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Boulder Mountain Parks: Floristic Survey
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Boulder Mountain Parks

Floristic Survey,

Vegetation,

and

Conservation Management

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Boulder, Colorado

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Introduction

The City Mountain Parks exist as the *sanctum sanctorum* of Boulder, Colorado. It is here that a wealth of plants and animals find the habitat they require to continue the drama in which they have acted through evolutionary time. These forested foothills, with their precipitous crags and protected canyons, serve as one of the last low-elevation refuges along the Colorado Front Range. Here, also, thousands of city dwellers find room to hike, climb, and observe nature on intimate terms. The Parks provide services that cannot be measured in dollars and cents. With the increasing urbanization of the Front Range and the loss of biological diversity worldwide, the wisdom of the Boulder community to protect this landscape is becoming evermore apparent.

This report is a continuation of the floristic work begun in 1989 (Hogan, 1989). In that work a survey of plants of special concern on the northwest side of Green Mountain was accomplished, and a report was submitted that focused on the rare plants documented in that area. This year's work was concentrated in the Lost Gulch drainage to the west of Flagstaff Mountain. In addition, Skunk Canyon on the southeast side of Green Mountain, and Fern Canyon and Shadow Canyon on Bear Peak were explored. The ranges of many plants of special concern were extended during the 1990 field season, resulting in a better understanding of the vegetation and flora of the Mountain Parks.

In this report a description of the Park's vegetation will be

introduced to help provide a basis for future studies. In the Discussion a consideration of management issues will be presented. In this section issues specific to the Mountain Parks will be addressed, as well as broader issues that place the Parks in the context of a larger, regional ecosystem. Finally, a complete list of those vascular plants observed during this year's survey will be given in the Appendix.

Site

The City of Boulder Mountain Parks is broadly bounded by Boulder Creek to the north, South Boulder Creek to the south, the plains to the east, and forested hills to the west that extend to the Continental Divide (Figure 1). The Parks is approximately six miles (ca. 10 km) in length and two miles (ca. 3 km) in breadth, comprising more than 7,000 acres (ca. 2800 ha). Bear Canyon, with its east-west trending creek, is a major topographic feature in the central section of the mountain front. Green Mountain lies to the north of this canyon, whereas Bear Peak and South Boulder Peak are found to the south. Much of the Parks is in the montane zone (Marr, 1961), which is characterized by a mixed forest of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*).

Climate. The easternmost extension of the Rocky Mountains is near Boulder, where there occurs an abrupt rise of nearly 3,000 feet (ca. 1000 m). This rise produces an orographic effect that provides the mountains above Boulder with greater precipitation than surrounding areas. Greater moisture also results due to Boulder's position in a topographic arc that opens to the east, serving to funnel upslope storm systems against the hills. Botanists have commented on the ameliorated conditions along the mountain front (Vestal, 1917, 1919), and have pointed to the cloud veil that forms on the mountains, creating locally humid conditions (Weber, 1965).

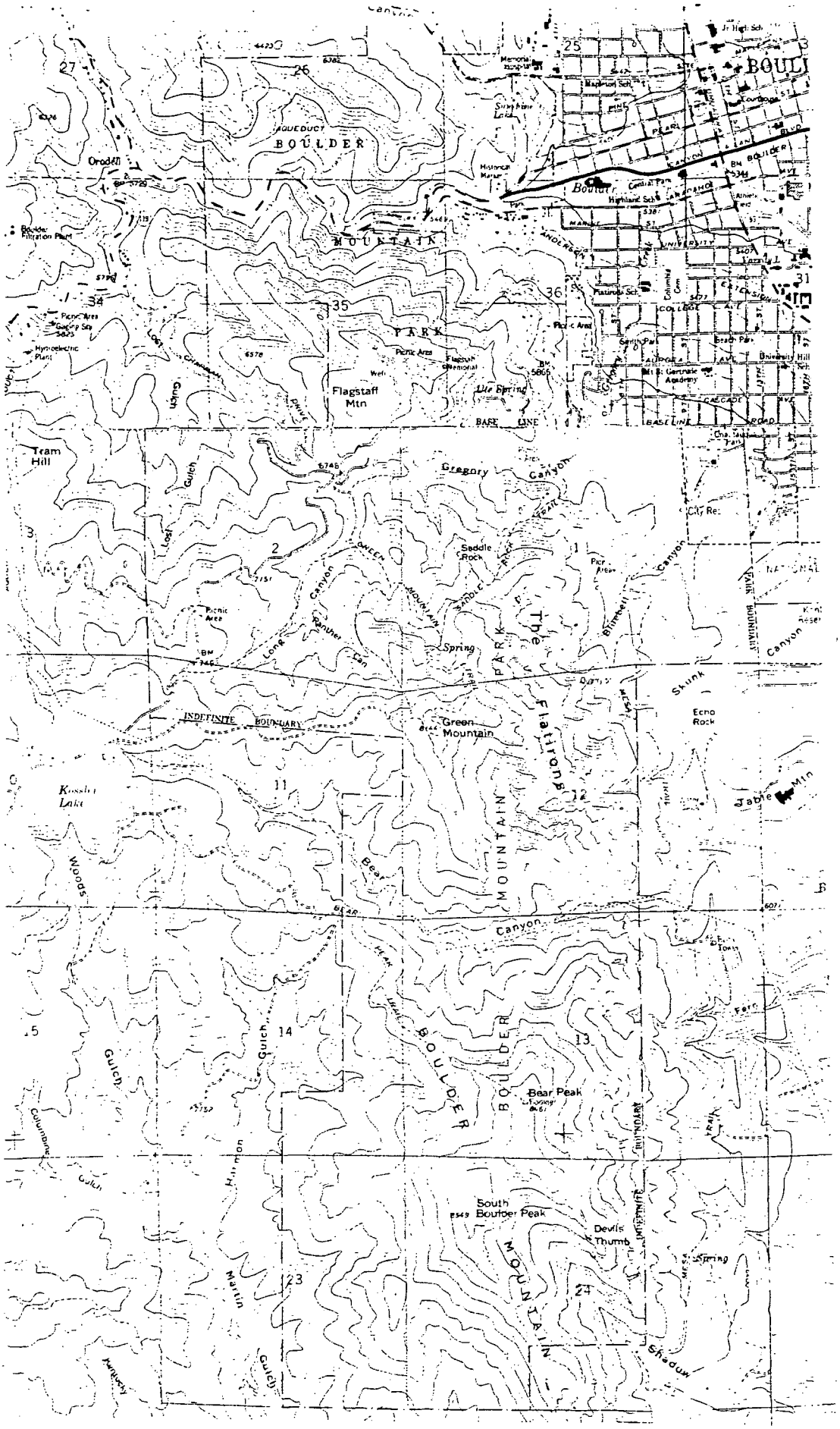
BOULDER
MOUNTAIN
PARK
Flagstaff Mtn
Team Hill
Gregory Canyon
Saddle Rock
The Flatirons
Green Mountain
INDEFINITE BOUNDARY
Skunk Canyon
Echo Rock
Jable Mtn
Bear Canyon
BOULDER MOUNTAIN
Bear Peak
South Boulder Peak
Devils Thumb
Shadow Mtn
Woods Gulch
Martin Gulch
Harmon Gulch
Columbine Gulch
Boulder
BASE LINE
COLLEGE AVE
CASCADE ROAD
Orodell
Boulder Filtration Plant
Hydroelectric Plant
Picnic Area
Historical Marker
Spring

Figure 1

The city of Boulder has an annual precipitation of 18 inches (45 cm), with the maximum moisture occurring in April and May. Upslope storms occur in spring and autumn when air masses from the Gulf of Mexico are forced up against the mountain front. Convective storms are common on late summer afternoons (Barry, 1973; Marr, 1961).

The mean annual temperature is 51^{0}F (10.5^{0}C) with July the warmest month (74^{0}F/23^{0}C) and January the coldest (32^{0}F/0^{0}C). There are approximately 150 frost-free days per year. Winds are predominantly from the west, with strong, warm, dry chinooks occurring in the winter months. The weather in 1990 was marked by an early season with record-high temperatures, a midseason period with unusually high precipitation, and a late season that fell within statistical norms.

Geology/Soils. The study areas were underlain by granite and sandstone. The Boulder Creek granite is a dark grey, faintly banded granodiorite of Precambrian age. The Fountain Formation is a Pennsylvanian arkose sandstone and conglomerate that forms the scenic Flatirons (Chronic & Chronic, 1972; Lovering & Goddard, 1950).

Although a study of the soils is beyond the scope of this report, certain inferences can be made from published information (Johnson & Cline, 1965; Soil Survey Staff, 1975) and field observations. The *Soil Survey of Boulder County* (1975) places two complexes in the study area, the Juget-Rock outcrop and the Fern Cliff-Allens Park rock outcrop. These complexes are dominated by

Ustolls, cryoboralfs, and numerous areas of lithic orthents where bedrock approaches the surface. Alluvial soils are present in the stream bottoms.

Study Sites. All of the study sites were situated on the Eldorado Springs U.S.G.S. quadrangle, T.1S R.71W. Shadow Canyon is a prominent northwest-trending rift between South Boulder Peak and Bear Peak. Located in Section 24, this steep canyon extends from 6,550 feet (1965 m) at the Mesa Trail to 8,200 feet (2460 m) at a saddle between the two peaks. Although there is a moist zone in the lower reaches of the canyon, most of this area is dry, with poorly developed soils and a depauperate flora as a result. A large percentage of the canyon is composed of rock talus.

Fern Canyon in Section 13 is on the northeast side of Bear Peak. A smaller, more protected canyon than Shadow Canyon, it extends from 6,400 feet (1920 m) at the Mesa Trail to 7,400 feet (2220 m), where it meets the north ridge of Bear Peak. Like Shadow Canyon, this canyon is characterized by a high percentage of talus cover and a mesic moisture regime in its lower reaches, with more xeric conditions higher on the mountain's flank. Both of these canyons display a conspicuous contact zone between the Fountain Formation and the underlying granite in their upper reaches.

Skunk Canyon in Section 12 is located on the southeast side of Green Mountain. It extends from 6,500 feet (1950 m) at the Mesa Trail to 7,900 feet (2370 m) where it meets the Greenman Trail below the Green Mountain summit. Unlike the areas explored on Bear Peak, this canyon harbors a mesic vegetation well above its lower

reaches. A prominent narrows formed by the Flatirons is located low in the canyon. Beyond this point a vegetation is found that is marked by box elder (*Negundo aceroides*), river birch (*Betula fontinalis*), aspen (*Populus tremuloides*), and plants of special concern, such as sarsaparilla (*Aralia nudicaulis*) and black snakeroot (*Sanicula marilandica*). Skunk Canyon does not have an established trail, and in its central region the canyon possesses a remote feeling. With its diverse vegetation and relatively undisturbed position, this area is as an important habitat for wildlife. The upper slopes of the canyon display a history of disturbance. Insect damage, indicated by an abundance of snags, was observed on the northeast facing walls. The upper southeast-facing slopes have a flora marked by an adventive (non-native) character. Although the substrate on these slopes is very unstable and soil development is minimal, the preponderance of cheatgrass (*Anisantha tectorum*), mullein (*Verbascum thapsus*), and other weedy species is remarkable.

Lost Gulch lies to the west of Flagstaff Mountain, to the north of Long Canyon, and to the east of Tram Hill (Figure 2). Its mapped location is T.1S R.71W Sec.2 & 3 and T.1N R.71W Sec.34 & 35. This paper uses "Lost Gulch" in reference to the area as a whole, rather than restricting the name to the single drainage that is labeled Lost Gulch on the topographic map ("Lost Gulch proper").

The area extends from Boulder Canyon at 6,000 feet (1800 m) to the Flagstaff Road at 7,500 feet (2250 m), a distance of about 1.5 miles (ca. 2.5 km). Along with this steep gradient, the area is

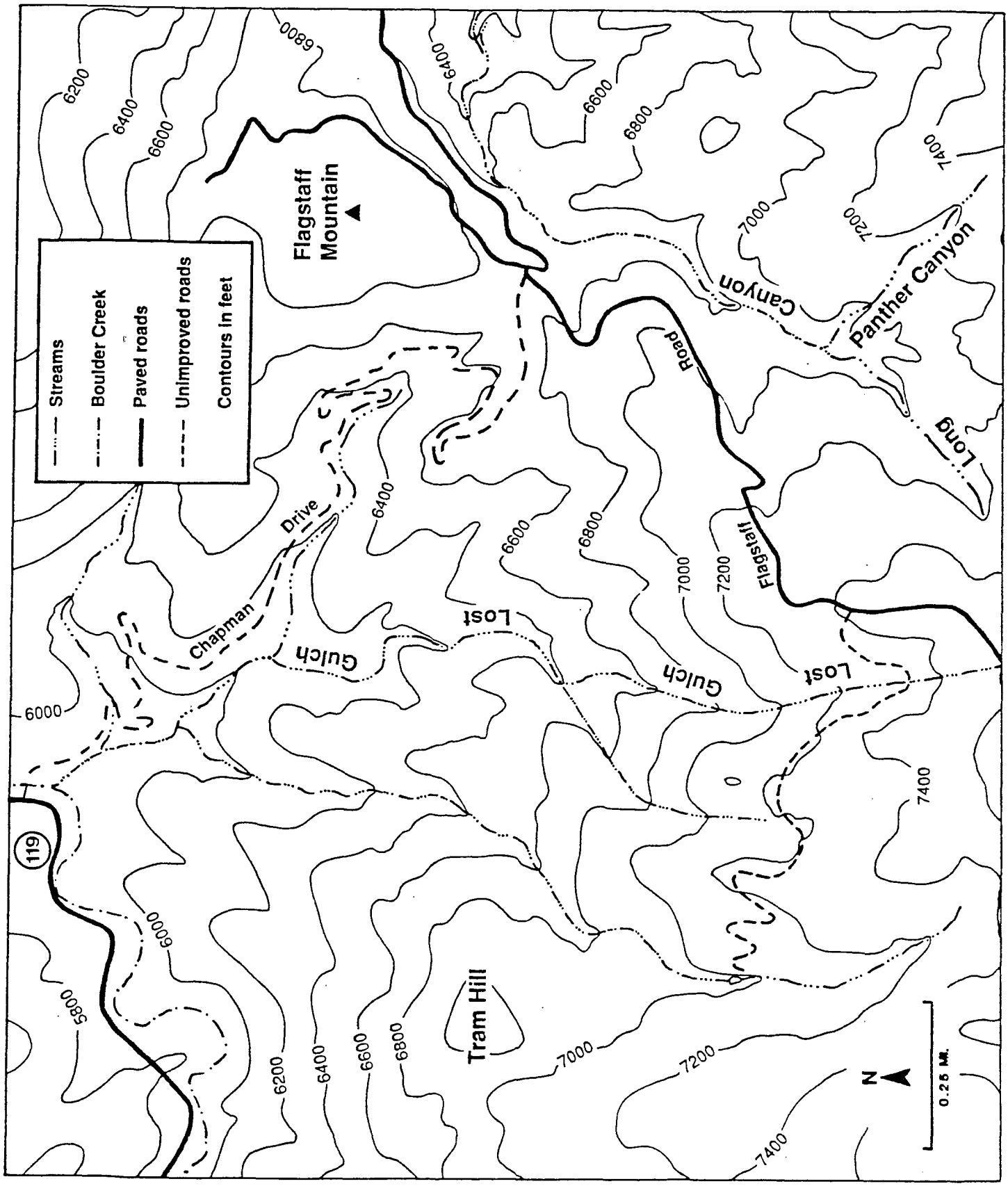
Streams
Boulder Creek
Paved roads
Unimproved roads
Contours in feet
Flagstaff Mountain
Tram Hill
Chapman Drive
Lost Gulch
Lost Gulch
Flagstaff Road
Canyon
Panther Canyon
Long
119
6000
6200
6400
6600
6800
7000
7200
7400
5800
N
0.25 MI.

Figure 2

characterized by its north-facing aspect and a deeply dissected topography. Unlike the previously mentioned canyons that are largely underlain by the Fountain Formation, Lost Gulch is entirely granitic. In its upper reaches three drainages carry water for most of the season and are the sites for a rich riparian vegetation. The westernmost of these drainages is artificially maintained by a pond associated with a private residence. The easterly drainage, Lost Gulch proper, is the richest stream in regard to the plants of special concern.

Lost Gulch is marked by its heterogeneous character. Dry woodlands are contrasted with moist ravines, whereas shaded forests are adjacent to open meadows. The absence of trails in Lost Gulch contributes to its value as a biological refuge.

Vegetation

Several investigators have reported on the vegetation of the Colorado Front Range (Vestal, 1917; Marr, 1961; Peet, 1981; Cooper, 1984). These works have been quantitative to various degrees, and provide a basis for looking more closely at the vegetation of the Boulder Mountain Parks. This section relies on these works and on observations made in the field during the last two field seasons. I believe that Cooper's (1984) paper provides the best framework for a discussion of the Mountain Park's vegetation.

Vegetation is the collective assemblage of plants in the landscape. Vegetation is distinct from the *flora* of a region, which in the most elemental sense is a list of the plants occurring there. A flora may take a variety of forms, ranging from a simple checklist to a work with complete descriptions and diagnostic keys. A flora does not give weight to any particular species, it concerns itself with their presence or absence. Vegetation, on the other hand, concentrates on those species that characterize the landscape; these are often, but not necessarily, the dominant plants. The basic unit of a flora is the species; the basic unit of vegetation is the community (Daubenmire, 1968). The plant community can be considered an integrator of soil type, moisture regime, microclimate, slope, aspect, elevation, and temperature (Mueller-Dombois & Ellenberg, 1974).

Communities are not stable features of the landscape; they

are a dynamic assemblage of species, both plants and animals, shaped by biotic and abiotic factors. Nevertheless, the makeup of communities is often predictable, and it is reasonable to develop classification systems for them (Hunter, 1990). In order for a classification system to be useful for managers it must be detailed enough to recognize real ecological differences. A broad description of the Mountain Parks recognizes a montane forest as the dominant vegetation type. This vegetation can be more meaningfully described, however, in terms of its dominant species: Ponderosa Pine Forests, Douglas-fir Forests, and a Mixed Ponderosa Pine and Douglas-fir Forest. These vegetation types form a mosaic landscape and are indicative of real differences in the environment. More informative classifications will result when future studies incorporate the understory component into their analyses (Frey, 1978).

Ponderosa Pine Forest is the dominant vegetation at lower elevations and on south-facing hillsides. This vegetation type can range from open woodlands on the mesa tops to relatively dense stands in the shelter of the canyons. Generally this vegetation is recognized by its woodland character, in which scattered trees provide less than 50% of the cover over a graminoid-dominated understory (Peet, 1981). Historically these sites were affected by periodic fires, which maintained their open structure and supported the graminoid understory (Cooper, 1961; White, 1985). With European settlement and its practice of fire suppression and livestock grazing, this community underwent a physiognomic shift

from woodland to forest (Marr, 1961). Photographic evidence indicates that treeline has progressed onto the mesa tops during this century (Veblen & Lorenz, 1986). Anthropogenic impact has resulted in denser stands of ponderosa pine (*Pinus ponderosa*) along the mountain front and an expansion of treeline at the expense of presettlement prairie vegetation.

Douglas- fir Forest is the dominant vegetation at higher elevations and upon steep, north-facing slopes at lower elevations. In contrast to the Ponderosa Pine Forests and woodlands, this vegetation type is characterized by a closed canopy and a relatively depauperate understory. Shrubs play a more important role in the Douglas-fir Forest, whereas graminoids, with the exception of *Carex geyeri*, are less significant. Postsettlement fire suppression has altered the naturally high fire frequency these forests were subjected to, and has resulted in high sapling densities, as well as increased fuel loads (Peet, 1981). Pockets of old groves of large trees are scattered throughout the Mountain Parks.

The Douglas-fir Forest, particularly north-facing sites at higher elevations, are habitat for some of the more interesting herbaceous plants in the Mountain Parks. These include the orchids, fairy slipper (*Calypso bulbosa)* and rattlesnake plantain (*Goodyera oblongifolia*), and species in the Pyrolaceae such as the rare white veined pyrola (*Pyrola picta)* and the more common pipsissewa (*Chimaphila umbellata*).

The **Mixed Ponderosa Pine and Douglas-fir Forest** is a

vegetation of the Mountain Parks intermediate between the two types already discussed. Both Marr (1961) and Peet (1981) recognize this mixed forest type, placing their discussion of the Douglas-fir Forest under this broader classification. An unresolved question relevant to the Mountain Parks is how much of each vegetation type actually exists in the Parks. At this time it seems appropriate to follow Cooper (1984) in recognizing the pure stands of Douglas-fir (*Pseudotsuga menziesii*) as a distinct entity, while recognizing a zone where it co-occurs with ponderosa pine. The two species often grow together on the steep east and west faces of the mountains.

An important component of the Mixed Forest on drier sites at higher elevations is the limber pine (*Pinus flexilis*). A stand where this species is particularly evident is on the northeast slopes of Green Mountain above Greenman Springs. Lodgepole pine (*Pinus contorta*) also may appear in mixed forests as it does to the south and west of the Bear Peak summit. At the saddle between Bear Peak and South Boulder Peak five species of conifers occur: ponderosa pine, Douglas-fir, lodgepole pine, limber pine, and Rocky Mountain juniper (*Sabina scopulorum*). Overall, the Mixed Forest vegetation represents a blending of the Mountain Parks plant species; it is generally not as open as the Ponderosa Pine type and is usually more xeric than the Douglas-fir type.

Grassland vegetation is scattered in pockets of various extent west of the Mesa Trail, and is the dominant formation eastward on the plains. In the mountains it is most frequent on ridge tops and

gentle south-facing slopes (Marr, 1961). Grasslands are often associated with fine textured soils in which herbaceous species have a competitive advantage over trees in seedling establishment. Cutting and grazing are also responsible for some of the grasslands in the Mountain Parks.

Cooper (1984) discusses three different categories of grasslands in the Parks: true lowland prairies with tall grass species, such as big bluestem (*Andropogon gerardii*), indian grass (*Sorghastrum avenaceum*), and switch grass (*Panicum virgatum*); an upland aspect of the lowland prairie that occurs on the rocky mesa tops with such species as little bluestem (*Schizachyrium scoparium*) and prairie dropseed (*Sporobolus heterolepis*); and the grassland of mesa slopes and bottomlands where western wheatgrass (*Pascopyrum smithii*), bluegrass (*Poa agassizensis*), and Canada bluegrass (*P.compressa*) are often dominant. Species associated with the short grass prairie, such as blue gramma (*Chondrosum gracilis*) and buffalo grass (*Buchloe dactyloides*), can be abundant on xeric sites.

Vestal (1917) also separates the grasslands of the foothills into three associations. His classes - primitive grassland, mixed grassland, and bunch grass - approximate Cooper's categories.

More importantly, these associations indicate that this vegetation type is a complex one; to refer to it as "grassland" is an oversimplification that may not convey a significant level of ecological information to the managers who are trying to apply an ecosystem perspective to their work. In his discussion of

grasslands, Vestal mentions this complexity and the difficulties involved in characterizing this vegetation: "The assemblage is most heterogeneous, since the many plants include widely diverse ecological, geographic, and floristic types. Extreme xerophytes and relatively mesophytic plants, plants of widely varying growth form and seasonal relations, of great difference in plasticity to environmental variation, in altitudinal and habitat range, may occur in the same small grassland area."

The grassland-forest boundary is one of the most species- rich areas in western North America (Peet, 1978). This ecotone represents a significant portion of the Mountain Parks. For both these reasons, the ecological structure and functions of grasslands and their margins are deserving of further study.

Riparian Vegetation is the richest vegetation type, both floristically and ecologically, in the Mountain Parks. Peet (1978) documented the low elevation riparian forests along the Colorado Front Range as having plant species diversity values as high as any reported from western North America. It is also along these narrow ribbons of moisture that a disproportionate percentage of the local fauna is found. Thomas (1979) has reported that in the Blue Mountains of eastern Oregon and Washington, 285 of the 378 species of terrestrial vertebrates are either directly dependent on riparian areas or prefer them to other habitats. Other studies have shown similar patterns in riparian zones (Hunter, 1990). Along with the high number of plant and animal species associated with this vegetation type, riparian areas play an important role in

the cycling of nutrients through the ecosystem.

Cooper (1984) separates the Riparian Vegetation of the Mountain Parks into three zones: Plains Riparian, Foothills Riparian, and Mountain Riparian. Based on the dominance of broad-leaved cottonwood (*Populus deltoides*) and peach-leaved willow (*Salix amygdaloides*), it is clear that Plains Riparian is a meaningful delineation. As one approaches the mountain front and enters the Foothills Riparian Zone, these two species are replaced by box elder (*Negundo aceroides*), wild plum (*Prunus americana*), and chokecherry (*Padus virginiana*).

The Foothills Riparian Vegetation is notable for its deciduous nature and high number of shrub species. Both the Foothills Riparian and the Mountain Riparian vegetation types share a strong affinity with the flora of eastern North America. Such species as wild sarsaparilla (*Aralia nudicaulis*), black snakeroot (*Sanicula marilandica*), and hazelnut (*Corylus cornuta*) reflect this relationship.

As one moves up the streams into the Mountain Riparian Zone, box elder and wild plum disappear. The dominants in this vegetation type become mountain maple (*Acer glabrum*) and river birch (*Betula fontinalis*), small trees that occur at lower elevations, but extend farther up the elevation gradient than those species with which they are found in the Foothills Riparian Zone. Aspen (*Populus tremuloides*) can also be more readily observed along these mesic, high-elevation sites. It is the understory species that most clearly characterize the distinction between the two

zones. Many of the plants of special concern in the Boulder Mountain Parks are found in the Mountain Riparian Vegetation (Hogan, 1989). Along these spring-fed rivulets such rarities as broad-lipped twayblade (*Listera convallarioides*), white adders-mouth (*Malaxis monophyllos*), dwarf raspberry (*Cylactis pubescens*), and rattlesnake fern (*Botrypus virginianus*) occur. Other characteristic species of this vegetation are bush honeysuckle (*Distegia involucrata*), twisted stalk (*Streptopus fassettii*), and the lady fern (*Athyrium filix-femina*).

Although Cooper (1984) states that Mountain Riparian Vegetation is found only on the north side of Green Mountain, this year's work has documented similar habitats in Lost Gulch. On a late season field trip I also discovered at least one drainage on the north side of Bear Peak of this type. This latter drainage is the only site in which twinflower (*Linnaea borealis*) is known in the Mountain Parks, and the second site in which blueberry (*Vaccinium myrtillus*) has been observed.

The entire chain of vegetation that borders the water courses of the Mountain Parks - Plains, Foothills, and Mountain Riparian - is deserving of the utmost protection. Although these ribbons of moisture represent only a small fraction of the area in the Parks, they are the hub around which the biological wealth of the Parks revolves.

Cliffs and Rock Faces. The Flatirons are a scenic landmark of the Boulder area. In addition to this formation, the sedimentary layers to the east and the granitic bedrock to the west make up a

significant portion of the Mountain Parks landscape. Although these areas are not rich in species, they often serve as the primary habitat for a variety of ferns. *Cheilanthes fendleri* and *Asplenium septentrionale* are known from rock crevices. *Polypodium amorphum* is an uncommon fern restricted to protected granite ledges. American rock brake (*Cryptogramma acrostichoides*) and the *Woodsia* species (*W. oregana, W. scopulina*) are other ferns that are primarily associated with this habitat. In addition to these vascular species, an unexplored wealth of lichens and mosses live among the cliffs and rocks.

These sites also serve as important wildlife habitat by providing physical protection in a relatively stable environment. Most of the species that use these areas obtain their food and water nearby; therefore, cliffs and rock faces adjacent to water are particularly important to the reptiles, birds, and mammals that depend upon them (Thomas, 1979).

Rock climbing is a popular activity with a long tradition in the Boulder Mountain Parks. It is important that management guidelines be established that will protect the plants and animals whose homes are the climbers' playground.

Methods

This year's work was facilitated by the survey conducted in 1989 (Hogan, 1989). Having a current floristic list with habitat notes was an important advantage in beginning this year's field season. Along with the species list, experience gained in 1989 afforded a wealth of clues pertaining to the times and places that particular species and communities might be found.

Plants of special concern were defined as those species that are rare or endangered, relicts, those that are infrequent in the study area even though they may be abundant elsewhere, and those locally common species that are otherwise restricted.

At the start of the 1990 field season, species lists relevant to the area were reviewed (Daniels, 1911; Weber, 1976; Cooper, 1984; Hogan, 1989). Large-scale maps (1:6000) were studied to provide a perspective that is often lost when on the ground. Field work was conducted throughout the active growing season, from May 15 through the end of September. Approximately 300 field hours were devoted to the survey.

Historical records and personal experience indicated that the richest floristic sites would be found along the narrow riparian corridors of the area. The first month of the field season was devoted to a careful exploration of these sites. An effort was made to stay within six feet (2 m) of each of the principal drainages for their entire course. These included the drainages in

Shadow, Fern, and Skunk Canyons, as well as the three drainages in Lost Gulch. This strategy was helpful in locating several sites where a rare and diverse flora was found. The association of a high diversity with rare species has been noted by other investigators. Nilsson (1988) writes, "The only predictable feature was that species richness was higher on sites with rare species than on sites without rare species. The results suggest that each river has largely unique vegetation features, and that extensive field surveys are the only guarantee of success in the selection of river sites for the purpose of conservation."

Whereas the focus during the early season was on the mesic strips in the canyon bottoms, drier upland sites were also investigated. In Lost Gulch this included the Tram Hill area and the ridges to the east and west of Lost Gulch proper. In Shadow and Fern Canyons on Bear Peak, where the mesic sites are restricted to the lower reaches of the drainages, the drier areas were investigated by making forays from the established trails that climb the length of these canyons. The Bear Peak summit was traversed two times during this period. The uplands of Skunk Canyon were more problematic due to the steepness of the terrain and the lack of trails, but two days in June were devoted to exploring the drier sites in this canyon.

After this initial stage, in which several species-rich sites were identified, coverage was expanded into some of the lesser tributaries in Lost Gulch, and the time spent between mesic and xeric habitats was more equivalent. The majority of an area's

species are found in the early stages of a floristic survey. This is the period when most of the ubiquitous plants are documented. Although the species list increases more slowly as the season progresses, these later stages are the time when promising sites are returned to again and again. Concomitantly, this is the period when late-season plants and those furtive species that have been missed are documented.

A complete inventory of all the vascular plants in the area was compiled. The collection of voucher specimens was not permitted due to Mountain Park policy. Although most of the plants were familiar or readily keyed in the field, diagnostic parts were collected when it was necessary to determine an identification in the herbarium. This was necessary most often with grasses and sedges.

Results

Three hundred and forty-nine species of vascular plants in 248 genera and 82 families were observed in this survey (see Appendix). The largest families were Asteraceae and Poaceae, with 58 and 41 species, respectively. Non-native (adventive) species comprised fifteen percent (52 species) of the flora. Two of the plants, broad-lipped twayblade (*Listera convallarioides)* and white veined pyrola (*Pyrola picta*), are Colorado Plant Species of Special Concern as recognized by the Colorado Natural Areas Program (CONAP, 1989).

This year's list differs from that of 1989 most notably in the absence of those species that are specific to level benches along streambanks. The steep gradient of the drainages in Lost Gulch may account for the absence of such rare plants as paper birch (*Betula papyrifera*), rattlesnake fern (*Botrypus virginianus*), white adders-mouth (*Malaxis monophyllos*), and the wood lily (*Lilium philadelphicum*). Future studies should continue to look for these species, as well as the woodland alaskan orchis (*Piperia unalascensis*) and the grasses of mesic sites, such as false melic (*Schizachne purpurascens*), hairy brome (*Bromopsis pubescens*), and prairie wedge-grass (*Sphenopholis obtusata*).

Rich communities were found in the relatively few areas where the gradient was less steep and soils could accumulate. Plants associated with these sites include baneberry (*Actaea rubra*), wild sarsaparilla (*Aralia nudicaulis*), lady fern (*Athyrium filix-*

femina), Dewey's sedge (*Carex deweyana*), enchanters nightshade (*Circaea alpina*), dwarf raspberry (*Cylactis pubescens*), tall manna grass (*Glyceria elata*), northern bog orchid (*Limnorchis saccata*), rough-leaved ricegrass (*Oryzopsis asperifolia*), black snakeroot (*Sanicula marilandica*), and twisted stalk (*Streptopus fassettii*). It should be stressed that, although this year's survey was not successful in documenting four of the state-listed species that were found in 1989, the riparian communities that were documented are of critical importance. The plants associated with these communities, although not uncommon to riparian habitats in the Mountain Parks, are of limited distribution in western North America and represent a special resource of the Parks.

Although this year's survey differed from that of 1989 in the absence of some species, it was distinguished by the presence of others. These species were usually found at lower elevations and represent an intermingling of the plains and montane floras. Plants such as agrimony (*Agrimonia striata*), big bluestem (*Andropogon gerardii*), side-oats grama (*Bouteloua curtipendula*), joe-pye weed (*Eupatorium maculatum*), and needle-and-thread grass (*Stipa comata*) are characteristic of this prairie element. Due to its proximity to the city and the ready access that the Mesa Trail provides, the grassland-forest ecotone is subject to increasing human impact. Conflicting perspectives on the management of this area should be measured against the biological diversity it contains.

Skunk Canyon on Green Mountain differed significantly from

Shadow and Fern Canyons on Bear Peak. Above their lower, more mesic reaches, these latter canyons displayed a depauperate flora with an understory often characterized by Oregon grape (*Mahonia repens*) and common juniper (*Juniperus communis*). In contrast, Skunk Canyon carried intermittent water in its drainage throughout the season and possessed a richer flora in the canyon bottom. This contrast is not uncommon in semiarid regions where moisture is the critical environmental factor controlling plant growth. Why Green Mountain displays a more mesic hydrologic regime than Bear Peak is an unanswered question. The structure of the geologic faulting and the relation of the Fountain Formation with the underlying granite may provide clues. It should be noted that this year's work used the Mesa Trail as the eastern boundary for its survey of Shadow, Fern, and Skunk Canyons. Each of these canyons extends below this boundary and is more mesic in these lower reaches where a more luxuriant vegetation is found.

The ranges of two state-listed species of special concern were extended during this year's work. Broad-lipped twayblade (*Listera convallarioides*) was observed in each of the drainages in Lost Gulch. It was also documented during a late season reconnaissance of a drainage on the north side of Bear Peak. White veined pyrola (*Pyrola picta*) was observed in Lost Gulch and each of the other three canyons. This species was never abundant, and although usually associated with shaded woods, it was also observed on relatively xeric sites at higher elevations.

Discussion

Traditional conservation efforts have focused on the protection of particular species or localized habitats. The wetlands of duck hunters, the riparian communities of Trout Unlimited, university research camps, and preserves such as the Boulder Mountain Parks represent crucial nodes of biological diversity that have been protected through these efforts. It is important that conservationists continue to work toward saving "the last of the least and the best of the rest" (The Nature Conservancy, 1982). Nevertheless, contemporary thinking in conservation biology shows that this approach, although necessary, is not sufficient to halt the loss of biological diversity (Wilcox, 1984).

Ecosystems are composed of not only the biotic and abiotic components of an environment, but also include the interactions that produce a flow of energy and a cycling of nutrients. There has been an emphasis on the structural components of preserves without an awareness of the functional role these components play. These roles are manifested in the pollination of an orchid by a bee, the decay of a log on the forest floor, the predatory strike of a goshawk. It is not enough to protect the site where the orchid is found, we must also protect the environment upon which the bee depends.

The Nature Conservancy employs the metaphor of coarse filters and fine filters for saving biological diversity. The coarse

filter approach involves the conservation of an ecosystem encompassing a wide variety of habitats that will serve to protect the majority of species in a region. This approach is designed to include all those species that might otherwise be forgotten - the "invisible diversity" of microbial life (Odum, 1984), inconspicuous plants and insects, and those species that don't evoke human sentiment. The coarse filter approach protects the integrity of the ecosystem in which these species live.

A problem with this approach is that rare species with a limited distribution may not be protected in a preserve that doesn't include the specific site(s) where that species occurs. This is where the fine filter approach comes into play. It is directed toward individual species known to be endangered and designed to catch those rare species that have slipped through the pores of the coarse filter (Hunter, 1990). The Boulder Mountain Parks is a heterogeneous landscape with a wide variety of habitat types that, if protected from inordinate human impact, will serve to protect many of the species found therein. However, certain species of plants and animals are known from only one or two sites in the Parks, and these areas need to be given special attention in management decisions. It is important that both a coarse filter and fine filter approach be employed in order to encompass different levels in the ecosystem hierarchy.

Many resource management decisions are involved with this problem of hierarchy. At what level in the spatial or temporal scale are decisions being made? In this context it is useful to

introduce three basic scales of diversity (Whittaker, 1972). Alpha diversity is the number of species within a single habitat or community. An example of alpha diversity is the number of species found in an area like the Chautauqua meadow. Beta diversity is defined as the degree of change in species diversity along an environmental gradient or series of habitats (Magurran, 1988). Whereas alpha diversity is diversity *within* a habitat, beta diversity is diversity *between* habitats. Finally, the total diversity of a landscape or bioregion is called gamma diversity. An example of gamma diversity might be the number of species in the Mountain Parks or in the entire southern Rocky Mountains. Alpha, beta, and gamma diversity apply to spatial scales that are different by many orders of magnitude - from a meadow, to a landscape, to a bioregion. These different levels of diversity provide insight into the use of "edges" in resource management.

The "edge effect" is a concept that has been long regarded as an effective means of increasing species diversity. Although certain species, especially game animals, thrive in edge habitat, forest edges also have a negative impact on other plant and animal species (Terborgh, 1989). As landscapes become increasingly fragmented, the flora and fauna of forest interiors become threatened. Edge habitat may serve to increase species numbers at a localized site (alpha diversity), but diversity at the regional scale (gamma diversity) will probably be compromised. It is not enough simply to base policy on local conditions; as fragmentation continues, decisions must be based on a landscape perspective if

native species are to be protected.

Fragmentation is considered by many conservation biologists to be the most significant factor contributing to the extinction of species (Harris, 1984; Wilcox, 1984). Fragmentation results in the loss of habitat and the insularization of the remaining habitat. As Diamond (1981) says, "not only will a reserve which saves only a small part of a particular habitat start out with fewer species than a larger one, it will ultimately lose them faster." Although there exists a lively academic debate over what criteria are most useful in designing nature preserves, there is a consensus that the bigger the preserve, the better the chances that the full suite of species found there will survive.

Pickett and Thompson (1978) define a minimum dynamic area as "the smallest area with a natural disturbance regime, which contains internal recolonization sources, and hence minimizes extinction." Unfortunately, there are few, if any, regions remaining in the world large enough to encompass this minimum dynamic area and offset the effect of anthropogenic fragmentation. Nevertheless, the concept is not irrelevant to conservation. Noss (1987) writes, "a system of natural areas, interconnected with each other and integrated with the landuse of the surrounding landscape, may provide some of the functions of a minimum dynamic area, such as recolonization sources, gene flow, a mix of habitats in the system as a whole, and alternative refugia for species to escape natural enemies and disturbance episodes."

The city and county of Boulder are in a unique position to put

these concepts into practice. Rocky Mountain National Park, Forest Service lands, city and county open space, the City Mountain Parks, and smaller sites, both public and private, represent a wide array of native diversity. Adopting an interagency landscape perspective to the management of these lands would serve to enhance this diversity and protect it for future generations. A strategy that identifies the richest sites, protects them with adequate buffers, and establishes corridors of connectivity could be the framework for an ecosystem management policy. Decisions concerning the placement of trails, housing construction, land purchases, and forest management could all be made within this framework.

A criticism often leveled at this approach is that it requires a degree of cooperation between agencies that is not realistic (Gilbert, 1988). Yet, the very nature of ecosystems dictates a broad, cooperative strategy to their management. An ecosystem approach will not preclude the traditional work of the ranger and forester. Managers will still need to have an intimate knowledge of their particular region and make decisions based upon that knowledge. But without an awareness of what is occurring beyond the boundaries of their province, managers may find their best intentions being undermined. A challenge to resource professionals is to develop cooperative models that will demonstrate the efficacy of the ecosystem approach to conservation.

It is necessary to work on many levels simultaneously. Rare species and communities need to be documented and appropriate protective measures enacted. Policies for the Mountain Parks need

to be developed that will minimize localized impact on the landscape. And, finally, the Mountain Parks need to be placed in the context of the greater bioregion in which it exists and an ecosystem perspective must be employed when appropriate.

Recommendations

Many of the recommendations below have been introduced or alluded to throughout this paper. It is recognized that management decisions are rarely made on ecological criteria alone, but that social, economic, and political considerations are also important factors. These recommendations attempt to present a balanced perspective in which difficult management decisions are based on accurate environmental information.

1. The Parks should continue to identify and protect species and communities of special concern within its own jurisdiction. The most critical species of special concern should be regularly monitored and accurate records of their numbers, locations, and distributions should be maintained. In addition, a biological inventory of the Parks should be supported.

A great deal of information on the flora and fauna is already known. This information can serve as a foundation for future work serving to document the immigration and/or extinction of plants and animals in the Parks. This information can also serve in ecological studies that have management implications. Studies on forest structure and the diversity of the grassland-forest ecotone have been mentioned. A detailed vegetation mapping program would also serve many management purposes.

Guidelines for future studies should be carefully articulated to minimize the impact of the work. Concomitantly, studies should

be conducted in accordance with accepted scientific standards. This may involve the collection of specimens and the coring of trees. The methods of each study should be evaluated on a case-by-case basis, both for their impact on the environment and for their efficiency in terms of time and money. It is important that the goals of the study are in accordance with the methods proposed.

2. Streamside habitats should be protected from human disturbance. Any thinning operations or other forestry-related practices should be managed to prevent adverse impacts. Dropping trees in the drainages should be prohibited and erosion from any upslope operations should be prevented. Any future trail construction and/or maintenance should be cognizant of the special nature of these habitats.

Drainages that do not have trails in them should be kept inviolate. Trails can serve as corridors for non-native species, serving to undermine the ecological integrity of an area. In addition, the increased human use resulting from trails is a serious disturbance to the wildlife that depend upon these areas. Skunk Canyon and Lost Gulch represent two of the last drainages in the Mountain Parks that are trailless and they should remain so.

3. Fire suppression policy in the Boulder Mountain Parks needs to be addressed. It is recognized that the Parks is too small and too close to human homes to allow a natural fire regime to occur. Nevertheless, policies that prevent the heavy impact

that fire fighting imposes on the landscape should be implemented. A firefighting strategy that employs the existing system of roads and works to contain fires within drainages is suggested. Taking heavy equipment into riparian drainages or onto the steep slopes of canyons with their shallow soils might prove more disastrous than any impact of the fire itself. In order to reduce the chances of catastrophic fire in the Mountain Parks, a combination of controlled burns and carefully managed thinning operations should be investigated.

4. The public perception of the Boulder Mountain Parks as a recreational resource should be balanced with an appreciation of the Parks as a biological preserve. Management decisions that place limits on human use will be difficult to implement without this shift in perspective. If the ecological integrity of the Parks is to be preserved in the face of an increasing population, decisions that limit human use will become more and more necessary. Horses, dog owners, climbers, runners, hikers, and people involved in nature study, all have impacts of varying degree. An appreciation of the Mountain Parks as a critical link in regional biodiversity will help to minimize conflicts with these various user groups. This shift in perspective needs to occur on all levels, from school children to government officials.

5. The Boulder Mountain Parks should be viewed in the context of the larger regional landscape. If the Parks is not to become an

isolated island subject to the loss of species dictated by such insularity, it must be managed as part of the regional ecosystem. This will require a closer working relationship with other agencies and an effort by Parks managers to educate more reluctant colleagues on the necessity for such an approach.

Conclusion

Resource professionals entrusted with the management of natural areas such as the Boulder Mountain Parks are continually confronted with the dilemma of making decisions in the face of inadequate knowledge. The complexity of nature belies a complete understanding, yet to be paralyzed by our want of knowledge is to risk losses that future generations will be slow to forgive.

Conceptual debates over management decisions are a vital element of those decisions. More research is needed. But what is more often lacking is the social, political, and moral will to enact decisions that are based on relatively informed criteria. Leopold (1949) has provided a touchstone that we can measure our actions against: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." The recommendations and findings presented in this report will be best served when such a land ethic is accepted by those who use and depend upon the Boulder Mountain Parks.

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APPENDIX

Annotated Species List

Nomenclature follows Weber (Wittmann and Weber, 1990). If other names are considered to be more familiar, these are provided. In addition to the local manuals (Weber, 1976, 1990), other works used in compiling this list include the *Flora of the Great Plains* (Great Plains Flora Association, 1986), *Intermountain Flora* (Cronquist et al., 1977), *Manual of the Plants of Colorado* (Harrington, 1954), *Native Orchids of the United States and Canada* (Luer, 1975), and *Vascular Plants of Wyoming* (Dorn, 1988).

FERNS and FERN ALLIES

ASPIDIACEAE Shield Fern Family

Dryopteris filix-mas (L.) Schott. MALE FERN.
A handsome fern; not uncommon in moist, shaded sites.

ASPLENIACEAE Spleenwort Family

Asplenium septentrionale (L.) Hoffman. GRASSFERN.
Observed in Fern Canyon, growing in seams of Fountain Sandstone.

ATHYRIACEAE Lady Fern Family

Athyrium filix-femina (L.) Roth. LADY FERN.
Often found with *Dryopteris filix-mas*, but not as common.

Cystopteris fragilis (L.) Bernh. BRITTLE FERN.
Most common fern of the Mountain Parks; extemely variable.

CRYPTOGRAMMACEAE Rock Brake Family

Cryptogramma acrostichoides R.Brown. AMERICAN ROCK BRAKE.
C. crispa (L.) R.Br. ssp.*acrostichoides* (R.Br.) Hultén.
Not infrequent in rocky sites.

EQUISETACEAE Horsetail Family

Equisetum arvense L. FIELD HORSETAIL.
Locally abundant in moist sites.

Hippochaete hyemalis (L.) Bruhin. TALL SCOURING-RUSH.
Equisetum hyemale L.
Locally abundant in moist sites.

Hippochaete laevigata (A.Braun) Farwell. SMOOTH SCOURING-RUSH.
Equisetum laevigatum A.Braun
Less common than *H. hyemalis*; similar sites.

HYPOLEPIDACEAE Bracken Family

Pteridium aquilinum (L.) Kuhn ssp. **lanuginosum** (Bongard) Hultén.
BRACKEN FERN.
Common, rank fern of moist sites.

POLYPODIACEAE Polypody Family

Polypodium amorphum Suksdorf. POLYPODY.
Infrequent in protected rock crevices; easily observed near the summit of Bear Peak.

SELAGINELLACEAE Little Club-moss Family

Selaginella densa Rydberg.
Dry, gravelly soils in forests; scattered, never abundant.

Selaginella underwoodii Hieronymus.
Less common, more mesic sites than *S. densa*.

WOODSIACEAE Woodsia Family

Woodsia scopulina Eaton. ROCKY MOUNTAIN WOODSIA.
Uncommon in rock crevices; spreading stem hairs diagnostic.

GYMNOSPERMS

CUPRESSACEAE Cypress Family

Juniperus communis L. ssp. **alpina** (Smith) Celakowski.
COMMON JUNIPER.
Common shrubby Juniper of foothills.

Sabina scopulorum (Sargent) Rydberg. ROCKY MOUNTAIN JUNIPER.
Juniperus scopulorum Sargent.
Scattered throughout area; associated with drier sites, but sometimes found growing along streams.

PINACEAE Pine Family

Pinus contorta Douglas ssp. **latifolia** (Engelmann) Critchfield.
LODGEPOLE PINE.
Along south ridge of Bear Peak intermixed with *P. flexilis, P. ponderosa,* and *Pseudotsuga menziesii*.

Pinus flexilis James. LIMBER PINE.
Scattered at higher elevations.

Pinus ponderosa Douglas ssp. **scopulorum** (Watson) Weber.
PONDEROSA PINE.
Common pine of Mountain Parks.

Pseudotsuga menziesii (Mirbel) Franco. DOUGLAS FIR.
Codominant with *Pinus ponderosa*; more common on north facing slopes.

ANGIOSPERMS

ACERACEAE Maple Family

Acer glabrum Torrey. MOUNTAIN MAPLE.
Small tree, frequent along streams and in the canyons.

Negundo aceroides (L.) Moench. BOX ELDER.
Acer negundo L.
Common streamside tree in lower reaches of canyons; especially frequent in Skunk Canyon.

AGAVACEAE Agave Family

Yucca glauca Nuttall. SPANISH BAYONET
Dry hillslopes.

ALLIACEAE Onion Family
(Liliaceae)

Allium cernuum Roth. NODDING ONION.
Woodland species.

Allium geyeri Watson. WILD ONION.
Woodland species.

ALSINACEAE Chickweed Family
(Caryophyllaceae)

Alsine media L. CHICKWEED.
Stellaria media (L.) Vill.
Moist sites along streams; observed in western drainage of Lost Gulch; adventive.

Cerastium nutans Rafinesque. NODDING MOUSE-EARS.
Frequent in moist areas.

Cerastium strictum L. MOUSE-EARS.
C. arvense of Colorado literature.
Common throughout Mountain Parks.

Paronychia jamesii T.& G. JAMES' NAILWORT.
Associated with granitic grus in study area; frequent in lower reaches of Lost Gulch.

Pseudostellaria jamesiana (Torrey) Weber & Hartman. TUBER STARWORT.
Stellaria jamesiana Torrey.
Common woodland species; blooming in early season.

ANACARDIACEAE Sumac Family

Rhus glabra L. SMOOTH SUMAC.
Shrub of disturbed site.

Toxicodendron rydbergii (Small) Greene. POISON IVY.
Moist sites at lower elevations; abundant in Skunk Canyon and lower Lost Gulch.

APIACEAE/UMBELLIFERAE Parsley Family

Aletes acaulis (Torrey) C. & R. MOUNTAIN CARAWAY.
Common in rocky areas.

Angelica ampla Nelson. GIANT ANGELICA.
Uncommon along streambanks; observed in Lost Gulch.

Harbouria trachypleura (Gray) C. & R. WHISKBROOM PARSLEY.
Frequent on dry, open slopes; a Front Range endemic.

Heracleum sphondylium L. ssp. **montanum** (Schleicher) Briquet.
COW PARSNIP.
Common rank herb of streambanks.

Ligusticum porteri C. & R. PORTER'S LOVAGE, OSHA.
Common herb of streambanks; popular among herbalists.

Lomatium orientale C. & R. SALT & PEPPER.
Early blooming species of open sites.

Osmorhiza depauperata Philippi. SWEET CICELY.
Frequent in mesic sites.

Sanicula marilandica L. BLACK SNAKEROOT.
Locally common in cool, mesic sites near streams. An eastern woodland species.

APOCYNACEAE Dogbane Family

Apocynum androsaemifolium L. SPREADING DOGBANE.
Common in openings.

ARALIACEAE Ginseng Family

Aralia nudicaulis L. WILD SARSAPARILLA.
Cool, moist sites along streams. An eastern woodland species restricted to mesic habitats in western North America. Locally common along streambanks in study area; particularly abundant in middle reaches of Skunk Canyon.

ASCLEPIADACEAE Milkweed Family

Asclepias speciosa Torrey. SHOWY MILKWEED
Scattered; associated with disturbance.

ASPARAGACEAE Asparagus Family

Asparagus officinale L. ASPARAGUS
Infrequent; adventive.

ASTERACEAE/COMPOSITEAE Sunflower Family

Achillea lanulosa Nuttall. YARROW.
Common.

Acosta diffusa (Lam.) Sojak. KNAPWEED,CORNFLOWER.
Centaurea diffusa Lam.
Scattered throughout Mountain Parks on disturbed sites; a rampant colonizer; adventive.

Agoseris aurantiaca (Hooker) Greene. FALSE DANDELION.
Infrequent; observed in Lost Gulch.

Ambrosia artemisiifolia L. var. **elatior** (L.) Descourtils.
An annual *Ambrosia* of disturbed sites, infrequent; adventive.

Ambrosia psilostachya DC. WESTERN RAGWEED.
Weedy species of disturbed sites.

Ambrosia trifida L. GIANT RAGWEED.
Weedy species of disturbed sites; not as common as *A. psilostachya*.

Anaphalis margaritacea (L.) Bentham & Hooker. PEARLY EVERLASTING.
Infrequent; associated with mesic sites; observed in upper Lost Gulch.

Antennaria howellii Greene. NORTHERN PUSSYTOES.
A. neglecta of Colorado literature.
A species of cool canyons; often abundant on northwest facing slopes in Lost Gulch.

Antennaria parvifolia Nuttall. MOUNTAIN PUSSYTOES.
Not always easy to distinguish from *A.rosea*; both of these species are widely distributed throughout the study area.

Antennaria rosea Greene. PINK PUSSYTOES.

Arctium minus Bernhardi. BURDOCK.
Adventive species; often near streams.

Arnica cordifolia Hooker. HEARTLEAF ARNICA.
Common woodland species blooming in early season.

Arnica fulgens Pursh. ORANGE ARNICA.
Not uncommon at lower elevations.

Artemisia frigida Willdenow. SILVER SAGE.
Widespread throughout the Mountain Parks.

Artemisia ludoviciana Nuttall. PRAIRIE SAGE.
Very common throughout the Mountain Parks.

Aster laevis L. var. **geyeri** Gray. SMOOTH ASTER.
Common blue aster of late summer.

Aster porteri Gray. PORTER'S ASTER.
Common white aster of late summer; endemic to east slope.

Bahia dissecta (Gray) Britton. BAHIA.
Handsome plant of open sites; flowering in late summer.

Brickellia grandiflora (Hooker) Nuttall. BRICKELLIA.
Frequent on rocky slopes.

Carduus nutans L. ssp .**macrolepis** (Peterman) Kazmi.
PLUMELESS THISTLE.
Disturbed areas; adventive.

Chlorocrepis albiflora (Hooker) Weber. WHITE HAWKWEED.
Hieracium albiflora Hooker.
Common.

Cichorium intybus L. CHICORY.
Disturbed areas; adventive.

Cirsium arvense (L.) Scopoli. CANADA THISTLE.
Invasive in the Mountain Parks; adventive.

Cirsium vulgare (Savi) Tenore. BULL THISTLE.
Infrequent weedy species; adventive.

Erigeron colo-mexicanus Nelson. FLEABANE.
Occasional.

Erigeron compositus Pursh. CUTLEAF FLEABANE.
Occasional.

Erigeron divergens T. & G. SPREADING FLEABANE.
Occasional.

Erigeron eximius Greene. PALE FLEABANE.
Scattered throughout the Mountain Parks; most populations with white ray flowers.

Erigeron flagellaris Gray. WHIPLASH FLEABANE.
Most common *Erigeron* of study area, sometimes forming extensive mats.

Erigeron speciosus (Lindley) DC. SHOWY FLEABANE.
Infrequent; scattered throughout Mountain Parks.

Eupatorium maculatum L. JOE-PYE WEED.
Lower Shadow Canyon near stream.

Gaillardia aristata Pursh. BLANKET FLOWER.
Open sites.

Gnaphalium viscosum H.B.K. CUDWEED.
Common; adventive.

Gutierrezia sarothrae (Pursh) Britton & Rusby. SNAKEWEED.
Dry sites at lower elevations.

Helianthus pumilus Nuttall. SUNFLOWER.
Common.

Heterotheca fulcrata (Greene) Shinners. GOLDEN ASTER.
Chrysopsis fulcrata Greene.
Common; larger flowered than *H.villosa*.

Heterotheca villosa (Pursh) Shinners. GOLDEN ASTER.
Chrysopsis villosa (Pursh) Nuttall.
More abundant and flowering earlier than *H.fulcrata*.

Lactuca biennis (Moench) Fernald. TALL BLUE LETTUCE.
Uncommon; along streams in Lost Gulch. Like *L.canadensis*, this species has affinities with woodland species to the east.

Lactuca canadensis L. CANADIAN WILD LETTUCE.
Uncommon; moist sites in Lost Gulch.

Lactuca serriola L. PRICKLY LETTUCE.
Common *Lactuca* of Mountain Parks; adventive.

Liatris punctata Hooker. BLAZING STAR.
Common in open sites in late summer.

Machaeranthera pattersonii (Gray) Greene. TANSY ASTER.
Aster pattersonii Gray
Infrequent, more common at higher elevation.

Oligosporus campestris (L.) Cassini ssp. **caudatus** (Michaux) Weber.
WESTERN SAGEWORT.
Artemisia campestris L.
Open sites, locally abundant.

Oreochrysum parryi (Gray) Rydberg. PARRY GOLDENROD.
Haplopappus parryi Gray
Infrequent at higher elevations.

Packera fendleri (Gray) Weber & Löve. FENDLER'S SENECIO.
Senecio fendleri Gray
Common woodland species.

Rudbeckia ampla Nelson. TALL CONEFLOWER.
R. laciniata L. var. *ampla* (Nelson) Cronquist
Common along streams.

Senecio eremophilus Richardson ssp. **kingii** (Rydb.) Douglas & Ruyle-Douglas. WESTERN GOLDEN SENECIO.
Scattered woodland species in Mountain Parks.

Senecio integerrimus Nuttall. SPRING SENECIO.
Common *Senecio* of early season.

Senecio rapifolius Nuttall. TURNIPLEAVED SENECIO.
Front Range endemic found in upper reaches of Skunk, Fern & Shadow Canyons.

Senecio spartioides T.& G. BROOM SENECIO.
Late season *Senecio* at lower elevations.

Solidago missouriensis Nuttall. SMOOTH GOLDENROD.
Common and widespread.

Solidago multiradiata Aiton ssp. **scopulorum** (Gray) Weber.
Observed in upper Shadow Canyon.

Solidago serotinoides Löve & Löve. LATE GOLDENROD.
S.gigantea Aiton.
Occasional in moist areas.

Solidago spathulata DC var. **neomexicana** (Gray) Cronquist.
Scattered in the Mountain Parks.

Stenactis strigosa (Muhlenberg) DC. DAISY FLEABANE.
Erigeron strigosus Muhl.
Moist sites in latter half of season.

Taraxacum officinale G.H. Weber. COMMON DANDELION.
Occasional; adventive.

Townsendia grandiflora Nuttall. SHOWY EASTER DAISY.
Common on dry slopes in Lost Gulch.

Tragopogon dubius Scopoli ssp. **major** (Jacquin) Vollmann. SALSIFY.
Scattered throughout Mountain Parks; adventive.

BERBERIDACEAE Barberry Family

Mahonia repens (Lindley) G. Don. OREGON GRAPE.
Common.

BETULACEAE Birch Family

Betula fontinalis Sargent. RIVER BIRCH.
Common along streambanks and other moist sites.

Corylus cornuta Marshall. HAZELNUT.
Common along streambanks, particularly abundant in lower Lost Gulch. Communities dominated by this species provide important wildlife habitat and are not common in Colorado beyond the Front Range.

BORAGINACEAE Borage Family

Cynoglossum officinale L. HOUND'S TONGUE.
Common in disturbed areas; adventive.

Hackelia floribunda (Lehmann) Johnston. STICKSEED.
Scattered in open areas.

Lithospermum incisum Lehmann. NARROW-LEAVED PUCCOON.
Common species of early season; open sites.

Lithospermum multiflorum Torrey. MANY-FLOWERED PUCCOON.
Later flowering than *L.incisum*; somewhat less frequent.

Mertensia lanceolata (Pursh) DC. BLUEBELLS.
Common species of early season.

Onosmodium molle Michx. var. **occidentale** (Mackenzie) Cochrane.
FALSE GROMWELL.
Occasional in dry areas.

Oreocarya virgata (Porter) Greene. MINER'S CANDLE.
Cryptantha virgata (Porter) Payson.
Occasional in dry areas.

BRASSICACEAE/CRUCIFERAE Mustard Family

Alyssum alyssoides L. ALYSSUM.
Weed of disturbed sites; adventive.

Alyssum minus (L.) Rothmaler. ALYSSUM.
Weed of disturbed sites; adventive.

Arabis hirsuta (L.) Scopoli. HAIRY ROCK CRESS.
Scattered; adventive.

Boechera fendleri (Watson) Weber. FENDLER'S ROCK CRESS.
Arabis fendleri Watson.
Occasional; dry sites.

Camelina microcarpa Andrzejowski. FALSE FLAX.
Early season mustard; adventive.

Descurainia richardsonii (Sweet) Schultz. WESTERN TANSY MUSTARD.
Moist areas near streams.

Draba nemorosa L. WHITLOWWORT.
Dry hillsides; adventive.

Erysimum capitatum (Douglas) Greene. WESTERN WALLFLOWER.
Common; flowers in this region tend toward orange as opposed to the yellow varieties in other areas.

Lesquerella montana (Gray) Watson. MOUNTAIN BLADDER-POD.
An early season species of drier sites.

Neolepia campestre (L.) Weber. FIELD CRESS.
Lepidium campestre (L.) R.Brown
Scattered; adventive.

Noccaea montana (L.) Meyer. WILD CANDYTUFT.
Thlaspi montanum L.
Common white mustard of early season.

Physaria vitulifera Rydberg. DOUBLE BLADDER-POD.
Dry sites; East Slope endemic.

Sisymbrium altissimum L. JIM HILL MUSTARD.
Disturbed sites near roads; adventive.

Turritis glabra L. TOWER MUSTARD.
Arabis glabra (L.) Bernh.
Scattered throughout Mountain Parks; adventive.

CACTACEAE Cactus Family

Opuntia macrorhiza Engelmann. PRICKLY PEAR CACTUS.
O.compressa (Salisbury.) Macbr.
Dry sites.

Opuntia polyacantha Haworth. STARVATION CACTUS.
Dry sites.

CALOCHORTACEAE Mariposa Family (Liliaceae)

Calochortus gunnisonii Watson. MARIPOSA LILY.
Beautful flower of grassy hillsides.

CAMPANULACEAE Bell Flower Family

Campanula rotundifolia L. HAREBELL.
Common.

CANNABACEAE Hops Family

Humulus lupulus L. ssp. **americanus** (Nuttall) Löve & Löve.
WILD HOPS.
Lower Shadow Canyon.

CAPRIFOLIACEAE Honeysuckle Family

Distegia involucrata (Banks) Cockerell. BUSH HONEYSUCKLE.
Lonicera involucrata (Richardson) Banks.
Frequent shrub along streams.

Sambucus microbotrys Rydberg. ELDERBERRY.
S. racemosa L. of Colorado literature.
Uncommon; a few plants observed in Lost Gulch and Skunk Canyon.

Symphoricarpos albus (L.) Blake. SNOWBERRY.
Frequent.

Viburnum edule (Michaux) Rafinesque. BUSH-CRANBERRY.
Uncommon; observed along stream in Lost Gulch.

Viburnum lantana L. WAYFARING TREE.
Infrequent; observed in Skunk Canyon; adventive.

CARYOPHYLLACEAE Pink Family (see also Alsinaceae)

Gastrolychnis drummondii (Hooker) Löve & Löve. CAMPION.
Melandrium drummondii (Hooker) Hultén.
Silene drummondii Hooker
Scattered species of dry woodlands.

Saponaria officinalis L. SOAPWORT, BOUNCING BET.
Disturbed sites near roads; adventive.

Silene vulgaris (Moench) Garcke. CATCHFLY.
Streamsides; adventive.

CHENOPODIACEAE Goosefoot Family

Chenopodium album L. PIGWEED.
Weed of disturbed sites; adventive.

Chenopodium fremontii Watson. FREMONT'S GOOSEFOOT.
Open sites.

Chenopodium leptophyllum (Nuttall) Watson.
Disturbed sites.

Teloxys botrys (L.) Weber. WORMSEED.
Chenopodium botrys L.
Weed of disturbed sites; adventive.

COMMELINACEAE Spiderwort Family

Tradescantia occidentalis (Britton) Smyth. SPIDERWORT.
Dry, gravelly sites.

CONVALLARIACEAE Mayflower Family (Liliaceae)

Maianthemum amplexicaule (Nuttall) Weber. FALSE SOLOMON'S SEAL.
Smilacina racemosa of Colorado literature.
Common in cool, shaded sites.

Maianthemum stellatum (L.) Link. FALSE SOLOMON'S SEAL.
Smilacina stellata (L.) Desfontaines.
Common, often found with *M. amplexicaule*.

COPTACEAE Meadow Rue Family (Ranunculaceae)

Thalictrum fendleri Engelmann. MEADOW RUE.
Forests and shaded ravines.

CORNACEAE Dogwood Family

Swida sericea (L.) Holub. RED OSIER DOGWOOD.
Cornus stolonifera Michaux.
Infrequent along streambanks.

CRASSULACEAE Stonecrop Family

Amerosedum lanceolatum (Torrey) Löve & Löve. STONECROP.
Sedum lanceolatum Torrey.
Common.

CYPERACEAE Sedge Family

Carex deweyana Schweinitz.
Shaded sites near streams.

Carex foenea Willdenow.
Dry slopes.

Carex geophila Mackenzie.
Scattered throughout dry woodlands.

Carex geyeri Boott. ELK SEDGE.
Forest understory.

Carex limnophila Hermann.
Streamsides.

Carex microptera Mackenzie.
Frequent along streams.

Carex occidentalis Bailey.
Scattered throughout Mountain Parks.

Carex pennsylvanica Lamarck ssp. **heliophila** (Mackenzie) Weber.
C.heliophila Mackenzie
Early flowering sedge of drier sites.

Carex rossii Boott.
Scattered throughout dry woodlands; apparently more common than *C.geophila*.

ELAEAGNACEAE Oleaster Family

Shepherdia canadensis (L.) Nuttall. BUFFALOBERRY.
Scattered observations in upper Lost Gulch.

ERICACEAE Heath Family
(see also Monotropaceae, Pyrolaceae)

Arctostaphylos uva-ursi (L.) Sprengel ssp. **adenotricha** (Fernald & Macbride) Calder & Taylor. KINNIKINNIK, BEARBERRY.
Common understory species of Mountain Parks.

EUPHORBIACEAE Spurge Family

Tithymalus montanus (Engelmann) Small. ROCKY MT. SPURGE.
Euphorbia robusta of Colorado literature.
Dry sites.

FABACEAE/LEGUMINOSAE Pea Family

Astragalus flexuosus (Hooker) G. Don. WIRY MILK VETCH.
Scattered throughout Mountain Parks.

Astragalus parryi Gray. PARRY'S MILK VETCH.
Infrequent; drier sites.

Astragalus shortianus Nuttall.
Flower of early season; dry sites.

Astragalus tenellus Pursh. LOOSE-FLOWERED MILK VETCH.
Woodlands.

Lupinus argenteus Pursh. COMMON LUPINE.
Common; scattered throughout area.

Medicago lupulina L. BLACK MEDIC.
Weed of disturbed sites; adventive.

Melilotus alba Medicus. WHITE SWEET CLOVER.
Disturbed sites; adventive.

Melilotus officinalis (L.) Pallas. YELLOW SWEET CLOVER.
Disturbed sites; adventive.

Oxytropis lamberti Pursh. COLORADO LOCO.
Occasional on dry hillsides.

Psoralidium tenuiflora (Pursh) Rydberg.
Psoralea tenuiflora Pursh.
Open sites; a plains species.

Thermopsis divaricarpa Nelson. GOLDEN BANNER.
Common.

Trifolium repens L. WHITE DUTCH CLOVER.
Disturbed sites; adventive.

Trifolium pratense L. RED CLOVER.
Disturbed sites; adventive.

FUMARIACEAE Fumitory Family

Corydalis aurea Willdenow. GOLDEN SMOKE.
Colonizer of tree fall mounds and animal disturbed soils.

GENTIANACEAE Gentian Family

Frasera speciosa Douglas. MONUMENT PLANT, GREEN GENTIAN.
Scattered throughout area.

Gentianella acuta (Michaux) Hiitonen. LITTLE GENTIAN.
G.amarella of the Colorado literature.

GERANIACEAE Geranium Family

Erodium cicutarium (L.) L'Heritier. STORKSBILL.
Early season flower of disturbed sites; adventive.

Geranium caespitosum James. COMMON GERANIUM.
Frequent; drier sites.

Geranium richardsonii Fischer & Trautvetter. WHITE GERANIUM.
Cool, moist sites; a species more common to higher altitudes.

GROSSULARIACEAE Currant or Gooseberry Family

Ribes aureum Pursh. GOLDEN CURRANT.
Lower canyons.

Ribes cereum Douglas. WAX CURRANT.
Common *Ribes* of Mountain Parks.

Ribes inerme Rydberg. COMMON GOOSEBERRY.
Infrequent; moist sites.

HELLEBORACEAE Hellebore Family (Ranunculaceae)

Aconitum columbianum Nuttall. MONKSHOOD.
Infrequent along streambanks; a species of higher altitudes.

Actaea rubra (Aiton) Willdenow ssp. **arguta** (Nuttall) Hultén.
BANEBERRY.
Infrequent; cool, mesic sites.

Aquilegia coerulea James. BLUE COLUMBINE.
Scattered; usually in moist, shaded sites.

Delphinium nuttallianum Pritzel. BLUE LARKSPUR.
D.nelsonii Greene.
Common in early season.

HYDRANGEACEAE Hydrangea Family

Jamesia americana T. & G. WAXFLOWER.
Shrub of forest understory and craggy sites; a relictual species common to this area.

HYDROPHYLLACEAE Waterleaf Family

Hydrophyllum fendleri (Gray) Heller. WATERLEAF.
Common in moist sites.

Phacelia heterophylla Pursh. SCORPION WEED.
Common in dry sites.

IRIDACEAE Iris Family

Iris missouriensis Nuttall. WILD IRIS.
Infrequent; lower elevations of study area.

Sisyrinchium montanum Greene. BLUE-EYED-GRASS.
Infrequent; moist sites at lower elevations.

JUNCACEAE Rush Family

Juncus arcticus Willd. ssp. **ater** (Rydb.) Hultén.
Moist sites.

Juncus bufonius L. TOAD RUSH.
Disturbed sites with moisture.

Juncus dudleyi Wiegand.
Uncommon; moist sites.

Luzula parviflora (Ehrhart) Desv. WOOD RUSH.
Scattered; streambanks.

LAMIACEAE/LABIATAE Mint Family

Leonurus cardiaca L. MOTHERWORT.
Infrequent; observed in Skunk Canyon; adventive.

Mentha arvensis L. FIELD MINT.
Streambanks.

Monarda fistulosa L. var. **menthifolia** (Graham) Fernald.
PINK BERGAMOT.
Open, more mesic sites; a lovely plant of mid-summer.

Nepeta cataria L. CATNIP.
Scattered; adventive.

Prunella vulgaris L. HEAL-ALL.
Common; streambanks.

Scutellaria brittonii Porter. BRITTON SKULLCAP.
Frequent in drier sites.

LILIACEAE Lily Family

(see also Alliaceae, Convallariaceae, Calochortaceae, Melianthiaceae, and Uvulariaceae)

Leucocrinum montanum Nuttall. SAND LILY.
Dry sites; a beautiful wildflower of the early season.

LINACEAE Flax Family

Adenolinum lewisii (Pursh) Löve & Löve. WILD FLAX.
Linum lewisii Pursh.
Frequent in drier sites.

MELANTHIACEAE False Hellebore Family (Liliaceae)

Toxicoscordion venenosum (Watson) Rydberg. DEATH CAMAS.
Zigadenus venenosus Watson.
Occasional; dry sites.

MONOTROPACEAE Pinesap Family (Ericaceae)

Pterospora andromedea Nuttall. PINEDROPS.
Scattered in forests.

ONAGRACEAE Evening-primrose Family

Chamerion danielsii Löve. FIREWEED.
C.angustifolium of Colorado literature.
Epilobium angustifolium of Colorado literature.

Circaea alpina L. ssp. **pacifica** (Ascherson & Magnus) Raven.
ENCHANTERS NIGHTSHADE.
Locally abundant along streambanks; restricted to this habitat.

Epilobium brachycarpum Presl. ANNUAL WILLOW HERB.
E.paniculatum Nuttall.
Weedy; drier sites.

Epilobium ciliatum Rafinesque. ssp. **glandulosum** (Lehmann) Hoch & Raven.
NORTHERN WILLOW HERB.
Most common *Epilobium* of the area; moist sites.

Epilobium hornemannii Reichenbach.
Uncommon; streamsides.

Epilobium lactiflorum Haussknecht.
Uncommon; streamsides.

Gayophytum diffusum T.& G. ssp. **parviflorum** Lewis & Szweykowski.
Scattered; drier sites.

Oenothera caespitosa Nuttall. WHITE STEMLESS EVENING-PRIMROSE.
Dry, open sites; early season.

Oenothera villosa Thunberg ssp. **strigosa** (Rydberg) Dietrich & Raven.
COMMON EVENING PRIMROSE.
O.strigosa (Rydberg) Mack & Bush.
Scattered in openings.

ORCHIDACEAE Orchid Family

Calypso bulbosa (L.) Oakes. FAIRY SLIPPER.
North facing slopes at higher elevations; flowering in early season; never common.

Corallorhiza maculata Rafinesque. SPOTTED CORAL ROOT.
Frequent species of dry woodlands.

Corallorhiza striata Lindley. STRIPED CORAL ROOT.
Rare in Mountain Parks; small populations observed in Fern Canyon, Skunk Canyon, and Lost Gulch.

Corallorhiza wisteriana Conrad. SPRING CORAL ROOT.
Rare in Mountain Parks; one site in upper Lost Gulch. A southeastern species that flowers early in the season.

Goodyera oblongifolia Rafinesque. RATTLESNAKE PLANTAIN.
Occasional; scattered throughout deeper woods.

Limnorchis saccata (Greene) Löve & Simon. NORTHERN BOG ORCHID.
Habenaria saccata Greene.
Platanthera saccata (Greene) Hultén.
Found only in wet sites along streams; infrequent in the Mountain Parks.

Listera convallarioides (Schwartz) Nuttall. BROAD-LIPPED TWAYBLADE.
A true rarity of the Mountain Parks; always found along streambanks, often on small benches. Two populations observed in Lost Gulch proper - one about a quarter mile below the access road, the other about three quarters of a mile below the road. The former is associated with a small stand of aspen, the latter is just above (upstream) a group of about twenty snags in and near the stream. Two other small populations were observed in Lost Gulch, one in the middle drainage and the other in the westerly drainage near the upper boundary line.

OXALIDACEAE Wood-sorrel Family

Oxalis dillenii Jacquin. WOOD SORREL.
Weedy species of disturbed sites.

PLANTAGINACEAE Plantain Family

Plantago lanceolata L. ENGLISH PLANTAIN.
Weedy species of disturbed sites; adventive.

Plantago major L. COMMON PLANTAIN.
Similar sites, adventive.

POACEAE/GRAMINEAE Grass Family

Agrostis gigantea Roth. RED TOP.
Scattered throughout Mountain Parks in more mesic sites; adventive.

Agrostis scabra Willdenow. TICKLEGRASS.
The native counterpart of *A.gigantea;* less common, similar sites.

Andropogon gerardii Vitman. BIG BLUESTEM.
Woodland meadows; a Tall Grass Prairie species.

Anisantha tectorum (L.) Nevski. CHEAT GRASS.
Bromus tectorum L.
Dry, disturbed sites; adventive.

Arrhenatherum elatius (L.) Presl. TALL OAT GRASS.
Disturbed site in Lost Gulch; adventive.

Bouteloua curtipendula (Michx.) Torrey. SIDE-OATS GRAMA.
Woodland openings; a prairie species.

Bromopsis inermis (Leysser) Holub. SMOOTH BROME.
Bromus inermis Leysser.
Often near trails and roads; adventive.

Bromopsis lanatipes (Shear) Holub. BROME.
Bromus lanatipes Shear.
Common throughout forests of the Mountain Parks.

Bromus briziformis Fischer & Meyer. RATTLESNAKE GRASS.
Dry, often disturbed sites; adventive.

Bromus japonicus Thunberg. JAPANESE BROME.
Disturbed sites; adventive.

Chondrosum gracile H.B.& K. BLUE GRAMA.
Bouteloua gracilis (H.B.& K.) Lagasca.
Dry, open slopes.

Dactylis glomerata L. ORCHARD GRASS.
Common; adventive.

Danthonia spicata (L.) Beauvois. POVERTY OAT GRASS.
Frequent throughout the Mountain Parks.

Dichanthelium oligosanthes (Schultes) Gould.
Panicum oligosanthes Schultes.
Dry, rocky sites.

Elymus canadensis L. CANADA WILD RYE.
A late season grass; scattered along trails and roads.

Elymus glaucus Buckley. BLUE WILD RYE.
Frequent in Mountain Parks; a woodland species.

Elymus longifolius (Smith) Gould. SQUIRREL TAIL.
Sitanion longifolium Smith.
Open sites, often disturbed.

Elymus trachycaulus (Link) Gould. SLENDER WHEATGRASS.
Agropyron trachycaulum (Link) Malte.
Woodland species; scattered.

Elymus repens (L.) Nevski. QUACK GRASS.
Agropyron repens (L.) Beauvois.
Disturbed areas; adventive.

Festuca rubra L. RED FESCUE.
Woodland openings.

Festuca saximontana Rydberg.
Meadows.

Glyceria elata (Nash) Hitchcock. TALL MANNA GRASS.
Moist areas.

Glyceria striata (Lamarck) Hitchcock. FOWL MANNA GRASS.
Moist areas.

Koeleria macrantha (Ledebour) Schultes. JUNE GRASS.
Scattered throughout study area.

Leucopoa kingii (Watson) Weber. SPIKE FESCUE.
Hesperochloa kingii (Watson) Rydberg.
Ponderosa Pine forests.

Leymus ambiguus (Vasey & Scribner) Dewey. COLORADO WILD RYE.
Elymus ambiguus Vasey & Scribner.
Infrequent; growing in dense mats.

Muhlenbergia montana (Nuttall) Hitchcock. MOUNTAIN MUHLY.
Dry, often gravelly sites.

Oryzopsis asperifolia Michaux. ROUGH-LEAVED RICEGRASS.
Infrequent; in the shade of streambank vegetation.

Oryzopsis micrantha (Trin. & Rupr.) Thurber. LITTLESEED RICEGRASS.
Shaded sites in forest understory; not common.

Pascopyrum smithii (Rydberg) Löve. WESTERN WHEATGRASS.
Agropyron smithii Rydberg.
Drier sites.

Phleum pratense L. TIMOTHY.
Common near trails and roads; adventive.

Poa agassizensis Boivin & D. Löve. BLUEGRASS.
Open forests.

Poa compressa L. CANADA BLUEGRASS.
A common *Poa* of the Mountain Parks.

Poa fendleriana (Steudel) Vasey. MUTTONGRASS.
Frequent on dry slopes.

Poa nemoralis L. ssp. **interior** (Rydberg) Butters & Abbe.
Rocky sites.

Poa palustris L. SWAMP BLUEGRASS.
Wet areas.

Schizachyrium scoparium (Michaux) Nash. LITTLE BLUESTEM.
Andropogon scoparius Michaux.
Dry, open sites; a prairie species.

Stipa comata Trinius & Ruprecht. NEEDLE-AND-THREAD.
Open sites, usually at lower elevations.

Stipa lettermanii Vasey. NEEDLEGRASS.
Drier woodland sites.

Stipa nelsonii Scribner. NEEDLEGRASS.
S.columbiana Macoun.
More common *Stipa* of woodlands.

Stipa scribneri Vasey.
Infrequent in drier sites at lower elevations.

POLEMONIACEAE Phlox Family

Collomia linearis Nuttall. NARROWLEAVED COLLOMIA.
Common in dry woodlands.

Gilia ophthalmoides Brand.
Early season annual of dry sites.

Gilia pinnatifida Nuttall. SMALL FLOWERED GILIA.
G.calcarea of the Colorado literature.
Disturbed sites near roads and trails.

Microsteris gracilis (Douglas) Greene.
Frequent in early season, often associated with *Collinsia parviflora*.

Phlox multiflora Nelson. MANY-FLOWERED PHLOX.
Abundant on open slopes in early season.

POLYGONACEAE Buckwheat Family

Acetosella vulgaris (Koch) Fourreau. SHEEP SORREL.
Rumex acetosella L.
Weedy, disturbed sites; adventive.

Eriogonum umbellatum Torrey. SULPHUR FLOWER.
Common in dry, open sites.

Polygonum douglasii Greene. DOUGLAS KNOTWEED.
Dry sites.

Pterogonum alatum (Torrey) Gross. WINGED BUCKWHEAT.
Eriogonum alatum Torrey.
Frequent on drier sites.

Rumex aquaticus L. ssp. **occidentalis** (Watson) Hultén. DOCK.
R. occidentalis Watson.
Common in the western drainage of Lost Gulch.

Rumex crispus L. CURLY DOCK.
Disturbed sites; adventive.

PORTULACEAE Purslane Family

Claytonia rosea Rydberg. SPRING BEAUTY.
C.lanceolata Pursh.
Common in early season; a Foothills endemic.

PRIMULACEAE Primrose Family

Androsace septentrionalis L. ROCK PRIMROSE.
Scattered throughout the Mountain Parks.

Dodecatheon pulchellum (Rafinesque) Merrill. SHOOTING STAR.
Locally abundant along streams in early season.

PYROLACEAE Wintergreen Family

Chimaphila umbellata (L.) Barton ssp. **occidentalis** (Rydb.) Hultén.
PIPSISSEWA.
Cooler sites at higher elevations; very little of this species was observed in Lost Gulch.

Orthilia secunda (L.) House. ONE-SIDED WINTERGREEN.
Pyrola secunda L.
Ramischia secunda (L.) Garcke.
Scattered in cooler forest sites.

Pyrola chlorantha Swartz. GREEN-FLOWERED PYROLA.
P.virens Schweigge.
Frequent *Pyrola* of the Mountain Parks, but never abundant.

Pyrola picta Smith. WHITE VEINED PYROLA.
Known from only three other localities in Colorado, this beautiful *Pyrola* is usually found at higher elevations in the Mountain Parks. Scattered observations of this species were made in Shadow, Fern, and Skunk Canyons; fewer plants were seen in upper Lost Gulch.

Pyrola rotundifolia L. ssp. **asarifolia** (Michaux) Löve.
ROUND LEAVED PYROLA.
P.asarifolia Michaux.
Uncommon; cool, moist sites.

RANUNCULACEAE Buttercup Family (see also Helleboraceae)

Anemone cylindrica Gray. THIMBLEWEED.
Frequent in the Mountain Parks at lower elevations.

Atragene occidentalis Hornemann. BLUE CLEMATIS.
Clematis occidentalis (Hornemann) DC.
Scattered throughout the Mountain Parks; a viney species most easily noticed in the autumn when its leaves turn yellow.

Cyrtorhyncha ranunculina Nuttall. NUTTALL'S BUTTERCUP.
Ranunculus ranunculinus (Nuttall) Rydberg.
Observed on streamside ledges in Lost Gulch; a southern Rocky Mountain endemic.

Pulsatilla patens (L.) Miller ssp. **multifida** (Pritzel) Zamels.
PASQUE FLOWER.
Anemone patens L.
Not uncommon at lower elevations in the Mountain Parks; a harbinger of the flowering season.

Ranunculus abortivus L. ssp. **acrolasius** (Fernald) Kapoor.
SMALL-FLOWERED CROWFOOT.
Not infrequent along streams early season; a species with eastern woodland affinities.

Ranunculus macounii Britton. MACOUN'S BUTTERCUP.
Occasional; streamsides.

RHAMNACEAE Buckthorn Family

Ceanothus fendleri Gray. BUCKBRUSH.
Common, an important component of the forest and woodland vegetation.

Ceanothus herbaceus Rafinesque. REDROOT.
Uncommon in the Mountain Parks; a relictual species of the prairies.

Ceanothus velutinus Douglas. STICKY LAUREL.
Scattered throughout the Mountain Parks; less common than *C.fendleri*.

ROSACEAE Rose Family

Agrimonia striata Michaux. AGRIMONY.
Infrequent, streamsides.

Amelanchier alnifolia Nuttall. SERVICEBERRY.
Occasional shrub or small tree of the Mountain Parks.

Cerasus pennsylvanica (L.) Loiseleur. PIN CHERRY.
Prunus pennsylvanica L.
Scattered along the drainages in Lost Gulch.

Cercocarpus montanus Rafinesque. MOUNTAIN-MAHOGONY.
Dry, open sites; not as common in the Mountain Parks as elsewhere along the Front Range.

Cylactis pubescens (Rafinesque) Weber. DWARF RASPBERRY.
Rubus pubescens Rafinesque.
An eastern woodland relictual species; scattered along the drainages in upper Lost Gulch.

Drymocallis fissa (Nutt.) Rydberg.
Potentilla fissa Nuttall.
Common Cinquefoil of the Mountain Parks.

Fragaria vesca L. ssp. **bracteata** (Heller) Staudt. STRAWBERRY.
F.americana (Porter) Britton.
Infrequent, cooler sites.

Fragaria virginia Miller ssp. **glauca** (Watson) Staudt. STRAWBERRY.
F.ovalis (Lehmann) Rydberg
Common; scattered throughout the Mountain Parks.

Geum macrophyllum Willdenow. LARGE-LEAVED AVENS.
Frequent in moist sites.

Holodiscus dumosus (Hooker) Heller. OCEANSPRAY.
Observed on the western side of the Bear Pk. summit growing among rocks and talus.

Oreobatus deliciosus (James) Rydberg. BOULDER RASPBERRY.
Rubus deliciosus James.
Occasional; drier sites.

Padus virginiana (L.) Miller ssp. **melanocarpa** (Nelson) Weber. CHOKECHERRY.
Prunus virginiana L.
Common shrub throughout the Mountain Parks.

Physocarpus monogynus (Torrey) Coulter. NINEBARK.
Common shrub of hillsides.

Potentilla hippiana Lehmann. WOOLY CINQUEFOIL.
Drier sites; occasional.

Prunus americana Marshall. WILD PLUM.
Growing in gulches and streamsides at lower elevations.

Rosa woodsii Lindley. WILD ROSE.
The common wild rose of the Mountain Parks.

Rubacer parviflorum (Nuttall) Rydberg. THIMBLEBERRY.
Rubus parviflorus Nuttall.
Infrequent; cool ravines.

Rubus idaeus L. ssp. **melanolasius** (Dieck) Focke. WILD RASPBERRY.
Abundant in area, often forming thickets.

Sorbus scopulina Greene. MOUNTAIN-ASH.
Infrequent along streams and mesic sites; a Rocky Mountain endemic.

RUBIACEAE Madder Family

Galium septentrionale Roemer & Schultes. NORTHERN BEDSTRAW.
G.boreale of Colorado literature.
Common *Galium* of the Mountain Parks; an understory herb.

Galium spurium L. FALSE CLEAVERS.
Occasional in cooler sites; adventive.

Galium triflorum Michaux. FRAGRANT BEDSTRAW.
Not uncommon along streams and moist areas.

SALICACEAE Willow Family

Populus angustifolia James. NARROWLEAF COTTONWOOD.
Streamsides at lower elevations.

Populus deltoides Marshall ssp. **monilifera** (Aiton) Eckenwalder.
PLAINS COTTONWOOD.
P.sargentii Dode.
Streamsides; marginally entering the Mountain Parks from the eastern plains where it is the common streamside cottonwood.

Populus tremuloides Michaux. ASPEN.
Scattered throughout the Mountain Parks; more common in mesic sites.

Salix bebbiana Sargent. BEAKED WILLOW.
S.depressa of Colorado literature.
Common willow of streambanks.

Salix exigua Nuttall. SANDBAR WILLOW.
Scattered along streams; infrequent.

Salix irrorata Andersson. BLUESTEM WILLOW.
Lower elevations; a southwestern species.

Salix scouleriana Barratt.
A willow of drier sites; infrequent.

SANTALACEAE Sandalwood Family

Comandra umbellata (L.) Nuttall. BASTARD TOADFLAX.
Scattered throughout Mountain Parks on drier sites.

SAXIFRAGACEAE Saxifrage Family

Heuchera bracteata (Torrey) Seringe. BRACTED ALUM ROOT.
Rocky sites in forest, often growing on ledges, common.

Heuchera parvifolia Nuttall. COMMON ALUM ROOT.
Similar sites as *H.bracteata*; apparently not as common.

Micranthes rhomboidea (Greene) Small. SNOWBALL SAXIFRAGE.
Saxifraga rhomboidea Greene.
Scattered throughout Mountain Parks.

SCROPHULARIACEAE Figwort Family

Castilleja linariifolia Bentham. WYOMING PAINTBRUSH.
Scattered at higher elevations; easily observed along the north ridge of Bear Pk.

Castilleja miniata Douglas. SCARLET PAINTBRUSH.
The more common *Castilleja* of the Mountain Parks.

Collinsia parviflora Douglas. BABY-BLUE-EYES.
A common annual scattered throughout the area; small, but very pretty.

Mimulus floribundus Douglas. MONKEY FLOWER.
Often growing in seeps perched on bedrock; not common.

Orthocarpus luteus Nuttall. YELLOW OWL CLOVER.
Infrequent; drier hillsides.

Penstemon glaber Pursh. SMOOTH PENSTEMON.
P.alpinus Torrey.
Occasional throughout Mountain Parks in midsummer.

Penstemon secundiflorus Bentham. ONE-SIDED PENSTEMON.
Common in early summer in woodlands and meadows.

Penstemon virens Pennell. LOW PENSTEMON.
Most common and widespread *Penstemon* of the Mountain Parks.

Scrophularia lanceolata Pursh. FIGWORT.
A frequent species of mesic sites.

Verbascum thapsus L. MULLEIN.
Common in disturbed sites; adventive.

Veronica americana (Raf.) Schweintz. AMERICAN BROOKLIME.
Frequent in and along streams.

SOLANACEAE Nightshade Family

Physalis virginiana Miller. GROUND CHERRY.
Open sites.

ULMACEAE Elm Family

Ulmus pumila L. SIBERIAN ELM.
Lower Skunk Canyon; adventive.

URTICACEAE Nettle Family

Urtica gracilis Aiton. STINGING NETTLE.
U.dioica L. var. *gracilis* Aiton.
Along streams in lower canyons; common in lower Shadow Canyon.

UVULARIACEAE Bellwort Family
(Liliaceae)

Disporum trachycarpum (Watson) Bentham & Hooker. FAIRYBELLS.
Shaded woods.

Streptopus fassettii Löve & Löve. TWISTED STALK.
S.amplexifolius of Colorado literature.
Shaded streambanks.

VERBENACEAE Vervain Family

Verbena bracteata Lagasca & Rodriguez. VERVAIN.
Weed of disturbed; adventive.

VIOLACEAE Violet Family

Viola adunca Smith
Scattered throughout the Mountain Parks; mesic sites.

Viola nuttalli Pursh. YELLOW VIOLET.
Common flower of early season.

Viola rydbergii Greene.
V.rugulosa of the Colorado literature.
V.canadensis of the Colorado literature.
This and the next species often grow together, *V.scopulorum* being more common on slightly drier ground; they are frequent in the early season in the understory of cooler forests.

Viola scopulorum (Gray) Greene.
V.canadensis L. var. *scopulorum*.
This species has smaller leaves and flowers, and lacks hairs on the petiole and leaf midvein as in *V.rydbergii*.

VITACEAE Grape Family

Parthenocissus inserta (Kerner) Fritsch. VIRGINIA CREEPER.
Lower canyons.

Vitis riparia Michaux. WILD GRAPE.
Abundant at the "narrows" in lower Skunk Canyon.