Eldorado Mountain/ Doudy Draw
Trail Study Area (TSA)

Inventory Report

February 24, 2006

Table of Contents

Eldorado Mountain/ Doudy Draw Trail Study Area (TSA) Inventory Report

Introduction

This inventory report represents a compilation and analysis of the known resources within the Eldorado Mountain/ Doudy Draw Trail Study Area (TSA). The information is based on field studies, natural resource and recreation inventories, and on-the-ground knowledge of the area by OSMP staff and the public. The goal of this inventory report is to inform decisions about how to provide a quality visitor experience while ensuring the protection of the area's natural, agricultural, and cultural resources.

An inventory report is the first step in the Trail Study Area planning process. The overall process includes the following steps:

- Inventory and assess natural and recreational resources.
- Assess existing visitor access and use patterns.
- Identify desired visitor destinations, connections, and activities.
- Identify and evaluate trail improvement alternatives—benefits, costs, and impacts.
- Select the most desirable and feasible alternatives and incorporate into a plan.
- Adopt the plan.

The information in this report will be used to help address the trail planning management strategy in the OSMP Visitor Master Plan. Trail planning involves the study and evaluation of potential new trails and trail connections and their relationship to management area designations. Planning for the Trail Study Area will produce a comprehensive set of recommendations including:

- Actions for existing trails--improvements and relocations.
- Actions for undesignated trails--designation and relocation or improvement, designation without improvement, and elimination and restoration.
- Actions for new trails--construction of new trails and linkages.

Summary of Inventory Findings

Several major findings become evident from the information presented in this inventory. These findings were used to create a list of issues and opportunities which will help guide discussions about how to balance visitor use and resource protection.

Ecological Values

The TSA contains exceptional ecological values that result from:

- a diverse mix of overlapping habitats and ecosystems that occur in the transition zone between the Great Plains and the Rocky Mountains.
- relatively intact ecosystems, including the large habitat blocks that are penetrated by few if any roads or trails.
- the larger landscape of protected public lands that are physically connected and allow wildlife to travel unencumbered by barriers.

Recreational Values

The TSA offers opportunities for quality visitor experiences because of the combination of:

- a rich mix of different ecosystems that provides many different types of experiences; visitors can learn about and appreciate these ecosystems as they experience them.
- the feeling of remoteness (due to location and varied terrain).

- a long history of human use of the area which provides visitors with the opportunity to learn about and appreciate the area's rich cultural history.

Increasing Visitation

The TSA receives a significant amount of visitor use that is growing as the area is discovered by more visitors. A substantial amount of visitor travel is unsupported by OSMP trail infrastructure. Visitors travel in many parts of the TSA using old roads and a myriad of user-created undesignated trails. The extensive network of undesignated trails indicates there are destinations and routes which are not served by designated trails. The extent of off-trail travel, and its location in sensitive areas, has caused natural resource impacts. Historically low levels of patrol and maintenance have contributed to these impacts.

Integrated Management Actions

Opportunities exist to both provide trails and visitor access and to lessen the impact of visitor use on natural and cultural resources by eliminating undesignated trails and implementing special protection measures.

Issues and Opportunities

Existing Trails and Trailheads

Issue: Existing trails need improvements to lessen environmental impacts and provide a better visitor experience.
Opportunity: A relatively small number of trail improvements or reroutes can improve physical and environmental sustainability, while also improving the visitor's experience.

Issue: Existing trailheads are deficient because of parking overflow, parking lot design and access off busy roads.
Opportunity: The functionality and safety of existing trailheads could be improved. In addition, a new trailhead could be considered.

Undesignated Trails

Issue: Visitor travel off-trail in several areas where designated trails have not been provided has created a high density of undesignated trails, with many located in sensitive areas. The extensive network of undesignated trails has resulted in habitat degradation, reduced functionality of habitat blocks, and poor trail access and conditions for visitors in many cases.
Opportunity: Undesignated trail management (including maintenance, signing and patrol) could substantially reduce trail densities, remove resource impacts, and improve trail access by providing sustainable trails to appropriate destinations and restoring unneeded or damaging undesignated trails.

New Trails

Issue: Off-trail patterns of visitor use suggest the need to consider adding new trails to selected destinations currently sought out by visitors traveling off-trail.
Opportunity: Sustainable trails could be designated or built to serve appropriate destinations and provide internal and external trail connections.

Resource Protection and Recreational Activities

Issue: Review the status of recreational activities occurring in the TSA to determine if current types and levels of recreational activities are compatible with resource protection.

Opportunity: Ensure that suitable infrastructure and management are in place to support recreational activities and protect natural and cultural resources. For new trails, locations can be selected to encourage visitors to stay on trail and avoid or minimize resource impacts. Trail locations should be based on: minimizing the number of new trails; locating trails at the periphery of habitat blocks; avoiding or minimizing riparian and drainage crossings; and avoiding or otherwise protecting patches with rare and sensitive species or communities and habitats of special concern

Visitor Safety

Issue: Visitor safety issues become more important to address with increased visitor use.
Opportunity: Numerous opportunities exist to improve visitor safety. The most significant safety issues are: visitors crossing S.H. 93 to continue travel on the Community Ditch Trail; visitor at-grade crossings of Eldorado Springs Drive; vehicle access to and from S.H. 93 from Flatirons Vista trailhead; visitors trespassing and crossing the Union Pacific Railroad to reach climbing destinations; and hazards related to fast-moving water in the Denver Water Canal.

Area Description

The Eldorado Mountain/ Doudy Draw Trail Study Area is located in the southwestern portion of the OSMP system and includes properties acquired by the city of Boulder over the past 30 years. The TSA encompasses about 3,200 acres with two thirds of the area classified as Natural Area and one third as Habitat Conservation Area. The elevation of the TSA ranges from 5560 feet at the grasslands along State Highway 93 to 8300 feet at the top of Eldorado Mountain. General location data for the TSA can be found on figure 1.

Management Area Designations

Management area designations define a management emphasis for different areas within the Open Space and Mountain Parks land system, based on a primary open space purpose (e.g., provision of quality passive recreational opportunities, preservation of agriculture, and protection and restoration of natural systems). The management designation defines suitable visitor activities in each type of area and under what conditions those activities can occur. The management designation also defines the management strategies needed to enhance visitor experience and ensure compatibility of visitor activities with resource protection.

The primary goal of area management is to encourage visitor use in areas that can best accommodate the use, which includes areas that can provide a high-quality visitor experience and ensure compatibility of visitor use with natural, agricultural, and cultural resources. Areas with highly vulnerable resources require a higher level of protection: directing people away from sensitive resources, placing conditions on the use that avoids or minimizes impact, or providing visitor infrastructure to ensure acceptable levels of impact.

Two management area designations are defined for the TSA: Natural Area and Habitat Conservation Area. These management area designations provide the overall context for how visitor activities should occur. The characteristics and goals for Natural Areas and Habitat Conservation Areas are described below.

Natural Areas

Characteristics

- Locations can be both close to and remote from development.
- Varying levels of visitor use, types of activities, and availability of facilities.
- Conditions of natural ecosystems are variable--many areas with ecological systems in good condition, some with evidence of human use and impacts.

- May be in proximity to agricultural production and operations.

Goals

- Accommodate low-impact visitor activities where adequate trails exist or can be built, and resource impacts can be minimized.
- Provide opportunities for passive recreational and educational activities that require topographic relief or a natural setting (e.g., hang/paragliding, climbing/bouldering, nature study, scenic viewing).
- Protect the quality of natural and agricultural resources (especially where high value resources exist).
- Eliminate undesignated trails when they are redundant or damaging to resources.

Habitat Conservation Areas

Characteristics

- Tend to be located in more remote areas.
- Typically represent the largest blocks of an ecosystem type with few, if any, trails or roads.
- Lower level of visitor use; no or few trails and trailheads.
- Naturally functioning ecosystems (but may contain areas with evidence of human use and impacts).

Goals

- Maintain, enhance, and/or restore naturally functioning ecological systems.
- Maintain, enhance, and restore habitat for species of concern identified in the Boulder County and the Boulder Valley Comprehensive Plans.
- Provide public access and passive recreational opportunities that foster appreciation and understanding of ecological systems and have minimal impacts on native plant communities and wildlife habitats or other resources.
- Eliminate all undesignated trails, unless they are made part of the designated trails system or provide specialized access to appropriate low-use destinations.
- Where sustainable infrastructure exists, continue to allow public access to appropriate destinations.

Recreation Resources

Passive recreational facilities in the Eldorado Mountain/Doudy Draw Trail Study Area include designated access areas such as trailheads and designated multi-use trails which are signed and maintained. There are 7.2 miles of designated trails in the TSA, 2.7 miles of which are managed for multiple use. Undesignated access points and undesignated trails create major management issues . These undesignated trails are typically created when there are not designated trails connected to destinations. There are approximately 27 miles of undesignated trails in the TSA. The Open Space and Mountain Parks Department discourages use of undesignated access points and undesignated trails because they: 1) are not monitored and maintained, 2) lack design standards and are not considered physically sustainable, 3) often adversely impact natural, cultural or agricultural resources, and 4) may create issues such as promoting trespass on private property. The Eldorado Mountain/Doudy Draw Trail Study Area (TSA) is accessed via the designated Doudy Draw and Flatirons Vista Trailheads, the Community Ditch Trail at Highway 93, the at-grade pedestrian crossing of Highway 93 from Greenbelt Plateau Trailhead, the Fowler Trail East at County Rd. 67, and the Fowler Trail West at the Eldorado Canyon State Park boundary. There are a number of undesignated accesses from private residences and property.

There are an estimated 90,000 to 100,000 visits to the TSA per year. Flatirons Vista and Doudy Draw trailheads account for about 60,000 visits according to the 2005 OSMP Visitation Study.

Fowler Trail at County Road 67 accounts for about 9,000 visits and Fowler West Trail at Eldorado Canyon State Park accounts for 4,000, based on counts in fall and winter 2005/2006. While not monitored, Community Ditch at Highway 93 probably adds 20,000 to 30,000 visits. Based on the Flatirons Vista and Doudy Draw Trailhead information from the Visitation Study, visits are distributed across all seasons, with winter having slightly less visitation than other seasons. There is no "slow" season for the area.

Travel patterns were analyzed using designated and undesignated trails and knowledge of natural features. The location of undesignated trails indicates that there is a desire to access locations not served by designated trails. Several popular destinations are not served by designated trails including the Denver Water Board Road, the Lindsay Pond, and a large loop south of Doudy Draw Trail near Flatirons Vista Trailhead. Other destinations have fewer visits such as Mickey Mouse and Peanuts Wall climbing areas. There are numerous private property access and trespass issues. The area has historically had low levels of patrol, maintenance and signs.

Current passive recreation conditions are described below. Designated trailheads and trails are described. Visitor use patterns in the area are identified. Finally, recreational issues are summarized including safety hazards, visitor satisfaction, visitor use conflicts and property issues. The Trail and Undesignated Trails map (figure 2) should be used in conjunction with descriptions.

Trailheads

Flatirons Vista Trailhead

Flatirons Vista Trailhead is located on the west side of Highway 93, just south of Highway 128. Parking for 24 vehicles currently exists. Vehicles with horse trailers reduce available parking. One bear proof trash can, one dog bag station dispenser, one bike rack, an information board with regulations posted and trailhead sign are provided. No restroom facilities are provided at the trailhead.

Heavier use occurs on weekends, with minimal to moderate use on weekdays. Overflow parking occurs in Highway 93right-of-way. The rectangular shaped parking lot does not function adequately for horse trailer parking and turnaround. The trailhead parking lot is also used as an informal "Park-and-Ride" during ski season, displacing OSMP visitors.

Safety concerns exist due to a lack of acceleration and deceleration lanes or a middle turning lane on Highway 93. Sightlines are limited. Vehicles exiting the parking lot, including slow moving trucks pulling horse trailers, must merge into high speed traffic on Highway 93. This is particularly hazardous when there is spill over parking on the road corridor and when traffic volumes are heavier, which is increasingly common. Several accidents in the roadway associated with access into and out of the trailhead have occurred.

Approximately 26,000 visits were recorded from this trailhead at the fence ¼ mile up the hill to the west (this includes traffic from Greenbelt Plateau Trailhead.) Visitation Study figures are provided below.

Estimated Flatirons Vista Trailhead Visitation		
Date	*Estimated Visits*	*% of Annual Visits*
Summer '04 (June-Aug)	5,596	21%
Fall '04 (Sep-Nov)	7,713	30%
Winter '04 (Dec-Feb)	5,105	20%
Spring '05 (March-May)	7,489	29%
Total Annual	25,903	

Doudy Draw Trailhead

The Doudy Draw Trailhead is located approximately three miles west of Highway 93. There is parking for approximately 32 vehicles without horse trailers. One bear proof trash can, one dog bag station dispenser, one bike rack, one restroom, an information board with regulations posted and a trailhead sign are provided. Two ADA compliant parking spaces are signed and maintained. A restroom is located approximately one-third mile south of the trailhead up the Doudy Draw Trail. The South Mesa Trailhead with 51 parking spots is located across Eldorado Springs Drive. This trailhead has picnic and restroom facilities.

Heavier use occurs on weekends, with minimal to moderate use on weekdays. Parking commonly overflows into State Highway 170 Right-of-Way. The highway is signed "no parking" adjacent to the trailhead because of safety concerns that include vehicle speeds, poor sight lines and a pedestrian crossing to South Mesa Trailhead. The parking area is moderately sized for horse trailer parking and turning around. The rectangular corral parking functions poorly for horse trailer parking and turn around. The trailhead and amenities are in generally good condition. Additional parking is available at South Mesa Trailhead.

Approximately 34,000 visits were recorded from this trailhead in 2004 with the majority of visits occurring during spring and summer. Visitation Study figures are provided below:

Estimated Doudy Draw Trailhead Visitation		
Date	*Estimated Visits*	*% of Annual Visits*
Summer '04 (June-Aug)	10,759	32%
Fall '04 (Sep-Nov)	7,638	23%
Winter '04 (Dec-Feb)	6,272	18%
Spring '05 (March-May)	9,222	27%
Total Annual	33,891	

Designated Accesses

Highway 93 and Community Ditch Access

Community Ditch Trail crosses Highway 93 at grade. Visitors crossing Highway 93 create a significant public safety concern. OSMP staff is currently negotiating with the Farmers Reservoir and Irrigation Company to utilize an existing box culvert for an underpass under Highway 93. Vehicles add to safety concerns at this location by parking in the Highway Right-of-Way, backing into high speed traffic with poor sight lines, and make U-turns on the highway.

Fowler Trail East Access

Fowler Trail East access is 0.2 miles south of Eldorado Springs Drive on County Road 67. This road is approximately 20 feet wide asphalt and open to motor vehicles, hikers, bikers and equestrians. Use has been increasing at this access since it was purchased thirteen years ago. There is no designated parking lot at this location although at busy times 10 to 20 cars can be parked along the road. Emergency access could be impeded with these conditions. Based on monitoring information from the fall and winter of 2005/2006, there are likely about 9,000 annual visits from this access.

Fowler Trail West Access

Fowler Trail West access is at the boundary of Eldorado Canyon State Park and is a continuation of the state park's Fowler Trail. The trail is natural surface. The boundary is signed with applicable regulations. The state park requires that dogs be leashed; OSMP requires dogs to beon leash or

on corridor under voice and sight control. Based on limited trail monitoring information from the winter of 2006, there are likely about 4,000 annual visits from this access.

Undesignated Accesses

The following are major undesignated accesses. Other undesignated accesses exist.

Eldorado Springs "Post Office" Access

This access is a web of undesignated trails located in the drainage south and above the Eldorado Springs Post Office. Most of this trail network runs through private property to the north of OSMP. The Post Office trail connects with Fowler Trail at four different locations on OSMP property. It is used primarily by residents of Eldorado Springs. The majority of undesignated trails in this area are not located on OSMP land.

Mickey Mouse Wall Access

Climbers use several routes to access Mickey Mouse Wall. This climbing route is featured in at least five guidebooks and has four different routes listed as options for access. The southern access along the railroad track private property is the only route that does not cross OSMP property from the north and east. All four routes require trespass over railroad property and other private property. Access near the Conda Mine is probably the most common access route. Access is gained to this route via the Fowler Trail from: 1) inside the state park at the Fowler Trailhead and Fowler Trail West, 2) from the Post Office Trail in Eldorado Springs, or 3) from Fowler Trail East.

Peanuts Wall Access

Climbers have used both Eldorado Canyon State Park and OSMP lands to access Peanuts Wall. All of Lower Peanuts Wall and part of Upper Peanuts Wall are on state property. OSMP staff is working with Eldorado Canyon State Parks staff and local climbers on a lease agreement that gives management authority for all of Peanuts Wall and Continental Crags, which is south of (above) Peanuts Wall, to the park. The access to Continental Crags is south of (above) Peanuts Wall and access is usually from the Rattlesnake Trail. The park also manages this access. Part of the lease provides for a cooperative relationship between the park and OSMP to fundraise and create volunteer and staff projects to define climber access.

Designated Trails

Doudy Draw Trail

The Doudy Draw Trail connects the Doudy Draw Trailhead and Flatirons Vista Trailhead and goes through a variety of habitats: grasslands, pine savanna, shrubland and riparian areas. Starting at the Flatirons Vista Trailhead to the third gate above Doudy Draw, the trail is maintained as a 10 foot wide natural surface service road that parallels power transmission lines. Parallel undesignated foot/equestrian/dog paths have developed, which may in part be due to the cobbly nature of the trail tread.

The Doudy Draw switchback has problems related to soil erosion and slumping. Its original design and construction have created problems that are exacerbated by the high clay content soils. The bottom leg of the switchback is steep, exceeding 15% in some areas. The wooden steps and retaining wall have helped address the grade concerns, but require extensive annual maintenance. The top leg of the switchback does not drain off the end of the turning platform like it should. This additional water flow down to the lower leg of the trail creates added erosion problems.

The upper creek crossing has inadequate drainage on the approaches creating muddy soil conditions and possible sedimentation into the stream during rainy periods. An open gate, fencing, and a confusing trail alignment create a situation where it is difficult to know the designated route. The second creek crossing's steep southern approach has created conditions for a deeply rutted trail and possible sedimentation into the stream during wet seasons. Visitors have placed a large wooden plank to cross the stream. Much of the trail south to Community Ditch has become braided and rutted due to heavy traffic during wet periods, clay soils, and lack of side slopes needed to shed water across the trail. Rain and snow create slick, muddy conditions resulting in further off trail travel and braiding. Crusher fines have been added to large sections of the trail to improve muddy tread conditions with limited effectiveness.

Near the restroom, an unimproved road accesses Community Ditch for ditch maintenance purposes. The confusing alignment and "no bikes" sign at the trail junction near the restroom create the impression that it is the designated trail and preferred route. North of the restroom, the Doudy Draw Trail is asphalt that is cracking and the edges are starting to break away. The asphalt is too narrow for service vehicles, exacerbating the asphalt deterioration. Parallel foot/equestrian/bike/dog paths have developed. This section of trail to the bridge at Community Ditch is the only part of the Doudy Draw Trail that is open to bicycles.

Community Ditch Trail

This trail is an eight foot wide natural surface road maintained by the ditch company. It is heavily braided. It is open to dogs under voice and sight control and bicycles.

Undesignated Trails

Off trail use by visitors is a growing management issue as evidenced by the numerous and visible undesignated trails. The relative low use of the area compared to the South Mesa Trailhead draws increasing levels of visitor use and offers a good alternative when other areas are congested or crowded. The increasing use of the area presents significant challenges to OSMP management of the area.

The TSA is a popular destination for all levels of recreation use and visitors sometimes follow undesignated trails. The undesignated trail network accesses many areas not served by the designated trail system. This is partly due to relatively unmanaged visitor use over the last twenty years. It is also due to past and current land uses that direct visitor use. Old infrastructure including access roads for an old townsite and for canal construction are used for informal access and have created undesignated trails. Existing infrastructure such as utility lines, ditches, grazing use (including water access, ditch crossings and salt blocks), and forest restoration access have created an informal network of paths. Travel patterns are often directed by fence lines. Posted regulations regarding trespass on private property are routinely disregarded.

Most people use the designated trail system consisting of Doudy Draw, Community Ditch and Fowler trails. Many visitors also travel off-trail to known destinations. Some of the more frequently used routes and destinations include:

- A loop trail near Flatirons Vista Trailhead consisting of Doudy Draw Trail and an undesignated trail east of Doudy Draw and on the southern OSMP property boundary.
- The Lindsay Pond is an attraction that draws people into and up Doudy Draw.
- The Denver Water Board canal provides travel opportunities for a variety of recreational uses. The old railroad grade to the north and east provides an attractive loop for some. Others explore the Flatiron Vista / Dowdy Draw area on undesignated trails or off trail.
- An undesignated loop trail west of Doudy Draw trailhead.

- Parallel undesignated trails next to Doudy Draw trail near Flatirons Vista Trailhead and Doudy Draw trailhead. Avoiding cobbly natural surface and asphalt trails likely played a role in this trail's development.
- The undesignated trails west and south of the Denver Water Board Canal attract very low levels of traffic, primarily from hikers, climbers and equestrians.
- Individuals access OSMP from adjacent private properties, with frequent visitation by Eldorado Springs residents.

Some of the impacts from undesignated trails may be eliminated by improved maintenance of the existing trail system, improved information signs, improved patrol, and closing of remaining undesignated trails.

Destinations and Connections

Staff used 2002 undesignated trails mapping, field visits and conversations with individuals familiar with the area to determine visitation patterns. Figure 2 shows the existing situation from visitor use on the ground.

Activity Patterns

Specific recreational activities and management actions result in distinct pattern of visitor use on the ground.

- Hikers use numerous trail connections on designated and non-designated trails.
- Dog walkers enjoy voice and sight control on Community Ditch Trail and Lower Doudy Draw Trail. Seasonal leash is required on Upper Doudy Draw Trail because of breeding bird and bear activity. No dogs are allowed west of Upper Doudy Draw Trail, except for Fowler Trail where on corridor voice and sight control regulations exist.
- Bikers use the lower Doudy Draw and Community Ditch Trails to connect to Marshal Mesa area trails and connections east.
- Horesback riders access most parts of the area, with a large percent of travel off designated trails. The area is a destination for riders from Boulder, Jefferson, Adams and other Front Range counties.
- Climbers access Mickey Mouse Wall from a variety of locations, all of which cross private property. Bouldering occurs on a rock near Fowler Trail East and access is gained from Rattlesnake Trail across OSMP to the "Cloud Nine" bouldering located on private land to the South of OSMP.
- Paragliders have used the "Matterhorn" site for instructional and recreational flying. No designated trails support this use.
- Bird watchers, naturalists, photographers, geologists and history buffs explore the area, often off designated trails.

Trail Connections

There are two regional connections listed in the Boulder Valley and Boulder County Comprehensive Plans that are relative to this TSA.

Jefferson County – A trail is planned to connect with Jefferson County to the south. The conceptual alignment is on the east side of Highway 93. Because the connection is conceptual, the feasibility of making the connection on either side of Highway 93 will be considered. This is currently part of the Front Range Trail conceptual alignment. There are high wildlife values and private property to the west, including the Coal Creek riparian corridor, indicating the trail connection here would be more difficult.

Walker Ranch Open Space – There is a conceptual multi-use trail alignment connecting the Doudy Draw/South Mesa Trailhead to Boulder County Parks and Open Space's Walker Ranch. The eastern part of this trail alignment is along Eldorado Springs Drive.

Recreational Issues

Safety Hazards

The Eldorado Mountain/Doudy Draw TSA has many of the same general safety hazards that are present in other areas of OSMP. There are hazards specific to the area that present additional visitor safety issues. Safety issues related to trailheads are noted here and described in greater detail in the trailhead section.

The Denver Water Board Road, especially at the road cut areas, experiences routine rock fall. The road cut passageway is narrow with limited passing room and creates a greater likelihood for conflict between hikers, equestrians and dog walkers. The Denver Water Board Canal presents significant hazards to any person that may fall in or attempt to cross. The canal runs deceptively swift and is a particular hazard near the siphon area.

Ongoing forest management activities and wildland fire operations have created a high density of snags that are unstable and likely are not suitable for routine or formal travel patterns. Another safety concern is the Union Pacific Railroad, particularly at the tunnel crossings. The Union Pacific Railroad is posted that trespass is prohibited.

There are safety issues of traffic merging and pedestrians crossing roads at Flatirons Vista Trailhead and Doudy Draw Trailhead (see trailhead descriptions).

Other specific and general safety issues include agricultural operations, older unused agricultural resources, power lines, utilities, vehicle traffic on access roads, and dog and wildlife management.

Visitor Use Conflicts

User conflicts are generally defined as experiences that are conflictive, make you feel uncomfortable, or interfere with the goals of your outdoor experience. Situations that can lead to conflict include: 1) crowding, particularly at trailheads and on trails on nice weekend days, 2) understanding and obeying dog regulations, 3) vehicle management on County Road 67 where there is little parking and little room for turning, and 4) changes in posted regulations at the Eldorado Canyon State Park and OSMP boundary on the Fowler Trail.

Visitor Satisfaction

As part of the 2005 Open Space and Mountain Parks Visitation Study, a survey measured visitor satisfaction on the OSMP system two ways. First, eight survey questions rated satisfaction with issues or services. Another question rated overall visitor satisfaction. A correlation analysis was conducted between the individual issues or services and overall satisfaction. Five items emerged as significant suggesting that attention to these items is the most likely way to improve overalll visitor satisfaction:

- fixing eroded or trampled areas,
- enforcement of rules,
- providing trash cans and bag dispensers,
- improving experience with dogs and dog walkers, and

- improving usefulness of signs and brochures.

A second question was asked if the visitor had any conflicts or unpleasant experiences that day. Conflicts were reported on 3.6% of visits. Conflict descriptions included: dog management, OSMP management, nature, other visitors, bikes, horses, and miscellaneous. Two categories emerged that were also found in the satisfaction analysis: trail deterioration (fixing eroded or trampled areas) and dog management. This result reinforces the need to work on these two issues to improve the visitor experience.

Property Rights Issues

Community Ditch:
The Farmers Reservoir and Irrigation Company (FRICO) owns an easement approximately 20' wide on either side of the centerline of the ditch for maintenance purposes. Disagreement exists between the City and FRICO regarding who owns fee title.

Stengel Lane:
The lower portion of Stengel Lane along the Dunn II property is owned in fee by the City. The upper portion of Stengel Lane along the Stengel II property is private property. The City has been granted a non exclusive easement over this portion for maintenance only.

Denver Water Board Canal:
In general, Denver Water Board owns fee title to an area 50' on either side of the water conduit. Permission would need to be granted for public use. However, rights were reserved by the previous private property land owner which provided the right to follow the southern boundary of the conduit and cross the area owned by Denver Water to access the property on the other side. A legal opinion would be needed in order to determine if these rights run with the land and still exist.

Existing Denver-Rio Grande Railroad and Old Railroad Grade:
The existing railroad owns fee title to an area which ranges in width from 400' to 600'. Permission would need to be granted for public use.

The old railroad grade was never used for rail purposes. It can be argued that any rights granted for this use have long been abandoned and no longer exist.

Xcel Power Line:
An easement approximately 50' wide was granted to Xcel Energy (formerly PSCO) for power transmission lines. In addition a 45' wide easement runs parallel to the Xcel easement for telephone (these are both power lines) lines. In general, both easements are located in the area of the existing power lines.

County Road 67:
In 1908, Boulder County established CR 225 (CR 67) to run from Eldorado Springs Drive to the Forest Park townsite. This ROW follows the existing road up to the first switchback and then travels generally south to the Denver Water conduit. This ROW has not been vacated and still exists. Its exact extent is questionable.

Cultural and Agricultural Resources

The Eldorado Mountain/Doudy Draw Trail Study Area has a rich history. Aboriginal tribes lived in and roamed through the area prior to European settlement. Railroads, mining, farming, ranching and climbing have been influential in the area for the past 150 years. Archeologists and historians have identified forty-three (43) individual cultural sites in the TSA. The area is eligible for historic

district designation because of the importance of historical activities in the area. Some of the sites identified in the study area are eligible or potentially eligible for placement on the National Register of Historic Places.

For the purposes of this report cultural resources are at least 50 years old. Cultural resources may include buildings, structures, sites, districts, or objects having scientific, historic, archeological, or social values. Agricultural information is limited to an account of current grazing practices.

An understanding of the natural and cultural resources contributes to an appreciation of how the human presence has changed and how it has affected the Boulder Valley.

Cultural and agricultural resources are displayed on figure 3.

Cultural Resources

The following summarizes information contained in the ground surveys for the Eldorado Springs Management Area that were completed in 1991 and 1995 (Gleichman et al., 1991; Tucker and Gleichman, 1995).

Five Identified or possible cultural sites or finds were reported from the surveys. Evidence of Native American or aboriginal peoples is sparse in the study area. The low number of identified aboriginal or pre-European historic sites may in part be due to the heavy vegetation cover and resulting poor ground visibility. Areas adjacent to perennial streams contain little surface evidence of prehistoric occupation or use, probably because these materials were washed away by the periodic flooding which characterizes these drainages. The extensive collection of materials and destruction of aboriginal sites by settlement and development is another factor reducing the amount of visible material.

Archaeologists and historians documented thirty-eight (38) identified historic sites. Five of the identified sites appear to have been associated with railroad construction in the late nineteenth and early twentieth centuries. At least 21 of the identified sites appear to have an association with historic agricultural activities in the area. Three identified sites are associated with historic mining activities. Several sites contributed to transportation (roads) or historic land development activities in the area (e.g., the Forest Park Townsite).

Several of these identified sites may be eligible for listing on the National Register of Historic Places. Two structures – the Beasley cabin and the Redrock Cola cabin – are recommended for specific management measures to stabilize and secure the remaining structural elements. Two other historic sites ("railroad camps") associated with railroad construction in the area are recommended for additional stabilization and protection measures. Some of the identified historic sites may be suitable for education or interpretive use and management.

Agricultural Resources

Grazing

Livestock grazing is the primary agricultural use in the TSA. The Flatirons Vista, West Rudd, Dunn II and Moore Family properties are currently leased for grazing use. The Stengel II property was last grazed during the 2003 growing season. The Lindsay, Eldorado Mountain and Moore Robinson properties have not been grazed intentionally since they were purchased by OSMP (or shortly thereafter). Short periods of trespass grazing have occurred on these properties.

The grazing rotation changes each year based on staff input. There can be livestock in the TSA from May – December each year. Grazing periods typically range from 30 – 60 days.

Flatirons Vista has the most variable grazing schedule and may be used at any time by up to 250 yearlings or 150 cows/calves/bulls. This property can provide up to 250 animal unit months of forage. The pond located west of the Flatirons Vista trailhead is the primary water source for this property. There is also a corral located by the Flatirons Vista trailhead that is used to sort and load livestock.

West Rudd has most recently been used for grazing in the spring and/or fall. Community Ditch and the Davidson Ditch are primary water sources for this property. Grazing is limited to periods when water is flowing in either of these ditches. There is a developed spring on this property located northwest of the Matterhorn property on the north facing slope of the mesa. This spring historically provided enough water to graze the property for the grazing season. For the last ten years water flow from this spring has been intermittent and unreliable. There is a well on the Matterhorn property that could be developed as an additional water source. West Rudd can provide up to 320 animal unit months of forage.

The Dunn II property can potentially provide up to 150 animal unit months of forage. The property has been grazed for 30 to 45 days between August 1st and September 30th. The Dunn II property will not be grazed in 2006. Future grazing will likely occur in either the spring or fall as determined by OSMP staff. Livestock water sources for this property include Community Ditch, intermittent flow in Doudy Draw, and a developed livestock pond / tank located north of Community Ditch on the western property boundary.

The Moore Family property has been grazed seasonally between May and August by approximately 15 animals. This will likely continue in the near future.

Agricultural Water Management

Ditch cleaning and water delivery monitoring activities along Davidson Ditch and Community Ditch will continue to take place. The headgate for the Eggleston #4 lateral is located along Coal Creek on the Flatirons Vista property. This ditch runs along the eastern boundary of this property and runs just west of the current trailhead location. No agricultural use is proposed for the area where a dam breached in the southwest portion of the Flatirons Vista property. There is also a well and livestock tank on the Stengel II property which will no longer be used for agricultural activity.

Natural Resources

The Eldorado Mountain/Doudy Draw Trail Study Area is part of a large network of protected lands linking the Rocky Mountains to the Great Plains (figure 4). The Front Range is the fastest growing region of Colorado, and opportunities to protect large landscapes like this one, containing two major and very different ecosystems, are quickly disappearing.

Forests and open woodlands of ponderosa pine and Douglas fir dominate the western third of the TSA. These forested lands are connected with national forest and wilderness areas extending beyond the Continental Divide. These forests provide important habitat for wide ranging species like elk, black bears and mountain lions. The forests extend eastward where tree density decreases and ponderosa pine woodlands give way to ponderosa savannas which transition to open grasslands.

The grasslands within the TSA vary from introduced pasture grasses to high quality native tallgrass communities. These communities are part of the largest intact block of native grassland habitat in Boulder County. These “southern grasslands” include city, county, state and federal lands. This

area provides opportunities for grassland nesting birds, wintering elk, hunting raptors and the potential to reintroduce extirpated species like the plains sharp-tailed grouse.

Nearly half of all the vegetation alliances known to occur on the OSMP system can be found in this TSA. The variation in habitats supports 478 plant species in 97 different botanical families (Hogan 1994). Unique habitat conditions also support seven state listed plant species of concern and numerous plant communities that are both locally and globally rare. Mature ponderosa pine stands support a variety of old-growth dependent species, including northern goshawk, flammulated owl, and hairy woodpecker. The sedimentary cliffs of Eldorado Mountain provide nest sites for several raptor species including peregrine falcon, golden eagle, prairie falcon, red-tailed hawk, and turkey vulture. The large contiguous shrublands of Doudy Draw and Bull Gulch provide nesting habitat for many species of conservation concern including scrub jays, yellow warblers, and blue grosbeaks.

Natural resources found in the TSA are described below. These resources are displayed on figure 5.

Geological and Paleontological Resources

The Eldorado Mountain/Doudy Draw Trail Study Area contains some of the best examples of local geology and is particularly instructive regarding the interesting patterns of sedimentation and mountain building uplifts in the area. The TSA lies in and along the foothills on the eastern flank of the Southern Rocky Mountains. The area includes rock formations dating from about 1.7 billion to 65 million years before present and unconsolidated surficial deposits dating from the last 2 million years. Prominently visible are the characteristic “hogback” and “flatiron” formations.

The oldest rock units in the area are the igneous and metamorphic rocks that underlie the foothills at the western edge of the study area. The eastern portion of the foothills, as well as the pediment and mesa areas east of the foothills, is underlain by younger sedimentary rock units. These sedimentary rock layers are covered by more recent unconsolidated deposits, such as the thin gravelly alluvium that caps the mesa tops.

The Dakota Group, Morrison Formation and Laramie Formation contain dinosaur tracks, plant and animal fossils and other evidence indicating low-lying depositional environments. A wave-rippled bed in the younger part of the Dakota Group was deposited on tidal flats and now forms the distinctive “ripple rock” on the Lindsay Open Space in the study area.

- **Dinosaur tracks** are preserved as casts at the bottoms of depositional surfaces (stream and beach “beds”) and as imprints on upper bedding surfaces. Dinosaur tracks have been removed or vandalized by “collectors” in the area. Natural weathering continues to erode and impact track localities. The tracks are contained in similar depositional strata as the more well-known Dinosaur Ridge further south at Morrison, Colorado.
- **Invertebrate fossils** such as ammonites, clams, oysters and stromatolites are found in rocks that formed seas and shorelines in earlier geological periods that are represented in the study area.
- **Sedimentary features** such as delicate round-topped “mini-ripples,” mud-crack clasts, fossilized imprints of wood, fossilized root marks, fossilized bone fragments, unusual mineralized concretions and “packed-pebble” conglomerates occur in the Dakota Group in the study area.

Vegetation Communities

Xeric Tallgrass Prairie Communities

Description: Several tallgrass plant communities, dominated by big bluestem are found in Boulder Valley from the forest edge to the eastern fringes of the outwash mesas (appendix 1). In Colorado, tallgrass communities are found along the northern Front Range at the foot of the mountains, in the Mesa de Maya area in the southeast, and in sandhills in the northeastern part of the state. Some of the largest areas of tallgrass remaining in the state are in the Boulder area. The Colorado Tallgrass Prairie State Natural Area was designated on OSMP land in 1984, in recognition of the state-wide importance of Boulder's tallgrass prairie. The foothills tallgrass communities in the Boulder area have similarities to the mid-western prairies of the Great Plains, but also have distinctive characteristics. Tallgrass prairie is considered rare and imperiled globally, and is one of the most endangered vegetation types in the world.

The conservation rankings for the communities that occur in Colorado range from critically imperiled to imperiled. Xeric tallgrass communities have been highlighted and identified as conservation targets by The Nature Conservancy's ecoregional assessment of the Southern Rocky Mountain area. Southern Boulder County and northern Jefferson County may have the largest areas of these xeric tallgrass communities remaining in the ecoregion.

Habitat: Xeric tallgrass plant associations occur at elevations between 5400 and 7600 feet in Colorado. They are found in meadows at the prairie-forest interface, along steep "hogback" slopes in the foothills, and on mesa tops. The occurrences in ponderosa pine openings are relatively small, generally from 3-100 acres. Tallgrass stands on large outwash mesas can range from a few hundred acres to over 1000 acres. Stands found on slopes, mesas, and ridges usually occur on soils that have rock and gravel in the upper profile. This allows for quick infiltration of precipitation and more available soil moisture and nutrients when compared to adjacent finer textured soils which support different plant associations. These coarse materials near the surface may act to reduce evaporation. Underlying, heavier clay layers absorb and retain enough moisture to support tallgrass prairie and montane plant species. The higher precipitation at the base of the mountains, combined with the geology and soils, provides habitat for xeric and mesic tallgrass in the Boulder area.

Current Condition: Historically, xeric tallgrass communities were probably widespread along the eastern Rocky Mountain Front of Colorado. Fire suppression, grazing practices, mining and urbanization have altered or destroyed the cover and much of the habitat. Some of the largest areas of tallgrass remaining in the state are in the Boulder area. On OSMP land, prescribed fire, cattle grazing and a variety of weed management practices are used to restore and manage tallgrass communities.

- *Rare and threatened grasslands globally and statewide*
- *Predominant native vegetation over large areas of the TSA*
- *Noxious weed species pose a major threat to tallgrass communities on OSMP*

Xeric tallgrass community patches are distributed across the western and southern parts of the OSMP system, ranging in size from less than an acre to more than one thousand acres. The largest areas occur in southern Boulder County and northern Jefferson County. The Eldorado Mountain/Dowdy Draw TSA contains patches of xeric tallgrass totaling nearly 900 acres, which is seventeen percent of the tallgrass documented across the OSMP system. Most of the tallgrass community stands in the TSA are large, matrix-forming occurrences. Several thousand acres of tallgrass and other grassland community types occur on surrounding OSMP areas and on other public and private land to the north, east and south of the TSA, creating a nearly contiguous prairie landscape. The size, quality and composition of this foothills grassland community complex is unmatched in our region.

Noxious weed species pose a major threat to tallgrass communities on OSMP. In general, mesa top tallgrass communities tend to have fewer invasive weed species than tallgrass patches on slopes. Most tallgrass community stands in the TSA are in good condition with high cover of native species and limited distribution of noxious weed species. High quality examples with low presence of weeds and high cover of diagnostic tallgrass species make up approximately 20 to 30 percent of the documented tallgrass patches in the TSA.

Foothills Deciduous Shrublands

Description: Foothills shrublands support the highest breeding bird densities of any OSMP ecosystems. The shrublands of Doudy Draw and Bull Gulch support 33 breeding bird species including 9 species of special concern (Jones 1993). Several breeding bird species of foothills shrub patches are shrub specialists, including green-tailed towhees, Virginia's warblers, luzuli buntings, and blue-gray gnatcatchers (Berry 1997).

Foothills shrublands also provide habitat for a wide variety of mammals. The patchy mosaic of shrublands provides cover, forage, and movement corridors for a diverse mix of wildlife. A mix of shrublands and near-by grasslands, like those found in Doudy Draw, create ideal habitat for Preble's mice, a federally listed species. Bears, songbirds, mule deer, mountain lions, and small mammals are a few of the animals that utilize shrublands for food and movement across the landscape.

The vegetation alliances that define these shrublands are displayed in appendix 1.

Habitat: Deciduous shrublands require relatively high levels of water and usually occur with ephemeral water sources. North facing slopes, draws, gulleys, and seeps all provide ideal conditions for deciduous shrublands. Due to the water needs and the areas they inhabit there is often an overlap, in species and composition, between foothills shrublands and the riparian shrublands described below. Shrublands form a patchy structure across the landscape inhabiting various slopes and soil types. They are often found within or between grassland and forest ecosystems or along riparian corridors.

Current Conditions: Foothills shrublands are a relatively rare habitat type along the northern Front Range foothills and on the OSMP land system. Less than five percent of all fee properties on OSMP are mapped in the deciduous shrubland alliances. Of these, 15% are within the Eldorado/Doudy Draw TSA. The Doudy Draw and Bull Gulch shrub complex (93 acres) forms the second largest deciduous shrubland in the system. Most occurrences of shrublands within the TSA boundary are of high quality with few occurrences of priority weeds.

- *Rare and threatened community statewide*
- *Habitat for a rich diversity of birds and mammals*
- *Large percentage of OSMP's total shrublands are in this TSA (15%)*

Wetlands and Riparian Communities

Description: Wetlands are among the most biologically diverse and productive ecosystems on earth (Mitsch and Gosselink 2000, NRC 1995). In their natural state, they provide a variety of societal and ecological benefits including flood conveyance, shoreline stability, water quality improvements, food chain support, fish and wildlife habitat and recreational values.

The U.S. Fish and Wildlife Service (Cowardin et al. 1979) defines wetlands as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." According to this definition, wetlands must have one or more of the following three attributes: (1)) at least periodically, the land supports predominantly hydrophytes (wetland plants); (2) the substrate is predominantly undrained hydric soil; and (3) the

substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

Riparian ecosystems are a common wetland type in the study area where soils and soil moisture are affected by the adjacent stream. They are characterized by distinctive vegetation and physical and soil characteristics influenced by surface or subsurface water.

Riparian ecosystems are extremely important landscapes in Colorado because they support disproportionately high levels of biological diversity. Although they comprise less than two percent of the land cover, riparian areas provide habitat for approximately 80 percent of birds, mammals, herptiles and fish native to Colorado. Many are species that depend almost entirely on these streamside and aquatic habitats for their survival.

Habitat: Several wetland types occur within the study area depending on water source, topography, landscape setting, soils and other factors (appendix 1). Generally, these factors dictate the plant species that are capable of growing in the wetland and ultimately on the long-term vegetation communities found there. Water to support wetlands can come from a variety of sources and it is not uncommon for a wetland to have several sources of water. The most common water sources for wetlands in the TSA include streams, ditches, ponds, high ground water and springs.

Typical wetland types in the study area include riparian forests and shublands, emergent marshes, wet meadows, springs, seeps and ponds.

Wetland in the TSA also provide habitat for many animals including bears, mountain lions, songbirds, raptors, mule deer, elk, small mammals and herptiles. The wildlife habitat value of these ecosystems is described in more detail in other sections of this report.

Current Conditions: Undeveloped riparian corridors are becoming increasingly scarce along Colorado's Front Range and are particularly rare in the Denver-Boulder Metropolitan Area. Riparian corridors are threatened by urban and suburban development, overgrazing by livestock, water development and water management practices, utilities and transportation (including trail) development, and infestation by non-native plant species. As mentioned above, wetlands perform a number of functions that are ecologically important and beneficial to society. D'Amico (1995) evaluated the functions of wetlands in the study area and found ground water recharge, food chain support and wildlife habitat functions are performed to a high degree by many of the wetlands.

- *Rare habitat type along the Northern Front Range and on OSMP lands*
- *High value habitat for disproportionately large percentage of wildlife species, which utilize it for critical life stages*
- *Large percentage of OSMP's total wetlands are in this TSA (20%)*

Approximately 20 percent (ca. 350 acres) of the wetlands in the OSMP land system are within the TSA. Roughly half of these wetlands are riparian wetland types.

Mature Ponderosa Pine Forests

Description: One hundred years of fire suppression and poor management have led to overgrown forests across the Front Range. Old growth and well developed understory have been suppressed in many areas. There are however, pockets across the OSMP system that display characteristics of "near old-growth" or mature forests. These areas are unique from other ponderosa forests based on high densities of large, old trees, large dead standing trees, and a heterogeneous structure.

Large living trees and snags are important to numerous cavity nesting birds including northern pygmy owls, hairy woodpeckers, and red-breasted nuthatches. These have all been documented in the Eldorado/ Doudy Draw TSA (Jones 1993). The large trees and dense cover also provide habitat for forest interior species such as goshawks, which have been recorded along the Spring

Brook drainage. A diverse mix of mammals also use the dense cover and canopies of mature forests in the TSA including Abert's squirrels, bobcats, mountain lions and wild turkey.

Habitat: Mature forests have high numbers of large trees (greater than 19 inches in diameter), high snag densities (3-5 snags per acre larger than 13 inches in diameter), and a multi layered canopy (Jones 1993). High densities of trees can also be important to some interior species and an average age greater than 100 years often means the stand has a number of older trees.

- *Rare habitat type along the Northern Front Range and on OSMP lands*
- *Forest interior habitat and cavity-nesting habitat for many bird and mammal species*
- *About 80 acres of mature forests occur in the TSA*

Current Conditions: In the TSA there are about 80 total acres in three areas that meet the characteristics of a mature forest. These areas are in upper Doudy Draw/ Bull Gulch, along Spring Creek (both east and west of the canal), and near Eldorado State Park just south and east of the Rattlesnake Gulch trail. Based on anecdotal reports these areas see regular use by mountain lions, turkeys, bears and a wide variety of bird species (Nolan, pers. comm.).

Mountain Mahogany Shrublands

Description: The mountain mahogany shrubland community is a small subset of the larger deciduous shrubland matrix. Deciduous shrublands such as mountain mahogany make up less than five percent of all the vegetation cover on OSMP. Despite their small size, shrubland communities support the highest breeding bird densities of habitat types sampled on OSMP (Jones 1993) and provide important feeding areas and movement corridors for mammals. Shrublands also add to the overall biodiversity of OSMP.

Within the Eldorado/ Doudy Draw TSA, mountain mahogany occurs as a part of a more complex vegetative community. The Mixed Foothills Shrubland community as defined by the Colorado Natural Heritage Program (CNHP) includes mountain mahogany (*Cercocarpus montanus*), skunkbrush (*Rhus aromatica ssp. trilobata*), and big bluestem (*Andropogon gerardii*).

The CNHP lists the Mixed Foothills Shrubland community as vulnerable to extirpation or extinction in the state and across its entire range (G3S3). The G3S3 ranking indicates that there are relatively few (often fewer than 80) known populations. The CNHP ranking reflects this community's relatively small range which is limited to Colorado.

Habitat: The Mountain Mahogany shrubland alliance is most commonly found between 5000 and 7000 ft. on the dry rocky slopes of hogbacks. Most stands are on moderately steed slopes between 20-30%. Inhabited soils are often shallow loams with limited water holding capacity. Up to 75% of the ground surface may consist of bare exposed rock and weathered debris (Kettler and Pineda 1999). Often, these shrublands occur within ponderosa woodlands and savannas.

- *Rare vegetation community along the Northern Front Range and on OSMP lands, about 150 acres occur in this TSA*
- *Forms habitat, rich forage areas, and movement corridors for birds and mammals*
- *Experiencing growing pressure from development and changes in fire regimes*

Current Conditions: The mixed foothills shrubland community that includes mountain mahogany is only documented at a few sites along the Front Range. Available habitat is experiencing growing pressure from development and changes to natural fire regimes. In the absence of fire, ponderosa pine seedlings have replaced many mahogany stands. Development along the Front Range has also filled much of the habitat once available to these shrublands.

Mountain mahogany shrublands are rare across the OSMP system. There are only about 150 acres mapped in this alliance on lands managed by OSMP. Within the Eldorado/ Doudy Draw area there are about 5 acres of mountain mahogany scattered across the TSA. The four examples within the TSA boundary are all of high quality with few occurrences of priority weeds.

Needle and Thread Grassland Community

Description: The needle and thread (*Hesperostipa comata*) – East plant community is found mainly along the eastern mountain front of northern Colorado at lower elevations (5100 – 5760 feet). Diagnostic species include needle and threadgrass (*Hesperostipa comata*), blue grama (*Chondrosum gracile*), sideoats grama (*Bouteloua curtipendula*), and dwarf morning-glory (*Evolvulus nuttallianus*). The conservation rank is G2S2, which indicates that the community is imperiled on global and state levels (20 or fewer occurrences).

Habitat: This association occurs on east and west facing "hogback" slopes along the mountain front, and on rock outcrops in northeastern Colorado. In the Boulder area, the community is also found on the eastern portions of outwash mesas. Several stands have been documented on soils derived from limestone and sandstone of the Morrison, Dakota, Lykins, and Lyons formations. The community is dominated by the bunch grasses needle and threadgrass (*Hesperostipa comata*) (20-60% cover), and blue grama (*Chondrosum gracile*).

Current Conditions: Needle and threadgrass prairie occurs on hogback and ridge formations and on rocky mesas in north Boulder Valley and in the southern grasslands on OSMP. The largest patches, ranging from one to over 75 acres in size, are on the mesas and outcrops of East and West Beech properties and the eastern portions of the outwash mesas in the Southern Grasslands. Relatively small patches, totaling approximately 20 acres, are found in the Eldorado Mountain/Dowdy Draw TSA. Currently, the needle and thread grass patches in the TSA are in fair to good condition based on the relatively high cover of native species and moderate cover of non-native species that are of low priority for OSMP weed management. On the other hand, the presence of dalmation toadflax and other high priority noxious weeds in the vicinity of the Flatirons Vista/Dowdy Draw trailhead poses a significant potential threat to the needle and thread communities nearby.

- *Rare and threatened community statewide*
- *About 20 acres of needle and thread grassland are found in the TSA*
- *Vulnerable to invasion by noxious weed species*

Rare and Sensitive Plant Species

Records and locations for rare and unique plants in an area are the result of inventories, searches and monitoring. On-going mapping and tracking by staff and volunteers occurs on an annual basis.

Carrionflower (*Smilax lasioneura*)

Description: Carrionflower is a perennial, dioecious vine (to 7 feet in length) found in moist, wooded riparian habitats along the northern Front Range foothills of Colorado and in similar habitats in the central Great Plains and eastern United States. In the Boulder area, *Smilax lasioneura* occurs in several canyons and small draws from Gregory Canyon to upper Dowdy Draw in the Eldorado Mountain/Dowdy Draw TSA. At the global level, the conservation status is considered secure (G5), but in Colorado the conservation ranking classifies the species as vulnerable to extirpation (S3).

Habitat: In Colorado, carrionflower occurs from about 5500 to 6500 feet along the base of the mountains in moist canyon bottoms and draws with riparian woodlands. It is able to colonize naturally disturbed habitats such as flood-prone canyon stream banks. The Colorado populations

are at the western edge of the species' range. Carrionflower contributes to the rich floral diversity found in foothills riparian shrublands in the Boulder area.

- *Rare and threatened statewide and on OSMP land*
- *Associated with high quality riparian areas and foothills shrublands*

Current Conditions: Carrionflower occurs on OSMP land in several canyons and seeps in the Chautauqua and Gregory Canyon area, Skunk and Fern canyons, Shadow Canyon, and the Spring Brook and upper Dowdy Draw areas in the TSA. One outlying location is in the Southern Grasslands HCA in the vicinity of Coal Creek. Associated species are typically native riparian shrubs and a variety of native and non-native forbs and grasses. Carrionflower is considered vulnerable to extirpation in Colorado due to the threat of habitat removal by development along the Front Range. Though threats to OSMP occurrences have not been assessed comprehensively, the removal of individuals by direct impacts and the displacement of habitat by non-native species are likely to be the greatest potential threats.

Dwarf Leadplant (*Amorpha nana*)

Description: Dwarf leadplant is a low shrub between one and two feet tall that occurs in foothills grasslands along the Front Range in Colorado. It is one of the few shrub species occurring in prairie grasslands in the northern Great Plains. Along with other grassland shrub species, leadplant provides structure and food for birds and other wildlife. Leadplant is restricted to areas that are protected from heavy grazing. Dwarf leadplant is ranked as imperiled to vulnerable (S2S3) by CNHP within Colorado, which indicates that there are fewer than 100 populations in the state. The global conservation status is "secure" (G5), meaning the species is relatively common in portions of its range.

Habitat: The distribution of dwarf leadplant is centered in the northern Great Plains from Manitoba and Ontario into North and South Dakota, Minnesota and Iowa. The Colorado populations of dwarf leadplant occur at the western edge of the species' range and are several hundred miles disjunct from the main part of the range. In the Boulder area, leadplant is closely associated with grassland communities dominated by big bluestem and occurs primarily on north and northeast-facing slopes of outwash mesas below 6500 feet. The largest populations on OSMP are found at the forest-grassland interface. Relatively small populations (between 5 and 50 individuals) are located in the Eldorado/Dowdy Draw TSA in meadows at the forest edge and in grasslands east of Dowdy Draw on the slopes of low outwash mesas.

- *Rare and threatened statewide and on OSMP land*
- *Closely associated with grassland communities with Big Bluestem, and most commonly found along the forest/ grassland interface*

Current Conditions: Within the TSA, small leadplant populations occur just east and west of the Denver Water Board Canal road in forest openings where road maintenance does not appear to impact the plants, and in grasslands east of Dowdy Draw. Though threats to OSMP occurrences have not been assessed comprehensively, the removal of individuals by direct impacts and the displacement of habitat by non-native species are likely to be the greatest potential threats to local populations.

Frostweed (*Crocanthemum bicknellii*)

Description: Frostweed, a member of the rockrose family, is widely distributed across the U.S. but is much less common in the state and Boulder County. On the OSMP system, frostweed occurs in forested areas that have burned in recent history. Due to the disturbance caused by fire, frostweed often occurs with annual weeds and in exposed soils. The CNHP lists frostweed as globally secure but imperiled on a local level (G5S2). The S2 ranking means frostweed is restricted to very few populations (20 or fewer) in the state.

Habitat: On OSMP land, frostweed occurs around 6000 feet in recently burned forests. Frostweed also favors a savannah tree density (12-25% canopy cover) and rocky well drained soils.

Current Conditions: Frostweed is not widely distributed on OSMP. The low number of populations could be attributed to densely stocked forests and a lack of natural fire intervals. Within the Eldorado/ Doudy Draw TSA frostweed is found within the burn areas west of the diversion canal. These areas were burned in 1995. Other potential habitat includes the 2003 Lindsay forest burn and the 2004 Lindsay meadow burn. Both of these sites were recently searched but no populations were found (it may take a few seasons for frostweed to get established after a burn).

- *Rare and threatened statewide and on OSMP land*
- *Found within the TSA in recently burned forest patches*

Grassfern (*Asplenium septentrionale*)

Description: The grassfern is a small spleenwort that is only found in rock crevices and large talus. Because of its close resemblance to a tuft of grass, it is easily overlooked. The Colorado Natural Heritage Program lists grassfern as vulnerable to extirpation or extinction in the state (S3 ranking) due to its restricted range. The S3 ranking indicates that there are relatively few (often fewer than 80) known populations in Colorado.

Habitat: On OSMP, grassfern is known to occur in a number of rocky sites including the Flatirons, Eldorado Mountain, Lost Gulch, and Green Mountain. In Colorado the species has only been collected at elevations above 5800 ft. (based on CU herbarium records). Vegetation alliances on OSMP likely to support grassfern are open sparsely vegetated cliffs, rock outcrops, and montane talus fields.

Current Conditions: Due to grassfern's habitat, it is very susceptible to climbing, bouldering, and the "rock cleaning" associated with climbing. Grassfern often inhabits the small crevices and holes in rocks that are used by climbers as holds. On rocks that are regularly climbed the grassfern is often smashed by hands or feet or removed to improve the hold. On undisturbed rocks grassferns are very successful and are often part of diverse associations with lichens and other rock dwelling species.

- *Rare and threatened statewide and on OSMP land*
- *Limited to large boulders and rock cliffs which makes it vulnerable to rock climbing and bouldering*

Grassyslope Sedge (*Carex oreocharis*)

Description: Grassyslope sedge is an upland plant occurring in montane grasslands in southern Wyoming, Colorado, northern New Mexico, and northern Arizona. This dryland sedge is 1 to 3.5 decimeters tall when in flower with stiff, grass-like leaves clustered near the base. The conservation ranking is G3S1, indicating that the species is considered vulnerable and at a moderate risk of extinction globally, and critically imperiled in Colorado.

Habitat: Typically, *C. oreocharis* is found in localized patches on higher elevation (7500-10,600 ft.) dry slopes and montane grasslands in granitic soils. In the Boulder area, this species occurs between elevations of 5400-5600 feet on the rocky substrates of outwash mesas, and is associated with xeric tallgrass plant communities. Grassyslope sedge may be distributed more widely on the Rocky Flats Mesa and mesas of similar geologic origin and age in southern Boulder County.

Current Conditions: The only documented occurrence on OSMP land is on the West Rudd property in the

- *Rare and threatened globally, statewide and on OSMP land*
- *The only documented occurrence on OSMP is within this TSA*

northern part of the Eldorado Mountain/Dowdy Draw TSA. In the Boulder area, grassyslope sedge has also been documented on the Rocky Flats Mesa in the area included currently in the Rocky Flats NWR. It is at the edge of its elevational range in the Boulder Valley area, and is considered very rare in Colorado. Potential threats to the West Rudd sedge population are the displacement of habitat by non-native species and direct impacts caused by ground disturbing activities.

Prairie Violet (*Viola pedatifida*)

Description: The prairie violet is found along the forest/ grassland interface of OSMP usually in forest openings or along forest edges. The CNHP lists prairie violet as imperiled on a local level and globally secure (S2G5). The global security of prairie violet is due to its large range which includes Colorado to Ohio and from Texas up through Manitoba. Locally, prairie violet is much rarer and is restricted to very few populations (20 or fewer) in Colorado.

Habitat: Prairie violets are most commonly found in woodland meadows and ponderosa savannas on OSMP. Throughout the system, prairie violets are found between 5500 and 6100 feet in elevation and on rocky or well drained soils.

Current Conditions: On OSMP, prairie violets are only known to occur at six general sites; the Shanahan ridge area, Chautauqua meadow, north of Lee Hill rd. on the Parsons property, along the South Mesa trail, in the Tallgrass 7 natural area, and on the Lindsay property within the Eldo/ Doudy Draw TSA. Within the TSA boundary there are two known occurrences of prairie violets. Potential threats to the TSA occurrences include the displacement of habitat by non-native species and direct impacts from ground disturbance.

- *Rare and threatened statewide and on OSMP land*
- *Limited to six general sites on OSMP and there are two known occurrences in the TSA*

Ute ladies'-tresses orchid (*Spiranthes diluvialis*)

Description: The Ute ladies'-tresses orchid is a perennial, terrestrial orchid species associated with low elevation streams and river systems in the Rocky Mountain and Intermountain areas of the western U. S. The flowering stalk may be 8 to 20 inches tall with small stem leaves and a cluster of longer linear leaves at the base. Flowering occurs from late July through early September. Individual plants can live for more than a decade and possibly for several decades. *Spiranthes diluvialis* has been on the federal list of "threatened" species since 1992. The global and state rankings, G2S2, indicate that the species is imperiled because of extreme rarity. One of the largest populations known throughout the plant's range occurs in the South Boulder Creek floodplain and associated stream terraces on OSMP land.

Habitat: Typical Ute ladies'-tresses habitat occurs where high gradient, confined streams shift to low gradient, unconfined streams, forming relatively stable wet meadow and riparian habitat. Across its eight-state distribution, the orchid occurs at elevations ranging from 720-7000 feet. The orchid is found where vegetation is mostly herbaceous and relatively low in stature (less than 2 feet in height) in moist to very wet meadows along streams or in abandoned stream meanders. The edges of springs, seeps, and lakeshores may also provide orchid habitat. Natural disturbances like flooding, ungulate grazing, and fire help to maintain habitat. The primary pollinators are large bumble bees, and the presence of other flowering plants that attract bumble bees enhances the quality of orchid habitat. Typically, soils in Ute ladies'-tresses habitat along the Colorado Front Range are shallow sandy clay loams or silts over rocky alluvial deposits. Ground water levels remain within two feet of the ground surface during the orchid's growing season, and are influenced by flood irrigation practices in most of the Boulder Valley habitat. The clayey soils may be saturated by high groundwater, or as water is drawn from the coarser underlying material into the clay by capillary action.

The *Spiranthes diluvialis* occurrence in the Eldorado Mountain/Dowdy Draw TSA is small (highest count over a ten year inventory period = 4 individuals) and relatively isolated from the largest Boulder Valley occurrences in meadows along South Boulder Creek. In the Dowdy Draw site, orchid habitat is at the edge of a small wet meadow that is subirrigated by seepage from Community Ditch.

Current Conditions: Results from more than ten years of annual inventories and a demographic study, indicate that the South Boulder Creek Ute ladies'-tresses population is stable. The population is comprised of numerous wet meadow and riparian occurrences, with a total of over 15,000 individuals. The Dowdy Draw site, a small outlying occurrence in the South Boulder Creek population, may be susceptible to extirpation due to the low number of individuals and the potential threats posed by non-native plants, recreation, cattle grazing and changes in hydrology.

- *Federally listed as a threatened species and protection is a legal requirement of the Endangered Species Act*
- *Doudy Draw population is small and isolated from the larger South Boulder Creek populations*

The protection of federally listed plant and animal species and the preservation of their habitat is a legal requirement as stipulated by the Endangered Species Act. OSMP places a high priority on protecting and effectively managing habitat for federally and CNHP-listed species. Conservation of the Dowdy Draw orchid occurrence is especially important because it is an isolated subpopulation that may be genetically distinct from *Spiranthes diluvialis* plants in other occurrences within the South Boulder Creek population.

Exotic and Invasive Species

Several non-native plant species of concern (state listed) occur in the management area (appendix 2). In the context of recreational trails and use, species posing the greatest threat to native vegetation include: myrtle spurge (*Tithymalus myrsinites*), diffuse knapweed (*Acosta diffusa*), sulphur cinquefoil (*Potentilla recta*), dalmation toadflax (*Linaria genistifolia* subsp. *dalmatica*), Jointed goatgrass (*Cylindropyrum cylindricum*), Chicory (*Cichorium intybus*), Canada thistle (*Breea arvensis*), and cheatgrass (*Anisantha tectorum*).

Disturbed areas provide habitat for weed species to invade. Noxious, non-native species can displace native plant species and degrade wildlife habitat. Long term financial impacts may also result from invasive species control and containment. Some non-natives readily colonize and spread along recreational trails, while other weed species are not as closely associated with trailside environments. Weed species that thrive in frequently disturbed soils where there is little competition from other vegetation, tend to grow well along trail corridors. Typically, trailside non-natives produce seeds that are easily picked up and transported to other areas on clothing, boots, and/or pet fur. The potential for trailside weeds to spread threatens the quality of adjacent native vegetation, including habitat for rare plants and plant communities, and wildlife.

Wildlife Guilds

Grassland Nesting Birds

Description: The grasslands in the eastern portion of the study area are home to numerous grassland nesting birds of interest including western meadowlarks (*Sturnella neglecta*), vesper sparrows (*Pooecetes gramineus*), grasshopper sparrows (*Ammodramus savannarum*), lark sparrows (*Chondestes grammacus*), and common nighthawks (*Chordeiles minor*). In the last few decades grassland birds have shown steeper, more consistent, and more geographically widespread declines than any other behavioral or ecological guild of North American birds. Habitat loss and fragmentation, and declining habitat quality are thought to be the drivers of this precipitous decline. Nesting on the ground, these birds are also highly vulnerable to predation, particularly by generalist and human-commensal predators.

Habitat: Many of these birds can be considered grassland interior species, with breeding populations more abundant in areas distanced from other land-use types such as suburban developments, recreational trails, and cropland. Many of them have a strong association with native grasslands such as the xeric tallgrass alliances that dominate the study area. As the cover of non-native species increases, the nest density of most grassland bird species decreases.

Current Conditions: When compared to five other large grasslands on OSMP properties, the grasslands within the northeast part of this Trail Study Area have higher densities of Western Meadowlarks than most areas, average densities of vesper sparrows, and slightly below average densities of grasshopper sparrows and lark sparrows. Flatirons Vista has higher than average densities of vesper sparrows, and average densities of other species. One unique characteristic of this study area is the high density of Common Nighthawk nests compared to other areas. They especially seem to like the mesas above Eldorado Springs Drive.

- *Because of drastic loss and degradation of native grassland habitat, populations of grassland-nesting birds are in precipitous decline*
- *Eastern portion of the TSA contains xeric tallgrass and mixed grass species that provide habitat to these species*
- *The TSA supports high densities of Common Nighthawks*

Grassland birds can be negatively impacted by recreational trails. On OSMP lands, Miller et al. (1998) found that grassland bird nest density was lower along recreational trails than farther away from trails, and that birds nesting adjacent to trails had lower nest survival than those nesting farther away from trails. These effects extend 200 m away from trails. Habitat quality can be threatened by grassland composition and the invasion of noxious weeds.

Forest Nesting Raptors

Description: The forest nesting raptors that live in this study area include both hawks and owls. They work well as target species for conservation, because they require a heterogeneous forest landscape to meet all of their needs.

Habitat and Current Status: Hawks: Sharp-shinned hawks (*Accipiter striatus*), a state vulnerable species (S3), nest in dense Douglas fir stands in the foothills and mountains of Boulder County and are a possible breeder within the study area. Coopers hawks (*Accipiter cooperii*) are vulnerable in Colorado (S3), and are a regular breeder in the study area. They are thought to need large tracts of relatively mature forests. This species usually avoids populated areas when nesting. Northern goshawks (*Accipiter gentilis*), also a state vulnerable species (S3), have been observed in the study area. They nest in aspen groves and dense Douglas-fir stands in the mountains of Boulder County. In lower elevation foothills forests, goshawks typically nest in the crowns of large ponderosa pines. They need mature forests for nesting and a variety of forest conditions for foraging.

Owls: In Colorado, Flammulated owls (*Otus flammeolus*) typically nest in mid-elevation ponderosa pine and aspen forests. Their populations are isolated and restricted to mature forests. They are a Boulder County species of special concern, and are listed by the U.S. Forest Service as a sensitive species and as a management indicator species. Singing flammulated owls have been observed in the Spring Brook drainage, where they probably breed, but may not nest every year. The mature forest along Spring Brook above the diversion canal is good nesting habitat for this species with large trees, large snags, a multi-layered canopy, and abundant shrub vegetation. Northern pygmy owls (*Glaucidium gnoma*) inhabit coniferous forests throughout the foothills and

- *Several species of hawks and owls inhabit the forested areas of the TSA*
- *Forest nesting raptors require mature forests, heterogeneous habitat patches, and large dead standing trees*
- *Some of the forest nesting raptors found in this TSA are listed as state vulnerable species*

mountains of Colorado. They require snags for nesting and in Boulder County their nests have most frequently been found in cavities of ponderosa pines in the foothills at 1800-2400 m. Lower Bull Gulch and Spring Brook west of the canal both offer nesting habitat for northern pygmy owls, which have been observed at these sites. The northern saw-whet owl (*Aegolius acadicus*) nests in coniferous forests, pinon-juniper woodlands, and montane riparian forests at 1700-3200 m. They favor open forests where voles are plentiful. Northern saw-whet owls have been heard along Spring Brook west of the canal, and the ponderosa pine forests growing on the mesas on either side of the canal are structurally similar to known saw-whet owl nesting habitat in other parts of the county. Eastern screech owls (*Otus asio*) exist in Doudy Draw, and lower Bull Gulch, but a scarcity of dead or dying cottonwoods probably limits their opportunities to nest.

Cliff Nesting Raptors

Description: The mountain backdrop west of Boulder comprises some of the best habitat for cliff nesting raptor communities anywhere in the state and surrounding region. The presence of numerous cliffs and rock formations with overall high quality avian, forest and grassland habitats accounts for some of the highest cliff nesting raptor occurrences in the region.

In the 1970's with peregrine falcon populations in steep decline in the west and near extinction in the Eastern United States as well as a general decline in other falcon and eagle species, the need to protect this highly valued resource became a high priority.

The rock formation known as the Mickey Mouse Wall has long been known as an important resource for cliff nesting raptors. OSMP has been formally monitoring the area since the mid 1980's and the occurrence of successful peregrine falcon nesting is above average. The Mickey Mouse Wall also has an above average rate of multi species nesting. There are records of peregrine falcon and golden eagle activity at the Mickey in the same year as well as recent peregrine and prairie falcon activity in the same year.

The peregrine falcon is now delisted from the Federal Endangered Species Act after a decade long effort to repopulate and reintroduce the species to its native range. The peregrine falcon is globally ranked as threatened species and is a State of Colorado Species of Special Concern. The prairie falcon is on the County list of isolated species. Both the peregrine falcon and the prairie falcon are protected by the Federal Migratory Bird Act and it is a federal offense to disturb, flush from a nest, and possess living specimens or pieces and/or parts of specimens or their nest materials without specific permission. The golden eagle is on the County list as an isolated species, is a species of Global concern and is protected by the Federal Bald Eagle Protection Act which prevents nest disturbances and possession of specimens.

Habitat: The Mickey Mouse Wall is an ideal location for cliff nesting raptor species given its location, orientation, height, and proximity to high value forest and grassland habitats. The Mickey's nesting success rates are above average across the system and it is a frequent and regular location for peregrine falcon activity. The topography of the surrounding area allows for adult raptors to keep a keen eye out for competitors and predators and the many ledges and "potholes" common in the flatiron's Fountain Formation sandstone are apparent.

To a lesser degree the rock formations known as the Cryptic Crags comprise good alternate nesting territory locations for multiple cliff nesting species.

Current Conditions: The City of Boulder in combination with the Boulder County Nature Association (BCNA), the Colorado Division of Wildlife (CDOW) and the U.S. Fish and Wildlife Service (USFWS) began formally protecting cliff nesting raptor nesting and roosting sites in 1984. This effort was

- *Several raptor species nest on the cliffs of Eldorado Mountain; they are protected by federal law and OSMP seasonal closures*
- *Mickey Mouse Wall and Cryptic Crags are hot spots for raptor nesting, and rock climbing and hiking is seasonally prohibited in closure areas*
- *The raptors in the TSA have been regularly monitored since the late '80s*

initiated after BCNA and others began formally monitoring the occurrence of cliff-nesting species in the late 1970's. Given the region's increasing population, an increase in overall visitation and Boulder's rich history as a world-class rock climbing destination the City's cliff nesting program began in earnest. The closure period is typically from February 1st to July 31st each year and OSMP makes critical decisions based on observed activity about the need to broaden or discontinue a given closure. Continued cooperation with the local climbing community and climbing groups is critical for the continued success of the raptor nesting program.

OSMP currently manages eight cliff nesting raptor closures and monitors others areas every year for activity and makes management decisions accordingly. The seasonal wildlife closure for the Mickey Mouse Wall formally began in 1991, the same year as other closures like the Third Flatiron and Shadow Canyon.

Both peregrine and prairie falcons are regularly observed nesting at the Mickey Mouse Wall. There are records of golden eagle Activity in the area as well. In 2004, four Peregrine Falcon chicks fledged from the Mickey and an active Prairie Falcon site was observed in the area as well.

The formal monitoring effort at The Mickey Mouse Wall began in the late 80's and OSMP staff monitored the area for the first several years of the closure. Since 2001, OSMP has relied on veteran volunteers from the volunteer raptor monitors to accomplish the bulk of the data collection effort. Monitors collect data and call rangers if closure violations are observed. OSMP relies on volunteers for the majority of the data collected for its cliff nesting monitoring program.

Wildlife Species

Mountain Lion (*Felis concolor*)

Description: The mountain lion is our largest cat**.** It preys mainly on deer, but also takes elk, moose, mice, ground squirrels, rabbits, porcupines, raccoons, domestic livestock, and occasionally bobcats, foxes, insects, birds, berries, and fish. Carrion is rarely eaten. Mountain lions range widely in search of food, easily covering 15 to 25 miles in a day. Annual home ranges vary widely from 15 to 300 square miles, so this study area must be viewed as part of a larger network of protected lands providing habitat for this species.

Habitat: Mountain lions inhabit most ecosystems of Colorado including the eastern plains. However, they are most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinon-juniper woodlands. Mountain lions may hunt by day or night, and require cover for stalking. Lions usually hunt by stealth from brushy, wooded, or rough terrain. Mountain lions, especially with cubs, require free water.

Current Conditions: The entire western half of the study area appears to be used by mountain lions. They seem to frequent upper Doudy Draw, and one lion was detected using the Doudy Draw trail at night. While mountain lions in undisturbed areas tend to be most active around sunset and sunrise, mountain lions near human presence tend to be more active after sunset and during night hours (Van Dyke et al. 1986).

- *Top-level predator that contributes to overall ecosystem structure and function*
- *Ranges over a wide area (much larger than the TSA), thereby requiring landscape connectivity*
- *Seeks out concentrations of deer as their main prey species (the TSA has a high concentration of deer)*

During the Christmas Bird counts of 2005, 73 mule deer were observed in the study area. Though mountain lion densities in the study area are unknown, the presence of so many deer indicates that this area is likely important foraging habitat for mountain lions. It is estimated that an adult mountain lion has to kill a deer at least every other week to survive the winter. Their populations are therefore highly dependent on deer. There is some evidence that deer populations

in this area have declined substantially in the last couple decades, possibly as a result of Chronic Wasting Disease. If this is the case it may be more challenging for lions to meet their nutritional needs.

Lenth et al. 2005 *in prep* found that recreation without dogs displaces deer from a corridor extending up to 50 m on either side of trails, and that recreation accompanied by dogs displaces deer from a corridor at least twice that wide. Thus recreational activity along trails, especially when accompanied by dogs, may effectively reduce the potential for trail corridors to serve as a foraging habitat for mountain lions. Beier (1995) found that lions avoided corridors with excessive noise, lighting, and domestic dogs.

Bobcat (*Lynx rufus*)

Description: Bobcats are about twice the size of a domestic cat, with a bobbed, black-tipped tail and long legs. Rabbits compose the majority of their diet, but bobcats will opportunistically feed on practically any prey item including mice, chipmunks, squirrels, prairie dogs, snowshoe hares, porcupines, small birds, deer, and amphibians.

Habitat: Bobcats are most common in the rocky, broken terrain of foothills and canyonlands. Preferred habitats are pinon-juniper woodlands and montane forests, which provide resting and denning sites and good cover for hunting. Steep-sloped rocky areas with dense vertical cover are chosen as day time perches. However bobcats do occupy all ecosystems in Colorado including riparian woodlands and eastern plains. They avoid unbroken grasslands, agricultural land, and densely populated areas. Bobcats hunt by surprise, sitting near or above game trails and waiting for prey to come by. Except during the breeding season, and when rearing young, bobcats are usually solitary creatures. However they will share refuges during inclement weather. Home ranges in the West vary from 3 to 30 square miles.

Current Conditions: Bobcats are very secretive, but have on rare occasions been sighted in the study area. Bobcats are solitary and strictly carnivorous, resulting in low densities and in resource specializations that increase their probability of local extinctions. Landscape connectivity appears to be the key to persistence of bobcat populations in developing landscapes. Findings of Lenth et al. 2005 *in prep* demonstrate that bobcats may be sensitive to the presence of dogs: bobcats were detected almost exclusively in areas that prohibit dogs. Coyotes are an important natural predator of bobcats, thus dogs may be perceived as predators.

- *Rare and secretive predator found in the TSA*
- *Ranges over a wide area, thereby requiring landscape connectivity*

Black Bears (*Ursus americanus*)

Description: The black bear is Colorado's largest surviving carnivore. Black bears opportunistically eat insects, larvae, and a variety of mammals including rodents, rabbits, and ungulates, but their diet is mostly vegetation. Emerging grasses and succulent forbs are favorites in spring, and berries and mast are preferred in late fall. Carrion is an especially important food resource in spring. Cubs are born in the den in late January or February, and stay with their mother for 1½ to 2½ years. Aside from these family groups, black bears are usually solitary animals, with annual home range estimates in Colorado as large as 75 square miles. Since the entire trail study area is smaller than the home range of one black bear it is important to think about this study area as part of larger network of protected areas connected by migration corridors which together provide habitat for this species.

Habitat: Black bears can survive in practically any habitat that provides sufficient food and cover, but in Colorado they are most common in montane shrublands and forests, and subalpine forests at moderate elevations, especially in areas with well developed stands of berry-producing shrubs. Black bears are secretive and usually stay near rough terrain or dense vegetation which provides

escape cover. In Colorado, black bears generally make their winter dens in rock cavities or excavations under shrubs and trees. The single most important factor in determining the reproductive success of bears is meeting their pre-denning nutritional needs. In the fall, berry producing shrublands provide critical feeding areas allowing black bears to put on sufficient weight to bear young.

- *Top-level predator that contributes to overall ecosystem structure and function*
- *Ranges over a wide area (much larger than the TSA), thereby requiring landscape connectivity*
- *Utilizes riparian areas as movement corridors and feeding habitat*

Current Conditions: The main threats to black bears are habitat loss, human-conflicts, and hunting. Riparian areas typically offer the highest quality black bear foods, which is a factor contributing to conflicts with humans, because riparian areas often contain trails. Bears have been detected using the Doudy Draw trail regularly at night, but much less often during the day, which suggests that they may be avoiding trail corridors when human activity is high, but using them at night when there are few humans present. Black bears are known to switch their foraging behavior from diurnal to nocturnal when contact with humans is likely within their home range during the day (Ayres et al. 1986). Within the study area, upper Doudy Draw is an especially high use area for fall feeding.

Elk (*Cervus elaphus*)

Description: Elk are among the better studied big game mammals of North America. They breed in the fall, with the peak of the rut in Colorado occurring during the last week of September and first week of October. Males have harems of 5-20 cows, and most calves are born in late May or early June.

Habitat: Once elk ranged well eastward on the Great Plains, but today they are associated with semi-open forest or forest edges adjacent to parks, meadows, and alpine tundra. Calving grounds are carefully selected by cows, and are generally in locations where cover, forage, and water are in juxtaposition. Elk tend to inhabit higher elevations during spring and summer and migrate to lower elevations for winter, but some herds are sedentary. Migrating elk typically follow the melting snowpack upslope in spring, while snow depth of about 40 cm triggers elk movement to winter ranges. They favor relatively steep slopes (10-15 percent) and ridgetops.

Current Conditions: The forest-grassland ecotone of the study area provides ideal habitat for elk. There is widespread sign of elk use in the Lindsay-Jeffco portion of the study area, and in the forests and meadows on both sides of the diversion canal. The study area represents an important corridor for seasonal east-west migrations, and is one of the only places in Boulder County where elk come all the way down to the plains.

- *Ranges over a wide area (much larger than the TSA), thereby requiring landscape connectivity*
- *The TSA represents one of the only corridors for seasonal Elk migration in the County*
- *Normally shy to human presence*

Ungulates commonly respond to recreation by flushing. Elk have been recorded flushing from on-trail recreationists at distances of 200 m to 650 m (Gaines et al. 2003). Similarly, bison, mule deer, and pronghorn antelope all exhibited a 70% probability of flushing from on-trail recreationists within 100 m from trails (Taylor & Knight 2003). These flushing distances increase when recreationists are off-trail, or accompanied by dogs (Miller et al. 2001). In addition, the reproductive success of elk has been shown to decrease following human disturbance to calving areas.

Prairie Dogs (*Cynomys ludovicianus*)

Description: The Black-tailed prairie dog is a medium sized burrowing rodent inhabiting short- and mixed-grass prairie ecosystems from Mexico to Canada along the east side of the Rocky Mountains. Prairie dogs form colonies made up of multiple coteries or family groups. Prairie dogs use vocalizations and body language to warn the others in the colony of potential danger (i.e., predators), the type of predator, and to give the "all-clear" once danger has passed (Hoogland 1995; Ackers & Slobodchikoff 1999).

Habitat: Prairie dogs in this TSA primarily occupy the perennial graminiod vegetation subclass and more specifically the Big Bluestem/Yellow Indiangrass herbaceous alliance. The Flatirons Vista colony has transformed some of the occupied area into what the OSMP Grassland Ecologist calls the "Black-tailed prairie dog grassland complex" which includes areas of non-native forbs and bare soil. The Lindsay property colony is one of the smallest and most isolated colonies in OSMP. It is also the highest elevation prairie dog colony in OSMP sitting isolated on a mesa top.

- *Common species in many parts of OSMP, but disappearing along the Front Range and many other places*
- *A "keystone" species that provides food, shelter, and vegetation diversity for many other species*
- *TSA has three small colonies that are isolated from other colonies on OSMP*

Current Conditions: OSMP has almost 4000 acres of prairie dog colonies constituting a healthy prairie dog ecosystem. There is a prairie dog Habitat Conservation Area (HCA) within the Eldorado Mtn./Doudy Draw TSA near the Flatirons Vista Trailhead. The prairie dog colony within this HCA was affected by plague in 1994 and again in 1999 which completely killed off the majority, if not all, of the prairie dogs. Prairie dogs were reintroduced into the HCA in 2000 and today there is a healthy population extending beyond the HCA's boundary. There are two additional small colonies within the TSA. One atop the mesa on the Lindsay Property, and one on the West Rudd property near the corner of Hwy 93 and Eldorado Springs Drive. The colonies on this TSA are widely spaced and generally isolated from other prairie dog colonies in the OSMP system.

Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*)

Description: The Preble's meadow jumping mouse (PMJM) is a small mouse with a long tail, long hind legs and hind feet. Living in tall, dense vegetation they usually move by crawling or making short hops along the ground, but when disturbed they can make phenomenal leaps, changing direction mid-air by using their tail as a rudder. The PMJM is primarily nocturnal, but may be active some during the day. They bear two to three litters a year, averaging five young per litter. They sleep in an underground burrow (hibernacula) from September to May. The PMJM range extends along the front range of the rockies from SE Wyoming south to Colorado Springs. As this area has undergone rapid residential, commercial, agricultural, and industrial development Preble's habitat has been greatly impacted. This habitat loss and fragmentation led to the Federal listing of the mouse as threatened on May 13, 1998. In December 2005 the U. S. Fish and Wildlife Service received two petitions to delist the mouse claiming that Preble's meadow jumping mouse does not meet the definition of a separate species and therefore was listed in error but recent genetic testing shows evidence that PMJM is indeed a unique species. For now, the PMJM is still listed as a Federally Threatened species.

Habitat: The PMJM is believed to have arrived in Colorado during the last ice age, and remained after the glaciers receded. In the drier post-glacial climate the mouse was confined to riparian ecosystems where moisture was more plentiful. They prefer areas of lush herbaceous vegetation eating mostly seeds, fruits, fungi and insects. They do not cache food, but do store body fat in preparation for hibernation. Home ranges have been estimated at 0.08 to 0.35 ha (< 1acre).

Preble's habitat is comprised of well-developed plains riparian vegetation with adjacent, relatively undisturbed grassland communities and a nearby water source. These riparian areas include a

relatively dense combination of grasses, forbs, and shrubs. Preble's use upland habitats to feed and create hibernacula for the winter. This area can be up to 300 feet from the 100 year floodplain.

Current Conditions: PMJM was trapped on Spring Brook (Pague et al. 1994) in the Eldorado Mtn./Doudy Draw Trail Study Area in 1993. The lower portion of Spring Brook is designated as Critical Habitat for PMJM by the US Fish and Wildlife Service. Doudy Draw represents the best potential habitat for Preble's within the study area, although in 1998 attempts to trap PMJM proved unsuccessful along the lower trailed portion of Doudy Draw. It is unknown if the upper portion of Doudy Draw/Bull Gulch has been surveyed for PMJM.

- *Federally listed threatened species; lower portion of Spring Brook is designated as critical habitat*
- *Restricted to undisturbed riparian areas and adjacent grasslands*

Wild Turkey (*Meleagris gallopavo*)

Description: The wild turkey, native to North America, is noted for its elusiveness. Turkey bones were the second most common bone found in the rubbish piles of Native Americans, after deer. Turkeys live in Colorado year round, and they mostly travel by walking, but are adept runners and strong flyers for short distances. In the 19th and early 20th centuries, wild turkey populations dropped drastically due to hunting and habitat loss, but have since rebounded.

Habitat: Wild turkeys live in open woodlands and forests with many clearings and meadows. In Colorado they are most often found in pinon-juniper woodlands and ponderosa pine forests. They forage on the ground in flocks, eating plants and invertebrates. They roost in flocks preferring trees on eastern slopes and near water in the winter. Wild turkeys nest in mixed-conifer stands and fire seres on moderately steep slopes where understory density is high. They make their nests on the ground, by lining a shallow depression with leaves, and covering it up with vines and other plants. Females sit on the nest for nearly a month, making them very vulnerable to predators.

Current Conditions: Turkey populations are only known in a few areas on OSMP. Lost Gulch/ Flagstaff Mountain and the Lindsay/ Doudy Draw areas have the highest turkey activity in the system. There have been many sightings of wild turkeys in this study area, particularly in the recently burned areas.

- *Requires grasslands and forests in juxtaposition and is known to only a few areas on OSMP lands*
- *Normally shy to human presence; easily displaced by encounters with humans and dogs*

Where turkeys are not hunted, their major predators are coyotes, bobcats, mountain lions, domestic dogs, golden eagles, and great-horned owls. Turkey populations are also regulated by roosting sites and food availability, water in winter, and spring rainfall which determines the abundance of vegetation and insects which are critical for young turkeys.

Plains Sharp-tailed Grouse (*Tympanuchus phasianellus jamesi)*

Description: The plains sharp-tailed grouse historically occurred throughout eastern Colorado, and was an important food source for Native Americans and early settlers to the Great Plains. The eastern edge of the foothills of Boulder County was an area of particularly high abundance for plains sharp-tailed grouse. Beginning in the late 1800's loss of habitat to overgrazing, cultivation, forest encroachment (due to fire suppression), and urbanization caused steep population declines. The present population of this subspecies consists of less than 100 birds in Douglas County.

Habitat: The plains sharp-tailed grouse historically occupied mixed tall and short grass prairies with abundant deciduous shrubs. They also used rolling hills with scrub thickets and grassy savannahs. Scrub oaks, serviceberries, and willow provide critical winter shelter and food. Medium to tall grasses provide habitat for courtship and nesting. These grouse eat a variety of forbs, grasses, buds, and insects. In spring leks the males invite the females to mate by

performing an elaborate dance. These events occur in wet meadows, ridges and knolls, or recently burned areas.

Current Conditions: The plains sharp-tailed grouse is common elsewhere (G4) but is critically imperiled in Colorado (S1) because of its continued declines and extremely small population size. Urbanization across the Front Range has led to a dramatic decline in available habitat. The southern grasslands of Boulder County were identified in the 1992 sharp-tailed grouse recovery plan as a reintroduction site. In order to down-list this bird to threatened, three discrete breeding populations of at least 100 individuals must be established in addition to the Douglas County population. A reintroduction was attempted in 2003 but was unsuccessful.
Inter-breeding with Greater Pairie-chickens, loss of habitat due to urban development, fire suppression, exotic species invasion, and vegetative succession caused by grazing are factors affecting viability of this species in Colorado. Sharp-tailed grouse require very large areas with limited disturbance especially during the breeding season.

- *Common species in some places but critically imperiled in Colorado; currently extinct locally*
- *OSMP is designated as a reintroduction site in the southern grasslands*

Blue Grouse (*Dendragapus obscurus*)

Description: The blue grouse is endemic to mountainous regions of western North America. It winters in coniferous forests where conifer needles comprise the main winter food.

Habitat: Blue grouse preferred breeding habitat is the forest-grassland ecotone, ranging from shrub/steppe communities up to 1 mile from a forest edge, to montane forest communities with relatively open tree canopies. Shrub/steppe habitats are usually a various mixture of shrubs, bunchgrasses and xeric forbs. Forest habitats are dominated by ponderosa pine, Douglas-fir, and true firs. Winter habitat is almost exclusively montane conifer forest. Blue grouse mainly eat vegetable matter, but small juveniles are very dependent on invertebrates. They feed in trees and in forest clearings, but hens with young broods often choose open areas with lush vegetation and high insect abundance. As vegetation in open areas dries out, grouse move to more mesic sites. Major food items include leaves and flowers of herbs; leaves, flowers and berries of shrubs; conifer needles, buds and twigs; and invertebrates. Nests are a small scrape on the ground lined with dead leaves and twigs.

- *Common on OSMP at higher elevations but limited to a small portion of the TSA*
- *Presence of blue grouse in the TSA seem to be more limited as the presence of people and dogs has increased*

Current Conditions: Rugged mountainous habitat has helped protect the blue grouse. They still occupy most of their original range, though their densities may have been higher in the past. Blue grouse are common in some higher elevation areas of OSMP. They have been observed near the peaks and the western side of Mountain Parks. Blue grouse were historically common on the Lindsay property but observational data shows a decrease in occurrences coinciding with the introduction of dog use to the west side of Lindsay Ridge. The only recent sightings of blue grouse within the TSA are at higher elevations near the Mickey Mouse formation (Taylor pers. comm. and Mahoney pers. comm.)

Northern Leopard Frog (*Rana pipiens*)

Description: The northern leopard frog is a slim, long-legged, green or brownish frog with dark oval spots, each surrounded by a lighter halo. Larvae are dark brown to olive tadpoles. Previously common, this frog has experienced significant and widespread declines and is now becoming scarce in many areas of Colorado.

Habitat: The northern leopard frog requires a mosaic of habitats to meet annual requirements of all life stages. It is usually found in permanent water bodies with rooted aquatic vegetation, but in

summer it commonly inhabits wet meadows and fields. Taller, denser vegetation seems to be avoided. Leopard frogs take cover and overwinter underwater on the bottom of deep ponds, sometimes under debris. Eggs are laid, and larvae develop in shallow, still, permanent water, generally in areas well exposed to sunlight. Egg masses, which contain several hundred to several thousand ova, are attached to vegetation just below the surface of the water. Adults may migrate up to several kilometers between years. Leopard frogs eat various small invertebrates along the water's edge, or in nearby meadows or fields. Primary foods include insects, spiders, leeches and snails, but they rarely eat small vertebrates such as small frogs, fish, birds, and snakes and they are sometimes cannibalistic. Larvae eat algae, plant tissue, organic debris, and some small invertebrates.

Current Conditions: The leopard frog population in Colorado is threatened (S3). Its population in the Rocky Mountains of Colorado has declined, and the frog is no longer extant in most localities where historically it occurred. Potential threats within the study area include competition and predation by bullfrogs or other introduced species, and bacterial infection that can be introduced by humans or dogs. Crowding and high temperatures can make Leopard frogs more vulnerable to bacterial infection (e.g. red-leg disease).

- *State threatened species and rare across the OSMP system*
- *Lindsay Pond, and possibly other wetland areas, harbors Northern Leopard Frogs*

Butterflies

Hop-feeding Azure (*Celastrina hummulus)*

Description: This butterfly is a recently described butterfly species (1998) that is endemic to Colorado's Front Range, from Larimer to El Paso counties.

Habitat: The hops-feeding azure is restricted to wild hops (*Humulus lupulus*) as a larval host plant. It lives in mountain canyons and valleys that contain permanent water, at a minimum elevation of 5300 ft. Colonies occur where the hostplant grows, usually at the edges of gulch bottoms, in sunny rocky/steep areas. Adults of both sexes feed on various flowers, including waxflower (*Jamesia Americana*). During peak flight in mid-June, males will patrol the hostplant all day to seek females. Both sexes stay in close proximity to the host plant (usually within 300 ft.). Eggs are oviposited mostly onto the flower buds of the male hops plant. Older larvae are tended by ants.

Current Conditions: Extensive urbanization and alteration of habitat are the main threats to this species. The Hops Feeding Azure is ranked Globally (G2G3) and at the state level (S2). It is not known to occur in the study area, but the presence of its hostplant is a good indicator that the Hops-feeding azure may occur here, and at a minimum demonstrates that there is good potential habitat. Non-native plants pose a significant threat to this species. There is also some concern that collection of wild hops flowers for beer brewing may affect larval food supply. The hops blue has very limited dispersal rates, so continuous habitat is important for its protection.

- *Only occurs along the Front Range; rare and threatened statewide and globally*
- *Requires wild hops, which occurs in the TSA, as its host plant*

Mottled Duskywing (*Erynnis martialis)*

Description: The mottled duskywing is a small butterfly. It flies along Colorado's Front Range from April to mid-June. Adult males can be found on hilltops or along ridges perched on low vegetation or the ground waiting for females.

Habitat: The mottled duskywing is closely associated with hilly country, often near wooded areas or open shrubby areas with stands of mahogany (*Cercocarpus sp.)* and buckbrush (*Ceanthus sp.)* at an elevation range of 4500 to 9800 ft. The host plant for this species is various types of wild lilac

(*Ceanothus sp*.) including buckbrush (*Ceanothus fendleri*) and red root (*C. herbaceous*). Adults have been observed nectaring on the white flowers of the host plant.

Current Conditions: Presence of the mottled duskywing has been reported from 9 counties in Colorado, including one recorded occurence within the TSA. Mottled duskywing habitats are at risk of alteration, including through fire suppression, encroachment of development, and habitat fragmentation. The mottled duskywing has very limited dispersal rates, so continuous habitat is important for its protection. The mottled duskywing is common globally (G4), but imperiled to vulnerable in Colorado (S2S3).

- *Rare and threatened statewide and on OSMP land*
- *Requires host plants of various types of wild lilac, which occur in isolated areas of the TSA*

References

Ackers, S. H., & C. N. Slobodchikoff. 1999. Communication of Stimulus Size and Shape in Alarm Calls of Gunnison's Prairie Dogs, *Cynomys gunnisoni.* Ethology. 105: 149.

Agnew, W., Uresk, D.W., Hansen, R.M., 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixedgrass prairie in western South Dakota. Journal of Range Management 39, 135–139.

Ayres, L. A., L. S. Chow, and D. M. Graber. 1986. Black bear activity patterns and modifications induced by human presence in Sequoia National Park. International Conference Bear Research and Management Plan 6:151-154.

Beier, P. 1995. Dispersal of juvenile cougars in fragmented habitat. Journal of Wildlife Management. 59:228-237.

Berry, M.E., and Bock C.E.. Effects of habitat and landscape characteristics on avian breeding distributions in Colorado foothills shrub. The Southwestern Naturalist 43(4): 453-461

Boulder County Comprehensive Plan, Goals, Policies, and Maps, 1988. Boulder County land Use Department, 126 pp.

Bridge, Raymond. 2004. The Geology of Boulder County. Lone Eagle Publications, Boulder, CO. 468 pp.

City of Boulder. 1999. City of Boulder forest ecosystem management plan, Part 1. City of Boulder Open Space Department, City of Boulder Mountain Parks Division, Parks and Recreation Department, and City of Boulder Wildland Fire Division, Boulder Fire Department.

Ceballos, G., Pacheco, J., List, R., 1999. Influence of prairie dogs (Cynomys ludovicianus) on habitat heterogeneity and mammalian diversity in Mexico. Journal of Arid Environments 41, 161–172.

Colorado Division of Wildlife. 2002. Draft Proposal: Plains Sharp-tailed Grouse Reintroduction-Southern Boulder County and Rocky Flats Area.

Connelly, J. W., M. W. Gratson, and K. P. Reese. 1998. Sharp-tailed Grouse. *In* The Birds of North America, No. 354 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Department the Interior, Fish and Wildlife Service, Washington, D.C.

Crooks, K. R. 2002. Relative sensitivities of mammalian carnivores to habitat fragmentation. Conservation Biology 16:488-502.

Dahl, T.E. 1990. Wetlands losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

D'Amico, D. R. 1995. Identification and Mapping of Wetlands in the Doudy Draw/Eldorado Mountain Area, Boulder County, Colorado. Unpublished report to City of Boulder Open Space Department.

Desmond, M.J., Savidge, J.A., 1996. Factors influencing burrowing owl (Speotyto cunicularia) nest densities and numbers in western Nebraska. American Midland Naturalist 136, 143–148.

Eaton, Stephen W. 1992. Wild Turkey. *In* The Birds of North America, No. 354 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The Ameican Ornithologists' Union.

Fitzgerald, J. P., C. A. Meaney, and D. M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History, Denver, CO.

Gaines, W. L., P. H. Singleton, R. C. Ross. 2003. Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586. USDA, Forest Service, Portland, OR.

Gleichman, P.J., A. Harrison, and J. Firor. 1991. A cultural resource inventory of City of Boulder Southern Open Space. Unpublished report. City of Boulder, 32 pp.

Goodrich, J.M., Buskirk, S.W., 1998. Spacing and ecology of North American badgers (Taxidea taxus) in a prairie-dog (Cynomys leucurus) complex. Journal of Mammalogy 79, 171–179.
Gross, J. E. COVERS version 2.000 Natural Resource Ecology Lab, Colorado State University.

Hickman, S. 1990. Evidence of edge species attraction to nature trails within deciduous forests. Natural Areas Journal 10:3-5

Hogan, T.. 1994. A floristic inventory of the Doudy Draw/ Eldorado Mountain property, City of Boulder Open Space, Boulder, Colorado. Unpublished report to the City of Boulder Open Space department

Hoogland, J.L., 1995. The Black-tailed Prairie Dog: Social Life of a Burrowing Mammal. The University of Chicago Press, Chicago, IL.

Jones, C.G., Lawton, J.H., Shachak, M., 1994. Organisms as ecosystem engineers. Oikos 69, 373–386.

Jones, S.R.. 1990. Managing Boulder Mountain Parks Ecosystems for Bird and Mammal Populations. Unpublished report to City of Boulder Mountain Parks Department.

Jones, S. R. 1993. A preliminary survey of avian species of special concern on the City of Boulder's Doudy Draw and Eldorado Mountain Properties. Unpublished report to City of Boulder Open Space.

Jones, S. R. 1994. Distribution of owls on the City of Boulder's Doudy Draw and Eldorado Mountain Properties. Unpublished report to City of Boulder Open Space.

Jones, S. R., January 26, 2006 personal communication to OSMP staff

Joslin, G., and H. Youmans, coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society.

Kettler, S., and Pineda, P.. 1999. Management alternatives for natural communities and imperiled butterflies at Horsetooth Mountain Park, Larimer County, Colorado. Colorado Natural Heritage Program, Fort Collins, Colorado.

Kingery, H.E.., 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership, CO.

Koford, C.B., 1958. Prairie dogs, whitefaces, and blue grama. Wildlife Monographs 3, 1–78.

Kotliar, N.B., Baker, B.W., Whicker, A.D., Plumb, G., 1999. A critical review of assumptions about the prairie dog as a keystone species. Environmental Management 24, 177–192.

Kretzer, J.E., Cully Jr., J.F., 2001. Effects of black-tailed prairie dogs on reptiles and amphibians in Kansas shortgrass prairie. The Southwestern Naturalist 46, 171–177.

Lenth, B. E., and R. L. Knight. *In prep.* Effects of dogs on wildlife communities along recreational trails.

Magle, S., J. Zhu, and K.R. Crooks. 2005. Behavioral responses to repeated human intrusion by Black-tailed prairie dogs (*CYNOMYS LUDOVICIANUS*)**.** Journal of Mammalogy, 86(3):524–530.

Mahoney, L., January 30, 2006, personal communication to OSMP staff

Meaney, C. A., A. K. Ruggles, N. W. Clippinger, and B. C. Lubow. 2002. The Impact of Recreational Trails and Grazing on Small Mammals in the Colorado Piedmont. The Prairie Naturalist 34:115-136.

Mieras, Barbara. 1996. Reconaissance Report on Geologic Conditions: Eldorado Mountain Management Area. Unpublished report. City of Boulder, 32 pp.

Miller, J. E. and B. D. Leopold. 1992. Population influences: predators. Pages 119-128 in J. G. Dickson ed. The wild turkey: biology and management. Stackpole Books, Mechanicsburg, PA.

Miller, S. G., R. L. Knight, and C. K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

Miller, S. G., R. L. Knight, and C. K. Miller. 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin. 29:124-132.

Mitsch, W. J. and J. G. Gosselink. Wetlands (3rd Ed.). 2000. John Wiley & Sons, Inc., New York.

Moir, W. and Dietrich. 1988. Old-Growth Ponderosa Pine from Succession in Pine-bunchgrass Forests in Arizona and New Mexico. Natural Areas Journal, 8(1): 17-24.
National Research Council. 1995. Wetlands, Characteristics and Boundaries. National Academy Press. Washington, D.C.
Nolan, G., January 17, 2006, personal communication to OSMP staff

Open Space/Real Estate Department, City of Boulder, 1995. Open Space long Range Management Policies. City of Boulder Open Space/Real Estate Department, 66 p.

Pague, C.A., A.R. Ellingson, and C.J. Carcano. 1994. CHNP Inventory of Mammals Occurring in Doudy Draw Open Space, Boulder and Jefferson Counties.

Taylor, A. R., and R. L. Knight. 2003. Wildlife responses to recreation and associated visitor perceptions. Ecological Applications. 13: 951-963.

Tucker, D.B., and Gleichman, P.J. 1995. A Cultural Resource Inventory of City of Boulder Open Space: The Doudy Draw Drainage and Eldorado Mountain. Unpublished report. City of Boulder, 75 pp.

Van Dyke, F. G., R. H. Brocke, H. G. Shaw, B. B. Ackerman, T. P. Hemker, F. G. Lindzey. 1986. Reactions of mountain lions to logging and human activity. Journal of Wildlife Management 50:95-102.

Weber, W.A. and Wittmann, R.C.. 2001. Colorado Flora: Eastern Slope, Third Edition. University Press of Colorado, CO.

Wheeler, B. 1990. City of Boulder Open Space Cultural Resource Guidelines. Unpublished report. City of Boulder Open Space/Real Estate Department, 13 pp.

Zwickel, F. C. Blue Grouse. 1992 *In* The Birds of North America, No. 15 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The Ameican Ornithologists' Union.

Websites

Colorado Natural Heritage Program, www.cnhp.colostate.edu

Herp Scope, www.herpscope.com

Nature Serve Explorer, www.natureserve.org/explorer

Rocky Mountain Bird Observatory, www.rmbo.org

USDA, PLANTS Database, www.plants.usda.gov

US Fish and Wildlife Service, Preble's Meadow Jumping Mouse Page, www.r6.fws.gov/preble

University of Colorado Herbarium Database, http://cumuseum.colorado.edu/Research/Botany/Databases

Appendices

Appendix 1: Vegetation Alliances

Vegetation mapping is a key source of information on vegetation types and their distribution on the OSMP system. The OSMP system wide vegetation map not only shows the current location, frequency and patch sizes of different vegetation types, it also allows for tracking the status of vegetation over time. Vegetation has been mapped within a nationally accepted framework, the National Vegetation Classification System, which classifies and describes the terrestrial vegetation of the United States. Plant communities on OSMP are mapped at the alliance level in this classification system. The alliances are defined by the dominant lifeform (shrubs, trees, grass, etc.) and one or two dominant species. The following table displays the vegetation communities discussed in the Inventory Report.

Alliance Name	Acres in the TSA
Xeric Tallgrass Alliance Types	
Big bluestem-(Yellow Indiangrass) herbaceous alliance	743
Big bluestem-(Blue Joint, Switchgrass) herbaceous alliance	3
Ponderosa pine/ Big bluestem xeric tallgrass savanna herbaceous vegetation	126
Deciduous Shrubland Alliance Types	
Choke Cherry Shrubland Alliance	45
Ill-scented Sumac Intermittently Flooded Shrubland Alliance	61
Smooth Sumac Shrubland Alliance	36
Western Snowberry Temporarily Flooded Shrubland Alliance	60
Woods' Rose Temporarily Flooded Shrubland Alliance	6
Wetland and Riparian Alliance Types	
Narrowleaf Cottonwood Temporarily Flooded Alliance	11
Boxelder Temporarily Flooded Woodland Alliance	11
Peachleaf Willow Temporarily Flooded Woodland Alliance	3
Eastern Cottonwood (Plains cottonwood) Temporarily Flooded Woodland Alliance	1
Crack Willow Temporarily Flooded Woodland Alliance	1
Rocky Mountain Maple Temporarily Flooded Shrubland Alliance	9
Hawthorn Temporarily Flooded Shrubland Alliance	34
Bluestem Willow Temporarily Flooded Shrubland Alliance	3
Sandbar Willow Temporarily Flooded Shrubland Alliance	4
Prairie Cordgrass Temporarily Flooded Herbaceous Alliance	1
Western wheatgrass Temporarily Flooded Herbaceous Alliance	76
Baltic rush Temporarily Flooded Herbaceous Alliance	38
Nebraska sedge Temporarily Flooded Herbaceous Alliance	3
Cattail semi permanently Flooded Herbaceous Alliance	<1

Appendix 2: Exotic and Invasive Species

Noxious Non-native Plant Species Occurring in the Eldorado Mountain/Dowdy Draw Trail Study Area				
Common Name	*Scientific Name*	*State Rank*	*Primary Habitat*	*Distribution in TSA*
Highest priority noxious weed species related to trails and visitor use planning				
Myrtle spurge	*Tithymalus myrsinites*	List A	Upland	Scattered; < 10 sites
Dalmation toadflax	*Linaria genistifolia* subsp. *dalmatica*	List B	Upland	Widespread; > 10 sites
Diffuse knapweed	*Acosta diffusa*	List B	Upland, trailsides	Widespread; > 10 sites
Sulphur cinquefoil	*Potentilla recta*	List B	Upland, riparian	Widespread; > 10 sites
Jointed goatgrass	*Cylindropyrum cylindricum*	List C	Upland	Rare; two sites known
Chicory	*Cichorium intybus*	List C	Wet meadow, trailsides	Widespread; > 10 sites
Other OSMP-listed noxious weed species				
Canada thistle	*Breea arvensis*	List B	Wetland, riparian	Widespread; > 10 sites
Leafy spurge	*Tithymalus uralensis*	List B	Upland	Rare; one site known
Bouncing bet	*Saponaria officinalis*	List B	riparian	Infrequent; Dowdy Draw
Bull thistle	*Cirsium vulgare*	List B	upland	Scattered; < 5 sites
Houndstongue	*Cynoglossum officinale*	List B	Upland, riparian	Widespread; > 10 sites
Musk thistle	*Carduus nutans*	List B	Upland	Widespread; > 10 sites
Oxeye daisy	*Chrysanthemum leucanthemum*	List B	Riparian	One site; Coal Creek
Mullein	*Verbascum thapsus*	List C	Upland	Widespread; > 10 sites
St. Johnswort	*Hypericum perforatum*	List C	Upland	Widespread; > 10 sites
Field bindweed	*Convolvulus arvensis*	List C	Upland	Widespread; > 10 sites
Cheatgrass, Japanese brome	*Anisantha tectorum, Bromus japonicus*	List C	Upland	Widespread; > 10 sites
Redstem filaree	*Erodium cicutarium*	List B	Upland	Widespread; > 10 sites
Perennial rhizomatous invasive grasses (PRIGs)	Example: Smooth brome, *Bromopsis inermis*	OSMP	Upland	Widespread; > 10 sites
Canada bluegrass	*Poa compressa*	OSMP	Upland	Widespread; > 10 sites
Queen Ann's lace	*Daucus carota*	OSMP	Wet meadow	Widespread; > 10 sites
Foxglove	*Digitalis purpurea*	OSMP	Riparian	Rare; two sites