waters for sport fishing. The majority of the native fish species are non-game, small fishes (e.g., darters, minnows, shiners, and topminnows). Of these, species that need clear water and are intolerant of siltation are rare in the Fort Collins area.

Distribution of Colorado fishes have been severely altered by humans since the mid-1800's from mining, industrial, agricultural, and urbanization activities. Surface water flows entering streams that flow through City natural areas are altered from an array of impacts that occur off the site and not under the control of the Natural Areas Program, including accumulation of nutrients from treated sewage and fertilizers, spilled oil and gas, mud, silt, pesticides, etc. Thus, opportunities to enhance habitat for native fishes are limited on local natural areas to bank improvements and adding artificial structures that primarily benefit non-native game fishes. On regional sites, there are more opportunities to improve watersheds and, thus, water quality for native fishes (e.g., by eliminating cattle grazing, or protecting stream banks from compaction and overgrazing by cattle).

General Guidelines for Management of Native Fishes on Natural Areas

- Evaluate fish habitat enhancements as appropriate (e.g., sinking Christmas trees).
- Remove trash and debris from stream courses.
- Work with CDOW to stock native small fishes, where appropriate.
- Close eroded banks from use by anglers and/or install fishing steps.
- Stabilize eroding stream banks with native plantings or seedings.
- Reshape and recontour ditch banks to restore natural conditions that will promote the establishment of wetland plants.
- Prevent or limit cattle grazing near streams on regional natural areas.

Insects and Other Invertebrates

Unfortunately, little is known about most insect and other invertebrate communities of our natural areas. Thus, little attention has been given to protecting or enhancing habitat for this group of animals. We are fortunate in the Fort Collins community, to have several entomologists, Dr. Paul Opler and Dr. Boris Kondratieff, who have provided some information on butterflies and aquatic insects, and a few observations of rare terrestrial insects. Notably, local scientists have concluded that this region is the fourth richest butterfly region in North America (north of Mexico) (Opler, 1994).

Insects and other small invertebrates, near the bottom of the food chain, comprise the main food source for numerous species of fish and smaller terrestrial birds, as well as many ducks and other waterbirds during at least the breeding through brood rearing season. Invertebrate populations are often used as key indicator species in the assessment of the general health of wetland and upland communities, but have not been well studied, to date, on City natural areas. Many species are extremely sensitive to small environmental changes and are useful in determining impacts to a system.

Several sites that support high insect diversity or rare insect populations have been identified in Fort Collins along the Poudre River, Fossil Creek, and in the foothills. For example, Pineridge Natural Area contains rare foothills and prairie butterflies. According to Dr. Kondratieff at CSU, at least 10 other species of insects are found at Pineridge that have not been documented elsewhere in Colorado. At Bobcat Ridge Natural Area, a globally vulnerable subspecies of butterfly, the Moss's elfin, was documented on the site in 2004.

Due to their visibility and colors, the general public has an interest in maintaining and enhancing butterfly populations. Often, specific types of flowers and flower colors are more attractive to butterflies and most butterflies have specific host plants on which they deposit their eggs.

Most insects and other invertebrates are highly sensitive to even small amounts of insecticides. Although the City rarely uses insecticides in natural areas management, they have been used several times over the last few years for West Nile virus disease prevention during outbreaks of human cases. Another occasion in the use of insecticides is for flea control related plague disease prevention in prairie dog towns.

General Management Guidelines for Insects and Other Invertebrates on Natural Areas

- Explore ways to obtain more information about insect and other invertebrate populations on City Natural Areas.
- Protect and enhance populations of native flowering plants of importance for both migrant and resident butterfly populations for nectar and larval host plants.
- Protect habitat of rare butterfly populations from disturbance.
- Where possible, reshape ditch banks to restore more natural contours and allow establishment of wetland plants that serve as larval host sites for butterflies and provide habitat for numerous aquatic species.
- Limit disturbance to, and pesticide use on, known areas of high diversity and/or rare populations of insects.
- Ensure that mosquito control in Fort Collins for West Nile virus disease prevention uses the least detrimental form of insect control (e.g., bacterial larval control in wetlands, reduction of backyard breeding sites) coupled with surveillance data to limit impact to non-target insect populations, except in the case of human outbreak that would likely require spraying non-target insecticides.

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Chapter 6: Prairie Dog Management

I. Background
II. History of the Natural Areas Program conservation of prairie dog habitat
III. Current management practices
IV. Results and evaluation of 2004-2006 data collection
V. Prairie dog management and guidelines for urban colonies
    a. Management approach
        i. Defining suitable habitat using filters
        ii. Managing for spatial variability using zones
    b. General guidelines
VI. Timeline of prairie dog management in Fort Collins 1990 – 2006

The black-tailed prairie dog is an important and, at times, controversial species. Prairie dogs historically occupied over 100 million acres of shortgrass and mixed-grass prairie in 11 western states. They are considered a "keystone" species because the habitat they create provides habitat for a wide diversity of grassland wildlife. Currently, only 1 to 2% of this historic habitat remains occupied by prairie dogs. This decline in prairie dog habitat and abundance was the result of changing land use patterns (conversion of native prairie to agriculture), habitat fragmentation, disease (sylvatic plague), and extermination. From 2001 to 2004, the U.S. Fish and Wildlife Service, under the authority of the Endangered Species Act, considered the black-tailed prairie dog to be warranted for listing as a federally threatened species, but was ultimately precluded from listing due to other priorities.

The development of the future management approach for prairie dogs (as described in the latter half of the chapter) was strongly guided by all of the "Principles of Wildlife Management" (also in chapter 1). However, there are unique challenges to managing prairie dogs, especially in an urban setting. It is the aim of the Natural Areas Program to manage primarily for overall ecosystem health while also maximizing prairie dog conservation efforts. As stated in chapter 4, stresses unique to the urban environment can drastically alter the resilience and resistance of an ecosystem. In its historic condition, the localized and sustained grazing exerted on the system by prairie dogs is balanced by the presence of off colony vegetation. Also, in a larger contiguous ecosystem, prairie dog colonies add to the mosaic of the overall ecosystem.

In a fragmented urbanized habitat, prairie dog colonies serve a different role and the localized yet severe disturbance can have uniquely detrimental effects on ecosystem health. On a small patch of land, it is common for a prairie dog colony to expand out to the perimeters of that land, and the mosaic pattern disappears. Furthermore, due to decreased predator abundance, and reduced ability of the animals to disperse, densities may escalate and the severity of impact to the land and vegetation increases (Johnson and Collinge, 2004). Finally, in the urban environment, there is often not an increase of plant or animal species diversity and therefore prairie dogs do not necessarily serve as keystone species. Due to the lack of native seeds on the perimeter of colonies, and the presence of weed seeds, we have observed very low diversity of vegetation and high dominance by non-native forbs. Furthermore, many of the species documented as

obligately dependent on the prairie dog colonies, are infrequent or absent in the City of Fort Collins.

Consequently, while prairie dogs were a key component to the functioning of pre-settlement prairie ecosystems, it is the conclusion of the Natural Areas staff that due to land-use fragmentation and urbanization, the scale of prairie dog interactions with its habitat is incompatible with the small isolated patch natural areas within the Fort Collins-Larimer County area. As such, it is necessary to actively manage the location and density of prairie dogs. Finally, we recognize that by promoting ecosystem health as our primary objective, due to the ubiquitous effects of fragmentation on our ecosystem, we are applying a narrower and unique definition of ecosystem health where soil stability, plant cover, and native species diversity are the top priorities. This definition will drive our ensuing monitoring program for prairie dog colonies and help us identify thresholds appropriate to the urban setting.

I. Background

Management of prairie dogs in Fort Collins is guided by state regulations administered through the Colorado Division of Wildlife as well as local city land use and municipal code in Fort Collins. Since March of 1998, management of prairie dogs on City natural areas has also been guided by a series of policies outlined in the 1998 document "Prairie Dog Policy for City Natural Areas." This policy was born out of a collaborative effort made up of citizen advocates, wildlife professionals, city managers, and politicians. The 1998 Policy established 33 policies that addressed various prairie dog issues, including land protection, education, research, natural control, barriers, relocation, disease control, and fumigation. These policies mainly served to formalize practices and techniques used by the City since 1992 when the Natural Areas Program was established.

Today, the City of Fort Collins Natural Areas Program manages more than 1,000 acres of urban prairie dog colonies on approximately 9,000 local acres of natural areas within and adjacent to Fort Collins (11% of local natural area acreage). Many of these natural areas are located in or near the city's urban landscape adjoining private lands and properties, subsequently fragmenting sustainable prairie dog habitat. In addition to local populations, the City's Soapstone Prairie Natural Area currently supports 534 acres of occupied prairie dog habitat (2006).

Since biennial monitoring began in 2004, the inhabited colony acreage on natural areas has seen a system-wide doubling (>100%) both in terms of acreage and population size. This expansion of prairie dogs on natural areas, coupled with their setting in the urban landscape, has become problematic. For example, data collected in 2006 suggest that the overall health of the grassland vegetation is declining. As a result of prairie dog grazing pressure, bare soil is becoming exposed, subjecting many sites to wind erosion (see chapter 4 regarding "habitat thresholds and management triggers").

Because the Natural Areas Program is managing for overall ecosystem health, and for the viability of multiple species and plant communities (i.e., not just prairie dogs and associated plant and animal communities); and, because the Program needs to develop a more sophisticated approach to prairie dog management, this chapter revises and updates current policies and

management approaches. These changes are intended to ensure the most responsible stewardship of both prairie dog populations and other conservation values as stated in the Program's mission and management goals outlined in pages 6 and 7 of this document.

II. History of Natural Area Program's prairie dog habitat conservation

The Natural Areas Program through the support of the citizens of Fort Collins has demonstrated a commitment to the conservation and stewardship of prairie dog habitat and the habitat of all native wildlife since 1992. This commitment has taken many forms through the years and includes:

- acquisition of lands with (or with potential) prairie dog habitats (see Table 6.1)
- participation in, and creation of, professional forums related to prairie dog management
- extensive public education and outreach on the value of the prairie dog ecosystem
- self-directed efforts to research new non-lethal forms of management and control
- public participation through open and honest dialogue with concerned citizens

A detailed timeline (1990 – 2006) is presented at the end of this chapter that highlights the Natural Areas Program's spectrum of efforts to ensure the long-term conservation of prairie dogs and their habitat. During this period, the Natural Areas Program has acquired numerous existing prairie dog colonies as well as additional lands that may serve as prairie dog habitat in the future. In addition to habitat conservation, the program has used fumigation, relocation, barriers, and predator enhancements to manage prairie dog populations in urban areas.

Most importantly, the Natural Areas Program recognizes the importance of the role of prairie dogs in the ecosystem and has actively pursued acquisition of local lands that include occupied or suitable prairie dog habitat. To that end, a total of 4,788 local acres (not including Bobcat Ridge or Soapstone Prairie Natural Areas) of potential grassland and prairie dog habitat has been acquired by the program and its partners:

Local Natural Areas	Site Acreage*	When Acquired
Cathy Fromme Prairie	1,079	1993 – 2002
Colina Mariposa	207	1998 – 2000
Coyote Ridge	1,095	1994 – 2000
Eagle View	86	2002
Fossil Creek Wetlands	220	1995
Fossil Creek Reservoir Regional Open Space	470	2001-2003
Hazaleus	163	1999
McKee Farm	995	1997
Pelican Marsh	159	2002
Pineridge (additions)	230	1992 - 1998
Prairie Dog Meadow	84	1994 - 2003

Summary: 4,788 local acres* purchased from 1992 through 2003

Table 6.1. Summary of local acres acquired in fee purchase between 1992 and 2003 containing either occupied or potential prairie dog habitat.
**Note not all acreage within a site is occupied or suitable prairie dog habitat.*

III. Current Management Practices

In 2006, urban prairie dog colonies were scattered across 14 local natural areas within Fort Collins. In this largely urban context, prairie dogs are unable to naturally expand their home ranges, and as a result, graze vegetation at a level that cannot be sustained by the grassland (especially in drought conditions). The Natural Areas Program currently employs a suite of techniques to manage prairie dogs and their habitat.

Inventory and Monitoring
Information is perhaps the most powerful management tool and provides data on the population status, vegetation condition, and other factors that drive science-based decision making.

Fumigation
Fumigation is the only legal method of extermination that complies with EPA requirements and Fort Collins City Code. Fumitoxin (and other brands) comes in the form of a tablet that is dropped into prairie dog burrows (the hole is then plugged) and in contact with soil moisture emits a gas that forms toxic fumes. Care is taken by trained applicators to avoid extermination of a burrow where other wildlife species may be present. For example, if a burrowing owl pair occupies a site, the area will not be fumigated as long as the owl inhabits the burrows.

Relocation
The relocation of prairie dogs is more art than science. The Natural Areas Program and other Front Range communities have used relocation with some success. At this time, the number of relocation "receiving sites" ranges is extremely limited on public lands and especially on private lands. Private landowners are reluctant to accept prairie dogs as they pose unique management issues. On public lands, potential receiving sites are frequently in need of vegetative restoration thus severely limiting the opportunity to use relocation as a prairie dog management tool. Other concerns with relocations include disruption of social structures of tightly knit prairie dog family groups (i.e., coteries) and the high cost per animal. The appropriate permit is acquired from the Colorado Division of Wildlife.

Trapping and Donation
Both the U.S. Fish and Wildlife Service's National Black-footed Ferret Conservation Center in Carr, Colorado, and the Rocky Mountain Raptor Rehabilitation Center in Fort Collins accept the donation of both live and dead prairie dogs for feed or conditioning activities. Although donations are more often taken for feed rather than conditioning, the Natural Areas Program views this use of prairie dogs as a positive contribution to other on-going wildlife conservation efforts. The appropriate permit is acquired from the Colorado Division of Wildlife.

Barriers
The City has used a number of techniques to reduce the level of prairie dog movement onto adjacent private property. These include the installation of solid vinyl barrier fence, earthen berms, shrub plantings, straw bales, and raptor perches (to enhance predation). While these methods are helpful, they cannot provide a complete deterrent to prairie dog movement into adjacent areas.

Plague Management

Sylvatic plague was introduced from Asia and first identified in prairie dog populations in the mid-1930's. Because most prairie dogs and some wildlife and domestic pets have no natural immunity, plague is capable of causing massive die-offs in prairie dog populations. In the event of a plague outbreak on City natural areas, City officials consult with the Larimer County Department of Health and Environment to determine the extent to which human protective measures such as postings and closures should be enacted. If deemed prudent by County health officials, City staff will dust prairie dog burrows with an insecticide to kill the fleas and help prevent their spread.

Reproductive Controls

The City of Fort Collins Natural Areas Program is currently pursuing an experimental trial with the National Wildlife Research Center on two methods of reproductive controls that could become another tool for managing prairie dog populations. The first method involves a single injection of a Gonadotropin-releasing hormone (GnRH) registered as GonaCon. Male and female prairie dogs are trapped prior to the sexual active season and injected with the substance that inhibits cholesterol production necessary for sexual hormone formation. Prairie dogs are then ear-tagged to ensure that they are not re-injected. Effective contraception is expected to last a minimum of 2 years for prairie dogs (prairie dogs may only breed 2 or 3 times during a lifetime). Anticipated cost of each injection is expected to cost $ 1.00 plus the staff time necessary to conduct the procedure.

A second method in testing is the use of Diazacon™ a cholesterol mimic that inhibits cholesterol production and blocks sexual hormone formation. Diazacon™ is administered by feeding treated rolled oats to prairie dogs. For prairie dogs, this application would take place by the end of November and would comprise of ten feedings over a 2-week period to result in effective serum levels. This technique would require feedings each year to maintain sterilization. Costs for this operation are unknown at this time.

Testing on both of these techniques began in fall of 2006. If the trial runs are successful, full product licensing and registration with the EPA and FDA could take an additional 2 years. Thus, the earliest this tool could be available would be 2009 or 2010.

Education and Outreach

As part of the Natural Areas Program, a formal education and outreach program was begun in 1994. Education efforts have emphasized informing the citizenry about the values of the grassland ecosystem including the vital role of prairie dogs.

Prairie Education & Outreach Programs	
Year	Number of People
2002	516
2003	639
2004	921
2005	1,250

The Natural Areas education program has coordinated 261 volunteer naturalist programs about the prairie including slide shows, classroom presentations, and field trips to more than 5,700 people since 1994. **This averages to about one prairie program every other week, for over 10 years.**

The Natural Areas Program educational outreach is comprised of several components: volunteer Master Naturalists, interpretive features, printed materials, teacher trainings, public presentations, the City's website, and community events. The Master Naturalist Program reaches schoolchildren, scouts, seniors, families, teachers, and recreationists. Over 200 volunteer naturalists and 100 teachers have been trained with 20% (naturalists) and 50% (teachers) of their training time spent on prairie dogs and prairie ecosystems. Other volunteer projects that have instilled community involvement are prairie dog population surveys, installing vinyl barriers, planting shrub barriers, predator enhancements, and relocation efforts. Over the past 10 years the program has delivered 30+ projects each with 5-30 volunteers.

The main outdoor classroom for prairie dogs and the prairie ecosystems is Cathy Fromme Prairie, which opened in 1997. The raptor observation building, trail pull-offs, and interpretive panels along the trail all have a common theme: educating visitors about the importance of prairie dogs to the ecosystem.

The Natural Areas Program education staff develops original materials specific to City natural areas, but also extensively uses other materials from US Fish and Wildlife Service, Colorado Division of Wildlife, Bureau of Land Management, University of Nebraska, Rocky Mountain Bird Observatory, National Wildlife Federation, and the University of Northern Colorado. The educational programs include specific topics and activities such as:

- prairie dog behavior
- plant and animal adaptations to the prairie ecosystem
- food web learning activities
- relationships between prairie dogs and predators
- effects of prairie dog burrowing activity on other wildlife
- soils and plants
- challenges of managing prairie dogs in urban environments
- public attitudes about prairie dogs

Conclusion of Current Management Practices

To date, the City of Fort Collins Natural Areas Program has implemented a variety of sophisticated prairie dog management practices. A constant reinvention of these techniques and development of new tools will be critical to the future conservation of prairie dogs in urban settings.

IV. Results and Evaluation of 2004-2006 Data Collection

Objectives and Methods

In 2004, the City of Fort Collins Natural Areas Program initiated a biennial effort to survey all prairie dog towns on natural areas land and evaluate the status of vegetation conditions. The specific objectives of this survey were threefold:

1. **Map size and location of all prairie dog colonies.** A hand-held GPS unit is used to circumnavigate the boundary of each prairie dog colony.

2. **Estimate the total prairie dog population on each property.** This is accomplished through a numeric procedure that extrapolates population size based on population density. The method divides burrow density data with an "animal factor" that influences the number of burrows per prairie dog.
3. **Measure vegetation characteristics in each prairie dog colony with permanent vegetation transects.** This is accomplished through established methods (line-point) for assessing vegetation cover by species. From this it was possible to calculate several vegetation parameters.

The goal of the biennial survey is to develop sound, un-biased data on prairie dog population dynamics and habitat condition to help inform and drive management and conservation strategies for the long-term health and sustainability of prairie dogs and their habitat.

Trends

Overall, from 2004-2006 the total inhabited acreage by prairie dogs more than doubled. Estimates of the population indicate the total population has increased 2.3 fold from approximately 6,000 in 2004 to more than 14,000 in 2006 (see Figures 6.1 and 6.2). The estimated density of prairie dogs on the colonies ranges from 4-62 animals per acre and averages 16 animals per acre. The vegetation data indicate that average habitat conditions in areas inhabited by prairie dogs consist of very low percent live plant cover, species richness, and percent of native species versus non-native species.

Prairie Dog Colony Maps

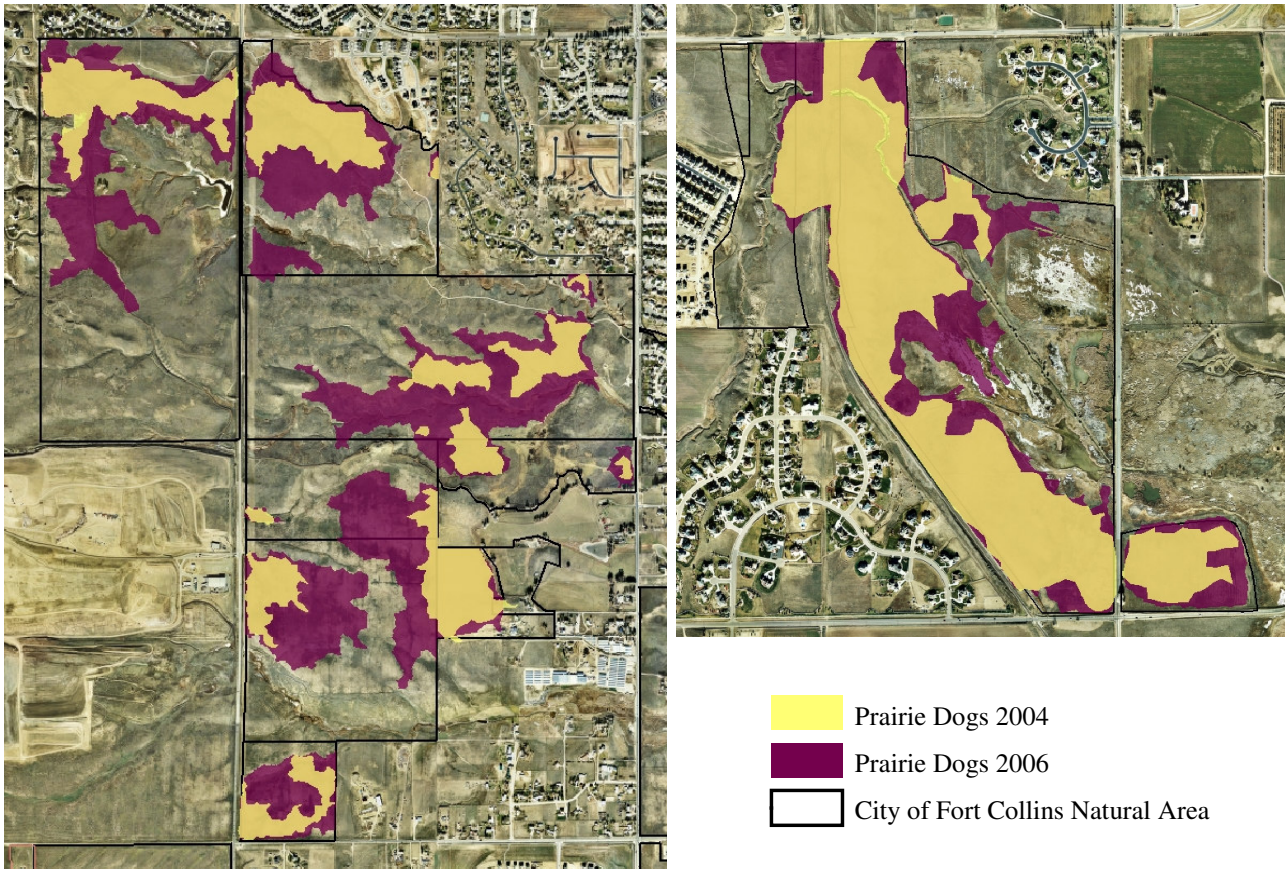


Figure 6.1. The expansion areas of two representative natural areas (Cathy Fromme Prairie on the left and Fossil Creek Wetlands on the right) 2004 – 2006. System-wide there was an overall doubling in net prairie dog acreage and population between 2004 and 2006.

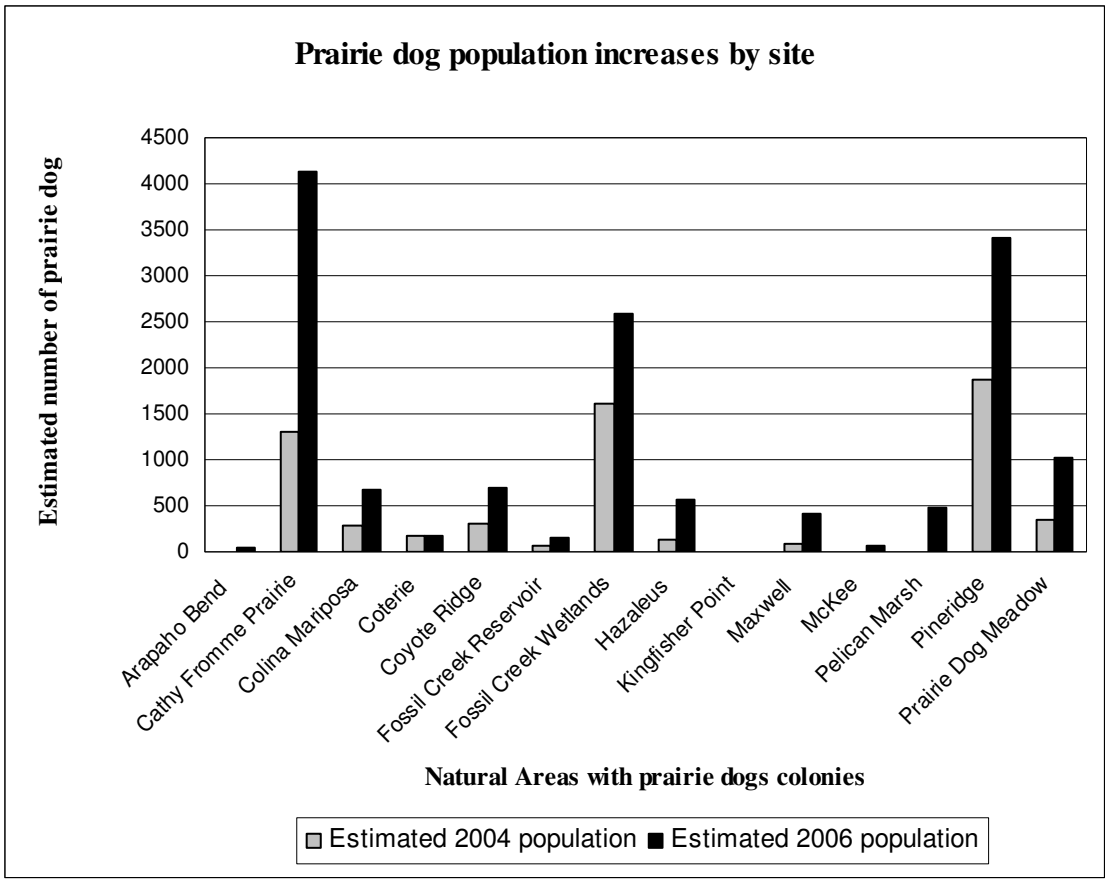


Figure 6.2. Estimated number of prairie dogs by site during a 2-year period from 2004 to 2006. Areas with only 2006 data indicate new colonies since 2004. The estimated population size of urban prairie dogs has more than doubled, rising from an estimated 6,000 animals in 2004 to >14,000 in 2006.

Vegetation Data

Information on current vegetation (habitat) conditions was gathered in September of 2006 in an effort to better understand and quantify differences in vegetation attributes between prairie dog colonies. A total of 38 transects in 14 colonies were used to gather a variety of cover parameters such as percent plant cover by species, percent bare ground, and percent litter. A small number of transects were measured in off colony habitat, however due to the tremendous variation in historical land-use, and the low number of these controls sites, they were ultimately not appropriate control measures.

Due to the overall sample size and number of sites, rigorous statistical analysis is not possible at this time. However, important observations revealed in the data are provided below. Future sampling efforts may be expanded in an effort to better evaluate the importance of these observations.

- The average area covered by live vegetation was **29%** (Figure 6.3).
- The average number of plant species observed per transect was **3**.
- A weed species (non-native) was the dominant plant on 60% of the transects.

- As the ratio of weeds to native species increased, the number of total species detected decreased.
- By sorting the data into plant functional groups the dominance by non-native perennial forbs becomes evident (Figure 6.3). This group consists of 99% bindweed (a Colorado state listed noxious weed).

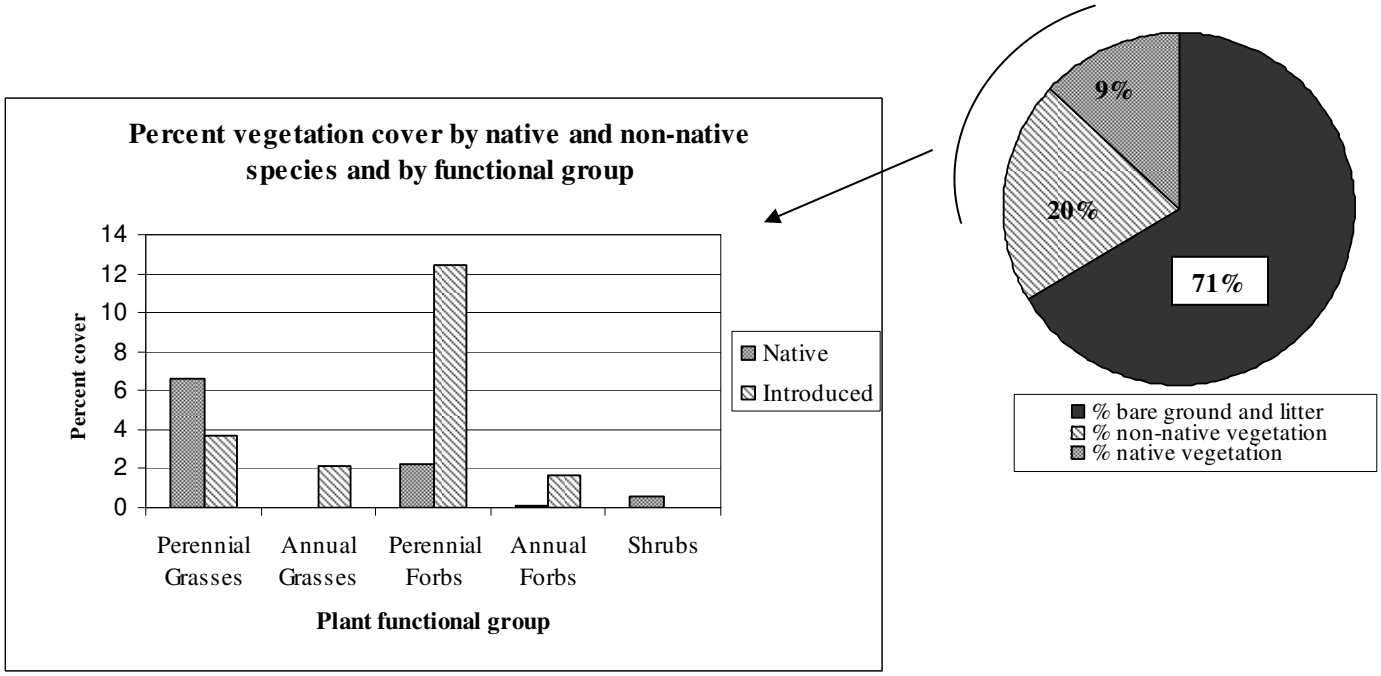


Figure 6.3. The pie chart (right) represents the total percent cover detected on the vegetation transects located within prairie dog colonies. The bar graph (left) summarizes the average percent vegetation cover by plant functional group. The dominance by the perennial forbs is due to dominance by the noxious weed *Convovulus arvensis* (bindweed*).* This graph summarizes the data from 38 transects on 14 colonies.

* Pineridge Natural Area has greater plant diversity, and greater cover by perennial grasses when compared to other areas. If the sampling data from the Pineridge vegetation transects were omitted from the graphs above, the graphs would portray a greater dominance by the non-native perennial forb component and even lower contribution by the native perennial grasses (only 4%). Also, the overall plant cover would be reduced to 24%**.**

In summary, the vegetation data can be used to understand the condition of land affected by year-long, high-intensity grazing by prairie dogs after several years with lower than average precipitation. It should be emphasized that vegetation transects were located primarily in the flatter topography immediately east of the foothills, however, about one third of the transects were located in the foothills. These areas were originally composed of a mosaic of short and mixed grass ecosystems. Given the natural range of variability across these habitats, along with extreme differences in annual precipitation it is difficult and inappropriate to apply an average for live vegetation cover from either the short or mixed grass habitat as a reference value. The range for such extremes might be from 45 to 80% cover by live vegetation.

Prairie dog grazing and burrow construction is expected to reduce total vegetative cover whether they are grazing in an unfragmented healthy grassland or in urban natural areas. However,

several stresses unique to the urban environment affect the ecosystem's resistance to this reduction in plant cover which increases the likelihood that soil erosion will occur. One stress in the urban setting is the presence of many barriers to prairie dog movement. Consequently, they are unable to travel when necessary for better food resources, which increase the grazing intensity and frequency on the surviving plant community within the burrow system. Similarly, on some natural areas they are unable to disperse and create new burrow systems as the population increases.

Therefore, there is extreme grazing pressure exerted on the vegetation. Regardless of density, prairie dogs will purposely reduce vegetation immediately around their burrows for visual benefits , such as predator detection. Another factor is the change that occurs to the composition of the vegetation because the reduced cover, provides opportunities for invasive species to establish. As witnessed on Cathy Fromme Prairie (through observation), a diverse native plant community was quickly turned into a mono-culture of bindweed when prairie dogs moved into an area. There is consequently a significant decrease in the ecosystems resistance to soil erosion due to loss of species diversity, lower diversity of rooting structures within the soil profile, and changes in the composition of plant functional groups (and specifically a reduction in the perennial grass component). In some natural areas, soil erosion is evident through rills, pedestalled plants, soil accumulation along fence lines and soil accumulation in adjacent residential yards, porches and gutters.

Conclusions from the 2004-2006 Data

The results indicate that the prairie dog populations are growing resulting in a *2.3* fold increase from approximately 6,000 in 2004 to more than 14,000 in 2006. Vegetation within the prairie dog colonies is dominated by non-native species (predominantly bindweed) and is providing such little cover that resistance to soil erosion is low. Soil loss appears imminent on some sites, and already occurring on others.

In conclusion, there are two major concerns regarding current prairie dog populations.

1. Instead of trending towards increased resistance and resilience to disturbance and for high native species diversity, (see Chapter 4) the City's urban prairie dog colonies are instead trending towards and arriving at the margins of ecological sustainability and diversity.
2. The ecological degradation of sites with prairie dog colonies in the urban setting across the critical and irreversible threshold of soil and nutrient loss is alarming. Not only is recovery expected to be prohibitively costly, but it is not guaranteed because success of ecological restoration is dependent on factors (mainly precipitation) beyond our control.

This situation can be graphically depicted using the following model of change over time given different management and site conditions:

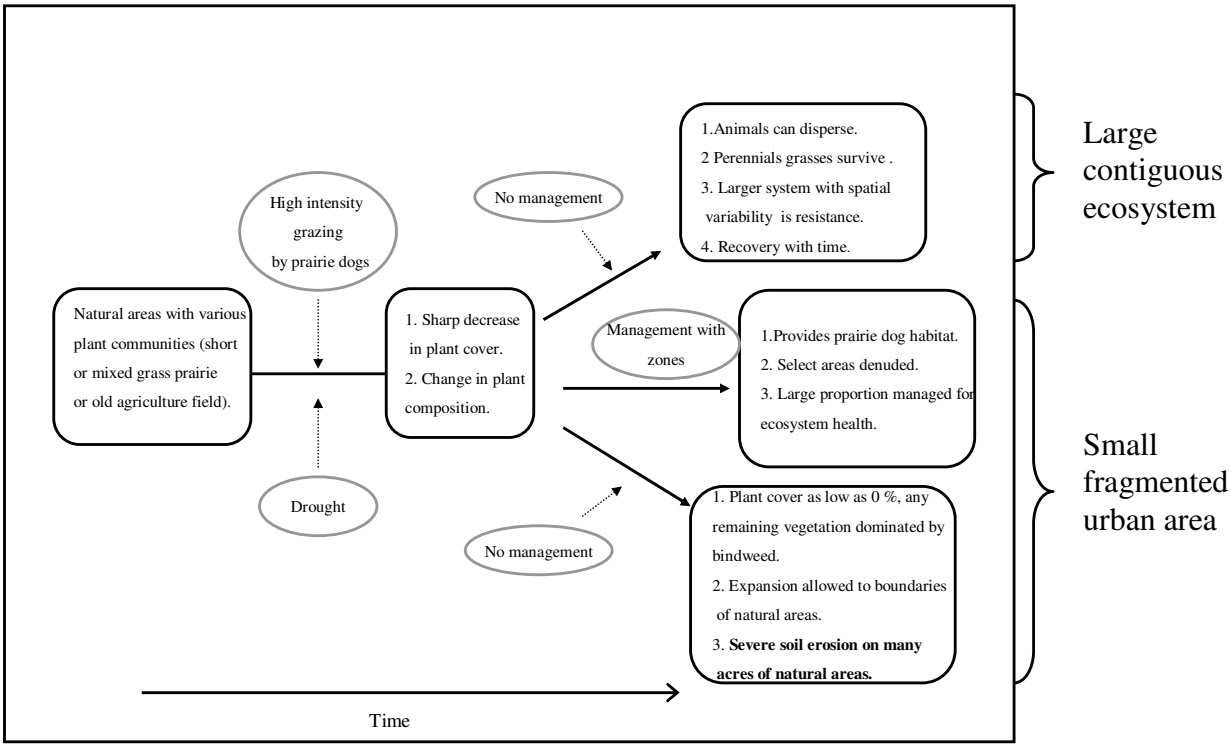


Figure 6.4 Modeling change over time in natural areas affected by prairie dog grazing.

V. Prairie Dog Management and Guidelines for Urban Colonies

The following set of guidelines are intended to update and replace the 1998 "Prairie Dog Policy for City Natural Areas" adopted by council resolution in March of 1998.

The broader aspects of this plan provide firm and clear direction for managing prairie dogs relative to grassland health. However, the details of the plan continue to allow considerable flexibility for prairie dog management and ecological monitoring methods. Management of prairie dogs will always be controversial especially when lethal forms of control are necessary. This plan aims, over time, to maximize grassland health while minimizing the necessity to use reactive lethal methods. However, it is important to note that over the short term (3–5 years), considerable population management (lethal control) may be necessary to achieve the desired baseline condition.

A. Management Approach

The long-term (15 year) plan for prairie dog management was developed using principles from the model of ecosystem management, the overarching objective of promoting grassland health (see chapter 4), as well as fundamentals from prairie dog ecology (Hoogland, 2006). The first step is to identify suitable prairie dog habitat (acres and location) within the urban natural area

system by using a series of "filters". The second step is to manage for spatial variability within the suitable habitat by mapping out 3 management "zones".

i. Identifying suitable habitat using filters

Filter 1 - Determine Available Prairie Dog Habitat
Available prairie dog habitat is defined as areas greater than 50 acres that:

- ✓ Do not have hydric (wet or saturated) soils.
- ✓ Are dominated by grass or herbaceous plants (excludes forests, shrublands, etc.).
- ✓ Lands with slopes less than 10%.

Filter 2 – Areas that represent other high-priority conservation targets. These represent areas where prairie dogs will be excluded.

- ✓ Areas with rare plants such as *Physaria bellii* (Bell's twinpod).
- ✓ Sites with unique flora or fauna that would be adversely affected by the high-intensity grazing.
- ✓ Active ecological restoration areas, because prairie dogs disturb the soil and graze upon germinating vegetation.
- ✓ High quality grasslands with substantial native vegetation deserving protection. The definition of high quality grasslands in a larger context would inherently include prairie dog colonies. However, in this context, we are referring to areas with high percentage of native vegetation species that would be vulnerable to invasion by non-native species when bare ground is exposed (due to grazing by prairie dogs).

Filter 3 – Minimum prairie dog complex size of 50 acres

- ✓ Does the land remaining after filters #1, and #2, still consist of 50 or more contiguous acres? (The raptor surveys of the 1990's indicated a much greater likelihood that raptors will use a prairie dog colony as a food source if it is greater than 50 acres in size.)
- ✓ The entire 50 acres must also be without habitat barriers. For example, a four-lane road, or the Poudre River will act as a barrier to prairie dog movement.

Filter 4 –Zonation (described in detail below)

ii. Managing for spatial variability using zones

The land remaining after the first three filters will be considered as suitable prairie dog habitat. Management zones (described below) will be used to identify and differentiate the level and intensity of prairie dog management relative to conservation of intact grassland communities.

After applying the filters, each natural area with suitable habitat will then be analyzed independently and designated into management zones A, B, and C. Designation will be based on the following:

- Relevant site conditions,
- Short and long term historical land-use,
- Current prairie dog populations and existing burrow systems,
- Minimizing the edge to interior ratio for the shape of each zone,

- Minimizing fragmentation of Zones "C,"
- *As a general guideline*, the ratio of acres for the zones A,B and C will be 40:20:40.

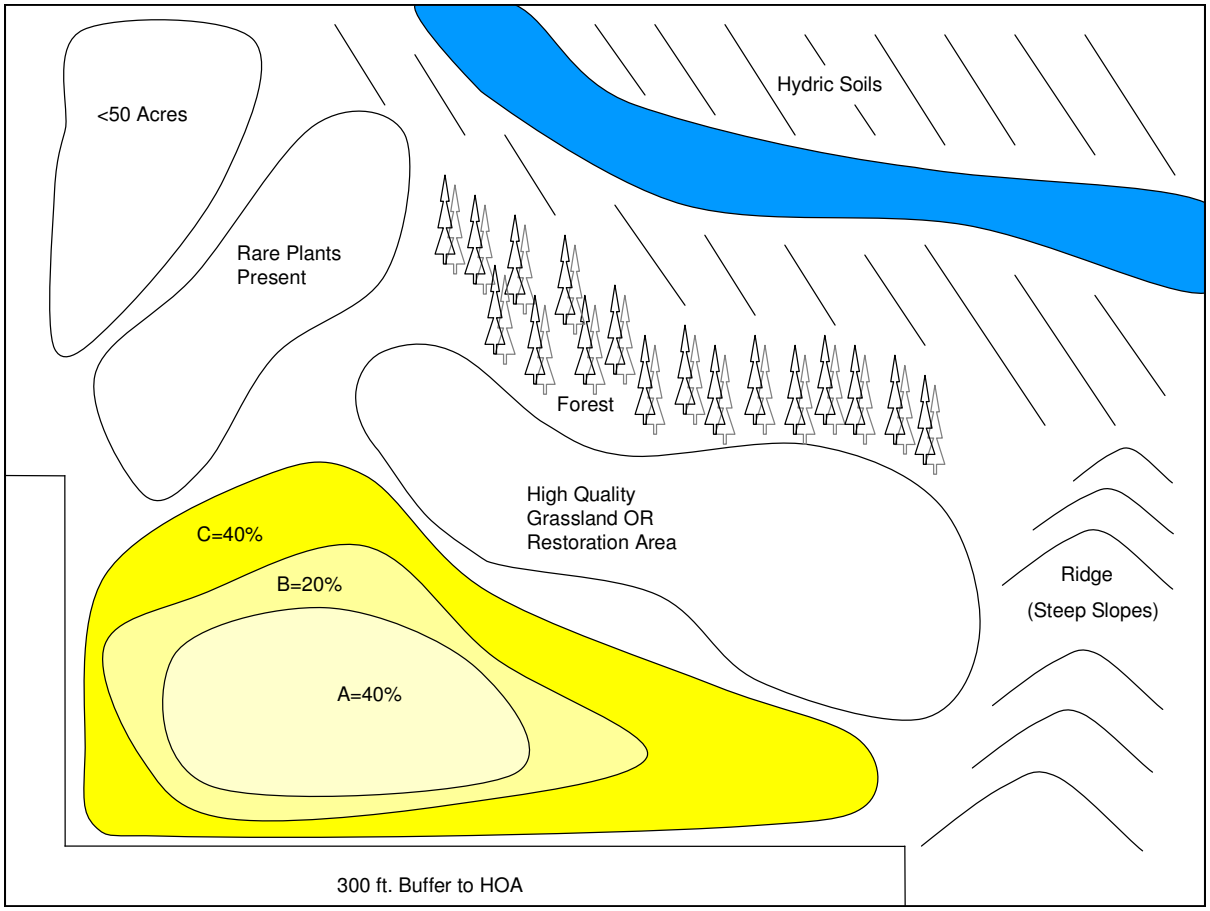
Management Objectives and Methods for the Zones A, B, and C

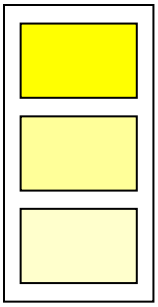
Once the suitable acreage of prairie dog habitat is defined through the filter approach described above, that acreage will be subdivided into three management zones where the percentage of the acreage will be 40% for zone A, 20% for zone B, and 40% for zone C.

Zone A: *Core prairie dog habitat*: Areas where prairie dogs will be allowed to live with little to no population management or human intervention. Consequently, the vegetation community in zone A will be reflective of the localized and sustained grazing. Because of urban parameters, the locations designated as Zone "A" is expected to become severely denuded and be dominated by non-natives. The only regular management expected will be management of noxious weeds. Management of the prairie dog population will not occur regularly but they may be managed to effect a change in the density and to relieve grazing pressure in Zone B.

Zone B: *Density reduction zone*: Prairie dogs will be allowed to inhabit Zone B but the density and colony boundary will be intensively managed in order to prevent degradation of any of the three ecosystem attributes (soil stability, hydrologic functioning, biotic integrity). A specific definition of ecosystem integrity (and related attributes) will be developed for the urban setting. A multi-tiered monitoring approach utilizing a rapid assessment or short-term monitoring approach will facilitate the collection of data over many natural areas in a cost-effective manner. If data begins to indicate that vegetation parameters are approaching unacceptable levels (based on change from a reference site, see zone C), then more intensive monitoring will be applied so that management intervention can occur before the site crosses an irreversible threshold. Any given "B" zone may be managed as a prairie dog exclusion zone under the short term, if conditions are degraded to such an extent that natural recovery will be unlikely with year-long high-intensity grazing.

Zone C: *Grassland Reserve Area/Prairie dog exclusion zone*: Zone C will be managed for ecosystem health and for the restoration or maintenance of the optimal vegetation community consistent with ecological site potential and within limits of historical land-use. Prairie dogs will not be allowed to occupy (create burrows in) this zone. This zone will also serve as a grassland health reference site for monitoring the adjacent Zone B. Initially, the condition of the plant community in Zone C will be assessed. If restoration (at any level) is required, then another off-site area will be located to serve as a reference site for monitoring





Suitable prairie dog habitat

NOT suitable prairie dog habitat

Figure 6.5 Filters and zones applied to a fictitious natural area.

Table 6.2. Summary of management implications for prairie dog management zones:

	A: Core 40% [a]	**B: Density Reduction** 20% [a]	**C: Buffer, No Prairie Dogs** 40% [a]
Purpose	Manage to allow prairie dogs to live with no to minimal human intervention	Management zone: Manage to protect soil stability, hydrologic functioning, biotic integrity	Manage for optimal ecosystem health.
Site conditions [b]	Reduced plant cover with less desirable plant community; some soil movement from wind and water both on and off site	Plant cover variable; increased cover by perennial grasses and dominance by native species, less soil movement compared to zone A	Plant cover representative of natural conditions, plant community native perennial grasses and forbs. Soil movement mimics natural condition.
Biotic community [b]	Monitor to reference with zone B	Some percent change acceptable from zone C	Reference site; mgt will be aimed at having optimal conditions for site
Weed control	Yes	Yes	Yes
Relocation [c]	Yes, if applicable	Yes, if applicable	Yes, if applicable
Birth control [d]	Ok	Ok	No
Fumigation	Less preferred	Ok	Primary tool
Trap and donate	Yes	Yes	Yes
Restoration	No	Ok	Aggressive

[a] These percentages will serve as general guidelines. Each site will be analyzed independently allowing the site conditions, shape of polygon of potential habitat to also affect the 40:20:40 ratio.
[b] Methods for monitoring and acceptable departure of conditions from the reference site are TBD. A tiered set of monitoring options will be proposed and applied as appropriate given site conditions and yearly resource limitations (budget, seasonal staffing, etc.).
[c] Only when suitable relocation sites exist.
[d] **May** be an option in several years.

There will be three stages for implementing this plan:

- January 2007 to June 2007: Develop 15-year suitability and zoning map and details of monitoring plan.
- June 2007 → onwards: Implement plans as resources permit.
- 2011: Evaluate success of plan and present to Council.

B. General Guidelines:

(1) The prairie dog management approach and guidelines apply only to designated natural areas managed by the Natural Areas Program. These guidelines have been developed specifically for urban natural areas. If deemed appropriate they will also be applied to the regional sites. However, they are subordinate to the management plans of the regional sites. They do not apply to sites managed by other City departments, agencies or private lands. Prairie dog control on these sites will be determined by the managing department and will be conducted in accordance with the City Code.

(2) The Land Conservation and Stewardship Advisory Board will be responsible for reviewing the prairie dog management approach and guidelines on a periodic basis (not to exceed 5-7 years). They will advise the Natural Resources Director if a more extensive review or changes in the guidelines are warranted.

- **Relocation Guidelines**

(1) Prairie dogs may be relocated only if (a) suitable recipient sites are available; and; (b) plague is not known to be present in the capture and release sites; and; (c) expertise is available to relocate the animals; and; (d) the appropriate CDOW and FDA permits are issued; and; (e) donor and recipient sites have been dusted with an insecticide by a licensed applicator.

(2) Relocation may be used to reduce the density of prairie dogs in a natural area or in an effort to reintroduce them to a suitable City-owned natural area. Factors that will be considered prior to any relocation or reintroduction will include but are not limited to:

- the ecological condition and carrying capacity of donor and recipient sites
- prairie dog population trends at donor and recipient sites
- status and consideration of site management plans for recipient sites
- proximity to adjacent landowners
- funding and staffing considerations
- disease concerns if relevant
- presence of other wildlife species

(3) Prairie dogs relocated to an unoccupied site shall be released at a number less than the anticipated carrying capacity of the site in order to allow for natural population recruitment and expansion, yet it may also be necessary to establish a minimum number to improve survival rates following relocations

(4) To ensure that dependent young prairie dogs are not left in burrows, relocation should be avoided from March 1-May 31st. The Colorado Division of Wildlife does allow prairie dog relocation during these months but only if the burrows are fumigated immediately after relocation activities cease. Thus, to minimize the need for lethal control measures, relocation activities should not occur during March, April, and May. Preferred months for relocation are June through September, however, could continue through December, conditions permitting.

(5) Prairie dogs relocated to sites that do not contain recently (within 1 year) active prairie dog burrows must be prepared prior to relocation by production of artificial burrows through augering or some other method acceptable to the CDOW.

- **Trapping and Donation Guideline**

(1) When population density reduction is necessary and when resources permit the Natural Areas Program will trap and donate animals to either the U.S. Fish and Wildlife Service's National Black-footed Ferret Conservation Center in Carr, Colorado, or to the Rocky Mountain Raptor Rehabilitation Center in Fort Collins.

- **Fumigation Guidelines**

(1) The Natural Areas Program will use fumigation (as one tool) to manage prairie dog colony size, shape, density and distribution on city-managed natural area sites. Prior to lethal control, consideration will be given to (**in no order of priority**):

- possible non-lethal alternatives
- the ecological condition and carrying capacity of the site
- population trends for the site and other natural areas
- adjacent landowner concerns
- funding and staffing considerations
- disease concerns if relevant.

(2) Fumigation will be conducted under the guidance of a Colorado Department of Agriculture licensed Qualified Supervisor and in a manner consistent with product labeling.

- **Disease Control Guidelines**

(1) In the case of suspected plague, the Natural Areas Program will work cooperatively with the Larimer County Department of Health and Environment and the Center for Disease Control. Neighbors and visitors to the natural area in the vicinity of plague-positive prairie dogs or flea tests will be notified via sign postings and notices distributed via the news media.

(2) Natural areas known to contain prairie dogs that have died from, or are known to be infected with plague may be posted as closed to recreational use. If the trails are permitted to remain open, signs shall be posted and specific restrictions may be implemented. Dusting with insecticide as a control method to slow the spread of fleas hosting the plague bacteria will be evaluated on a case-by-case basis in consultation with the Larimer County Department of Health and Environment.

- **Barrier Guidelines**

(1) The Natural Areas Program will continue to maintain and improve existing prairie dog barriers on City natural areas. Local volunteer groups may be recruited to assist in these endeavors.

(2) The Natural Areas Program will continue to investigate new artificial and vegetative barrier designs. Experiments will be conducted on a limited basis in order to evaluate new designs. Construction of new barriers will be very limited due to high costs of installation and maintenance.

(3) In choosing new barrier designs, maintain sensitivity to human visual aesthetics and natural functions of the site (e.g., drainage) and movement of other wildlife species.

(4) The Natural Areas Program will continue to encourage existing developments adjacent to existing city natural areas occupied by prairie dog colonies to construct and maintain prairie dog barriers on private land.

- **Land Protection Guidelines**

(1) The Natural Areas Program will continue to acquire and manage large grassland or cropland parcels in the Fort Collins area that can be restored to native short-grass prairie and are able to support large (>50 acres) prairie dog colonies.

(2) The Natural Areas Program will continue to acquire or otherwise protect lands for the purpose of maintaining undeveloped corridors between prairie dog colonies to encourage the movement of mammalian predators and possibly also to allow migration of prairie dogs to allow for genetic mixing.

- **Education Guideline**

(1) The Natural Areas Program will continue to provide educational opportunities for the public on the ecology and management of prairie dogs in an urban setting. Topics will include the natural history and importance of prairie dog colonies and urban management issues such as population control, balance in the ecosystem, plague, and human interactions. As in line with this plan, education will also emphasize the larger ecological and community management goals of the City's natural areas as well as other grassland wildlife species found in the natural areas system.

- **Monitoring, Research and Experimentation Guidelines**

(1) The Natural Areas Program will continue to work independently and in partnership with other public and private organizations in prairie dog management, research, and experimentation. Research areas will focus on population controls through sterilization and in-situ restoration methods that do not require prairie dog removal.

(2) As resources permit, the Natural Areas Program will continue to conduct a comprehensive inventory of prairie dog populations and vegetative conditions at least once every other year. Data collected will provide information on the colony location, size, configuration, and trends related to population size and grassland health. Frequency and intensity of monitoring may be adjusted based on need and availability of resources (staff, funding, etc.).

(3) The Natural Areas Program will continue an on-going effort to monitor the presence/absence of both prairie dog dependent species and prairie dog associated species.

(4) The focus of future grassland health monitoring efforts will be on the conditions of the vegetation communities within prairie dog management zones (see management approach, above). Efforts will be concentrated in zones B and C to ensure ecosystem attributes such as soil stability, native plant cover and abundance are consistent within established thresholds. Monitoring efforts may vary in intensity depending on site issues and program.

Conclusion

The conservation of prairie dogs and the ecosystem they support is best viewed in the long-term. Barring unpredictable plague epizootics or other major natural disturbances, urban populations will continue to serve as disconnected population "reservoirs." In large, regional areas like Soapstone Prairie, existing populations may exhibit more natural expansion and recession cycles. One future goal for Soapstone could be to allow the present prairie dog colonies to expand and

disperse to a size large enough to support the reintroduction of the federally endangered black-footed ferret, a natural prairie dog predator (see Chapter 7).

The City of Fort Collins Natural Areas Program will continue to promote the conservation of grasslands and prairie dogs. More than a decade of effort has considerably advanced the art and science of prairie dog management in urban environments. The management plan and guidelines in this chapter represent a further advancement and refinement of the City's efforts.

VI . Timeline of Prairie Dog Management in Fort Collins 1990 - 2006

1990:

- Initiation of 10-year research project Winter Raptor Survey to determine raptor utilization on prairie dog colonies and support additional acquisition of more prairie dog inhabited lands.

1992:

- Adoption of *Natural Areas Policy Plan* identifies prairie dog habitat (and potential habitat) for areas of conservation and acquisition.
- Staff begins to provide advice to other City departments on the management of prairie dogs on City lands.

1993:

- Installed first artificial barriers at the Coterie and Pineridge to prevent movement to the Light and Power Substation and adjacent county residences, respectively.
- Conducted fumigation to control buffer areas adjacent to new developments.

1994:

- Acquired habitat and potential habitat at Maxwell and Fossil Creek Wetlands.
- Added additional barriers and initiated native shrub and grass plantings to prevent movement to adjacent properties at the Coterie (Prospect Rd. and Timberline Light and Power Substation), Maxwell (Spruce Dr.), Prairie Dog Meadow (Brittany Knolls), and Pineridge to enhance and beautify artificial barriers.
- Conducted fumigation to establish buffer areas at Cathy Fromme Prairie, Pineridge, and Maxwell.

1996:

- Conducted fumigation on 30 acres of Cathy Fromme Prairie for site restoration.

1997:

- Acquired potential habitat at McKee Farm (973 acres).
- Installed artificial barriers at Pelican Marsh to prevent movement onto Victoria Estates.
- First citizen protest opposing the use of fumigation by the City of Fort Collins.
- Plague outbreaks at Cathy Fromme Prairie, Coyote Ridge and Pineridge.
- 470 burrows fumigated at Pineridge, Prairie Dog Meadow, Pelican Marsh, and Maxwell for density control.

1998:

- City Council adopted *Prairie Dog Policy for City Natural Areas* listing 33 directives to guide management of prairie dogs on city natural areas.
- Natural Areas Program relocates 209 prairie dogs from Fossil Creek Wetland (overpopulated and moving onto Paragon Estates) to Cathy Fromme Prairie (site was plagued out in 1997).
- Natural Areas Program acquired remaining parcels at Pineridge.
- Plague outbreaks at Cathy Fromme Prairie and Colina Mariposa.
- Fumigation conducted on 1,600 total burrows for density control on five natural areas.

1999:

- Acquired 168-acre Hazeleus Natural Area.
- Relocated 61 prairie dogs from Maxwell to Cathy Fromme Prairie (a 1998 plague site).
- Installed "raptor-perches" at Prairie Dog Meadow, Fossil Creek Wetlands, and Cathy Fromme Prairie.

- Published Winter Raptor Survey Results.
- Plague outbreaks at Hazaleus and Pelican Marsh.
- Fumigation conducted on 674 burrows for the purpose of buffer control on six natural areas.

2000

- City's Master Naturalist Program begins formal training on prairie dog issues to trainees.
- Forty-two prairie dogs relocated from Prairie Dog Meadow (overpopulated) to Pineridge (plagued out in 1997).
- Acquired 192 acres at Colina Mariposa Natural Area and 1,118 acres at Coyote Ridge Natural Area, and 3 acres at the Coterie.
- First research project to study prairie dog population genetics in urban environment.
- Fumigation conducted on 60 burrows on three natural areas.

2001

- Natural Areas Program co-hosted and sponsored first "Colorado Front Range Prairie Dog Technical Workshop." Staff provided poster session information and led field trips in Fort Collins.
- Relocated 68 prairie dogs from Two Creeks to Meadow Springs Ranch to establish Black-footed Ferret Conservation Center colony.
- Relocated 165 prairie dogs from several natural areas to Maxwell.
- Fumigation conducted on nearly 1,000 burrows for site restoration at Two Creeks Natural Area.

2002

- Acquired 156 acres at Pelican Marsh.
- Acquired final parcels at Cathy Fromme Prairie, now totaling 1,088 acres.
- Fumigation conducted on 960 burrows at 3 separate natural areas.

2003

- Co-hosted the second "Colorado Prairie Dog Technical Workshop."
- First effort made to comprehensively map occupied prairie dog colonies.
- Acquired final parcels at Prairie Dog Meadow, now totaling 84 acres.
- Began initial research efforts of grassland restoration with prairie dogs on site at Prairie Dog Meadow.
- Fumigation conducted on 155 burrows at Pelican Marsh for restoration.

2004

- Established Front Range Working Group comprised of land mangers from city, county, state, and federal agencies.
- Acquired approximately 18,000 acres of land including 400 acres of prairie dog colonies at Soapstone Prairie.
- Fumigation conducted on 208 burrows on three natural areas for barrier control.

2005

- Co-hosted the "Great Plains Grassland Species Conservation Conference."
- Initiated additional research to examine the use of non-palatable, un-edible plants for grassland restoration at Prairie Dog Meadow.
- Initiated dialog with Natural Resources Advisory Board to amend language of prairie dog policy to allow for donation to raptor program.
- Removed 248 prairie dogs from Pineridge to U.S. Fish & Wildlife Services Black-Footed Ferret Conservation Center and another 120 prairie dogs for the Rocky Mountain Raptor Program for the purpose of reducing densities adjacent to Drake Substation.
- Attempted site stabilization through the use of cover crops at a 50-acre site at Pineridge.
- Reviewed citizen proposal to sterilize prairie dogs at the Coterie.
- Fumigation conducted on 423 burrows at Prairie Dog Meadow for restoration and 40 burrows at Fossil Creek Wetland for buffer control.

2006

- Initiated the rehabilitation effort at Pineridge Natural Area through soil conservation practices, planting of native grasses, and fumigation of prairie dogs on 50 acres.

- Held a series of meetings with citizen advocacy group to provide awareness on prairie dog management needs and considered a proposal for in-situ sterilization experiment.
- Plague outbreak at Maxwell Natural Area.
- Completed draft work on Wildlife Management Guidelines including an update of the Natural Areas Program's prairie dog policy. Reviewed by Land Conservation and Stewardship Board on December 13.
- Developed cooperative effort with the National Wildlife Research Center on experimental effort to use reproductive controls to manage prairie dog populations.
- Conducted extensive educational outreach to concerned citizens regarding prairie dog management.

Chapter references

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Hoogland, J.L., 2006. Conservation of the Black-tailed Prairie Dog- Saving North America's Western Grasslands. Island Press, Washington, DC.

Chapter 7: Native Species Recovery & Reintroduction: Soapstone Prairie Natural Area

In this chapter we explore opportunities to further advance the wildlife conservation mission of the Natural Areas Program. Because of the size, diversity of habitat, and landscape context of Soapstone Prairie Natural Area, there may be opportunities to re-establish imperiled, native wildlife to this grassland and shrub ecosystem. Three species are of conservation interest for Soapstone: the black-footed ferret, sharp-tailed grouse, and American bison. While we only focus these three species, additional species may be of interest for possible reintroductions into the Soapstone Prairie Natural as information is gathered. As an example, northern leopard frog (*Rana pipiens*) and brassy minnow (*Hybognathus hankinsoni*) are species of conservation concern and are known to occur in the vicinity of Soapstone Prairie. Surveys will be conducted in the near future to determine the status of these species and their habitat on Soapstone Prairie. Reintroduction efforts may move forward depending on survey results.

The opportunities explored in this chapter are not intended to be prescriptive, instead they describe possibilities that may or may not be pursued by the City. Decisions to pursue these alternatives will be based on many factors, including probability of success, funding, relationships with neighbors, agency approvals, community support, and the overall management objectives of the Soapstone Prairie Natural Area Management Plan (due to be completed in late 2007).

Black-footed Ferret

The black-footed ferret (*Mustela nigripes*) is the only ferret species endemic to North America's grassland ecosystems. Historically, the black-footed ferret ranged throughout the Great Plains occupying areas in 12 states and two Canadian provinces (Black Footed Ferret Recovery Plan, 1988). Today, the black-footed ferret is considered the most endangered mammal in North America and has been listed by the U.S. Fish and Wildlife Service as a federally endangered species since March, 1967. (Note: The Endangered Species of Act of 1973 afforded federal protection status to species that were listed [but not protected] by the U.S. Fish and Wildlife Service.) Loss of habitat, widespread prairie dog eradication programs (the ferret's primary food source), and the introduction of bubonic plague are cited as the primary causes for the ferrets' decline in the 20th century.

<u>The Opportunity</u>

There are nearly 19,000 acres of Soapstone Prairie that are held in direct public ownership with an additional 55,000 acres of other public and privately protected lands surrounding this landscape. Given the landscape context, only a fraction of the public land constitutes the minimum area necessary to support a ferret reintroduction. In spring of 2006, there were an estimated 534 acres of occupied prairie dog towns (and growing) within Soapstone Prairie Natural Area. As a rule of thumb, a minimum of 5,000 acres of healthy prairie dog acreage in a protected landscape is the most important parameter required by the U.S. Fish and Wildlife Service to be considered for reintroduction.

Plains Sharp-tailed grouse

The plains sharp-tailed grouse (*Tympanuchus phasianellus jamesii*) is a native Colorado grassland bird that once nested over much of the northern two-thirds of Colorado's eastern prairie including the area that is now Soapstone Prairie Natural Area. Due to the conversion of grassland to cropland and land development, the grouse has declined to a present population consisting of only a few hundred birds in Douglas and possibly Weld County. For this reason the bird is listed as endangered by the Colorado Division of Wildlife.

The Opportunity

Portions of Soapstone Prairie may provide suitable reintroduction sites. Discussions have been held with the Colorado Division of Wildlife regarding the possibility of pursuing a sharp-tailed grouse reintroduction.

American Bison

The American, bison more commonly known as buffalo, once dominated the North American grassland landscape. As an ecological force, bison were responsible for creating a mosaic of grassland conditions through the process of grazing, soil disturbance and subsequent re-growth of vegetation. While historic populations across North America once numbered in the tens of millions, by the early 1900's the entire wild population had been reduced to 23 individuals. Today, wild populations are estimated at 200,000 and limited to places like Yellowstone National Park and the Henry Mountains of Utah. More relevant to Soapstone Prairie, publicly managed herds are kept at Wind Cave National Park, Custer State Park (SD), the National Bison Range (MT), Turner Properties (NM), and Mendano Zapata Ranch operated by the Nature Conservancy in Colorado.

The Opportunity

There are nearly 19,000 acres of Soapstone Prairie that are held in direct public ownership with an additional 55,000 acres of other public and private protected lands surrounding this landscape. Within this landscape context, Soapstone Prairie could in the interest of wildlife conservation and restoration, serve as a genetic reservoir of reintroduced wild bison.

In the table below, a few of the important pros and cons are described:

Pros	Cons
Native Grazer	More difficult to manage than cattle
Innovative approach to grassland management	Visitor safety issues and concerns
Aesthetics	Possible Fencing requirements
Progressive Vision	Higher management and maintenance costs

Additional considerations:

Bison are very appealing "charismatic mega-fauna" that many wildlife enthusiast enjoy watching in the natural prairie landscape. Reintroduction of bison at Soapstone Prairie Natural Area would be a significant initial step in restoring native wildlife to this natural area. Bison also have

lesser water requirements than cattle which would reduce the overall need to maintain water supply infrastructure.

While all these factors are appealing at first glance, decisions will be required to move forward with this effort. First, the safety of staff and visitors would need consideration as would the level of fencing and herding that may be necessary. Also, as the site cannot support an infinite number of bison, limits on population size would need to be determined and decisions made on how to handle excess animals. This necessity would manifest a need to develop a comprehensive Bison grazing plan to address infrastructure issues, population management, ecosystem health, and herd culling.

- Plan to address issues such as infrastructure, population management, ecosystem health, and herd culling.

Chapter Citations

U.S. Fish and Wildlife Service, 1988. Black Footed Ferret Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 154pp.

Chapter 8: Wildlife and Human Conflicts

In general, the citizens of Fort Collins highly value local wildlife. Seeing animals in the wild contributes to human enjoyment of nature and adds aesthetic value in the urban environment. However, some native wildlife species can be considered "pest" species by some when they come into conflict with humans. Conflicts can occur when people visit a natural area and encounter wildlife, but most often when species that inhabit natural areas move onto adjoining, private property.

The Colorado Division of Wildlife (CDOW) has management and protection jurisdiction over wildlife species in the State of Colorado, including those within the City of Fort Collins. With the exception of small rodents, trapping or killing of pest wildlife that represent a threat to human health, safety, or property within the city limits requires approval by the CDOW. In general, Fort Collins residents seek to solve wildlife problems humanely, without killing animals. The Larimer Humane Society provides educational information through their "Wildkind" program on how to reduce conflict with animals in your backyard (See Appendix A).

Overall, during the last 15 years, the City's Natural Areas Program has received very few complaints about wildlife on or adjacent to natural areas, with the exception of the black-tailed prairie dog, thoroughly discussed in Chapter 6. Prairie dogs also have been the species most managed by the Natural Areas Program to limit wildlife conflicts with neighbors.

Although any species of native wildlife could fall into the category of a "pest" at some time for a resident of Fort Collins, the Natural Areas Program (NAP) has received inquiries or complaints about less than a dozen species (or groups of species) over the last 15 years (Table 8.1). Usually, it is the Natural Areas Program's role to provide information and/or direct the resident to another agency, and not to take management action. Agencies with local offices that provide helpful information on managing problem wildlife include the Colorado Division of Wildlife, Colorado State University Cooperative Extension, U. S. Department of Agriculture (Animal and Plant Health Inspection Service, Wildlife Services Program), and the Larimer County Humane Society.

To date, the Natural Areas Program has taken some wildlife management actions beyond providing information to the public, in the management of four native wildlife species.

Black-tailed Prairie Dog

By far, the prairie dog has been the most controversial species that the Natural Areas Program has dealt with in its 15-year history, prompting research, policies, restoration, and intense management actions (see Chapter 6). Prairie dogs primarily become an issue when they move onto neighboring, private property. Concern is not only for the destruction of landscaped areas, but also for the spread of plague, a potentially fatal disease for humans, their pets, and other wildlife species.

Beaver

The beaver is the largest rodent found in North America and has made a come back in many areas of the U.S. since it was nearly driven to extinction due to over-trapping for the fur trade. When beavers modify streams by building dams and impounding flows, they do have the potential to flood private property and destroy structures. The City's Stormwater Utility is responsible for maintaining flows in drainages throughout Fort Collins and, generally, is responsible for the removal of hazardous beaver dams. If beavers continue to rebuild in the same location, they are relocated to another area.

Beavers can impact natural areas by gnawing on larger cottonwoods. In areas of heavy beaver use, the Natural Areas Program has painted larger tree trunks with a sand/paint mix to discourage gnawing (a previous method was to wrap trees with chicken wire, which can be hazardous to other wildlife). Although beavers "harvest" cottonwoods and do not kill the trees, they can produce a lot of localized changes--short, stubby cottonwoods rather than mature, tall cottonwoods valued as nesting and feeding sites by songbirds.

In most of the city, beaver co-exist well with humans and other wildlife species. Beavers in Fort Collins have been found to carry tularemia, a potentially fatal disease for humans, their pets, and other wildlife species (see chapter 10, Management and Control of Wildlife Diseases).

In recent years the beaver population along the Poudre River corridor has seemingly increased. Along with this increase in abundance comes a potential increase in problems associated with the beaver's ability to construct dam structures that prevent the free flow of water. Once a dam or blockage is constructed, a common response is to remove the beavers from the area and remove the dam. However, alternatives exist that allow for beaver dams to remain yet allow for the management of water levels and flow. Many devices have been shown to be successful in correcting water level and flow (examples include flexible pond leveler, Clemson pond leveler, beaver deceiver). However, no one device is appropriate for all situations. Site dependent variables of topography, water volume, vegetation, flooding potential, and others dictate what type of structure or flow device is necessary to alleviate the problem. Not all cases of beaver damming can be corrected with a flow device and dam removal will remain a viable response. In some cases, the natural areas program may elect to manage for beaver presence in non-critical stormwater areas.

General Guidelines for Beaver Management on Natural Areas

- Staff will evaluate each beaver dam on a case by case basis to determine the potential for flooding, impacts to property if flooding occurs, and any impacts to public safety. Control devices will not be installed if public safety is an issue or if damage to private property will occur. In these cases, dams will be removed and beaver removed from the area if possible. Note: this guideline applies to management of cottonwoods only in Natural Areas.

Canada Geese

Canada geese are year-round residents of Fort Collins, but numbers of geese increase substantially during winter when the city and other urban areas along the Front Range become

popular winter refuges for migrant geese because of the ample supply of food and water and lack of hunting. Canada geese are primarily considered a "pest" species on golf courses and in parks because of their droppings. Geese can also overgraze and damage golf courses and turf grass on parks and private open space areas. Fortunately, the Canada goose is not much of problem on natural areas--taller, unmowed grasses are not as appealing to the geese for grazing. When geese are feeding in larger numbers on a natural area, they are almost always in large fields and not where people travel or "play."

The Natural Areas Program has had some problems with Canada geese eating newly planted upland or wetland plants. In one case, wire fencing was temporarily installed to prevent geese from pulling up new wetland seedlings at a natural area during the first growing season to help establish the plantings. The Natural Areas Program has also worked with CDOW to provide research sites for trapping and neckbanding young geese to study their movements as part of a larger U.S. Fish and Wildlife Service project. This study is expected to continue until 2009.

Northern Flicker

Northern flickers can be annoying to humans when they "hammer" or "drum" on their residence or nearby structures, especially in early morning. Most drumming occurs in late winter and early spring when males are territorial. Damage of siding and eaves can occur at anytime of the year, as a result of territorial displays, attempts to build a nest cavity, or feeding activities if the wood supports insects that flickers feed on.

Although the Natural Areas Program has rarely received complaints about flickers in our natural areas, the program has received numerous calls requesting information on how to prevent the drumming or destruction of siding. As part of our efforts to educate the public on the value of wildlife and to help lessen the negative impact of flickers on structures, the Natural Areas Program provides free flicker boxes built primarily by volunteers with the Program.

Other Species

Several other native wildlife species may, on occasion, be considered pests. Although not treated in detail here, Table 8.1 describes management considerations for deer, raccoon, skunk, coyote, garter snakes, and prairie rattlesnakes when human conflict arises in relation to natural areas management.

Table 8.1. Potential Problems Posed by Native Wildlife Species in Urban Natural Areas

Species	Potential Problems	Local Conflict Level	Management Action
Black-tailed prairie dog (*Cynomys ludovicianus*)	Private property damage. Can carry plague infected fleas that may be picked up by humans, pets, and other wildlife.	High	Population management (see Chapter 6).
Beaver (*Castor canadensis*)	Flooding structures or private property. Flooding structures on natural areas. Cutting of large cottonwoods. Can carry tularemia, rarely transmitted to humans.	Moderate	The City of Fort Collins' Stormwater Utility removes dams with potential to flood structures or private property and, occasionally, relocates beavers. City Natural Areas Program (NAP) paints (sand/paint mix) cottonwoods to prevent gnawing and preserve large trees for wildlife.
Canada goose (*Branta canadensis*)	Droppings are unsightly, unsanitary. Aggressive towards children and pets. Overcrowding can cause avian diseases (e.g., botulism, avian cholera, and duck plague). Droppings add nutrients to lakes and ponds, adding to algae build up; algae die off depletes oxygen supply of water, possibly killing fish and other aquatic organisms and releasing hydrogen sulfide (foul odor).	Moderate	NAP rarely receives complaints regarding geese on natural areas. NAP occasionally uses wire fencing to protect newly planted wetland seedlings from being destroyed by geese. CDOW conducts goose research on natural areas.
Northern flicker (*Colaptes auratus*)	Hammers or "drums" on houses and other structures. Drills holes into siding and eaves. Loud calling early in morning during late winter and early spring.	Moderate	NAP rarely receives complaints regarding flickers on natural areas. NAP provides free nest boxes to businesses and residences experiencing damage from flickers excavating holes in their buildings.
Deer (*Odocoileus* spp.)	Damage to ornamental and garden plants. Host for ticks and associated tick-borne diseases, which can be transmitted to humans (see ch 10).	Low	NAP rarely receives complaints regarding deer on natural areas; no management action is planned at this time.

Table 8.1. Potential Problems Posed by Native Wildlife Species in Urban Natural Areas

Raccoon (*Procyon lotor*)	Damage to gardens and crops. Denning in residential or commercial buildings. Transmit rabies and other diseases to humans, pets, and other wildlife.	Low	NAP rarely receives complaints regarding raccoons on natural areas; no management action is planned at this time.
Striped skunk (*Mephitis mephitis*)	Denning in residential or commercial buildings. Strong odor. Transmit rabies and other diseases to humans, pets, and other wildlife.	Low	NAP rarely receives complaints regarding skunks on natural areas; no management action is planned at this time.
Coyote (Canis latrans)	Prey on domestic cats or small dogs. Transmit rabies and other diseases to humans, pets, and other wildlife.	Low	NAP rarely receives complaints regarding coyotes on natural areas; no management action is planned at this time. May need to control at Soapstone Prairie if found to be impacting swift fox population.
Garter snakes (*Thamnophis* spp.)	Fear of being bitten (not venomous).	Low	NAP rarely receives complaints regarding garter snakes on natural areas; no management action is planned at this time.
Prairie rattlesnake (*Crotalus viridus viridus*)	Could cause death to child or pet if bitten.	Low	NAP rarely receives complaints regarding rattlesnakes on natural areas; no management action is planned at this time.

Chapter 9: Non-Native Wildlife Species Management

Non-native species are those plant or animal species that were not present to this region at the time of European settlement. Due to aggressive habits and lack of natural predators many non-native species become abundant and have the ability to out-compete native species. This negative interaction impacts native species through competition for food, displacement from areas of suitable habitat, or loss due to increased predation rates.

Many non-native species are found within Fort Collins natural areas. In many cases, non-native species are common and efforts to remove them from a natural area may be of limited value due to ease of in-migration from the surrounding landscape. However, if removal is necessary due to concern related to public safety or environmental impact, Natural Areas Program staff will work with the Colorado Division of Wildlife (CDOW), City of Fort Collins Animal Control officers (Animal Control), and other groups as needed to safely and humanely remove the animal(s).

A second option to limit non-native species is to modify existing habitat conditions. If this approach is feasible, habitat modification through management or restoration practices can be implemented. However, given most invasive non-native species are considered "generalists" as habitat users this option will have limited potential.

A summary of certain non-native species along with management options are provided below. Specific management guidelines are suggested only when management action by the Natural Areas Program could result in a desired outcome.

Feral / Free Ranging Dogs

Feral dogs may be difficult to distinguish between a domestic dog found off leash or free ranging in a natural area. They look like domestic dogs but generally are more haggard in appearance and are often found in small packs. Feral dogs are considered a threat to humans because of their lack of fear of humans and because they have been known to attack without provocation. Also, feral dogs are predators and can have negative impacts on native wildlife on a natural area. If feral or free ranging dogs are sighted on a natural area, staff will contact Animal Control officers to capture and remove the animal. Ranger staff may post photos of the dog in the event that it is an escaped pet.

Domestic dogs can also have a significant impact on the surrounding wildlife. A recent study conducted in Boulder County Open Space trails examined wildlife activity on trails with dogs (off leash) as compared to trails where dogs were prohibited (Lenth et. al., 2006). The presence of off-leash dogs "correlated with altered patterns of habitat utilization by several wildlife species where activity was significantly lower in proximity to trails. The effect extended out to 100 m for mule deer and 50 m for several rodents species." The Program aims to minimize the impact dogs have on wildlife through regulations and enforcement of leash laws. All of the City's natural areas have leash laws and most are patrolled by rangers on daily basis. A recent visitor use survey conducted in Fort Collins natural areas indicated that compliance with the leash law is very high (up to 92%).

Feral / Free Ranging Cats
Feral and free roaming house cats predate upon birds, rodents, and small mammals. Urbanization and the related increased presence of free roaming house cats has a tremendous influence on survival of small birds and mammals. Scientific studies conclude that hundreds of millions of birds and three times as many small mammals are killed every year by feral or free roaming cats.

The Natural Areas Program aims to educate the public about the significant impact that cats have on these wildlife guilds. The Program will continue to make informational pamphlets on this topic available to the public and will also look into additional ways to improve our efforts at educating the public on this issue. Currently, if feral or free ranging cats are sighted on a natural area, staff will contact Animal Control officers to remove the animal. Information and photos of the cat may be posted by Ranger staff in the event it is a free roaming pet.

Other Feral Animals
The Natural Areas Program will respond on a case by case basis to encounters with any other feral animals. Depending on the specific animal and circumstance the appropriate agency such as Colorado Division of Wildlife, Larimer Humane Society, Colorado State Patrol, or the Larimer County Department of Health and Environment will be contacted.

Bullfrogs (Rana catesbeiana)
North American bullfrogs are native to eastern U.S.; Nova Scotia to central Florida, from the East coast to Wisconsin, they now occur in the Great Plains and Rockies. Introduction into Colorado dates to the early 1900's.

North American bullfrogs live in or near warm, still, shallow waters found in lakes, ponds, rivers, or wetlands and predate upon snakes, worms, insects, crustaceans, frogs, tadpoles, and aquatic eggs of fish, frogs, insects, or salamanders. Predation on other frog species is a major impact and is in part a contributing factor to population declines of some species.

Bullfrog control is difficult so complete removal is unlikely in any natural area. Staff will continue to promote harvest opportunities on natural areas following rules and regulations set by the Colorado Division of Wildlife. Staff will encourage research on bullfrog management and reduction techniques and stay abreast of emerging management techniques.

General Management Guidelines for Bullfrogs in Natural Areas
- In consultation with CDOW, will determine and implement, when appropriate, management options available to control bullfrog populations.
- Will determine the best course of action to promote the legal harvest of bullfrogs.

Carp (Cyprinus carpio***)***
Carp are large bottom-feeding fish found throughout the United States. This species occurs naturally in Asia and Europe, but was introduced to many North American locations during the early 1800's.

Carp displace emergent and submergent vegetation through feeding and to some extent spawning activities. Their diet consists of mollusks, insects, worms, crustaceans, algae, aquatic plants (dead or living), and seeds. During foraging activities, carp suck in and expel water, mud, and debris. This activity results in the uprooting of aquatic plants, the release of nutrients, and an increase in suspended sediments that increase water turbidity and limit light penetration (thus, limiting aquatic plant growth).

The removal or control of carp is difficult but can occur with the use of aquatic pesticides (rotenone). However, use of these pesticides removes all fish, both native and non-native within the system. As such, Natural Areas Program staff will continue to promote harvest opportunities on natural areas, following rules and regulations set by the Colorado Division of Wildlife. Further, staff will consult with CDOW if management opportunities are made available or if any pesticide use or fishery management technique (introduce predatory fish) to remove or reduce carp is desired.

General Management Guidelines for Carp within Natural Areas waterways

- In consultation with CDOW, will determine and implement, when appropriate, management options available to reduce carp populations.

***Mosquito fish* (*Gambusia spp.*).**
Mosquito fish refers to either the western or eastern species of *Gambusia*. This guppy-like fish is one to two inches in length, silver to gray in color, and resembles the common minnow. It is very adaptable, tolerant of a wide range of water qualities, and its expansion is only limited by severe climates.

As its name suggests, this fish has been widely released to help in the control of mosquitoes. Females of the species have been reported to eat several hundred mosquito larvae per day. However, research suggests that *Gambusia* is no more effective at controlling mosquitoes than many other native predators. Further, mosquito fish have been shown to have negative ecological impacts anywhere they are introduced. This species is highly predaceous on native fish larva and readily out-competes native species of minnow for available forage or harassing those competitors until death. The decline of up to 20 species of native minnows has been linked to the introduction of mosquito fish outside of its native range.

Mosquito fish are difficult to eliminate once established, so the best way to reduce their effects is to control their further spread. Staff will not permit the release of mosquito fish into any waters found within a natural area. A permit is required for the release of fish and wildlife onto City natural areas.

Chapter references

Lenth, B., Brennan, M., Knight, R., 2006. Effects of dogs on wildlife communities. Final research report submitted to Boulder County Open Space and Mountain Parks.

Chapter 10: Management and Control of Wildlife Diseases

The Natural Areas Program considers wildlife disease an important component of wildlife management. Wildlife diseases are often only noticed when the disease can be transferred to humans, pets, or livestock. Wildlife management must also consider the impacts to wildlife populations and efforts to conserve them. As this is a relatively new area of study for the typical disease research agencies, the Natural Areas Program will continue to participate in forums to learn more about how management actions can help promote the health of wildlife in our natural areas.

Currently, the Natural Areas Program's role in wildlife disease management is centered on providing public and visitor notification about the presence of a disease and any public health risk the disease may pose to the public. Detailed information regarding diseases that cause public health risk is available through the website for the National Center for Disease Control (CDC) (See Appendix A).

This chapter provides general information about seven diseases that are commonly found in the Fort Collins area and defines the management role of the Natural Areas Program related to diseases found in the city's natural areas.

Plague

Plague is a widespread disease affecting many rodent species in western North America and around the world. The word sylvatic is used to describe plague affecting animals. When humans get plague it is usually in the form of bubonic plague. It is believed that plague was introduced to North America in the early 1900 through ship rats. Plague is now commonly found in rock squirrels, prairie dogs, wood rats, and other species of ground squirrels and chipmunks. Other animals in the plague cycle include fox squirrels, tree squirrels, swift fox, wild rabbits, and domestic pets.

Plague is caused by a bacterium (*Yersinia pestis*) transferred by flea bites or through direct contact with an infected animal (including transmission to humans). The most common form of plague is bubonic, where symptoms include swollen lymph glands (buboes). Other forms of plague are septicemic (when the blood stream is infected) and pneumonic (when the lungs are infected). In the cases of bubonic and septicemic plague, the disease cannot be transmitted from human to human. However, pneumonic plague can be transmitted through breathing infected respiratory droplets from an infected person or animal. In humans, symptoms may be seen 2 – 6 days after exposure and include sudden fever and chills, severe headache, muscle aches, nausea, vomiting, and a general feeling of illness. If detected early, antibiotics can be effective; otherwise, life-threatening complications may follow. A doctor should be consulted as soon as symptoms appear.

Plague has had a significant impact on wildlife populations, especially prairie dogs, in Fort Collins natural areas. Since 1997, plague has been recorded in prairie dog populations in the foothills and Fossil Creek drainage. Sites include Coyote Ridge, Pineridge, Maxwell, Cathy

Fromme Prairie, Colina Mariposa, Hazaleus, and Pelican Marsh. While in most cases the prairie dog populations were significantly impacted or even eliminated, colonies generally re-established within several years.

Plague in our Natural Areas

The City of Fort Collins does not regularly control for fleas to prevent plague on city natural areas. Individual precautions for natural area visitors and staff are always encouraged. These include minimizing direct human contact with animals and their burrows/nests/dens; not feeding or enticing rodents; using insecticide on clothing, arms, and legs when hiking or camping; keeping pets restrained from roaming (leash); and using insecticide powders or shampoos on pets every few days while in possible plague areas.

General Management Strategies Related to Plague in Natural Areas:

- Prairie dog populations on natural areas will be monitored on a routine basis. A drastic decrease in a population will indicate the need to investigate further and bring dead animals in for testing.
- Appropriate protective equipment and procedures (such as dusting burrows) will be used during relocations to protect staff or volunteers from potential exposure.
- Dead animals should be reported to the Natural Areas Program and, if deemed appropriate, they will be tested by the Center for Disease Control.

In the case of a plague epizootic in one of the natural areas:

- The Natural Areas Program will notify and work cooperatively with the Larimer County Department of Health and Environment.
- Signs will be posted at all entrances to the Natural Area warning the visitor of the presence of plague and necessary precautions.
- Public notification will be made via local media contacts.
- Permitted group activities in affected areas may temporarily cease
- Dusting of prairie dog burrows with insecticide to kill the host fleas may be done to reduce the spread of the disease.
- Natural Area or trail closures may be necessary.

Tick-borne disease

While there are eight diseases transmitted by ticks in the United States, four might occur in Colorado and the other four are unlikely to be found in this region. The four potential tick-borne diseases are Colorado Tick Fever, Rocky Mountain Spotted Fever, Relapsing Fever and Tularemia. Tularemia is the only tick-borne disease that has been documented on the natural areas.

Tularemia

Tularemia is a disease caused by the bacteria *Francisella tularensis*, and affects both humans and wildlife. Like plague, it can be transferred through direct contact with an infected animal or through the bite of an infected insect, primarily deerflies and ticks.

Persons at highest risk are those handling infected animals, particularly hunters. Less common means of spreading the disease include drinking contaminated water, inhaling contaminated dust or soil, or being bit by a wild animal, cat, or dog that has been in contact with an infected animal. Most human cases of tularemia are a result of dressing or skinning infected rabbits; hence, it is commonly referred to as "rabbit fever." It is not spread from human to human.

Symptoms usually occur in 2 – 10 days after exposure. Tularemia may be first recognized by the presence of an ulcer-type of lesion at the insect bite site and enlarged, swollen, painful glands near the bite. A sore throat, intestinal pain, vomiting, and diarrhea may result from ingesting the organism in water or meat. Inhaling the organism may produce a fever and pneumonia. This disease can be treated with antibiotics and your doctor should be consulted as soon as symptoms appear.

Tularemia in our Natural Areas

Individual precautions are encouraged for natural area visitors and staff. Preventive measures include wearing protective clothing, searching for and removing ticks, and wearing insect repellant containing DEET. Gloves must always be worn when handling sick or dead animals. Children should not handle sick or dead animals, especially rabbits.

Tularemia has been a rare occurrence in Fort Collins. When present, it is usually detected in local beaver populations. In the spring of 2002 tularemia was found in a dead weasel at CSU's Environmental Learning Center. Several other animals in the area appeared to be affected, including beaver and possibly raccoons. Public notification took place in conjunction with the Larimer County Department of Health and Environment through press releases and sign postings at surrounding natural areas.

General Management Strategies Related to Tularemia in Natural Areas:

- Dead animals should be reported to the Natural Areas Program and, if deemed appropriate, they will be tested by the Center for Disease Control.

In case of a tularemia epizootic in or near by one of the natural areas:

- The Natural Areas Program shall notify and work cooperatively with the Larimer County Department of Health and Environment.
- Signs will be posted at all entrances to the natural area warning the visitor of the presence of tularemia.
- Public notification will be made via local media contacts.
- Permitted group activities in affected areas may temporarily cease.
- Natural Area or trail closures may be necessary.
- Soil and water samples may be tested for the presence of the causative bacterium.

Rabies

Rabies is a viral disease transmitted through the bite of an infected animal. It has existed in this country for more than a century. In Colorado, rabies mostly affects bats and rarely affects other wild and domestic animals. Rodents in Colorado have not been infected with rabies. Animals most commonly infected are bats, raccoons, skunks, foxes and coyotes and to a much lesser extent cats, dogs, and cattle.

The rabies virus causes a disease of the brain called encephalopathy (a disease of the brain altering brain function or structure) and eventually death. Symptoms in humans include fever, headache, and general malaise. As the disease progresses symptoms become more specific and may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hyper-salivation, difficulty swallowing, and hydrophobia (fear of water), eventually leading to death. Once symptoms appear, it is too late for treatment; however a post exposure vaccine is extremely effective. One should seek medical attention immediately after possible exposure to the rabies virus and definitely if bitten by a wild or domestic animal.

Rabies in our Natural Areas

Most recent cases of human rabies have been from bats that were trapped in houses. To prevent this incident, homes should be inspected and possible entry points sealed. To help prevent the spread of rabies certain precautions to be practiced include: keeping domestic cats, dogs and ferret vaccinations current, and teaching children never to handle unfamiliar or wild animals.

General Management Strategies Related to Rabies in Natural Areas:

- Animals displaying unusual behavior or dead animals should be reported to the Natural Areas Program and if deemed appropriate, they will be tested by the Center for Disease Control.
- The Natural Areas Program will work cooperatively with the Larimer County Department of Health and Environment should there be any indicators of a rabies epizootic.

Distemper

Canine distemper is a viral disease causing illness in domestic dogs and wild carnivores such as raccoons, coyotes, skunks, foxes, and mink. It is different from, but related to the human measles virus. Feline distemper is an entirely different virus. The signs of distemper in wildlife are often confused with rabies and include: mucous secretions around the eyes and nose, coughing, paralysis, open sores, twitching, shaking or other abnormal behaviors. The virus is transmitted through infected animal's secretions and excretions, especially respiratory excretions. Food and water can become contaminated by airborne secretions. Distemper cannot be transmitted to humans.

Distemper in our Natural Areas:

The occurrence of distemper in domestic animals has been greatly reduced by vaccination programs. Another precaution to protect dogs is to keep them on leash and do not allow dogs to investigate or eat dead wildlife. Distemper seems to be cyclical in nature and at times has had a

significant impact on local raccoon populations. In years with increased deaths due to distemper, signs have been posted and dead animals have been collected and cremated to help reduce the spread of the disease to the remaining populations.

General Management Strategies Related to Distemper in Natural Areas:

- Animals displaying unusual behavior or dead animals should be reported to the Natural Areas Program and, if deemed appropriate, they will be tested by the Center for Disease Control.
- Signs will be posted in natural areas during times of increased incidence of distemper in wild animals.

Chronic Wasting Disease (CWD)

CWD is a relatively new disease first found in captive mule deer in Colorado in the 1960's. It is a form of spongiform encephalopathy, a neurological disease that affects the brain of infected animals. CWD affects cervids (hoofed, ruminant animals, males typically having antlers) such as mule deer, white-tailed deer, elk, and moose. It is in the same family of diseases that causes "mad cow disease."

Transmissable spongiform encephalopathy is caused by a prion (which is an infectious, abnormally structured protein that causes abnormal protein cell production in the brain) leading to rapidly progressive brain damage which is always fatal. An emaciated animal with a lack of coordination or other abnormal behaviors are signs that an animal may have chronic wasting disease. This disease is not yet known to be transmitted to humans; however, hunters should take certain precautions when handling deer, elk, or moose carcasses in hunting units where CWD is known to occur.

The Colorado Division of Wildlife is the agency spearheading the effort to prevent the spread of chronic wasting disease beyond historically infected areas. They are also working to reduce its prevalence within infected geographic areas by removing infected deer and elk from diseased herds, enforcing illegal feeding regulations and transport laws from infected areas or into the state, and continuing research in conjunction with other agencies.

<u>Chronic Wasting Disease in Natural Areas</u>

Chronic wasting disease can be found in Larimer County and is probably present on many of the City natural areas inhabited by deer. In the spring of 2002, two deer testing positive for CWD were found along the Poudre River. The Colorado Division of Wildlife was given a permit to test and euthanize deer in natural areas along the river. With the acquisition of regional natural areas, the Natural Areas Program anticipates increased involvement with the Colorado Division of Wildlife's efforts to manage the spread of this disease.

General Management Strategies Related to Chronic Wasting Disease in Natural Areas:

- Monitor deer and elk populations for any symptoms of chronic wasting disease in conjunction with the Colorado Division of Wildlife.
- Work cooperatively with the Colorado Division of Wildlife in the event that chronic wasting disease is found at one of the natural areas.

West Nile Virus

West Nile is a virus transmitted via infected mosquitoes. It was first found in Colorado in 2002. Birds are carriers of this disease. A mosquito becomes infected after biting an infected bird and transmits the virus to another animal or human with subsequent bites. A mosquito does not become infected by biting an infected mammal (person-to-person transmission does not occur). There are dozens of species of mosquitoes in Colorado and not all carry the West Nile Virus. On the Front Range, the virus is primarily transmitted by *Culex tarsalis* and *Culex pipiens*.

Some people who become infected with West Nile Virus do not have symptoms. For those who do, symptoms appear 5-15 days after a mosquito bite. Typically the symptoms include fever, headache, and a general feeling of illness. These last for 2-7 days. In rare instances, the virus can cause encephalitis, an inflammation of the brain. This will include the above symptoms plus stiff neck, disorientation, and tremors or coma. Severe infections can result in permanent brain damage or death. There are no treatments for this infection besides supportive care. However, a doctor should still be consulted.

West Nile in our Natural Areas

Individual precautions for natural area visitors, citizens at home, and staff are always encouraged. Precautions to avoid mosquito bites include limiting outdoor activity at dawn and dusk, wearing protective clothing and insect repellant – especially repellant with DEET, and making sure screens on windows and doors function properly. Another precaution is to eliminate areas of standing water around your house where mosquitoes breed. Remove or change water twice weekly in anything that collects water. Examples include birdbaths, pet dishes, toys, tires, flower-pots, pools, wheelbarrows, and clogged gutters.

In 2003, Colorado had the nation's largest number of reported cases of West Nile Virus (WNV). Almost 3,000 people were infected; 62 Coloradans died of West Nile Virus (9 in Larimer County) and 622 people required hospitalization statewide. While 2005 and 2006 were far less serious, public health professionals recommend continued vigilance.

The City of Fort Collins contracts with Colorado Mosquito Control to continue to gather data, educate the public, and mitigate spread of the virus through mosquito larviciding. The Natural Areas Program supports this contract financially and with staff expertise on the West Nile Virus Team. The Natural Areas Program also helps distribute educational information as well as educating and training employees on precautions to stay safe at work, and proper reporting and handling of dead animals found on natural areas.

The effects of West Nile Virus on bird populations are not yet fully understood; however, preliminary data indicate some species mortality rates have the potential to disrupt population dynamics. The extent of mortality in the wild is unknown and so is the ability of each population to rebound to pre-West Nile Virus numbers. However, while some populations will likely be unaffected, others may dwindle to numbers too low to survive or rebound. Species and populations already at threat are particularly vulnerable (i.e. rare, threatened, or endangered species; species in captive breeding programs; and species with lower reproductive rates).

General Management Strategies Related to West Nile in Natural Areas:

- The Natural Areas Program will continue to support the West Nile Team and city contractor to monitor mosquito populations on natural areas.
- The Natural Areas Program will continue to distribute educational information (pamphlets) and train staff.

Hantavirus

There are several different Hantaviruses that exist around the world. The Hantaviruses in the Americas typically affect the pulmonary system and hence the disease is called Hantavirus Pulmonary Syndrome (HPS). Each rodent host species supports a different virus; all cause the same or very similar disease. HPS was recognized as a disease after the outbreak in the Four Corners area of the U.S. in 1993, although it probably has existed for centuries, as Navajo legend suggests. The 1993 outbreak was caused by the Sin Nombre virus, which is carried by deer mice (*Peromyscus maniculatus*) and is the cause of the majority of HPS cases in humans.

Typical symptoms of HPS are fever and deep muscle aches, and can include headache, dizziness, nausea, and stomach problems. As the disease progresses, symptoms may include breathing difficulty and shortness of breathe due to the lungs filling with fluid. Although no vaccine or cure exists for this disease, early medical attention and intensive care will increase the chances for survival.

HPS is a rare, yet deadly disease that is contracted through contact with rodent excrement and saliva, generally when it is breathed in from contaminated air. When mice or rat droppings, urine, or nesting material is stirred up, small particles become suspended in the air and dust (called aerosolization). To reduce the potential to breathe contaminated dust, certain precautions should be used when cleaning an area with potential mouse habitation. These precautions include wearing rubber gloves, wetting down the area with mouse droppings/nesting materials with a bleach solution or household disinfectant, bagging and discarding contaminated materials, and thoroughly washing hands.

<u>Hantavirus in our Natural Areas</u>

Hantavirus poses a concern for staff who may enter deserted buildings in our natural areas. Appropriate protective equipment should be worn including rubber gloves and respirators. The Natural Areas Program has hired professional clean up crews to clean out buildings on natural areas, such as Bobcat Ridge, with high amounts of rodent excrement.

General Management Strategies Related to Hantavirus in Natural Areas:

- The Natural Areas Program will work cooperatively with the Larimer County Department of Health and Environment should there be any indicators of an epizootic.
- Appropriate personal protective equipment and procedures will be used by staff cleaning out any buildings with potential mouse habitation.

Who to Contact Regarding Wildlife Disease Emergencies and Inquires

Potential Disease: Animal often does not appear to be injured, however displays behavior that is not consistant with the species or out of charater e.g., wandering aimlessly and exposing itself to dangers it would normally avoid.

- Do Not Attempt to Approach or Handle the Animal**!**
- If You Feel Threatened or In Danger call **911**
- Document Observations and Location

Contact Information:

- Larimer County Department of Health and Enivronment 970-498-6775
- **If in a Natural Area also** contact a Natural Areas Ranger 970-416-2147

Wildlife Friendly Fencing

The Natural Areas Program seeks to construct and alter fencing to allow a variety of wildlife species safe passage. Fence design plays a major role in the protection of wildlife travel corridors. Fence design that lacks consideration of wildlife (i.e. standard five-strand barbed wire, picket fence, etc.) can fragment habitat, sever access to or from breeding grounds, and in extreme cases cause death via entanglement. Typical five-strand barbed wire fencing is known to cause entanglement of ungulates. The accepted design for wildlife friendly fencing is set forth by a set of guidelines prepared by the USDA Natural Resources Conservation Service.

The Natural Areas Program works to alter barbed wire fencing to reduce impacts to wildlife. The majority of fencing on local Natural Areas consists of a buck-and-rail style that allows passage for wildlife of all kinds. Future fencing designs will continue to allow for wildlife movement. Fencing at our larger sites may include three-strand smooth wire fence to accommodate effective barriers to livestock. Other fencing styles may include a single-rail fence in parking areas to establish the limits of a parking area.

Habitat Protection Guideline

- The Natural Areas Program will continue construct and alter fencing to allow a variety of wildlife species safe passage.

Stock Tank Escape Ladders

Stock tank escape ladders are designed to provide escape for avian and terrestrial wildlife from stock watering tanks. For years ranchers have used wood planks set across the tank to allow for birds and mammals to climb out of the water. However, as water levels decrease so do the efficacy of the wood planks. A newly developed design that uses expanded metal secured to the side of the tank, allows for wildlife to escape at all levels of water. The Natural Areas Program has installed ladders employing this new design at all permanent stock tank locations. More information regarding this new design can be found by contacting the Rocky Mountain Bird Observatory or the Colorado Division of Wildlife.

Stock tank escape ladder, installed winter 2006, at Soapstone Prairie Natural Area.

Habitat Protection Guideline

- The Natural Areas Program will continue to install and maintain stock tank escape ladders for the protection of avian and terrestrial wildlife.

Beaver Trees

In 2004 the Natural Areas Program began an innovative program to manage beaver and non-native tree species along the Poudre River. Rather than the traditional method of wrapping desired trees in chicken wire (which needs to be replaced periodically to avoid tree strangulation), the Natural Areas Program applied a mixture of sand and latex paint to the base of cottonwood and various other native riparian trees species. The grit provided by the sand in this mixture deters beaver from felling native trees as a source of food and lodge material. Although the beaver prefer the softer wood of the cottonwood, ample supply of non-native crack willow provide both sustenance and building materials.

The sand paint mixture can be applied either by way of pneumatic paint sprayer or by brush. The paint color is carefully chosen to mimic the natural color of the target species (in this case native cottonwood) and applied to a height roughly of 4 feet. Anecdotal observations indicate this method has been very successful at reducing beaver herbivory and is generally more aesthetically pleasing than chicken wire.

Habitat Protection Guideline

- The Natural Areas Program will continue to protect cottonwood trees along major waterways from beaver herbivory.

Foreground; cottonwood treated with sand/latex pain mixture.

Raptor Poles, Osprey Platforms

The Natural Areas Program constructs raptor poles to enhance raptor predation in and around prairie dog colonies. Sites such as Prairie Dog Meadow and Fossil Creek Wetlands natural areas support large prairie dog populations yet lack natural raptor perches. Typically non-native crack willows are removed from an off-site location, limbed, and then transported to the receiving site. Natural Areas staff has observed frequent use of the raptor poles by raptors including red-tailed hawks, and ferruginous hawks. As always, more data on effectiveness is desired.

Osprey platforms have long been used to provide a safe nesting site for osprey around man-made

and natural ponds. In recent years, ospreys have used artificial nesting platforms at Riverbend Ponds and Cottonwood Hollow natural areas. Nesting platforms consist of a single pole 40-60 feet tall with a circular platform fixed atop, and perpendicular to the pole.

Turtle Trees

Strategically placed dead tree limbs provide excellent perching habitat for turtles in natural area ponds. Trees of sufficient bole size to both anchor in the pond silt and breach the water surface provide desirable sunning locations for turtles. Currently, the Natural Areas Program has installed turtle tree habitat improvements at the following Natural Areas: Riverbend Ponds, Redwing Marsh, North Shields Pond, and Kingfisher Point.

Artificial Nesting Boxes

Since 2003, the Natural Areas program has facilitated the building, distribution and use of artificial nesting boxes for both bats and northern flickers. Currently the Natural Areas Program provides wood and supplies to volunteers who then cut and assemble the boxes. The artificial nesting boxes are then made available to the public at no cost. A tracking sheet is also distributed to record successful use of mounted boxes. Providing nesting habitat for bats and northern flickers (both species have demonstrated a propensity to utilize artificial habitat) plays a major role in reducing wildlife/public conflict at a low cost to the Natural Areas Program.

As West Nile Virus continues its march across the western United States, public agencies are increasingly called to mitigate mosquito/public interactions. As bats feed largely on mosquitoes, promoting bat habitat by providing bat boxes is a toxin free "biocontrol" that the Natural Areas Program supports.

The northern flicker is an insectivorous native bird found throughout the northern Colorado region. This is a species that presents both positive and negative interactions with the public. While primarily predating upon ants, northern flickers are also notorious for creating a disturbance for homeowners by hammering on exterior walls and roofs of homes. This is often an act of declaration, establishing presence and readiness for mates, as well as searching for suitable nesting sites. However, for homeowners, it becomes a nuisance. Flicker boxes provided by the Natural Areas Program to the public at no cost offer a solution that may resolve the homeowner's frustration while still providing the flicker with a nesting site.

Habitat Enhancement Guideline

- The Natural Areas Program will continue to provide resources for volunteers to construct artificial nesting boxes and distribute the boxes to the citizens of Fort Collins upon request.

Fish Habitat – Recycled Christmas Trees

Providing a high-quality fishing experience to the recreating public through improved fish habitat is important to the Natural Areas Program. To this end, the Natural Areas Program has worked cooperatively with the Colorado Division of Wildlife to recycle discarded Christmas trees create aquatic habitat and underwater shelter in ponds at Arapaho Bend Natural Area. Six to eight trees are banded together using wire and connected to recycled tires, which serve as

anchors. The trees are then distributed to areas of appropriate depth and location for fish shelter and allowed to sink. This is a practice widely used by Colorado State Parks and other land management agencies.

Habitat Enhancement Guideline

- The Natural Areas Program will continue to work collaboratively with the Colorado Division of Wildlife to improve both the fishery in our ponds and diversity of native fish.

Standing "Non-hazard" Dead Trees

Standing dead trees that pose no hazard are typically allowed to stand and serve as perching sites for all birds and foraging sites for insectivorous birds like flickers, woodpeckers, and other species.

Habitat Enhancement Guideline

- The Natural Areas Program will continue to allow standing, non-hazard dead trees to stand when possible. From time to time, exceptions may be made for safety, aesthetics, and viewsheds, or other similar reasons.

Promote Backyard Wildlife Habitat

The concept of promoting backyard wildlife is referring specifically to smaller wildlife species such as butterflies and songbirds. In contrast, we do not want to habituate larger species such bear or deer to humans due to the conflicts that can ensue.

The basic elements of backyard wildlife habitat consist of a source for food, water, cover, and a safe location to reproduce and raise young. Habitats can be designed to encourage specific types of wildlife, (i.e. butterflies, songbirds, insects, etc.) or a combination of wildlife. Careful design planning is important and should consider proximity of habitat elements and a diverse structure. The Natural Areas Program, as well as the National Wildlife Federation have developed educational web pages on how to promote backyard wildlife habitats (See Appendix A).

Habitat Enhancement Guideline

- The Natural Areas Program will continue to promote backyard wildlife habitat as time and resources permit.

Chapter 12: Wildlife Inventory and Monitoring

Habitat management, assessment, and wildlife population inventory and monitoring are important tools that direct and enable managers to enhance the conservation values of our natural areas. Every natural area from the smallest to the largest has some capability to contribute to the conservation of native wildlife. The type of habitat, its size, juxtaposition, and connectivity to other habitats, as well as how the property is managed in large part determines what type of wildlife will occupy the area. As such, wildlife management goals for natural areas are based on an assessment of existing and potential habitat conditions, current and potential species richness and diversity, and species of management interest. Consequently, a monitoring program for any given wildlife management objective may involve collecting information on the wildlife itself or a variety of habitat components.

Inventory and Monitoring Wildlife

Monitoring species richness, diversity, and local abundance provides information necessary for managers to critically evaluate habitat management efforts and actions taken to minimize wildlife disturbance (trail placement, seasonal closures etc.). Also, since natural areas range in size from less than 10 acres to nearly 20,000 acres and range from shortgrass prairie to riparian forests to mid-elevation pine forests, no one inventory and monitoring technique will be suitable for all properties, habitat types, and wildlife species.

A second factor to consider is that while all natural area properties play important roles in the life histories of some wildlife species, many areas are too small and/or isolated to strongly influence local population size. In these cases, monitoring efforts will focus on changes in relative abundance and measures of species richness. Conversely, large properties may have an influence on local population size and in some cases direct estimates of abundance are appropriate for monitoring of some wildlife species.

Population indices are techniques that measure abundance relative to an identified standard or to another property. These techniques typically measure species density and/or the number of different species relative to a standardized unit of effort such as time searched or miles walked. Generally, sampling protocol is developed to minimize variability caused by climatic events, observers, and habitat conditions. These techniques are relatively easy and inexpensive to conduct but results are only comparable to results gathered using the exact same technique. These techniques are based only on the number of animals observed and cannot account for, or measure, what is not observed. Relative abundance estimates or indices will be the most common category of data collected for inventory and monitoring on natural areas.

Population estimates generally are conducted by trained staff and have strict sampling assumptions that must be met. These techniques measure both the animals observed and estimate the animals not observed during the sampling period. Examples include using distance sampling techniques and mark recapture techniques. Since actual population estimates are made, data are comparable to any technique that produces population estimates. Population estimates will rarely be used and likely to be applicable only to regional properties and some clusters of natural areas such as the foothills region.

Prior to the start of any monitoring program, efforts will be made to determine if an existing protocol is in use by other conservation groups. Examples include Colorado Division of Wildlife monitoring efforts, Partners in Flight monitoring, Christmas bird counts, and North American Amphibian Monitoring Protocol. If so, protocol will be followed thereby allowing for data collected on a natural area to be compared to existing data sets collected over several years and within a larger landscape. If no protocol exists, consultation with other agencies or conservation organizations will occur and a protocol developed based on species of interest, habitat type, and type of estimate desired (indices vs. direct estimate).

Most inventory and monitoring protocol are based on visual and/or auditory survey techniques. However, certain wildlife species are difficult to detect using these types of surveys. Examples include animals that are nocturnal, species widely distributed in low densities (large predators), are secretive in nature, or when disturbance needs to be minimized (i.e. den sites). Monitoring techniques will be tailored to the situation and based on consultation with other conservation groups. Examples of techniques to avoid disturbance or to help increase observations include remote cameras, mist nets, scent posts, track plates, fur snags, and when possible radio telemetry.

Inventory and Monitoring wildlife habitat and wildlife influences

It is often useful to collect data on potential wildlife habitat or on the influence wildlife has on the environment. Designing a program for either objective must be very specific to the focal species or issue. Implementing such a program will be highly dependent on available budget, staffing, and other resources. Similarly, as discussed in chapter four, assessment of ecosystem health is essential to managing for sustainable habitat. Thus, efforts will be made to monitor soil stability, hydrologic function, biotic integrity and other ecosystem components to ensure the long-term health of urban habitats within Fort Collins. Implementation of this monitoring will be dependant upon specific information needs and will vary in intensity both in terms of cost and scientific rigor. The list below details an example of monitoring intensity from least to most intensive:

1. Anectdotal observation by field staff.
2. Rapid assessment techniques intended to gather limited data.
3. Short-term monitoring efforts designed to assess ecosystem health.
4. Long-term monitoring efforts designed to assess ecosystem health.
5. Implementation of statistically rigorous science experiment or observational study.

Research

Many natural areas provide unique research opportunities especially to local university students and faculty. The Natural Areas Program staff will encourage the use of natural area properties for research directly related to wildlife conservation issues. A Natural Area Program permit is required for these types of activities.

General guideline for wildlife conservation research in Natural Areas

- Natural Areas Program staff will encourage the use of natural area properties for research directly related to wildlife conservation issues.

Natural areas serve many purposes that include wildlife conservation and public participation in activities such as nature viewing and wildlife observation. In many cases, wildlife inventory and monitoring efforts can be combined with public participation and provide an opportunity for the public to gather wildlife related information. Natural Areas will, through outreach and education, encourage members of the public to participate in monitoring efforts.

Conclusion

Monitoring wildlife, their habitat and their influences can be extremely valuable for making sound management decisions. It must be emphasized, however, that extensive inventory, monitoring or research it is not the primary objective of the Natural Areas program and consequently may often be beyond the program's resources. The high costs and time required to gain useful information on any species prohibits the program from monitoring all species and habitats. As such, monitoring will be used when possible in situations when it is likely to have a considerable impact on management decisions.

Chapter 13: Future Research and Information Needs

The following chapter reviews future research and information needs. This research may be conducted by the Natural Areas Program, but it is more likely to be conducted by partners with cooperation from the Natural Areas Program.

Research: Contraceptive Techniques for Prairie Dog Control

As referred to in Chapter 7, the Natural Areas Program is working in collaboration with researchers from the U.S.D.A. National Wildlife Research Center to explore two different types of contraceptive techniques for prairie dogs. Initial laboratory research on these methods began in August 2006 and was followed by in-situ field trials during the fall of 2006, to be continued through 2007. If the experimental trials are successful, product registration the U.S. Food and Drug Administration and Environmental Protection Agency could take up to two years. Thus, these new tools could be available as soon as late 2009 or early 2010. A description of each of the methods is found below.

GnRH - Gonadotropin-releasing hormone

The first method involved the single injection of a Gonadotropin-releasing hormone called (GnRH) registered as GonaCon. GnRH is a hormone produced by the hypothalamus section of the brain that signals the body to produce sex hormones such as estrogen, progesterone, and testosterone. These hormones in turn stimulate sexual activity in animals by triggering estrus in females and sperm production in males

The aim of added GnRH vaccine is to bind to or "tie up" the GnRH produced within an animal's body so that it does not trigger the release of sexual hormones. The vaccine induces the body to make antibodies against its own GnRH. To do this, GnRH is chemically synthesized by attaching a foreign protein to the normal chemical structure. As a result, when the GnRH vaccine is injected into the animal's body, the body's immune response neutralizes the hormone's function, resulting in infertility in both males and females. Effective contraception in females reduces hormone level to the point that females do not ovulate or come into estrus. In males, reduced testosterone levels results in a size reduction in the testicles and the lack of interest in females that are in estrus.

GonaCon is administered via a single injection (no follow up booster is necessary). Male and female prairie dogs would need to be trapped and ear-tagged (to prevent a second injection) in late September or early October as sexual activity in prairie dogs can begin as early as December. It is thought that effective contraception period would last a minimum of two years for prairie dogs.

Diazacon

A second method is an orally ingested product Diazacon, a cholesterol mimic that inhibits cholesterol production and blocks sexual hormone formation.

Cholesterol is necessary for sexual hormone formation. By blocking cholesterol production you block the production of hormones necessary for reproduction such as estrogen, progesterone, and testosterone. A small study was undertaken by the National Wildlife Research Center to test

whether diazacon might be effective in prairie dogs. Due to delays in obtaining the proper permits, treatment began later into the breeding season than planned. Despite this, the average number of young as a proportion of treated adults was reduced by 59% when compared to a control population. One shortcoming of this method is that diazacon wears off after a couple of months, thus requiring repeated yearly applications prior to reproductive cycles.

Diazacon is administered orally by treated rolled oats. For prairie dogs, this application would take place by the end of November and would comprise of ten feedings over a two week period to result in effective serum levels. Currently, scientists conclude that indirect effects on non-target species (such as accumulation in the food chain) appear to be minimal. According the researchers at the NWRC, a large quantity of bait (more than a typical raptor or other wildlife could eat in a given time period) would need to be consumed to inhibit reproductive capacity.

Research: Wildlife Movement Patterns and Corridor Protection

The Natural Areas Program has an extensive network of natural areas located throughout the city of Fort Collins and surrounding areas. In several cases, natural area properties are directly adjacent to one another. However, properties are not frequently in direct contact with another natural area and at times may be isolated by urban development.

Research is needed to better understand movement patterns between Natural Area properties that exhibit differing types of connectivity. Effort can then focus on conserving lands that contribute to wildlife movement such as adjacent habitats on private lands. Second, management practices can be employed that correct movement barriers.

General Guidelines for Future Research Related to Wildlife Movement & Corridor Protection

- Participate as a partner in the Colorado Division of Wildlife's Front Range radio telemetry studies on mountain lion movement.
- Partner with Colorado State University to design and conduct urban wildlife studies using radio telemetry.
- Identify high use movement corridors through telemetry, remote cameras, or other techniques. Develop conservation plans to conserve important connections.
- Identify potential movement barriers and identify possible solutions (additional land conservation, habitat modification, employ wildlife passage techniques such as drift fence/culverts).

Biological Inventory

Several inventory techniques were discussed in Chapter 12. Wildlife inventory and monitoring programs have been employed on several natural areas in past years. Staff will compile inventory/monitoring techniques by species by natural areas to develop a complete list of ongoing efforts. From this inventory/monitoring programs will be evaluated and standardized techniques established. This will ensure the collection of data that will be comparable across natural areas and between years. Because of the small size of many of the urban natural areas, some inventories are not possible. Therefore the City will consider information from biological

inventories that are conducted at the regional scale (by agencies like the Colorado Division of Wildlife) to augment our understanding of local populations.

Management efforts often are triggered by high or low densities of target species. For example, some urban natural areas have a recent history of prairie dog abundance at densities higher than the capability of the habitat to sustain them. This lead to relatively large areas becoming extremely over grazed and prone to wind erosion. Staff responded by reducing prairie dog densities and replanting native vegetation.

Population and habitat management challenges are not limited to urban natural areas or prairie dogs. For example, Bobcat Ridge and Soapstone Prairie natural areas have elk, mule deer, and pronghorn, all species that are known to increase in abundance under some circumstances. Staff will work to develop current density estimates of target species using techniques outlined in Chapter 12. From this estimate, as necessary, management goals will be established and a management plan developed to achieve the goals developed.

General Guidelines for Biological Inventory in Natural Areas

- Establish monitoring protocols as described in Chapter 12.
- Partner with Colorado State University to conduct habitat use studies for select wildlife species of interest.
- Continue to build partnerships with Audubon Society and other conservation groups to gather wildlife use information.
- Work to identify critical breeding, migration, or other habitats of relatively high use.
- Dedicate seasonal staff to monitoring program.
- Identify species of interest and determine current estimates of species density.
- As necessary establish management objectives and a monitoring program to measure progress toward objectives.
- Partner with CDOW, Rocky Mountain Elk Foundation, Mule Deer Foundation and others to develop and implement management plans.
- Large regional properties may provide the opportunity to participate in reintroduction of species. Natural Areas staff will work with CDOW, USFWS and others to identify these opportunities.
- Develop a list of species reintroduction opportunities for all natural areas.
- Contact the appropriate agencies to discuss possible options and management actions to consider in the interim period (disease control, habitat improvement, etc).

Inventory: Aquatic Wildife

Aquatic resources found on natural areas consist of both natural water courses such as the Cache La Poudre River; Boxelder, Spring, and Fossil Creeks; as well as man-made water bodies (primarily gravel ponds and ditches). As with terrestrial habitats, species inventories, species monitoring, species management goals, and habitat management plans can help guide the Natural Areas Program management activities. Many species associated with aquatic habitats can be inventoried and monitored by Natural Areas Program staff; however, some species such as fish need specialized equipment not owned by the City of Fort Collins. The Colorado Division of

Wildlife currently monitors fisheries and the Natural Areas Program will work them to obtain any needed inventory or monitoring data. Other inventory and monitoring will fall into those activities staff can undertake, and those activities that will require outside assistance from the Colorado Division of Wildlife and other agencies.

Potential Staff Activities (depends on budget and staffing resources)

- Conduct breeding amphibian inventories following the North American Amphibian Monitoring Protocol and/or the Colorado Division of Wildlife protocol.
- Evaluate shallow water habitat for management and/or restoration.
- Create/enhance access for non motorized recreation.
- Evaluate, identify need for, and develop management plans for upland buffers for runoff control.
- Continue to manage riparian areas as habitat and stream buffers.

Partnered Activities

- Inventory fish species.
- Develop non-motorized fishing opportunities (fishing docks, etc.).
- Within natural river and creek corridors, work to restore backwater areas, side channels, and wetlands within the floodplain corridors in and near Fort Collins.
- Work with Stormwater staff to identify trees that create scour sites, habitat etc. Work within existing policies to keep trees that pose no flood threats.

Appendix A: Responding to Wildlife Emergencies (and other Wildlife Contacts)

Requests for release of rehabilitated animals (Wildkind Program, etc.)
There is informal, verbal agreement that the Natural Areas Program will find natural areas on which rehabilitated animals from the local Wildkind program can be released. Wildkind must submit a Natural Areas permit request stating the number and species of animals. The Natural Areas Program will then select the most appropriate release site(s) in an effort to accommodate the request even in cases when the expected carrying capacity for those species may been exceeded. All releases conducted by the Natural Areas Program, or on Natural Areas Program property must comply with Colorado Division of Wildlife requirements and regulations regarding animal releases.

For dead animals:
Road Kill is most often observed in or near paved and dirt roads and the animal appears to have died from a traumatic event.
- Move the animal off of the road if possible, using a shovel or stick…Do not handle the animal with your bare hands**!**
- Moving the animal away from traffic will potentially reduce possible injury to wildlife scavengers

Who to Contact:
- Larimer Humane Society 498-6775

Suspious Circumstance are most often associated with trauma caused from an unnatural event, like malicious human behavior e.g., abuse or poaching.
- Do not handle the animal**!**
- Document observations and photograph if possible

Who to Contact:
- Larimer Humane Society 498-6775
- Colorado Division of Wildlife 472-4300
- **After Hours** Contact: Colorado State Patrol 1- 888-477-4328
- **If in Natural Area also** Contact a Natural Areas Ranger 416-2147

For Injured Animals
Injured Animals will display signs of trama associated with conflict from humans or other animals and is not always easy to determine.
- Do not attempt to approach or handle the animal**!**
- If you feel threatened or in danger call **911**
- Document observations and location

Who to Contact:
- Larimer Humane Society 226-3647
- **If in Natural Area also** Contact a Natural Areas Ranger 416-2147
- **After Hours** Contact: Colorado State Patrol 1-888-477-4328

- If raptor then contact Rocky Mountain Raptor Center 484-5889

Potential Disease animal often does not appear to be injured; however, displays behavior that is not consistant with the species or out of character (e.g., wandering aimlessly and exposed to things it would normally avoid.)

- Do not attempt to approach or handle the animal**!**
- If you feel threatened or in danger call **911**
- Document observations and location

Who to contact:

- Larimer County Department of Health and Environment 498-6775
- **If in a Natural Area also** Contact a Natural Areas Ranger 416-2147

Information on potential diseases to humans

- Center for Disease Control (CDC) phone 1-800-232-4636
  - Website: http://www.cdc.gov.
  - Web link regarding insect borne diseases: http://www.cdc.gov/ncidod/diseases/insects/diseases.htm

Backyard Wildlife web links

- City of Fort Collins Backyard Wildlife:
  - www.ci.fort-collins.co.us/naturalareas/habitat.php.

- National Wildlife Federation backyard wildlife program
  - www.nwf.org/backyard.

Appendix B: Key to Wildlife Species of Concern in City of Fort Collins Natural Areas

Colorado Natural Heritage Program (CNHP) Ranking (not a legal designation)	
Level	**Description**
G/S1	Critically imperiled globally/state because of rarity (5 or few occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G/S2	Imperiled globally/state because of rarity (6-20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G/S3	Vulnerable through its range or found locally in a restricted range (21-100 occurrences).
G/S4	Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.
G/S5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GNR	Not yet ranked globally.
G#T#	Trinomial rank (T) is used for subspecies ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not permanent residents.
S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
SZ	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
Notes: # represents rank (1-5). Where two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the element falls between the two numbers.	

State/Federal Status (legal designation)	
Level	**Description**
SE	State Endangered--those species or subspecies of native wildlife whose prospects for survival or recruitment within Colorado are in jeopardy, as determined by the Wildlife Commission for the Colorado Division of Wildlife.
ST	State Threatened--those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct.

SSC	State Special Concern--species or subspecies of native wildlife which have been removed from the State threatened or endangered list within the last 5 years; are proposed for Federal listing (or are Federal listed "candidate species") and are not already State listed; have experienced, based on available data, a downward trend in numbers or distribution lasting at least 5 years which may lead to a threatened or endangered status; or are otherwise determined to be vulnerable in Colorado, as determined by the Commission.
FLE	Federal Listed Endangered--defined by the U.S. Fish and Wildlife Service as a species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range.
FLT	Federal Listed Threatened--defined as a species, subspecies, or variety likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
FC	Federal Candidate--taxa for which substantial biological information exists on file to support a proposal to list as Endangered or Threatened, but no proposal has yet been accepted and published in the Federal Register.
FSS	Forest Service Sensitive--species identified by the Regional Forester for which population viability is a concern as evidenced by (1) significant current or predicted downward trends in population numbers or density and (2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Forest Service Sensitive species are noted due to the proximity of one regional natural area to Forest Service Properties.

Appendix C: Amphibians and Reptiles of Larimer County

Amphibians and Reptiles of Larimer County Colorado Herpetological Society's Guide to the Reptiles and Amphibians of Colorado. http://coloherp.org/geo/counties/coulari.php		
Common Name	**Scientific Name**	**Reference**
Tiger salamander	*Ambystoma tigrinum*	H
Western toad	*Bufo boreas*	H
Great Plains toad	*Bufo cognatus*	*
Woodhouse's toad	*Bufo woodhousii*	H
Western chorus frog	*Pseudacris triseriata*	H
Bullfrog	*Rana catesbeiana*	RJW1
Northern leopard frog	*Rana pipiens*	H
Wood frog	*Rana sylvatica*	H
Plains spadefoot	*Spea bombifrons*	H
Turtles		
Common Name	**Scientific Name**	**Reference**
Spiny softshell	*Apalone spinifera*	*
Snapping turtle	*Chelydra serpentina*	H
Painted turtle	*Chrysemys picta*	H
Ornate box turtle	*Terrapene ornata*	*
Lizards		
Common Name	**Scientific Name**	**Reference**
Six-lined racerunner	*Cnemidophorus sexlineatus*	H
Many-lined skink	*Eumeces multivirgatus*	H
Lesser earless lizard	*Holbrookia maculata*	H
Short-horned lizard	*Phrynosoma hernandesi*	H
Prairie lizard / Plateau lizard	*Sceloporus undulatus*	H

Snakes		
Common Name	**Scientific Name**	**Reference**
Racer	*Coluber constrictor*	H
Western rattlesnake	*Crotalus viridis*	H
Western hognose snake	*Heterodon nasicus*	H
Milk snake	*Lampropeltis triangulum*	H
Smooth green snake	*Liochlorophis vernalis*	*
Northern water snake	*Nerodia sipedon*	H
Gopher snake	*Pituophis catenifer*	H
Plains blackhead snake	*Tantilla nigriceps*	H
Western terrestrial garter snake	*Thamnophis elegans*	H
Plains garter snake	*Thamnophis radix*	H
Common garter snake	*Thamnophis sirtalis*	H
Lined snake	*Tropidoclonoin lineatum*	*

* Indicates that, while the species has not been documented for the county, it may occur there (Reichard et al. 1996).

\# Indicates that, while at least one of the subspecies has not been documented for the county, two possible subspecies of the same species may occur in the county.

H Hammerson, G. A. 1986. Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Publ. No. DOW-M-1-3-86 131 pp.

RJW 1 Wiese, R. J. 1990. Survey of the bullfrog along the Front Range and in eastern Colorado, 1989. Unpubl. rept., Colorado Division of Wildlife, Denver.

Appendix D: Summary of Comments

The following tables include comments from 5 distinct groups:

1. Land Conservation and Stewardship Board
2. City Council
3. Natural Resources Advisory Board
4. Colorado Division of Wildlife
5. Other Peer Review
6. Public

In addition to the comments presented in the following tables there were many minor suggestions. The majority of the minor detailed editorial and scientific comments (not included below) were readily incorporated into the document as they improved the accuracy or clarity of the document.

1. Land Conservation Stewardship Board (12-13-06)

#	Comments/Issues	Response
1	*Application*: Concern over nebulous application of these guidelines and specific topics to local as compared versus regional Natural Areas.	Inserted new paragraphs in Ch 1 to further clarify intent and application of specific sections of the document. Also, extra wording inserted into the executive summary and throughout document to reduce confusion.
2	Concern the guidelines might bind us to certain management practices in inappropriate situations in the future	Sentences added in Ch 1 to clarify that these are guidelines and that each situation will be responded to based on specific conditions.
3	Request to add more info on backyard wildlife	Added references in text and web links in Appendix.
4	Can we create seasonal fishing restrictions to protect bird habitat?	This idea will be considered for site specific management.
5	Request for improvement on discussion from Lyme disease to all tick-borne diseases and related human interface.	Edited into Ch 10 (Management and Control of Wildlife Diseases)
6	Various opinions on the approval process for emergency lethal control of prairie dogs.	This issue was omitted because emergency fumigation almost never occurs.
7	Request for improved discussion over the threat of free ranging house cats to songbirds.	Additional paragraph inserted.

2. City Council Work Session (1-9-06)

#	Comments/Issues	Response
8	Concern about resources and reality of implementing prairie dog management.	➢ We have kept the system of filters and zones as originally described. ➢ We have added annual (biannual) review by LCSB board on progress of the implementation. ➢ We plan to continue to consult with experts in prairie dog and grassland management throughout 2007. ➢ This document is written as a set of Guidelines and is not meant to be prescriptive. ➢ Staff will determine exact methods for implementing this plan beginning in the spring of 2007 and will carefully evaluate the allocation of resources over time as well as the success or failure of the applied methods
9	Expressed their wish that the *Guidelines* be utilized, when appropriate, by other City departments.	No changes to document
10	Request for a side-by-side comparison of the existing *Prairie Dog Plan* and the proposed language of the *Guidelines* that pertains to prairie dog management.	Comparison table provided in packet.
11	Why is administrative adoption preferred over Council adoption?	See Agenda Item Summary
12	Concern about dead and down tree and snag habitat on the Poudre River and coordination between Utilities and Natural Resources.	See memo from Utilities
13	Additional language regarding house and feral cats in natural areas.	Additional paragraph inserted.
14	Request for list of outside reviewers	List provided in packet

3. Natural Resources Advisory Board (1-17-07)

#	Comments/Issues	Response
15	Positive feedback on adopting new proactive management approach (ecosystem health) as opposed to former more reactionary approach.	Thanks for your support.
16	Interest from this board in seeing these Guidelines be applied by other City departments.	No changes to document
17	Interest in seeing City Code adopt principles and ideas from WMG.	No changes to document
18	Why don't we do more to control foxes?	This is CDOW's domain. Also, according to CDOW they are a native species.

19	Dogs off leash are a large problem- request that this topic receives more emphasis in document	Additional paragraph inserted.

4. Colorado Division of Wildlife (1-07)

Many detailed technical suggestions based on CDOW expertise was provided throughout the document. These were readily incorporated.

#	Comments/Issues	Response
20	Language about the role of hunting on regional properties should be strengthened.	A new paragraph written into ch 5 (Native species management)
21	A limited and closely managed Big Game hunting program should be implemented on Soapstone and other large parcels as they are acquired.	The Soapstone and Red Mountain Management Plans (and public input process) are still in process.
22	All issues of regulatory authority over wildlife management should be placed at the beginning of the document to eliminate confusion.	Added new introductory paragraph in Ch 2 to clarify legal framework.
23	Many details were requested regarding proper implementation and monitoring of prairie dog plan.	This document is written as a set of Guidelines and is not meant to be prescriptive. Some of the details requested by CDOW will be added to this document, however, many of these details will be determined and implemented at the site plan level. CDOW did not have any new/alternative recommendation for management of prairie dogs. CDOW will be included in future consultations as we develop prairie dog monitoring methods.

5. Other Peer Review (1-07)

Much of the peer review included detailed, scientifically oriented comments for chapter 6 (prairie dog management). In most cases, these details were accepted and incorporated because the input came from experts on the subject.

#	Comments/Issues	Response
24	These guidelines will allow for a 1 acre of prairie dog for every 9 acres of suitable land. This is probably the about the same ratio (or higher) of occupancy that existed in the region prior to European settlement.	Great!
25	"It's obvious you have drawn from the benefit of past experiences. Realizing you will be fine tuning as more information is gained, this appears as a very workable plan."	Thank you.
26	Clearly define which chapters apply to urban sites and which to regional.	Inserted new paragraphs in Ch 1 to further clarify intent and application of specific sections of the document. Also, extra wording inserted into the executive summary and throughout

		document to reduce confusion.
27	Ch. 6 (prairie dog management): We repeatedly received positive feedback and reference to sound science and management on the proposed prairie dog management system. There was regular concern about reality of implementation and feasibility with limited resources for success.	See Response #8
28	Ch. 6: Various comments about the size relationship between the three zones (40:20:40)	We have maintained this guideline of 40:20:40. However, this is only a guideline, each colony will be individually analyzed.
29	Ch. 6: Critique that we are making causal relationship between prairie dogs and ecosystem health yet they are an integral part of a healthy ecosystem	Added new paragraphs in the beginning of the chapter explaining relationship between urbanization, prairie dogs, and ecosystem health.
30	Ch. 6: Define "high quality grasslands" (in filters) because it is serving as a filter for excluding prairie dogs yet they are an integral part of the healthy short-grass prairie.	Definition added.
31	Ch. 6: Several requests for full description of the methods to explain the origin of the 2006 population data.	Made minor changes to enhance clarity; however, a full-blown description is outside the scope of the guidelines document.
32	Ch. 6: Skeptical that you will have the time, resources, and manpower to constantly prevent prairie dogs from migrating from zone A into B and C. Not only that, but invasive plants will likely be moving between those borders as well.	Have acknowledged all these concerns. Program will use adaptive management in the process to maximize resources and effectiveness. This plan aims to reduce weed control by reducing possible expansion by prairie dogs. Program will continue to control noxious weeds. This commenter had no new/alternative suggestions for prairie dog management.
33	Ch 7 (native species reintroductions): This chapter does not belong in document and only belongs in Soapstone Management Plan.	Have kept this chapter, yet the wording has changed slightly to emphasize that these are *ideas*, etc not actual *plans* for reintroductions.

6. Public (From 1-12-07 to 2-9-07)

Public Notification Process: The document was posted online for 1 month and an open house was held on Feb 5th. The open house and website (with document, video presentation and comment form available) were publicized through a press release sent Jan. 22nd. A postcard mailing was sent to 211 neighboring residents, all natural area volunteers, and the prairie dog advocate group. In addition, the flyer was posted at natural area trailheads. An article was published in the Coloradoan on Jan. 12th after the City Council study session on Jan. 9th.

We received 3 comments online and 18 comments the evening of the open house.

#	**Comments/Issues**	**Response**
34	**Compliments and support for the entire document** 1. Many "Thank you's" and "Good luck". 2. Plan seems active in terms of attaining	Thank you for the support.

	management goals and passive in that it supports habitat enhancement with limited disturbances to the ecosystem. 3. Managing such small areas seems challenging. Good luck balancing interests, values, and management objectives.	
35	**Overall support for the new prairie dog management approach.** 1. You are taking the right approach in terms of prairie dog management- you address the main points and back them up well. 2. Fumigation seems necessary. 3. Prairie dog population this past season was terrible. I would like to co-exist with wildlife but not at the expense of my property…Would like to see management at Fossil Creek a <u>high</u> priority. 4. Three-zone plan considers potential problems 5. Creating a buffer is important. Do not want to see natural areas further degraded.	Thank you for the support and input.
36	**Opposition to lethal control.** 1. Opposition to all lethal control, volunteer to help with relocation. 2. This plan calls for more lethal control than previous plan. 3. Hope you continue to talk to the prairie dog advocates. 6. Why are you proceeding with this policy without investigating the effects of the blizzard on the populations? 7. Without 6-week notification, no accountability to public or government bodies. 8. Will you be building barriers on the edge of the zones? The animals won't know where these zones are and will be killed when they move into them. 9. Keep in mind the black-tailed prairie dog is a threatened species. You have the mentality that if you fumigate them "they will always grow back." 10. I used to enjoy the natural areas because they were a wildlife sanctuary. This has ruined my joy in visiting the natural areas. Why can't you wait 2.5 years for birth control to be ready and rather than fumigating now. Birth control is the most humane and long-lasting control. 11. Prairie dogs are an asset to the urban setting and serve as a keystone species.	➢ Prairie dog management will require some population control. ➢ The proposed approach is intended to balance <u>overall ecosystem health</u> *and* <u>sustainability of prairie dogs</u> and other natural values. ➢ Assessments will use most recent population data. ➢ Political and ecological limitations to finding relocation sites make it only very rarely available as a management tool. ➢ Periodic review by Land Conservation Stewardship Board is our proposed accountability. ➢ We will not be building barriers at the edge of zones. Will use adaptive management to apply these guidelines in the most sensible way. The first year will be an opportunity to learn how animal density and dispersal will respond to the plan and adjust accordingly. ➢ Other comments noted.
37	**Concern about resources and reality of implementing prairie dog management.**	See Response #8

38	**Concern about the side effects of lethal control.** 1. Fumigation will kill other wildlife. 2. Observe and record side effects of fumigation on ecosystem. 3. Birth control chemicals ending up in water. 4. Bioaccumulation of birth control? 5. Trap and poison off-site to reduce side affects to ecosystem.	➢ Applicators are trained to assess the site prior to fumigation to minimize lethal affect on non-target wildlife. ➢ Because of the relatively small size of prairie dogs, effective dosage of birth control will have inconsequential impacts on other parts of the ecosystem.
39	**Suggestions for alternative prairie dog management methods.** 1. Re-evaluate population monitoring methods and consult with prairie dog specialists. 2. Consider using non-lethal technique "Reverse Dispersal Translocation."	➢ We are developing comprehensive methods for monitoring both prairie dogs. ➢ Local wildlife and grassland ecologists will be consulted to help develop methods that maximize effectiveness and achieve objectives.
40	"You are managing a Wildlife Sanctuary and **should be managing for multiple use**, RV use, hunting etc…"	Primary mission of the program is conservation while providing recreation opportunities. Recent study indicated that local natural areas are well used, a total of 3.7 million visits annually and 47,000 users.

Appendix E: Board Letters of Recommendation

1. Land Conservation Stewardship Board

Memorandum

To: City Council
From: John Stokes
Through: Darin Atteberry
Date: February 15, 2007

Re: Land Conservation and Stewardship Board recommendation

The following recommendation to City Council was made by the Land Conservation and Stewardship Board at its February 14 meeting:

The Land Conservation and Stewardship Board recommends to City Council that it rescind the existing *Prairie Dog Policy for City Natural Areas*, and that staff administratively adopt the proposed *Wildlife Management Guidelines* on March 15th or later.

The recommendation was unanimously approved.

The Board recommended administrative adoption of the *Wildlife Management Guidelines* on March 15th or later to provide additional time for the public to comment on the most recent draft of the document (posted at *http://www.fcgov.com/naturalareas/wildlife-guidelines* on February 13th).

2. Natural Resources Advisory Board

Date: 30 January 2007

To: Mayor and Council Members

From: Linda Knowlton on behalf of the Natural Resources Advisory Board

Subject: Natural Areas Wildlife Management Guidelines

The Natural Resources Advisory Board unanimously recommends that City Council deactivate the 1998 Natural Areas Wildlife Management Plan so that the Natural Resources Department can administratively adopt the 2007 Guidelines.

The NRAB reviewed the draft guidelines at its January 17 meeting because, while the natural areas are no longer the purview of this board, wildlife does not observe jurisdictional boundaries and management practices on natural areas will have an effect on wildlife throughout the city.

We recognize that the changes to the prairie dog management policy will be opposed by a small segment of the population. But we feel that the focus on the overall health of the ecosystem is appropriate, especially in an urban setting.

Please feel free to contact me if you have any questions. I can be reached at 223-9328 or llknowlton@juno.com

Appendix F: Removal of Downed Trees Along the Poudre River

Memorandum

Date: February 8, 2007

To: Mayor and Council Members

Thru: Darin Atteberry, City Manager
Michael B. Smith, Fort Collins Utilities General Manager
Marty Heffernan, Director, CLRS

From: Jim Hibbard, Water Engineering and Field Services Manager
John Stokes, Director, Natural Resources Department

Re: Poudre River Removal of Downed Trees

On January 9, 2007 at a work session Council discussed the Natural Areas Management Guidelines for natural areas owned and managed by the Natural Resources Department. During that discussion questions were raised concerning the Utilities removal of downed trees along the Poudre River corridor. On January 31, 2007, Utilities and Natural Resources staff met to discuss the issue. The following is a summary of that discussion.

Historical Perspective of Vegetation along the River:

There is much scientific discussion surrounding the historic condition along the Poudre River prior to settlement of the region in the mid-1800's. One theory is that the river corridor today is much more vegetated than historically in the absence of wildfires and widespread beaver activity. The river might have had sparser cottonwood gallery with the understory dominated by grasses and only a small shrub component. In this scenario, removal of woody debris would mimic merely a fraction of the function historically provided by fire and beaver herbivory.

A second line of scientific thinking postulates that the river corridor was more vegetated than the present but with willows and other shrub-like growth forms. This scenario includes beaver activity but assumes that fire was not as commonplace as in the first scenario. The present-day removal of large woody debris by the Utilities Department under this scenario is inconsequential from a historic perspective.

Lastly, one major way the Poudre river system is different today than in the past is the lack of regular flooding events that scoured the banks, and created sandy "bars" perfect substrate for the germination of cottonwoods.

Poudre River Clean-up of Downed Trees:

The annual removal of downed trees in the river corridor attempts to achieve a balance between public safety and infrastructure protection while still recognizing the natural habitat values of those trees. Annually crews from the Utilities Department inspect the river corridor and identify areas where large downed trees could create a problem of plugging of bridges or canal structures in the event of high water conditions within the river corridor. This plugging has the potential to dam the river, causing a washout of structures and possible redirecting of the flood flows out of the river corridor.

During a flooding event, bridges and canal structures are inspected continuously to monitor the amount of debris collecting on the structure. Once a structure becomes plugged, crews are then required to unplug the structure during the flood event creating a risk to crews and their equipment.

Smaller trees are usually left in place and only large trees that would pose this plugging problem are removed. Large trees that are anchored in the stream bank are not removed. Depending on the past years weather patterns, some years may be more labor intensive than other years. For example, if high winds or snow on trees that are leafed out break off a large number of trees, then that year might include more removal than other years. And visa versa, some year's very minimal removal has taken place. In areas where removal takes place, that area is not clear cut, some downed trees will be left behind. If necessary, consultation with representatives of the City's Natural Resources Department and Forestry Departments takes place where questions arise about the viability or importance of certain trees. For example, if a downed tree is providing bank stabilization and is unlikely to be become dislodged, then that tree would be left in place. Areas where the plugging of crossings is not a concern, then downed tree removal is not performed, such as below the Environmental Learning Center on the end of Drake Street.

Future Monitoring:

Considering the ecological importance of the Poudre River corridor and in light of the recent council discussion, the Natural Resources Department (possibly in conjunction with the Utilities Department) will explore the possibility of establishing a baseline ecological monitoring study of the river corridor through town in 2007. The goals of this monitoring study would be to establish the existing baseline conditions, evaluate the health of the river corridor for wildlife use, and evaluate any long-term effects from activities such as the proposed Northern Integrated Supply Project. Specific details of that study would be determined this spring and would be shared with the Land Conservation and Stewardship Board.

Appendix G: Comparison of 1998 Prairie Dog Policy and 2007 Wildlife Management Guidelines

	1998 Prairie Dog Policy	**Wildlife Management Guidelines (2007)**
Document initiated because…	Initiated because of citizen concern regarding exterminations.	Initiated by staff because of detrimental impacts of expanding populations on grasslands and citizen concern.
Long-term overall plan	Plan focuses on land acquisition, maintaining and managing existing large (>50 acres) colonies. Plan allows for fumigation of prairie dogs on unsuitable small sites.	Provide a framework for managing wildlife and wildlife habitat within the context of the overarching goal of promoting and enhancing ecosystem health and sustainability. Provides long-term guideline for determining and managing prairie dogs in suitable and appropriate habitat based on system of filters and zones.
Primary management methods **(Best management practices applied in both cases)**	Land acquisition, use of barriers, education, fumigation, relocation, disease control (plague), research and experimentation.	Filters and zonation, fumigation, trapping and donating, disease control, contraception possible, relocation. Land acquisition within city limits limited. Barrier construction limited due to low cost effectiveness. Barrier maintenance will continue.
Cause for active population management	When movement into adjacent properties causes damage, for restoration of degraded habitat, for removal in unsuitable habitat.	When animals exist or move into unsuitable areas as guided by the process of applying ecologically based filters and zones.
Education	Through a variety of interpretive strategies, disseminate information on natural history (locally and regionally) of prairie dogs, as well as management issues and methods.	Continues to recognize the critical role of education and interpretation. Information about prairie dog natural history and management will continue to be provided through a variety of strategies.
Public notification process for prairie dog removal	6 week public notification to provide public opportunity to identify suitable relocation sites.	No public notification. Since the 1998 plan, the public has been unable to find suitable relocation sites outside of the City-owned properties. Current state law now limits relocation to other counties.
Monitoring	No directive for monitoring. Monitoring was initiated in 2003 and continued through 2006.	Will establish a formal monitoring program for prairie dog populations and vegetation conditions.
Review and management guidance	Partner with other land managers, research and experimentation. Periodic review, (not to exceed 5 years) by Natural Resource Advisory Board was required.	Progress, results of management will be reviewed by LCSB every 6 months. Reviewed by Council in 5 years