

**A SYSTEMATIC INVENTORY
OF RARE AND IMPERILED BUTTERFLIES
ON THE CITY OF BOULDER OPEN SPACE AND MOUNTAIN
PARKS
and recommendations for their conservation
Field Season 1997**

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*Can the butterfly
be seen by the caterpillar?
Not by other caterpillars,
it cannot. It can be seen only
with butterfly eyes.*

Phillip St. Romain

EXECUTIVE SUMMARY

Colorado's union of the Rocky Mountains with the Great Plains has created an exceptionally diverse set of circumstances: moist montane forests, lush tallgrass prairies, arid shortgrass prairies, and desert life zones. This fantastic and unusual array of distinct, but co-occurring ecosystems all can be encountered in a day's hike within the boundaries of the City of Boulder's Open Space and Mountain Parks areas. This extraordinary variety of habitats provides for an extremely diverse and rich butterfly and skipper community. Representatives from the biogeographic regions of the northern arctic and boreal biomes, Rocky Mountains, southwestern deserts, and grasslands of the Great Plains may all be encountered here.

With this information in mind, in 1997, for the second consecutive field season, the Colorado Natural Heritage Program (CNHP) was contracted by the City of Boulder Open Space and City of Boulder Mountain Parks to conduct a systematic inventory of rare and imperiled butterflies on the Open Space and Mountain Parks properties. The goal of this project was to accumulate and examine existing biological data, incorporate appropriate portions into the CNHP's Biological Conservation Database, and with appropriate field surveys, identify significant natural heritage resources (rare or imperiled butterfly populations) occurring on City of Boulder Open Space and Mountain Parks. The information is prioritized according to the conditions of the populations and species' level of imperilment. We were also asked to make recommendations on actions that will protect these resources.

A total of 44 Targeted Inventory Areas (TIAs) were originally outlined for this survey in 1996. Between 1996 and 1997, a total of 42 or 95.5% were actually surveyed. We located butterfly or skipper species of concern in 12 or 28.5% of the TIAs surveyed. More than one species of concern was located within seven of the TIAs surveyed.

In total, 10 of the 14 targeted skipper species of concern were documented on the City of Boulder Open Space and Mountain Parks through this survey. At least four of these natural heritage resources are of global significance. A colony of *Celastrina* undescribed species 1, the Hops azure, a globally rare butterfly found in restricted habitat on the Colorado Front Range, was confirmed in Skunk Canyon. *Speyeria idalia*, the Regal fritillary, a globally rare or uncommon species, was documented from these surveys for the second consecutive season, and is hence included in this report. Sightings for this species were near Chautauqua Meadows in 1996, and near Towhee Trail in 1997. The Ottoo skipper (*Hesperia ottoe*), also a globally rare or uncommon species was located successfully on Foothills Open Space, Mesa Trail, and Marshall Mesa. The Arogos skipper (*Atrytone arogos*), also a globally rare or uncommon species, was reconfirmed from Beech Open Space, Foothills Open Space, and additionally documented from Mesa Trail near South Boulder Creek, and at Marshall Mesas. The remainder of rare or imperiled species found are of a state-wide significance. Overall, the concentration of rare or imperiled species indicated that conservation in City of Boulder Open Space and Mountain Parks will have state-wide as well as global consequences for the conservation of biological diversity.

Based on the combination of information collected in this study and previously-existing information, five potential conservation sites have been identified for City of Boulder Open Space and Mountain Parks. Most sites were expanded from existing sites based on information gathered during the course of this survey. Four of the five sites in this report are designated as globally significant, based on the location of a globally imperiled butterfly or skipper, or because of inclusion of other globally significant elements already documented in these areas. Briefly,

these five sites are the North Boulder Grasslands site, the Boulder Foothills site, the Shanahan Grasslands site, the Marshall Mesa site, and the Doudy Draw site.

RECOMMENDATIONS

- The Colorado Natural Heritage Program recommends that City of Boulder Open Space and City of Boulder Mountain Parks design a management and conservation plan to include the targeted butterflies and skippers documented in this survey. In particular, careful attention should be given to the tallgrass strip of prairie along the foothills north of Boulder (North Boulder Grassland Conservation site). This strip of habitat is potentially contiguous from just south of Lyons to the north end of Boulder, and this remnant is a wonderful example of tallgrass prairie in the state of Colorado. Consideration should be given to easements, acquisitions, and alliances to ensure that further fragmentation of this special habitat does not occur.
- Management should focus primarily on conservation sites with occurrences actually documented within this inventory. Compromising over site management, and accepting second- or third-best solutions jeopardizes the future of rare specialists, which are the most exacting in their requirements and the most sensitive to habitat change. Sedentary species, especially, need continuous habitat. Without this continuous habitat, the individuals or populations are reluctant to cross or unable to recognize areas of unsuitable habitat, for example, a four-lane highway, or a patch of disturbed habitat containing weeds. Additionally, species with low mobility cannot exist for extended periods of time during successive years in unsuitable or degrading habitat (Oates *in* Pullin 1995). By using butterflies as targets and tools for conservation management, many other coexisting and codependent organisms, such as their food plants, hostplants, and natural enemies, may also be effectively safeguarded (New et al. 1995).
- A secondary priority should be given to those areas demonstrating excellent potential for further occurrences of butterfly and skipper species of conservation concern.
- Increase public awareness of the ecological significance of butterflies and skippers. This would not be limited to their aesthetic values, but would incorporate their importance as environmental indicators, and would demonstrate the success of implemented management plans.
- Further inventories, research, and monitoring are necessary to acquire a more thorough understanding of butterfly habits and habitats. Continue to monitor, document, and verify both known and predicted localities for targeted species of butterflies and skippers. With continued management, especially in areas that are experimentally managed for burns and clearing, positive or negative occurrences should be reported. Simple non-intrusive monitoring techniques described by Pollard and Yates (1993) have been widely employed in Great Britain and are gaining favor in the United States (Opler 1994). These monitoring techniques should be modified to monitor areas away from trails in the more undisturbed areas. This would insure more accurate monitoring of rare specialists not normally encountered on a trail situation (Ellingson pers. comm.).

- Combine efforts with interested allies including Boulder County Nature Association, U.S. Forest Service, Boulder County Open Space, The Nature Conservancy, and private landowners to design and effect a practical strategic plan aimed for the long-term survival of the targeted butterflies and skippers and their habitats.

INTRODUCTION

Butterfly and Skipper Diversity of the Colorado Front Range

The Colorado Front Range and its eastern foothills are well-known for their biological diversity (Opler 1994, Whitney 1983, Armstrong 1972). The convergence of the Rocky Mountains' interface with the Great Plains provides an unusual variety of environmental conditions, supporting moist and arid zones, mountain and plain habitats, forest and grassland communities. This provides for a heterogeneous group of organisms representing the biogeographic elements of northern arctic and boreal biomes, Rocky Mountains, southwestern deserts, and grassland of the Great Plains.

Butterfly and skipper species are particularly numerous on the Front Range of Colorado. Approximately 176 of 750 North American (north of Mexico) species of butterflies and skippers are resident or regular colonists on the Colorado Front Range, making it the fourth richest butterfly region in the United States (Opler 1994, Opler and Krizek 1984). At the highest elevations, butterflies and skippers of arctic affinities occur at their southern limits. Species typical of the Rocky Mountain boreal forests are found at middle elevations and reach their eastern limits here. The lowest elevations of the foothills and adjacent plains support Great Plains species at the western limits of their range, and those of the southwestern mountains and deserts occur near their northern limits. The highest species richness in butterflies occurs in the low foothills and foothill canyons (Opler 1994), an area rich in other taxa as well (Weber 1995, Jones 1987, Armstrong 1972).

While the high diversity of species of this area is largely due to the mixing of these distinctive flora and faunas, several taxa are endemic to the Front Range foothills and adjacent plains (Opler 1994, Armstrong 1972). Such regional endemics are considered by the CNHP as high priorities for conservation efforts, and have importance on an evolutionary scale as well. Among butterflies, the Hops blue (*Celastrina* undescribed species 1) and Schryver's elfin (*Callophrys mossii schryveri*) are two such examples.

Also of high conservation priority are species of the eastern Great Plains occurring in disjunct populations along the Colorado Front Range. Such species include the Ottoe skipper (*Hesperia ottoe*), the Arogos skipper (*Atrytone arogos*), the Dusted skipper (*Atrytonopsis hianna*), the Crossline skipper (*Polites origenes*), and the Two-spotted skipper (*Euphyes bimacula*). Such disjunct populations are often of conservation significance (Lesica and Allendorf 1995) because genetic diversity and adaptation of the species can be greatly affected by habitat fragmentation. The results of preserving genetic diversity and intact habitat can protect species from local catastrophic events. Furthermore, many of these species are associated with xeric or mesic tallgrass prairies (*Andropogon gerardii-Schizachyrium scoparium* or *Andropogon gerardii-Sorghastrum nutans*), displaying a similar disjunct distribution and are potentially threatened by increasing land conversion. High rates of habitat destruction throughout the Great Plains region may increase the importance of these disjunct populations. The Ottoe skipper is vulnerable throughout its range (G3), as is the Arogos skipper (G3G4), thus increasing the conservation importance of Colorado populations (see pages 15 through 20 for global, state, and biodiversity ranking definitions).

Other eastern species reaching the western limit of their distribution here are endemic to the western Great Plains shortgrass habitats. Species of conservation concern due to their local

rarity or sensitivity to disturbance include the Rhesus skipper (*Polites rhesus*) (G4S2S3) and the Colorado blue (*Euphilotes rita coloradensis*) (G4T2T3S2).

Still, other species of the Front Range are distinctly characteristic of the Southern Rocky Mountains. While many of these still find ample undisturbed habitat throughout the mountainous areas of Colorado, Snow's skipper (*Paratrytone snowi*) (G4S3) is of conservation concern and possible dependency on late-successional forest (Opler pers. comm).

Butterfly and skipper species whose ranges are centered in the deserts of southwest North America are also found on the Front Range. Of these, the Arrowhead skipper (*Stinga morrisoni*) (G4S3S4) and the Hilltop little skipper (*Amblyscirtes simius*) (G4S3) are of some conservation concern due to localized distributions and habitat preferences.

Purpose

The purpose of this study was to identify areas in special need of butterfly monitoring, as well as to provide baseline information regarding which species are found in City of Boulder Open Space and Mountain Parks. Knowing the locations of rare or imperiled butterfly species is the first step towards effective conservation of the species and their habitats.

To assist in such efforts, the Colorado Natural Heritage Program conducted a systematic inventory of City of Boulder Open Space and City of Boulder Mountain Parks properties for butterfly and skipper species of conservation concern. By combining detailed distributional information with available information regarding species' ecological requirements, useful protection and management recommendations have been made. The implementation of these recommendations would add considerably to the effective conservation of biological diversity on the Colorado Front Range, and have global implications for some species.

In addition to the value of protecting uncommon species, the presence and abundance of butterfly species can serve as an indicator of environmental change, and may be severely affected by various management activities (Pollard and Yates 1993). Simple non-intrusive monitoring techniques described by Pollard and Yates (1993) have been widely employed in Great Britain and are gaining favor in the United States (Opler 1994). Such monitoring recommendations were to be made, if warranted.

BACKGROUND

Colorado's Natural Heritage Program

To place this document in context, it is useful to understand the history and functions of the Colorado Natural Heritage Program (CNHP).

CNHP is the state's primary comprehensive biological diversity data center, gathering information and field observations to help develop statewide conservation priorities. After operating in Colorado for 14 years, the Program was relocated from the State Division of Parks and Outdoor Recreation to the University of Colorado Museum in 1992, and more recently to the College of Natural Resources at Colorado State University.

The multi-disciplinary team of scientists and information managers gathers comprehensive information on rare, threatened, and endangered species and significant natural communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system, the Biological Conservation Data System (BCD). Sources include published and unpublished literature, museum and herbaria labels, and field surveys conducted by knowledgeable naturalists, experts, agency personnel, and our own staff of botanists, ecologists, and zoologists. Information management staff carefully plot the data on 1:24,000 scale USGS maps and enter it into the BCD. The BCD can be accessed by many categories, including taxonomic group, global and state rarity rank, federal and state legal status, source, observation date, county, quadrangle map, watershed, management area, township, range, and section, precision, and conservation unit.

The CNHP is part of an international network of conservation data centers that use the Biological and Conservation Data System developed by The Nature Conservancy. The CNHP has effective relationships with several state and federal agencies, including the Colorado Natural Areas Program, Colorado Department of Natural Resources, the Colorado Division of Wildlife, the U.S. Environmental Protection Agency, and the U.S. Forest Service. Numerous local governments and private entities also work closely with CNHP. Use of the data by many different individuals and organizations, including Great Outdoors! Colorado, encourages a proactive approach to development and conservation thereby reducing the potential for conflict. Information collected by the Heritage Programs throughout the globe provides a means to protect species before the need for legal endangerment status arises.

Concentrating on site-specific data for each element of natural diversity allows us to evaluate the significance of each to the conservation of Colorado's, and indeed a global natural biological diversity. By using species rarity ranks and occurrence quality ratings, priorities can be established for the protection of the most sensitive or imperiled sites. An updated locational database and priority-setting system such as CNHP provides is an effective, proactive land-planning tool.

The Natural Heritage Network and Biodiversity

Colorado is well-known for its rich diversity of geography, wildlife, plants, and natural communities. However, like many other states, it is experiencing a loss of much of its flora and fauna. This decline in biodiversity is a global trend resulting from human population growth, land development, and subsequent habitat loss. Globally, the loss in species diversity has become so rapid and severe that Wilson (1988) has compared the phenomenon to the great natural catastrophes at the end of the Paleozoic and Mesozoic eras.

The need to address this loss in biodiversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country were not based upon preserving biodiversity; instead, they primarily focused on preserving game animals, striking scenery, and locally favorite open spaces. To address this absence of a methodical, scientifically-based approach to preserving biodiversity, Robert Jenkins, in association with The Nature Conservancy, developed the Natural Heritage Methodology in 1978.

Recognizing that rare and specialist species are more likely to become extinct than common and generalist species, the Natural Heritage Methodology ranks species according to their rarity or degree of imperilment. The ranking system is scientifically based upon the number of known locations of the species as well as its biology. By ranking the relative rarity or imperilment of a species, the quality of its populations, and the importance of associated conservation sites, the methodology can facilitate prioritizing conservation efforts so the most rare and imperiled species may be preserved first. As the scientific community began to realize that plant communities are as equally important as individual entities, this methodology has also been applied to ranking and preserving significant natural plant communities. By protecting and managing aggregate units, associated species that we do not track can be included and protected.

The Natural Heritage Methodology is utilized by Natural Heritage Programs throughout North, Central, and South America, forming an international database network. Natural Heritage Network data centers are located in each of the 50 U.S. states, five provinces of Canada, and 13 countries in Central and South America and the Caribbean. This network enables scientists to monitor the status of species from a state, national, and global perspective. It also enables conservationists and natural resource managers to make informed, objective decisions in prioritizing and focusing conservation efforts.

What is Biological Diversity?

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on Earth, from species such as viruses, bacteria, and protists, through multicellular kingdoms of fungi, plants, animals. At finer levels of organization, biological diversity includes the genetic variation within species, both among geographically separated populations and among individuals within single populations. On a wider scale, diversity includes variations in the biological communities in which species live, the ecosystems in which communities exist, and the interactions among these levels. All levels are necessary for the continued survival of species and natural communities, and all are important for the well-being of humans. It stands to reason that natural diversity should be of concern to everyone.

The biological diversity of an area can be described at four levels:

1. **Genetic Diversity.** The genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species is variable between populations of a species within its geographic range. Loss of a population results in a loss of genetic diversity for that species and a reduction of total biological diversity for the region. This unique genetic information cannot be reclaimed.
2. **Species Diversity.** The total number and abundance of plant and animal species and subspecies in an area.
3. **Community Diversity.** The variety of natural communities or ecosystems within that area. These communities may be diagnostic or even endemic to an area. It is within these ecosystems that all life dwells.
4. **Landscape Diversity.** The type, condition, pattern, and connectedness of natural communities. A landscape consisting of a mosaic of natural communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape may also contain several distinct ecosystems, such as a riparian corridor meandering through shortgrass prairie. Fragmentation of landscapes, loss of connections, and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region. Humans and the results of their activities are integral parts of most landscapes.

The conservation of natural diversity must include all levels of diversity: genetic, species, community, and landscape. Each level is dependent on the other levels and inextricably linked. In addition, and all too often omitted, humans are also linked to all levels of this hierarchy. We at the Colorado Natural Heritage Program believe that a healthy, natural environment and human environment go hand in hand, and that recognition of the most imperiled elements is an important step in comprehensive conservation planning.

The Natural Heritage Ranking System

Information is gathered by CNHP on Colorado's plants, animals, and natural communities. Each of these species and natural communities is considered an **element of natural diversity**, or simply an **element**. Each element is assigned a rank that indicates its relative degree of imperilment on a five-point scale (i.e., 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. This factor is weighted more heavily because an element found in one place is more imperiled than something found in twenty-one places. Other important factors are: size of the geographic range, number of individuals, trends in both population and distribution, identifiable threats, and number of already protected occurrences.

Element rarity ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the degree of imperilment of an element. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to imperiled (S1 - S3). Those with a ranking of S3S4 are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. Watchlisted species are noted in the lists by an asterisk (*) next to the species name. A complete description of each of the Natural Heritage ranks is provided on pages 15 through 20.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding, and resident species. As noted in Table 1, ranks followed by a "B", i.e., S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N", i.e., S4N, refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table 1. Definition of Colorado Natural Heritage Rarity Ranks

Global rarity ranks are based on the range-wide status of a species. State rarity ranks are based on the status of a species in an individual state. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character. **These ranks should not be interpreted as legal designations.**

G/S1 Critically imperiled globally/state because of rarity (five or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.

G/S2 Imperiled globally/state because of rarity (six to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.

G/S3 Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).

G/S4 Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.

G/S5 Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GX Presumed extinct.

G#? Indicates uncertainty about an assigned global rank.

G/SU Unable to assign rank due to lack of available information.

GQ Indicates uncertainty about taxonomic status.

G/SH Historically known, but not verified for an extended period, usually.

G#T# Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.

S#B Refers to the breeding season imperilment of elements that are not permanent residents.

S#N Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used

SZ Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.

SA Accidental in the state.

SR Reported to occur in the state, but unverified.

S? Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

Note: Where two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the element falls between the two numbers.

Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the time frame in which conservation protection must occur. In most cases, this rank refers to the need for a major change of protective status (e.g., agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to alleviate threats that are related to land ownership or designation. The following codes are used to indicate the rating best describing the urgency to **protect** the area:

- P1** Immediately threatened by severely destructive forces to occur within one year of rank date; protect now or never!
- P2** Threat expected within five years.
- P3** Definable threat but not in the next five years.
- P4** No threat known for foreseeable future.
- P5** Land protection complete or adequate reasons exists not to protect the site; do not act on this site.

A protection action involves increasing the current level of legal protection accorded one or more tracts at a potential conservation area. It may also include activities such as educational or public relations campaigns or collaborative planning efforts with public or private entities to minimize adverse impacts to element occurrences at a site. It does not include management actions, i.e., any action requiring stewardship intervention. Threats that may require a protection action are as follows:

1. Anthropogenic forces that threaten the existence of one or more element occurrences at a site; e.g., development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence and timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
2. The inability to undertake a management action in the absence of a protection action; e.g., obtaining a management agreement;
3. In extraordinary circumstances, a prospective change in ownership management that will make future protection actions more difficult.

Management Urgency Ranks

Management urgency ranks (M-ranks) indicate the time frame in which a change in management of the element or site must occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (e.g., increased fire frequency, decreased herbivory, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, rerouting trails, patrolling for collectors, hunters, or trespassers, etc.). Management action does not include legal,

political, or administrative measures taken to protect a potential conservation area. The following codes are used to indicate the action needed to be taken at the area:

- M1** Management action required immediately or element occurrences could be lost or irretrievably degraded within one year.
- M2** New management action will be needed within five years to prevent the loss of element occurrences.
- M3** New management action will be needed within five years to maintain current quality of element occurrences.
- M4** Although not currently threatened, management may be needed in the future to maintain the current quality of element occurrences.
- M5** No serious management needs known or anticipated at the site.

Element Occurrence Ranks

Actual location of elements, whether they be single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to its ecological quality whenever sufficient information is available. This ranking system is designed to indicate which occurrences are ecologically the healthiest and the most viable, thus focusing conservation efforts where they will be the most successful. The EO-Rank is based on four factors:

- 1. Quality.** The representativeness of the occurrence as compared to element occurrence (EO) specifications including maturity, size, and numbers. The element occurrence specifications are set by a consensus of experts regarding the element in question;
- 2. Condition.** How much has the site and EO been damaged or altered from its optimal condition and character;
- 3. Viability.** The long term prospects for continued existence of this occurrence;
- 4. Defensibility.** The extent to which the occurrence can be protected from extrinsic human factors that might otherwise degrade or destroy it.

Each of these factors are rated on a scale of A through D, with A representing an excellent grade and D representing a poor grade. These grades are then averaged to determine an appropriate EO-Rank for the occurrence. If there is insufficient information available to rank an element occurrence, an EO-Rank is not assigned. Possible EO-Ranks and their appropriate definitions are as follows:

- A** Large estimated population with ecological processes intact and evidence of long-term persistence and reproduction.
- B** Moderate estimated population with ecological processes intact, and evidence of reproduction or long-term persistence. Also, large estimated population with ecological processes degraded but restorable with some effort.

C Small estimated population with ecological processes intact, and evidence of long-term persistence or reproduction. Also, moderate estimated population size with ecosystem processes degraded but restorable, and large population size with ecosystem processes irreversibly altered or interrupted.

D Very small estimated population from apparently suitable habitat. Also, small estimated population with ecosystem processes degraded, or irreversibly altered.

Potential Conservation Sites

In order to successfully protect populations or occurrences, it is necessary to delineate potential conservation sites. These potential conservation sites focus on capturing the ecological processes that are necessary to support the continued existence of a particular element of natural heritage significance. Potential conservation sites may include a single occurrence of a rare element or a suite of rare elements or significant features.

The goal of the process is to identify a land area that can provide the habitat and ecological processes upon which a particular element or suite of elements depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses. The proposed boundary does not automatically exclude all activity. It is a hypothesis that some activities will prove degrading to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the potential conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

Potential Conservation Site Boundaries

Once the presence of rare or imperiled species or significant natural communities has been confirmed, the first step towards its protection is the delineation of a potential conservation site planning boundary. In general, the potential conservation site planning boundary is an estimate of the landscape that supports the rare elements as well as the ecological processes that allow them to persist. In developing such boundaries, CNHP staff considers a number of factors that include, but are not limited to:

- the extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the site and the surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater, e.g., by protecting recharge zones;
- land intended to protect the site against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

As the label "potential conservation site planning" indicates, the boundaries presented here are for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with protection goals for natural heritage resources and sensitive species. All land within the potential conservation site planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning at all levels.

Off-Site Considerations

Furthermore, it is often the case that all relevant ecological processes cannot be contained within a site of reasonable size. Taken to the extreme, the threat of ozone depletion could expand every site to include the whole globe. The boundaries illustrated in this report signify the immediate, and therefore most important, area in need of protection. Continued landscape level conservation efforts are needed. This will involve broad-county-wide or regional efforts as well as coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

Ranking of Conservation Sites

One of the strongest ways that the CNHP uses these element and element occurrence ranks is to assess the overall biodiversity significance of a site, including one or many element occurrences. Based on these ranks, each site is assigned a **biodiversity** (or B-) **rank**:

- B1** Outstanding Significance: only site known for an element or an excellent occurrence of a G1 species.
- B2** Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.
- B3** High Significance: excellent example of any community type, good occurrence of a G3 species, or a large concentration of good occurrences of state rare species.
- B4** Moderate or Regional Significance: good example of a community type, excellent or good occurrence of state-rare species.
- B5** General or Local Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

Legal Designations

Natural Heritage rarity ranks should not be interpreted as legal designations. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by either the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as "Sensitive," as does the Bureau of Land Management. Table 2 defines the special status assigned by these agencies and provides a key to the abbreviations used by CNHP.

Please note that the U.S. Fish and Wildlife Service has issued a Notice of Review in the February 28, 1996 Federal Register for plant and animal species that are "candidates" for listing as endangered or threatened under the Endangered Species Act. The revised candidate list replaces an old system that listed many more species under three categories: Category 1 (C1), Category 2 (C2), and Category 3 (including 3A, 3B, 3C). Beginning with the February 28, 1996 notice, the Service will recognize only those species that would have been included in the former Category 1 as candidates for listing. This includes those species for which the Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act.

Candidate species listed in the February 28, 1996 Federal Register are indicated with a "C". While obsolete legal status codes (Category 2 and 3) are no longer used, CNHP will continue to maintain them in its Biological and Conservation Data system for reference.

Table 2. Federal and State Agency Special Designations

1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)	
LE	Endangered; taxa formally listed as endangered.
E(S/A)	Endangered due to similarity of appearance with listed species.
LT	Threatened; taxa formally listed as threatened.
PE/PT	Proposed E or T; taxa formally proposed for listing as endangered or threatened.
C	Candidate: taxa for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.
2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as "S")	
FS	Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by:
a.	Significant current or predicted downward trends in population numbers or density.
b.	Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")	
BLM	Sensitive: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state.
4. State Status (Colorado Division of Wildlife):	
E	Endangered
T	Threatened
SC	Special Concern

METHODS

The study followed a general method that the Colorado Natural Heritage Program has successfully employed in rare or imperiled species inventories.

Existing information collection. Existing information from all major local butterfly collections (Henderson Museum at University of Colorado Boulder, Gillette Museum at Colorado State University, Denver Museum of Natural History) has been integrated into the BCD. Additional information was attained from the Ray E. Stanford personal collection. Extensive habitat information regarding the study area was provided by City of Boulder Open Space and Mountain Parks personnel. Also, much of the information regarding the habits and habitats of the butterflies and skippers was provided *via* personal communication with lepidopterists Ray E. Stanford and Charles Slater.

Identify potentially occurring species. Using known county records (Stanford and Opler 1993) previously input in the BCD, a list of rare or imperiled butterfly species known to occur in Boulder County was compiled (see Table 3). Based on elevational range, the list was limited to those potentially occurring on the City of Boulder's Open Space and Mountain Parks. Other potential county records from a list provided by Ray Stanford were identified from records in adjacent counties. These potential species were identified by using habitat data common to both Boulder and the adjacent counties.

Table 3. Butterfly and Skipper Species of Concern (in order of Global Rank)

Element	Common name	Global Rank	State Rank	Federal Sens.	Federal Status	State Status
<i>Celastrina</i> sp. 1	Hop-feeding azure	G2Q	S2			
<i>Speyeria idalia</i>	Regal fritillary	G3	S1	FS	C	
<i>Hesperia ottoe</i>	Ottoe skipper	G3?	S2			
<i>Atrytone arogos</i>	Arogos skipper	G3G4	S2			
<i>Euphyes bimacula</i>	Two-spotted skipper	G4	S2			
<i>Erynnis martialis</i>	Mottled dusky wing	G4	S2S3			
<i>Polites rhesus</i>	Rhesus skipper	G4	S2S3			
<i>Amblyscirtes simius</i>	Simius roadside skipper	G4	S3			
<i>Paratrytone snowi</i>	Snow's skipper	G4	S3			
<i>Stinga morrisoni</i> *	Morrison's skipper	G4	S3S4			
<i>Atrytonopsis hianna</i>	Dusted skipper	G4G5	S2			
<i>Euphilotes rita coloradensis</i>	Colorado blue	G4T2T3	S2			
<i>Callophrys mossii schryveri</i>	Schryver's elfin	G4T3	S2S3			
<i>Polites origenes</i>	Crossline skipper	G5	S3			

* = Watchlisted species

Select and prioritize Targeted Inventory Areas. Targeted Inventory Areas (TIAs) were selected by identifying suitable habitats for the targeted species. The survey areas were prioritized by the targeted butterfly's time of emergence, CNHP ranking, and by habitat condition. Use of aerial photographs and vegetation maps provided by City of Boulder Open Space and Mountain Parks proved particularly useful. The knowledge of Open Space and Mountain Parks staff was significant in targeting areas with high habitat potential. The inclusion of historical records provided information for potential updates as well.

Table 4. Targeted Inventory Areas and Related Targeted Butterfly or Skipper Species (please refer to map in back cover of this document)

Targeted Inventory Area (TIA)	TIA #	Targeted Species
South Boulder Tallgrass	1	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Fancher	2	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Goodhue Ditch	3	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Rolling Rock Ranch	4	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
East Doudy Draw	5	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
East Spring Brook	6	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
West Varra	7	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Doudy Draw Mesas	8	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Erynnis martialis</i>
Beech Shortgrass	9	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Boulderland Shortgrass	10	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Left Hand Valley Reservoir	11	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Boulder Valley Shortgrass	12	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Foothills Trail	13	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Euphyes bimacula</i>
Dry Creek	14	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Beech Hogback	15	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Stinga morrisoni</i>
Fourmile Hogback	16	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Stinga morrisoni</i>
Red Rocks	17	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> ,
Boulder Valley Wetlands	18	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Boulder Valley Scarp	19	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Wonderland Hogback	20	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Chautauqua Meadows	21	<i>Speyeria idalia</i> , <i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Gregory Canyon	22	<i>Celastrina</i> sp. 1, <i>Callophrys mossii schryveri</i> , <i>Paratrytone snowi</i>
Bear Canyon	23	<i>Celastrina</i> sp. 1, <i>Callophrys mossii schryveri</i> ,

Targeted Inventory Area (TIA)	TIA #	Targeted Species
		<i>Paratrytone snowi</i>
East Devil's Thumb	24	<i>Paratrytone snowi</i>
Fern Canyon	25	<i>Paratrytone snowi</i>
Shadow Canyon	26	<i>Callophrys mossii schryveri, Paratrytone snowi</i>
Skunk Canyon	27	<i>Celastrina sp. 1, Callophrys mossii schryveri, Paratrytone snowi</i>
Bluebell Canyon (includes Coyote Canyon)	28	<i>Celastrina sp. 1, Callophrys mossii schryveri, Paratrytone snowi</i>
West Marshall	29	<i>Hesperia ottoe, Atrytone arogos, Polites origenes, Atrytonopsis hianna,</i>
South Marshall	30	<i>Hesperia ottoe, Atrytone arogos, Polites origenes, Atrytonopsis hianna,</i>
Big Bluestem Trail	31	<i>Speyeria idalia, Hesperia ottoe, Atrytone arogos, Polites origenes, Atrytonopsis hianna,</i>
Doudy Draw	32	<i>Hesperia ottoe, Atrytone arogos, Polites origenes, Atrytonopsis hianna,</i>
Spring Brook	33	<i>Celastrina sp. 1</i>
Boulder Creek	34	<i>Celastrina sp. 1, Callophrys mossii schryveri, Paratrytone snowi, Stinga morrisoni</i>
Mount Sanitas	35	<i>Atrytone arogos, Atrytonopsis hianna, Erynnis martialis, Stinga morrisoni</i>
Operations Center	36	<i>Speyeria idalia, Euphyes bimacula</i>
Tram Hill/Lost Gulch	37	<i>Paratrytone snowi, Callophrys mossii schryveri, Stinga morrisoni</i>
Campbell Cliffs	38	<i>Celastrina sp. 1</i>
South Boulder Creek	39	<i>Celastrina sp. 1,</i>
Halfway House	40	<i>Paratrytone snowi, Atrytonopsis hianna</i>
Sunshine Canyon	41	<i>Atrytone arogos, Atrytonopsis hianna, Stinga morrisoni,</i>
Mesa Trail (west of NCAR)	42	<i>Atrytone arogos, Atrytonopsis hianna, Stinga morrisoni</i>
Greenbear	43	<i>Paratrytone snowi</i>
Tenderfoot Trail	44	<i>Erynnis martialis, Callophrys mossii schryveri, Paratrytone snow, Stinga morrisoni</i>

Field surveys. Field surveys took place during times concordant with the species' flight periods. Most surveys took place in late June through July, but some early (late-April, May) and late (August) surveys were included. Trained personnel conducted the surveys, and collection was limited to voucher specimens of targeted species and to those species difficult to distinguish in the field. The relative "quality" of rare or imperiled butterflies and skippers was estimated (= element occurrence rank), and a brief assessment of relevant ecological processes, threats, and management concerns was noted during the surveys.

Delineation of potential conservation site planning boundaries. The potential conservation sites are delineated by a **potential conservation site planning boundary**. In developing these boundaries, a number of factors was considered including: habitat for rare butterfly and skipper species, protection of water quality, protection from potentially detrimental land uses, and maintenance of ecological processes necessary for perpetuation of significant elements in the area.

RESULTS

A total of 44 Targeted Inventory Areas (TIAs) was outlined for this survey in 1996. During 1996 and 1997, 42 of these were actually surveyed (95.5%). Success of locating butterfly or skipper species of conservation concern occurred in 12 (28.5%) of the TIAs surveyed. More than one species of concern was located within seven of the areas surveyed. Colorado Natural Heritage Program field zoologists documented 10 of the 14 targeted rare or imperiled butterfly or skipper species on City of Boulder Open Space and Mountain Parks through this inventory.

This section includes:

- A table summarizing the Potential Conservation Sites and attached butterfly and skipper species of concern;
- A profile of each Potential Conservation Site, including site description, location, and protection and management considerations;
- A map of the site with the boundaries delineated on a 7.5 minute quadrangle, with the significant butterfly species indicated;
- A photograph of the site;
- A table summarizing the search results for butterfly species of significance; and
- A table providing a summary of search results for the Targeted Inventory Areas outlined for this survey.

Potential Conservation Sites

The following pages outline the Potential Conservation Sites designated by the CNHP as they relate to the butterfly and skipper species documented during this survey. The delineation of a potential conservation planning boundary in this report does not confer any regulatory protection on recommended areas. These boundaries are intended to guide planning and making decisions for the conservation of these significant areas.

All sites delineated in this report contain other rare and imperiled taxa which are also of conservation concern. This adds levels of complexity to management plans, and all of these elements should be considered in the design of such management plans. It also further indicates that the City of Boulder Open Space and City of Boulder Mountain Parks properties are of very high conservation significance.

This report emphasizes protection and management needs for the butterfly and skipper species of concern. While other taxa may benefit from such actions, specific needs of the other taxa are not addressed here. Information regarding the other occurrences listed here, as well as protection of many of these elements is available at the Colorado Natural Heritage Program.

Five sites have been outlined based on results from the 1996 and 1997 field seasons. These include: the North Boulder Grasslands site, the Boulder Foothills site, the Shanahan Grasslands site, the Marshall Mesa site, and the Doudy Draw site.

After the 1997 season, there were a number of changes in these sites. This included the merging of two smaller, adjacent, previously designated sites into the Boulder

Foothills site, originally including the site name Green Mountain Boulder (Pineda 1997). Additionally, the boundaries for the Shanahan Grasslands site were re-evaluated and re-drawn with respect to new information made available in 1997, as were those of the North Boulder Grasslands. All sites within this report underwent Biodiversity Rank re-evaluation as a result of newly incorporated information.

Table 5 below is intended to summarize the Potential Conservation Sites outlined in this report, and their attached butterfly and skipper species of significance.

For complete Potential Conservation Site Information, please refer to page 26. For Global and State Rankings for each of the species of concern, please see Table 3, page 22. For Biodiversity Ranks, Protection Ranks, and Management Ranks, please see pages 15 through 20. For species information, please see the Species Characterization Abstracts for each of these species beginning on page 69

Table 5. Potential Conservation Sites

Potential Conservation Site	Biodiversity Rank	Protection Rank	Management Rank	Butterfly Species of Concern
North Boulder Grasslands	B2	P3	M2	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Euphyes bimacula</i>
Boulder Foothills	B3	P2	M2	<i>Celastrina</i> sp. 1, <i>Atrytone arogos</i> , <i>Stinga morrisoni</i> , <i>Erynnis martialis</i> , <i>Paratrytone snowi</i> , <i>Callophrys mossii schryveri</i>
Shanahan Grasslands	B3	P4	M3	<i>Speyeria idalia</i> , <i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i>
Marshall Mesa	B3	P4	M3	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Erynnis martialis</i>
Doudy Draw	B3	P4	M2	<i>Erynnis martialis</i>

Potential Conservation Site Format

Each potential conservation site is described in a standard site report reflecting data fields in CNHP's Biological and Conservation Data System (BCD). The sections of this report and the contents are outlined and explained below.

Biodiversity Rank (B-rank): The overall significance of the site in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. Please see page 20 for the definitions of the ranks.

Protection Urgency Rank (P-rank): An estimate of the time frame in which conservation protection must occur. This rank generally refers to the need for a major change of protective status (e.g., ownership or designation as a natural area). Please see page 17 for the definitions of the ranks.

Management Urgency Rank (M-rank): An estimate of the time frame in which conservation management must occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (legal, political, or administrative measures). See page 17 for the definitions of the ranks.

Location: General location and specific road/trail directions.

Legal Description: USGS 7.5 minute quadrangle name and Township, Range, and Section(s).

General Description: A brief narrative of the topography, vegetation, and current use of the potential conservation site. Common names are used along with scientific names.

Biodiversity Rank Justification: A synopsis of the significant elements occurring in the site. A table within the site profile lists the element occurrences found within the site (in order of Global Rank), their rarity ranks, the occurrence ranks and federal and state agency special designations. The species or community that is the primary element of concern is flagged within the table. See Table 1 on page 16 for explanations of ranks and Table 2 on page 21 for legal designations.

Boundary Justification: Justification for the location of the potential conservation site planning boundary delineated in this report, including all known occurrences of natural heritage resources and, in some cases, adjacent lands required for their protection.

Protection Rank Justification: A summary of major land ownership issues that may affect the site and the element(s) within the site.

Management Rank Justification: A summary of site management issues that may affect the long-term viability of the site.

North Boulder Grasslands

Biodiversity Rank: B2 (Very high significance)

The North Boulder Grasslands site contains an excellent occurrence of the globally rare plant species, Bell's twinpod (*Physaria bellii*). Four species of state-rare skippers are also found at this site.

Protection Urgency Rank: P3 (Definable threat, but not in the next five years)

The majority of this site is owned and managed by the City of Boulder Open Space and Boulder County Open Space. There are private inholdings within and adjacent to this site. Purchase by open space entities or conservation easements are recommended for these privately-owned properties.

Management Urgency Rank: M2 (Action needed within five years to prevent loss of element occurrences)

The wetland area included within this site is heavily invaded by exotics. Noxious weed invasion (e.g., for knapweed (*Centaurea* spp.) should be closely monitored and managed. The grasslands should be monitored and managed closely for noxious weed invasion and increased tree density. Discourage building of additional trails. Enforce use of leashes on pets, where leash requirements are posted.

Location: This site is located just north of Boulder along Highway 36, and includes Foothills Open Space and Beech Open Space.

Legal Description: USGS 7.5 minute quadrangle: Boulder; T1N R70W Section 6, 7; T1N R71W, S1, 12; T2N R70W S19, 30, 31; T2N R71W, S24,25, 36.

General Description: Elevation: 1633 to 1890 m (5360 to 6475 feet). The site is a heavily recreated area, used by hikers, joggers, cyclists, horseback riders, and parasailers. (**Grasslands**) The western portion of this site is defined by steep reddish-brown stony loam ridges with shrubby slopes and scattered ponderosa pine (*Pinus ponderosa*) on the ridge tops. Downhill to the east, the site is characterized by rolling hills and swales of shale/limestone substrate with tallgrass prairie graminoids, chiefly big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), western wheatgrass (*Agropyron smithii*), needle and thread grass (*Stipa comata*), New Mexican feather grass (*Stipa neomexicana*), and Indian rice grass (*Oryzopsis hymenoides*). Hillsides are dominated by shrubby stands of mountain mahogany (*Cercocarpus montanus*) and skunkbrush (*Rhus trilobata*). The site contains numerous small eastward-flowing drainages. Some of the more vegetated drainages contain plains cottonwood (*Populus deltoides*), plum (*Prunus* spp.), willow (*Salix* spp.), hackberry (*Celtis occidentalis*), hawthorn (*Crataegus*), with an understory of sedges and rushes (*Carex* spp. and *Juncus* spp.). Little bluestem (*S. scoparium*) becomes more abundant eastward as the habitat becomes more arid and finally graduates into mostly shortgrass prairie where blue grama (*Bouteloua gracilis*) dominates, along with side-oats grama (*Bouteloua curtipendula*), buffalo grass (*Buchloë dactyloides*), and three-awn (*Aristida* spp.).

(Wetland) The wetland area is defined by a calcareous, strongly alkaline substrate with slow permeability. There are a few shallow ditches appearing to drain into the immediately adjacent reservoir. The meadow is flat, soggy, and contains many sedges and rushes (*Carex* spp., *Juncus* spp.), and other wet meadow graminoids. There is an abundance of showy milkweed (*Asclepias speciosa*) and swamp milkweed (*Asclepias incarnata*). The meadow is heavily invaded by Canada thistle (*Cirsium arvense*), and common teasel (*Dipsacus sylvestris*). Additionally, Russian olive (*Elaeagnus angustifolia*) is becoming established.

Biodiversity Rank Justification: Contains an excellent occurrence of a globally imperiled plant species, *Physaria bellii* (Bell’s twinpod). This plant species is a Colorado endemic, and is restricted to limestones and limey shales of the Niobrara and Pierre formations. Currently, their about approximately 26 occurrences in Colorado.

Table 6. Butterfly and Skippers of Concern at the North Boulder Grasslands Site

Element	Common name	Global Rank	State Rank	Federal Sens.	Federal Status	State Status	*EO Rank
<i>Hesperia ottoe</i>	Ottoe skipper	G3?	S2				B
<i>Atrytone arogos</i>	Arogos skipper	G3G4	S2				B
<i>Euphyes bimacula</i>	Two-spotted skipper	G4	S2				B/C
<i>Polites origenes</i>	Crossline skipper	G5	S3				B

*EO = Element Occurrence

Table 7. Other Natural Heritage Elements at the North Boulder Grasslands Site

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Physaria bellii</i> †	Bell’s twinpod	G2	S2				A
<i>Stipa neomexicana</i>	Great Plains mixed grass prairies	G3	S2				B
<i>Gaura neomexicana</i> ssp. <i>coloradensis</i>	Colorado butterfly weed	G4T2	S1	C	FS		H
<i>Viola pedatifida</i>	Prairie violet	G5	S2				No assigned rank

*EO = Element Occurrence

† = Basis for Biodiversity Rank (B-rank)

Boundary Justification: To manage for rare plant occurrences, the roads and the exposed limestone soils are included. The Bell’s twinpod, in particular, has an affinity for this soil type, and the boundary is meant to include management for weedy invasions from the roadside onto this soil type. For invertebrate occurrences, contiguous grasslands in between actual documented occurrences is included. This is to provide as much intact prairie as possible

so that genetic exchange may continue for these occurrences, and to minimize habitat fragmentation. The boundary drawn at the western ridgetops is meant to manage for weeds and trail disturbance occurring near these ridgetops. Negative impacts occurring near the top of this outlined watershed could negatively impact grassland quality further downhill.

Protection Rank Justification: The majority of this site is designated open space, and therefore land protection is complete on open space areas. The southern private inholding appears to have good management, as the area appears to be in fairly good condition; however, it is unknown at this time what future plans have been designated for this piece of property. Additionally, on the northern part of the site, there is another inholding with a warehouse, and again, it is unknown what land practices are planned for that piece of property. Clearly, some widening of the property road has taken place during the time this survey was carried out.

Management Rank Justification: Wetland area is heavily invaded by Canada thistle (*Cirsium arvense*) and common teasel (*Dipsacus sylvestris*). Although the thistle is used profusely by nectaring insects, it appears to be outcompeting much of the native vegetation, especially Nebraska sedge (*Carex nebrascensis*), a hostplant for the two-spotted skipper (*Euphyes bimacula*).

The grasslands should be monitored and managed closely for noxious weed invasions, especially knapweed (*Centaurea* spp). Caution should be used in the application of broadleaf herbicides so damage to nectaring sources is minimized. If leash requirements are posted, then the use of leashes on pets should be enforced (posted leash requirements are often ignored). Unrestrained pets contribute to the spread of exotic flora *via* seed dispersal, and additionally disturb wildlife inhabiting these areas. Discourage building of additional trails to prevent further fragmentation of habitat and to control the spread of invasive weeds. If trails are added, they should be placed to minimize erosion occurring through precipitation runoff and through pedestrian and bike-traffic. On the north end of the site, there is a horse ranch appearing to be grazed rather extensively and is invaded by many noxious exotics and native increasers, additionally fragmenting the prairie and negatively affecting the natural quality of the site.

The skippers at this site require intact and open grasslands. Should the ponderosa pine continue to increase, the grassland quality will decline. It may become necessary to manually thin the trees or use prescribed burns. Caution should be exercised with prescribed fire management. Because of fragmentation of the habitat, frequent burning or burning patches that are too large may inhibit or prevent recolonization of butterflies and skippers inhabiting the area. Many of these invertebrate species have sedentary populations, precluding colonization from adjacent areas if the current inhabiting population is damaged or destroyed by fire.

Figure 1. North Boulder Grasslands site indicating its butterfly occurrences.

Figure 2. Foothills Trail within the North Boulder Grasslands site.
Photo by Phyllis M. Pineda

Figure 3. Beech Open Space within the North Boulder Grasslands site.
Photo by Phyllis M. Pineda

Boulder Foothills

Biodiversity Rank: B3 (High significance)

The Boulder Foothills site contains a good occurrence of the globally rare montane grassland community, Parry's oatgrass (*Danthonia parryi*). Additionally, it contains six state rare butterflies, and ten state rare plants, nesting peregrine falcons, and a healthy riparian area.

Protection Urgency Rank: P2 (Threat expected within five years)

This site has multiple owners and management: City of Boulder Mountain Parks, City of Boulder Open Space, U.S. Forest Service, and several privately owned tracts. Privately owned tracts are believed to be held as 35-acre or 5-acre tracts, actively fragmenting the site.

Management Urgency Rank: M2 (Management action needed within five years to prevent the loss of element occurrences)

Management is recommended for the increasing tree density due to past fire suppression. Also, the native understory graminoids and forbs are at risk due to increased and sometimes accelerated invasion of weedy and exotic forbs. Adjacent housing developments may affect Open Space management plans.

Location: This site may be accessed *via* Flagstaff Mountain Road West of Boulder, Highway 119 west of Boulder, and Eldorado Canyon Road southwest of Boulder. In general, it is the area including the Boulder Flatirons and the associated mountain parks to the west of the Flatirons.

Legal Description: USGS 7.5 minute quadrangles Eldorado Springs and Tungsten: T1S R71W, Sections 1 through 16, 21 through 28; Boulder: T1N R70W, Sections 34, 35, 36.

General Description: Elevation: 1697 to 2255m (5570 to 7400 feet). The Boulder Foothills site is characterized by soils which are mainly stony sandy loam, gravely sandy loam, colluvial outwash and rock outcrop, with red sandstone substrates at lower end, and crumbly granitic soils at the upper end. Canyons within this site are characterized by bedrock and boulder-strewn streambeds, with dense, shady riparian growth on canyon bottoms. Vegetation in the canyon riparian zone and adjacent slopes includes: narrow-leaf cottonwood (*Populus angustifolia*), quaking aspen (*Populus tremuloides*), willows (*Salix* spp.), plum (*Prunus* spp.), with an understory of shade-tolerant forbs, ferns and mosses. North-facing adjacent slopes contain shady ponderosa pine-Douglas fir forest (*Pinus ponderosa-Pseudotsuga menziesii*). South-facing slopes are characterized by scattered, open ponderosa pine savanna with shrubby patches of skunkbrush (*Rhus trilobata*), currant (*Ribes* spp.), buckbrush (*Ceanothus fendleri*), and rarely mountain mahogany (*Cercocarpus montanus*), accompanied by a graminoid understory of big bluestem (*Andropogon gerardii*), western wheatgrass (*Agropyron smithii*), and blue grama (*Bouteloua gracilis*).

Biodiversity Rank Justification: The Boulder Foothills site contains a good occurrence of a globally rare montane grassland community (*Danthonia parryi*). These grasslands are characterized by their growth on dry hillsides in the montane and subalpine zones. There are

approximately 18 occurrences of this grassland type reported for Colorado, with some occurring in the Boulder area.

Table 8. Butterflies and Skippers of Concern at the Boulder Foothills Site

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Celastrina</i> sp. 1	Hop-feeding azure	G2Q	S2				B
<i>Atrytone arogos</i>	Arogos skipper	G3G4	S2				H
<i>Stinga morrisoni</i> †	Morrison's skipper	G3G4	S3S4				B
<i>Erynnis martialis</i>	Mottled duskywing	G4	S2S3				B
<i>Paratrytone snowi</i>	Snow's skipper	G4	S3				B
<i>Callophrys mossii schryveri</i>	Schryver's elfin	G4T3	S2S3				B

*EO = Element Occurrence

† = Watchlisted species

Table 9. Other Natural Heritage Elements at the Boulder Foothills Site

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Danthonia parryi</i> †	Montane grasslands	G2?	S2?				B
<i>Betula occidentalis/ Mesic forb</i>	Foothills riparian shrubland	G3	S2				B
<i>Carex torreyi</i>	Torrey sedge	G4	S1				No assigned rank
<i>Malaxis brachypoda</i>	White adder's mouth	G4	S1				No assigned rank
<i>Pseudotsuga menziesii/ Betula occidentalis</i>	Montane riparian forest	G4	S3				B
<i>Pyrola picta</i>	Pictureleaf wintergreen	G4G5	S3				No assigned rank

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Plecotus townsendii pallescens</i>	Pale lump-nosed bat	G4T4	S2				No assigned rank
<i>Falco peregrinus anatum</i>	American peregrine falcon	G4T4	S2B, SZN		LE	T	B
<i>Betula papyrifera</i>	Paper birch	G5	S1				No assigned rank
<i>Carex saximontana</i>	Rocky Mountain sedge	G5	S1				No assigned rank
<i>Cretaegus chrysoarpa</i>	Yellow hawthorn	G5	S1S2				No assigned rank
<i>Listera convallarioides</i>	Broad-leafed twayblade	G5	S2				A
<i>Sorex merriami</i>	Merriam's shrew	G5	S3				H
<i>Lilium philadelphicum</i>	Wood lily	G5	S3				B

*EO = Element Occurrence

† = Basis for Biodiversity Rank (B-rank)

Boundary Rank Justification: The site includes all known occurrences in the vicinity of Green Mountain and its slopes, the Flatirons, the South Boulder Peak area, Bear Canyon, a portion of the South Boulder Creek watershed below Gross Reservoir, west to include the Keystone Gulch watershed, and east to the foothills bordering the city of Boulder. This boundary is drawn to provide management for weedy floral invasions, trail management, roadside management, and urban development occurring near Walker Ranch. It is drawn with the idea that management plans will include broad-scale and macro-management in place of patch or micro-management. It is meant to encourage active planning in cooperation with other entities, such as the U.S. Forest Service, and private land owners.

Protection Rank Justification: This site is has multiple owners and management: City of Boulder Mountain Parks, City of Boulder Open Space, U.S. Forest Service, and several privately owned tracts. Not all privately owned tracts are visibly developed; it is unknown when and how these tracts will be developed. Development of such tracts further fragments this area and will decrease the overall natural quality of the site.

Because of developmental pressure on the boundaries of the Open Space areas, there is concern that private property ownership may influence the open space management practices.

Management Rank Justification: The upper portion of Bear Canyon has an erosion problem directly evident on the trail. This erosion is channeling water away from its natural drainage pattern, but is unclear how this affects the viability of the plant life. Not only has it damaged the trail (forcing off-trail access), but also contributes to the spread of exotics by

washing seeds and other plant litter from the trail, into Bear Creek, carrying these further downstream. This concern is repeated on the northern aspect of Tenderfoot Trail (Chapman Fire Road), although to a lesser extent.

Should the ponderosa pine continue to increase, the grassland quality will decline. It may become necessary to manually thin trees or use prescribed burns. Smooth brome, formerly introduced into livestock-grazed areas of the site, exhibits a threat to the native grass occurrences, especially in cool wet years (e.g., to big bluestem). This decrease in the native graminoid cover affects butterfly and skipper specialists whose larval stages depend on native grasses to complete their life cycles.

Caution should be exercised with prescribed fire management. Because of fragmentation of the habitat, frequent burning or burning patches that are too large may inhibit or prevent recolonization of butterflies and skippers inhabiting the area. Many of these invertebrate species have sedentary populations, precluding colonization from adjacent areas if the current inhabiting population is damaged or destroyed by fire.

Concern for the private inholding manifests itself in several ways. Primarily, private land tracts further fragment a landscape, decreasing the natural quality of the area. Landowners may introduce flora which could escape and become an additional management concern in the effort to control noxious exotic flora. Introduction of domestic pets will increase disturbance among the wildlife already inhabiting the area, especially bird and rodent populations. Presence of humans in the area may inhibit the use of fire management due to the risk it imposes to human life, and because burned areas are not aesthetically pleasing to homeowners inhabiting the area.

Figure 4. Boulder Foothills site indicating its butterfly occurrences.

Figure 5. Tenderfoot Trail within the Boulder Foothills site.
Photo by Phyllis M. Pineda

Figure 6. Bear Canyon within the Boulder Foothills site.
Photo by Phyllis M. Pineda

Shanahan Grasslands

Biodiversity Rank: B3 (High significance)

The Shanahan Grasslands site contains a good occurrence of a globally rare wet prairie community (*Andropogon gerardii-Sorghastrum nutans*), in addition to a state rare violet (*Viola pedatifida*) two globally rare, and two state rare skippers and butterflies.

Protection Urgency Rank: P4 (No threat known for foreseeable future)

This site is owned and managed by City of Boulder Open Space.

Management Urgency Rank: M3 (Management action needed within five years)

Management is recommended for the increased tree density due to past fire suppression. Also, the native graminoids and forbs are at risk due to increased and sometimes accelerated invasion of weedy and exotic forbs. Adjacent housing developments may affect open space management plans.

Location: Located southwest of Boulder between NCAR and Eldorado Springs Road, along South Boulder Creek, near Shanahan Ridge.

Legal Description: USGS 7.5 minute quadrangle Eldorado Springs: T1S R70W, Sections 17 through 20.

General Description: Elevation: 1706 to 1830m (5600 to 6000 feet). Currently, the area is managed through livestock grazing. The site is used by hikers, joggers, and some cycling occurs on the wider trails. The site is bordered on the southeast by South Boulder Creek. The soils of the Shanahan Grasslands site are very cobbly sandy loams. Proceeding northwest from the creek, the area is a rolling and hilly grassland with ponderosa pine savanna encroaching from the west. The grassland is dominated by tallgrass prairie graminoids: big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), side oats grama (*Bouteloua curtipendula*), switchgrass (*Panicum virgatum*), needle and thread grass (*Stipa comata*) and western wheatgrass (*Agropyron smithii*). Gulches flow in an easterly direction towards South Boulder Creek and contain riparian vegetation, i.e., hackberry (*Celtis occidentalis*), plum (*Prunus* spp.), sedges (*Carex* spp.), and rushes (*Juncus* spp.), with sparse prairie cord-grass (*Spartina pectinata*) occurring in treeless areas. Most of the exotic flora encountered in this site are contained within the swales and gulches and include: cheatgrass (*Bromus tectorum*), Canada thistle (*Cirsium arvense*) and musk thistle (*Carduus nutans*). In contrast, the hilltops contain more well-drained soils, and are nearly weed-free.

On the lower end of the meadows, near the northeastern portion of the site is an area characterized as a wet meadow containing sedges, rushes, wild iris (*Iris missouriensis*), prairie scurfpea (*Psoralea tenuiflora*), and an abundance of the exotic birdfoot trefoil (*Lotus tenua*). This meadow appears to have been altered for watering of livestock.

Much of the hydrology has been altered, especially on the lower eastern end, in the more open prairie area. Many of the natural drainages that formerly drained into South Boulder Creek have been modified to drain into South Boulder Foothills Ditch. It is unclear as to how this

affects the prairie occurrences on the lower end, or the hydrologic quality of South Boulder Creek.

Biodiversity Rank Justification: This site contains a good occurrence of a globally rare wet prairie community (*Andropogon gerardii-Sorghastrum nutans*). Currently, there are only six known occurrences of this community type in Colorado, with most known from the eastern portion of the state.

Table 10. Butterfly and Skippers of Concern at the Shanahan Grasslands Site

Element	Common name	Global Rank	State Rank	Federal Sens.	Federal Status	State Status	*EO Rank
<i>Speyeria idalia</i>	Regal fritillary	G3	S1	FS	C		Unranked (need info)
<i>Hesperia ottoe</i>	Ottoe skipper	G3?	S2				B
<i>Atrytone arogos</i>	Arogos skipper	G3G4	S2				B
<i>Polites origenes</i>	Crossline skipper	G5	S3				B

*EO = Element Occurrence

Table 11. Other Natural Heritage Elements at the Shanahan Grasslands Site

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Andropogon gerardii-Sorghastrum nutans</i> †	Wet prairie community	G2G3	S1				B
<i>Viola pedatifida</i>	Prairie violet	G5	S2				No assigned rank

*EO = Element Occurrence

† = Basis for Biodiversity Rank (B-rank)

Boundary Justification: Boundary includes all of the above occurrences and suitable grassland habitat and drainages. To manage for rare plant and invertebrate occurrences, the contiguous grassland included to provide for genetic exchange. Additionally, areas adjacent to housing developments along South Boulder Creek are included to manage for weedy invasions.

Protection Rank Justification: Land protection complete throughout entire site by open space designation.

Management Rank Justification: Prairie specialist invertebrate and plant occurrences are experiencing a reduction in suitable habitat due to increased ponderosa pine density encroaching from the west, development along Highway 93, and housing developments to the east of the site.

Should the ponderosa pine continue to increase, the grassland quality will decline. It may become necessary to manually thin trees or use prescribed burns. Caution should be exercised

with prescribed fire management. Because of fragmentation of the habitat, frequent burning or burning patches that are too large may inhibit or prevent recolonization of butterflies and skippers inhabiting the area. Many of these invertebrate species have sedentary populations, precluding colonization from adjacent areas if the current inhabiting population is damaged or destroyed by fire.

A four-lane highway fragments this area from its continued prairie component to the east, severely limiting the flow of genetic exchange between invertebrate species occurring on either side of the highway. This makes it crucial to maintain as much open, continuous, and intact prairie as possible, to provide sufficiently for genetic exchange in this area.

Weedy invasions along South Boulder Creek and from the hills in the west pose some threat to the natural quality of the prairie grasses outlined by these site boundaries. Noxious weed invasions should be closely monitored and managed. Exotics exhibit a preference for historically or presently disturbed areas, and appear to have small impact in areas without apparent topsoil disturbance. However, Canada thistle (*C. arvensis*) seems to prefer damp drainages, disturbed or not, and may show continued spread in the absence of active management. Reseeding these areas with native graminoids and flora is recommended.

Figure 7. Shanahan Grasslands site indicating its butterfly occurrences.

Figure 8. Mesa Trail within the Shanahan Grasslands site.
Photo by Phyllis M. Pineda

Figure 9. Towhee Trail within the Shanahan Grasslands site.
Photo by Phyllis M. Pineda

Marshall Mesa

Biodiversity Rank: B3 (High significance)

The Marshall Mesa site contains an good occurrence of the globally rare Ottoe skipper (*Hesperia ottoe*). Additionally, a state rare violet, a globally rare skipper, and a state rare skipper are contained within this site.

Protection Urgency Rank: P4 (No threat known for foreseeable future)

This site is owned and managed by City of Boulder Open Space.

Management Urgency Rank: M3 (Management action needed within five years.)

Exotic flora and increasers exist on the lower portion of the site, some possibly needing aggressive management to prevent invasion of more natural grassland areas.

Location: East of Marshall (south of Boulder), on Highway 170, at Marshall Mesa Open Space. This site includes a portion of Community Ditch.

Legal Description: USGS 7.5 minute quadrangle Louisville: T1S R70W Sections 1, 2.

General Description: Elevation: 1690 to 1768m (5550 to 5800 feet). Current management uses grazing. Area is used by hikers, joggers and cyclists. Historically, the area was mined for coal. Soils are mostly terrace escarpments with thin layers of cobbles over sedimentary soils. Area consists of high rolling mesas and swales, mostly treeless on the mesas, except for a few ponderosa pine trees. One-seeded juniper (*Juniperus monosperma*) occurs infrequently on the hilltops. The mesa tops, hillsides and swales contain a mosaic of grasses: big bluestem (*Andropogon gerardii*), needle and thread grass (*Stipa comata*), western wheatgrass (*Agropyron smithii*), blue grama (*Bouteloua gracilis*), and buffalo grass (*Buchloë dactyloides*).

The hillsides that roll down and northward below Community Ditch are shrubby with skunkbrush (*Rhus trilobata*), mountain mahogany (*Cercocarpus montanus*), shrubby cinquefoil (*Pentaphylloides floribunda*), and New Jersey tea (*Ceanothus herbaceus*). These hills continue a downward plunge with scattered ponderosa pine becoming increasingly dense. Here the soils consist of rock outcrop with an exposed bedrock of granite, along with sandstone, shale and limestone. There are open, exposed and historically disturbed areas that exhibit invasion by exotics: cheat grass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), bindweed (*Convolvulus arvensis*), and knapweed (*Centaurea* spp.).

Community Ditch divides the east and west sides of this site, altering the hydrology of the lower portion of the site. This ditch is a rather large, canal-like diversion with established riparian vegetation: narrowleaf cottonwood (*Populus angustifolia*), plains cottonwood (*Populus deltoides*), plum (*Prunus* spp.), willow (*Salix* spp.), and lead plant (*Amorpha* spp.).

Biodiversity Rank Justification: This site supports a good occurrence of a globally rare skipper, the Ottoe skipper (*Hesperia ottoe*). This skipper is a prairie specialist preferring relatively undisturbed grasslands. Those found along the Colorado Front Range are considered to be disjunct in their Great Plains distribution, holding and importance in evolutionary terms,

and therefore biodiversity. Currently, there are an estimated 14 occurrences reported for Colorado.

Table 12. Butterfly and Skippers of Concern at the Marshall Mesa Site

Element	Common name	Global Rank	State Rank	Federal Sens.	Federal Status	State Status	*EO Rank
<i>Hesperia ottoe</i> †	Ottoe skipper	G3?	S2				B
<i>Atrytone arogos</i>	Arogos skipper	G3G4	S2				B
<i>Erynnis martialis</i>	Mottled duskywing	G4	S2S3				B

*EO = Element Occurrence

† = Basis for Biodiversity Rank (B-rank)

Table 13. Other Natural Heritage Elements at the Marshall Mesa Site

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Viola pedatifida</i>	Prairie violet	G5	S2				No assigned rank

*EO = Element Occurrence

Boundary Justification: The Marshall Mesa site includes all recognized element occurrences in this area, as well as the surrounding prairie, mesa tops, scrubby slopes and most of the area included in this small watershed as suitable habitat for these occurrences. Such a site is designed to provide continuity of open prairie habitat, facilitating genetic exchange, and maintaining a healthy genetic diversity. It also includes areas adjacent to the reservoir, roadsides to manage for noxious weed invasions.

Protection Rank Justification: Land protection is complete with open space designation. A members-only access reservoir adjacent to the site may have formally included suitable habitat prior to its inundation by the reservoir.

Management Rank Justification: While the area contains many exotics and increasers, the majority of those exist mainly near the trailhead, an area of historic topsoil disturbance. These weedy occurrences do not appear to be moving into the grassland where the topsoil is undisturbed. More aggressive management may be needed for knapweed (*Centaurea* spp.) and bindweed (*Convolvulus arvensis*). Additionally, exotics associated with the adjacent reservoir should be monitored, and managed for should they spread into the prairie areas. Reseeding with native vegetation in these areas is recommended.

Management should maintain social trail closures and discourage construction of new trails to prevent further fragmentation and spread of exotics. Growth of trees into this patch of prairie should be monitored and removal of these may be necessary.

A four-lane highway fragments this area away from its continued prairie component to the west, severely limiting the flow of genetic exchange between invertebrate species occurring

on either side of the highway. This makes it crucial to maintain as much open, continuous, and intact prairie as possible, to provide sufficiently for genetic exchange in this area.

Area is historically known for its coal mining, and there is some concern that mines still containing fires may eventually cause slumping in the rock outcrop areas.

Figure 10. Marshall Mesa site indicating its butterfly occurrences.

Figure 11. Mesa within the Marshall Mesa site.
Photo by Phyllis M. Pineda

Figure 12. Prairie within the Marshall Mesa site.
Photo by Phyllis M. Pineda

Doudy Draw

Biodiversity Rank: B3 (High significance)

The Doudy Draw site contains a degraded occurrence of the globally rare plant, Ute ladies tresses orchid (*Spiranthes diluvialis*). Additionally, the proposed endangered mammal, the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), and an occurrence of a state rare skipper, the mottled duskywing (*Erynnis martialis*) are found here.

Protection Urgency Rank: P4 (No threat known for foreseeable future)

This site is owned and managed by City of Boulder Open Space.

Management Urgency Rank: M2 (Management action needed within five years to prevent the loss of element occurrences)

Many exotics and increasers exist on the lower portion of the site, especially in flood prone areas, negatively affecting the viability of the imperiled Ute ladies tresses orchid.

Location: Doudy Draw is located about one mile east of Eldorado Springs. From the intersection of Highway 93 and Eldorado Springs Road south of Boulder, travel approximately two miles west to Doudy Draw Trailhead, located on the south side of the road.

Legal Description: USGS 7.5 minute quadrangle Eldorado Springs: T1S R70W Sections 29-32; T2S R70W Section 6; T2S R71W Section 1.

General Description: Elevation: 1719 to 1756m (5640 to 5760 feet). This site is currently managed through livestock grazing. This site is used by joggers, hikers, horseback riders and cyclists. Soils are very cobbly sandy loam and terrace escarpments. Mesa tops consist of a mosaic of grasses, big bluestem (*Andropogon gerardii*), needle and thread grass (*Stipa comata*), blue grama (*Bouteloua gracilis*), and June grass (*Koeleria macrantha*). These mesa tops are fairly free of exotic flora, except for early spring occurrences of alyssum. Slopes are dominated by shrubby patches of woody vegetation: skunkbrush (*Rhus trilobata*), rose (*Rosa* spp.), sumac (*Rhus glabra*), New Jersey tea (*Ceanothus herbaceus*), and support robust patches of big bluestem interspersed with weedy patches of smooth brome (*Bromopsis inermis*), cheat grass (*Bromus tectorum*), and chicory (*Cichorium intybus*).

There is a drainage directly below the slope of the eastern mesa flowing northward into South Boulder Creek. Between the mesas exists a flood-prone area containing patches of shrubby vegetation, skunkbrush, rose, sumac, hawthorne (*Crataegus* spp.), plum (*Prunus* spp.), and grassy patches of big bluestem and western wheatgrass (*Agropyron smithii*). The floodplain is somewhat disturbed and weedy with cheat grass, alyssum, smooth brome, chicory, knapweed (*Centaurea* spp.) (not abundant). Possibly, this floodplain was subject to historic topsoil disturbance, as an historic homestead site is located directly across the road at the South Boulder Creek trailhead. The trail passes through this floodplain, contributing to the number of exotics and the degree of disturbance found in the floodplain.

Biodiversity Rank Justification: This site supports a degraded occurrence of the listed threatened, globally imperiled plant species, Ute ladies tresses (*Spiranthes diluvialis*).

Additionally, there is a degraded occurrence of the proposed-endangered Preble's meadow jumping mouse (*Zapus hudsonius preblei*). Both this plant and mammal species have limited ecological distributions in this region, restricted to riparian areas below 1950 meters (6500 feet).

Table 14. Butterfly and Skippers of Concern at the Doudy Draw Site

Element	Common name	Global Rank	State Rank	Federal Sens.	Federal Status	State Status	*EO Rank
<i>Erynnis martialis</i>	Mottled duskywing	G4	S2S3				B

*EO = Element Occurrence

Table 15. Other Natural Heritage Elements at the Doudy Draw Site

Element	Common name	Global Rank	State Rank	Federal Status	Federal Sens.	State Status	*EO Rank
<i>Spiranthes diluvialis</i> †	Ute ladies tresses	G2	S2	LT			D
<i>Viola pedatifida</i>	Prairie violet	G5	S2				No assigned rank
<i>Amorpha nana</i>	Dwarf wild indigo	G5	S2S3				No assigned rank
<i>Zapus hudsonius preblei</i>	Preble's meadow jumping mouse	G5T2	S1	PE	FS	SC	D

*EO = Element Occurrence

†= Basis for Biodiversity Rank (B-rank)

Boundary Justification: The boundary is drawn to include the above occurrences and adjacent suitable habitat. This is a small site, and a larger boundary may be appropriate to secure hydrological and other ecological processes.

Protection Rank Justification: Protection of the land is complete by open space designation. There are housing developments adjacent to the site.

Management Rank Justification: Exotic flora may further out-compete native grasses and forbs, especially in flood prone zone. Reseeding with native flora is recommended. Currently the mesas are treeless, although the surrounding prairies presently resemble an open woodland dominated by ponderosa pine. An open prairie habitat is needed to maintain the populations of butterflies, skippers and plants; therefore any encroachment by the ponderosa pine should be discouraged.

Figure 13. Doudy Draw site indicating its butterfly occurrences.



Figure 14. Doudy Draw site.
Photo by Phyllis M. Pineda

Summary of Search Results

The table below is intended to summarize the search results for the targeted butterfly species of significance. Date of encounter (1996 or 1997 field season), its Potential Conservation Site, and the locality within that site are indicated.

For Global and State Rankings, please see Table 3 on page 22. For species information, please see the Species Characterization Abstracts for each of these species beginning on page 69. For Potential Conservation Site Information, please refer to pages 26 through 50.

Table 16. Butterfly Species of Significance and Search Results for 1996 and 1997

Species	1997?	1996?	Potential Conservation Site	Location of Occurrence
<i>Amblyscirtes simius</i> §	No	No		
<i>Atrytone arogos</i>	Yes	Yes	North Boulder Grasslands Shanahan Grasslands, Marshall Mesa	Foothills Trail (1997, 1996), Mesa Trail (1997), Marshall (1997)
<i>Atrytonopsis hianna</i> §	No	No		
<i>Callophrys mossii schryveri</i>	Yes	Yes	Boulder Foothills	Tenderfoot Trail (1997), Gregory Canyon (1996)
<i>Celastrina</i> sp. 1	Yes	Yes	Boulder Foothills	Skunk Canyon (1997), Coyote Canyon (1996)
<i>Erynnis martialis</i>	Yes	Yes	Boulder Foothills Marshall Mesa Doudy Draw	Tenderfoot Trail (1997), Marshall (1996) Doudy Draw (1996)
<i>Euphilotes rita coloradensis</i> §	No	No		
<i>Euphyes bimacula</i>	Yes	Yes	North Boulder Grasslands	Foothills Trail (1997), Left Hand Res. (1996)
<i>Hesperia ottoe</i>	Yes	No	North Boulder Grasslands, Shanahan Grasslands, Marshall Mesa	Foothills Trail (1997), Mesa Trail (1997), Marshall (1997)
<i>Paratrytone snowi</i>	Yes	Yes	Boulder Foothills	Bear Canyon (1997), Gregory Canyon (1996)

Species	1997?	1996?	Potential Conservation Site	Location of Occurrence
<i>Polites origenes</i>	Yes	Yes	North Boulder Grasslands Shanahan Grasslands	Foothills Trail (1996, 1997) Shanahan (1996, 1997), Mesa Trail (1996, 1997).
<i>Polites rhesus</i> §	No	No		
<i>Speyeria idalia</i>	Yes	Yes	Shanahan Grasslands, Boulder Foothills	Towhee Trail (1997), Halfway House (1996)
<i>Stinga morrisoni</i> *†	Yes	No	Boulder Foothills	Tenderfoot Trail (1997)

* = Watchlisted species

† = County record for Boulder in 1997

§ = Not recorded from Boulder County, but expected

Targeted Inventory Areas Results

The table below is intended to provide a summary of search results for the Targeted Inventory Areas outlined for this survey. These are summarized for both 1996 and 1997 surveys. If they are included within one of the Potential Conservation Sites designated in this report, it is located in the column titled “Potential Conservation Site”. “Priority?” indicates whether they are considered to contain potential habitat for targeted species of concern, and is indicated by “High, Medium or Low”.

For ease of reference, they are listed in order of Targeted Inventory Area number (TIA#).

Table 17. Targeted Inventory Areas

Targeted Inventory Area (TIA)	TIA #	Potential Conservation Site	Surveyed ?	Success?	Priority?	Targeted Species
South Boulder Tallgrass	1		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Fancher	2		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Goodhue Ditch	3		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Rolling Rock Ranch	4		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
East Doudy Draw	5	Doudy Draw	Yes	No	Medium	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
East Spring Brook	6		No	No	?	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
West Varra	7		Yes	No	Low	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Doudy Draw Mesas	8		Yes	Yes	High	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Erynnis martialis</i>
Beech Shortgrass	9	North Boulder Grasslands	Yes	No	Low	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Boulderland Shortgrass	10	North Boulder	Yes	No	Low	<i>Polites rhesus</i> ,

Targeted Inventory Area (TIA)	TIA #	Potential Conservation Site	Surveyed ?	Success?	Priority?	Targeted Species
		Grasslands				<i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Left Hand Valley Reservoir	11	North Boulder Grasslands	Yes	Yes	Medium	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Boulder Valley Shortgrass	12		Yes	No	Low	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Foothills Trail	13	North Boulder Grasslands	Yes	Yes	High	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Euphyes bimacula</i>
Dry Creek	14		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Beech Hogback	15	North Boulder Grasslands	Yes	Yes	High	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Stinga morrisoni</i>
Fourmile Hogback	16	North Boulder Grasslands	Yes	Yes	High	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i> , <i>Stinga morrisoni</i>
Red Rocks	17		Yes	No	Low	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Boulder Valley Wetlands	18		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Boulder Valley Scarp	19	North Boulder Grasslands	Yes	No	Low	<i>Polites rhesus</i> , <i>Amblyscirtes simius</i> , <i>Euphilotes rita coloradensis</i>
Wonderland Hogback	20		Yes	No	High	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Chautauqua Meadows	21	Boulder Foothills	Yes	No	Medium	<i>Speyeria idalia</i> , <i>Hesperia ottoe</i> ,

Targeted Inventory Area (TIA)	TIA #	Potential Conservation Site	Surveyed ?	Success?	Priority?	Targeted Species
						<i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Gregory Canyon	22	Boulder Foothills	Yes	Yes	Medium	<i>Celastrina</i> sp. 1, <i>Callophrys mossii schryveri</i> , <i>Paratrytone snowi</i>
Bear Canyon	23	Boulder Foothills	Yes	Yes	Medium	<i>Celastrina</i> sp. 1, <i>Callophrys mossii schryveri</i> , <i>Paratrytone snowi</i>
East Devil's Thumb	24	Boulder Foothills	Yes	No	Low	<i>Paratrytone snowi</i>
Fern Canyon	25	Boulder Foothills	Yes	No	Low	<i>Paratrytone snowi</i>
Shadow Canyon	26	Boulder Foothills	Yes	No	Low	<i>Callophrys mossii schryveri</i> , <i>Paratrytone snowi</i>
Skunk Canyon	27	Boulder Foothills	Yes	Yes	High	<i>Celastrina</i> sp. 1, <i>Callophrys mossii schryveri</i> , <i>Paratrytone snowi</i>
Bluebell Canyon (includes Coyote Canyon)	28	Boulder Foothills	Yes	No	High	<i>Celastrina</i> sp. 1, <i>Callophrys mossii schryveri</i> , <i>Paratrytone snowi</i>
West Marshall	29		Yes	No	Low	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
South Marshall	30	Marshall Mesas	Yes	Yes	High	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Big Bluestem Trail	31	Shanahan Grasslands	Yes	Yes	High	<i>Speyeria idalia</i> , <i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Doudy Draw	32		Yes	No	Low	<i>Hesperia ottoe</i> , <i>Atrytone arogos</i> , <i>Polites origenes</i> , <i>Atrytonopsis hianna</i>
Spring Brook	33		No	No	?	<i>Celastrina</i> sp. 1
Boulder Creek	34		Yes	No	Low	<i>Celastrina</i> sp. 1, <i>Callophrys mossii</i>

Targeted Inventory Area (TIA)	TIA #	Potential Conservation Site	Surveyed ?	Success?	Priority?	Targeted Species
						<i>schryveri</i> , <i>Paratrytone snowi</i> , <i>Stinga morrisoni</i>
Mount Sanitas	35		Yes	No	Low	<i>Atrytone arogos</i> , <i>Atrytonopsis hianna</i> , <i>Erynnis martialis</i> , <i>Amblyscirtes simius</i> , <i>Stinga morrisoni</i>
Operations Center	36		Yes	No	Low	<i>Speyeria idalia</i> , <i>Euphyes bimacula</i>
Tram Hill/Lost Gulch	37	Boulder Foothills	Yes	No	Low	<i>Paratrytone snow</i> , <i>Callophrys mossii schryveri</i> , <i>Stinga morrisoni</i>
Campbell Cliffs	38	Boulder Foothills	Yes	No	Medium	<i>Celastrina</i> sp. 1
South Boulder Creek	39	Shanahan Grasslands	Yes	No	Medium	<i>Celastrina</i> sp. 1,
Halfway House	40	Boulder Foothills	Yes	Yes	Low	<i>Paratrytone snowi</i> , <i>Atrytonopsis hianna</i>
Sunshine Canyon	41		Yes	No	Low	<i>Atrytone arogos</i> , <i>Atrytonopsis hianna</i> , <i>Stinga morrisoni</i> ,
Mesa Trail (west of NCAR)	42	Boulder Foothills	Yes	No	Low	<i>Atrytone arogos</i> , <i>Atrytonopsis hianna</i> , <i>Stinga morrisoni</i>
Greenbear	43	Boulder Foothills	Yes	No	High	<i>Paratrytone snowi</i>
Tenderfoot Trail	44	Boulder Foothills	Yes	Yes	Medium	<i>Erynnis martialis</i> , <i>Callophrys mossii schryveri</i> , <i>Paratrytone snow</i> , <i>Stinga morrisoni</i> , <i>Amblyscirtes simius</i>

CONCLUSIONS

The anticipated importance that City of Boulder's Open Space and Mountain Parks lends to butterfly and skipper conservation has been further supported by our findings. Not only are these properties rich in species, but several rare or imperiled species, including local endemics, have populations here.

As all actual occurrences in this survey occurred on City of Boulder's Open Space and Mountain Parks properties, land protection of these targeted species is secure.

All targeted butterflies and skippers documented in this survey have a very strong prospect for long-term viability on City of Boulder Open Space and Mountain Parks properties should proper management and conservation plans be implemented. Management consideration should be given to all elements (flora and fauna) occurring or potentially occurring in these sites.

Examples of threats to continued survival of these species include continued trail construction, housing developments bordering designated open space properties, exotic floral invasion and increased tree density to formerly open habitats. An open, unfragmented, and relatively natural habitat is necessary for both hostplant and plant community survival and, consequently, to the species' survival. This includes both canyon and prairie habitats. The development of management plans should include tactics to protect the butterflies and skippers and other key elements. Careful consideration should be given to those sites adjacent to private property, or if previous-owner management methods are still in place. Management actions in these areas will have to consider the impact that urban development or previous management has on the site and to the species contained within.

To secure viable populations of the targeted species the conservation sites presented here are a basis for recommendation in the design of management plans.

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APPENDICES

SPECIES INFORMATION

These appendices will provide some brief background information regarding those species of concern targeted for the City of Boulder Open Space and Mountain Parks. It may be useful to incorporate some of this information as a management tool for any plans or actions taken by open space personnel.

In Appendix A, the characterization abstracts for each species targeted in these inventories are given in taxonomic order. This appendix includes both those species known to occur and those potentially occurring within the study site. Those confirmed from the study site are accompanied by photos of the species and its habitat.

Each abstract gives information with respect to taxonomy, global and state distribution, habitat, phenologies, and management issues. These are intended to be a guide for basic information regarding these species. More detailed information can be found in Scott (1986) and Ferris and Brown (1981).

Appendix B is a table giving a brief overview of the targeted species adult phenologies, in respect to their flight times. These are listed in order of seasonal appearance.

In Appendix C, a list of associated butterfly and skipper species of butterflies is given in taxonomic order. It is not a list of all species known from Boulder County; rather it is a list of species as they were documented from the study area during 1996 and 1997.

Appendix A
Invertebrate Characterization Abstracts

Invertebrate Characterization Abstract
Erynnis martialis
Mottled dusky wing

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: HesperIIDae Genus: *Erynnis*

Taxonomic Comments: No subspecies are listed for this species (Miller and Brown 1981). The second phenotype of the Afranius duskywing (*Erynnis afranius*) is often mistaken for *E. martialis*; fortunately, the two almost never occupy the same habitat simultaneously (Ferris and Brown 1981).

CNHP Ranking: G4S2S3

Distribution: Global range: Eastern United States from Massachusetts and New York west across Ontario and the Great Lakes states to Minnesota and western Iowa, then south to Georgia, the Gulf states, and central Texas (Opler and Krizek 1984). West to eastern Nebraska, eastern Kansas, the Ozarks, and disjunct isolated populations in the eastern foothills of the Rocky Mountains in central Colorado, and in the Black Hills (Opler 1994, Stanford and Opler 1993, Opler and Krizek 1984, Ferris and Brown 1981). State range: Front Range foothills from to 3000m (8200 feet) (Opler 1981). Reported from nine counties (Stanford and Opler 1993): Boulder, Clear Creek, Custer, Douglas, Fremont, Huerfano, Jefferson, Larimer, Pueblo.

Known Locations in Study Site: From this survey, this species has been successfully located at Tenderfoot Trail (Boulder Foothills site), Marshall Mesas (Marshall Mesa site), and Doudy Draw Mesas (Doudy Draw site).

Habitat Comments: Elevational range: 1371 to 3000m (4500 to 8200 feet). Usually confined to hilly country containing its hostplant buckbrush (*Ceanothus* spp.) (Opler and Krizek 1984). Inhabits shrubby foothills with stands of mahogany (*Cercocarpus* spp.) and buckbrush (*Ceanothus* spp.) and oak woodlands (Ferris and Brown 1981). Also, wooded uplands; open woods and thickets; clumps of vegetation on plains (Pyle 1981).

Phenology: One flight mid May-June in Colorado; two flights throughout the rest of the range (Scott 1986, Opler and Krizek 1984). Males perch on hilltops (Ferris and Brown 1981). Seldom abundant (Pyle 1981).

Larval Hostplant: Shrub Rhamnaceae, including *Ceanothus americanus*, *herbaceus*, *fendleri*; adults sip nectar of flowers, including *Ceanothus* spp. (Scott 1986).

Known Threats and Management Issues: Foothills habitats at risk of loss by anthropogenic alteration, including: fire suppression, habitat fragmentation, and urban development.

Figure 15. *Erynnis martialis*.
Photo by Paul Opler

Figure 16. Habitat for *Erynnis martialis*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract
Stinga morrisoni
Morrison's skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Hesperidae Genus: *Stinga*

Taxonomic Comments: A monotypic genus.

CNHP Ranking: G4S3S4

Distribution: Global range: Along the Colorado Front Range from the Wyoming border south through Colorado, into New Mexico, Arizona, and Texas. State range: From Larimer County southward. Known from 15 counties in Colorado: Alamosa, Clear Creek, Custer, Douglas, El Paso, Fremont, Gilpin, Huerfano, Jefferson, Larimer, Las Animas, Park, Saguache, Teller (Stanford and Opler 1993). Boulder County was documented for the first time during this study.

Known Locations in Study Site: This species was successfully located at Tenderfoot Trail in the Boulder Foothills site. This was a documented county record for this species in 1997.

Habitat Comments: Occupies open pinyon and ponderosa pine foothills in the upper Sonoran, below 2926m (9600 feet) (Scott 1986). May have an association with crumbly granitic soils (R. Stanford pers. comm.).

Phenology: One flight, May through Mid-June in the Colorado Foothills. Late-May through early-July at higher altitudes (Scott 1986). Uncommon to locally common in most years. Males perch all day on hilltops, usually next to shrubs or trees, to await females.

Larval Hostplant: Not well-known; blue grama (*Bouteloua gracilis*) or little blue stem (*Schizachyrium scoparium*) is suspected by habitat association (Ferris and Brown 1981).

Known Threats and Management Issues: Species' habitat is rapidly being developed from Colorado Springs to Fort Collins; low elevations along the Colorado Front Range Foothills are especially favored for development. Fire suppression, habitat fragmentation, and weedy invasions also affect quality of habitat. Historically threatened by logging.

Figure 17. *Stinga morrisoni*.
Photo by Paul Opler

Figure 18. Habitat for *Stinga morrisoni*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract

Hesperia ottoe

Ottoe Skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Hesperidae Genus: *Hesperia*

Taxonomic Comments: No subspecies reported (Miller and Brown 1981). Western populations of this species average paler in color on the upperside compared to more eastern populations, but this coloring can be variable (Scott 1986).

CNHP Ranking: G3S2

Distribution: Global range: Great Plains range extends from southern Manitoba south to northern Texas, and northeastward to the Great Lakes Regions (Scott 1984, Ferris and Brown 1981). State range: Base of the Front Range from El Paso County north to the Wyoming state line, and a few records from the eastern plains of Colorado. Apparently a Front Range disjunct restricted to mid- and tallgrass prairies. Known from nine counties in Colorado: Arapahoe, Boulder, Douglas, Elbert, El Paso, Jefferson, Larimer, Phillips, Yuma (Stanford and Opler 1993).

Known Locations in Study Site: This species was successfully located at Foothills Trail (North Boulder Grasslands site), Mesa Trail near South Boulder Creek (Shanahan Grasslands site), and Marshall Mesas (Marshall Mesa site).

Habitat Comments: In Colorado, this species occupies mid- to tallgrass undisturbed prairies or high quality grazed prairie on the plains and Front Range foothills, especially gently sloping meadows below 1920m in elevation (6300 feet). Avoids weedy conditions (Scott 1986, Ferris and Brown 1981, Pyle 1981).

Phenology: The Ottoe skipper has one brood per year, with adults flying from mid-June through early August, reaching peak abundance in early July (Sedman and Hess 1985, Opler and Krizek 1984). The adult males begin to emerge before the females. Emergence is extended over a two-week period in late-June through mid-July, with females offset by about a week. Life span for adults is about 19 days in nature. Males perch on flowers or low plants during warm daylight hours when seeking mates (Dana 1981).

Larval Hostplants: Big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*) side oats grama (*Bouteloua curtipendula*) (Scott 1986).

Known Threats and Management Issues: Declines are likely due to continued destruction of prairie habitat by conversion to cropland and urban developments. Additionally, along the Colorado Front Range, increased loss of its disjunct habitat may be attributed to increased tree density into former prairie habitat, due in part to fire suppression.

Figure 19. *Hesperia ottoe*.
Photo by Paul Opler

Figure 20. Habitat for *Hesperia ottoe*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract

Polites rhesus

Rhesus skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Hersperiidae Genus: *Polites*

Taxonomic Comments: No subspecies reported (Brown and Miller 1981). Examination of genitalic characteristics indicate that this species, and its sister species *P. carus*, should be included in the genus *Polites*. This moves both species of the genus *Yvretta* to *Polites*, thus creating the *Yvretta* group within the genus *Polites* (Burns 1994).

CNHP Ranking: G4S2S3

Distribution: Global range: In shortgrass prairie, this species ranges from southern Canada (Saskatchewan and Alberta) in a fairly narrow strip through the western Great Plains and southern Rocky Mountains of the United States (Stanford and Opler 1993), to the high mountains of Central Mexico (Burns 1994). State Range: Known from 20 counties in Colorado : Alamosa, Arapahoe, Baca, Chaffee, Custer, Denver, Douglas, El Paso, Elbert, Fremont, Huerfano, Jefferson, Larimer, Las Animas, Morgan, Park, Pueblo, Saguache, Weld, Yuma (Stanford and Opler 1993).

Known Locations in Study Site: This species has not been successfully located within the study site. It has not been documented from Boulder County, although it is expected (Stanford pers. comm.).

Habitat Comments: Upper Sonoran to lower Canadian zone shortgrass and mixed-grass prairie habitats (Scott 1986); records from 1150 to 2850m (3800 to 9300 feet) (Ferris and Brown 1981).

Phenology: One flight, mostly May, and late-May to mid-June at higher altitudes (Scott 1986); mid-June in South Park (Ferris and Brown 1981). Rare in most years, but in wet seasons it may swarm over prairies and congregate on blossoms of prostrate milk vetch (*Astragalus* spp.) species (Ferris and Brown 1981). Males will perch during sunny warm mornings on hilltops to await females. Adults will sip nectar of flowers, especially Drummond's milkvetch (*A. drummondii*) (Scott 1986).

Larval Hostplant: Blue grama (*Bouteloua gracilis*).

Known Threats and Management Issues: Existing threats are: fragmentation of habitat by conversion to agricultural use, or by mismanagement of grazing regimes, possibly reducing cover of hostplant.

Invertebrate Characterization Abstract
Polites origenes rhena
Cross-line skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: HesperIIDae Genus: *Polites*

Taxonomic Comments: Two subspecies occur in North America: *origenes* and *rhena*. *P. o. rhena* occurs in Colorado (Ferris and Brown 1981). *Polites origenes rhena* is larger and more tawny than eastern subspecies *origenes* (Ferris and Brown 1981). Resembles *P. themistocles*, but is slightly larger and darker; the mail stigma is straight, females usually (and males often) have faint hindwing spots, and females nearly lack an orange upper-forewing streak.

CNHP Ranking: G5S3

Distribution: Global range: This species occurs in the eastern United States and southern Canada, with disjunct populations in meadows adjoining the Rocky Mountain foothills, and similar habitats in the Black Hills of South Dakota (Ferris and Brown 1981). State range: Colorado Front Range lower foothill canyons where they open onto the plains (Ferris and Brown 1981, Brown 1957). Known from 13 counties in Colorado (Stanford and Opler 1993): Adams, Arapahoe, Boulder, Custer, Douglas, El Paso, Elbert, Fremont, Gilpin, Jefferson, Larimer, Las Animas, Pueblo.

Known Locations in the Study Site: This species has been successfully located at Beech Open Space, Foothills Trail (both located within the North Boulder Grasslands site), and at the Shanahan Grasslands site.

Habitat Comments: Elevational range: 1645 to 2316m in Colorado (5400-7600 feet). Grasslands, serpentine or sandy barrens, canyon openings near plains (Pyle 1981). Swales and grassy meadows adjoining rocky mountain foothills (Ferris and Brown 1981).

Phenology: One brood emerging in mid-June through July in Colorado (Ferris and Brown 1981, Pyle 1981). Males perch all day in grassy swales and valley bottoms to await females (Scott 1986).

Larval Hostplant: In Colorado, the hostplant is suspected to be big bluestem (*Andropogon gerardii*) by habitat association (Stanford pers. comm).

Known Threats and Management Issues: Habitat, especially along the foothills of Colorado is subject to continued destruction of prairie habitat by conversion to cropland and for urban developments. Additionally, habitat loss may be attributed to increased tree density into former prairie habitat.

Figure 21. *Polites origenes rhena*.
Photo by Paul Opler

Figure 22. Habitat for *Polites origenes rhena*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract

Atrytone arogos iowa

Arogos skipper

Taxonomy:

Class: Insecta

Order: Lepidoptera

Family: HesperIIDae

Genus: *Atrytone*

Taxonomic Comments: Most authors recognize two subspecies: *arogos* formerly Atlantic and Gulf coastal plains from New York to Florida and Louisiana and *iowa* of the Great Plains, with subspecies *iowa* demonstrating reduced dark markings (Ferris and Brown 1981). Colorado populations are subspecies *iowa*.

CNHP Ranking: G3G4S2

Distribution: Global range: The Arogos skipper occupies a patchy range from Long Island south along the Piedmont and coastal plain to peninsular Florida and west along the Gulf to eastern Texas. A separate group of populations occurs on the prairies from southern Minnesota and adjacent Wisconsin west to eastern Wyoming and south to Missouri, Oklahoma, and northeastern Colorado (Opler and Krizek 1984). State range: Known only from northern lower Front Range and extreme northeastern Colorado in five counties (Stanford and Opler 1993): Arapahoe, Boulder, Jefferson, Larimer, Yuma.

Known Locations within the Study Site: This species has successfully been located at Beech Open Space and Foothills Trail (North Boulder Grasslands site), Mesa Trail near South Boulder Creek (Shanahan Grasslands site), and Marshall Mesas (Marshall Mesa site).

Habitat Comments: Maximum elevation: 1890m (6200 feet). May be encountered in relatively undisturbed sloping mixed- and tallgrass prairie meadows (Ferris and Brown 1981).

Phenology: Short flight with emergence of adults beginning in late-June through mid-July near the foothills, a week or two earlier eastward on the plains. Males perch on flowers and tall grass blades to await females, mainly in the afternoon when thunderclouds have developed. In sunny morning hours when most butterflies are active, Arogos skipper individuals are difficult to find except on flowers (Ferris and Brown 1981).

Larval Hostplant: Big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), possibly switch grass (*Panicum* spp.) (Scott 1986).

Known Threats and Management Issues: Prairie habitats have been severely altered by agricultural conversion, urban development, fire suppression, and mismanagement of livestock grazing. These threats continue to impact prairie habitat fragments (Panzer 1988). Introduced grasses and other forbs, i.e., smooth brome (*Bromus inermis*), cheat grass (*Bromus tectorum*) and knapweed (*Centaurea* spp.) threaten to invade existing prairie habitats. Additionally, increased tree density negatively affects the quality of suitable habitat.

Figure 23. *Atrytone arogos*.
Photo by Paul Opler

Figure 24. Habitat for *Atrytone arogos*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract
Paratrytone snowi
Snow's skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: HesperIIDae Genus: *Paratrytone*

Taxonomic Comments: Burns (1992) moved *snowi* into the genus *Paratrytone* (from the genus *Ochlodes*) based on female and male genitalic characters. Rocky Mountain specimens are typical *snowi*; a subspecies with larger spots occurs in central Mexico (Ferris and Brown 1981).

CNHP Rank: G4S3

Distribution: Global range: Restricted to the central and southern Rocky Mountains south to Puebla, Mexico, with records from Arizona, New Mexico, Colorado, southeast Wyoming, and two to six (taxonomic question) counties in Mexico (Stanford and Opler 1993, Ferris and Brown 1981). State range: Known from 19 counties in Colorado (Stanford and Opler 1993): Boulder, Chaffee, Conejos, Costilla, Custer, Douglas, El Paso, Gunnison, Hinsdale, Huerfano, Jefferson, Larimer, Las Animas, Mineral, Park, Pueblo, Rio Grande, Saguache, Teller.

Known Locations within the Study Site: This species was successfully located at the junction of Gregory and Long Canyon and in Bear Canyon, both within the Boulder Foothills site.

Habitat Comments: Elevational range is 2072m to 2926m (6800 to 9600 feet). Inhabits upper Transition to Canadian Zone woodlands, especially the upper edge of ponderosa pine forest (Scott 1986) and riparian habitats in pine forests (Ferris and Brown 1981). In some areas of Colorado, known to frequent wet montane meadows (Emmel et al. 1992). Usually encountered in gulches and ravine bottoms in sunny openings.

Phenology: Flies in mid-July to early-August in most areas, July in northern Colorado (Scott 1986). Males perch all day in narrow dry gullies to await females, and court there and elsewhere at flowers (Scott 1986). Horsemint (*Monarda* spp. especially *fistulosa*) is a favored nectar source (Ferris and Brown 1981).

Larval Hostplant: Hostplant is unknown; however, J. Scott has observed oviposition on the grass pine dropseed (*Blepharoneuron tricholepsis*), and observed attempted oviposition on mountain muhly (*Muhlenbergia montana*) in southern Colorado (Ferris and Brown 1981).

Known Threats and Management Issues: This species prefers a high quality, open woodland. Preferred habitats are at risk due to deforestation for timber harvest, or increased tree density. Increased tree density may be attributed to a successional response to fire suppression; this may increase the threat of large scale fires, possibly destroying suitable habitat.

Figure 25. *Paratrytone snowi*.
Photo by Paul Opler

Figure 26. Habitat for *Paratrytone snowi*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract
Euphyes bimacula
Two-Spotted Skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: HesperIIDae Genus: *Euphyes*

CNHP Rank: G3G4S1

Taxonomic Comments: Two subspecies are provisionally recognized in North America: *acanootus* and *illinois*. Colorado populations are assigned provisionally to the subspecies *illinois*. The western populations are larger and brighter above than eastern populations, but more dull gray beneath with prominent veins on ventral-hindwing (Ferris and Brown 1981).

Distribution: Global range: From New England and Ontario south to Virginia and westward to Wisconsin, Iowa, Nebraska and northeast Colorado (Ferris and Brown 1981). State range: Known from four counties in northeastern Colorado: Boulder, Larimer, Morgan, and Yuma (Stanford and Opler 1993).

Known Locations within the Study Site: This species has been successfully located in a wet meadow on the west side of Left Hand Reservoir, and additionally at the base of Foothills Trail. Both of these occurrences are within the North Boulder Grasslands site.

Habitat Comments: This species is a post-glacial relict inhabiting bogs, marshes, pond edges and adjacent fields, and sedge meadows containing *Carex* spp. (Ferris and Brown 1981, Pyle 1981).

Phenology: Short flight from late June through mid-July (Ferris and Brown 1981). Males await females while perched on tall stalks in open sedge marshes and are extremely wary. Both sexes visit flowers (Ferris and Brown 1981).

Larval Hostplant: Nebraska sedge (*Carex nebrascensis*) (Stanford pers. comm.).

Known Threats and Management Issues: Development of wetlands for hay, pasture, cropland, livestock watering holes or reservoirs are the most serious threats to this skipper. Additionally, aggressive floral exotics, such as Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*) and common teasel (*Dipascus sylvestris*) negatively impact suitable habitat by displacing native vegetation in these meadows.

Figure 27. *Euphyes bimacula*.
Photo by Paul Opler

Figure 28. Habitat for *Euphyes bimacula*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract
Atrytonopsis hianna turneri
Dusted skipper

Taxonomy:

Class: Insecta

Order: Lepidoptera

Family: HesperIIDae

Genus: *Atrytonopsis*

Taxonomic Comments: Two subspecies are recognized in North America: *turneri* and *hianna* (Miller and Brown 1981). Subspecies *turneri* occurs in Colorado (Ferris and Brown 1981). Subspecies *hianna* has few or no under-hindwing spots when compared with subspecies *turneri* (Scott 1986).

CNHP Rank: G4G5S2

Distribution: Global range: Frequents northeastern North America from Saskatchewan and New England south to Florida and the Ozark Plateau. Several disjunct western populations comprise the Rocky Mountain subspecies. New Mexico records require confirmation (Ferris and Brown 1981). State range: Found in the foothills of the Arkansas headwaters, and in Larimer County (Stanford and Opler 1993). Larimer County populations are apparently peripheral to eastern populations, while Arkansas drainage populations are believed to be disjunct (Scott 1986, Ferris and Brown 1981). Known from five Colorado counties: Custer, El Paso, Fremont, Larimer, Pueblo.

Known Locations within the Study Site: This species was not successfully located in the study site. It has not been documented from Boulder County, although it is expected (Stanford pers. comm.).

Habitat Comments: Inhabits Transition Zone open dry fields, open woodland, and prairie gulches (Scott 1986). This skipper is found in bluestem grasslands, and often on acid pine or pine-oak barrens or prairies (Pyle 1981). Inhabits relatively undisturbed canyons and open pine woodlands from 1615 to 2195m (5300 to 7200 feet). These habitats are subject to fire, and the skipper must either survive burning or be a good colonist (Opler and Krizek 1984, Pyle 1981).

Phenology: In Colorado, it has one brood, with adults flying from May to mid-June. Males perch in flat clearings or gullies, usually on the ground to await females. Adults will nectar on beardtounge (*Penstemon*) species, and on blackberry, strawberry, and clover (Scott 1986).

Larval Hostplants: Big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*).

Known Threats and Management Issues: Given its lower Front Range distribution, it may be threatened by increasing development. Fire suppression is changing the character of its Front Range habitat reducing the open shrublands and woodlands preferred by this species.

Invertebrate Characterization Abstract
Amblyscirtes simius
Simius roadside skipper

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Hesperidae Genus: *Amblyscirtes*

Taxonomic Comments: No subspecies reported for this species (Miller and Brown 1981). May belong in a separate genus because of mating habits and genitalic differences uncharacteristic for the genus *Amblyscirtes* (Scott 1986).

CNHP Rank: G4S3

Distribution: Global range: In shortgrass prairie, ranges from southern Saskatchewan south to Sonora, Mexico, through Montana, Wyoming, Colorado, Arizona, New Mexico, and Texas (Scott 1986, Ferris and Brown 1981). State range: Known from 10 counties in Colorado: Baca, Custer, El Paso, Fremont, Huerfano, Larimer, Otero, Pueblo, Rio Grande, Saguache (Stanford and Opler 1993).

Known Locations within the Study Site: This species has not been successfully located in the study site. It has not been documented from Boulder County, although it is expected (Stanford pers. comm.).

Habitat Comments: Shortgrass and mixed-grass prairie and open pinyon-juniper woodland (Scott 1986). This species occurs in hilly prairie, and there seems to be a correlation with shaley substrates (Stanford pers. comm). Occurs in shortgrass prairie up to 2800m (9000 feet) (Scott 1986, Ferris and Brown 1981).

Phenology: In the Rocky Mountain region, the flight period begins in mid-May and continues through July, depending on elevation and latitude (Scott 1986, Ferris and Brown 1981). It is usually uncommon, but may swarm briefly in wetter years (Ferris and Brown 1981). Adults sip nectar of many flowers, including blue beardtongue (*Penstemon* spp.) (Scott 1986). Males are usually active very early and late in the day. In sunny, calm weather, males perch on hilltops and small prairie prominences to await females (Ferris and Brown 1981).

Larval Hostplant: Blue grama (*Bouteloua gracilis*) (Scott 1986).

Known Threats and Management Issues: Existing threats include conversion of habitat for housing developments, mismanagement of grazing regimes, or agricultural use resulting in habitat fragmentation and reduction in good cover of hostplant.

Invertebrate Characterization Abstract
Callophrys mossii schryveri
Schryver's elfin

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Lycaenidae Genus: *Callophrys*

Taxonomic Comments: Formerly in the genus *Incisalia*. The *mossii* complex is separated from the *fotis* complex due to its preference for stonecrop (*Sedum* spp.) as a hostplant. Subspecies *schryveri* occurs in Colorado (Ferris and Brown 1981). *C. mossii schryveri* range is restricted to the Rocky Mountain region. Contrasts with species *C. mossii* in that it is smaller, has a lighter dorsal color in the male; and more contrasting ventral hindwing markings (Scott 1986).

CNHP Rank: G4T3S2S3

Distribution: Global range: The *mossii* complex is confined to the northwestern portion of the United States and southwestern Canada extending south to central California and to east-central Colorado (Stanford and Opler 1993, Ferris and Brown 1981). State range: Foothills and lower montane canyons between 1828 and 2438m (6000 to 8000 feet) (Ferris and Brown 1981). Known from nine counties in the Colorado Rocky Mountain region (Stanford and Opler 1993): Boulder, Clear Creek, Douglas, El Paso, Fremont, Gilpin, Jefferson, Larimer, and Pueblo.

Known Locations in the Study Site: This subspecies has been successfully located in Gregory Canyon and Tenderfoot Trail. Both of these occurrences are within the Boulder Foothills site.

Habitat Comments: Elevational range is between 1828 and 2438m (6000 to 8000 feet). Occupies suitable habitat in Transition to lower Canadian Zone wooded canyons containing the hostplant (Scott 1986). Canyons with steep rocky slopes, mossy bare summits and ridges, brushy foothill ravines, sagebrush hillsides and flats (Pyle 1981).

Phenology: One brood. Flies from February to June depending on locality (Pyle 1981). It is one of the first non-hibernating butterflies to appear in the spring (Ferris and Brown 1981). Stays close to the hostplant, flying erratically and close to the ground, often in inaccessible areas. Males come to damp earth, perching on low shrubs or ground, females are more reclusive and remain higher up on slopes (Pyle 1981). Adults are local, moving an average of only 50m for males and 52m for females over a lifetime (Scott 1986). Males perch all day on shrubs in gulches and on slopes to await females (Scott 1986).

Larval Hostplant: Stonecrop (*Sedum lanceolatum*).

Known Threats and Management Issues: The greatest current threats are extensive urbanization and alteration of habitat. Noxious exotic plants, recreational development and water development continue to threaten lower foothill canyons (even on public lands). The absence of fire and increased tree density may negatively impact hostplant.

Figure 29. *Callophrys mossii schryveri*.
Photo by Paul Opler

Figure 30. Habitat for *Callophrys mossii schryveri*.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract
Euphilotes rita coloradensis
Colorado blue

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Lycaenidae Genus: *Euphilotes*

Taxonomic Comments: There are four recognized subspecies in North America: *rita*, *coloradensis*, *spaldingi*, and *mattoni* (Miller and Brown 1981).

CNHP Rank: G4T2T3S2

Distribution: Global range: The buckwheat blue, *Euphilotes rita* is distributed exclusively in the southwestern United States, from the Mojave Desert of southern California to New Mexico and northward from Nevada to Utah, northern New Mexico, and southern Wyoming. State range: Subspecies *coloradensis* distributed from eastern Colorado (east of the divide) north to south-central Wyoming (Scott 1986). Known from 21 counties in Colorado: Adams, Alamosa, Arapahoe, Chaffee, Cheyenne, Costilla, Custer, Denver, Douglas, El Paso, Elbert, Fremont, Kit Carson, Larimer, Lincoln, Morgan, Prowers, Rio Grande, Saguache, Washington, Weld (Stanford and Opler 1993).

Known Locations within the Study Site: This species has not been successfully located within the study site. It is not documented from Boulder County, although it is expected (Stanford pers. comm.).

Habitat Comments: This subspecies is encountered in Upper Sonoran Desert and plateau country and in undisturbed prairies from 1524 to 2133m in elevation (5000 to 7000 feet) (Ferris and Brown 1981). Found in undisturbed prairie sites where the food plant, bushy eriogonum, (*Eriogonum effusum*) grows abundantly (Stanford pers. comm). Habitats require light to moderate grazing by wildlife or cattle.

Phenology: One flight, mostly August (Scott 1986). Brood coincides with blooming of hostplant. Adults nectar exclusively on larval hostplant and are most easily encountered there (Stanford pers. comm).

Larval Hostplant: Bushy eriogonum (*Eriogonum effusum*).

Known Threats and Management Issues: Threats to habitat include cropland conversion of prairie habitat, removal of grazing regimes, weedy invasions, and suburban development, all resulting in habitat fragmentation. Grazing levels need to be determined to maintain habitat quality.

Invertebrate Characterization Abstract

Celastrina sp 1 Hop-feeding azure

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Lycaenidae Genus: *Celastrina*

Taxonomic Comments: An undescribed species (Opler pers. comm.). The placement of the hops-feeding azure within the summer azures is uncertain. Some believe that it is a distinct species (Wright 1995).

CNHP Rank: G2QS2

Distribution: Global range: Foothills of eastern Colorado Rockies (Wright 1995). State range: Probably endemic to the Front Range of Colorado (Opler pers. comm.). Documented from eight Front Range counties in Colorado : Adams, Arapahoe, Boulder, Douglas, El Paso, Elbert, Jefferson, Larimer (Stanford and Opler 1996, Ellingson et al. 1996, Stanford and Opler 1993).

Known Locations within the Study Site: In 1996, a single individual was documented from Coyote Canyon with no evidence of hostplant or a colony. Efforts to locate the colony were not successful in 1996, and was thus treated as a stray (Pineda 1997). In 1997, a colony of this species was successfully located in Skunk Canyon. Skunk Canyon is located in the Boulder Foothills site.

Habitat Comments: Minimum elevation: 1615m (5300 feet). Typical habitats are mountain canyons and valleys that contain permanent water and contain wild hops (*Humulus lupulus*) (Wright 1995, Fisher 1981), found clambering over shrubs and rocky slopes in canyons and foothills (Weber 1976).

Larval Hostplant: Wild hops (*Humulus lupulus*).

Phenology: Adult flight: Single brood, emerging late May to June; rarely found through mid-July (Wright 1995, Opler pers. comm.). Larval hostplant is wild hops (*Humulus lupulus*).

Known Threats and Management Issues: Extensive urbanization and alteration of habitat is a major threat. Noxious exotic plants, recreational development and water development also continue to threaten lower foothill canyons (even on public lands). Formal description may increase collecting pressure (Opler pers. comm.). Management should include control of noxious weeds and control tree density. Hostplant is an early-successional plant requiring open, sunny areas within canyon habitats. There is some concern that collection of the flowers (for beer brewing purposes) may affect larval food supply.

Figure 31. *Celastrina* sp. 1.
Photo by Paul Opler

Figure 32. Hostplant for *Celastrina* sp. 1.
Photo by Phyllis M. Pineda

Invertebrate Characterization Abstract

Speyeria idalia

Regal fritillary

Taxonomy:

Class: Insecta Order: Lepidoptera
Family: Nymphalidae Genus: *Speyeria*

Taxonomic Comments: One of the two most unique species in the genus. Genus sometimes lumped with *Argynnis* in older literature (Ferris and Brown 1981).

CNHP Rank: G3S1

Distribution: Global range: The range historically extended from New Brunswick to southern lower Michigan, Manitoba, and eastern Montana and in Appalachians to northern Georgia. It suffered a drastic loss of range in the 1980's, especially since 1987. Populations are known to be historic or extirpated in all six New England states, eastern Canada (Ontario, Quebec, New Brunswick), New York, New Jersey, West Virginia, Ohio, and Michigan. Status is unknown in Virginia but extant (1993-94); an apparently reliable report for North Carolina in 1994 (Swengel and Swengel 1994). State range: One confirmed colony in Kit Carson County (Stanford pers. comm). Sightings of worn individuals outside of breeding season known from 11 other Colorado counties (Stanford and Opler 1993): Boulder, Douglas, El Paso, Gilpin, Jefferson, Kit Carson, Logan, Morgan, Park, Sedgwick, and Yuma.

Known Locations within the Study Site: In 1996, this species was sighted near Halfway House on Flagstaff Mountain Road (Boulder Foothills site), and in 1997, it was successfully located at Towhee Trail near South Boulder Creek (Shanahan Grasslands site). The 1996 sighting was not documented as an actual occurrence due to the small size of the surveyed area. The 1997 sighting is being treated as a tentative occurrence because of its proximity to a known hostplant, the size of the habitat, and its phenological condition. Additional surveys should be continued near Towhee Trail to determine the presence or absence of a permanent colony.

Habitat Comments: Found in moist meadows and undisturbed prairie lands near marshes (Ryke et al. 1994, Ferris and Brown 1981). Range reduced with conversion of prairies to agriculture, but this species may re-establish in moist areas associated with reservoirs and irrigation projects (Ferris and Brown 1981).

Phenology: One brood with emergence of adults sometimes staggered; therefore, it may be found during most of the summer (Ferris and Brown 1981). One flight June through early September (Scott 1986). Females mate soon after emergence, but delay oviposition for at least a month. Females oviposit on dead vegetation near the hostplant. The larvae overwinter as hatchlings and are nocturnal feeders of violets (*Viola* spp.) in the spring (Ryke et al. 1994).

Larval Hostplant: Herb Violaceae including birdfoot violet (*Viola pedatifida*) (Scott 1986).

Known Threats and Management Issues: Declines are likely due to continuing destruction and fragmentation of plains habitat by the conversion of prairies to cropland. Although individuals are sometimes found near irrigation projects and other artificial moist habitats, emphasis should be placed on the preservation of native habitat in natural condition.

This species is a highly mobile species and may require corridors of undisturbed habitat, or large unfragmented portions of habitat in order to maintain genetic viability and diversity.

Figure 33. *Speyeria idalia*.
Photo by Paul Opler

Figure 34. Habitat for *Speyeria idalia*.
Photo by Phyllis M. Pineda

Appendix B. Adult Butterfly and Skipper Phenologies

This table is intended to provide an outline for adult appearances (flight and mating times) for each of the targeted species of concern.

For Global and State Rankings, please see Table 3 on page 22. For species information, please see the Species Characterization Abstracts for each of these species beginning on page 69.

Table 18. Adult Phenologies for Targeted Species of Concern

Species	April		May		June		July		August	
<i>Callophrys mossii</i>	⇒	⇒	⇒							
<i>schryveri</i>	⇒	⇒	⇒							
<i>Polites rhesus</i>			⇒	⇒						
			⇒	⇒						
<i>Stinga morrisoni</i>			⇒	⇒	⇒					
			⇒	⇒	⇒					
<i>Atrytonopsis</i>				⇒	⇒					
<i>hianna</i>				⇒	⇒					
<i>Erynnis martialis</i>			⇒	⇒	⇒	⇒				
			⇒	⇒	⇒	⇒				
<i>Amblyscirtes</i>			⇒	⇒	⇒	⇒				
<i>simius</i>			⇒	⇒	⇒	⇒				
<i>Celastrina</i> sp. 1				⇒	⇒	⇒	⇒			
					⇒	⇒				
<i>Polites origenes</i>					⇒	⇒	⇒			
					⇒	⇒	⇒			
<i>Euphyes</i>						⇒	⇒			
<i>bimacula</i>						⇒	⇒			
<i>Hesperia ottoe</i>						⇒	⇒	⇒		
						⇒	⇒	⇒		
<i>Atrytone arogos</i>						⇒	⇒	⇒		
						⇒	⇒	⇒		
<i>Paratrytone</i>							⇒	⇒		
<i>snowi</i>							⇒	⇒		
<i>Euphilotes rita</i>									⇒	⇒
<i>coloradensis</i>									⇒	⇒

Appendix C. Associated Butterfly and Skipper Species

A checklist is provided below of species that were verified in the study area during 1996 and 1997. Any and all specimens taken have been deposited at the Henderson Museum at University of Colorado in Boulder, Colorado.

Family Hesperidae (Skippers and Skipperlings)

<i>Epargyreus clarus</i>	Silver-spotted skipper
<i>Thorbyes pylades</i>	Northern cloudywing
* <i>Erynnis martialis</i>	Mottled duskywing
<i>Erynnis pacuvius</i>	Pacuvius duskywing
<i>Erynnis afranius</i>	Afranius duskywing
<i>Erynnis persius</i>	Persius duskywing
<i>Pyrgus communis</i>	Common checkered-skipper
<i>Pholisora cattulus</i>	Common sootywing
<i>Piruna pirus</i>	Russet skipperling
<i>Oarisma garita</i>	Garita skipperling
*† <i>Stinga morrisoni</i>	Morrison's skipper
<i>Hesperia uncas</i>	Uncas skipper
* <i>Hesperia ottoe</i>	Ottoe skipper
<i>Hesperia leonardus pawnee</i>	Leonard's skipper
<i>Hesperia pahaska</i>	Pahaska skipper
<i>Hesperia viridis</i>	Green skipper
<i>Polites themistocles</i>	Tawny-edged skipper
* <i>Polites origenes</i>	Crossline skipper
<i>Polites mystic</i>	Long dash
* <i>Atrytone arogos</i>	Arogos skipper
<i>Atrytone logan</i>	Delaware skipper
<i>Ochlodes sylvanoides</i>	Rare skipper
* <i>Paratrytone snowi</i>	Snow's skipper
<i>Poanes taxiles</i>	Taxiles skipper
* <i>Euphyes bimacula</i>	Two-spotted skipper
<i>Euphyes vestris</i>	Dun skipper
<i>Amblyscirtes aenus</i>	Bronze roadside skipper

Family Papilionidae (Swallowtails)

<i>Papilio polixenes</i>	Black swallowtail
<i>Papilio zelicaon</i>	Anise swallowtail
<i>Papilio indra</i>	Indra swallowtail
<i>Pterourus rutulus</i>	Western tiger swallowtail
<i>Pterourus multicaudata</i>	Two-tailed swallowtail
<i>Pterourus eurymedon</i>	Pale swallowtail

Family Pieridae (Whites and Sulfurs)

<i>Pontia sysimbrii</i>	Spring white
<i>Pontia protodice</i>	Checkered white
<i>Pontia occidentalis</i>	Western white
<i>Artogeia rapae</i>	Cabbage white
<i>Euchloe ausonides</i>	Creamy marbling
<i>Euchloe olympia</i>	Olympia marble
<i>Anthocharis sara</i>	Sara orangetip
<i>Colias philodice</i>	Clouded sulfur
<i>Colias eurytheme</i>	Orange sulfur
<i>Colias alexandra</i>	Queen Alexandra's sulfur
<i>Eurema mexicana</i>	Mexican yellow

Family Lycaenidae (Coppers, Hairstreaks, Blues, and Metalmarks)

<i>Lycaena dione</i>	Gray copper
<i>Lycaena hyllus</i>	Bronze copper
<i>Chalceria heteronea</i>	Blue copper
<i>Harkenclenus titus</i>	Coral hairstreak
<i>Satyrium liparops</i>	Striped hairstreak
<i>Satyrium saepium</i>	Hedgerow hairstreak
<i>Callophrys affinis apama</i>	Bramble hairstreak
<i>Callophrys sheridanii</i>	Sheridan's hairstreak

<i>Callophrys augustinus</i>	Brown elfin
* <i>Callophrys mossii schryveri</i>	Schryver's elfin
<i>Callophrys polios</i>	Hoary elfin
<i>Callophrys eryphon</i>	Western pine elfin
<i>Mitoura siva</i>	Juniper hairstreak
<i>Strymon melinus</i>	Gray hairstreak
<i>Hemiargus isola</i>	Reakirt's blue
<i>Everes amyntula</i>	Western tailed-blue
<i>Celastrina ladon</i>	Spring azure
* <i>Celastrina</i> sp. 1	Hops azure
<i>Euphilotes enoptes ancilla</i>	Dotted blue
<i>Glaucopsyche piasus</i>	Arrowhead blue
<i>Glaucopsyche lygdamus</i>	Silvery blue
<i>Lycaeides melissa</i>	Melissa blue
<i>Icaricia icariodes</i>	Boisduval's blue
<i>Icaricia acmon</i>	Acmon blue
<i>Agriades rustica</i>	Arctic blue
<i>Apodemia nais</i>	Nais metalmark

Family Nymphalidae (Fritillaries, Checkers, Anglewings, and Nymphs)

<i>Euptoieta claudia</i>	Variegated fritillary
<i>Speyeria aphrodite</i>	Aphrodite fritillary
* <i>Speyeria idalia</i>	Regal fritillary
<i>Speyeria edwardsii</i>	Edwards' fritillary
<i>Speyeria coronis</i>	Coronis fritillary
<i>Speyeria callippe</i>	Callippe fritillary
<i>Polydryas arachne</i>	Arachne checkerspot
<i>Charidryas gorgone</i>	Gorgone checkerspot
<i>Phyciodes tharos</i>	Pearl crescent
<i>Phyciodes pratensis</i>	Field crescent
<i>Euphydryas anicia</i>	Anicia checkerspot
<i>Polygonia interrogationis</i>	Question mark
<i>Polygonia satyrus</i>	Satyr comma
<i>Polygonia gracilis</i>	Hoary comma
<i>Nymphalis antiopa</i>	Mourning cloak
<i>Nymphalis milberti</i>	Milbert's tortoise shell
<i>Vanessa cardui</i>	Painted lady
<i>Basilarchia atlantis</i>	Red admiral
<i>Basilarchia archippus</i>	Viceroy
<i>Basilarchia weidemeyerii</i>	Weidemeyer's admiral
<i>Asterocampa celtis</i>	Hackberry emperor
<i>Coenonympha tullia</i>	Ochre ringlet
<i>Cercyonis pegala</i>	Common wood nymph
<i>Cercyonis oetus</i>	Small wood nymph
<i>Erebia epipsodea</i>	Common alpine
<i>Oeneis chryxus</i>	Chryxus arctic

Family Danaidae (Milkweed Butterflies)

<i>Danaus plexippus</i>	Monarch
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*Tracked by the CNHP

†Watchlisted species

