Making the Vision...

A Reality

THE NORTH BOULDER VALLEY AREA MANAGEMENT PLAN

June 3, 1997

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FOREWORD

Making the Vision... A Reality

When the Common Becomes Special — North Boulder Valley

Open space didn't just happen thirty years ago. Boulder residents created a vision and set about making it happen. The mountain backdrop attracted early open space supporters. Scenery sold. Viewsheds and location formed the initial underpinnings of the Open Space Program because green grass, trees, and mountains reminded us of what we liked and where we came from.

The importance of landscapes is replacing the lure of vistas. In the past thirty years, natural landscapes have been transformed in the face of rapid and concentrated change in the Boulder Valley and Boulder County. Natural has become rural; rural, instantly urban. Land is taken and used in many ways -- for residential development, roads, power lines, and golf courses. Worst of all, land is taken for granted. Only after land is lost do we realize the importance of what was common -- the unplowed prairie grasslands, the uncut forests, the mosaic of farms and ranches, the "rightness" of towns woven into the rural tapestry. Only remnants of natural landscapes remain. The common has become special. This is North Boulder Valley.

Answers to the question "What is this place?" are not found on a map, through a car window, or on a television screen. The answers are "out there," on the ground. Now we take great pains to preserve the special, to define the place, to say "this is who we are and this is how we'll be here and care for this place."

Sensing this Place

The North Boulder Valley Area Management Plan is a translation of the vision of Open Space, of current information, and of management actions into something that works on the ground. The plan is a framework for the protection of the natural, agricultural, cultural, and recreational resources and for the preservation of the land.

The Plan charts the course for the future of Open Space in North Boulder Valley by providing management guidance, based upon the integration of the history and collective experience of the community and this place. Success will be measured by the long-term health and integrity of the land. Please read the North Boulder Valley Area Management Plan with care. We welcome your comments and commitment to its future.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1 PURPOSE

The purpose of the North Boulder Valley Area Management Plan (Figure 1) is to provide specific management direction for natural, cultural, agricultural, and passive recreational resources, to resolve potential conflicts between management goals, and to ensure effective public participation. North Boulder Valley is one of seven distinct areas delineated for area management planning; area delineation was based primarily on size, watershed, location, and land uses (Figure 2).

Land and resource management is based on the best available information. Results of monitoring the effects of land uses and management actions over time will help determine adaptive management responses to changing natural conditions.

1.2 GOALS

Plan goals provide the framework to guide the development of the management actions for North Boulder Valley. These broad goals are further defined in the accompanying resource sections of this Plan. Each resource section contains specific resource goals, objectives, and management actions.

The goals of the North Boulder Valley Area Management Plan are:

- **Acquire lands consistent with the Open Space Charter (Appendix 1.1) and the Area Management Plan goals and ensure proper management of easements and Open Space properties;**
- **Manage and preserve the natural and cultural resources of North Boulder Valley;**
- **Restore and improve natural, cultural, passive recreational, and agricultural resources where suitable;**
- **Manage and preserve land for passive recreation use, for its aesthetic or passive recreational value, and for its contribution to the quality of life of the community;**
- **Maintain sustainable agricultural operations by balancing economic and natural resource considerations; and**
- **Use education and outreach to accomplish the management goals of the North Boulder Valley Area Management Plan.**

1.3 DESCRIPTION OF MANAGEMENT AREA

The combination of topography, climate, geology, and soils in the North Boulder Valley results in a rich ecological diversity. Ponderosa pine woodlands with native grass and shrub under-stories, mixed grass, and shortgrass prairies are significant plant communities in North

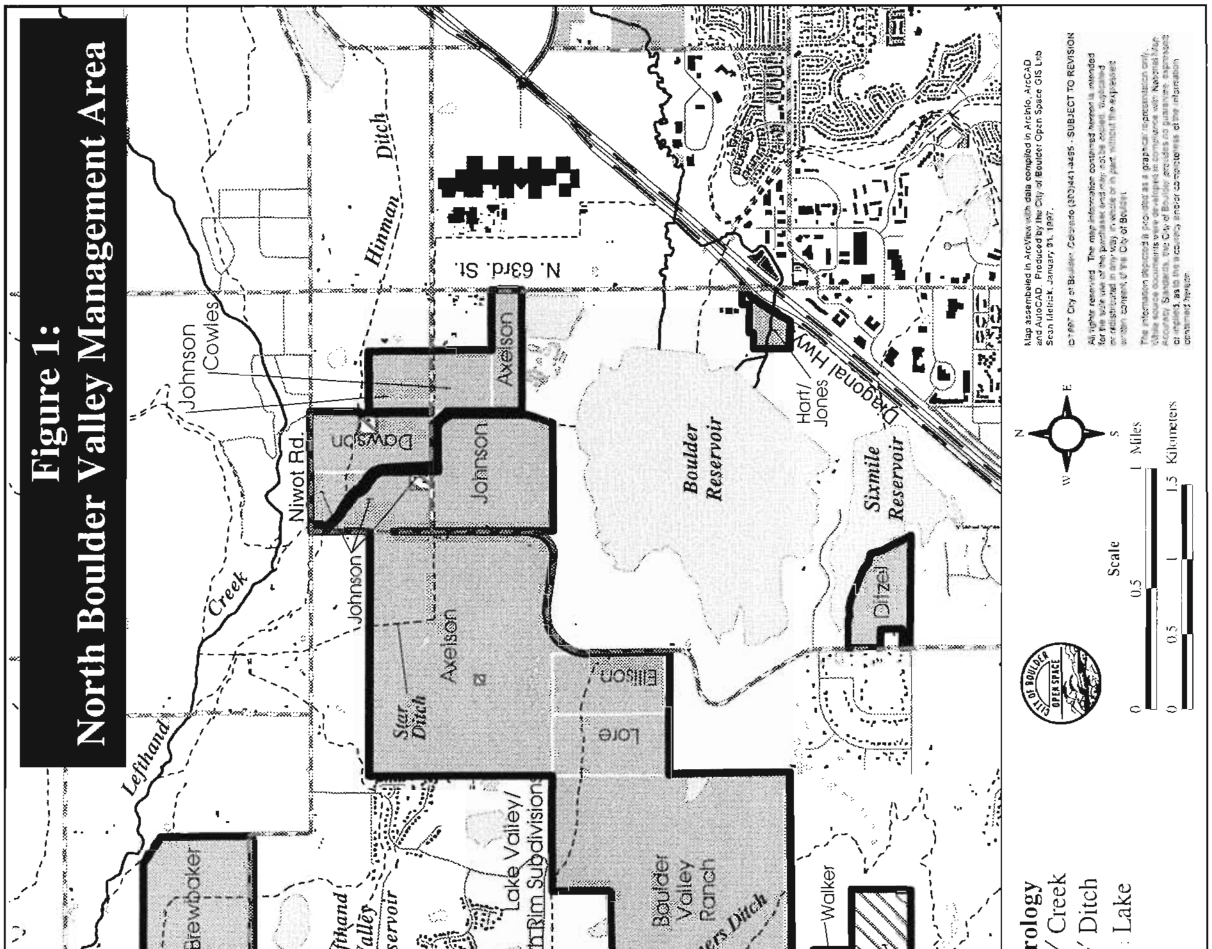
Figure 1:
North Boulder Valley Management Area
North Boulder Valley Management Area
City of Boulder Open Space
Open Space
Conservation Easement / Restricted Access
Roads
Arterial
Highway
Street
1993 Buildings
Hydrology
Creek
Ditch
Lake
Scale
Miles
Kilometers
Joder Arabian Ranch
Joder
Beech
Neichlen
Schneider
Gilbert
Parsons
Mann
Private Mann Prop.
US Hwy. 36
Olde Stage Rd.
Fourmile Creek
Nebo Rd.
Six Mile Fold
Neva Rd.
Beech Groundwater Contamination Site
Boulder Land, Irrigation and Power
Mesa Reservoir
Silver Lake Ditch
Degge/ Schneider
Loukonen Brothers
Boulder Warehouse
Walker
Brewbaker
Lefthand Creek
Lefthand Valley Reservoir
Lake Valley/ North Rim Subdivision
Boulder Valley Ranch
Farmers Ditch
Lore
Ellison
Axelson
Star Ditch
Johnson
Dawson
Niwot Rd.
Johnson (Cowles)
N. 63rd. St.
Hinman Ditch
Boulder Reservoir
Sixmile Reservoir
Ditzel
Hart/ Jones
Diagonal Hwy.

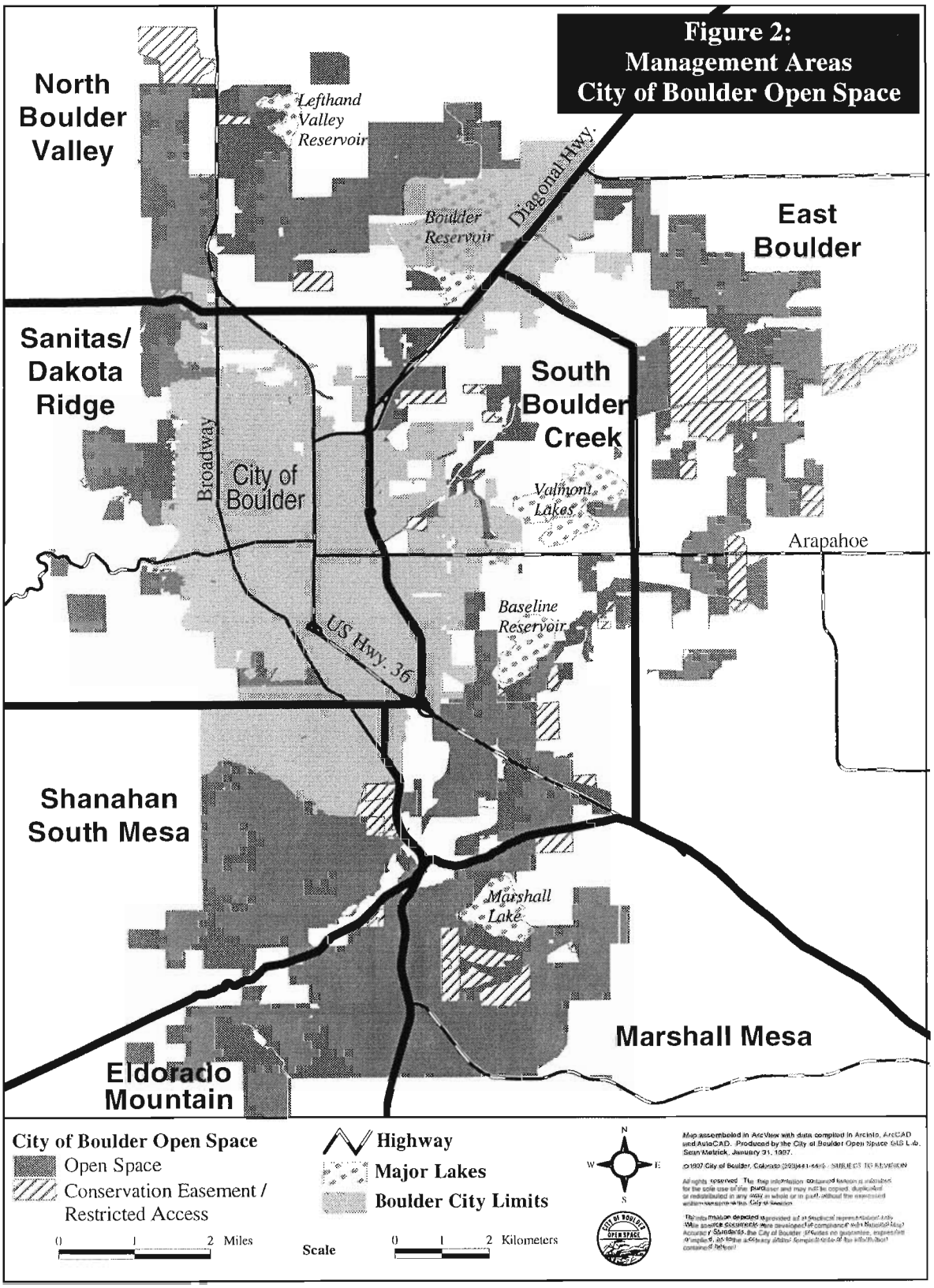
Figure 2:
Management Areas
City of Boulder Open Space
North Boulder Valley
Lefthand Valley Reservoir
Diagonal Hwy.
Boulder Reservoir
East Boulder
Sanitas/ Dakota Ridge
Broadway
City of Boulder
South Boulder Creek
Valmont Lakes
Arapahoe
Baseline Reservoir
US Hwy. 36
Shanahan South Mesa
Marshall Lake
Marshall Mesa
Eldorado Mountain
City of Boulder Open Space
Open Space
Conservation Easement / Restricted Access
Highway
Major Lakes
Boulder City Limits
0 1 2 Miles
Scale
0 1 2 Kilometers
N
W
E
S
Map assembled in ArcView with data compiled in Arcinfo, ArcCAD and AutoCAD. Produced by the City of Boulder Open Space GIS Lab. Sean Metrick, January 31, 1997.
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CITY OF BOULDER OPEN SPACE

Boulder Valley. Rare plants, such as Bell's twinpod (*Physaria bellii*), occur on the shale outcrops along the mesas. North Boulder Valley and the adjacent Boulder Reservoir support extensive wetlands, including sedge meadows, cattail marshes, and lake shorelines.

These diverse plant communities support a wide variety of mammals, birds, reptiles, amphibians, fish, and invertebrates. Extensive prairie dog colonies provide a prey base and habitat for raptors, including historic occurrences of burrowing owls. Wintering and migrating bald eagles use perch sites in the area. Mule deer and mountain lions are common in the ponderosa pine woodlands and shrublands of the higher elevations.

Agriculture is the predominant land use east of U.S. Highway 36/State Highway 7 (U.S. 36) and helps to maintain the rural character of the Boulder Valley. Agricultural practices include cattle grazing, horse boarding, and harvesting of irrigated crops (forage and grains).

Portions of the North Boulder Valley Management Area are also very popular with a wide variety of visitors. Common activities include jogging, bicycling, exercising pets, hiking, horseback riding, photography, and wildlife viewing. Unusual geologic formations can be observed and studied within the area and on the adjacent Six-Mile Fold Natural Area managed by Boulder County.

The North Boulder Valley Inventory Report (City of Boulder 1996c) contains detailed information on resources and land uses; accompanied by extensive resource maps. The Inventory Report is designed as a reference and is the data source for the North Boulder Valley Area Management Plan.

1.4 AREA MANAGEMENT PLANNING PROCESS

An interdisciplinary team of Open Space staff was formed to develop this Management Plan for the Open Space lands in North Boulder Valley. The purpose of the interdisciplinary team was to integrate the various skills and expertise within the Open Space Program into a common problem-solving effort. The team was responsible for undertaking the planning process to meet the goals of the North Boulder Valley Management Area. The steps in the management planning process are:

1. Identify issues and concerns;
2. Conduct a resource inventory and complete an inventory report;
3. Develop general management direction;
4. Draft plan with proposed management objectives and actions;
5. Adopt and implement plan; and
6. Monitor and revise the selected plan

The first step in the planning process began in the spring of 1995. The interdisciplinary team defined the Management Area and drafted the initial issues and concerns to be addressed in the Plan. The draft issues and concerns were reviewed at a public open house held June 14, 1995. New issues from the open house were incorporated and the team began developing a resource inventory report to provide the information needed to resolve these issues.

The North Boulder Valley Inventory Report was completed May 30, 1996 and reviewed at a public open house held June 12, 1996. After the open house, the results of the Inventory Report were presented to the Open Space Board of Trustees.

Public field trips were held July 25 and 27, 1996 to review and seek input on significant issues within North Boulder Valley. A study session with the Open Space Board of Trustees and a public field trip were held on August 14, 1996 to review information from the previous public meetings and refine the general management direction for the area. The draft general management direction was presented to the Open Space Board of Trustees on August 28, 1996. At a November 19, 1996 public meeting, members of the public and Open Space staff met to further discuss recreational opportunities in the North Boulder Valley, particularly trail alternatives west of U.S. 36. Input from this meeting was reviewed by the Open Space Board of Trustees on December 11, 1996, and a general management direction was approved.

A draft North Boulder Valley Area Management Plan was reviewed at an open house and presentation to the Open Space Board of Trustees on February 26, 1997. Input from those sessions was incorporated into this Management Plan. The North Boulder Valley Area Management Plan was presented to the Open Space Board of Trustees for its review and approved on April 9, 1997.

Comments from all previous public meetings have been reviewed and incorporated into the recommendations in this Management Plan for North Boulder Valley. Each open house and public meeting was announced in local newspapers and posted on information boards throughout the Management Area, and notices were mailed to interested individuals.

Open Space staff will develop implementation strategies and integrate the approved management actions into annual work programs and capital improvement projects. Annual work programs and capital improvement projects are reviewed and approved by City Council, through the City's budget process. The Plan will be monitored and evaluated on an annual basis.

1.5 PLAN GUIDANCE

The "planning context" chapter in the North Boulder Valley Inventory Report outlines the basis for the policies and direction of the Open Space Program in the Boulder Valley. Area management plans translate the general direction contained in the Open Space Long Range Management Policies (City of Boulder 1995), City of Boulder Charter, Boulder Valley

Comprehensive Plan (City of Boulder 1990), and Boulder County Comprehensive Plan (Boulder County Land Use Staff 1986) into specific management actions on the ground.

In the North Boulder Valley, direction for decision-making is provided in four guidance documents:

Boulder County Comprehensive Plan -- Environmental Conservation Areas: are "large and relatively undeveloped areas of the County that possess a high degree of naturalness, contain high quality or unique landscape features and/or have significant restoration potential. Size, quality, and geographic location make them important tools for combating the affects [sic] of habitat fragmentation" (Boulder County Land Use Staff 1986). Environmental Conservation Area #11 covers the Boulder Valley Ranch/Beech Open Space in North Boulder Valley.

Boulder Valley Comprehensive Plan -- Boulder Valley Natural Ecosystems: are places that support natural ecosystems or native plants and animals that possess important ecological, biological, or geological values. Most of the North Boulder Valley Area is designated as "natural ecosystems" on the Boulder Valley Natural Ecosystems Map.

Black-tailed Prairie Dog Habitat Conservation Plan -- prairie dog Habitat Conservation Areas: "will be managed so that prairie dogs may undergo processes of expansion and decline and cause natural shifts in vegetation dominance and animal use.... Prairie dogs will exist essentially undisturbed in a habitat conservation area insofar as it is legally and reasonably possible. Such an area may be used for other purposes including education and research" (City of Boulder 1996b). A large portion of the Management Area is habitat conservation areas.

Long Range Management Policies -- managing competing purposes: "Some proposals regarding management of Open Space properties may include consideration of competing purposes. The Charter does not specify the relative priorities of the purposes. Weighing of potential benefits and impacts of proposed management actions will include consideration of long-term viability and health of natural resources" (City of Boulder 1995). Coordination and cooperation with private landowners and other land management agencies to meet mutual resource management goals will include City of Boulder Mountain Parks, City of Boulder Public Works, Boulder County Parks and Open Space, Colorado Division of Wildlife, and Colorado State Forest Service.

1.6 MANAGEMENT THEMES

Three principal management themes frame the North Boulder Valley Area Management Plan: (1) protecting the land and the place, (2) keeping agriculture in a changing rural setting, and (3) recreating experiences on a landscape of remnants. Protecting the land comes first. Without the land there is no community and no place.

1.6.1 The Land and The Place

At first, only the great herds of bison, elk, and antelope were here, following the retreat of the glaciers 20,000 years ago. The rolling, dissected lands of the North Boulder Valley harbored humans after that. Wandering groups followed the migratory herds -- prey and predator. We know this from the evidence of their camps and the leavings from their hunting and gathering. They were a part of this place. A place where the expansive grasslands of the Great Plains finally run out of space against the wall of the Front Range. The abundance of different plants and animals at this natural crossroads supported the first migrating people that wintered here.

Migrating Europeans came later. One hundred forty years ago, immigrant settlers divided the land into small farms and ranches. Roads and ditches appeared on the land; linear tracks crisscrossing the land, but influenced by it. Agrarian communities developed, connected to the mining camps to the west. Gold and silver were mined, prairies were plowed, and cattle grazed what was left of the grasslands in the name of destiny. More lines appeared on the land; mostly bottom lines found in ledger books -- more roads, more fences, more transmission lines, more railroads. As small crossroads in the North Boulder Valley turned into towns, and towns into cities, the lines on the land became straighter and wider; linear rushes to somewhere. Few places in the North Boulder Valley remained unaltered.

The homogenization of Western landscapes has left only remnants of the original landscape; leftover artifacts of times before. These remnants retain the essence of a place -- a definition in a sea of sameness. North Boulder Valley is a congregation of remnants. Its special places are the woody draws and ephemeral streams, the native prairies with seasonal flushes of wildflowers -- some rare and threatened with further loss of the places they need to live -- and the hunting grounds for birds of prey soaring wild but hardly free as their nesting and feeding areas disappear; they are bound, like us, to what is left.

The North Boulder Valley Area Management Plan is a guide, accompanied by a toolbox, for maintaining what is special about this place. Resource management will be coordinated to protect the special and unique, recognizing that perhaps what may appear most common and least unique may be the most special. North Boulder Valley has changed dramatically. For years a forgotten "back 40," North Boulder Valley has transformed into a recreation mecca and attractive building location, accommodating a burgeoning population in Boulder County.

The 4,500 acres of Open Space in North Boulder Valley can no longer be "left alone." Natural resource protection and land preservation for land areas in the midst of urban development require intensive management. Maintaining the sense of this place requires management direction and balance. The western half of the North Boulder Valley has a management focus on maintaining natural processes and functions to support and preserve native ecosystems. Management of the eastern half of North Boulder Valley is characterized by agricultural and recreational uses.

1.6.2 Protecting the Natural Community

The most important purpose of the North Boulder Valley Area Management Plan is to provide the framework to protect the land, for its human and natural communities, by maintaining the ecological health and agricultural productivity of the place. The management focus is on natural communities, comprised of native ecosystems populated with native plants and animals. A primary effort targets the maintenance of plant and wildlife habitats to sustain populations and numbers of individuals. Management of Open Space in North Boulder Valley will attempt to minimize or eliminate human impacts on habitats or places where plants and animals live and to restore some plant and animal habitats and populations where possible.

Ridding the North Boulder Valley of non-native species, noxious weeds in particular, is a key component of the management focus on protecting the land. Non-native noxious weeds have colonized and transformed hundreds of acres of native grasslands into single species monocultures. Diffuse knapweed, Canada thistle, cheatgrass, and Mediterranean sage are migrants that have found favorable living conditions in the area. Eroded and disturbed areas create competitive advantages for non-native species, displacing more desirable native plants and animals. Native species "hang on" in various places where they can but are replaced quickly and lost as weeds invade.

Farming and ranching historically created the conditions supporting these invasions of non-native species. A major goal of managing agricultural operations in North Boulder Valley will be to reduce opportunities for the establishment and spread of non-native plants. Agricultural operations will be carefully monitored to determine the "condition" of the land. Livestock grazing will be used prescriptively to reduce the competitive advantage of non-native species. Given the history of grazing in the North Boulder Valley, this agricultural focus begins a circling back to when grazers were historically a part of the natural functions and processes of native grasslands.

Ground water, perennial and ephemeral streams, ponds and reservoirs, and the seasonal delivery of irrigation water combine to support a varied, biologically rich landscape. Wetlands in North Boulder Valley are supported by every type of natural and artificial water conveyance and storage vessel. In a semiarid climate, wetlands become one of the most important parts of the landscape mosaic. Careful management and monitoring of agricultural operations will serve to protect and preserve wetlands and water quality in North Boulder Valley by reducing and minimizing the effects of invading weeds, grazing, pesticides, and irrigation.

Large concentrations of raptors, or birds of prey, commonly occur in North Boulder Valley. Although numbers and species vary with seasonal migrations and nesting localities, raptors are dependent upon the association and proximity of the variety of natural habitats found in the North Boulder Valley. The combination of shortgrass, midgrass, and tallgrass prairies, woody draws, shrublands, wetlands, forests, and ponds provide prime conditions to support a wide

variety of birds and mammals. Relatively extensive prairie dog colonies or towns serve as a main prey base for many raptors and create habitats for other birds and mammals through their excavating and burrowing.

Biological rarity and uniqueness occur as well in North Boulder Valley. Several rare plants, the best known being Bell's twinpod found on highly erodible barren outcrops of Niobrara shale, live in North Boulder Valley. Large mammalian predators like the mountain lion roam the rougher terrain of more isolated areas. Monitoring and protecting occurrences of rare plants and animals in North Boulder Valley are major management emphases. Keeping a full complement of natural communities and their inhabitants includes protecting rare and unique species as important parts of these communities.

1.6.3 Keeping Agriculture in a Changing Rural Setting

Except for the 4,500 acres of Open Space, much of the "rural" has disappeared in the North Boulder Valley. Most of North Boulder Valley was grazed continually by domestic livestock for more than seventy-five years. Row crops and alfalfa and grass hay have been planted on some of the land in the Management Area for almost as long. Suburban enclaves now cover and have transformed parts of North Boulder Valley. The resulting loss of agricultural land presents a management dilemma -- how to maintain viable agricultural operations when the regional infrastructure supporting agriculture disappears.

Open Space agricultural operations in North Boulder Valley combine traditional ranching and crop production. Boulder Valley Ranch has a horse boarding facility. Agricultural lands in the North Boulder Valley are leased to local operators under annual operating agreements with the City of Boulder. Agricultural lessees are responsible for much of the agricultural operations, including the handling and use of Open Space water rights.

The changing landscape setting in North Boulder Valley has dictated changes in agricultural operations. Some agricultural operations will help accomplish other management goals. Livestock grazing earlier this century created conditions encouraging major weed infestations. Now, grazing will be used to help control non-native weeds. Integrated Pest Management will focus on reducing the need for pesticide applications by controlling undesirable non-native plants and crop insect "pests" with biological controls, hand removal, and targeted pesticide controls. Grazing of boarded horses will be removed from fragile grasslands. Some areas will not be grazed. Increased use of prescribed fire and other natural processes will occur in specific areas to accomplish management goals.

The greatest change for agriculture has been the numbers of people recreating in North Boulder Valley. People recreating on an operating ranch can lead to conflicts for certain uses during certain times of the year. Recreational uses will be managed to minimize impacts on agricultural operations (e.g., dog and livestock encounters). An educational focus on understanding the need

to maintain viable agriculture in North Boulder Valley will change management challenges into opportunities.

1.6.4 Recreating Experiences on a Remnant Landscape

More people are recreating in North Boulder Valley. Passive recreation activities range from hiking and horseback riding to dog walking, mountain bike riding, and running. Visitors need ways to get onto Open Space; places to go when they get there; and guidance, information, and basic amenities for a safe and enjoyable experience. Development of recreational facilities (such as trails and trailheads) can follow demand for recreational opportunities. Anticipating expanding demand, guiding where visitors go, and what they do is appropriate in some areas of Open Space. Management in North Boulder Valley combines these two approaches of providing for current and future recreational needs.

Management of passive recreation in the North Boulder Valley focuses on the quality of the recreational experience while ensuring the protection of the land and natural communities. New trails and trailheads will be designed to accommodate various uses and visitation levels and will be located at "edges" of developed areas, where impacts on natural communities and agricultural operations are less severe. Visitor information will emphasize themes of "being light on the land," "knowing your environment," and "how to have fun." Certain seasons or times of the year may require special rules for visitors in order to protect the land and natural communities which make North Boulder Valley a special place. Some recreational uses may have to be adjusted or limited at times or in certain places.

North Boulder Valley has always been on the way to somewhere -- a place to pass through, a gateway to the mountains, a jumping-off point for the mining camps, an off-road trail to Boulder Reservoir. Today, visitors will be encouraged to stop and take their time to appreciate the special place that is North Boulder Valley. Connections and cooperation remain as important now as they were historically to ensure that the land and the place endure.

1.6.5 Summary

These are the major management themes of the North Boulder Valley Area Management Plan. Monitoring outcomes of the recommended management actions will result in adjustments through the use of a dynamic management approach. Success will be measured by the long-term health and functional integrity of the land.

The following sections of this Plan have been arranged by individual resource for organizational purposes. However, it is important to note that all resources are interconnected and interdependent. Each section has been reviewed by the interdisciplinary team to integrate the various resource goals, objectives, and recommended management actions. In many cases,

individual resource objectives and management actions are so closely related that some repetition occurs between sections.

The implementation section describes overall plan priorities, with management actions prioritized into tiers. The tiers will be used to determine annual work programs and will incorporate the management needs of North Boulder Valley with those of the rest of the Open Space system.

2. GEOLOGIC/PALEONTOLOGIC RESOURCES

2.1 BACKGROUND

The extent and significance of the geologic/paleontologic resources within the Management Area are fairly well known. Six-Mile Fold is known for its geologic/paleontologic resources and other important sites have been located within North Boulder Valley. Many of these resources are considered irreplaceable. A comprehensive inventory of these geologic and paleontologic resources should be conducted and suitable sites identified and interpreted. Visitor use should be discouraged or restricted in sensitive areas. Every effort will be made to preserve and protect significant geologic and paleontologic resources whenever possible and reasonable. Interpreting, protecting, and preserving significant and fragile geologic and paleontologic resources are major management challenges.

2.2 GOAL STATEMENT

The following broad goal statement was developed to guide geologic and paleontologic resource management for North Boulder Valley:

Preserve and interpret the geologic and paleontologic resources of the area.

2.3 OBJECTIVES

The Open Space Program has set the following objectives in order to meet the geologic and paleontologic resource management goal. The objectives are:

- Identify, document, and evaluate significant geologic and paleontologic resources within the North Boulder Valley;
- Protect and preserve significant geologic and paleontologic resources within the Management Area; and
- Interpret sites and educate visitors to understand and appreciate geologic and paleontologic resources.

2.4 MANAGEMENT RECOMMENDATIONS

2.4.1 Objective #1: Identify, document, and evaluate significant geologic and paleontologic resource sites within the North Boulder Valley.

Recommended Management Actions

- Prepare a map of the area locating geologic and paleontologic features of educational significance; known sites of rare or unique rock, mineral, or fossil occurrences; and potential locations of illegal "casual collecting" of rock, mineral, and fossil specimens. The base map on which the various sites are located should be a geologic map because geologic specimens found in one site within a formation are often found at other sites in the same formation. This map will be used by Open Space to aid in the protection and management of these resources (e.g., patrol and monitoring).
- Inventory significant paleontologic resources in the area. Significant fossils, for the purpose of this Management Plan, include vertebrate fossils and any invertebrate fossils that are commonly collected without permits.

2.4.2 Objective #2: Protect and preserve significant geologic and paleontologic resources within the project area.

Protecting and preserving geologic and paleontologic resources present unique challenges. Generally, only vertebrate fossils may be protected under the authority of various federal and state laws. On City of Boulder Open Space lands, all geologic and paleontologic resources are protected from collection. Special management actions may be required to protect geologic and paleontologic resources on Open Space lands and should be considered on a case-by-case basis. These measures will vary with individual situations, but may include: (1) physical protection such as fences, grills, barriers, and other structures; (2) increased patrol of properties which are especially vulnerable to vandalism or other damage; (3) use of signs, where they will not attract attention to otherwise inconspicuous sites; (4) development of measures which consider geologic and paleontologic resource management in other resource management and development programs; (5) avoiding publicity about resources susceptible to vandalism; anonymity of sites, where necessary for their preservation, should be maintained by careful review of any requests from the public for locational information; (6) gaining public understanding and support through education and interpretation efforts; (7) closing of sites or areas; and (8) selected removal and preservation of rare or unique geologic and paleontologic specimens that are fragile or susceptible to erosion, vandalism, or theft. Records will be made of the nature and location of geologic and paleontologic resources as outlined under Objective #1. Once the decision to recover geologic and paleontologic resources has been made, all materials collected will be stored and maintained in an authorized repository except when being used for display, research, evaluation, or other educational purposes, as approved by the Open Space Program.

Recommended Management Actions

- Interpret suitable sites (see Objective #3).
- Discourage public access in areas susceptible to damage and vandalism.
- Notify Open Space staff of known geologic and paleontologic resource sites and potential locations of illegal "casual collecting" sites, and patrol these areas on a routine basis.
- Train Open Space staff to identify potential geologic and paleontologic resources in the field.

2.4.3 Objective #3: Interpret sites and educate visitors to understand and appreciate geologic and paleontologic resources.

Gaining public understanding and support through education and interpretation is one of the most effective ways to protect geologic and paleontologic resources. Suitable geologic and paleontologic resource sites should be identified and interpreted (e.g., Six-Mile Fold, Dakota hogback), while visitor use should be discouraged or restricted in sensitive areas. Suitable geologic and paleontologic resource sites for education are generally sites which are well known and that are not susceptible to vandalism. Interpretive signs should only be used where they will not attract attention to an otherwise inconspicuous site.

Recommended Management Actions

- Interpret suitable sites. Geologic and paleontologic resource interpretive themes should focus on geologic processes such as the formation of the Rocky Mountains and their relationships to the history of the area (mining and extractive uses).
- Interpret the Dakota hogback as the geographic boundary between the high plains and the Rocky Mountains. A discussion on the creation of the Rocky Mountains could be developed for this area.
- Discourage access in areas susceptible to damage and vandalism (e.g., erodible shale areas, rare vertebrate fossils).

3. VEGETATION

3.1 BACKGROUND

Native plants provide the basic structure and energy base for natural communities. Plant species diversity supports wildlife diversity by providing shelter, food, and nutrient cycling. Plant roots anchor soil and slow erosion, and provide food for extensive underground communities of small organisms that cycle minerals and allow the soil to support plants. Healthy native plant communities can serve as reference points for the restoration of degraded communities on similar sites. Diverse, colorful, and intriguing plant communities provide high quality visitor experiences. The native ecosystems in North Boulder Valley are part of a rich natural heritage that can be passed on to future generations through good land stewardship.

Native vegetation in the North Boulder Valley Management Area consists of short/midgrass prairie, mid/tall grass prairie, foothills ecotonal grassland, riparian woodland, plains and foothills shrub land, ponderosa pine savannah, and ponderosa pine woodland. Wetland vegetation is discussed in another section of this Plan. Some of the major influences affecting plant community character and condition are natural disturbances, soil types, topography, hydrology, wildlife interactions, invasion by non-native plant species, land use, and land management. Many of today's vegetation management challenges in the North Boulder Valley stem from past land use including livestock grazing, fire suppression, and the intentional or accidental introduction of non-native plant species.

North Boulder Valley has features that are different from other local foothills areas including outcrops of Niobrara and Pierre shale and sparsely forested slopes along the foothills ecotone. The shale outcrops support plant species uncommon to the Front Range of the Rocky Mountains, including Bell's twinpod (*Physaria bellii*), listed as globally rare by the Colorado Natural Heritage Program. Other species and communities of special concern are found generally in the western half of the Management Area and include New Mexico feather grass (*Hesperostipa neomexicana*) and needle and thread grass (*Hesperostipa* sp.) communities (mixed grass prairie), big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*) associations (xeric tallgrass prairie), ponderosa pine (*Pinus ponderosa*) savannah with big bluestem (*Andropogon gerardii*) and mountain mahogany (*Cercocarpus montanus*), ponderosa pine savannah with spike fescue (*Leucopoa kingii*), blue grama (*Chondrosum gracile*) and buffalo grass (*Buchloe dactyloides*) communities (shortgrass prairie), and prairie (birdfoot) violet (*Viola pedatifida*). Alkali wetlands in the Management Area are among the most rare plant communities in the Boulder Valley (see Wetlands section).

Priorities for native vegetation management in the Management Area are to preserve biological diversity and to allow and encourage natural processes and simulated natural processes to function and to improve plant community condition through integrated weed management, coordinated resource management, and restoration activities. Native plant conservation and

management strategies have been developed by considering the landscape context of Boulder Valley and the Colorado Front Range. The coordination of land stewardship planning with surrounding landowners and public land managing agencies is an important component of the program.

3.2 GOAL STATEMENT

Preserve and maintain native plant communities, protect rare species and communities, and restore native vegetation in suitable areas.

Major assumptions:

- Static or unchanging vegetation composition cannot be expected or managed because plant communities are dynamic in terms of spatial distribution and species composition over time.
- The preservation of native plant communities is dependent on the preservation and management of natural processes (e.g., hydrologic regime, fire, wildlife activity) that support native plant species and the protection of these communities from highly competitive non-native species.

3.3 OBJECTIVES

- Integrate vegetation management in North Boulder Valley with other resource goals and policies;
- Protect native plant community health using or simulating natural processes where possible;
- Prevent new infestations and manage existing infestations of priority non-native species of concern. Use the Integrated Pest Management planning process to develop prevention and control strategies for target species;
- Protect and maintain rare species and communities of special concern;
- Restore, reclaim, and enhance native vegetation in areas with restoration potential and/or reclamation needs. Use native plant species in the reclamation of areas impacted by development, land use, exotic plant control, and other ground disturbances;
- Inventory and monitor native vegetation to evaluate potential negative impacts of land management and to measure the effectiveness of vegetation management techniques; and
- Encourage public understanding of the ecology and conservation of native plants using educational materials and programs and by providing opportunities for volunteer involvement in resource management activities.

3.4 MANAGEMENT RECOMMENDATIONS

3.4.1 Objective #1: Integrate vegetation management in North Boulder Valley with other resource goals and policies.

The protection and management of plant communities in North Boulder Valley is guided by Open Space policy and intra- and interagency natural resource planning. Major themes for coordinated resource planning and management are native community restoration, wildlife habitat enhancement, Integrated Pest Management, water quality maintenance, fire management, and trails planning. The Open Space Department has adopted a coordinated resource management model to more effectively integrate natural resource planning and management.

Typical coordinated resource management programs strive to enhance communication and cooperation among agencies, staff members, and other stakeholders (public and private). The Open Space Department coordinated resource management model is designed to facilitate implementation of resource projects by interdisciplinary teams. Through the use of coordinated resource management, all major actions are discussed by the appropriate stakeholders, and decisions are made by the consensus of a staff coordinated resource group. Open Space Resource Specialists, serving as Coordinated Resource Managers, are responsible for integrating and documenting activities within a coordinated resource management area. A Coordinated Resource Manager functions as the principle contact for staff communication and public inquiry related to resource management activities. The Open Space system is divided into three coordinated resource management areas which are superimposed on smaller management areas. The North Boulder Valley Management Area represents a significant portion of the northern coordinated resource management area.

Management actions have been formulated to promote intra- and interagency coordinated management.

Recommended Management Actions

- Integrate vegetation management in North Boulder Valley with the Open Space Long Range Management Policies, Black-tailed Prairie Dog Habitat Conservation Plan, Open Space area management plans and other resource management plans (e.g., Forest Ecosystem Plan [in progress]).
- Implement vegetation management through the Open Space coordinated resource management model.
- Participate in City-wide and interagency fire planning and integrate North Boulder Valley fire management objectives and recommendations with interagency planning.
- Participate in interagency Integrated Pest Management planning and management.
- Develop a system-wide Open Space Integrated Pest Management plan to guide and integrate Integrated Pest Management activities.

- Coordinate resource management planning with neighboring public land management entities and other stakeholders. Major groups include City of Boulder Mountain Parks, City of Boulder Water Quality/Environmental Services group, City of Boulder Fire Department, interagency wildfire suppression team, Boulder County weed management, Colorado Department of Transportation, agricultural lessees, and home owner associations.

3.4.2 Objective #2: Protect native plant community health using or simulating natural processes where possible.

The preservation of native plant communities and natural processes in the North Boulder Valley involves ongoing active management. A coordinated resource management model is used by the Open Space Program to integrate the management of multiple resources and land uses. Long-term vegetation management in the North Boulder Valley Management Area will be based on the coordinated resource management model and an adaptive management strategy. Major components of the adaptive approach include:

- Collection of baseline information (i.e., inventories and mapping);
- Assessment of the condition of major community types and sensitive species/communities;
- Integration of baseline information and assessment results into resource management planning;
- Scheduled monitoring of condition, management treatment effects, and rare plant population status; and
- Analysis of monitoring data and formulation of adjusted management recommendations based on the results.

Native plant and animal communities are adapted to natural disturbances such as fire and ungulate grazing. The condition of native communities generally declines in terms of diversity, reproductive output, and overall vigor if important natural processes are interrupted or prevented from occurring. In the absence of fire, woodlands may encroach upon grasslands and grassland species may become less competitive in the face of weed invasions. When disturbances like fire and ungulate grazing are removed from the native grassland ecosystem, the resulting build-up of dried plant material can impede the flow of important essential minerals and increase the potential for a large uncontrollable wildfire to occur.

The grasslands of North Boulder Valley represent some of the largest remnant patches of mixed grass, shortgrass, and foothills grassland in the Boulder Valley area. Numerous natural processes continue to maintain and contribute to the dynamic nature of these grasslands. Prescribed fire and livestock grazing are tools available to resource managers for simulating natural processes that have been suppressed or otherwise altered over the last 150 years or more.

FIRE

Fires are a natural ecosystem process as evidenced by the abundance of fire-adapted native plants in the grassland and grassland-forest ecotone. Natural fires burned historically every three to ten years in grasslands and every seven to thirty years in ponderosa pine forests (Veblen 1996). Fires help to maintain the health and composition of plant communities while reducing the build-up of dried plant material. Fires shift the competitive advantage to native plant species relatively unaffected by fire and typically disadvantage non-native species.

Three types of fire are pertinent to fire management in North Boulder Valley. Prescribed fire is a controlled application of fire and is an important resource management tool. Prescribed natural fire applies prescriptive conditions to some wildfires. Prescribed natural fire is an infrequently-used type of fire management in the Boulder Valley. A third fire type, wildfire, is unplanned and is caused by natural conditions (e.g., a lightening strike) or human carelessness (e.g., a cigarette dropped beside the road). Wildfire management is addressed in the form of an interim wildfire management plan in Appendix 3.1.

North Boulder Valley has been divided into three fire planning and management zones based on the following: topographic features that affect fire behavior, sensitive resources, and resource management activities that vary across the landscape. Zones are characterized in terms of vegetation, terrain, and land use management. The information compiled for each zone is designed to assist in the development of prescribed burn plans, the formulation of wildland fire suppression strategy, and the implementation of Best Management Practices for resource protection. Appendix 3.2 contains a description and map of the conceptual fire planning and management zones.

Implemention of the fire management program within the North Boulder Valley Management Area will consider the following factors:

- Weather
- Air quality conditions/status
- Site conditions addressed by Best Management Practices (Appendix 3.1; e.g., wet and muddy conditions)
- Proximity to urban interface
- Hazardous materials
- Resource management conflicts (e.g., grazing rotations, weed control treatments, sensitive wildlife habitat, rare plant habitat)
- Species biology (i.e., timing in terms of plant growth stages and animal life cycles)
- Fire ecology of a particular plant community

Prescribed Fire

Prescribed fire is the controlled application of fire to vegetation, according to strict guidelines, to achieve specific land management goals. In some instances, it is the preferred means of

managing certain resources. Under environmental conditions specified in a prescribed burn plan, fire can be confined to a predetermined area and can accomplish specific resource management objectives. Appendix 3.3 outlines the contents of a prescribed burn plan.

In the North Boulder Valley Management Area, prescribed fire will be used as a training and cooperative exercise and a means of implementing vegetation management objectives. The City, other local land management agencies, and fire protection districts coordinate annually to conduct prescribed fires on City property. Prescribed fire projects can include training exercises, spring ditch burning operations, and natural resource management burns.

Open Space policies state that the Open Space Board of Trustees recommends prescribed fires, and the City of Boulder Wildland Fire Coordinator directs the implementation of written, approved prescriptions (City of Boulder 1995).

Recommended Management Actions for Prescribed Fire

Restore and manage fire as a natural or simulated natural process in grassland, wetland, shrub land, savannah, and woodland communities (see Wetlands section).

- Burn ungrazed native grasslands, where possible, with a burn frequency that prevents excessive build-up of dead plant material (thatch) and maintains the vigor of desired components of the plant community. Grassland types include shortgrass, mixed grass, and foothills mixed grassland. The actual burn frequency may vary due to weather conditions, prioritization of prescription burning across the Open Space system, the potential for biological invasion (weeds), and the coordination of multiple resource management activities. Spring, fall, or winter burns are preferable to summer burns due to wildfire danger, nesting birds, the timing of weed control burns, and other resource management issues. Air quality restrictions apply to most winter burning. Grassland areas that have remained ungrazed for three years or more (as of the Plan publishing date) are in fire planning and management Zone 1 on the west side of U.S. 36.
- Coordinate prescribed burning and prescribed grazing regimes in native grasslands and hayfields to allow the development of sufficient pre-burn fuel loading and to allow one or more growing seasons of rest before resumption of grazing.
- Use results of pre-burn and post-burn monitoring of plant community condition to determine ongoing grazing and burning regimes. Develop fire effects monitoring plans for priority areas: East Beech grasslands, diffuse knapweed infestations, and shale community sites.
- Burn savannah and woodland communities, when possible, with an approximate burn interval of eight to fifteen years or longer (Goldblum and Veblen 1992). The actual burn frequency may vary due to factors listed for grassland types. Burn recommendations should be based on monitoring results. Savannah and woodland types occur in Zone 1.
- Develop burn plans in coordination with area and system-wide resource management programs, following the burn plan guidelines. Consider sensitive plant species phenology, fire ecology, and the amount of habitat impacted by a fire. The zone descriptions highlight sensitive resources.

- Determine specific considerations and constraints associated with the various established zones. Document considerations and constraints in map form as applicable.
- Encourage research on fire effects on native communities (e.g., shrublands, shale communities).

Enhance wildlife habitat.
- Use prescribed fire to enhance wildlife habitat by maintaining plant species diversity and structural diversity in vegetation. Design burn prescriptions to produce specific effects such as mosaic patterns and to minimize negative impacts to uncommon or rare habitat types.
- Encourage research on fire effects as they relate to wildlife and wildlife habitat.
- Consider potential impacts to sensitive wildlife, including the effects of burning on life cycle stage, seasonal activity, and habitat size and condition.

Control exotic plant species of concern.
- Use prescribed fire as a management tool for controlling exotic species of concern. Fire is used presently to control Canada thistle and weedy species that invade irrigation ditch banks and the margins of cropped fields. Burn selected Canada thistle infestations annually or semi-annually until desired level of control is achieved. Consider use of prescribed fire for cheat grass control. Burn diffuse knapweed "tumbleweed" collections along fence lines. More information is needed before fire can be considered a reliable tool for controlling diffuse knapweed, Mediterranean sage, and Russian olive (see Appendix 3.4 for species specific recommendations and guidelines for burning).
- Encourage research to determine the effects of fire on native communities, sensitive species and communities, and exotic species of concern.

Maintain irrigation ditch function and efficiency.
- Use prescribed fire to maintain the function of irrigation systems. Burn irrigation ditches annually or semi-annually as dictated by weather, the prioritization of ditch-burning projects, and resource limitations (staff time and funding).

Reduce the risk of catastrophic fire by reducing fuel loading.
- Identify potential mitigation projects through the Wildland Fire Hazard Mitigation Project.
- Introduce prescribed fire and other mitigation techniques where appropriate.

Develop educational programing that promotes the use of fire as a beneficial means of vegetation management and a technique for fire risk mitigation within the scope of this planning unit.
- See Education and Outreach section.

Integrate prescribed burn planning for the North Boulder Valley Management Area with system-wide Open Space fire management planning. This would include interagency burn planning within Boulder County.

- Participate in interagency coordination and cooperation in fire management planning and implementation.
- Formalize annual prescribed burn planning in the form of an Open Space prescribed fire manual and a five year operating plan. Incorporate proposed North Boulder Valley burns (see Table 3.1 that follows).
- Use prescribed fire as a training and research tool.
- Establish and use criteria to prioritize prescribed burn projects in North Boulder Valley for annual Open Space fire management planning. Recommended criteria include:

Priority burn objectives

- Reduce fuel loading to prevent large-scale catastrophic fire.
- Control a state or County listed noxious species or an Open Space high priority species.
- Control multiple weed species of concern.
- Control multiple weed species and remove vegetation and plant litter to maintain irrigation water flow.
- Improve condition of native grasslands in areas where results of monitoring indicate that the optimum burn interval has been exceeded, fuel loading meets the prescription, and where livestock grazing will be rested for a minimum of one growing season after burning.

Priority burn conditions

- Size of burn meets Open Space system-wide annual burn planning needs.
- Resources required to conduct burn are available.
- Burn may be conducted during more than one season (flexibility in timing).
- Burn poses minimal or no threat to sensitive resources, human safety, private property, or Open Space structures.

Table 3.1 PROPOSED PRESCRIBED BURNS
North Boulder Valley Management Area
(Implementation beginning in 1997)

Location (Size)	Vegetation Type	Season	Resource Objective
Mann/Schneider (30 acres)	Non-native and native grass	Mid-spring	Thatch removal, native species enhancement
East Beech (north)	Native mixed grass	Spring	Noxious weed control, thatch removal
Boulder Valley Ranch, Wetland #449	Wetland	Spring	Noxious weed control, thatch removal, native species enhancement
East Beech (north) Wetland #444	Wetland	Spring	Noxious weed control, thatch removal, native species enhancement
Farmers Ditch	Grass and shrubs	Early spring	Maintenance
Star Ditch	Grass	Early spring	Maintenance
Johnson Ditch	Grass	Early spring	Maintenance

Prescribed Natural Fire

Prescribed natural fire is fire of natural origin permitted to burn, under certain conditions, to achieve predetermined resource management objectives. Wildfires originating in areas that meet all prescription parameters may, with the prior written agreement of managers of adjacent land and wildland fire control agencies, be reclassified as prescribed natural fires and managed in accordance with the approved fire management plan for the North Boulder Valley (City of Boulder 1995).

Recommended Management Actions for Prescribed Natural Fire

Promote and implement prescribed natural fires as another means to meet resource management objectives.

- Include prescribed natural fires in the prescribed fire and annual Wildfire Operational Plans.
- Investigate the feasibility of small-scale prescribed natural fire in the North Boulder Valley.
- Identify potential areas where prescribed natural fires may be used.
- Create a clear and concise map displaying these areas for use by wildfire managers.

- Identify areas and seasons where fires should be controlled to prevent damage to sensitive species or other native species important to management goals.

PRESCRIPTIVE LIVESTOCK GRAZING

Livestock grazing is used: (1) for prescriptive management of native grasslands and non-native species of concern, and (2) as a component of agricultural operations. In natural resources management, livestock grazing is used to simulate the effects of natural processes that may be missing or functionally altered in ecosystems. The effects of natural disturbances such as native ungulate grazing, flooding, and fire are partially simulated through prescriptive livestock grazing. Cattle are the most commonly used grazers on Open Space land (see Agriculture section).

Recommended Management Actions

- Time livestock grazing on native grasslands to minimize negative impacts to native grasses and forbs and to provide the opportunity for native plant reproduction to occur. Time grazing to minimize or eliminate impacts to ground nesting birds. Dormant season grazing is preferred for short and mixed grassland types and tallgrass patches.
- Develop grazing prescriptions for native grasslands.
- Develop methods to assess and monitor grassland condition. Use the results of monitoring and assessing condition to develop and adjust annual grazing plans. Factors influencing condition include native plant vigor, native species composition, non-native species composition and status, amount of plant litter accumulation, soil stability, and amount of bare ground.
- Coordinate prescribed burn planning and Integrated Pest Management planning with grazing rest/rotation regimes where appropriate.
- Use prescriptive grazing as an Integrated Pest Management technique to control target weed species (Appendix 3.4). Spring grazing can be used to control Canada thistle and cheatgrass. Grazing regimes in knapweed infested areas should optimize native grass growth and reproduction (e.g., dormant season grazing). Support ongoing research investigating grazing effects on diffuse knapweed.
- Protect riparian and shrub communities and assist in the restoration of woody vegetation by adjusting grazing intensity, removing areas from grazing, fencing areas for one or more grazing periods, and/or manipulating the distribution of use through water source and salt block placement. The Dry Creek riparian corridor, other drainages on East Beech, and the shaley draws on Boulder Valley Ranch (west of the ranch buildings and north of Longhorn Road) are candidates for adjusted grazing regimes and restoration (see Wetlands section).

3.4.3 Objective #3. Prevent new infestations and manage existing infestations of priority non-native species of concern. Use the Integrated Pest Management planning process to develop prevention and control strategies for target species.

Non-native species of concern threaten native plant communities and agricultural operations by displacing desirable species. Exotic plants that are highly invasive usually do not have natural pathogens and predators to keep their populations in check. Some non-natives, like diffuse knapweed, out compete natives and may produce substances that are toxic to other plant species. Problem species may compete effectively for water, nutrients, and other resources. By displacing native species, aggressive non-natives threaten native plant community integrity and wildlife habitat.

The primary non-native species of special concern in the Management Area are diffuse knapweed (*Acosta diffusa*), Canada thistle (*Breea arvensis*), Mediterranean sage (*Salvia aethiopsis*), Russian olive (*Elaeagnus angustifolia*), and cheatgrass (*Anisantha tectorum*). These species are designated as undesirable plants by the Colorado Weed Management Act, Boulder County Undesirable Plant Management Plan, and/or the Open Space Program. Dalmation toadflax (*Linaria genistifolia* ssp. *dalmatica*), yellow toadflax (*Linaria vulgaris*), and myrtle spurge (*Tithymalus myrsinites*) are less common in the North Boulder Valley than the species listed above but also pose significant potential threats to native communities.

The Open Space Program accomplishes non-native species control through Integrated Pest Management. The City of Boulder Integrated Pest Management Policy (City of Boulder undated) provides the general guidance for the Open Space Integrated Pest Management program. Integrated Pest Management is a decision-making process which selects, integrates, and implements weed control techniques to prevent or manage non-native populations. Integrated Pest Management focuses on long-term prevention or suppression of problem species while reducing the impact that control techniques may have on the environment, human health, and non-target organisms. A whole systems approach is used, looking at the non-native species as they relate to the entire ecosystem.

Ranking, inventory, mapping, monitoring, and evaluation are the methods used in setting Integrated Pest Management priorities. A ranking system provides an objective, ecologically-based decision-making framework for targeting species and infestations. Weed maps and inventories characterize infestations in terms of size, location, and threat to resources. Monitoring and evaluation track infestations and treatments over time to determine the successes and failures of the program.

This Management Plan contains detail that may not be included in subsequently developed area management plans. Additional information concerning the Integrated Pest Management process and specific treatments is provided here until a system-wide Integrated Pest Management plan is developed.

The Integrated Pest Management program for North Boulder Valley is designed to be flexible enough to adapt to the dynamics of weed infestations, plant communities, and land uses. Integrated Pest Management is an ongoing process and a significant time commitment. Annual

implementation of the Integrated Pest Management recommendations in the Management Area depends on the prioritization of Integrated Pest Management needs and actions across the Open Space system. Prevention and control are the primary strategies used in Integrated Pest Management and management actions for each strategy are listed below. Species specific descriptions and prevention and control methods are presented in Appendix 3.4. Crop pests are not addressed in this section (see the Agricultural section).

PREVENTION

Neighboring Lands

Prevention of new infestations of non-native species will be accomplished by working with neighboring landowners, agencies, and Open Space lessees to coordinate management of shared weed problems.

Recommended Management Actions for Prevention on Neighboring Lands

- Develop a memorandum of understanding with the Colorado Department of Transportation, Boulder County, and other City of Boulder Departments (Mountain Parks and Public Works) concerning control of diffuse knapweed, Mediterranean sage, and Canada thistle in state and county road right-of-ways. Include guidelines for rare and uncommon plant species conservation along highway right-of-ways.
- Develop a process for coordinated weed management planning.
- Communicate regularly with neighboring landowners to coordinate Integrated Pest Management planning and activity.
- Develop cooperative weed management strategies. Examples of cooperative weed control tasks are: (1) organize community weed pulls and hand-digging of weeds in rare plant habitat and other appropriate areas and encourage groups or individuals to adopt a rare species and/or conduct stewardship projects in sensitive areas; (2) install fence line barriers to control knapweed spread; (3) mow problem areas, using the proper seasonal timing to prevent spread of target species (Appendix 3.4); and (4) develop educational materials for new landowners.
- Develop and implement strategies to minimize the potential for introducing weeds and for creating conditions conducive to weed invasion (e.g., use of pre-cleaned construction equipment, weed-free hay, weed-free road and trail construction materials, native seed mixes in reclamation projects, timely reclamation in disturbed areas, etc.).
- Use Integrated Pest Management treatment selection criteria (Appendix 3.4) in planning cooperative weed control efforts. Emphasize the goals of protecting good water quality, human safety, and rare plant and animal species and communities.
- Include weed management strategies in lease agreements. Involve lessees in the development and review of annual operating plans.

Open Space Lands

Open Space Program activities will be conducted to minimize the potential for introducing weeds or creating conditions conducive to weed invasion.

Recommended Management Actions for Prevention on Open Space Lands

Agriculture

- Irrigate uniformly and efficiently to discourage the spread of Canada thistle, teasel, and knapweed.
- Use cultivation practices, plant materials, and crop rotation that will maximize the competitive ability of annual crops and hayfield species. Clean cultivating equipment before moving from one field to another.
- Prevent over-fertilization of cropland and transport of excess fertilizer by runoff (high soil nitrogen levels can increase the competitive ability of some weed species over most native species).
- Manage weed infestations in agricultural field buffer areas and along fence lines to prevent infestations in crop/hayfields.
- Place fences to avoid the creation of unmanageable areas (e.g., fenced ditch corridors that are periodically disturbed by cleaning become good sites for weeds to populate and are unavailable for prescription grazing or mowing). Place fences or reinforce existing fences to prevent the spread of knapweed. Place fences to maximize the benefits of prescribed livestock grazing while minimizing the potential for creating conditions for weed spread.
- Design livestock grazing regimes (timing, duration, stocking rate) to prevent overgrazing, erosion, and trailing. Place salt blocks, water sources, and supplemental forage to minimize erosion. When possible, use supplemental feed (hay) that is produced on the same property containing the livestock. Use weed-free hay, whenever possible, if hay is brought in from outside the leased area.

Recreation

- Plan trails to minimize the risk of weed introduction and spread. Do not place trails in areas with severe existing weed infestations. Keep trails out of wet areas. Minimize ongoing erosion in steep areas. Avoid creating a trail corridor that stretches from a weed infested area into an area with relatively few or no noxious weed infestations.
- Use weed-free materials in trail construction. Clean equipment used in the construction of trails before it is used on a new project and before it is moved to the next project. Minimize the area of ground disturbance and degree of soil compaction resulting from construction activities by limiting trips by equipment across an area, choosing staging areas that minimize erosion, and limiting the number of turn-around areas. Reclaim disturbed areas promptly to reduce the chance of weed invasion. Survey new trails for weed infestations annually.
- Encourage use of pelletized feed or weed-free forage for horses before and during visits to Open Space.

Fire Management

- Ensure wildfire suppression and prescribed burning monitoring activities: (1) select and use staging areas to minimize ground disturbance and avoid the spread of weeds to other areas, (2) avoid or minimize the construction of ground-disturbing fire breaks, and (3) avoid or minimize off-road use of vehicles and completely avoid wet or friable soils.

- Plan the timing and frequency of prescribed burning to optimize native plant growth and reproduction.
- Implement timely reclamation in areas where ground disturbance has occurred. Native plant species should be used in post-burn reclamation seedings or plantings.

Reclamation
- Use native plant species in reclamation projects following the policy set by the Long Range Management Policies.
- Follow guidelines for avoiding weed introduction and spread in fire management, trail construction, and reclamation activities.
- Use weed-free mulch for seedings. Use local weed-free topsoil.
- Review, evaluate, and manage reclamation projects annually for a minimum of three years to ensure early detection of weed infestations.
- Monitor reclaimed, undesignated trails annually for three to five years after closure.

Wildlife Management
- Use weed prevention and control techniques in prairie dog Habitat Conservation Areas in concordance with the Black-tailed Prairie Dog Habitat Conservation Plan. Use control techniques (i.e., mowing) in occupied prairie dog areas to prevent seed set and the spread of target weeds to neighboring areas. Coordinate grazing and fire management to optimize the regrowth of native vegetation in occupied and abandoned prairie dog habitat.

Weed Management
- Detect, map, and eradicate isolated infestations or single plants of high priority weed species before spreading occurs.

Education
- Train staff, volunteers, and the public to recognize weeds and the conditions that lead to their establishment.
- Educate agencies and the public about weed-free products (e.g., hay, road base) and other opportunities to prevent weed introduction and spread.

CONTROL

Appropriate techniques, following Integrated Pest Management guidelines, will be implemented to control target species. These include prevention; education; and cultural, mechanical, biological, and chemical control. Effective economical weed management combines several techniques to achieve desired results with the minimum environmental impact. Control strategies and tools used by the Open Space Program will be adapted over time as the results of monitoring and research become available. The list of species targeted for control will change as the status of weed populations change.

Periodic mapping of target species will be conducted to provide information for Integrated Pest Management planning and treatment effects monitoring. Baseline mapping of the distributions and densities of primary weed species of concern in North Boulder Valley Management Area was completed in 1996. Additional techniques may be used to monitor treatment effects and the effects of weed infestations on native communities. Monitoring may be included in the design of research projects conducted by staff, contractors, and researchers participating in the Open Space research program.

Species specific prevention and control methods and recommendations are in Appendix 3.4. The control treatments outlined in Appendix 3.4 describe annual strategies rather than a long-term plan. Any of the treatments described may be continued for many years, before other treatments are used, or different treatment types may be alternated every year or so. Treatment strategies are designed and redesigned each year as field observations and monitoring provide information for making management decisions.

Recommended Management Actions

- Use Integrated Pest Management decision making process and treatment selection criteria to choose treatments (City of Boulder undated). The selection criteria are:
  - Least hazardous to human health
  - Least disruptive of natural controls
  - Least toxic to non-target organisms
  - Least damaging to the general environment
  - Most likely to produce a permanent reduction in the environment's ability to support target pests
  - Cost effectiveness in the short- and long-term
- Develop and apply criteria to prioritize weed management projects. Example criteria include:
  - Species of concern is a state-listed noxious weed, County listed noxious weed, and/or Open Space priority weed (Appendix 3.5).
  - Species of concern threatens a rare plant species or community or the habitat of a rare wildlife species (e.g., diffuse knapweed is invading Bell's twinpod habitat).
  - Immediate control of an infestation is key to preventing its spread. Immediate control includes patches at trailheads, isolated patches, or individuals at the edge of or beyond larger infestations.
  - Species of concern is highly aggressive and rapidly spreading. Control treatments to date have not significantly reduced aerial extent, densities, or seed production.
  - Control can be achieved largely through treating an infestation on Open Space and neighboring lands by way of coordinated management.
  - Species for which effective control methods are known and projects for which resources are available.
  - Research or monitoring projects that potentially contribute to the knowledge of weed species biology, control methods, and effects on native species.
- Develop monitoring plan for priority weed species to monitor control treatment effects.

- Control Mediterranean sage by continuing present Integrated Pest Management strategies, expanding the treated area, or intensifying the treatments where applicable. The treatment of isolated patches is critical to the prevention of spread (Appendix 3.4).
  - Increase acreage treated with herbicides west of U.S. 36 and maintain the current level of control east of U.S. 36. The success of Open Space control efforts east of U.S. 36 will be limited until control strategies are implemented by private landowners on adjacent lands..
  - Reseed treated areas with native species.
  - Use hand digging to reduce densities on edges of infestations, in isolated patches, on steep terrain (inaccessible to spray equipment), and in sensitive (e.g., riparian) areas.
  - Monitor results of treatments annually and survey for weed spread semi-annually until the total acreage and densities are reduced to <50% of 1996 levels. Then, reevaluate monitoring schedule. Collect baseline information on plant community structure and composition.
  - Continue Integrated Pest Management control treatments until the species no longer threatens the health of native communities in North Boulder Valley.
  - Encourage research on biology, control methods, and their effects on native species.
  - Investigate the potential for acquisition of land/conservation agreements where infestations provide continued seed source to Open Space land and/or coordinate control with land owner.
- Control diffuse knapweed by intensifying control strategies (Appendix 3.4).
  - Investigate the potential for acquisition of land, conservation agreements, or coordinated Integrated Pest Management control where Open Space land receives an ongoing seed source from neighboring lands; dispersed by the prevailing west-to-east wind direction. In general, diffuse knapweed appears to be spreading from the vicinity of the southwest quarter of the Management Area to the east.
  - Consider aerial spraying of knapweed in coordination with surrounding landowners. Aerial spraying is a cost-effective alternative for chemically treating large acreages (several hundred acres or more, note: Tordon 22k cannot be used in Bell's twinpod habitat).
  - Intensify hand-pulling in rare plant habitat. Utilize volunteers, jail crews, and volunteer stewards.
  - Improve capacity for chemical application through the increased use of contractors.
  - Continue control techniques until the species no longer threatens the health of native communities in North Boulder Valley.
  - Encourage research on control strategies, fire effects, grazing effects, and the effects of control treatments on native species (especially Bell's twinpod).
- Control Canada thistle by intensifying control strategies (Appendix 3.4).
  - Use grazing, mowing, wick application of herbicides, burning, and insect controls.
  - Focus treatments on wetlands, riparian corridors, and rare species habitat.
  - Develop control "research" project that compares different treatments in similar ecosystems (see Wetlands section).

- Control or eliminate where feasible the small patches of less common weed species that have the potential to become widespread and/or threaten rare plant or animal habitat.
  - Hand pull all known infestations of toadflax (dalmation and yellow) and myrtle spurge annually.
  - Cut down and remove or girdle all large (>3 inches in diameter) Russian olive trees. Pull smaller trees mechanically.
  - Apply herbicide to stumps and girdled Russian olive trees to kill root system.

3.4.4 Objective #4. Protect and maintain rare species and communities of special concern.

North Boulder Valley supports a diverse native flora including rare species and communities. An important purpose of City of Boulder Open Space is to preserve and restore natural areas supporting "outstanding or rare examples of native species" (City of Boulder Charter). Two plant species and several communities or associations occurring in the Management Area are included in the Colorado Natural Heritage Program list of "rare and imperiled animals, plants, and natural communities. Appendix 6.2 of the North Boulder Valley Inventory Report (City of Boulder 1996c) summarizes the Colorado Natural Heritage Program information that is pertinent to North Boulder Valley and explains rare plant status rankings.

The major threats to species and communities of special concern are loss of habitat, displacement by non-native species, and direct destruction of individuals and habitat. The Open Space Program strives to preserve habitat and mitigate threats where possible.

One of the primary species of concern in North Boulder Valley is Bell's twinpod (*Physaria bellii*). This tiny mustard is locally common on shale outcrops of the Niobrara and Pierre Formations and globally rare. The Colorado Natural Heritage Program reports that two of the twenty-five known occurrences of the species in the world are found on Open Space in North Boulder Valley. The only occurrences of Bell's twinpod that are officially protected on public land are managed by City of Boulder Open Space and Boulder County Parks and Open Space (see the North Boulder Valley Inventory Report).

The following recommendations are designed to guide the conservation and management of rare plants and communities occurring in the Management Area. Wetland species and communities of concern are addressed in the Wetland Section of the plan.

Recommended Management Actions

- Monitor the status and trend of rare species/communities. Develop monitoring plans for Bell's twinpod (*Physaria bellii*), birdfoot violet (*Viola pedatifida*), and plant communities of special concern. Develop lower intensity monitoring plans for the New Mexico feather grass (*Hesperostipa neomexicana*) and needle and thread grass (*Hesperostipa* sp.) communities, blue grama (*Chondrosum gracile*) and buffalo grass (*Buchloe dactyloides*) shortgrass

communities, and the rare foothills ecotone plant associations. Consider resource limitations (e.g., staff time, funding) and Program priorities when designing monitoring projects. Examples of monitoring techniques are: (1) mapping the aerial extent and/or relative densities of species or communities, (2) collecting quantitative data on parameters such as species cover, frequency, density, or biomass, and (3) photographing at established photo points.

- Develop a conservation plan for Bell's twinpod to address influences from recreation, prairie dog activity, weed infestations, livestock activity, etc. The conservation plan would include a monitoring plan (referenced above) and strategies for integrating fire, wildlife, Integrated Pest Management, agricultural, and recreation management with the plan's long-term conservation of the rare species. Management recommendations based on the analysis of monitoring results would provide ongoing guidance for management planning.
- Plan recreational development to avoid or minimize direct, indirect, and cumulative negative effects on rare species, communities, and potential habitat. Direct impacts refer to displacement of plants and destruction of habitat by a ground-disturbing project. Examples of indirect impacts are erosion, weed invasion, or trail widening over time. Cumulative effects include soil compaction, weed invasion, and multiple trails in sensitive habitat. Consider sensitive plants when planning for trail placement, types of recreation authorized, trail surfacing, and maintenance.
- Develop and use a project checklist to identify and evaluate potential impacts to sensitive resources. The checklist would include information on presence and condition of rare plants, resulting in a "rare plant clearance" for projects on Open Space. Significant impacts include habitat destruction or degradation, weed introduction, and the cumulative impacts of multiple disturbances.
- Integrate rare plant management and weed management. Use control techniques that avoid negative impacts to species of special concern.
- Integrate rare plant management and fire management. Plan prescribed burning to avoid negative impacts to species of special concern. Use prescribed fire to enhance habitat for species and communities of special concern.
- Integrate rare plant management and livestock grazing management. Prevent negative impacts to species and communities of special concern by excluding livestock or by employing prescriptive grazing only.
- Solicit and support research on topics related to rare plant conservation and management for which available information is lacking. High priority research topics include the effects of weed control treatments on Bell's twinpod and needle and thread grassland communities, the effects of diffuse knapweed infestations on Bell's twinpod, and the effects of recreational activities on Bell's twinpod.

3.4.5 Objective #5. Restore, reclaim, and enhance native vegetation in areas with restoration potential and/or reclamation needs. Use native plant species in the reclamation of areas impacted by development, land use, exotic plant control, and other ground disturbances.

North Boulder Valley restoration and reclamation priorities target preventing the introduction and spread of non-native species of concern and manipulating the recovery of native communities that have been degraded by invasion of non-native species, land use, or current development projects. Species native to local ecosystems will be used in all seedings and plantings except for agricultural crop plantings (City of Boulder 1995).

The term "restoration" is used broadly here to describe the reestablishment of functioning native plant communities. Restoration techniques may include controlling non-native species of concern, adjusting prescriptive grazing regimes, using prescribed burning, interseeding, or planting propagules. Restoration plans will be based on observations of intact, reference communities, soils information, and pertinent literature (e.g., National Resource Conservation range site descriptions).

Reclamation refers to revegetating an area where vegetation has been removed by a disturbance such as trail and access point construction, high intensity human use, wildlife activity (e.g., prairie dogs), weed control treatments, or the removal of a structure. Reclamation plans are a component of all development projects that result in ground disturbance.

In the context of North Boulder Valley vegetation management, wildlife habitat enhancement refers to the manipulation of vegetation structure and distribution, small-scale seedings or plantings, or the restoration of native plant communities. Enhancement projects may include seedings, plantings, weed control, prescribed fire, prescriptive grazing, or exclosure of livestock.

Recommended Management Actions

Restoration

- Identify and document native communities that can serve as references for the restoration of other areas with similar site conditions. Candidate reference communities for mixed grass and shortgrass prairie restoration occur on East Beech and west of U.S. 36. Reference communities for restoration occur in other areas within the Boulder Valley and the region.
- Restore East Beech riparian areas. Manage livestock grazing to allow for the recovery of riparian woody vegetation. Temporarily fence small restoration sites where feasible.
- Restore areas treated for Mediterranean sage control when satisfactory levels of control have been reached. Restoration will involve seedings of multiple grass species. Restoration plans for the areas presently infested with Mediterranean sage must consider the presence of prairie dogs, as the infested areas are within a Habitat Conservation Area, predominantly on the Boulder Land Irrigation and Power and Schneider properties. Livestock grazing plans will be coordinated with the restoration of these areas.
- Restore wetlands and control non-native species of concern by restoring natural hydrology and manipulating irrigation water (see Wetland section).
- Assess grassland condition in cheatgrass control areas on East Beech and develop restoration plans as needed.

- Evaluate the restoration potential for degraded shale communities on Boulder Valley Ranch (west of the ranch buildings and north of Longhorn Road). A small occurrence of Bell's twinpod is located on these shale outcrops. Changes in livestock grazing management may allow these shale communities to recover.
- Evaluate native grass seed production as a crop alternative and a way of providing native seed for restoration and reclamation projects.
- Coordinate restoration planning and implementation where appropriate with City of Boulder Mountain Parks and the Boulder County Parks and Open Space Department. In particular, coordinate native plant salvage where ground-disturbing activities take place.
- Where possible include at least some locally collected seed to allow continuation of adapted local genomes (genetic races).

Reclamation

- Reclaim areas affected by disturbances such as new trail and trailhead construction, weed control treatment (e.g., Mediterranean sage infestations), and undesignated trail closures.
  - Develop reclamation plans for the Neva Road trailhead construction and all new trail construction in the Management Area (East Beech and Axelson trails).
  - Continue to incorporate reclamation seedings into Mediterranean sage control strategies.
  - Evaluate the need for reclamation of undesignated trails.
- Reclaim ranch roads that are not needed as access for lessees, wildland fire control, weed management, utility maintenance, or recreation.
- Seed irrigation ditch banks as needed when routine cleaning leaves bare soil. Coordinate with ditch operating companies to ensure that soils disturbed during ditch cleaning are spread and smoothed evenly to match the ditch bank contour.
- Level and seed abandoned prairie dog burrow entrances outside of Habitat Conservation Areas to improve irrigation water application and to prevent and control weed invasion.
- Develop and implement a reclamation plan for sites where structures are demolished.
- Coordinate with Boulder County Parks and Open Space to develop a reclamation plan for disturbed areas surrounding the Beech Pavilion.
- Follow Best Management Practices during reclamation to prevent the introduction and spread of non-native plant species of concern (see Objective #2) and to minimize soil erosion.

Wildlife Habitat Enhancement

- Enhance wildlife habitat and use native plantings for prairie dog management.
  - Plant shrubs as visual barriers to control the distribution of prairie dogs (see Wildlife section).
  - Plant trees to replace aging raptor perch sites (see Wildlife section).
  - Plant shrub and tree species in appropriate sites along the East Beech drainages.
  - Convert agricultural fields from annual crops to perennial native grass species where feasible at the edges of native grasslands (see Agricultural section for recommendations related to the use of native hay as an alternative crop).

Monitoring and Research

- Document baseline site conditions and reclamation/restoration project plans.
- Develop and apply a reclamation and restoration project evaluation protocol.
- Monitor and evaluate the ongoing success of reclamation and restoration projects annually for three to five years and adjust the monitoring schedule for subsequent years using evaluation results. Determine the need for additional seedings or plantings from annual monitoring and evaluation results. Monitor for the presence and status of invasive weed species.
- Encourage research in reclamation and restoration methods for North Boulder Valley plant community types.

3.4.6 Objective #6. Inventory and monitor native vegetation to evaluate potential negative impacts of land management and to measure the effectiveness of vegetation management techniques.

Systematic inventories of plant species have not been conducted in the Management Area. Plant species inventory needs will be prioritized and completed as time and resources allow. Species condition will be assessed qualitatively or quantitatively. Criteria used to assess condition include native versus non-native species composition and cover, the presence and functional status (where determinable) of various natural processes, and the extent or severity of erosion and compaction of the soil surface.

North Boulder Valley vegetation monitoring will be prioritized along with system-wide monitoring project proposals. Monitoring may be conducted at a low intensity (e.g., qualitative assessment from field reconnaissance) or at a higher intensity (e.g., quantitative data collection) depending on monitoring objectives, community characteristics, and available resources.

Recommended Management Actions

- Collect the appropriate baseline data to use as a reference for short-term and long-term monitoring.
  - Inventory vascular plant species in prairie dog Habitat Conservation Areas.
  - Inventory vascular plant species on the Niobrara and Pierre outcrops in the western half of the Management Area.
  - Conduct periodic inventories of Bell's twinpod occurrences and potential habitat.
  - Conduct periodic inventories of birdfoot violet occurrences and potential habitat.
- Develop monitoring to evaluate community or population trends and management treatment effects. Monitor to achieve a better understanding of the effects of Integrated Pest Management control methods and treatments on native plants, restoration and reclamation techniques, livestock grazing, and prescribed fire. Monitor the status of rare plants. Priority monitoring projects include:
  - Population trends in Bell's twinpod occurrences in areas with and without diffuse knapweed infestation.
  - Mediterranean sage population status and trends.

  - Plant community structure, composition, and trends in and near prairie dog-inhabited sites within Habitat Conservation Areas.
  - Fire effects on diffuse knapweed density and spread.
  - Grazing effects on native plant community types: needle and thread grassland, shale communities and shortgrass; monitor all grazed areas to ensure that management objectives are met; monitoring may be low intensity and qualitative or of higher intensity.
  - The effects of weed control treatments on target weed species and native plant communities.
- Develop integrated resource inventory and monitoring when feasible to optimize efficiency in data collection.
- Develop a natural community classification that is based on site potential so that management actions can be guided uniformly across the Open Space system.

3.4.7 Objective #7. Encourage public understanding of the ecology and conservation of native plants using educational materials and programs and by providing opportunities for volunteer involvement in resource management activities.

Recommended Management Actions

- Include a variety of information pertaining to vegetation management in educational brochures, informational signs, posters, and other materials provided to the public. Emphasize the following topics:
  - Grassland ecosystem: plant and animal diversity, species of special concern, natural processes, biological invasion (exotic plant species), land use and management
  - Foothills ecotone: biological, geological, and landscape diversity
  - Fire: ecology, prevention, developing an understanding of management objectives and methods
  - Exotic plant species: management, prevention of their introduction and spread, awareness of impacts to native communities and agriculture
  - Rare plant species and communities: (Bell's twinpod, birdfoot violet, plant communities as defined by dominant species and species associations (see Appendix 6.2 of the North Boulder Valley Inventory Report)), ecology, management, biological diversity
  - Restoration and reclamation: using healthy native communities as templates for restoring degraded communities, goals and objectives for restoration, goals and objectives for reclamation
  - Research: conducted on Open Space on various vegetation management topics, results from ongoing and completed projects (particularly implications for management and conservation)
- Provide opportunities for volunteer public involvement in land stewardship activities (see Education and Outreach section). Potential volunteer projects include:
  - Rare plant inventory
  - Various vegetation monitoring projects

- Open Space herbarium development and maintenance
- Noxious species removal from rare plant habitat
- Public education: participation in the Trail Guides and Stewardship Programs

4. WETLANDS

4.1 BACKGROUND

Thirty-five distinct wetlands cover approximately 260 acres of wetlands (≈5% of the land surface) in North Boulder Valley. Wetlands providing the highest ecological function are located: (1) north of Dry Creek on the Axelson property (a portion of wetland #548, see Figure 3 for specific wetland locations), (2) in the Dry Creek and Little Dry Creek drainages (wetlands #462, 449, and portions of 548), (3) in the central draws on the East Beech property (wetland # 594, 590, and 445), (4) bordering Lefthand Valley Reservoir to the northwest (wetland #444), and (5) in the salt marsh on the Hart-Jones property (wetland # 548). The majority of the wetlands in North Boulder Valley are naturally occurring, although several are associated with, and dependent upon, irrigation water. Because they are characterized by abundant water in an otherwise arid environment, wetlands tend to be among the most productive ecosystems in the Boulder Valley.

Wetlands provide a variety of important functions and values. They are home to many species of plants and animals. Wetlands filter runoff and adjacent surface waters to protect the quality of reservoirs, creeks, and drinking water. They protect shorelines from erosion and retain flood waters. Wetland plants provide shelter for many animals and they are the basis for far-reaching food chains. Wetlands produce great volumes of food for insects which are fed upon by fish, birds, bats, and frogs. These animals are eaten in turn by hawks, eagles, badgers, coyotes, and other predators. Wetlands are pleasing to look at. In recognition of the multitude of ecological functions and human values provided by wetlands, government agencies have established wetland protection programs. The cornerstone of these protection programs is regulations that prohibit certain types of activities in wetlands unless a permit is first obtained.

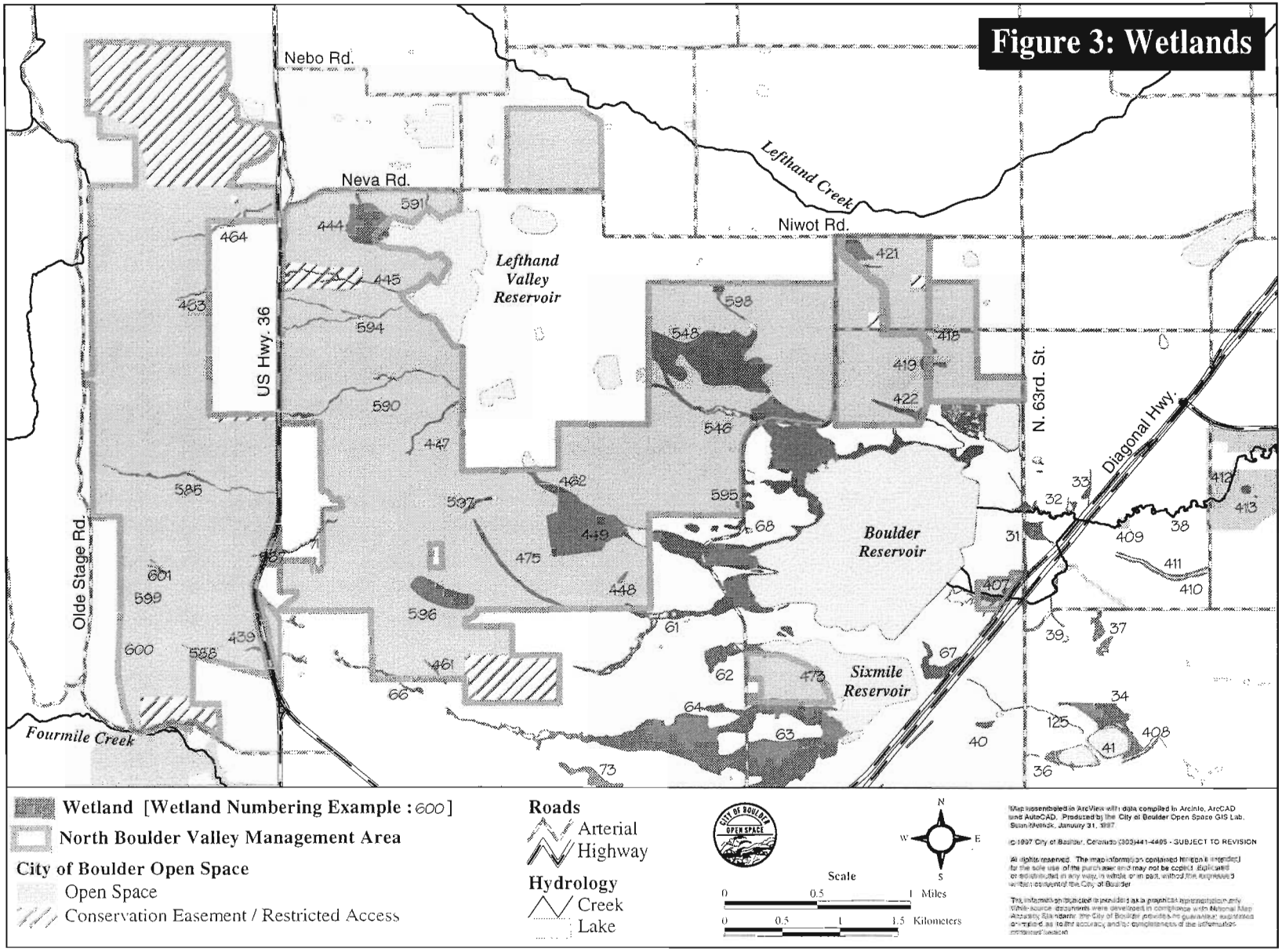
But regulatory programs are not sufficient to protect wetlands. Natural resource management must focus upon wetlands protection as well. Boulder's City Council endorsed a program of wetland protection which includes the preservation of wetlands on City-owned property.

4.2 GOAL STATEMENT

This section provides specific recommendations for managing the wetlands in the North Boulder Valley Management Area, in accordance with the wetland management goal approved by the Open Space Board of Trustees:

Preserve significant wetlands, minimize impacts to water quality and other wetland functions, and restore wetlands function in suitable areas.

Figure 3: Wetlands



4.3 OBJECTIVES

The Open Space Program has set the following objectives in order to meet the wetlands management goal. The objectives are:

- Identify and protect wetland water sources;
- Identify and protect wetland vegetation;
- Identify and protect the processes which create and support wetlands;
- Identify and protect wetland functions and values;
- Identify and protect nearby significant wetlands; and
- Comply with wetland regulations.

There are significant information gaps concerning wetlands that must be filled as part of the management of the North Boulder Valley. These gaps can be filled through research, monitoring, and patrol.

4.4 MANAGEMENT RECOMMENDATIONS

4.4.1 Objective #1: Identify and protect wetland water sources.

Shallow and deep ground water, irrigation water, urban runoff, and surface drainage are the most important sources of water for the wetlands in the North Boulder Valley. These management recommendations consider two categories of water source: (1) natural, and (2) artificial. In areas subject to irrigation, it is sometimes difficult to separate the contributions of natural and artificial water sources. There are also wetlands with mixed water sources; however, the predominant water source is usually apparent.

NATURAL WATER SOURCES

Montane Springs

The foothill drainages in the western portion of the Management Area are spring-fed. A small wetland at approximately 6,000 feet elevation marks the beginning of these drainages. Removal of water from the aquifer occurs primarily through natural processes (evaporation and transpiration) as well as from domestic water wells operating west of the Management Area. The Open Space Program has undertaken only one project which directly affects water supplies for wetlands in this area. In 1990, the Program displaced a portion of wetland #601 with a livestock water tank. This spring development involved piping the surface flow into a galvanized tank. The valve and intake assembly has fallen into disrepair because it has not been used for several years.

Recommended Management Actions for Montane Springs

- Determine the potential for residential development west of the Management Area. Compare build-out at existing County zoning levels with levels of existing development.

- If development potential is high, work with Boulder County to secure development rights in the Olde Stage area or seek other means of limiting development.
- Inform the Boulder County Land Use Department of the Open Space Program's concern about impacts of residential development upon ground water in this area.
- Review and comment on proposals for the Olde Stage area as they are submitted for development review (this includes not only residential development, but expansion of Pine Brook Hills well field, pumping capacity, Beech, etc.), emphasizing the appropriate Boulder Valley Comprehensive Plan policies and Open Space Program goals.
- Work with City of Boulder Water Quality/Environmental Services staff to monitor the progress of ground water cleanup at Beech/Raytheon facility.
- Evaluate the benefits and costs of removing the stock tank from wetland #601 (Parsons property) and restoring natural drainage patterns in this wetland.
- Evaluate wetland restoration/creation in the area of the northwest Beech water tanks.

Spring-fed Drainages of the Plains

Several of the deeply-cut drainages which cross the Beech and Boulder, Land, Irrigation, and Power properties, from west to east, have their headwaters east of U.S. 36. These drainages are primarily ground water fed, but also receive road runoff after storms and during snow melt. At least one of these drainages is contaminated by historic disposal practices at the Beech/Raytheon facility.

A small industrial complex is located at the corner of U.S. 36 and Longhorn Road. A concrete fabrication plant and a small commercial facility of unknown type are located north of the Foothills Trailhead. Several of these facilities obtain water from wells, which may reduce the flow of the nearby drainages. A water tank located within an easement on the Boulder, Land, Irrigation, and Power property is filled regularly to supply businesses along Longhorn Road with additional water. With the exception of these commercial buildings, the Beech facility, and the subdivision north of Neva Road, the tributary basin of these plains drainages is protected as Open Space.

Farmers probably began draining wetland #444 (west of Lefthand Valley Reservoir) after the construction of Lefthand Valley Reservoir. Drainage ditches, which are evident on the ground and in aerial photographs, have reduced the extent of this wetland. The water from this wetland currently drains into Lefthand Valley Reservoir, where it is unavailable for wetlands conservation or restoration by the Open Space Program.

Recommended Management Actions for Spring-fed Drainages of the Plains

- Review the long-term wetland impacts of all management activities that would impound, divert, or reduce flows in the spring-fed drainages to the east of U.S. 36.
- Determine the potential for development on private property in the industrial area along U.S. 36 and at the Beech/Raytheon plant. Project the build-out at existing County zoning levels.

- If development potential is high, secure development rights in the area to insure protection of ground water and to avoid future contamination.
- Inform Boulder County Land Use of the City's concern about impacts to ground water discharge and quality in the area.
- Review and comment on proposals for adjacent private property submitted for development review, emphasizing the appropriate Boulder Valley Comprehensive Plan policies and Open Space Program goals.
- Identify outfalls of road runoff and work with Boulder County to mitigate impacts of sediment and road contaminants.
- Determine if there are any water rights associated with the drains in wetland #444.
- Restore the hydrology of wetland #444 by filling or blocking the drainage ditches.

ARTIFICIAL WATER SOURCES

The Farmer's Ditch and water from Lefthand Creek both enter the Management Area at approximately the same elevation (5,280 feet and 5,320 feet respectively). The outfall of the Lake Valley Estates storm sewers and sewage treatment facility enters the Management Area at 5,240 feet. Oil wells which date from the Boulder Oil Field (circa 1900-1925) are scattered through the Management Area on the West Axelson property. Several of these wells are leaking water and support wetlands of varying size.

Irrigation Delivery-Ditches

Since improving irrigation efficiency has been identified as one of the key issues for agricultural management in the North Boulder Valley, it is likely that management actions will be proposed which may impact wetlands supported by current irrigation practices. Wetlands that rely primarily upon irrigation water are listed in the following table. These wetlands vary greatly in the degree to which they perform wetland functions and should be considered individually when changes are proposed for irrigation delivery systems.

Table 4.1 Wetlands Supported Primarily by Irrigation Water

Wetland #	Property	Description
419	Johnson	Tail water collection area in south central area. Amphibian breeding area.
422	Johnson	Tail water collection area in southeastern corner. High native wetland plant diversity.
473	Ditzel	High water inundation of Six-Mile Reservoir shoreline. Seasonal alkali flat wetland.

Table 4.1 Wetlands Supported Primarily by Irrigation Water

Wetland #	Property	Description
475	Boulder Valley Ranch	Farmer's Ditch (not a jurisdictional wetland, but provides significant wetland and riparian function). Cottonwoods serve as hunting perches and nesting trees for raptors. Cavity nesting birds also use the cottonwoods.
595	Lore	Tail water collection area in southeastern corner.
597	Boulder Valley Ranch	Farmer's Ditch lateral to the Boulder Valley Ranch complex pond. Probably not a jurisdictional wetland, but provides significant wetland function. Well-developed shrubland/wetland complex. Ditch has no defined banks through most of its length.
598	Axelson	Pond/wetland supported by Lefthand Creek water and (until recently) Haystack Butte #7 well. Once thought to support a population of small fish.

The Silver Lake Ditch once flowed into the North Boulder Valley, terminating at Mesa Reservoir. This ditch has been abandoned north of Yarmouth Avenue in the vicinity of the National Guard Armory. However, portions of the Silver Lake Ditch channel still exist and convey flood waters toward the usually dry lakebed of Mesa Reservoir. In 1995, several areas, including designated trails, were washed away by waters collected and conveyed by sections of the Silver Lake Ditch. In 1995, dormant wetland plants in the soil at Mesa Reservoir (as seed and underground roots and stems) began to grow. By the summer of 1996, wetland vegetation (mostly cattails) had become widespread amidst the weedy exotic plants in the lakebed.

Recommended Management Actions for Irrigation Delivery-Ditches

- Evaluate the effects of all changes in irrigation delivery systems on the specific functions of each wetland.
- Consider the broadest possible management potential for existing water rights (e.g., explore the use of water rights for in-stream flow and the support of non-traditional crops). Use irrigation to enhance important wetland functions where practical.

- Coordinate irrigation improvements to minimize impacts to wetlands (e.g., design a small flow to support a wetland as part of ditch improvements).
- Plan mitigation (reclamation) for changing vegetation patterns that follow the removal of a wetland's water source.
- Investigate the feasibility (water rights and infrastructure) of restoring small annual flows into Mesa Reservoir through repairs to the Silver Lake Ditch.
- Create small basins where ditch segments dump storm water to create small wetlands for flood storage and erosion control.

Leaking Oil Wells

Wetlands supported by leaking oil wells are small and typically flow into other larger wetlands. It is possible that the chemical composition of the well effluent may present water quality concerns in the future.

Recommended Management Actions for Leaking Oil Wells

- Work with City of Boulder Water Quality/Environmental Services staff to monitor the physical and chemical properties of oil well effluent where it exits the ground and downstream of associated wetlands. This will provide information on the constituents of the water as well as the treatment effect of the nearby wetlands.
- Investigate the feasibility of the City acquiring rights to the water leaking from oil wells.

Urban Runoff

The effluent of Lake Valley Estates sewage treatment facility (Fairway Metro Wastewater Plant) is applied to the Lake Valley golf course. This effluent eventually percolates toward Dry Creek. Discharge from storm sewers and runoff from the golf course enter Dry Creek directly. These discharges raise questions about water quality and the impact of flush flows on the wetlands and water supplies downstream. Water quality impacts include nutrient loading (nitrogen and phosphorus) and potential human health risks associated with levels of fecal coliform bacteria. The Dry Creek streambed has been downcut due to erosion of the silty clay loam soils and the drying and de-watering of the surrounding riparian margin.

Recommended Management Actions for Urban Runoff

- Work with City of Boulder Water Quality/Environmental Services staff to investigate the potential for Dry Creek to treat the urban runoff from Lake Valley Estates and the golf course.
- Determine opportunities that may exist for improving the ecological condition of Dry Creek.
- Coordinate and implement improvement projects for Dry Creek.
- Establish contact with representatives of the Lake Valley Estates Homeowners Association, Fairway Metro Wastewater Plant, and Lake Valley golf course to discuss water quality and discharge into Dry Creek.

4.4.2 Objective #2: Identify and protect wetland vegetation.

Wetlands are characterized not only by the availability of water during the growing season, but by distinctive vegetation as well. With naturally fluctuating water levels, there are four major direct impacts to wetland vegetation in the North Boulder Valley: (1) livestock impacts (grazing and trampling), (2) human impacts, (3) invasion by noxious and exotic plants, and (4) impacts on functions of rare plant communities.

LIVESTOCK IMPACTS

Livestock and humans are the major causes of wetland trampling. Cattle tend to congregate in wet areas, especially during dry weather. In order to exclude livestock, wetlands must be fenced either permanently or with a temporary (usually electric) fence. The trampling effect of livestock upon unprotected wetlands, especially woody draws, has been severe. Livestock have created pathways along the side slopes and through the channel bottoms of the spring-fed drainages on the Boulder Land Irrigation and Power and East Beech properties. In areas where shrub thickets are taller than cattle, they have formed tunnels through the vegetation, destroying the understory vegetation. Cattle seeking places to scratch and rub, break the trunks of isolated saplings before they mature.

Impacts to herbaceous wetlands have not been as visually striking. However, cattle tend to create hummocks in wetlands when the ground water is high, resulting in uneven microtopography. As a result, wet meadows are transformed into a complex of tiny dry hummocks and small flooded pools. Vegetation, adapted for life in the saturated soil, cannot persist in either the hummocks or hollows, and wetland plant composition changes subtly in these areas. North Boulder Valley wetlands are especially problematic because many are supported by slow ground water discharge throughout the year and the wetlands do not freeze solid. Grazing during any time of the year can result in significant trampling effects.

Although there are significant impacts to wetland vegetation from livestock, cattle grazing is one of the Program's primary techniques to combat infestations of weeds and is a cost-effective alternative to herbicide use. Certain wetland plants grow more vigorously if litter is periodically removed. Other species may not persist without periodic grazing, or burning. Although the effects may vary between grazing and burning, grazing is usually a more predictable and less expensive management technique.

The Dry Creek Mitigation Site (the eastern end of wetland #546) was established in 1991. Until this mitigation project is accepted by the U.S. Environmental Protection Agency, the Program has agreed not to graze this area without the prior approval of the Environmental Protection Agency.

Recommended Management Actions

The following techniques are proposed to balance the protection of wetland vegetation from livestock impacts with the need to control noxious weeds and remove dead vegetation. These recommendations target riparian drainages.

- Use the minimum number of livestock for the shortest duration possible to control weed populations.
- Investigate the practicality of establishing shade and rubbing posts in upland areas.
- Place salt and other supplements away from drainages (0.25 to 0.5 miles from a creek if possible) to discourage continual use of lowlands.
- Fence pastures to minimize impact to wetlands.
- Provide alternative watering sites (tanks or limited access points) for livestock.
- Work closely with lessees to ensure compliance with grazing plans.
- Use permanent photo plots to monitor wetland plant condition.
- Protect the Dry Creek Mitigation Site from livestock grazing until the project is accepted by the Environmental Protection Agency.

HUMAN IMPACTS

Human impacts to wetlands through trampling can also be significant. For example, two undesignated trails cut through wetland #444 (west of Lefthand Valley Reservoir). Although fences can restrict people from wetlands, they are usually more effective when combined with educational signs and careful trail placement. Trails *can* be placed through wetlands using causeways, boardwalks, and other engineering solutions. However, the preferred alternative is to avoid placing trails in wetlands.

Recommended Management Actions

- Implement trail maintenance project where the Hogback Ridge Trail crosses wetland #601 (montane spring-fed drainage).
- Re-direct travel around, rather than through, wetland #444 (west of Lefthand Valley Reservoir; see Passive Recreation section).
- Where wetland crossings are unavoidable, use boardwalks (with low water crossing for equestrians) to minimize impacts to surface flow and vegetation.

INVASIONS BY NOXIOUS AND EXOTIC PLANTS

Russian olive and Canada thistle are the most prevalent noxious plant species recorded in the wetlands of the North Boulder Valley Management Area. There are few Russian olives in the area; however, Canada thistle infestations are widespread and dense.

Almost all the wetlands in the Management Area are infested with Canada thistle. The four largest infestations are: (1) #548, West Axelson seepy hillside; (2) #546, Dry Creek riparian area;

(3) #596, Mesa Reservoir lake bed; (4) #444, west of Lefthand Valley Reservoir; and (5) #449, Little Dry Creek "wildlife area" upstream of the Boulder Valley Ranch reservoir.

Two of these infestations occur in large herbaceous wetlands that have been fenced and excluded from grazing; wetlands #444 and #449. Wetland #449 was burned in the winter of 1996. These two areas could be managed to compare the effect of burning and grazing (in wetlands #548 and #596) upon weed control and wetland plant vigor and diversity.

Recommended Management Actions

- Establish a program of prescribed burns for Canada thistle control and litter reduction in wetlands #444 and #449 (see Vegetation section).
- Use seasonal livestock grazing in wetlands #548 and #596 to control Canada thistle and remove accumulated litter (see Vegetation section).
- Encourage research and monitoring to determine optimal treatments for wetlands infested by Canada thistle.
- Develop an integrated weed management program for riparian areas using the grazing recommendations listed above (see Vegetation section).

IMPACTS ON FUNCTIONS OF RARE PLANT COMMUNITIES

Although all of the native plant communities found in the wetlands of the North Boulder Valley are locally rare (wetlands account for about 5% of the land surface in the Boulder Valley), the Great Plains Salt Meadow is listed as possibly imperiled globally because of "rarity, or because of other factors demonstrably making it very vulnerable to extinction throughout its range" (Colorado Natural Heritage Program 1996). These salt meadows are found along the edges of reservoirs and ponds throughout the North Boulder Valley. The largest and best example is on the Hart-Jones property. The property is relatively inaccessible to the public and receives very little management attention, patrol, or visitation. The fences are in disrepair and the neighboring landowner's livestock often wander onto the property.

These areas typically have high wildlife value, but the presence of selenium (a naturally occurring element) can result in deformed offspring in wildlife species (especially waterfowl) which feed in selenium rich areas. Pierre shale is a known source of this element. Selenium tends to become concentrated in salt marshes that are salty because of evaporation of water that seeps from reservoirs.

Recommended Management Actions

- Test the water in the Hart-Jones salt marsh for selenium and follow up as appropriate.
- Provide a boundary fence around the Hart-Jones property to protect the globally imperiled Great Plains Salt Meadow plant community.
- Identify and describe wetlands, including wetland vegetation, as properties are acquired in the planning area.

4.4.3 Objective #3: Identify and protect the processes which create and support wetlands.

Fire, flood, and grazing (by bison, elk, and deer) are the dominant natural disturbance regimes of wetlands in the North Boulder Valley. Flooding creates new stream channels and creates a diversity of wetland habitats in the flood plain. Dry Creek is probably the only drainage, within North Boulder Valley (because of the size of its tributary basin, local topographic factors, depth to bedrock), capable of meandering within its flood plain. The steep and narrow drainages of the plains are subject to seasonal flooding, but flood impacts are probably limited to within-channel modifications caused by scouring and deposition of sediments. Changes in the nature of Dry Creek's discharge (discussed above) have resulted in a deeply incised channel which does not support significant riparian vegetation.

Historically, mid-winter fires fueled by intense westerly winds probably swept through the North Boulder Valley. The impact of fire on herbaceous wetlands is probably similar to that reported for adjacent grasslands; accumulated leaf litter is reduced, nutrients are made available in the short-term, and productivity of certain perennial grasses increases after the burn. Wildfire suppression (especially in the absence of grazing) has resulted in dense thatch accumulations, slower rates of nutrient cycling, and increasing dominance by exotic species such as Canada thistle and teasel.

Grazing by native ungulates probably had many of the same effects as wildfires. Historic grazing patterns differ, however, from today's agricultural grazing in several respects. Native ungulates came and went as they pleased, probably tracking the nutrient availability of forage in accordance with their needs. Season, intensity, and frequency of use were unpredictable. It seems reasonable to suspect that the grazing season was much less uniform, intensity was probably either much greater (bison) or much lower (elk), and grazing in any given area was probably much less frequent.

Recommended Management Actions

- Describe the existing ecological and geomorphic conditions of Dry Creek in preparation for restoration.
- Determine what opportunities exist to improve the function of the creek.
- Work with the Fairway Metro Wastewater District, Lefthand Ditch Company, and other water users to coordinate beneficial management of Dry Creek.
- Encourage research on the impact of fire and various grazing prescriptions on wetland productivity and diversity.

4.4.4 Objective #4: Identify and protect wetland functions and values.

Recommended Management Actions

Ground Water Discharge

- Consult with a water attorney or specialist on water rights about filing upon areas of ground water discharge.

Wildlife Habitat

- Conduct periodic surveys to identify and monitor amphibian breeding areas.
- Monitor the effectiveness of other resource management recommendations on affected groups of animals.
- Evaluate the feasibility and desirability of re-establishing a shallow mudflat/wetland area in the fenced "pond" area on Boulder, Land, Irrigation, and Power.
- Enhance habitat for Preble's meadow jumping mouse where appropriate.
- Inventory and monitor insect populations in selected wetlands as indicators of habitat quality.

Fish Habitat

- In cooperation with the Colorado Division of Wildlife, survey fish populations in the creeks and reservoirs of the Management Area.

Passive Recreation and Public Education

Wetland enhancements should represent a balance of those which provide visible results for the public (watchable wildlife) and those in more remote areas which focus upon more sensitive species.

- Create a guided biking/walking tour of the wetlands of the North Boulder Valley (see Education and Outreach section).
- Install signs interpreting wetland functions and values where trails approach or enter wetlands (wetlands #444, 601, etc.; see Education and Outreach section).

Shoreline Anchoring

- Provide specific access points to creeks and ditches for livestock watering to prevent the destruction of vegetation, to protect banks, and reduce erosion.
- Provide alternative watering facilities for livestock instead of creeks and ditches.

Nutrient Storage and Retention

- Continue to work with the City of Boulder Water Quality/Environmental Services staff to monitor water quality in drainages tributary to Boulder Reservoir.
- Hire an intern to summarize the literature regarding wetland management techniques.

Sediment Trapping/Flood Storage

- Create small basins where ditch segments dump storm water to create small wetlands for flood storage and erosion control.

4.4.5 Objective #5: Identify and protect nearby significant wetlands.

There are wetlands on private lands in the general vicinity of the North Boulder Valley. In 1992, staff categorized privately-owned mapped wetlands by two analyses. The first analysis considered wetlands best suited for acquisition to be those that:

1. Performed three or more functions or values to a high degree (rating over 3)
2. Were designated by the Boulder Valley Comprehensive Plan land use map as either "Open Space" or "Environmental Preservation"
3. Are located in the Open Space Accelerated Acquisition Area
4. Are adjacent to wetlands already managed by the City

The ranking of wetlands according to these criteria provided a prioritized list. Staff worked from that list on a wetland by wetland basis to determine which wetlands were under the greatest threat of development and which were currently being sought as part of the Open Space system. Four categories emerged.

1. No threat, no negotiations
2. No threat, negotiations
3. Threat, negotiations under way
4. Threat, no negotiations underway

Most of the wetlands in the North Boulder Valley area are part of the Accelerated Acquisition Area and fall under either #2 or #3. Of specific interest are the wetlands located on the Beech in-holding, the Henrickson property, and that portion of the Degge/Boulder, Land, Irrigation, and Power property located in the unnamed draw north of Pleasant Ridge. The wetlands on the Gallagher property may include rare salt meadows.

Recommended Management Actions

- Evaluate wetland values on potential new acquisitions to aid in the prioritization of new properties.
- Review existing wetland mapping of acquisition areas with property agents to aid in the prioritization of new properties.
- A wetlands specialist should accompany lease managers when they tour properties prior to acquisition to coordinate potential management actions that may affect wetlands.

4.4.6 Objective #6: Comply with wetland regulations.

As the North Boulder Valley Area Management Plan is implemented, there may be projects which require authorization or permitting by federal or local regulatory agencies. Project managers should be aware that any projects affecting the size of a wetland or the degree to which

a wetland performs any function are subject to permitting by the City. Certain activities are exempt while others, such as maintenance, are allowed with Best Management Practices. Wetland permit applications take time to prepare and process. In some cases, impacts to species of concern must be addressed through surveys, which can only be completed at certain times of the year.

Recommended Management Actions

- Incorporate the wetlands permitting process into project time lines.

5. WILDLIFE

5.1 BACKGROUND

The diversity of wildlife habitats in the North Boulder Valley supports a rich variety of wildlife species. Ten major vertebrate habitat types occur in the area, with mixed grass prairie as the dominant habitat type. More than 150 vertebrate species are documented in North Boulder Valley. Riparian areas and wetlands surrounding Boulder Reservoir, Lefthand Reservoir, and west of Longhorn Road are critical for supporting populations of migrating and breeding neotropical migrant bird species, northern harriers, American bitterns, and, potentially, the Preble's meadow jumping mouse. Grasslands in North Boulder Valley contribute to the preservation of the black-tailed prairie dog in Boulder County. Proximity to high concentrations of waterfowl at the adjacent Boulder Reservoir and prairie dog colonies in North Boulder Valley are important for maintaining large winter raptor populations. Twenty-seven of the 69 species listed as species of concern in the Boulder Valley Comprehensive Plan have been recorded in the Management Area. American white pelican, ferruginous hawk, bald eagle, and peregrine falcon are listed by the Colorado Division of Wildlife as species of concern and have been recorded in North Boulder Valley.

Preservation of wildlife habitat was the principal wildlife management objective prior to this plan. Prairie dogs were controlled and prairie dog preserves identified and managed through a prairie dog management plan adopted in 1987 (City of Boulder 1987, City of Boulder 1996b). Mesa Reservoir was identified as wildlife habitat and some vegetation restoration occurred in an attempt to provide cover for wildlife. The Boulder Valley Ranch pond was stocked with fish and fishing permitted. Hunting has not been permitted in North Boulder Valley since acquisition by Open Space.

The principal focus of the wildlife program has been to collect baseline wildlife inventory and monitoring information. The North Boulder Valley Inventory Report presented data from observations, research, and inventory reports relevant to the North Boulder Valley. Information was provided on what species are expected in the area, what species are documented in the area, and what historical records of vertebrate species exist. Information on habitat types, surrounding land use, and special wildlife values was provided, along with a discussion of habitat affinities for selected wildlife species.

Extensive parts of North Boulder Valley are managed for prairie dogs -- a principal prey species for seasonal and resident raptors. The area west of U.S. 36 is in the range of large mammalian predators. Impacts from historical agricultural uses and increasing recreation uses combine to reduce the quality of ecological conditions and wildlife values in the eastern portion of the area. The combination of minimal historical grazing impacts and relatively light recreational use west of U.S. 36 results in one of the two last remaining contiguous and unfragmented areas in the Open Space system. Raptor concentrations, due to the proximity of prey and critical habitats

(roost/perch/nest sites), make the Management Area unique in the Boulder Valley. Species of special concern require specific management actions to protect their habitats and populations (amphibians: tiger salamanders, leopard frogs; reptiles: rattlesnake dens). Potential habitat for suspected extirpated species (e.g., burrowing owl) must also be maintained.

5.2 GOAL STATEMENT

This section provides recommendations for managing wildlife in the North Boulder Valley Management Area and focuses on wildlife resources and the wildlife management goal approved by the Open Space Board of Trustees:

Preserve wildlife and wildlife habitat through proper land stewardship that incorporates strategies of habitat enhancement and minimizes the impacts of land use harmful to wildlife.

5.3 OBJECTIVES

The Open Space Program has set the following objectives in order to meet the wildlife management goal. The objectives are:

- Inventory wildlife species to establish accurate and replicable monitoring, evaluate effectiveness of land management techniques, and measure the effectiveness of wildlife habitat enhancement activities;
- Maintain and/or restore wildlife habitat and/or populations at risk, based upon the results of ecological research and site specific monitoring;
- Coordinate wildlife management in the North Boulder Valley with other resource management plans (e.g., Forest Ecosystem Plan [in progress], Black-tailed Prairie Dog Habitat Conservation Plan, the future Boulder Mountain Parks Plan) and agencies;
- Integrate wildlife population and habitat protection/enhancement into other resource management actions; and
- Provide appropriate educational activities in order to convey information to the public on research, general wildlife facts, land protection strategies, and other related material. Provide volunteer opportunities for research, inventory, management, and education as appropriate.

5.4 MANAGEMENT RECOMMENDATIONS

5.4.1 Objective #1: Inventory wildlife species to establish accurate and replicable monitoring, evaluate effectiveness of land management techniques, and measure the effectiveness of wildlife habitat enhancement activities.

It may seem unusual to include inventory work as part of a management plan; however, responsible land stewardship cannot be planned and implemented without complete inventories. More available information allows better land stewardship.

Recommended management actions

- Conduct surveys for mammals, fish, birds, invertebrates, amphibians, and reptiles in coordination with survey efforts across the Open Space system.
- Conduct surveys, in coordination with survey efforts across the Open Space system, with an emphasis on species of special concern identified through the Colorado Natural Heritage Program, Boulder County Comprehensive Plan, and federal and state listed species.
- Encourage and conduct research targeting inventories of vertebrate and invertebrate wildlife species and assessing impacts of land uses (e.g., recreation, urban development, agriculture) on wildlife populations and habitat, through the City of Boulder Open Space/Mountain Parks Research Program.
- Coordinate efforts with local agencies and volunteer groups to make sure that wildlife sightings and information is shared on an annual or biannual basis.

5.4.2 Objective #2: Maintain and/or restore wildlife habitat and/or populations at risk, based upon results of ecological research and site-specific monitoring.

Through scientific research and monitoring, wildlife habitat and populations can be managed more responsibly. Sound analysis and site-specific review of monitoring and/or research reports help to identify habitat management requirements and population management needs. Much of this information was provided as part of the inventory for this Management Plan. More information will be available as part of the implementation of this plan.

Recommended management actions

- Create habitat suitable for Preble's meadow jumping mouse (in accordance with U.S. Fish and Wildlife guidance for habitat enhancement), in conjunction with wetland restoration work along Dry Creek.
- Evaluate the potential for maintaining populations of plains topminnows in the Dry Creek wetland mitigation site.
- Remove non-native fish from the Schneider pond to enhance habitat and protection for native tiger salamanders.
- Enhance natural habitat or create artificial habitat for purposes of encouraging species of concern (e.g., barn owls, bank swallows, cavity nesting birds).
- Identify and provide natural and/or artificial habitat for wildlife species to assist with Integrated Pest Management (e.g., bat roosts).

5.4.3 Objective #3: Coordinate wildlife management in the North Boulder Valley with other resource management plans and agencies.

System-wide resource management plans are essential to provide management guidelines for species and habitats extending beyond planning area boundaries. It is critical that these plans (e.g., Forest Ecosystem Plan [in progress], Black-tailed Prairie Dog Habitat Conservation Plan, the future Boulder Mountain Parks Plan) be incorporated into the North Boulder Valley Management Plan.

The Department's Black-Tailed Prairie Dog Habitat Conservation Plan calls for the designation of all transitional areas as either habitat conservation areas or removal areas. The area management planning process has been determined to be the "right time" to address transitional areas.

Recommended management actions

- Designate the Johnson/Dawson Transitional Area a Habitat Conservation Area (Figure 4), following enhancement of the irrigation delivery systems of the surrounding properties, with the following boundaries: East (border with private land), North (Niwot Road), West (fence line between Dawson and Johnson properties), and South (Hinman Ditch). The area proposed for designation as an Habitat Conservation Area cannot be efficiently irrigated and prairie dogs have persisted on this property despite widespread die-off in the general area. Existing visual barriers appear to be effective.
- Expand the Axelson Habitat Conservation Area to improve geographic boundaries. Proposed management activities on the Boulder Valley Ranch, Lore, and Ellison properties make the proposed boundaries more defensible and realistic. The new boundaries will be from North/South fenceline on east side of the Lake Valley Estates property boundary, east along furthermost North ditch lateral on crest of slope to the Ellison Fire Cache. Use fencing and artificial and natural barrier material (shrubs) to prevent the spread of prairie dogs onto irrigated land to the south.
- Adhere to the recommendations of the Black-tailed Prairie Dog Habitat Conservation Plan for designation of prairie dog colonies on existing properties or new acquisitions that occur outside of identified Habitat Conservation Areas.

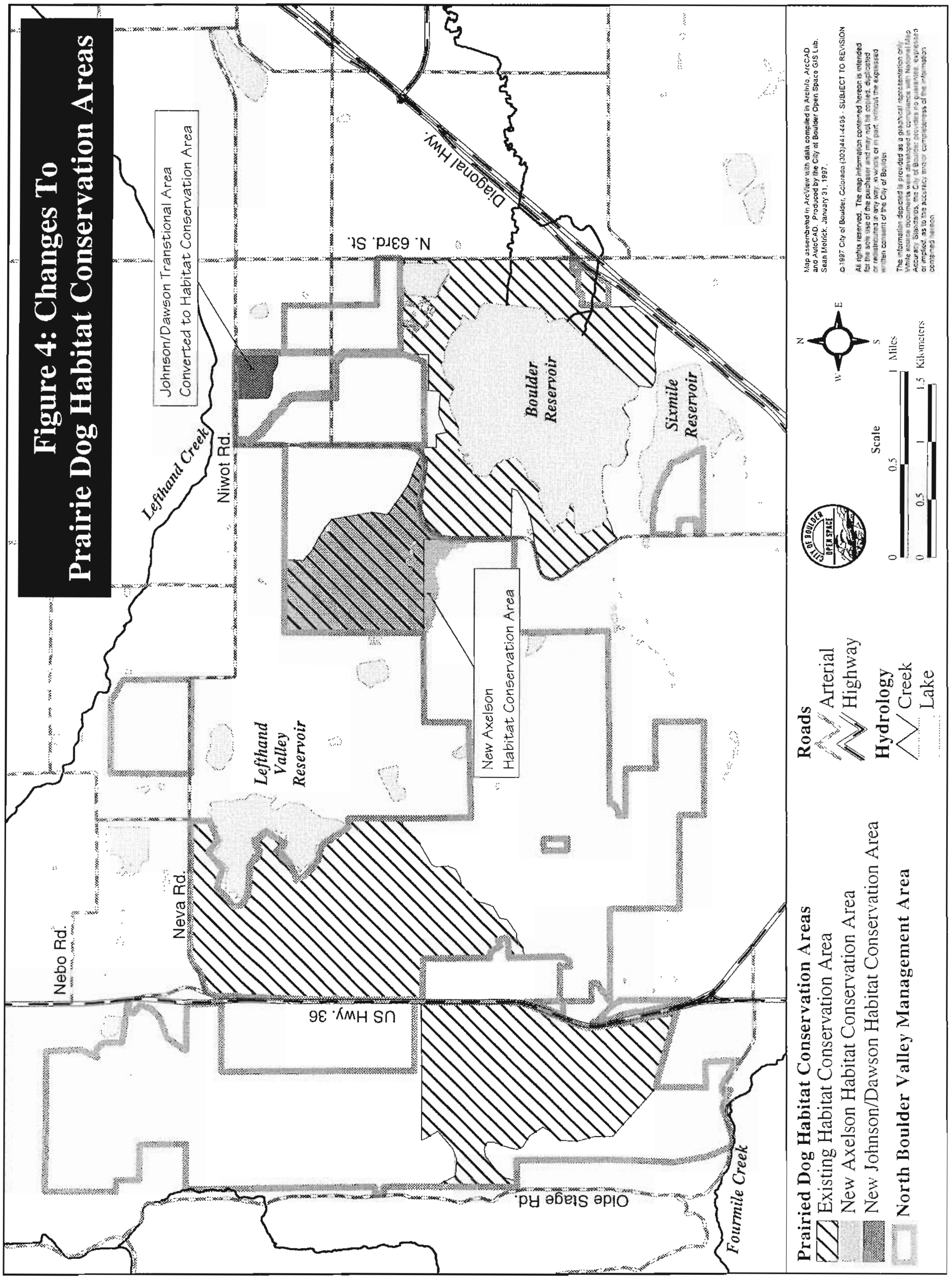


Figure 4: Changes To Prairie Dog Habitat Conservation Areas
Johnson/Dawson Transitional Area Converted to Habitat Conservation Area
New Axelson Habitat Conservation Area
Lefthand Creek
Niwot Rd.
N. 63rd. St.
Diagonal Hwy.
Boulder Reservoir
Sixmile Reservoir
Lefthand Valley Reservoir
Nebo Rd.
Neva Rd.
US Hwy. 36
Olde Stage Rd.
Fourmile Creek
Prairied Dog Habitat Conservation Areas
Existing Habitat Conservation Area
New Axelson Habitat Conservation Area
New Johnson/Dawson Habitat Conservation Area
North Boulder Valley Management Area
Roads
Arterial
Highway
Hydrology
Creek
Lake
Scale
0 0.5 1 Miles
0 0.5 1 1.5 Kilometers
N
E
S
W

5.4.4 Objective #4: Integrate wildlife population and habitat protection/ enhancement into other resource management actions.

In order to provide proper stewardship of wildlife habitat and populations, coordinated management with other resource objectives is critical. General guidelines need to be followed in order to protect, preserve, or enhance wildlife populations and habitat.

Recommended management actions

- Design grazing management objectives to minimize impacts to or enhance wildlife populations and habitat (e.g., provide a mixture of grazed and ungrazed pastures on an annual basis).
- Encourage the protection of large tracts of unfragmented land, undisturbed from the effects of recreational trails (i.e., West Beech, central Axelson, and East Beech properties). This maximizes available undisturbed habitat and minimizes impacts from edges. If future decisions are made to construct additional trails in these areas, these trails should be located to minimize habitat fragmentation and potential negative environmental impacts.
- Identify weed management priorities to benefit wildlife populations and habitats at risk on an annual basis. Provide this information to the Integrated Pest Management coordinator for use in prioritizing annual work plans.
- Design fire management objectives to minimize negative impacts to or enhance wildlife populations and habitat. Work on a long-term fire management plan with specific resource objectives (see Vegetation section).
- Encourage water/irrigation delivery systems that enhance or minimize impacts to wildlife populations and habitat (i.e., Mesa Reservoir, Boulder Land Irrigation and Power).

5.4.5 Objective #5: Provide appropriate educational activities in order to convey information to the public on research, general wildlife facts, land protection strategies, and other related material. Provide volunteer opportunities for research, inventory, management, and education, as appropriate.

Recommended management actions

- Place educational signs along trails and at trailheads that interpret significant wildlife resources of the North Boulder Valley; specifically prairie dogs, raptors, amphibians, and reptiles (see Education and Outreach section).
- Continue to utilize volunteers in programs such as avian monitoring and bat monitoring where appropriate.

6. CULTURAL RESOURCES

6.1 BACKGROUND

City of Boulder Open Space lands have played a significant role in the cultural heritage of the Boulder Valley and within the North Boulder Valley Management Area. The natural and cultural resources of these lands contribute to a better understanding of human kind and its environment. Cultural resources may include buildings, structures, sites, areas, or objects having scientific, historic, prehistoric, archaeologic, or social values. Only cultural manifestations over fifty years old will be considered for the purposes of this document. Many of these resources are considered irreplaceable and every effort will be made to preserve and protect significant cultural resources whenever possible and reasonable. Interpreting, protecting, and preserving significant and fragile archeological and historical resources are major management challenges.

6.2 GOAL STATEMENT

The following broad goal statement was developed to guide cultural resource management for North Boulder Valley:

Preserve and interpret the cultural resource sites and themes of the area.

6.3 OBJECTIVES

The Open Space Program has set the following objectives in order to meet the cultural resource management goal. The objectives are:

- Identify, document, and evaluate significant national, state, and local cultural resource sites and themes within North Boulder Valley;
- Protect and preserve significant national, state, and local cultural resources within the project area; and
- Interpret sites and educate visitors to understand and appreciate cultural resources.

6.4 MANAGEMENT RECOMMENDATIONS

6.4.1 Objective #1: Identify, document, and evaluate significant national, state, and local cultural resource sites and themes within North Boulder Valley.

The cultural resources of North Boulder Valley show that human presence in the area existed off-and-on over the past 10,000 to 15,000 years. Cultural resource themes represented in North

Boulder Valley include: (1) aboriginal pre-EuroAmerican history, (2) agriculture, (3) mining, (4) transportation, and (5) water and irrigation systems.

Forty cultural resource sites and 27 isolated finds have been documented in North Boulder Valley. Some of the cultural resource sites in the Management Area include an apparent game drive wall, stone circles, rockshelters, mining structures, a possible historic burial, an abandoned railroad grade, trash dumps, home sites, and agricultural ditches. The stone wall may be a prehistoric game drive wall and could be the only known example of a game drive wall in the hogback area of the plains/foothills transition region. In addition to the stone wall, a prehistoric lithic site, stone circle sites, rock shelters, and one of the historic homesite ruins may be eligible for the National Register of Historic Places, due to their potential ability to yield data important to the history or prehistory of the Management Area. The brick farm house on the Johnson property is eligible for the National Register of Historic Places because it is an example of the common brick construction and architecture used during the 1880s and 1890s. The remaining sites are not eligible for the National Register of Historic Places, but one of the standing buildings may be eligible for local landmarking.

Recommended Management Actions

- Evaluate the local significance of cultural resource sites which are proposed to be altered or removed. The unoccupied house on Axelson (Grandma Axelson's house, residence #3) should be evaluated for its local historical significance and managed accordingly (see Objective #2).
- Work with the Colorado Archaeological Society and other volunteers to further research historical background information on cultural resource sites within North Boulder Valley.

6.4.2 Objective #2: Protect and preserve significant national, state, and local cultural resources within the project area.

Although cultural resources are protected under the authority of various federal, state, and city laws, additional management actions may be required to protect cultural resources on Open Space lands. These measures will vary with individual situations, but may include: (1) physical protection such as fences, grills, barriers, and other structures; (2) increased patrol of properties which are especially vulnerable to vandalism or other damage; (3) use of signs, where they will not attract attention to otherwise inconspicuous sites; (4) development of measures which consider cultural resource management in other resource management and development programs; (5) avoiding publicity about resources susceptible to vandalism; anonymity of sites, where necessary for their preservation, should be furthered by denial of any requests from the public for locational information; (6) increase public understanding and support through educational and interpretive efforts; (7) closure of sites or areas; and (8) development of historic structure reports for historically/architecturally significant properties and the development of preservation plans which address recommended treatments and management of historic

resources. Significant historical structures should be maintained and used for Open Space purposes.

It is unlawful to destroy or remove any cultural resource from Open Space lands without permission (Boulder Revised Code 1981 §5-4-2 "Damaging Public Property"). Permission to remove these resources will be granted only after it has been determined that such removal will not adversely affect social, historical, archaeological, or scientific values. This determination will be made by the Open Space director based upon recommendations from staff, the Open Space Board of Trustees, and the advice of a cultural resource specialist. In emergencies, Open Space staff members or individuals acting under the authority of the Program may remove cultural resources to avoid imminent loss or destruction. Records will be made of the nature and location of such resources. Once the decision to recover cultural resources has been made, all materials collected will be stored and maintained in an authorized repository except when being used for display, research, evaluation, or other educational purposes.

Recommended Management Actions (see the Facilities section for further recommendations on facilities)

- Interpret suitable sites (see Objective #3).
- Discourage public access in areas susceptible to damage and vandalism (e.g., use signs, field contacts).
- Notify Open Space staff of existing cultural resource sites and patrol them on a routine basis.
- Train Open Space staff to identify potential cultural resources.
- Preserve the silo at the Ellison complex for its local historical significance.
- Preserve the Johnson residence (eligible for the National Register of Historic Places) and associated outbuildings and maintain as an occupied caretaker facility. The exterior of the residence will be maintained to preserve its historical integrity.
- Evaluate the Axelson residence #3 for local historical significance and:
  1. If it is locally significant, preserve the house and maintain as an occupied caretaker facility, or
  2. If it is not locally significant, safely remove the house.

6.4.3 Objective #3: Interpret sites and educate visitors to understand and appreciate cultural resources.

Gaining public understanding and support through education and interpretation efforts is one of the most effective ways to protect cultural resources. Suitable cultural resource sites will be identified and interpreted, while visitor use will be discouraged or restricted in sensitive areas. Suitable cultural resource sites for education are generally sites which are well known and that are not susceptible to vandalism. Interpretive signs will only be used where they will not attract attention to an otherwise inconspicuous site.

Recommended Management Actions (see Education and Outreach section)

- Interpret suitable sites. The prehistoric game drive wall, railroad grade, smelter site, oil field sites, Boulder Valley Ranch complex, and Star and Farmer's Ditches are well suited for education and interpretive activities. Work with volunteers to assist in the interpretation of suitable sites.
- Cultural resource interpretive themes will focus on aboriginal prehistory, agriculture, mining and extractive industries, transportation, and water resources (as identified in the Inventory Report). These broad resource themes represent all the known cultural resource sites identified in the North Boulder Valley.
- Discourage access in areas susceptible to vandalism.

7. PROPERTY

7.1 BACKGROUND

Open Space land acquisition in North Boulder Valley began in 1973 with the purchase of four key properties (Boulder Valley Ranch/Lore, Boulder Land Irrigation and Power, Gilbert, and Mann). Twenty-nine different properties are included in the Management Area. Several properties have conservation easements owned by the City. Conservation easements usually mean that the seller retains the use and management rights associated with the property. Three private properties claim access rights through the Management Area. Residential development of lands adjacent to Open Space (e.g., Lake Valley Estates, North Rim) results in several management issues: designated access to Open Space, encroachment on Open Space, impacts on native animals and plants and their habitats, and increased demands for recreational opportunities.

A variety of land ownerships, facilities, and Open Space conservation and other easements exist within North Boulder Valley. A complete inventory of all existing easements is being conducted as the basis for implementing a monitoring program.

7.2 GOAL STATEMENT

The following broad goal statement was developed to guide property acquisition and management for the North Boulder Valley:

Pursue acquisition of lands consistent with the Open Space Charter and the area management plan goals and ensure proper management of easements and Open Space properties.

7.3 OBJECTIVES

The Open Space Program has set the following objectives in order to meet the property acquisition and management goal. The objectives are:

- Acquire lands surrounding and within the planning area that meet Open Space Charter and area management goals;
- Research and document all easements and mineral and water rights in the North Boulder Valley Management Area;
- Monitor existing Open Space conservation and other easements for compliance;
- Work with adjacent landowners and agencies on cooperative management issues;
- Establish appropriate leases to meet management goals; and
- Coordinate and integrate reviews of new acquisitions.

7.4 MANAGEMENT RECOMMENDATIONS

7.4.1 Objective #1: Acquire lands surrounding and within the planning area that meet Open Space Charter and area management goals.

Acquisition in the North Boulder Valley area is an ongoing process, including the acquisition of certain property interests, water rights, and mineral rights. Acquisition of properties will be based on meeting Open Space Charter and area management goals, availability, purchase price and terms, and will be considered within the property acquisition needs for other parts of the Open Space system.

Recommended Management Actions

- Incorporate resource management needs and significant environmental values (including mineral rights, water rights, or other real property interests) into future acquisitions.
- Pursue individual acquisitions based on meeting Open Space Charter and area management goals, availability, price, and purchase terms.
- Consolidate Open Space lands by acquiring private inholdings.
- Reduce impacts from development of adjacent areas by reviewing City and County development applications for environmental protection, recreational access, and real estate management needs (applications are referred through the City's Development Review process through the County's referral process). Determine if resource management goals can be met through this process without actual purchase of a property interest.
- Assess trail access and development issues related to existing Open Space properties and future acquisitions.

7.4.2 Objective #2: Research and document all easements, mineral and water rights in the North Boulder Valley Management Area.

Existing utility and other easements, because of their location, may cause substantial damage to the resources that are being protected through acquisition. Establishing the location of the easement and a procedure for working with the easement owner may reduce negative impacts to the property through negotiation of a new easement location or possible abandonment of easements.

Recommended Management Actions

- Describe, locate, and document existing easements and right-of-ways.
- Establish procedures for managing existing utility easements.
- Review existing easement request policy.
- Abandon utility easements which are no longer in use or that have been revised.
- Renegotiate easements which do not meet Open Space management needs.
- Resolve ownership and maintenance issues on roadways within the Management Area.

- Inventory mineral interests on existing properties and determine mineral interests of new acquisitions.
- Inventory water rights on existing properties and determine water rights of new acquisitions.

7.4.3 Objective #3: Monitor existing Open Space conservation and other easements for compliance.

Conservation easements or development rights need to be monitored for compliance on a routine basis. A uniform understanding of these easement agreements and a procedure for monitoring are critical to protect the property right purchased.

Recommended Management Actions

- Determine responsible staff and establish procedures for easement compliance.
- Disseminate information on easements to staff and monitor for compliance.

7.4.4 Objective #4: Work with adjacent landowners and agencies on cooperative management issues.

Working with adjacent landowners is important to protect the resources of the properties in the Management Area. It is not efficient to manage City-owned land if efforts are not coordinated with adjacent landowners (e.g., controlling weeds on a property boundary). Acquisition staff will coordinate resource management efforts with adjacent landowners and Open Space staff (as it relates to encroachments, access, easements, weed control, prairie dog plan implementation, and agricultural concerns).

Recommended Management Actions

- Establish internal communication to achieve management goals.
- Continue to work with adjacent agencies and landowners to improve water quality for Open Space and surrounding areas.
- Work with Boulder County and other departments within the City to provide trail linkages that meet regional recreational needs. Assist negotiations with other agencies for trail connections.
- Work closely with City of Boulder Planning and Boulder County Land Use to ensure proper access and natural resource protection concerns are addressed as surrounding lands develop (Mann property and Planning Reserve Area).
- Work with the City of Boulder Planning and Boulder County Land Use to ensure that surrounding land uses are compatible with Open Space management (see Objective #1).
- Contact adjacent landowners and agencies on coordinated weed control efforts and other resource management needs (see Vegetation section).
- Coordinate with Open Space Operations staff to review and monitor the information related to the cleanup of the contaminated sites on East and West Beech.

- Negotiate written agreements with Boulder County for management of the Brewbaker property and use and management of the Beech Pavilion.
- Evaluate potential land trade opportunities with other public agencies (e.g., the Papini property managed by the City of Boulder Mountain Parks).
- Assist Boulder County to determine boundary encroachments in the North Rim/Lake Valley Estates subdivisions and coordinate removal of encroachments. Evaluate the possibility of managing the County-owned portion of the North Rim Trail.

7.4.5 Objective #5: Establish appropriate leases to meet management goals.

Recommended Management Actions

- Revise agricultural leases to reflect new management direction (see Agriculture section).
- Revise and monitor leases for caretaker and lessee facilities (see Facilities section).

7.4.6 Objective #6: Coordinate and integrate reviews of new acquisitions.

New properties will continue to be acquired in North Boulder Valley and in other Open Space management areas. Coordination with resource managers prior to and immediately after closing on a new property provides the opportunity to identify immediate management needs, incorporate them into acquisition costs, and integrate the property with the goals of the North Boulder Valley Area Management Plan.

Recommended Management Actions

- Coordinate acquisition of new Open Space lands with resource management needs. Establish management needs prior to acquisition, incorporate resource management requirements into purchase agreement, and incorporate major capitol improvement costs into the acquisition whenever possible.
- Inventory new properties and evaluate management needs based on the goals of the North Boulder Valley Area Management Plan.

8. FACILITIES

8.1 BACKGROUND

Facilities are considered to be structures or buildings which serve residential, office, or agricultural operations (see Passive Recreation section for information on other types of Open Space facilities). Several existing buildings and structures have been purchased incidental to land acquisition and the Open Space Program has constructed other facilities for land management purposes, primarily passive recreational use. Existing facilities in North Boulder Valley include shelters, outhouses, a pavilion, six houses, barns, and associated outbuildings. Many of these buildings are not in use. Each facility needs to be evaluated for its potential Open Space use and then managed accordingly.

8.2 GOAL STATEMENT

The goal of facility management is to:

> **Ensure safe, responsible, and efficient use and maintenance of all structures or buildings owned by the City of Boulder Open Space Program.**

Facilities with local, state, or national historical significance should be preserved, whenever possible, depending on associated costs and appropriate provisions for public safety. Facilities that can be used for Open Space purposes will be maintained, while others which do not serve Open Space purposes should be removed or relocated.

Uses and functions may include, but are not limited to:

- Maintenance and management of structures for public use and education;
- Leasing for uses and occupancies related to Open Space Program needs;
- Securing and maintaining the structures for future Open Space Program needs;
- Maintenance and management of structures associated with agricultural needs; and
- Removal of structures that cannot be made structurally sound or otherwise appropriate for Open Space Program needs.

8.3 OBJECTIVES

The Open Space Program has developed the following set of objectives in order to meet the facilitates management goal. The objectives are:

- Ensure proper management of existing buildings and structures; and
- Develop policies for the use of facilities.

8.4 MANAGEMENT RECOMMENDATIONS

8.4.1 Objective #1: Ensure proper management of existing buildings and structures.

Proper management of facilities will determine each structure's relationship to Open Space Program needs and evaluate each structures potential use. Associated costs and safety concerns will be an important consideration in determining uses. Facilities with local, state, or national historical significance will be preserved and stabilized whenever possible (see Cultural Resources section).

Recommended Management Actions

- Maintain Axelson residence #1 as an occupied caretaker facility and provide maintenance as needed.
- Remove the four sheds and chicken coops north of the access drive on the Axelson complex #1.
- Maintain Axelson residence #2 as an occupied caretaker facility and provide maintenance as needed.
- Remove the livestock corrals located west of the Quonset hut on the Axelson complex #2.
- Maintain the loafing sheds, corrals, and milk barn at the Axelson complex #3 for agricultural purposes. The remaining structures at this location which do not have historical significance should be removed because of aesthetic and safety concerns (see Cultural Resources section).
- Maintain the Boulder Valley Ranch house as an occupied facility for the agricultural lessee or other suitable caretakers.
- Improve the horse boarding facilities at Boulder Valley Ranch (see Agriculture section).
- Maintain the workshop, barns, hay storage, and riding arena at Boulder Valley Ranch for agricultural purposes.
- Further evaluate the "Silver Nickel" structure at Boulder Valley Ranch for repair costs and potential Open Space uses (e.g., for education and outreach).
- Preserve the Johnson house and maintain as an occupied caretaker facility. This structure is eligible for the National Register of Historic Places (see Cultural Resources section). A new drinking water supply should be established, minor interior repairs should be completed, and routine maintenance should be conducted as needed.
- Keep the Johnson milk barn for possible future agricultural uses.
- Maintain the Schneider house and associated buildings as an occupied caretaker facility and provide maintenance as needed.
- Evaluate the cisterns and stock tanks on West Beech for their influence on wetlands and manage accordingly.
- Coordinate with property agents and lease manager on property management and implementation of lease provisions.
- Ensure all facilities are safe and maintained to an acceptable standard.
- Inspect each facility annually, or as needed, for safety concerns.

- Test well water, at all occupied facilities, annually for contaminates.
- Inspect heating systems annually in all occupied facilities.

8.4.2 Objective #2: Develop policies for the use of facilities.

Recommended Management Actions

- Draft "caretaker" and "facilities" policies, present to the Open Space Board of Trustees, and implement policies in North Boulder Valley, once they are approved.
- Define acceptable standards for all occupied buildings.
- Coordinate use of facilities with other agencies. Finalize written agreement with Boulder County Parks and Open Space for use of the Beech Pavilion.
- Develop and monitor maintenance schedules for all facilities in North Boulder Valley.

9. AGRICULTURE

9.1 BACKGROUND

The North Boulder Valley Management Area has historically had many different types of agricultural production. Agricultural operations have included beef production, dairy farms, sheep production, poultry farms, horse boarding and livery, dry land and irrigated crop production, and irrigated forage production. Current agricultural practices in the North Boulder Valley include cattle grazing, horse boarding, and harvesting of irrigated forage and crops. Three agricultural leases are in effect in the Management Area and are held by local farmers and ranchers to help maintain viable agricultural operations and accomplish management goals.

Agricultural lands in the North Boulder Valley comprise some of the largest remaining contiguous properties under cultivation or grazing in the Boulder Valley. Approximately 350 acres of agricultural lands of state significance occur in the North Boulder Valley. Nearly 1,100 acres of locally significant agricultural lands are located within the Management Area. These properties have a combination of soils, irrigation potential, climate, historic land use, and/or geographic location which contribute to the viability of the local agricultural industry (Soil Conservation Service 1982). The principal agricultural management issue is sustaining agricultural operations in light of growing demands for competing land uses.

9.2 GOAL STATEMENT

This section provides recommendations for managing agricultural operations in the North Boulder Valley Management Area. An integrated planning approach will direct agricultural management toward the goal approved by the Open Space Board of Trustees:

Implement an agricultural management plan for maintaining sustainable agricultural operations on appropriate lands based upon economic and natural resource analyses.

9.3 OBJECTIVES

The Open Space Program has developed the following objectives to meet its agricultural management goal. The objectives are to:

- Implement Best Management Practices on croplands which ensure the sustainability of agricultural operations while protecting other natural resource values;
- Use the City's adjudicated water rights in an effective and efficient manner;
- Improve and maintain the ecological status of grasslands and other grazing lands; and
- Use agricultural facilities as appropriate and make improvements to these facilities so that benefits can be maximized.

Agricultural management plans must be carefully designed and include adequate flexibility. Individual property characteristics greatly influence which management practices will meet the stated objectives. Evaluation of each property will determine its agricultural potential and management actions will be prescribed accordingly. Agricultural management must ensure sustainability. Sustainable agriculture should provide continued economic viability, protect natural resources, and enhance the local quality of life.

9.4 MANAGEMENT RECOMMENDATIONS

9.4.1 Objective #1: Implement Best Management Practices on croplands which ensure the sustainability of agricultural operations while protecting other natural resource values.

Best Management Practices are recommended methods, structures, or practices designed to promote soil and water conservation which reduce the potential for surface and ground water contamination. Best Management Practices generally focus on the responsible application of agricultural chemicals and the efficient management of irrigation systems. Soil type and capability information are essential for developing Best Management Practices for a specific site. Other factors to consider include the depth to ground water and the relative location of surface waters and their potential for contamination. An analysis of this nature shows that many of the soils currently in agricultural production within this Management Area are suited to this purpose. However, some limitations do exist within the North Boulder Valley (e.g., shallow, rocky soils). Open Space staff is recommending agricultural practices which focus on forage production (native and non-native hay) because of the limitations on agricultural production.

Recommended Management Actions

- Incorporate and maintain hay production on lands currently used for annual crop production on the Axelson/Johnson/Dawson/Cowles lease area (Figure 5). Approximately 100 acres of this lease complex are currently utilized for growing small grains (corn, wheat, barley, etc.). These fields should be planted with hay and grass/hay mixtures to meet management objectives.
- Use aftermath (dormant season) livestock grazing on croplands to help supplement soil nutrients and decrease commercial fertilizer use.
- Diligently and efficiently apply irrigation water so that surface and ground water quality are protected. Irrigation infrastructure improvements will be necessary to meet this management goal.
- Evaluate fields to be planted with native grasses so that sensitive resources are protected from damage and contiguous blocks of native habitats can be enlarged (Figure 5).
- Encourage natural predation of crop pests by enhancing natural habitats and providing artificial nest boxes where appropriate. These predators include bats and numerous bird and insect species.

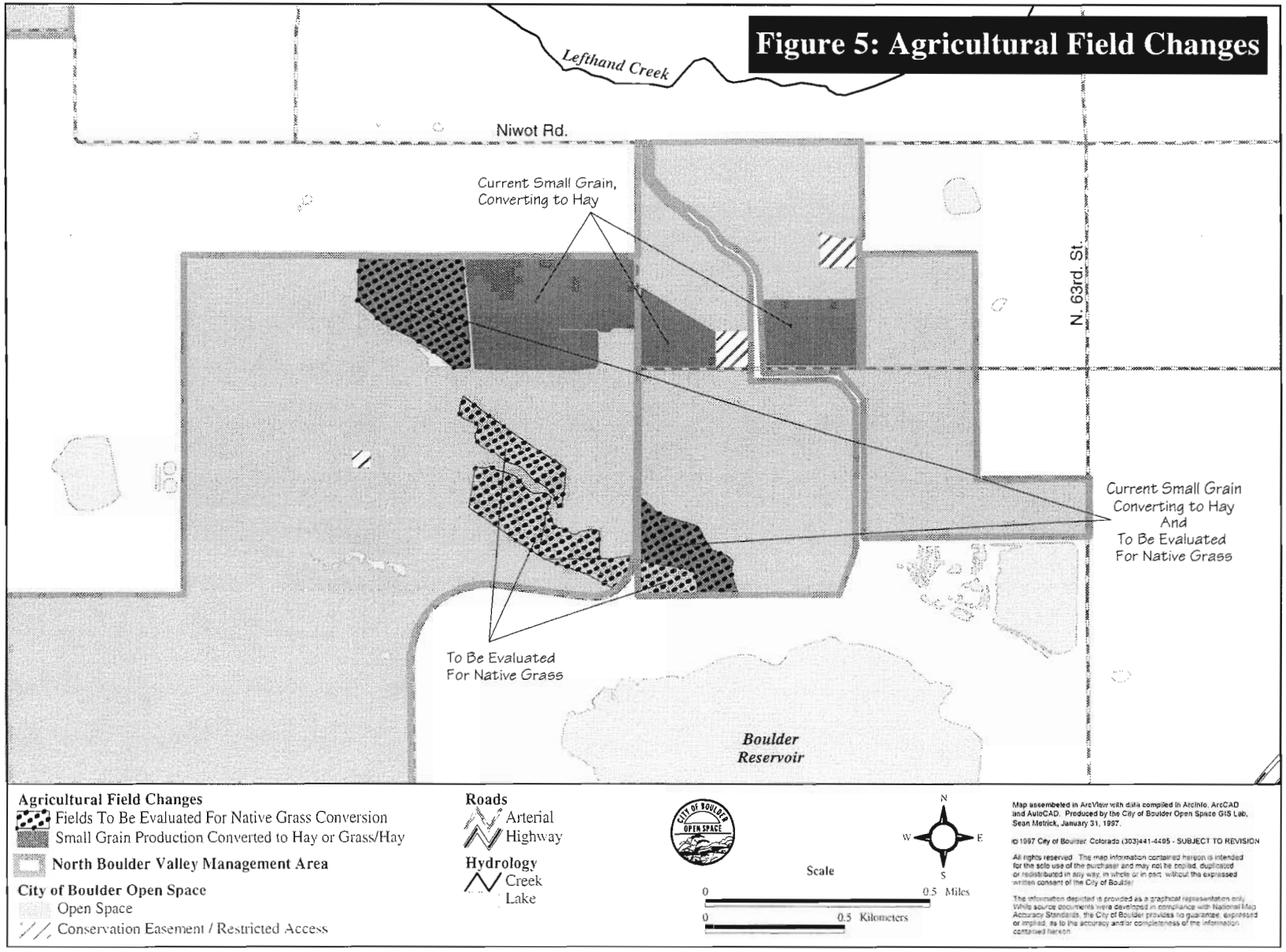


Figure 5: Agricultural Field Changes
Lefthand Creek
Niwot Rd.
N. 63rd. St.
Current Small Grain, Converting to Hay
Current Small Grain Converting to Hay And To Be Evaluated For Native Grass
To Be Evaluated For Native Grass
Boulder Reservoir
Agricultural Field Changes
Fields To Be Evaluated For Native Grass Conversion
Small Grain Production Converted to Hay or Grass/Hay
North Boulder Valley Management Area
City of Boulder Open Space
Open Space
Conservation Easement / Restricted Access
Roads
Arterial
Highway
Hydrology
Creek
Lake
CITY OF BOULDER OPEN SPACE
Scale
0 0.5 Miles
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W E
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Map assembeled in ArcView with data compiled in ArcInfo, ArcCAD and AutoCAD. Produced by the City of Boulder Open Space GIS Lab, Sean Metrick, January 31, 1997.
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- Evaluate alternative crops and cropping methods (e.g., native seed production, organic farming, alternative livestock) that are designed to improve agricultural efficiency and viability. Special attention should be given to irrigation management and facilities.
- Use an Integrated Pest Management strategy to control weed and crop pest populations.
- Coordinate with the Education and Outreach Division to initiate an educational and interpretive program with agriculture as a central theme (see Education and Outreach section).
- Coordinate agricultural activities with other resource activities by involving the Open Space staff Coordinated Resource Manager in planning and decision making.
- Locate passive recreational trails around the perimeter of agricultural lands so that conflicts between recreationists and agricultural operations are minimized.
- Maintain or modify agricultural leases so that the responsibilities of lessees are clearly defined and the costs of capital improvements can be regained.
- Integrate future Open Space acquisitions into the overall agricultural management plan.

9.4.2 Objective #2: Use the City's adjudicated water rights in an effective and efficient manner.

The City of Boulder Open Space Program owns adequate water rights to maintain viable agricultural operations in the North Boulder Valley Management Area (ERO 1995, ERO 1996). However, the adequacy of the Farmer's Ditch water rights, held by Open Space to serve the needs for irrigation within North Boulder Valley Management Area and the South Boulder Creek Management Area, has not been determined. While there appears to be adequate water rights to maintain viable agricultural operations, the water rights are inadequate to fully irrigate all the lands that are currently irrigated. Furthermore, many components of the water delivery system are in poor physical condition which results in inefficient irrigation practices. Three approaches are identified to achieve a viable agricultural operation within the North Boulder Valley Management Area. These approaches include:

- Repair and replace existing ditch laterals (ERO 1995, ERO 1996) to reduce seepage losses so that water is used more efficiently.
- Reduce the number of acres of irrigated crops so that more water is available per acre.
- Purchase or lease additional water rights.

The approaches selected for initial implementation should consider that many of the laterals and diversion structures used for water distribution are in disrepair and will need replacement within the next five years for irrigation to continue. Furthermore, many of the ditch laterals that have the greatest seepage losses are the same laterals that will need extensive maintenance.

It is recommended that an adaptive management approach be taken to improve the irrigation system within the North Boulder Valley and to meet the agricultural goals for this area. An adaptive management approach allows the water resource to be used flexibly by implementing

system improvements while simultaneously reducing the number of acres of irrigated crops before new water rights are purchased. Managing the system should include monitoring water use and modifying operations as information, knowledge, and experience are developed. Results of the water system improvements and irrigated acreage reduction should be reviewed in five years to determine if additional new water rights purchases are needed. New Open Space purchases should be integrated into the agricultural system by making appropriate decisions on the need to upgrade facilities, acquire additional water rights, or change cropping patterns to achieve a fully integrated system.

The water resource should also be utilized in a sustainable manner. Sustainable water use is the utilization of water resources for long-term economic (agricultural) benefit in a manner that does not diminish the status and function of the ecological systems that are being utilized. The sustainable use of water resources implicitly recognizes a holistic or multi-objective approach to managing water. Sustainable water system management takes into account human needs, hydrologic characteristics, and ecological conditions within the planning area. Within the North Boulder Valley Management Area, sustainable water use involves designing water infrastructure improvements in a manner that enhances or maintains all of the resources managed under the plan.

To meet water management objectives, infrastructure repair and replacement should proceed and should be designed to increase water delivery efficiency. Efficiency improvements should be monitored and factored into any decision to purchase additional water rights for this area.

One complication to fully utilizing the water resources within the North Boulder Valley Management Area is that water from the Farmer's Ditch is also used in the South Boulder Creek Management Area. Management of the Farmer's Ditch water owned by Open Space must be coordinated between both Management Areas. Because of this, an irrigation inventory and irrigability analysis should be completed for all Open Space lands served by the Farmer's Ditch. Any decision to acquire additional Farmer's Ditch shares for Open Space purposes should be based on the combined water needs of all Open Space lands served by Farmer's Ditch.

Recommended Management Actions

- Complete a physical inventory of all irrigation facilities in the North Boulder Valley.
- Use the inventory results to make structural improvements designed to increase long-term irrigation efficiency.
- Consult an irrigation specialist to design the specific irrigation system improvements identified in the inventory reports and physical inventory. Design recommendations will be consistent with maintaining long-term benefits to agriculture and natural resources (e.g., wetlands, wildlife, and recreation). In addition, the consultant should consider the hydrologic effects of the proposed irrigation improvements.
- Make suggested improvements to the Dawson and East Johnson croplands so that effective and efficient irrigation can occur.

- Monitor the effects of irrigation improvements on delineated wetlands in the Management Area.
- Make suggested improvements on the Cowles property so that prairie dog populations can be managed and the irrigated pasture on that property can be improved. The improvements made to the property will focus on more uniform irrigation, weed control, and the seeding of pasture grasses.
- Determine locations on the irrigated agricultural properties to install water measuring devices so that consumptive use can be more accurately monitored.
- Coordinate and communicate with City of Boulder Water Quality/Environmental Services staff to identify and implement agricultural Best Management Practices to prevent water quality degradation, particularly in areas that serve as a watershed to Boulder Reservoir.
- Monitor the effectiveness of the irrigation improvements and the reduction in crop area and modify water management as necessary.
- Conduct a five year review of the irrigation improvements and the reduction in crop area to determine the need to purchase additional water rights.
- Protect irrigation facilities by performing routine maintenance and care (e.g., ditch burning, emergency repairs, headgate repair).
- Complete an inventory of all other water structures that support agricultural activities within the Management Area that have not been examined within the scope of the irrigation facilities inventories (e.g., wells, springs, stock tanks).
- Maintain, upgrade, and replace water structures (wells, springs, stock tanks) or add new structures which support the goals outlined in this plan.
- Replace wooden turnout structures on Boulder Valley Ranch with concrete structures when necessary.
- Evaluate Open Space interests in Silver Lake Ditch and Mesa Reservoir to determine potential future uses for the associated water rights. Potential uses include creation of additional livestock watering areas, wetlands, and wildlife habitat. An analysis of the available water rights needs to be performed and the condition of the ditch needs to be evaluated to determine the feasibility of using this water source in this manner.

9.4.3 Objective #3: Improve and maintain the ecological status of native grasslands and other grazing lands.

Grazing by domestic livestock has had a significant influence on the native grasslands in the Management Area. Long-term heavy grazing by domestic livestock prior to acquisition by Open Space has resulted in less than optimal grassland conditions. Careful management of livestock grazing can be used as a management tool to meet many management objectives (e.g., weed management). Future grazing in the Management Area should require specific goal statements for each site derived from monitoring and inventory information. Timing and distribution of grazing pressure need to be altered for grassland conditions to improve. Care should be taken when planning grazing in prairie dog Habitat Conservation Areas so that the combined effects of both impacts do not cause irreparable resource damage.

An inventory and monitoring program must be developed in order to improve grassland condition. Monitoring should focus on soil stability, watershed function, and the potential for ecological recovery. Care should be taken so that grassland monitoring is incorporated along with other staff needs. For example, rare plant monitoring must be coordinated with the monitoring of the Black-tailed Prairie Dog Habitat Conservation Plan.

Recommended Management Actions

- Complete a comprehensive inventory and condition (ecological status) analysis of all grasslands so that management objectives can be set for each property or specific range site. Monitoring must also be associated with this so that management actions can be evaluated for effectiveness.
- Coordinate grassland monitoring with other associated grassland management (e.g., Black-tailed Prairie Dog Conservation Plan).
- Incorporate beneficial deferment (i.e., rest from grazing) into grazing plans so that the ecological status of desirable plant communities can be maintained or improved.
- Design grazing systems that incorporate a mosaic of grazing intensities throughout the Management Area. These grazing systems should benefit ground nesting grassland birds by providing variation in habitats.
- Closely coordinate grazing schedules with weed management schedules. This will be especially important in controlling Canada thistle, cheatgrass, and teasel infestations. Grazing by livestock as a weed management tool can be important in controlling weed infestations in wetlands and riparian areas. Careful management and coordination of grazing is essential so that resource damage does not occur.
- Investigate options for stock water development on East Beech and the southern part of Boulder Land Irrigation and Power. Livestock watering location is the biggest constraint to proper livestock management on these properties. Mesa Reservoir and Silver Lake Ditch represent good opportunities for development of livestock watering facilities.
- Allow aftermath (dormant season) grazing on all irrigated croplands to provide a source of fertilizer and organic matter.
- Use prescribed fires as a grassland management tool in appropriate areas. Prescribed fires should be planned using specific objectives.
- Protect native grasslands from the impacts of horse boarding operations. Boarded horses will primarily depend on irrigated pasture for forage and turn-out areas. Horse feeding will be augmented with supplemental hay and grazing on native grasslands, if available.
- Encourage weed-free hay production and feeding at Open Space facilities (e.g., trailheads, horse boarding areas, agricultural operations).

9.4.4 Objective #4: Use agricultural facilities as appropriate and make improvements to these facilities so that benefits can be maximized.

All of the agricultural properties in the North Boulder Valley have been utilized as such for many years. Because of the long-term nature of these agricultural operations, many facilities have

become degraded and need updating. Good examples of this include the horse boarding facilities on the Boulder Valley Ranch and the facilities at the Axelson complex #3. Many of the agricultural facilities are useless in their current state. Other agricultural facilities are currently used, but lead to inefficient agricultural operations. Agricultural management must be efficient and cost effective in order to maintain sustainable agricultural operations. Open Space staff is recommending that unused facilities which are not culturally or historically significant be removed or salvaged and that currently used facilities be updated to the appropriate standard.

Recommended Management Actions

- Build or improve hay storage facilities on the Boulder Valley Ranch and Axelson/Johnson/ Dawson/Cowles properties. Covered facilities maintain crop quality and net value of harvested hay crops.
- Improve the corral system used for horse boarding on Boulder Valley Ranch. These facilities need to be upgraded and maintained so that proper drainage of excess moisture can be maintained. Upgrades include regrading the corral area, replacing some of the rails and posts, and possibly building additional corrals to accommodate boarding needs.
- Maintain and improve irrigation facilities on agricultural properties so that sustainable agriculture operations are possible (see Objective #2).
- Maintain agricultural buildings and associated structures (e.g., corrals) in good condition in cooperation with the agricultural lessees.
- Use the results of the comprehensive fence inventory and data base to locate new fences, maintain current fences in an acceptable condition, and remove fences no longer needed.
- Remove unused and degraded facilities at the Axelson complex #3. The two loafing sheds, the milk barn, and corrals should be maintained and improved for greater utility.
- Remove the four sheds and chicken coops north of the access drive on the Axelson complex #1.
- Remove the livestock corrals located west of the quonset hut at the Axelson complex #2.
- Remove other facilities and debris which do not have historical significance or agricultural utility (e.g., old tires, wire, lumber, etc.).

10. PASSIVE RECREATION

10.1 BACKGROUND

The North Boulder Valley receives about 120,000 visits each year, less than 10% of the estimated total visits to City of Boulder Open Space. Results of a recent study indicate that recreational use in the North Boulder Valley is dominated by bicyclists (46%), hikers (36%), and joggers (21%). Horseback riding accounted for 2% of the use during the study. Four designated trailheads and approximately 13 miles of designated trails are currently located within North Boulder Valley. The principal focus of passive recreation management in past years has been to inventory and maintain designated trails and access points. In many cases, extensive reconstruction has occurred because some trails and access points were not properly designed or constructed for their intended uses. The majority of trails and access points within the planning area have resulted from past informal use patterns.

10.2 GOAL STATEMENT

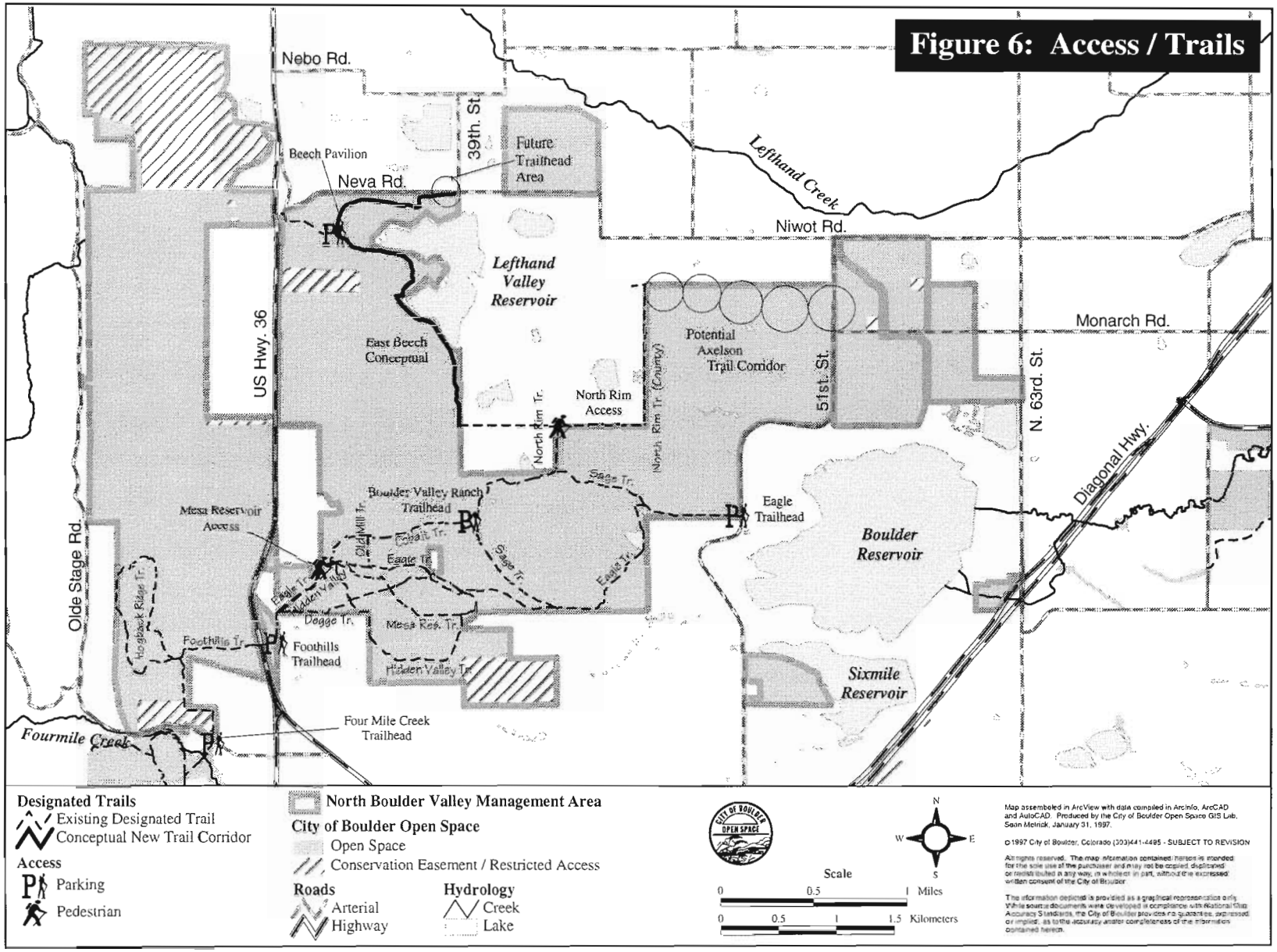
The following broad goal statement was developed to guide passive recreation management for the North Boulder Valley:

> **Manage and preserve land for passive recreation use, its aesthetic or passive recreational value, and its contribution to the quality of life of the community.**

The Long Range Management Policies state "Open Space will be managed in a way that provides for aesthetic enjoyment, minimizes cumulative impacts to the natural ecosystems and conflicts between users, considers user safety, preserves responsible agricultural use, provides for a quality recreational experience, and protects natural areas." Two new trails (approximately three miles of additional trail or an increase of approximately 23%), one new trailhead, and one new pedestrian access will provide additional passive recreation opportunities in the northern and eastern portions of the Management Area (Figure 6). The western portion of the Management Area (west of U.S. 36 and north of Foothills Trail) will be maintained as an undeveloped natural area. Future passive recreation needs will be evaluated annually and reassessed based on monitoring of trails and visitor use.

An extensive network of undesignated trails has developed in several areas of North Boulder Valley. Undesignated trails develop from informal use and result in impacts to soils, fragmentation of plant and animal communities, and the creation of corridors for the invasion of non-native species. Undesignated trails have developed primarily on more recently acquired Open Space where no designated trails or access points have been established. Creating new

Figure 6: Access / Trails



trails in these areas and encouraging use of these trails will focus recreational use to appropriate areas and reduce conflicts with other resource goals.

10.3 OBJECTIVES

The Open Space Program has set the following objectives to meet the passive recreation management goal.

- Provide a variety of appropriate quality passive recreation activities and outdoor education opportunities;
- Preserve scenic vistas and undeveloped views;
- Provide trails, access points, and passive recreational facilities to accommodate appropriate uses and to connect with adjacent trail systems;
- Provide safe passive recreation experiences; and
- Minimize passive recreation impacts to natural, cultural, and agricultural resources.

10.4 MANAGEMENT RECOMMENDATIONS

10.4.1 Objective #1: Provide a variety of appropriate quality passive recreation activities and outdoor education opportunities.

In the City of Boulder Charter, passive recreation is listed as one of the purposes of Open Space and certain activities are listed: hiking, photography or nature studies, and, if specifically designated, bicycling, horseback riding, or fishing. "Recreation" is often defined as activities that offer a contrast to work-related activities and that offer the possibility of constructive, restorative, and pleasurable benefits (Hammitt and Cole 1987). "Passive recreation" is generally considered to be those activities that occur in a natural setting which require minimal developments or facilities and the importance of the environment or setting for the activities is greater than in developed or active recreation situations.

Opportunities have been provided throughout the planning process to ensure public input on the type of passive recreational activities desired within the North Boulder Valley. A broad range of passive recreation opportunities (semi-developed to semi-wilderness) are provided on Open Space lands and within North Boulder Valley. Outdoor education opportunities and trails are provided to significant natural and cultural features of the area as appropriate. American Disabilities Act standards will be incorporated into the design of new passive recreational facilities whenever possible and reasonable. Passive recreational activities and opportunities will be reevaluated periodically to meet public and environmental preservation needs.

Recommended Management Actions

- Design and construct a new trail in the northern portion of the Management Area (East Beech, see Figure 6) which will provide new opportunities to experience grasslands, prairie dog areas, and raptors (see Objective #3). Further evaluate potential options for a pedestrian/equestrian/bicycle access (no vehicle parking) and a multi-use trail in the north eastern part of Management Area (Axelson, see Figure 6).
- Provide a variety of passive recreation activities in appropriate areas and continue to encourage on-trail use.
- Integrate appropriate management actions from a system-wide visitor use plan when completed (the visitor use plan for the Open Space system will include policies on trails, access, special uses, and commercial activities).
- Prohibit hang gliding within the Management Area due to direct impacts to Bell's twinpod, lack of suitable trails, and need for a system-wide policy on commercial uses.
- Allow horse boarding at Boulder Valley Ranch only in confined areas (stalls, corrals) and irrigated pastures. This type of horse boarding will prevent conflicts between visitors, damage to sensitive resources (Bell's twinpod, paleontologic resources) and disturbance from overgrazing (see Agricultural section for details on horse boarding activities).
- Discontinue horse grazing on native grasslands.
- Implement provisions of the City's Dog Management Program applicable to North Boulder Valley. Any changes to City's Dog Management recommendations for North Boulder Valley will be developed in a separate planning process independent of this Management Plan.
- Work with volunteers and user groups to ensure compliance and monitor the effectiveness of the proposed dog management policies.
- Develop surveys or public involvement processes to determine the types and quality of passive recreational experiences desired.

10.4.2 Objective #2: Preserve scenic vistas and undeveloped views.

Scenic vistas enhance recreational experiences on Open Space and provide aesthetic values for many people who never visit these lands (i.e., many people enjoy the beauty of these lands while not actually visiting them). Facilities should be located to minimize impacts to scenic views. New facilities should be designed to blend into the natural environment and existing facilities should be modified as needed.

Recommended Management Actions

- Design and construct the new trailhead along Neva Road to minimize visual impacts through appropriate location and use of visual barriers.
- Design and locate new trails to provide scenic vistas and minimize their visual impacts to surrounding lands.
- Use natural trail surfacing whenever possible to minimize the visual impacts of trails.
- Continue to acquire lands that provide scenic vistas and urban buffers.

10.4.3 Objective #3: Provide trails, access points, and passive recreational facilities to accommodate appropriate uses and to connect with adjacent trail systems.

Designated trails and access points (trails and trailheads which are signed, shown on public trail maps, and maintained by Open Space staff) will be provided to access appropriate natural and cultural features of the area. Carefully designed and constructed trails provide corridors for passive recreational opportunities and minimize the negative impacts of such activities. Designated trails and access points will be maintained and appropriate uses will be designated to minimize visitor conflicts and ensure resource protection.

The Open Space Program will continue to work with surrounding agencies to meet public needs. Future passive recreation needs will be evaluated on a periodic basis.

Recommended Management Actions

- Design and construct a new trailhead (with parking) and multi-use trail in the northern part of the project area. The trailhead will be located somewhere in the vicinity of Neva Road and 39th Street and the multi-use trail will head towards the southwestern portion of the North Rim Trail (Figure 6). Volunteers and user groups will be approached to assist with the construction of this trail.
- Further evaluate potential options for a pedestrian/equestrian/bicycle access (no vehicle parking) and a multi-use trail in the north eastern part of Management Area (Figure 6). Open Space will explore the possibility of rerouting this trail further north along the existing Open Space boundary or on adjacent lands to avoid impacts to a nearby raptor perch site (an abandoned telephone pole). If impacts from an alignment on Open Space are determined to be unacceptable, additional lands may need to be acquired or mitigation actions may need to be taken before a trail is constructed.
- Negotiate agreements with Boulder County Parks and Open Space to continue use of the Beech Pavilion as a special use facility (large group activities and picnics). When management agreements are finalized with Boulder County and the trailhead at Neva Road and 39th Street has been constructed, the Beech Trailhead will no longer serve as a public trailhead. Although the entrance road to the pavilion will be locked, the entry road will still serve as non-motorized trail access from U.S. 36 or the western portion of Neva Road.
- Negotiate an agreement with Boulder County to transfer management of the North Rim Trail to City of Boulder Open Space.
- Monitor new residential development and designate appropriate access points and trails. If residential development of the Mann property occurs, Open Space will designate appropriate pedestrian access/accesses and construct a multi-use trail from the neighborhood to the Foothills Trail.
- Evaluate future trail and access needs (connections to Boulder Reservoir trails and the East Boulder Trail system, a north-south trail through West Beech, Six-Mile Fold, Buckingham

Park) and cooperate with other public agencies on City, County, and Boulder Valley regional trail plans.

- Work with the Northern Water Conservancy District, Boulder County Parks and Open Space, and other City of Boulder departments to explore creating a trail corridor along the Boulder Feeder Canal. This trail corridor could provide a long distance trail to Lyons and other public lands north and west of Open Space (Heil and Hall Ranches).
- Monitor existing access points for problems (development of undesignated trails, capacity at trailheads, roadside parking, vandalism) and take appropriate actions to resolve these problems.
- Install two additional dog stations, one at Boulder Valley Ranch Trailhead and one at Eagle Trailhead.
- Install signs and a trail map at the entrance to Mesa Reservoir to encourage visitors to park at Foothills Trailhead. The trail map will highlight the existing trail connection between this entrance and the Foothills Trailhead. Install a trash at the entry to Mesa Reservoir to encourage visitors to pick up after themselves.
- Remove unnecessary recreational structures in the vicinity of Mesa Reservoir. The outhouse and small shelter to the northwest of Mesa Reservoir are not being used and should be removed for safety and aesthetic purposes.

10.4.4 Objective #4: Provide safe passive recreation experiences.

Visitor safety is an important consideration in providing appropriate passive recreational opportunities. New trails will be designed and constructed to minimize hazards and conflicts between uses. Old trails will be reconstructed as needed. Designated trails will be inspected and maintained on a regular basis. Passive recreational facilities will be inspected and maintained on a routine basis. Educating visitors on trail etiquette in order to minimize potential conflicts between visitors will be a management emphasis.

Recommended Management Actions

- Design and construct new trails through East Beech and Axelson to accommodate multiple uses and minimize safety hazards.
- Improve and maintain existing trails to accommodate appropriate uses.
- Designate appropriate passive recreational activities on trails to minimize interactions between various trail users. Mountain biking will be allowed only on trails designated with the international bike symbol (Foothills, Eagle, and Sage Trails; and the proposed trails). Hiking, jogging, and equestrian use will be allowed on all trails in the North Boulder Valley (see Objective #1).
- Continue maintenance on the steep portion of Eagle Trail and negotiate acquisition of private property to reroute this section of trail.
- Establish regular inventory, monitoring, and maintenance of trails, access points, passive recreational facilities, and high use areas to ensure safety hazards and maintenance needs are identified and corrected in a timely manner. Priority for monitoring will be given to areas

with heavy visitor use and areas with potential safety hazards. Information from the North Boulder Valley visitor use study (Wheeler 1995) will be used to identify high use areas.

- Provide emergency medical, fire suppression, and law enforcement services as needed to maintain and ensure public safety. These services will primarily be provided by the Open Space ranger staff in cooperation with other agencies (e.g., Boulder County Sheriffs Department, volunteer fire departments)
- Promote responsible use and trail etiquette through educational programs, signs, brochures, coordination, and outreach with user groups, field contacts with staff, and volunteer programs to minimize conflicts (see Education and Outreach section).
- Post warning notices or close trails temporarily for safety purposes as needed (bubonic plague outbreaks, periods of intense agricultural operations, application of herbicides, etc.). Trails will only be closed for the duration required to ensure visitor safety. The public should be separated from areas of intense agricultural activity when new trails are constructed. The proposed trail through Axelson should go around the corral and equipment area to minimize potential hazards to visitors.
- Limit horse boarding to confined areas and separated pastures to minimize interactions with other visitors.
- Request striping and pedestrian signs at the grade crossing where the Foothills Trail crosses Lee Hill Road to improve safety.

10.4.5 Objective #5: Minimize passive recreation impacts to natural, cultural, and agricultural resources.

Provision of passive recreational opportunities will be balanced with preservation of natural ecosystems and responsible agricultural use. Responsible visitor use and stewardship of Open Space lands will be promoted to ensure protection of agricultural, natural, and cultural resources. Trails and passive recreational facilities will be designed, constructed, and maintained to protect environmentally fragile and sensitive areas. Visitors will be encouraged to use designated trails and access points in order to minimize environmental impacts and staff resources. Appropriate passive recreational experiences will be designated on trails to minimize environmental impacts and prevent user conflicts. Dogs will be required to be on a hand-held leash on all trails within prairie dog Habitat Conservation Areas and prohibited off trail in these areas. Seasonal closures may be used in certain areas to prevent impacts to sensitive wildlife species (raptors). Trails and facilities will be located on appropriate soils to minimize soil erosion. Studies will be developed to determine potential impacts of passive recreation on natural resources and appropriate management actions will be implemented. Natural, cultural, and agricultural resources will be interpreted to increase the public's understanding of the significant resources in the area, to minimize visitor conflicts, and to discourage visitor use in sensitive areas.

Recommended Management Actions

- Focus public education and outreach on awareness and understanding of the natural, cultural, and agricultural resources located within the North Boulder Valley. Staff will work with

volunteers and user groups to create an understanding and appreciation for the natural, agricultural, and cultural resources of the area (see Education and Outreach section).

- Continue to encourage and fund research on recreational influences on Open Space lands.
- Monitor visitor use and evaluate recreational impacts on wildlife, vegetation, and agricultural activities in proposed trail areas (see Objective 10.4.3).
- Implement appropriate management actions (e.g., educational signs, use of fences, seasonal closures) based on inventory or monitoring results.
- Encourage use of designated trails and access points and discourage visitor use in sensitive areas (unfragmented areas: e.g., West Beech, prairie dog Habitat Conservation Areas, high quality wetlands, raptor perch areas, sensitive geologic/paleontologic areas, sensitive cultural resources, and Bell's twinpod habitat). Large trailhead signs, public trail maps, and educational signs will encourage visitors to use designated access points and trails.
- Conduct trail inventories to identify development of undesignated trails and access points.
- Close and reclaim undesignated trails and access points (some undesignated trails and access points will be improved and designated, see Objective #3). Undesignated trails and access points in the West Beech/Schneider/Mesa Reservoir area will be closed with physical barriers (slash with woody vegetation, fences, plantings of native vegetation), unnecessary gates removed, and educational signs placed to encourage use of designated trails and access points. The abandoned railroad grade on Parsons/Mann will be monitored and will remain in its current condition until future decisions on trails in this area are made.
- Post warning notices or close trails temporarily for protection of wildlife during vulnerable times of life cycles (e.g., nesting). Trails will only be closed for the duration required to protect wildlife.
- Locate new trails through East Beech and Axelson along the perimeter of natural areas to prevent fragmenting plant and animal habitat. The trail on East Beech should be located along the eastern perimeter to minimize impacts to wetlands, the prairie dog Habitat Conservation Area, and Bell's twinpod habitat. The trail on the Axelson property should be located along the northern perimeter to minimize impacts to wetlands, the prairie dog Habitat Conservation Area, raptors, and agricultural operations.
- Provide well-defined and drained trail surfaces to prevent trail braiding. Trail braiding results in vegetation trampling, erosion, and disturbed areas which increase the potential for introduction of weeds. Short sections of the Degge and Hidden Valley Trails will be reconstructed to prevent further trail braiding.
- Close the short section of trail immediately north and east of dry Mesa Reservoir. This short section of trail serves no purpose and other trails provide adequate access to this area.

11. EDUCATION AND OUTREACH

11.1 BACKGROUND

Open Space staff works closely with the public, local school districts, City departments, and outside agencies to provide information and education to the public, organizations, and students. Education and outreach activities are often the most effective means of stimulating understanding and appreciation of Open Space, providing information and orientation, helping to ensure resource protection, and promoting visitor safety. Open Space is an integral part of the Boulder Valley. Therefore, education and outreach activities are important in developing a better understanding of the need to maintain and preserve natural systems.

The Program's outreach activities provide opportunities for the community to provide comment, direction, and information to the Program. Effective public participation processes are essential to ensure the Program's awareness of community issues and perspectives and to maintain understanding and support for the Open Space Program. The Program endeavors to be responsive to the groups and individuals who comprise Boulder's broad and diverse "public." In 1996, the Program contracted a study of Open Space public outreach and communication. The study identified ways to obtain information on public opinions, target most effective strategies for the Program to use in outreach and communication, develop a five year outreach work plan with recommended education and outreach activities, and assist in developing strategies to improve communications with the public. Appropriate system-wide recommendations will be incorporated into education and outreach efforts for the North Boulder Valley Management Area. The education and outreach program for North Boulder Valley will include developing strong relationships with the local media (e.g., Daily Camera, Colorado Daily, radio stations) resulting in increased media coverage of Open Space activities and issues.

11.2 GOAL STATEMENT

The Open Space Program conducts education and outreach activities to achieve the following goals:

To foster relations between the Program, the public, City Council, the Open Space Board of Trustees, other City departments, agencies, and organizations; to educate others about the Open Space Program's mission, charter, and activities; and to provide environmental education.

11.3 OBJECTIVES

The Program's education and outreach goals will be met through the following objectives:

- Disseminate information concerning the ecology, natural history, and cultural history of the area;
- Disseminate information concerning the goals, projects, and operations of the Open Space Program;
- Disseminate information about the situations that arise when humans interact with natural systems and about ways of lessening or eliminating the impact of these interactions;
- Conduct projects and activities that provide opportunities for people to establish a relationship with the Open Space Program and land system;
- Engage in public participation processes which provide opportunities for public input and involvement in Open Space planning and decision making; and
- Identify goals and priorities for volunteer programs in the North Boulder Valley and implement these programs with neighbors, visitors, and interest groups.

11.4 MANAGEMENT RECOMMENDATIONS

11.4.1 Objective #1: Disseminate information concerning the ecology, natural history, and cultural history of the area.

Recommended Management Actions

- Continue regular educational programming in the North Boulder Valley area on natural and cultural history topics.
- Disseminate additional information on agricultural history and practices, prairie dogs, raptors, fire ecology, reptiles and amphibians, wetlands, cultural resources, rare plant communities, grasslands, woody draws, and weed infestation and control.
- Develop and install a series (three to five) of interpretive signs for the Boulder Valley Ranch complex which will inform visitors about the history of agricultural practices, ditches and irrigation, potential interactions between visitors and agricultural operations, current agricultural practices, impacts of aggressive noxious weeds on native plant communities and agricultural operations, history of grazing ungulates, and the integration of agricultural and natural resource management. These signs should be installed at strategic points along the Sage Trail and Eagle Trail loop.
- Develop and install an interpretive sign explaining the importance and diversity of native grasslands. This sign should be installed at a strategic point next to a trail which exhibits a characteristic native grassland.
- Develop and install an interpretive sign showing the relationship between prairie dog towns and raptor populations. This sign should be installed at a strategic point where a trail passes through a prairie dog town in a designated Habitat Conservation Area.
- Develop and install an interpretive sign educating the public on the importance and rarity of shale "barrens" plant communities. This sign should be installed at strategic points where trails pass near the shale slopes.
- Increase the amount of on-site education and outreach activities in the North Boulder Valley area.

- Coordinate with the Resource Conservation Division to develop "species list" brochures on amphibians and reptiles, birds, and mammals. Distribute these through trailhead brochure boxes.
- Use education to protect sensitive resources such as cultural and paleontologic resources, wetlands, and Bell's twinpod.
- Continue to evaluate the level of Nature Trails and other on-site programming in the North Boulder Valley, including the need to provide information on the Program's management policies and practices.
- Develop and distribute an agricultural brochure.
- Develop and distribute a brochure on raptors.
- Develop and distribute a self-guided trail brochure on wetlands which encourages visitors to visit and learn about the importance of different types of wetlands.

11.4.2 Objective #2: Disseminate information concerning the goals, projects, and operations of the Open Space Program.

Recommended Management Actions

- Disseminate information and educate the public on new regulations and management direction for North Boulder Valley through on-site programming, in-field contacts with staff, and a document to summarize the North Boulder Valley Area Management Plan.
- Coordinate with resource planners to design studies and collect data on resource inventories and visitor use (types, distribution, and levels of use) and distribute that information to the public and other resource management agencies.
- Continue to utilize information boards and brochure boxes to disseminate information.
- Install information boards at new trailheads.
- Install "Welcome" signs at major access points. "Welcome" signs are attractive, upright signs which reinforce the special regulations and unique natural resources of a given area.
- Develop and distribute a brochure on the North Boulder Valley area which will interpret the natural, cultural, and agricultural resources; identify trails and access points; and inform visitors of regulations within the Management Area.
- Distribute information on noxious weeds, including identification, prevention, control, and understanding of the impacts of aggressive noxious weeds on native plant communities and agricultural operations. Temporary signs with this information should be posted in areas with specific weed problems.
- Educate and inform the public on restoration projects, past or on-going, within the North Boulder Valley area, and on the importance of maintaining native communities as a reference for restoration projects.
- Develop educational materials and programs that enhance public knowledge and understanding of the Program's prescribed and natural fire programs in the North Boulder Valley.
- Educate agencies and the public about weed-free products (e.g., hay, road base) and other opportunities to prevent weed introduction and spread (see Vegetation section).

- Develop and install signs for any new dog regulations and use on-site staff and volunteer presence and interaction with the public to educate and inform the public of these changes.

11.4.3 Objective #3: Disseminate information about the situations that arise when humans interact with natural systems and about ways of lessening or eliminating the impact of these interactions.

Recommended Management Actions

- Continue to utilize information boards and brochure boxes to disseminate information on visitor etiquette.
- Continue to produce and distribute the "Keeping Open Space a Special Place" brochure.
- Utilize Public Information Counselors, Rangers, other staff, and volunteers to contact visitors in the area about interactions that occur between competing uses.
- Work with user groups and group members to disseminate information to visitors.
- Incorporate the provisions of the Dog Management Program into education and outreach activities (see Passive Recreation section).
- Develop and install signs for any new dog regulations and use on-site staff and volunteer presence and interaction with the public to educate and inform the public on any changes to dog regulations.
- Develop signs to encourage on-trail use, especially where trails pass through sensitive areas.

11.4.4 Objective #4: Conduct projects and activities that provide opportunities for people to establish a relationship with the Open Space Program and land system.

Recommended Management Actions

- Continue to have Ranger, Public Information Counselors, Trail Guides, and other staff and volunteer presence in the North Boulder Valley as an outreach tool and to address specific management goals.
- Direct Rangers, Public Information Counselors, Trail Guides, and other staff and volunteers to communicate with visitors on focal topics in the North Boulder Valley area (such as Bell's twinpod, fragile environments [e.g., shale slopes], agricultural operations, dog policies, visitor interactions, etc.).
- Develop appropriate measures for determining achievement and effectiveness of Education and Outreach Division programs.
- Work with staff to develop education and outreach topics for projects involving the resources and management of the North Boulder Valley. Identify the highest priority projects and develop completion schedules for them.
- Identify current and future neighborhoods, adjacent landowners, and community groups in order to establish and maintain relationships with these groups and individuals.

- Communicate with other land management agencies to proactively address issues of mutual interest on an annual basis.
- Work cooperatively with other public agencies conducting environmental education (e.g., City of Boulder Mountain Parks, Boulder County Parks and Open Space, U.S. Forest Service, etc.)
- Work proactively with adjacent landowners on noxious weed control.

11.4.5 Objective #5: Engage in public participation processes which provide opportunities for public input and involvement in Open Space planning and decision making.

Recommended Management Action

- Develop outreach and public participation process mechanisms which facilitate community involvement in Program planning and management as needed. This may include:
  - Conduct open houses and other public meetings.
  - Complete a stakeholders directory.
  - Develop systems for tracking and responding to public comment.
  - Utilize the media in public participation processes.

11.4.6 Objective #6: Identify goals and priorities for volunteer programs in the North Boulder Valley and implement these programs with neighbors, visitors, and interest groups.

Volunteer projects and outreach efforts will be developed to enhance citizens understanding of the resources and management issues in North Boulder Valley and to assist staff in implementing the Management Plan. Priority topics to focus volunteer and outreach efforts will be developing a better understanding of the natural and agricultural resources in North Boulder Valley (e.g., educational programs, inventory and monitoring of resources), visitor use issues (e.g., new dog regulations, minimizing impacts to resources and other visitors), and weed control.

Recommended Management Actions

- Continue to utilize volunteers to supplement staff in attaining the management goals of this Plan. Volunteer activities and groups may include the following:
  - Boulder Regional Conservation Crewleaders: lead or assist staff in leading volunteers on trail, restoration, service learning, and Stewardship projects.
  - Student Service Learning: students fulfill school community service requirements assisting staff with administrative or field tasks. Projects include restoration, weed eradication, fence removal, and other projects requested by staff.
  - Internships: volunteers develop new skills and work experience while assisting staff with Open Space projects.

- Community Corrections Crews: incarcerated volunteers directly supervised by staff assist with cleanups, land reclamation, fence work, and other projects.
- Court-Ordered Community Service Workers: lend labor and expertise while fulfilling court-ordered community service obligations.
- Labor Source Crews: maintain Open Space trailhead areas while developing job and socialization skills.
- Special Events and One Day Projects (Earth Day, National Trails Day, Boulder Bike Week, etc.): provide opportunities for organizations, neighborhoods, or interested citizens to participate in short-term projects; groups and individuals may then choose to join other ongoing programs.
- National Civilian Community Corps (Americorps): opportunities for young adults to work on trail work, fence building, reconstruction, and reclamation on several Open Space areas.
- Open Space Stewardship Program: provides individuals, families, schools, businesses, and organizations the opportunity to learn about and help staff maintain Open Space areas; the program encompasses both maintenance and education.
- Trail Guides Program: Guides provide the public with information and assist staff with observations, field work, education and outreach efforts, interpretive programs, and other Open Space projects.

- Expand outreach activities, including:
  - Attending homeowners association/neighborhood meetings
  - Participating in special community events
  - Providing information to newcomers

12. PLAN IMPLEMENTATION

Implementing the North Boulder Valley Area Management Plan will require identification and prioritization of management actions to accomplish resource management objectives and plan goals. These prioritized management actions will be reviewed on an annual basis to determine annual work programs within Open Space budget and staff constraints. Implementation of the North Boulder Valley Area Management Plan will be balanced with other resource needs throughout the Open Space system via system-wide work programs. These annual work programs will incorporate the management needs of North Boulder Valley with those of the whole Open Space system.

Annual capital improvement projects and work programs are reviewed and approved by the Open Space Board of Trustees and City Council through the City's budget process. This Management Plan will be evaluated on a periodic basis and revised in approximately five years. Due to the size, complexity, and variability of the Open Space system, an implementation time schedule has not been developed for the North Boulder Valley Area Management Plan.

Many of the management actions will be implemented within the first few years of Plan approval while others will take many years to accomplish. Some management tasks are ongoing; a continuation of current management actions. Some new management tasks are short-term in duration; other new management tasks are long-term, representing considerable investments of time and energy.

12.1 CRITERIA FOR PRIORITIZATION

Management actions have been evaluated and prioritized into tiers. Criteria for tier designation include the urgency, importance, and relationship of each action to other resource goals, objectives, and actions. Other considerations include community need, legal requirements, budget, personnel, timing and duration of management actions, permit requirements, and system-wide management needs.

Tier 1 management actions are the highest priority and are expected to be accomplished first. Tier 1 management actions are generally those actions that are considered urgent, extremely important to the preservation and protection of the resource, and are directly related to the accomplishment of other resource goals and objectives.

Tier 2 management actions are next in priority. Tier 2 management actions are important, but not urgent, and meet a combination of other resource goals and objectives.

Tier 3 management actions are important, but not critical to resource protection needs. Tier 3 management actions do not have to be completed in the immediate future and primarily fulfill a specific resource goal or objective.

The following descriptions of "priority management action tiers" serve as examples of adapting management actions into an integrated approach to land and resource management. These descriptions are not comprehensive descriptions of all management actions in the North Boulder Valley Area Management Plan. Appendix 12.1 contains a comprehensive list of all resource goals, objectives, and management actions with a tier designation and project duration given for each management action.

12.2 PLAN PRIORITIES

12.2.1 Tier 1-Higher Priority (urgent and extremely important)

Preservation of the natural, cultural, passive recreational, and agricultural resources of North Boulder Valley is a top management priority. Management actions accomplishing this plan goal are Tier 1 management actions. Below are examples of high priority Tier 1 goals, objectives, and management actions.

ACQUIRE LANDS CONSISTENT WITH THE OPEN SPACE CHARTER AND THE AREA MANAGEMENT PLAN GOALS

Acquiring new Open Space lands is urgent and important. Lands sold for development are unavailable for Open Space purposes. Costs of acquisition continue to rise, reducing the purchasing power of limited funds. New Open Space lands enhance protection of natural and cultural resources, provide new areas to recreate, and help to maintain agricultural resources.

- Purchase lands which consolidate land inholdings.
- Reduce the impacts of commercial and industrial areas.
- Provide regional trail linkages and enhance protection of North Boulder Valley's natural resources.

INFORMATION COLLECTION

Collection of baseline information is an essential component of resource management. Baseline inventories, combined with systematic monitoring alert resource managers to changes and trends in resource condition. Once resources have been inventoried and potential threats have been identified, impacts can be prevented or mitigated. Monitoring and research programs aid resource managers in understanding the condition of natural resources, natural processes, and the effects of various management techniques. The North Boulder Valley Inventory Report contains extensive resource inventory but additional baseline information is needed to fully understand the effects of management actions.

- Complete a comprehensive inventory and ecological condition analysis of all rangelands to establish management objectives. Monitoring enables management actions to be evaluated for effectiveness.
- Conduct species surveys as part of system-wide surveys of the Open Space, with an emphasis on species of special concern identified through the Colorado Natural Heritage Program, Boulder County Comprehensive Plan, and federal and state listed species.
- Develop monitoring to evaluate vegetation community or species population trends and management treatment effects. Monitor Integrated Pest Management control methods and treatments to achieve a better understanding of the effects on native plants, restoration and reclamation techniques, livestock grazing, and prescribed fire. Monitor the status of rare plants and rare animals.

MINIMIZE NATURAL, CULTURAL, PASSIVE RECREATIONAL, AND AGRICULTURAL RESOURCE IMPACTS

Immediate threats to resources must be dealt with before preventive measures, restoration, and improvements can be made.

- Redirect recreational use by constructing a new trail and trailhead on East Beech to mitigate impacts on rare plants, wetlands, and prairie dog colonies.
- Protect native grasslands from the impacts of horse boarding operations. Allow horse boarding in confined areas (stalls or paddocks) and use irrigated pastures for grazing of boarded horses.
- Develop prevention and control strategies for target weed species within an Integrated Pest Management program to maintain or restore native grasslands.
- Protect native plant communities, rare species, and communities of special concern through a variety of natural resource management techniques, using or simulating natural processes, such as fire and grazing, where possible.
- Encourage the protection of large tracts of unfragmented land, undisturbed from the effects of recreational trails (i.e., West Beech, central Axelson, and East Beech properties) to maximize available undisturbed habitat and minimizes impact from developed "edges."
- Protect wetland water sources, wetland vegetation, processes which create and support wetlands, wetland functions, and wetland values.
- Provide emergency medical, fire suppression, and law enforcement services as needed to maintain and ensure public safety.

COORDINATED MANAGEMENT

Protecting significant natural and cultural resources while maintaining passive recreational and agricultural uses in the North Boulder Valley requires integrated and coordinated management.

- Coordinate and communicate with the City of Boulder Water Quality/Environmental Services staff to identify and implement agricultural Best Management Practices to prevent water quality degradation, particularly in areas that serve as a watershed to Boulder Reservoir.
- Coordinate wildlife management in the North Boulder Valley Area with other resource management plans on public and private lands.
- Integrate wildlife population and habitat protection/enhancement into other resource management actions.
- Use prescriptive grazing as an Integrated Pest Management technique to control target weed species. Spring grazing can be used to control Canada thistle and cheatgrass. Grazing regimes in knapweed infested areas should optimize native grass growth and reproduction (e.g., dormant season grazing). Support ongoing research investigating grazing effects on diffuse knapweed.

12.2.2 **Tier 2-Medium Priority** (important, but not urgent)

Proactive or preventive management actions are the foundation for adaptive management that enable land managers to plan and make wise management decisions before threats reach critical levels. Tier 2 management actions are meant to sustain natural functions and processes. Tier 2 actions ensure that resource impacts are limited and resources not irretrievably lost through unintended consequences. Balancing management actions to meet multiple resource management goals and objectives is the purpose of Tier 2 management priorities. Below are examples of Tier 2 goals, objectives, and management actions.

EDUCATION AND OUTREACH

Education and outreach activities can increase a visitor's experience and encourage public involvement in the protection of natural and cultural resources. Some education and outreach management actions are considered Tier 1 priorities (e.g., posting new dog regulations, distributing information on weed impacts and control).

- Disseminate additional information on agricultural history and practices, prairie dogs, raptors, fire ecology, reptiles and amphibians, wetlands, cultural resources, rare plant communities, grasslands, woody draws, and weed infestation and control.
- Educate agencies and the public about weed-free products (e.g., hay, road base) and other opportunities to prevent weed introduction and spread.
- Encourage use of designated trails and access points to prevent future impacts to natural and cultural resources.

RESEARCH

- Conduct research to improve understanding of natural resources and develop better management strategies.
- Encourage research and monitoring to determine optimal treatments for wetlands infested by Canada thistle.

PREVENTIVE MEASURES

- Conduct routine trail maintenance to minimize erosion and safety concerns.
- Inspect facilities annually or as needed for safety concerns.

12.2.3 **Tier 3-Lower Priority** (important, but not critical to resource protection needs)

These are land and resource management actions that repair resource damage, land degradation, natural functions, and improve ecological condition. Some Tier 3 management actions may be done in conjunction with other higher priority actions. Tier 3 management actions may take place over longer time frames, with measures of success substantially in the future. Below are examples of Tier 3 goals, objectives, and management actions.

RESTORATION OF ECOLOGICAL CONDITION

- Restore, reclaim, and enhance native vegetation in areas with restoration potential and/or reclamation needs. Use native plant species to reclaim areas disturbed by development, high visitation, or exotic plant control.
- Evaluate wetland restoration/creation in the area of the northwest Beech water tanks.
- Remove non-native fish from the Schneider pond to enhance habitat and protection for native tiger salamanders.

FUNCTIONAL IMPROVEMENTS

- Work with the Northern Water Conservancy District, Boulder County Parks and Open Space, and other City of Boulder Departments to explore the possibility of creating a trail corridor along the Boulder Feeder Canal. This trail corridor could provide a regional trail to Lyons and connect to other public lands north and west of Boulder (Heil and Hall Open Space).
- Expand the prairie dog Habitat Conservation Area on the Axelson property to allow for additional prairie dog habitat and to make a more effective barrier against dispersal. Use fencing and artificial and natural barriers (shrubs) to prevent the spread of prairie dogs onto irrigated land to the south.
- Work with the Colorado Archaeological Society and other volunteers to further research historical background information on cultural resource sites within North Boulder Valley.

- Replace irrigation turnout structures on Boulder Valley Ranch with concrete structures when necessary.
- Build or improve hay storage facilities on the Boulder Valley Ranch and Axelson/Johnson/ Dawson/Cowles properties. Covered facilities maintain crop quality and net value of harvested hay crops.

The management tiers are meant to provide a rough framework for implementing the North Boulder Valley Area Management Plan. It is important to be flexible and adaptive when developing annual work programs. New properties with different resource conditions and management needs will be acquired and incorporated into the work program.

Annual work programs are the basis for accomplishing specific management actions identified in the plan. Management actions will be adapted as new information and monitoring results are available. Ongoing management actions will continue to be evaluated, and may be modified, as new actions are implemented. Implementation of management actions in annual work programs will be a function of staff levels, budgeted funds, and priority. The best available information from research data, inventories, and monitoring results will continue to provide the basis for management decisions and actions. The North Boulder Valley Area Management Plan is scheduled for a comprehensive review in five years.

PLAN CONTRIBUTORS

NORTH BOULDER VALLEY AREA MANAGEMENT PLAN INTERDISCIPLINARY TEAM MEMBERS

Bob Crifasi (Water Resource Specialist) - water and irrigation management; geologic and paleontologic resource management

Mark Gershman (Natural Resource Planner) - wetlands management; coordination of wetland issues (permits, Best Management Practices)

Ann Goodhart (Property Agent) - real estate/property/easement management and related issues

Cindy Hansen (Education/ Outreach Specialist) - community outreach and education opportunities, and overall coordination with the Education Outreach Division

Dave Kuntz (Planning Supervisor) - planning context; coordination with administrative staff and Open Space Board of Trustees; and integrating project into department work program

John Leither (Maintenance Person III Trails) - trail and facility management; overall coordination with Land Management staff

Sean Metrick (GIS Technician II) - cartography and Geographic Information System analysis

Clint Miller (Wildlife Biologist) - wildlife management; coordination of research needs

Andy Pelster (Resource Specialist) - agricultural management; coordination of natural resource and ranger staff, agricultural lessees, ERO, and Hydrosphere consultants

Lynn Riedel (Plant Ecologist) - vegetation management; coordination of integrated pest management and fire management

Brent Wheeler (Resource Planner) - project leader and plan compilation; passive recreation and cultural resource management and coordination of public process, Geographic Information System needs, coordination with Boulder County Parks and Open Space, and City of Boulder Mountain Parks

Other Area Management Plan Contributors

Many other staff members, surrounding agencies, consultants, and volunteers were involved in collecting information and completing the Management Plan. Other significant contributors include:

City of Boulder Fire Department: Justin Dombrowski and Marc Mullinex - wildfire management

Randy Coombs (Boulder County Parks and Open Space Resource Specialist) - coordination with Boulder County Parks and Open Space

Brett Davis (Resource Technician) - Integrated Pest Management

Laurie Deiter (Natural Resource Specialist) - Integrated Pest Management

ERO (environmental consulting firm) - agricultural analysis of Boulder Valley Ranch lease

Ann FitzSimmons (Administrative Assistant) - editorial assistance

Geographic Information System (GIS) Lab: Robert Grover, Jeff Holland, Todd Kipfer, Sean Metrick, Jon Osborne - fieldwork, maps and data development

Pete Gleichman (Archaeologist with Native Cultural Resources) - cultural resource inventories and management

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Hydrosphere (water resource consulting firm) - water resource analysis

Matt Jones (Open Space Planner) - public process and comment response summary

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Joe Mantione (Mountain Parks Planner) - coordination with the City of Boulder Mountain Parks Division, Parks and Recreation Department

Dawn Packard (Ranger) - ranger and visitor services information

Rich Smith (Education and Outreach Coordinator) - education and outreach information and editorial assistance

Greg Toll (Wildfire Mitigation Administrator) - fire management

Open Space Board of Trustees (OSBT): plan guidance and approval

Current members are:
Jon Howard, Crystal Gray, Suzanne Bohan, Chris Mueller, and Linda Andes-Georges

Past members involved with North Boulder Valley Area Management Plan include:
Elaine Little, Allen Crockett, and Dave Bones

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APPENDICES

APPENDIX 1.1 CHARTER OF THE CITY OF BOULDER, COLORADO ARTICLE XII. OPEN SPACE SEC. 176. OPEN SPACE PURPOSES: OPEN SPACE LAND

The management of Open Space lands is guided by the City Charter, as approved by the City of Boulder voters in 1986. Open Space land shall be acquired, maintained, preserved, retained, and used only for the following purposes:

- Preservation or restoration of natural areas characterized by or including terrain, geologic formations, flora, or fauna that is unusual, spectacular, historically important, scientifically valuable, or unique, or that represent outstanding or rare examples of native species;

- Preservation of water resources in their natural or traditional state, scenic areas or vistas, wildlife habitats, or fragile ecosystems;

- Preservation of land for passive recreation use, such as hiking, photography or nature study, and if specifically designated, bicycling, horseback riding, or fishing;

- Preservation of agricultural uses and land suitable for agricultural production;

- Utilization of land for shaping the development of the city, limiting urban spawl and disciplining growth;

- Utilization of non-urban land for spatial definition of urban areas;

- Utilization of land to prevent encroachment on floodplains; and

- Preservation of land for its aesthetic or passive recreational value and its contribution to the quality of life of the community.

APPENDIX 3.1 INTERIM WILDFIRE MANAGEMENT PLAN

The Open Space Program engages in wildfire prevention and suppression and uses prescribed fire to meet resource management objectives. The fire management program is conducted following the guidance provided by the Long Range Management Policies, Boulder Fire Department Master Plan (City of Boulder 1996a), and the Wildland Fire Management Operations Plan (City of Boulder 1996d). The Open Space Wildland Fire Hazard Mitigation Project (FIRMIT) and annual prescribed burn planning are based on these documents. An additional fire management plan is needed to provide a framework for integrating Open Space fire management with other resource management activities. In the absence of a system-wide fire management document, this section of the North Boulder Valley Management Plan includes guidelines for protecting natural resources and outlines basic considerations and constraints for fire management planning. Recommendations for managing wildfire in North Boulder Valley are presented.

Wildfires are those fires which result from a natural cause such as lighting or human carelessness (e.g., a cigarette thrown from a car). Suppression of fires during the past 100 years combined with residential development in North Boulder Valley, creates a high risk of wildfires or fire hazard. Fire hazards will be reduced through a variety of appropriate management actions that are consistent with accomplishing the resource management objectives of the North Boulder Valley Management Plan. Fire suppression will continue where natural fires threaten human lives and property, and where natural fires do not meet resource management goals or prescriptions. Wildfire management involves three major components: prevention and mitigation, suppression, and post fire follow-up.

FIRE PLANNING AND MANAGEMENT ZONES

North Boulder Valley has been divided into three fire planning and management zones based on the following: topographic features that affect fire behavior, sensitive resources, and resource management activities that vary across the landscape. Zones are characterized in terms of vegetation, terrain, and land use management. The information compiled for each zone is designed to assist in the development of prescribed burn plans, the formulation of wildland fire suppression strategy, and the implementation of Best Management Practices for resource protection. Appendix 3.2 contains a description of each fire planning and management zone and a map of the conceptual locations.

FIRE MANAGEMENT CONSTRAINTS AND CONSIDERATIONS

Implementing any phase of the fire management program within the North Boulder Valley Management Area includes:

- Weather
- Air quality conditions/status
- Site conditions addressed by Best Management Practices (e.g., wet and muddy conditions)
- Proximity to urban interface

- Hazardous materials
- Resource management conflicts (e.g., , grazing rotations, weed control treatments, sensitive wildlife habitat, rare plant habitat)
- Species biology (e.g., timing in terms of plant growth stages and animal life cycles)
- Fire ecology of a particular plant community

WILDFIRE MANAGEMENT

Wildfires are of natural or unauthorized human origin and do not meet an approved management prescription or resource management plan (City of Boulder 1995). The Wildland Fire Management Operations Plan states that, "All wildfires will be suppressed where and when possible" (City of Boulder 1996d). The Long Range Management Policies direct Open Space staff to "work with adjacent landowners, land managers, and local agencies to reduce the potential impacts of wildfire on human life, private property, and the cultural and natural resources of Open Space" (City of Boulder 1995).

Uncontrolled wildfires near the urban interface can result in high economic costs and environmental and aesthetic consequences (City of Boulder 1995). An urban interface occurs where urban development is adjacent to undeveloped areas such as publicly-owned land. Vegetation occurring throughout the Management Area has the potential for sustaining wildfire. Fire-adapted plants like ponderosa pine and native grasses are common, and in some areas fire suppression has resulted in accumulated fuels. The North Boulder Valley Inventory Report (City of Boulder 1996c) describes fire history and ecology in the Management Area.

Certain weather conditions can promote destructive wildfires that may affect neighboring land. Boulder's weather has a strong influence on fire behavior. The Front Range experiences strong winds, thunderstorms, high temperatures, and low relative humidities. Climatic conditions and combustible vegetation combine to create an environment susceptible to wildfires. In addition, as the number of Open Space visitors increases each year, the chance for human-ignited wildfires increases.

Recommended management actions for this sub-section will be grouped under the major components of wildfire management: prevention and mitigation, suppression, and post fire follow-up.

Prevention and Mitigation

The Wildfire Prevention Program informs citizens of wildfire hazards and of ways to mitigate fire effects through planning and education. The Wildland Fire Hazard Mitigation Project defines the wildfire threat and provides the public with information on wildfire mitigation and prevention. The important elements of this project are: public education, technical training, planning, and mitigation activities.

Recommended Management Actions

- Continue to participate in the interagency development of public education. Important topics include wildfire hazard awareness, prevention and mitigation strategies, and fire ecology (see Education and Outreach section).
- Participate in the interagency coordination of technical training in wildfire prevention and suppression. Target fire managers, firefighters, resource managers, volunteer fire departments, police departments, American Red Cross, and other support personnel (see "Suppression" below).
- Participate in the development of interagency goals, policies, and procedures for wildfire management. Current planning documents include the Wildland Fire Management section within the Boulder Fire Department's Master Plan and the Wildland Fire Management Operations Plan.
- Continue to participate in interagency wildfire prevention and mitigation programs. Integrate natural and cultural resource management goals and objectives for the North Boulder Valley with mitigation planning and implementation. Mitigation involves:
  - Identifying and assessing wildfire hazard
  - Prioritizing mitigation projects
  - Identifying key audiences in the community and providing them with information on wildfire hazards and mitigation techniques
  - Identifying and protecting sensitive species and communities, other native plants and wildlife, water quality, and air quality through Best Management Practices
  - Using multiple tools to physically mitigate wildfire hazards including mechanical methods (e.g., trimming, downed wood removal) and prescribed fire
  - Developing long-term plans to assess wildfire risk and implement mitigation techniques

Suppression

The Wildland Fire Management Operations Plan provides guidelines and procedures for interagency wildfire suppression in the Boulder Valley. All fires that are not defined as prescribed or prescribed natural fires are suppressed where possible. The Long Range Management Policies specify the use of suppression techniques that minimize damage to natural resources and ensure fire fighter and citizen safety. Open Space policies require a staff resource advisor to participate in the evaluation and implementation of fire suppression alternatives on Open Space land. In the North Boulder Valley, fire suppression will focus on fire fighter and public safety, protection of structures and private property, fire fighter training, planning and resource protection, and public education.

Recommended Management Actions

- Ensure firefighter and public safety.
  - Evacuate public and pets to predetermined staging, sheltering, or safety zones.
  - Enforce and ensure that all safety guidelines taught in firefighter training are strictly adhered to by firefighters and cooperators.
  - Identify and avoid threats to human health such as hazardous materials.

    - Continue implementation of safety measures throughout the complete burn period.
- Use appropriate suppression tactics to protect homes and other structures and to prevent the spread of fire to private lands.
- Participate in the interagency coordination and development of technical training in wildfire suppression. Target fire managers, firefighters, resource managers, volunteer fire departments, police departments, American Red Cross, and other support personnel.
    - Train using nationally recognized fire courses designed by the National Wildfire Coordinating Group that incorporate up-to-date methods and technology.
    - Include Best Management Practices for protecting natural resources and preventing the spread of non-native plant species of concern during fire suppression, in training.
    - Provide firefighters with background information on local site conditions and sensitive resources.
    - Develop resource advisor training.
    - Use prescribed fires, practice burns, and other field training whenever possible.
    - Provide regular training opportunities to refresh basic firefighter skills.
- Protect natural resources through pre-suppression planning and use of a resource advisor during fire suppression.
    - Characterize the North Boulder Valley Management Area for fire management purposes by identifying sensitive resources, access points, and potential staging and safety zones, structures, physical barriers to fire spread, and land ownership. The Wildland Fire Hazard Mitigation Project and the North Boulder Valley fire planning and management zone descriptions are designed to provide most of this information.
    - Incorporate information for fire management in a Geographic Information System database. Generate maps that display pertinent information.
    - Use suppression techniques that least damage natural resources and consider fire fighter and citizen safety. Implement Best Management Practices.
    - Ensure full extinguishment, when necessary, and allow for natural extinguishment when possible.
    - Use a resource advisor to coordinate with the fire Incident Commander.
    - Keep the community well-informed about fire management tactics and objectives.

Post-fire Suppression

Recommended Management Actions

- Identify areas of concern for soil stabilization.
- Identify areas of concern for vegetation and wildlife recovery.
- Identify areas of concern for water movement and erosion.
- Incorporate operational guidelines for addressing these issues. Use a resource advisor to determine whether preliminary reclamation activities (e.g., mitigation of fire line construction disturbance) are appropriate.
- Inform the public about post-fire activities.

BEST MANAGEMENT PRACTICES FOR GENERAL FIRE MANAGEMENT

Fire Operations/Resource Protection

- Formally identify roads, trails, emergency access, and other access and egresses prior to fire event.
- Incorporate into the fire operations plan different suppression strategies, control, contain, and confinement, based on ecosystem needs.
- Allow for natural extinguishment when possible.
- Assess the need for post-fire preliminary reclamation as directed by the fire operations plan. Implement reclamation during the mop-up phase of fire suppression under the direction of a resource advisor.
- Follow the guidance of resource advisors within the structure of the fire management operations.
- Before a fire event, identify sensitive areas within the planning unit which require special protection.
- Identify staging areas in a pre-plan to reduce unnecessary ground disturbance.
- Continue training and educational programs for firefighters on Best Management Practices within the Management Area.
- Reduce the risk of wildfire, and protect natural resources and public property through implementation of the fire mitigation program.

APPENDIX 3.2 FIRE PLANNING AND CONCEPTUAL MANAGEMENT ZONES

The fire management zones described below are conceptual and may be modified as additional lands and management needs are identified. Figure 7 is a map depicting the location of the conceptual fire management zones for North Boulder Valley.

WEST ZONE (dominant theme: foothills ecotone)

Vegetation types: foothills grassland, woody draws, shale communities, ponderosa pine savannah and woodland, wetlands, non-native grass; also of importance for management: tallgrass patches, Canada thistle patches

Sensitive resources: rare plant habitat (Bell's twinpod, birdfoot violet), woody draws, wetlands, grassland nesting bird habitat, rattlesnake denning area

Landscape features: steep slopes with east, north, and south aspects; hogback ridges; shale outcrops

Boundaries/barriers: North: future development; East: U.S. 36; South: future development; West: rocket fueling facility, housing development; Northwest: Boulder Mountain Parks; Northeast: Six-Mile Fold Natural Area

Land Management/Use: natural area, recreational trails, potential use of prescriptive grazing (no livestock grazing has occurred for several years)
Fire history: Olde Stage fire (1990)

CENTRAL ZONE (dominant theme: mixed grass and shortgrass prairie)
Vegetation types: shortgrass, mixed grass, shale communities, riparian woody and herbaceous, wetland, non-native forb, and grass (Canada thistle, Mediterranean sage, cheat grass, and diffuse knapweed)
Sensitive resources: rare plant (Bell's twinpod) habitat, grassland nesting bird habitat, prairie dog Habitat Conservation Area
Landscape features: mesas with flat tops and moderate to steep-sloped sides, grasslands with gentle slopes and small drainage, shale outcrops
Boundaries/ barriers: North: Neva Road (Open Space properties extend north of Neva Rd.); East: Farmer's Ditch, housing development, Lefthand Reservoir; South: sparse to moderately dense housing development; West: U.S. 36; Central: Longhorn Road, light industry near U.S. 36 and Longhorn Road; Other: structures on property adjacent to Boulder Land Irrigation and Power (coffee roasting business) and inholding property (antenna equipment)
Land Management/Use: native grassland, recreational trails, horse boarding and cattle grazing
Fire history: Olde Stage fire (1990)

EAST ZONE (dominant theme: irrigated and non-irrigated hay fields)
Vegetation types: non-native hayfield, native and non-native hayfield/pasture, wetlands (cattail marsh, sedge/rush, alkaline), native mixed grass
Sensitive resources: wetlands, raptor perch sites (large trees on Boulder Valley Ranch), prairie dog Habitat Conservation Area
Landscape features: upland gentle to moderate slopes, lowland gentle slopes, wetlands and grassland contiguous with Boulder Reservoir
Boundaries/ barriers: North: Niwot Road, private farms; East: Boulder Reservoir and surrounding land, housing development and private farms; South: Boulder Reservoir and surrounding land, private farms, housing development; West: Farmer's Ditch, housing development; Central: 55th Street, Boulder Reservoir Feeder Canal (owned by Northern Colorado Water Control District), seasonally irrigated hayfields
Land Management/Use: irrigated and non-irrigated hayfields and pastures, native mixed grassland and wetlands, horse boarding, cattle grazing
Fire History: prescribed fires East Boulder Valley Ranch 1993, Boulder Valley Ranch 1996

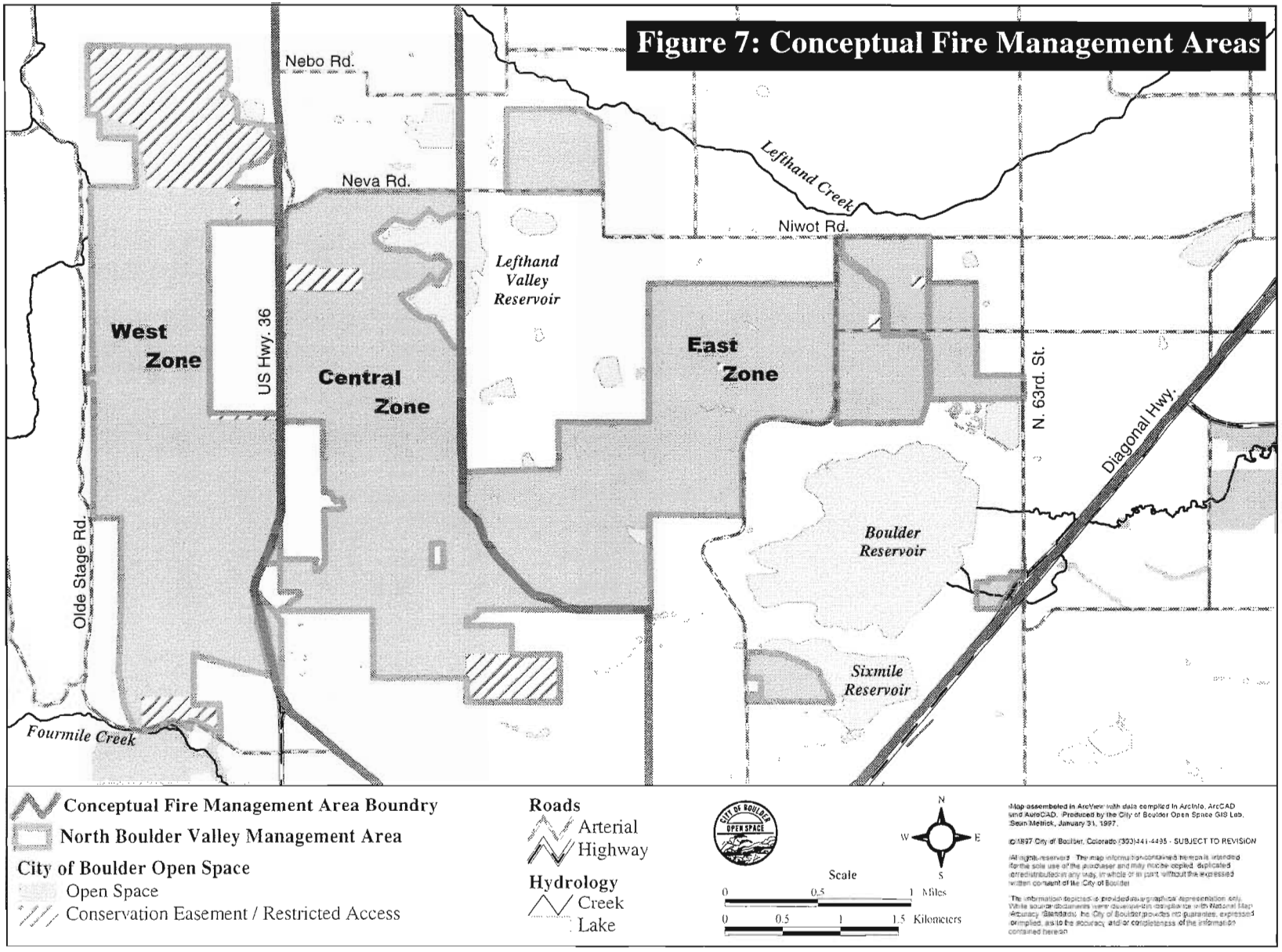
Figure 7: Conceptual Fire Management Areas
Nebo Rd.
Neva Rd.
Lefthand Creek
Niwot Rd.
Lefthand Valley Reservoir
West Zone
US Hwy. 36
Central Zone
East Zone
N. 63rd. St.
Diagonal Hwy.
Olde Stage Rd.
Boulder Reservoir
Sixmile Reservoir
Fourmile Creek
Conceptual Fire Management Area Boundry
North Boulder Valley Management Area
City of Boulder Open Space
Open Space
Conservation Easement / Restricted Access
Roads
Arterial
Highway
Hydrology
Creek
Lake
CITY OF BOULDER OPEN SPACE
N
W
E
S
Scale
0 0.5 1 Miles
0 0.5 1 1.5 Kilometers
Map assembled in ArcView with data compiled in ArcInfo, ArcCAD and AutoCAD. Produced by the City of Boulder Open Space GIS Lab, Sean Metrick, January 31, 1997.
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APPENDIX 3.3 PRESCRIBED BURN PLAN OUTLINE

Introduction

Goals/Objectives

Public Awareness/Education

Environmental/Weather Conditions

Environmental Considerations

Burn Area Description
- A. Location
- B. Drainage
- C. Exposure
- D. Slope
- E. Size of burn area
- F. Elevation
- G. Fire behavior fuel model
- H. Fuel loading by class
- I. Economic constraints
- J. Target date
- K. Time of day

Burn Prescription
- A. Air temperature
- B. Relative humidity
- C. 20 foot w ind speed
- D. Fine dead fuel moisture
- E. Precipitation

Prescribed Fire Behavior
- A. Predicted fire behavior
- B. Flame length
- C. Rate of spread
- D. Wind direction
- E. Smoke dispersion
- F. Fire characteristics
- G. Vegetation characteristics

Site Preparation

Pre-Burn Work List

A. Burn plan approved
B. 10 hour fuel sticks in place
C. Area weather forecasts
D. Identify water sources
E. Inform local fire districts, communications, and residents
F. Identify access/egress and potential hazards
G. Notify City Manager's office and Public Relations
H. Burn Team assembled/briefed
I. Contingency plan/safety zones identified
J. Any site specific needs identified

Public Information/Pre-burn Contacts

A. Air quality
B. Local media
C. Boulder County Public Information Officer
D. Boulder County Communications
E. Boulder County Sheriff's Department
F. Local fire districts
G. City of Boulder Fire Department
H. Local residents/adjacent landowners

Organizational Structure

A. Prescribed fire incident commander
B. Public Information Officer
C. Resource advisor
D. Safety officer
E. Ignition specialist
F. Holding boss
G. Holding crew
H. Mop up crew
I. Field observers

Resource Coordination

Time Tables

Cooperating Agencies

Maps

APPENDIX 3.4 PREVENTION AND CONTROL OF TARGET WEED SPECIES

This appendix is a summary of species-specific prevention and control strategies for target weed species in the North Boulder Valley Management Area. General information about weeds, Integrated Pest Management, and relevant governing policies can be found in the body of the management plan.

These guidelines for controlling high priority weed species in North Boulder Valley are not intended to limit the control and prevention strategies available to Open Space resource managers. As new equipment and information becomes available, they will be evaluated for possible integration into the Integrated Pest Management program, following City of Boulder and Open Space policies.

Cheatgrass a.k.a. Downy Brome (*Bromus tectorum* L.)

GENERAL INFORMATION

Description/Biology: Cheatgrass is an annual, or winter annual, 4-30 inches in height which reproduces by seed. Its stems and leaves are covered by soft "downy" hairs. It has a "drooping" inflorescence which contains many seeds. Cheatgrass seeds germinate in the fall, overwinter as seedlings, and flower in the spring. Seeds remain viable in the soil for two to five years.
Habitat: Within the Management Area, cheatgrass is found along roadsides, on rangeland, pastures, cropland, disturbed and waste areas. It has the potential to invade the majority of ecosystems found in the North Boulder Valley.
Threats to Open Space: Cheatgrass is a very efficient competitor for early spring soil moisture which would otherwise be used by native perennial grasses. In this way, the species can displace native vegetation and inhibit natural succession. Dried, mature plants pose a fire hazard. Young plants can be utilized as forage in some areas, but as they mature, seeds can cause injury to the mouths and eyes of grazing animals. Cheatgrass is also a common crop seed contaminant.

PREVENTION STRATEGIES

The use of weed-free seed, hay and fill dirt is critical to the prevention of new cheatgrass infestations.

CONTROL STRATEGIES

When choosing a control strategy, it is important to keep a couple of factors in mind. First, cheatgrass produces copious numbers of seeds (300+ per plant) and those seeds have a viability of two to five years. Second, strategies which cause wide scale disturbance (e.g., create patches of bare soil) may need to be coupled with activities that promote regeneration of native species.

For example, applying an herbicide to an area with a dense cheatgrass population will result in a large area of bare ground which is then susceptible to reintroduction or to invasion by another weedy species. Therefore, reseeding with native plant species may be necessary to obtain lasting results.

Mechanical: Spring mowing can reduce seed production, but should be used in conjunction with other methods to achieve the best results.
Chemical: Chemical control of cheatgrass is generally only used in agricultural areas, but atrazine has been researched for use on natural areas with some promising results. Open Space currently uses the following herbicides to control cheat grass in agricultural areas: Roundup (glyphosphate), Pursuit (imazethapyr), and Velpar (hexazinone). These herbicides are generally applied by tractor spraying. Herbicides which could potentially be used to control cheatgrass include: atrazine, bromacil, cynazine, chloropropham, diclofop, matribuzin, promamide, propham, simazine, terbacil, and trifluralin. Open Space does not currently use herbicides for cheatgrass control in natural areas (i.e., areas other than agricultural fields).
Biological: There is limited information on insect control methods, but it has been shown that some migratory grasshoppers will feed on cheatgrass. Spring grazing, as with spring mowing, can reduce seed production, but needs to be used in conjunction with other control strategies.
Other: Prescribed burns will kill seedlings and may reduce the seed bank, but surviving plants may produce seed more vigorously and more prolifically. These burns need to occur in the early spring in order to achieve the best results. Research has indicated that soil sucrose treatments (1600C/hectare/year) may be effective in combating annual plants such as cheatgrass.

Mediterranean Sage (*Salvia aethopsis* L.)

GENERAL INFORMATION

Description/Biology: Mediterranean sage is an aromatic, wooly biennial that grows up to three feet in height. In its first season it grows in the form of a rosette of felt-like grayish to blue-green leaves. In its second season Mediterranean sage "bolts" forming a stiff, squarish, profusely branched stem displaying white flowers at the branch tips. Upon maturity, the stalk detaches and distributes its seed though a tumbleweed action.
Habitat: Mediterranean sage is spreading rapidly in many parts of the west, including the North Boulder Valley. It has the potential to invade pastures, rangelands, meadows, and other open areas. Mediterranean sage infestations in Colorado are limited to Boulder County.
Threats to Open Space: Mediterranean sage is an aggressive weed that can form monocultures and has the potential to displace upland native vegetation throughout the North Boulder Valley.

PREVENTION STRATEGIES

Mediterranean sage was most likely introduced into the North Boulder Valley as an herb that escaped from a local garden. Public education concerning responsible landscaping may be an effective strategy for preventing new infestations. Fences may be used to contain an infestastion. Mature plants collect along fence lines and can be burned preventing further seed dispersal.

CONTROL STRATEGIES

Mechanical: Cutting the tap root 2-3 inches below the ground with a shovel is an effective method for combating lower density populations. This method is most effective if it occurs when the plant is first starting to bolt. Mowing is currently used by Open Space to contain an infestation, although this will not eliminate individual plants. Mowing can induce perennial-like growth in Mediterranean sage, but can also reduce the amount and spread of seeds.
Chemical: Open Space currently uses Tordon 22k (picloram) to control Mediterranean sage. Herbicide control is most effective when coupled with reseeding of native vegetation to increase competition.
Biological: Open Space is currently experimenting with the Mediterranean sage weevil (*Phrydiuches tau*) as a method of control.

Diffuse Knapweed (*Acosta diffusa* L.)

(syn. *Centaurea diffusa* L.)

GENERAL INFORMATION

Description/Biology: Diffuse knapweed is a biennial, occasionally annual, or short-lived perennial, that grows 1 to 3 feet tall. It is diffusely branched and has pinnately divided leaves. Its flowers range in color from white to rose to purplish. First year plants take the form of a rosette that eventually "bolt" into the mature plant. Each plant is capable of producing 1,000-18,000 seeds (a dense stand of knapweed can produce 40,000 seeds per square meter) and are spread when the mature plant breaks off at the base and tumbles with the wind. Seeds can remain viable in the soil for up to ten years. Humans also disperse seeds by way of vehicles, contaminated fill dirt, and contaminated hay.
Habitat: Diffuse knapweed was introduced from Eurasia and is now common throughout the arid west. It infests roadsides, waste areas, dry rangelands, pastures, and other upland areas.
Threats to Open Space: Diffuse knapweed is the most widespread and problematic weed in the Management Area. It is causing detrimental effects on most dry, upland habitats in the North Boulder Valley, including that of the rare Bell's twinpod (*Physaria bellii*). Knapweed displaces native vegetation by competing for moisture and nutrients. In addition, there is some evidence which indicates that knapweeds produce an allelopathic substance (a chemical substance which inhibits surrounding vegetation) thereby reducing competition. (Whitson et al, 1992).

PREVENTION STRATEGIES

Special care should be taken to use only weed-free fill dirt and hay where possible. Fences may be used to contain an infestastion. Mature plants collect along fence lines and can be burned preventing further seed dispersal.

CONTROL STRATEGIES

When selecting a control strategy for diffuse knapweed, the quantity of seed produced, and the length of seed viability are important considerations.

Cultural: Irrigation, where possible, can be effective in controlling diffuse knapweed and has the added benefit of stimulating grass competition. Where disturbance has occurred, seeding of native vegetation may be necessary to prevent further infestation.
Mechanical: Small populations can be hand pulled if care is taken to extract as much of the root as possible. If seed set has already occurred, the plants should be bagged and removed. Mowing can reduce seed production, but it will not kill the plant.
Chemical: Herbicide application can be effective when used in conjunction with other control and prevention strategies. Spring applications, before flowering, are most effective. The choice of application technique depends on the density of the infestation, terrain, and other factors. For small or scattered infestations, or on rough terrain, herbicides can be applied with a wick. On larger or denser infestations, they can be ground sprayed by way of a backpack or tractor. In the case of very large, dense populations, aerial spraying may be the most efficient method. Open Space currently uses Transline (clopyralid) or Tordon 22k (picloram) on knapweed. Herbicides which could potentially be used include 2,4-D, Banvel (dicamba), or tank mixes of any of the above.
Biological: Livestock (cows, sheep, and goats) will eat diffuse knapweed but the efficacy of grazing as a control method requires further study. Results from current, ongoing research on the effects of cattle grazing on knapweed (Beck 1996), will be incorporated into the Open Space Integrated Pest Management program. Insect control of diffuse knapweed is being researched and may prove an effective method of control. In 1992 Open Space released two types of insects on diffuse knapweed in the North Boulder Valley. A seedhead fly, *Euphoria affinis*, is a knapweed predator that is common throughout Colorado.
Other: Burning or cultivation can temporarily reduce knapweed populations, but they need to be used in conjunction with other methods to achieve any lasting control. Burning to stimulate native plant growth, and improve competition, is a promising control strategy. Research on effects of fire on knapweed is needed.

Canada Thistle (*Breea arvensis* L.)

(syn. *Cirsium arvense* L.)

GENERAL INFORMATION

Description/Biology: Canada thistle is a 1 to 6 foot tall colony forming perennial. It has an extensive root system and reproduces both vegetatively and by seed. Its leaves are alternate, lance-shaped, and divided into spiny tipped irregular lobes. Multiple seed heads occur on each plant. Flowers are usually pink and occasionally purple. Seeds are dispersed by the wind.
Habitat: Canada thistle is widespread throughout the Management Area, especially around agricultural areas, irrigation ditches, and riparian corridors.
Threats to Open Space: Canada thistle is a very aggressive and difficult to control weed which spreads rapidly and forms very dense patches. It out competes most of our native species and will form monocultures under the right conditions. Delicate wetland ecosystems are especially vulnerable to invasion, but meadows, rangelands, cropland, and riparian areas are vulnerable as well.

PREVENTION STRATEGIES

The use of weed-free fill dirt, hay, and crop seed is critical to the prevention of new Canada thistle infestations.

CONTROL STRATEGIES

There are a number of factors to keep in mind when choosing a control strategy for Canada thistle. First, every piece of the root system is capable of generating a new plant. Second, seeds may remain viable in the soil for up to twenty years. Third, Canada thistle maintains large root reserves that help it recover from stress. Finally, one of the best ways to control perennial weeds is a long-term program of stressing the plant, thereby depleting its root reserves. A combination of the following methods will achieve the best results.

Cultural: Under optimum conditions in an agricultural setting, cultivated grasses and alfalfa can compete with Canada thistle.
Mechanical: Frequent (e.g., monthly) mowing is effective in keeping Canada thistle's root reserves low. This method is especially effective when followed by a fall herbicide treatment. Mowing by itself is only effective at high frequencies over a number of years. Hand pulling isn't effective because of Canada thistle's regeneration capabilities.
Chemical: Herbicides should be used in conjunction with cultural and/or mechanical strategies. Application methods and herbicide selection vary with infestation density and environmental factors. Small infestations or infestations in ecologically sensitive areas may require the use of wick applicators and/or specialized herbicides. Larger infestations in less sensitive areas can be ground sprayed using a backpack sprayer or a tractor. In agricultural areas, Open Space currently

uses Roundup (glyphosphate), Banvel (dicamba), Bronate, Bladex (cyanazine), Buctril (bromoxynil), and Express (tribenuron). For natural areas, Open Space currently uses Rodeo (glyphosphate), with an added surfactant in ecologically sensitive areas, Telar (chlorsulfuron), and Roundup (glyphosphate) in less sensitive areas. Rodeo and Roundup are generally applied with a wick. Other herbicides which could potentially be used include 2,4-D.
Biological: Insect controls are currently being experimented with, but should be used with caution due to the possible negative impact on native thistle species.
Other: Spring burning or livestock grazing in Canada thistle infested communities can be effective when used in conjunction with other control strategies. An effective combination of treatments involves grazing or burning in early to mid-spring, followed by a summer mowing that is timed according to thistle development.

Russian Olive (*Elaegnus angustifolia* L.)

GENERAL INFORMATION

Description/Biology: Russian olive is a moderate sized (10-25 feet) tree with narrow, 2-3 inch, long silvery-green leaves. Its trunks and branches are armed with sharp, woody thorns. Russian olive reproduces by way of root suckers and seeds. Seeds are silver to green initially, turning tan to brown upon maturity, and olive shaped. Seed dispersal occurs mainly through birds.
Habitat: Russian olive was originally promoted to provide wind breaks and help prevent soil erosion. Its occurrence in the Management Area reflects these uses, but it has also spread to ditch and stream banks, into fields, and other areas frequented by birds.
Threats to Open Space: Russian olive is one of the hardiest and most aggressive trees introduced into the United States. This aggressive species displaces native cottonwood and willow trees along stream sides. Russian olive seedlings thrive in the shaded riparian understory and out compete native seedlings that are intolerant of shade. An estimated 1/3 of bird species who utilize cottonwoods and willows cannot use Russian olives. Russian olive trees affect agricultural operations by invading pastures and clogging irrigation ditches.

PREVENTION STRATEGIES

Russian olive is still planted locally as an ornamental tree and a wind break. Public education concerning responsible landscaping may be an effective strategy for preventing new infestations.

CONTROL STRATEGIES

Mechanical: The complete removal of smaller (<3 inches in diameter) trees can be achieved using a weed wrench. If seeds are present, the tree should be removed. Girdling or cutting larger trees down is only effective if an herbicide is immediately applied to the cambium to kill the roots, otherwise new branches will sprout from the roots and stump creating a "bush" that is even

more difficult to eradicate. Downed trees should be removed whether or not they contain seeds. Downed trees not only create a visual blight, but they also kill underlying vegetation, creating an ideal disturbance for invasion by opportunistic weeds.
Chemical: As mentioned above, an herbicide should be applied to the cambium of cut trees. It can be applied with a brush, sponge, or large gauge hypodermic needle. Herbicides used by Open Space for this purpose include: Garlon (triclopyr) and Roundup (glyphosphate).
Other: The burning of dense populations of Russian olive has been experimented with by other agencies with marginal success.

Dalmation Toadflax (*Linaria genistifolia* ssp. *dalmatica* L.), Yellow Toadflax a.k.a. butter and eggs (*Linaria vulgaris* Mill.) And Myrtle Spurge (*Tithymalus myrsinites* L. {syn. *Euphorbia myrsinites* L.})

Dalmation toadflax, yellow toadflax, and myrtle spurge occur in the Management Area in isolated patches. They are of greater concern in other parts of Open Space, and have the potential to become serious problems in the North Boulder Valley. Of greatest concern is the ability for myrtle spurge to invade the habitat of the rare Bell's twinpod.

These species should be hand pulled, bagged, and removed. Care should be taken to extract as much of their roots as possible as all three species can reproduce from root fragments. Care should also be taken to prevent or minimize skin contact with the milky latex of these plants, especially that of myrtle spurge, because it can be a serious irritant.

REFERENCES

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Stubbendieck, J. et. al. 1994. Weeds of Nebraska and the Great Plains. Nebraska Department of Agriculture.

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APPENDIX 3.5 UNDESIRABLE PLANT SPECIES
(As of 1996)

Current plant species that are designated as undesirable and must be managed under the Colorado Weed Management Act:

leafy spurge	*Tithymalus esula* (L.) Scopoli *Euphorbia esula* L.
Russian knapweed	*Acroptilon repens* (L.) De Candolle *Centaurea repens* L.
spotted knapweed	*Acosta maculosa* (L.) Holub *Centaurea maculosa* L.
diffuse knapweed	*Acosta diffusa* (Lamarck) Sojak *Centaurea difffusa* Lamarck

Additional plant species designated as undesirable plants under the Boulder County Undesirable Plant Management Plan:

Canada thistle	*Breea arvense* L. *Cirsium arvense* (L.) Scopolic
musk thistle	*Carduus nutans* L.
purple loosestrife	*Lythrum salicaria* L.
Mediterranean sage	*Salvia aethiopis* L.

Additional plant species designated as undesirable plants by the City of Boulder Open Space Department:

Russian olive	*Elaegnus angustifolia* L.
dalmation toadflax	*Linaria genistifolia* (L.) P. Miller subsp. *dalmatica* (L.) Maire et al. *Linaria dalmatica* (L.) P. Miller var. *macedonica* Fenzl
yellow toadflax	*Linaria vulgaris* P. Miller

hoary cress	*Cardaria draba* (L.) Desv.
perennial pepperweed	*Lepidium latifolium* L.

Species of concern: (important, but not on state, County, or City list)

myrtle spurge	*Euphorbia myrsinities* L.
bouncing bet	*Saponaria officinalis* L.
dames rocket	*Hesperis matronalis* L.
tamarisk	*Tamarix ramosissima* Ledeb.

APPENDIX 12.1 PRIORITIZED MANAGEMENT ACTIONS

The table below is a prioritized summary of management actions. The summary is derived from all the individual resource goals, objectives, and recommended management actions in the body of this Plan. Each section of the table has been reviewed by the interdisciplinary team in order to integrate the various resource goals, objectives, and recommended management actions. In many cases, individual resource objectives and management actions are so closely related that some repetition occurs.

In order to avoid repetition during Plan implementation, the resource objectives and management actions in this Appendix have been integrated and regrouped into discrete management actions. The resulting discrete management actions have then been placed in the appropriate resource section in the table. For organizational purposes, the table has been arranged by individual resource section. The table thus prioritizes management actions, provides a summary for Plan implementation, and will guide the development of annual work programs. For a complete listing of all resource objectives and management actions, please refer to the individual resource sections in the body of this Plan.

Summarized Management Goals, Objectives, and Actions
The table summarizes the prioritized management actions, according to tiers, and describes the duration and timing of each management action. The first column summarizes the goals, objectives, and management actions.

Duration and Timing of Each Management Action
The second column provides the duration and timing of each management action. The first letter describes if the action is current or new. New actions (N) have not been started and need to be incorporated into annual work programs, according to their respective prioritization. Current actions (C) are already incorporated into annual work programs.

The next letter describes how long it will take to accomplish an action. Short-term actions (S) should take less than two years to accomplish, once they have been started. Long-term actions (L) should take more than two years to accomplish, once they have been started. Ongoing actions (O) will continue over time and represent considerable investments of time and energy.

Tier Designation
The third column designates a tier for each management action. Tier 1 management actions are the highest priority and are expected to be accomplished first. Tier 2 management actions are next in priority and are important, but not urgent. Tier 3 management actions are important, but not critical, to resource protection needs and do not have to be completed in the immediate future (see the Implementation section for a complete description of tier designations).

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
GEOLOGIC AND PALEONTOLOGIC RESOURCES GOAL: ***Preserve and interpret the geologic and paleontologic resources of the area***		
Objective #1: Identify, document, and evaluate significant geologic and paleontologic resource sites within the North Boulder Valley.		
Inventory significant geologic and paleontologic resources.	N,S	3
Document and map significant geologic and paleontologic resources.	C,O	3
Objective #2: Protect and preserve significant geologic and paleontologic resources within the project area.		
Discourage public access to sites susceptible to damage and vandalism.	C,O	1
Notify staff of existing resources and patrol sites on a routine basis.	C,O	2
Train staff to identify potential resources.	C,O	2
VEGETATION GOAL: ***Preserve and maintain native plant communities, protect rare species and communities, and restore native vegetation in suitable areas.***		
Objective #1: Integrate vegetation management in North Boulder Valley with other resource goals and policies.		
Integrate vegetation management in North Boulder Valley with Open Space policy and resource management plans.	C,O	1
Coordinate resource management planning with neighboring public land management agencies and other stakeholders.	C,O	1
Develop a system-wide Open Space Integrated Pest Management plan to guide and integrate Integrated Pest Management activities.	N,O	1
Objective #2: Protect native plant community health using or simulating, natural processes where possible.		
Develop burn plans in coordination with area and system-wide resource management programs.	C,O	1
Use prescribed fire as a management tool for controlling exotic species of concern.	C,O	1
Use prescribed fire to maintain the function of irrigation systems.	C,O	1
Use a resource advisor during prescribed fire and suppression.	N,O	1
Time livestock grazing in native grasslands to minimize negative impacts to native grasses and forbs, and to provide opportunity for native plant reproduction to occur.	C,O	1

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Use the results of monitoring and assessment of condition to develop and adjust annual grazing plans.	N,O	1
Formalize annual prescribed burn planning in the form of an Open Space prescribed fire manual and a five year operating plan.	N,S	1
Develop methods to assess and monitor ecological condition of grasslands.	N,S	1
Develop grazing prescriptions for native grasslands.	N,S	1
Identify potential fire hazard mitigation projects.	C,L	2
Burn ungrazed native grasslands, where possible, with a burn frequency that prevents excessive build-up of dead plant material (thatch) and maintains plant community vigor.	C,O	2
Coordinate prescribed burning and prescribed grazing regimes in native grasslands and hayfields.	C,O	2
Use prescribed fire to enhance wildlife habitat by maintaining plant species diversity and structural diversity in vegetation.	C,O	2
Encourage research to determine the effects of fire on native communities, sensitive species and communities, and exotic species of concern.	C,O/N,L	2
Use results of pre- and post-burn monitoring of plant community condition to determine ongoing grazing and burning regimes.	N,O	2
Burn savannah and woodland communities, when possible, with an approximate burn interval of 8 to 15 years or longer.	N,O	2
Develop fire effects monitoring plans for East Beech grasslands, diffuse knapweed infested areas, and shale community sites.	N,S	2
Establish criteria to prioritize prescribed burn projects in North Boulder Valley for annual Open Space fire management planning.	N,S	2
Promote and implement prescribed natural fires to meet resource management objectives.	N,O	3
Objective #3. Prevent new infestations and manage existing infestations of priority non-native species of concern. Use the Integrated Pest Management planning process to develop prevention and control strategies for target species.		
Develop and implement strategies to reduce potential for weed introduction.	C,O	1

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Use integrated pest management treatment selection criteria in planning cooperative weed control efforts, focusing on safety and environmental risk reduction.	C,O	1
Use native species in reclamation prescriptions.	C,O	1
Detect, map, and eradicate isolated noxious weed infestations before spreading.	C,O	1
Conduct periodic mapping of noxious weed to update baseline map for annual planning.	C,O	1
Control Canada thistle by intensifying control strategies.	C,O	1
Control diffuse knapweed by intensifying control strategies.	C,O	1
Control Mediterranean sage by continuing current control strategies.	C,O	1
Use hand digging on perimeters and in appropriate areas.	C,O	1
Monitor results of weed control treatments annually.	C,O	1
Encourage research on species biology, control methods, and ecosystem effects.	C,O	1
Include weed management strategies in agricultural leases.	C,S	1
Develop coordinated weed management strategies with neighbors.	N,O	1
Cooperate with state and local agencies to implement control.	N,O	1
Involve lessees in development and review of annual weed control plans.	N,O	1
Clean trail construction equipment prior to use and when leaving construction site.	N,O	1
Reclaim disturbed or bare areas with native species.	N,O	1
Use weed-free mulch and local topsoil .	N,O	1
Develop memorandum of understanding with Colorado Department of Transportation and Boulder County Road District for control of weeds and guidelines for rare plants in road right-of-ways.	N,S	1
Develop process for coordinated weed management planning and outreach.	N,S	1
Develop best management practices for fire management that minimize disturbance and sources of weeds.	N,S	1
Design and set up specific noxious weed monitoring as needed.	N,S	1
Improve capacity for chemical application by increasing the number of contractors utilized.	N,S	1

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Control Russian olive, especially along streams and in wetlands.	C,O	2
Control or eliminate small occurrences of less common weeds (e.g., toadflax and myrtle spurge).	N,L	2
Meet regularly with neighboring landowners to evaluate and update coordinated weed management strategies.	N,O	2
Encourage use of weed-free hay and feed.	N,O	2
Reduce weed seed sources, where possible (e.g., hay, road base).	N,O	2
Control cheatgrass using a variety of management techniques (e.g., fire, grazing, reseeding).	C,O	3
Objective #4. Protect and maintain rare species and communities of special concern.		
Avoid or minimize direct, indirect and cumulative negative impacts on rare species, special plant communities, and potential habitat from recreational developments.	C,O	1
Integrate rare plant management with weed, fire, and livestock grazing management.	C,O	1
Develop monitoring plans for Bell's twinpod (*Physaria bellii*), birdfoot violet (*Viola pedatifida*), and plant communities of special concern.	N,S	1
Develop a conservation plan for Bell's twinpod that contains assessments of impacts from recreation, prairie dog activity, weed infestations, and livestock activity.	N,S	1
Develop and use a project checklist to identify and evaluate potential impacts to sensitive resources.	N,S	1
Solicit and support research on topics related to rare plant conservation and management.	C,O	2
Objective #5. Restore, reclaim, and enhance native vegetation in areas with restoration potential and/or reclamation needs. Use native plant species in the reclamation of areas disturbed by development, land use, exotic plant control, and other ground disturbances.		
Reclaim areas affected by disturbances such as new trail and trailhead construction, weed control treatment, and undesignated trail closures.	C,L	1
Coordinate restoration planning and implementation, where appropriate, with public agencies.	N,O	1
Restore areas treated for Mediterranean sage control when satisfactory levels of control have been reached.	N,S	1

Management Goals, Objectives, and Actions	Timing Code: N = new C = current --- S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Monitor and evaluate the ongoing success of reclamation and restoration projects annually for 3 to 5 years.	C,L	2
Document baseline site conditions and reclamation/restoration project plans.	C,L/O	2
Seed irrigation ditch banks as needed when routine ditch cleaning leave bare soil.	C,O	2
Level and seed abandoned prairie dog burrow entrances outside of Habitat Conservation Area's to improve irrigation water application and to prevent and control weed invasion.	C,O	2
Encourage research in reclamation and restoration methods for North Boulder Valley plant community types.	C,O	2
Develop and implement methods to evaluate reclamation and restoration projects using best management practices.	C,S/O	2
Restore East Beech riparian areas.	N,L	2
Develop and implement a reclamation plan for sites where structures are demolished.	N,O	2
Identify and document native communities that can serve as reference sites for the restoration of other areas with similar site conditions.	N,S	2
Assess grassland condition in cheatgrass control areas on East Beech and develop restoration plans as needed.	N,S	2
Evaluate the restoration potential for degraded shale communities on Boulder Valley Ranch.	N,S	2
Evaluate native grass seed production as a crop alternative and a way of providing native seed for restoration and reclamation.	N,S	2
Coordinate with Boulder County Parks and Open Space to develop reclamation plans for disturbed areas surrounding the Beech Pavilion.	N,S	2
Reclaim ranch roads that are not needed as access for lessees, wildland fire control, weed management, utility maintenance, or recreation.	N,S	2
Enhance wildlife habitat and use native plantings for black-tailed prairie dog management.	N,S	2
Objective #6. Inventory and monitor native vegetation to evaluate potential negative impacts of land management and to measure the effectiveness of vegetation management techniques.		

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Conduct periodic inventories of Bell's twinpod occurrences and potential habitat.	C,O	1
Develop monitoring to evaluate plant community or species population trends and management treatment effects.	C,O/N,O	1
Conduct periodic inventories of birdfoot violet occurrences and potential habitat.	C,O	2
Inventory vascular plant species in prairie dog Habitat Conservation Areas.	N,S	2
Inventory vascular plant species on the Niobrara and Pierre outcrops in the western half of the planning area.	N,S	2
Develop integrated resource inventory and monitoring when feasible to optimize efficiency in data collection.	N,S	2
Develop a natural community classification that is based on site potential so that management actions can be guided uniformly across the Open Space system.	N,S	2
Objective #7. Encourage public understanding of the ecology and conservation of native plants using educational materials and programs, and by providing opportunities for volunteer involvement in resource management activities.		
Provide opportunity for volunteer public involvement in land stewardship activities.	C,O	1
Include a variety of information pertaining to vegetation management in educational brochures, informational signs, posters, and other materials provided to the public.	N,L	1
WETLANDS GOAL: ***Preserve significant wetlands, minimize impacts to water quality and other wetland functions, and restore wetlands function in suitable areas.***		
Objective #1: Identify and protect wetland water sources.		
Evaluate proposed changes to irrigation system on wetlands.	C,O	1
Consider broadest possible management options for water rights.	N,O	1
Investigate restoring the hydrology of wetland #444 by filling or blocking drainage ditches.	N,S	1
Monitor chemical and physical qualities of oil well effluent.	N,S	1
Review and assess long-term impacts of management activities that would divert, impound or reduce surface flows supporting wetlands.	C,O	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Establish contact with adjacent landowners to discuss water quality issues related to surface runoff.	C,O	2
Monitor and review development proposals with particular attention to water resource development.	C,S	2
Propose limiting development where wetlands potentially affected.	N,L	2
Investigate possibility of restoring flows to Mesa Reservoir by repairing Silver Lake Ditch.	N,L	2
Create small wetlands associated along ditch segments, where possible.	N,L	2
Determine potential for residential development in Olde Stage Road.	N,S	2
Review development potential of private property east of Dakota Ridge.	N,S	2
Contact the Boulder County Land Use Department about development impacts and concerns.	N,S	2
Develop strategies to maintain water sources to drained wetlands. Reclaim dewatered wetlands, if possible.	N,S	2
Investigate options for treating urban runoff into Dry Creek.	N,S	2
Evaluate stock tank removal from wetland #601 and potential for restoring natural drainage patterns.	N,S	3
Objective #2: Identify and protect wetland vegetation.		
Use boardwalk construction where trails must cross wetlands.	C,O	1
Restrict grazing in Dry Creek mitigation site until EPA accepts completed project.	C,S	1
Develop Integrated Pest Management for weed control in riparian areas.	C,S	1
Fence pastures to minimize grazing impacts to wetlands.	N,L	1
Develop alternative watering sites for grazing.	N,L	1
Re-direct trail around wetland #444.	N,S	1
Provide boundary fence to protect wetland on Hart/Jones property.	N,S	1
Utilize minimum stocking rate and minimum duration possible, when using livestock for weed control.	C,O	2
Monitor lease compliance with regard to livestock grazing of wetlands.	C,O	2
Establish prescribed fire program in wetlands #444 and #449.	C,O	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Use livestock grazing on a prescriptive basis in wetland #548 and #596.	C,O	2
Encourage research on wetland Integrated Pest Management for weed control. Monitor Integrated Pest Management treatment effectiveness in wetlands.	C,O	2
Identify, describe, and map wetlands on new acquisitions.	C,O	2
Place salt and other feed supplements away from drainages.	N,O	2
Set up and use permanent photo points to monitor condition of vegetation.	N,O	2
Investigate practicality of establishing livestock shade and rubbing posts in upland areas.	N,S	2
Implement trail maintenance project at wetland #601.	N,S	2
Objective #3: Identify and protect the processes which create and support wetlands.		
Encourage research on fire and grazing prescriptions on wetlands.	C,O	2
Coordinate and implement improvement projects at Dry Creek.	N,L	2
Determine opportunities that may exist for improving ecology and geomorphology of Dry Creek.	N,S	2
Objective #4: Identify and protect wetland functions and values.		
Select and provide specific livestock watering points to protect wetlands and stream shorelines.	N,S	2
Review literature regarding wetland management techniques for nutrient retention.	N,L	3
WILDLIFE GOAL: ***Preserve wildlife and wildlife habitat through proper land stewardship that incorporates strategies of habitat enhancement and minimizes the impacts of land use harmful to wildlife.***		
Objective #1: *Inventory wildlife species to establish accurate and replicable monitoring, evaluate effectiveness of land management techniques, and measure the effectiveness of wildlife habitat enhancement activities.*		
Conduct surveys of small mammals, fish, birds, invertebrates, reptiles, and amphibians as part of systemwide surveys.	C,S	1
Survey animal species of special concern.	C,S	1
Focus research on inventories of wildlife species and impacts of land uses on wildlife populations and habitats.	C,O	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Objective #2: Maintain and/or restore wildlife habitat and/or populations at risk, based upon results of ecological research and site specific monitoring.		
Enhance or create habitat for species of special concern (e.g., barn owls, bank swallows, cavity nesting birds).	N,L	2
Identify and provide natural or artificial habitat for wildlife species to assist with Integrated Pest Management control of insects (e.g., bat roosts).	N,L	2
Create habitat for Preble's meadow jumping mouse along Dry Creek (in accordance with United States Fish and Wildlife Service guidance for habitat enhancement).	N,S	2
Evaluate potential for maintaining plains top minnows in Dry Creek mitigation site.	N,S	2
Remove non-native fish from Schneider pond to enhance tiger salamander habitat.	N,S	3
Objective #3: Coordinate wildlife management in the North Boulder Valley with other resources management plans.		
Follow recommendations of Prairie Dog Habitat Conservation Plan for designation of prairie dog colonies on existing and new properties.	C,O	1
Re-designate Dawson and Johnson prairie dog areas, if irrigation system improved.	N,S	1
Expand Axelson Prairie Dog Habitat Conservation Area.	N,S	3
Objective #4: Integrate wildlife population and habitat protection/ enhancement into other resource management actions.		
Encourage protection of large tracts of land unfragmented from trails.	C,O	1
Design grazing management to minimize impacts on wildlife populations and wildlife habitat.	C,O	2
Assist in prioritizing weed management in habitats that are at risk.	C,O	2
Assist in designing fire management that minimizes negative impacts and enhances habitat for wildlife.	C,O	2
Participate in long-term fire management plan with specific resource management objectives.	C,O	2
Participate in the design of water/irrigation systems that minimize impacts and enhances wildlife habitat.	C,O	2
Coordinate wildlife management goals with other agencies.	C,O	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current --- S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
CULTURAL RESOURCE GOAL: ***Preserve and interpret the cultural resource sites and themes of the area.***		
Objective #1: Identify, document, and evaluate significant national, state, and local cultural resource sites and themes within North Boulder Valley.		
Evaluate Axelson #3 for local significance.	N,S	1
Work with volunteers to conduct further research on history of North Boulder Valley.	C,O	3
Objective #2: Protect and preserve significant national, state, and local cultural resources within the project area.		
Evaluate Axelson residence #3 and (1) preserve as an occupied caretaker facility OR (2) remove safely (depending on local historical significance).	N,S	1
Notify Open Space staff of existing cultural resource sites and patrol them on a routine basis.	C,O	2
Train Open Space staff to identify potential cultural resources.	C,O	2
Preserve the silo at the Ellison complex for its local historical significance.	N,S	2
Discourage access to sites susceptible to vandalism and damage.	N,O	2
Preserve the Johnson residence and associated outbuildings and maintain as an occupied caretaker facility.	N,O	2
PROPERTY GOAL: ***Pursue acquisition of lands consistent with the Open Space Charter and the area management plan goals and ensure proper management of easements and Open Space properties.***		
Objective #1: Acquire lands surrounding and within the planning area that meet Open Space Charter and area management goals.		
Negotiate acquisitions of lands based on resource priorities, availability, price, and purchase terms.	C,O	1
Consolidate in-holdings through purchase, easements, or trade, where appropriate.	C,O	1
Identify and prioritize acquisitions related to resource management needs and environmental values.	N,O	1
Acquire additional land that allows rerouting the steep portion of the Eagle Trail to improve visitor safety.	C,L	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Reduce impacts of adjacent areas on Open Space through development review process.	C,O	3
Objective #2: Research and document all easements and mineral rights in the North Boulder Valley Management Area.		
Establish procedures for managing existing utility easements.	C,S	2
Describe, locate, and document existing easements and right-of-ways.	N,S	2
Renegotiate easements that do not meet Open Space management needs.	C,L	3
Inventory, acquire, and assist in management of water rights.	C,O	3
Inventory, acquire, and assist in management of mineral interests.	C,O	3
Resolve ownership and maintenance on roadways within North Boulder Valley management area.	CS	3
Review existing easement request policy.	N,S	3
Objective #3: Monitor existing Open Space conservation and other easements for compliance.		
Determine responsible staff and establish procedures for easement compliance.	N,S	1
Disseminate information on conservation and other easements for compliance monitoring.	N,S	2
Objective #4: Work with adjacent landowners and agencies on cooperative management issues.		
Establish procedures required to achieve management actions.	C,O	1
Work with other agencies to provide regional trail linkages.	C,L	2
Assist with negotiations for recreational use of the Northern Colorado Water Conservancy District Boulder Feeder Canal.	N,S	2
Work on agreements with Boulder County Parks and Open Space for management of the Beech Pavilion and North Rim Trail.	N,S	2
Negotiate written management agreements on Beech and Brewbaker properties with Boulder County.	N,S	2
Coordinate the review and monitoring of contaminated site cleanup on Beech properties.	C,L	3
Work with other planning agencies to provide appropriate access and natural resource protection as area lands develop.	C,O	3
Work with agencies to ensure surrounding land uses are compatible with City of Boulder Open Space management.	C,O	3

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Objective #5: Establish appropriate leases to meet management goals.		
Establish and monitor all leases for caretaker and lessee facilities.	C,O	1
Complete caretaker policy and implement in North Boulder Valley Management Area.	N,S	1
Revise agricultural leases to reflect new management direction.	N,L	3
Objective #6: Coordinate and integrate reviews of new acquisitions.		
Utilize resource management issues in the establishment of criteria for acquisition.	C,O	1
Coordinate the review of new acquisitions with staff.	C,O	1
Incorporate resource management requirements into purchase agreement where feasible.	C,O	1
Work with staff to inventory new properties and establish management plans.	N,O	1
Obtain Open Space Board of Trustees and City Council approval for purchases.	C,O	1
FACILITY GOAL : *Ensure safe, responsible, and efficient use and maintenance of all structures or buildings owned by the City of Boulder Open Space Program.*		
Objective #1: Ensure proper management of existing buildings and structures.		
Inspect each facility annually, or as needed, for safety concerns.	C,O	1
Test well water, at all occupied facilities, annually for contaminates.	C,O	1
Inspect heating systems annually in all occupied facilities.	C,O	1
Improve the horse boarding facilities at Boulder Valley Ranch.	N,S	1
Ensure all occupied buildings are safe and maintained to an acceptable standard.	C,O	1
Preserve the Johnson house and maintain as an occupied caretaker facility. A new drinking water supply should be established, minor interior repairs should be completed, and routine maintenance should be conducted as needed.	C,O	2
Maintain Axelson residence #1 as an occupied caretaker facility and provide maintenance as needed.	C,O	2
Maintain Axelson residence #2 as an occupied caretaker facility and provide maintenance as needed.	C,O	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current --- S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Remove the livestock corrals located west of the Quonset hut on the Axelson complex #2.	N,S	2
Maintain the loafing sheds, corrals, and milk barn at the Axelson complex #3 for agricultural purposes. Remove remaining structures at this location which do not have historical significance.	N,O	2
Maintain the Boulder Valley Ranch house as an occupied facility.	C,O	2
Maintain the workshop, barns, hay storage, and riding arena at Boulder Valley Ranch for agricultural purposes.	C,O	2
Maintain the Schneider house and associated buildings as an occupied caretaker facility and provide maintenance as needed.	C,O	2
Maintain the Johnson milk barn for possible future agricultural uses.	C,O	3
Remove the four sheds and chicken coops north of the access drive on the Axelson complex #1.	N,S	3
Further evaluate the "Silver Nickel" structure at Boulder Valley Ranch for repair costs and potential Open Space uses (e.g., for education and outreach).	C,O	3
Objective #2: Develop policies for the use of facilities.		
Define acceptable standards for all occupied buildings.	N,S	1
Draft caretaker and facilities policies, present to the Open Space Board of Trustees, and implement policies in North Boulder Valley, once they are approved.	N,S	3
AGRICULTURE GOAL: ***Implement an agricultural management plan for maintaining sustainable agricultural operations on appropriate lands based upon economic and natural resource analyses.***		
Objective #1: Implement Best Management Practices on croplands which ensure the sustainability of agricultural operations while protecting other natural resource values.		
Coordinate agricultural activities with other resource programs using the coordinated resource management approach.	N,O	1
Evaluate property for agricultural potential and use of best management practices.	C,O	2
Set up monitoring for success of crop pest Integrated Pest Management strategies.	C,O	2
Evaluate alternative crops and cropping methods.	C,O	2
Seed all crop fields to grass/legume hay mixes.	N,L	2

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Utilize Integrated Pest Management strategy for insect control, focus on native wildlife (bats and birds).	N,O	2
Reclaim identified agricultural fields to native grasses.	N,L	3
Evaluate selected fields for planting native grasses to enlarge blocks of wildlife habitat.	N,L	3
Objective #2: Use the City's adjudicated water rights in an effective and efficient manner.		
Monitor use of water rights to recommend any additional purchases or leases of water.	C,O	1
Protect irrigation infrastructure through diligent routine maintenance.	C,O	1
Oversee the diligent application of irrigation water.	C,O	1
Install additional measuring devices so consumptive use of water can be monitored.	N,L	1
Cooperate with Boulder Reservoir working group on water quality issues.	N,O	1
Improve irrigation distribution and efficiency on Dawson and eastern portion of Johnson properties.	N,S	1
Improve irrigation distribution and efficiency on Cowles property.	N,S	1
Design irrigation system for all irrigated properties (whole system approach).	N,S	1
Complete physical inventory of irrigation structures.	N,S	1
Maintain wells, springs, and stock tanks and evaluate improvements in support of resource management goals for the North Boulder Valley Management Area.	C,O	2
Establish ground water monitoring system and collect vegetation and irrigation data.	N,L	2
Monitor the effect of irrigation improvements on agricultural productivity.	N,L	2
Conduct surface and ground water hydrology investigation of irrigated areas.	N,L	2
Monitor water turned in at main headgates, establish record keeping system.	N,O	2
Replace wooden irrigation structures on Boulder Valley Ranch with concrete structures.	N,L	3

Management Goals, Objectives, and Actions	Timing Code: N = new C = current S = short-term L = long-term O = ongoing	Tier Designation: 1 = higher 2 = medium 3 = lower
Complete inventory of wells, springs, and stock tanks. Analyze well permits.	N,S	3
Objective #3: Improve and maintain the ecological status of native grasslands and other grazing lands.		
Coordinate grazing schedules with Integrated Pest Management schedule.	C,O	1
Protect native grasslands from impacts of horse boarding operation at Boulder Valley Ranch.	N,O	1
Inventory grasslands for ecological condition.	N,S	1
Utilize prescriptive grazing and prescribed burns to improve ecological condition of grasslands.	C,O	2
Encourage weed-free hay production on leased areas.	N,L	2
Incorporate beneficial deferment from grazing (rest rotation) into grazing plans.	N,O	2
Manage grazing to incorporate a mosaic of grazing intensities.	N,O	2
Develop monitoring system and monitor ecological condition of grasslands.	N,O	2
Identify and encourage research on grazing effects on ecosystems.	C,O	3
Identify and evaluate potential for livestock water development on the south BLIP property.	N,S	3
Identify and evaluate potential for livestock water development on the East Beech property.	N,S	3
Objective #4: Use agricultural facilities as appropriate and make improvements to these facilities so that benefits can be maximized.		
Construct visual barriers for prairie dog management as part of Prairie Dog Habitat Conservation Plan.	N,S	1
Maintain existing fences; inspect and maintain ranch gates; and remove fences no longer needed.	C,O	2
Maintain agricultural buildings in good condition (see Facility section).	C,O	2
Improve the corral system used for horse boarding on Boulder Valley Ranch by regrading the corral area, replacing some of the rails and posts, and possibly building additional corrals to accommodate boarding needs.	N,S	2

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Identify boundary/internal fences needed for resource protection, resource management, and visitor safety.	C,S	2
Construct or improve hay storage facilities as part of Boulder Valley Ranch, Axelson, Johnson, Dawson, and Cowles leases.	N,S	3
PASSIVE RECREATION GOAL: ***Manage and preserve land for passive recreation use, its aesthetic or passive recreational value, and its contribution to the quality of life of the community.***		
Objective #1: Provide a variety of appropriate quality passive recreation activities and outdoor education opportunities.		
Implement new dog regulations and policies (see dog management plan).	N,O	1
Prohibit hang gliding within the Management Area due to direct impacts to Bell's twinpod (*Physaria bellii*) and formation of undesignated trails.	N,S	1
Evaluate future trails with regard to dog policies.	N,S	2
Integrate new policies identified in visitor use plan, when available.	N,S	3
Objective #2: Provide scenic vistas and undeveloped views.		
Design new trailhead and trails to minimize visual impacts.	N,S	1
Objective #3: Provide trails, access points, and passive recreational facilities to accommodate appropriate uses and to connect with adjacent trail systems.		
Construct new trail and trailhead from Neva Road to North Rim connection.	N,S	1
Monitor Mann property for development, construct appropriate access and trail connections.	N,S	1
Monitor existing access points for problems and take appropriate actions to resolve these problems.	C,O	1
Install two additional dog stations, one at Boulder Valley Ranch Trailhead and one at Eagle Trailhead.	N,O	2
Install a trash can at the entry to Mesa Reservoir to encourage visitors to pick up after themselves.	N,O	2
Install signs and a trail map at the entrance to Mesa Reservoir to encourage visitors to park at Foothills Trailhead.	N,S	2
Monitor visitor use in area management unit.	C,O	2
Evaluate future trail needs in area and connections to regional system.	C,O	2

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Monitor new residential development and use patterns.	C,O	2
Further evaluate potential options for a pedestrian/equestrian/bicycle access (no vehicle parking) and a multi-use trail in the north eastern part of Management Area.	N,S	2
Remove unnecessary recreational structures (outhouse and small shelter) in the vicinity of Mesa Reservoir for safety and aesthetic purposes.	N,S	2
Objective #4: Provide safe passive recreation experiences.		
Designate appropriate passive recreational activities on trails to accommodate multiple uses and minimize safety hazards.	C,O	1
Provide emergency response, medical, fire suppression, and law enforcement services as needed to ensure public safety.	C,O	1
Post warning signs or implement temporary trail closures for safety, resource protection purposes, and to minimize conflicts with agricultural operations.	C,O	1
Emphasize trail etiquette/avoiding conflicts for visitor education.	N,O	1
Design trails and accesses to accommodate multiple uses and minimize safety hazards.	N,S	1
Request striping and pedestrian signs at the grade crossing where the Foothills Trail crosses Lee Hill Road to improve safety.	N,S	1
Regularly inspect and maintain designated trails, access points, and facilities.	C,O	2
Objective #5: Minimize passive recreation impacts to natural, cultural, and agricultural resources.		
Encourage use of designated trails and access points and discourage visitor use in sensitive areas.	C,O	1
Conduct trail inventories to identify development of undesignated trails and access points.	C,O	1
Close and reclaim undesignated trails and access points.	C,O	1
Design new trails, access points, and passive recreation facilities to minimize impacts to natural, cultural, and agricultural resources.	C,O	1
Temporarily close trails during intensive agricultural periods or sensitive wildlife periods.	C,O	1

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Close the short section of trail immediately north and east of dry Mesa Reservoir. This short section of trail serves no purpose and other trails provide adequate access to this area.	N,S	3
EDUCATION AND OUTREACH GOAL: ***To foster relations between the Program and members of the public and other organizations; to educate others about the Open Space Program's mission, charter, and activities; and to provide environmental education.***		
Objective #1: Disseminate information concerning the ecology, natural history, and cultural history of the area.		
Continue educational programming on natural and cultural history.	C,O	2
Disseminate additional information on focus topics.	N,L	2
Increase the number of on-site education and outreach activities held in the area.	N,O	2
Coordinate with natural resource staff to produce wildlife brochures.	N,O	2
Develop and install interpretive signs for Boulder Valley Ranch, Sage, and Eagle Trails.	N,S	2
Develop and install a sign on the importance and diversity of native grasslands.	N,S	2
Develop and install interpretive sign on prairie dogs and raptors.	N,S	2
Develop and install interpretive sign on the importance and rarity of shale communities.	N,S	2
Develop agricultural brochure.	N,S	2
Develop wetlands self-guided interpretive program.	N,S	2
Develop raptor brochure.	N,S	3

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Objective #2: Disseminate information concerning the goals, projects, and operations of the Open Space Program.		
Disseminate information and educate the public on new regulations and management direction for North Boulder Valley through on-site programming, in-field contacts with staff, and a document to summarize the North Boulder Valley Area Management Plan.	N,O	1
Distribute information on noxious weeds, impacts, spread, and control.	N,O	1
Use staff and volunteers in the field to educate and inform the public on new regulations.	N,O	1
Install information boards at new trailhead and pedestrian/equestrian access.	N,S	1
Develop and install signs for new dog regulations.	N,S	1
Coordinate with staff to design studies and collect data on resource inventories.	C,O	2
Continue to utilize information boards and brochure boxes.	C,O	2
Educate agencies and public on the value of weed-free products.	C,O	2
Develop and distribute a brochure on the North Boulder Valley area which will interpret the natural, cultural, and agricultural resources; identify trails and access points; and inform visitors of regulations.	N,O	2
Work with public to develop and provide information on native communities and restoration efforts.	N,O	2
Install welcome signs at access points.	N,S	2
Develop educational materials on prescribed burn program.	N,S	2
Objective #3: Disseminate information about the situations that arise when humans interact with natural systems and about ways of lessening or eliminating the impact of these interactions.		
Continue to use information boards and brochures about visitor etiquette.	C,O	1
Continue to distribute the "Keeping Boulder's Open Space a Special Place" brochure.	C,O	1
Use field staff and volunteers to contact visitors about visitor interactions.	C,O	1
Disseminate information (field staff and signs) on the provisions of the dog management plan.	N,S	1

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Develop signs to encourage on trail use, particularly in sensitive areas.	N,S	1
Work with user groups to disseminate information to their members.	C,O	2
Objective #4: Conduct projects and activities that provide opportunities for people to establish a relationship with the Open Space Program and land system.		
Continue to have field staff and volunteers conduct outreach activities which target specific management goals.	C,O	1
Train staff about specific topics to communicate to visitors.	C,O	2
Work with staff to develop outreach topics on resource management.	C,O	2
Communicate annually with other agencies to coordinate education and outreach opportunities of mutual interest.	C,O	2
Identify neighbors, adjacent landowners, and community groups to establish and continue working relationships.	N,O	2
Objective #5: Engage in public participation processes which provide opportunities for public input and involvement in Open Space planning and decision making.		
Develop public participation mechanisms and facilitate community involvement.	C,O	1
Objective #6: Identify goals and priorities for volunteer programs in the North Boulder Valley and implement these programs with neighbors, visitors, and interest groups.		
Continue to encourage on-trail use and discourage visitor use of sensitive resources.	C,O	1
Monitor sensitive resources for potential impacts.	C,O	1
Continue to utilize volunteers to supplement staff in attaining the management goals of this plan.	C,O	2
Continue to fund research on recreational impacts to resources.	C,O	2

Making the Vision...

A Reality

THE NORTH BOULDER VALLEY INVENTORY REPORT AND AREA MANAGEMENT PLAN

June 3, 1997

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