# Survey of Critical Biological Resources in Boulder County, Colorado 2007-2008



**Colorado Natural Heritage Program**
**Colorado State University**
**8002 Campus Delivery**
**Fort Collins, Colorado 80523-8002**

Natural Heritage Program COLORADO

Colorado State University

*Knowledge to Go Places*

**Survey of Critical Biological Resources in Boulder County, Colorado 2007-2008**

***Prepared for:***
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***"If I have seen further it is by standing on the shoulders of giants."***
**-Isaac Newton (1675)**

## EXECUTIVE SUMMARY

Citizens of Boulder County are concerned about issues of open space, wildlife habitat, and conservation of their unique natural surroundings. They recognize the need to plan for the conservation of the plants, animals and plant communities that are native to Boulder County. They also recognize that with limited economic resources, it is important to prioritize conservation efforts. The need for information on the locations of the most significant biological resources of the area is urgent.

In 2006, Boulder County requested that the Colorado Natural Heritage Program (CNHP) survey for critical biological resources of Boulder County. The goal of the project was to systematically identify the locations of rare species and significant natural plant communities in Boulder County, and to identify and prioritize areas of critical habitat (potential conservations areas) for these species and communities. Additional goals of the project were to help assess the biological integrity on specific lands under consideration for conservation action, update data on existing protected open space properties, and provide data for development review purposes through the Boulder County Land Use Department.

Field survey work began in May 2007 and continued through September 2008. Private lands within the eastern half of the county and specific properties identified by the clients were given the highest priority for inventory. Locations selected by CNHP for the survey were identified by examining existing biological data for rare plant and animal species, and significant plant communities (collectively called "elements") from CNHP's database and accumulating additional existing information on these elements. Areas that were expected to contain significant elements were delineated as "Targeted Inventory Areas" (TIAs). These areas were prioritized for inventory based on the relative rarity of the elements expected to be found there and the area's ability to maintain viable populations of those elements. Additional TIAs were identified by the clients. Extensive field surveys were conducted within the TIAs, and areas found to contain significant elements were delineated as "Potential Conservation Areas" (PCAs).

Results of the survey confirm that there are many areas with high biological significance in Boulder County. There are several rare plants and animals that depend on these areas for survival. All together, 58 rare or imperiled plant species, 32 rare or imperiled animal species (18 vertebrate and 14 invertebrates), and 63 plant communities of concern have been documented in Boulder County. Natural history summaries for many of these plants and animals are presented in the final section of this report. The CNHP database currently houses more than 450 element occurrence records (EORs) within Boulder County. As part of this project, 225 new EORs were created and approximately 150 EORs were updated.

Of particular interest are intact foothills and piedmont grassland communities in the northeastern and southeastern corners of the county, respectively. Also important are documented locations of the rare plants, like Bell's twinpod (*Physaria bellii*) and Larimer

aletes (*Aletes humilus*), and animal populations like Preble's meadow jumping mouse (*Zapus hudsonius preblei*) populations. Boulder County is truly unique with a remarkable richness of rare fauna and flora well worth preserving for future generations. Overall, the concentration and quality of imperiled elements and habitats attest to the fact that conservation efforts in Boulder County will have both statewide and global significance.

All of the PCAs presented in this report represent unique opportunities for the Partners to conserve significant components of the natural heritage of Boulder County, and each is worthy of conservation attention. However, some areas of the county stand out on a statewide or global scale, either because the species present are extremely rare and localized in their distribution, or because a suite of significant species and communities co-occur in a high quality landscape setting. These areas include the intact foothills to grassland complex in the northeastern part of the county, the rare plant concentration in the North St. Vrain watershed, and hogbacks supporting the rare Bell's twinpod and Piedmont grassland habitat.

The results of the survey will be provided to the Partners in GIS format and the report will be available to the pubic on the CNHP website (www.cnhp.colostate.edu).

## ACKNOWLEDGEMENTS

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# INTRODUCTION

The people of Boulder County have long recognized the importance of natural resources. Extractive natural resource use was the basis for settlement of Colorado and persistence of settlement in Boulder County. However, Boulder County's location on the landscape creates conditions for a broad diversity of habitats and biota; it has long attracted a diverse mix of people that used and then settled and developed the land, recognizing its value to support many facets of civilization. Early establishment of civic institutions and commercial enterprise broadened the initial focus of resource extraction to tourism, recreation, and study. The founding of the University of Colorado in 1876 set the stage for an influx of natural science professionals to live and work in Boulder County. Thus, natural resource use has long been coupled with a history of observation and research as well as protection and conservation in Boulder County.

*Boulder County Planning History*

Some form of land planning has occurred in Boulder County since its settlement by gold prospectors in 1867 (Smith 1981). Early recognition of the natural beauty of the rugged terrain prompted a nascent tourist industry (Croffutt 1885, Wolle 1949, Veblen and Lorenz 1991), an influence that balanced land preservation with natural resource use. The first informal open space, was purchased by the City of Boulder in 1898 to attract the Texas Chautauqua (League of Women Voters 2007), an organization that paired entertainment and education with the outdoors. Federal grants were garnered in 1907 to augment the 80-acre Chautauqua parcel with 1,600 acres of adjacent land preserved as parkland between the growing city and the mountains. Boulder County has continued to steadily attract residents punctuated by surges in growth. Each growth boom was addressed with planning efforts to preserve the nature of the communities in the county. For example, the Blue Line was established in 1959 to address urban growth and maintain an undeveloped mountain view behind the city of Boulder. Current planning continues to address natural resources. The Boulder County Comprehensive Plan has an Environmental Resource Element that contributes significantly to land use code (Boulder County Land Use Department 1999). Land managers and stewards are required to ensure biological diversity is not diminished. Beginning in 1967, consistent approval of sales taxes to preserve open space within municipalities and within the County demonstrates continued support for the protection of natural resources. On-going open space planning that is community-based perpetuates the shift in planning emphasis from development toward preservation (League of Women Voters 2007).

*Urgency and Need*

CNHP's *Survey of Critical Biological Resources of Boulder County, Colorado* project provides timely, up-to-date information on the breadth of critical biodiversity within Boulder County. Population growth along the Colorado Front Range exploded during the 1990's (U.S. Census Bureau 2008). Growth in Colorado outpaced national rates, especially in Boulder, Douglas, and Larimer counties along the Front Range. Growth rates have subsided since 2000, but development pressure continues to escalate with increased population. Master plans are scheduled for updating to incorporate significant

changes since the current plans were established. For example, the growth boom of the 1990's filled much of the build-out plan in the county, there have been significant changes in air and water quality regulations at both the state and federal levels to incorporate, and the continued decline in agricultural operations—formerly a source of large tracts of land in open character—impacts development patterns in the county. Further, recreational use of City- and County-managed open space (approximately 89,000 acres; Boulder County Parks and Open Space 2008) has reached record intensity levels; City and County open space properties receive about 1.2 million visitors per year, a staggering impact that challenges land managers and stewards. Current data on biological resources are needed to inform a variety of land management decisions, to evaluate development proposals in a timely and ecologically sensitive manner, to make land management decisions that sustain open space properties, and to prioritize conservation areas for purchase or agreement.

*Previous Research*

Boulder County has a wide range of plants, animals, and natural plant communities that have attracted notable scientific research. The concept of ecological life zones, a fundamental classification of the landscape (that will be used in this report), was developed from research sites in Boulder County and along the Front Range (Marr 1967). Pioneering studies in high elevation mountain ecology led to the founding of the Mountain Research Institute in 1921 and subsequent establishment of the Niwot Ridge Long Term Ecological Research (LTER) site, one of 26 LTER sites around the country that form the basis of research on large-scale, long term ecological phenomena throughout different biomes (LTER Network 2008). Hallock and Jones (1999) chronicle the historical studies of birds in Boulder County beginning with Gale in 1883, followed by Henderson in 1907 and 1908, Betts in 1913, and Alexander in 1937. The collections at the University of Colorado form a record from which authoritative state-wide scientific texts on mammals (Fitzgerald et. al. 1994), vascular plants (Weber and Wittmann 2001a, 2001b), and non-vascular plants (Weber and Wittman 2007) were based. This history of study has provided a patchwork of baseline data to inform the current picture of the abundance, distribution, and dynamics of biodiversity and its habitat in Boulder County.

Current research continues to inform the picture of biodiversity and documents changes and trends, which refines our understanding of the needs of biological organisms and their habitat within the jurisdiction of Boulder County. Modern research questions illustrate a shift toward addressing management considerations for biodiversity. Studies of abundance, diversity, and distribution of raptors (Berry et al. 1998, Berry and Bock 1998, Jones 1991), butterflies (Collinge et al. 2003), bats (Adams and Thibault 2006, Adams et al. 2003), and prairie dogs (*Cynomys ludovicianus*; Johnson and Collinge 2004) have occurred with an eye toward landscape requirements for species survival. Effects of recreation trails on bird communities (Miller et al. 2003), prairie dogs (Beckoff and Ickes 1999), raptors (Richardson and Miller 1997, Fletcher et al. 1999), andsmall mammals (Meaney et al. 2002) have characterized the impacts of people on these biodiversity. Impacts of landscape fragmentation and its implications on biodiversity conservation were investigated (Collinge and Forman 1998). Further, increased urbanization affects songbird diversity and distribution (Bock et al. 1999) and has secondary effects of

increased brood parasitism on songbird populations (Chace et al. 2003, Chace and Cruz 1997). Management of invasive species has been studied in riparian areas (Katz and Shafroth 2003) and in uplands (Luken and Seastedt 2004). Patch dynamics studies within biological communities elucidate the scale at which these elements need to be addressed (Keeler 2004, Collinge et al. 2003). Disturbance dynamics have been studied intensively, elucidating trends of forest structure to inform land management decisions. Long-term studies in four ecosystems in Boulder County were established by Marr (1967) during seminal studies on life zones. These study sites were re-visited to assess conditions after 28 years of change (Kooiman and Linhart 1986) and after 43 years (Korb and Ranker 2001). Ponderosa pine (*Pinus ponderosa*) savanna-grassland ecotone dynamics were investigated (Mast et al. 1998, League and Veblen 2006) as well as management recommendations studies for ponderosa pine forests (Wolk and Rocca 2008). Natural fire return intervals and processes were studied in light of anthropogenic change on the landscape (Veblen et all. 2000, Veblen and Lorenz 1991) with predictions of future trends offered (Reuth et al. 2002, Keane et al. 2002). There are many others.

The myriad past and present studies illustrate the breadth of biodiversity on the landscape of Boulder County and the County's commitment to its stewardship. While all biodiversity has inherent value, the goal of the *Survey of Critical Biological Resources of Boulder County, Colorado* project was to distill information on **rare, threatened, and endangered** biodiversity, a select set of species and habitats, from this wealth of research and information within the spatial scope of the County. These are the imperiled species that require land use and management attention to prevent extinction or local extirpation. Identifying places on the landscape that contain rare, threatened, and endangered biodiversity allows conservation of these resources for future generations, and proactive planning to avoid conflicts in the future between developers and natural resource managers. This survey of critical biological resources of Boulder County is part of an ongoing biological inventory of Colorado counties by CNHP. To date, similar inventories have been conducted in all or parts of 34 Colorado counties. In 2006, Boulder County Parks and Open Space requested that the Colorado Natural Heritage Program (CNHP) survey for critical biological resources of Boulder County.

This *Survey of Critical Biological Resources in Boulder County, Colorado* used the methods that are employed worldwide throughout Natural Heritage Programs and Conservation Data Centers (NatureServe 2008). These methods include ranking systems to prioritize biodiversity based on rarity and threats to its persistence. The primary focus of the project was to incorporate data on the locations of the plant and animal populations and plant communities on CNHP's list of rare and imperiled elements of biodiversity, assess their conservation value, and systematically prioritize these for conservation action.

The locations of biologically significant areas were identified by:

- Examining existing biological data for rare or imperiled plant and animal species and significant plant communities (collectively called **elements)**;

- Accumulating additional existing information (e.g., interviews of local experts); and
- Conducting extensive field surveys.

Locations in the county with natural heritage significance (those places where elements have been documented) are presented in this report as Potential Conservation Areas (PCAs). The goal was to identify a land area that can provide the habitat and ecological needs upon which a particular element or suite of elements depends for their continued existence. The best available knowledge of each species' life history was used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, and current and potential land uses to delineate PCA boundaries.

**The PCA boundaries delineated in this report do not confer any regulatory protection of the site, nor do they automatically recommend exclusion of all activity.** It is hypothesized that some activities will prove degrading to the element(s) or the ecological processes on which they depend, while others will not. The boundaries represent the best professional estimate of the primary area supporting the long-term survival of the targeted species or plant communities and are presented 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 of natural heritage resources and sensitive species. Please note that these boundaries are based primarily on our understanding of ecological systems. A thorough analysis of the human context and potential stresses was not conducted. All land within the conservation 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.

CNHP uses the Natural Heritage Ranking Methodology (NatureServe 2008) to prioritize conservation actions by identifying those areas that have the greatest chance of conservation success for the most imperiled elements. The sites are prioritized according to their **biodiversity significance rank**, or "B-rank," which ranges from B1 (outstanding significance) to B5 (general or statewide significance). These ranks are based on the conservation (imperilment or rarity) ranks for each element and the element occurrence ranks (viability rank) for that particular location. Therefore, the highest quality occurrences (those with the greatest likelihood of long-term survival) of the most imperiled elements are the highest priority (receive the highest B-rank). See Appendix A for more details. The B1-B3 sites are the highest priorities for conservation actions. Based on current knowledge, the sites in this report represent areas CNHP recommends for protection in order to preserve the natural heritage of Boulder County based on this survey.

In addition to presenting prioritized PCAs, this report also includes a section with biological summaries of selected plants and animals that are known to be found within the PCAs. It also contains lists of elements that are documented in the County, but are not necessarily attributed to PCAs due to life history characteristics and CNHP methodology for PCAs.

## *STUDY AREA*

There are many factors that drive the occurrence of biodiversity in the study area. These include biophysical factors like location, position on the regional landscape, geomorphology, climate, soils, and bedrock geology. These factors broadly dictate vegetation dynamics and wildlife habitat development. Overlain on top of the biophysical setting are historical factors like land use history, past and present. The next sections will discuss the biophysical and anthropogenic factors that affect biodiversity distribution in Boulder County. Boulder County spans a transitional area between two large ecological regions and thus has component elements of both. It has a mountainous west and a relatively flat east. The disparate resources of these markedly different halves molded land use and settlement of the area and continues to affect land use decisions today.

### *Study Area Location*

Boulder County is in north central Colorado embedded within the Colorado Front Range (Figure 1). It encompasses about 740 square miles (191,660 ha) and is roughly 30 mile east-west by 24 miles north-south. It ranges in elevation from 4,895 ft (1,492 m) in the northeastern part of the county where St. Vrain Creek crosses into Weld County to 14,259 feet (4,346 m) at the top of Long's Peak in Rocky Mountain National Park. The western boundary of Boulder County is formed by the Continental Divide, which is at its easternmost extent in Boulder County; hydrologic resources within the entire County flow east in the South Platte River Drainage. A most striking and defining feature of Boulder County is its rapid transition in elevation; all elevational life zones are compressed into a short distance within Boulder County. The full gradient of elevation from alpine to the plains is traversed within about fifteen miles in Boulder County, a remarkably short distance even on the Colorado Front Range.

### *Regional geomorphology*

Like many Front Range counties, Boulder County straddles the convergence of the high plains and the Rocky Mountains (Figure 2). The Colorado Front Range is characterized by the abrupt transition between the mountains and plains with intervening hogbacks. The mountainous region of Boulder County harbors evidence of the successive mountain building periods that resulted in the Ancient Rocky Mountains and the Rocky Mountains of today (Bridge 2004, Chronic and Williams 2002). There is a steep rise in slope at the foothills, with a leveling roughly between areas like Gold Hill and Ward, before a final rise toward the jagged ridges of the Indian Peaks.

Boulder County sits where the arc of the Denver Basin meets the Front Range. A series of sandstone hogbacks generally characterize the foothills of the Front Range, but the Denver Basin landscape feature pinches them out, compressing the transitional area to hundreds of meters rather than tens of miles. Only the steeply tilted Fountain Formation traverses the county as a hogback landform. The southern terminus of the foothills hogbacks extends just across the Boulder-Larimer county line to the south of Lyons in north-central Boulder County. Although Rabbit Mountain juts out into the Denver Basin, displaced by faulting (Braddock et al. 1988b, Madole et al. 1998), the hogback series so prominent in Larimer County to the north is largely replaced by outwash fans in Boulder

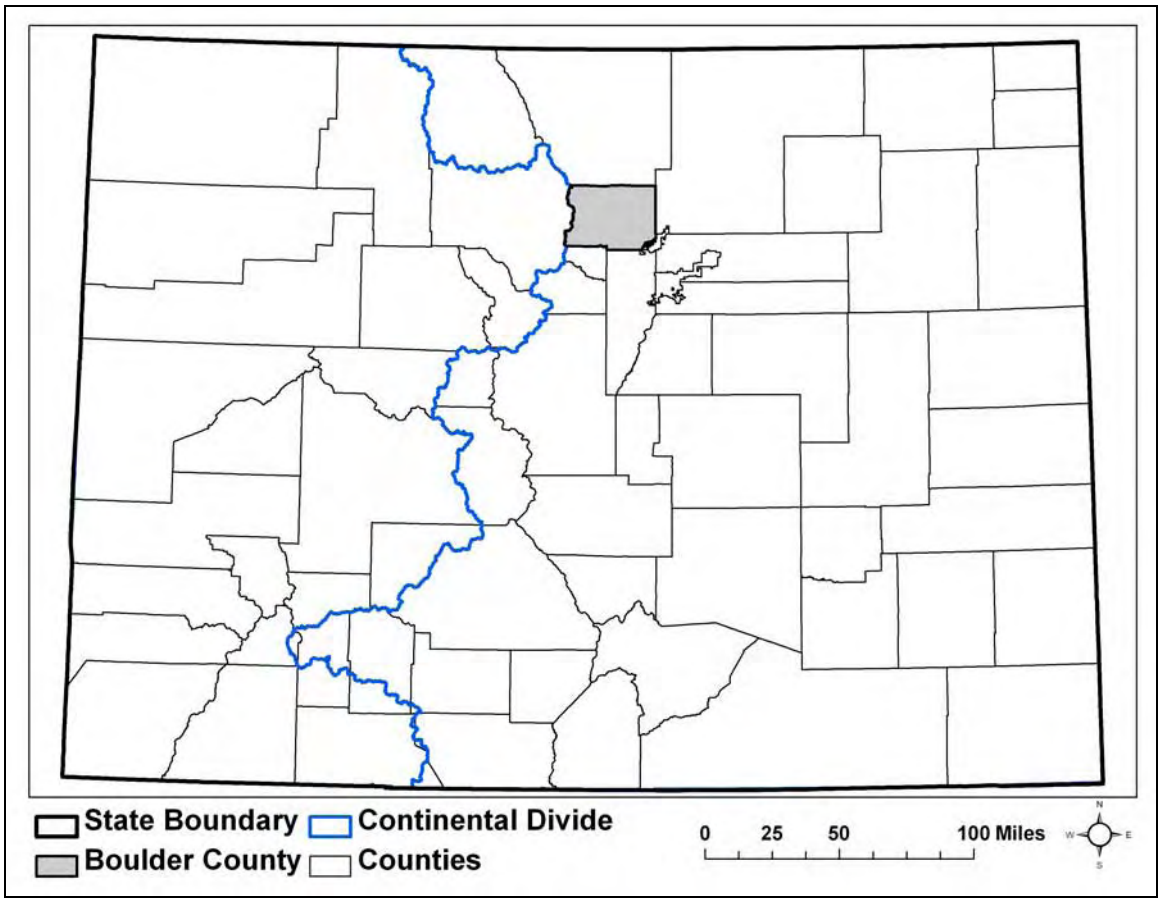



**Figure 1. Location of Boulder County within Colorado.**

County with their characteristic small mesa and valley landforms. The outwash mesas in Boulder County are unique within Colorado. They are capped with Quaternary alluvium debris, not volcanic flows, and are generally oriented east-west. The debris that flowed down from the mountain from the series of erosional events was deposited in multiple layers, each with different stability characteristics (Scott 1960). The most durable layers formed flat surfaces capping the mesas, like Table Mountain. Less durable layers were downcut into intervening valleys.

### *Ecoregions*

Boulder County occupies an ecological transition zone between the Rocky Mountains and the Great Plains in Colorado, which creates a wide diversity of landscapes and topographic features. Boulder County has areas located within both the Central Shortgrass Prairie and Southern Rocky Mountains ecoregions as defined by The Nature Conservancy (modified from Bailey 1994; Figure 3). The ecoregional boundary traverses Boulder County from north to south skirting the west side of Lyons and Boulder municipalities. The western two thirds of Boulder County is within the Northern Parks and Ranges section of the Southern Rocky Mountains ecoregion (Neely et al. 2001). The Southern Rocky Mountains ecoregion extends from southern Wyoming to northern New Mexico; the Front Range forms the northeastern edge of the Southern Rocky Mountain

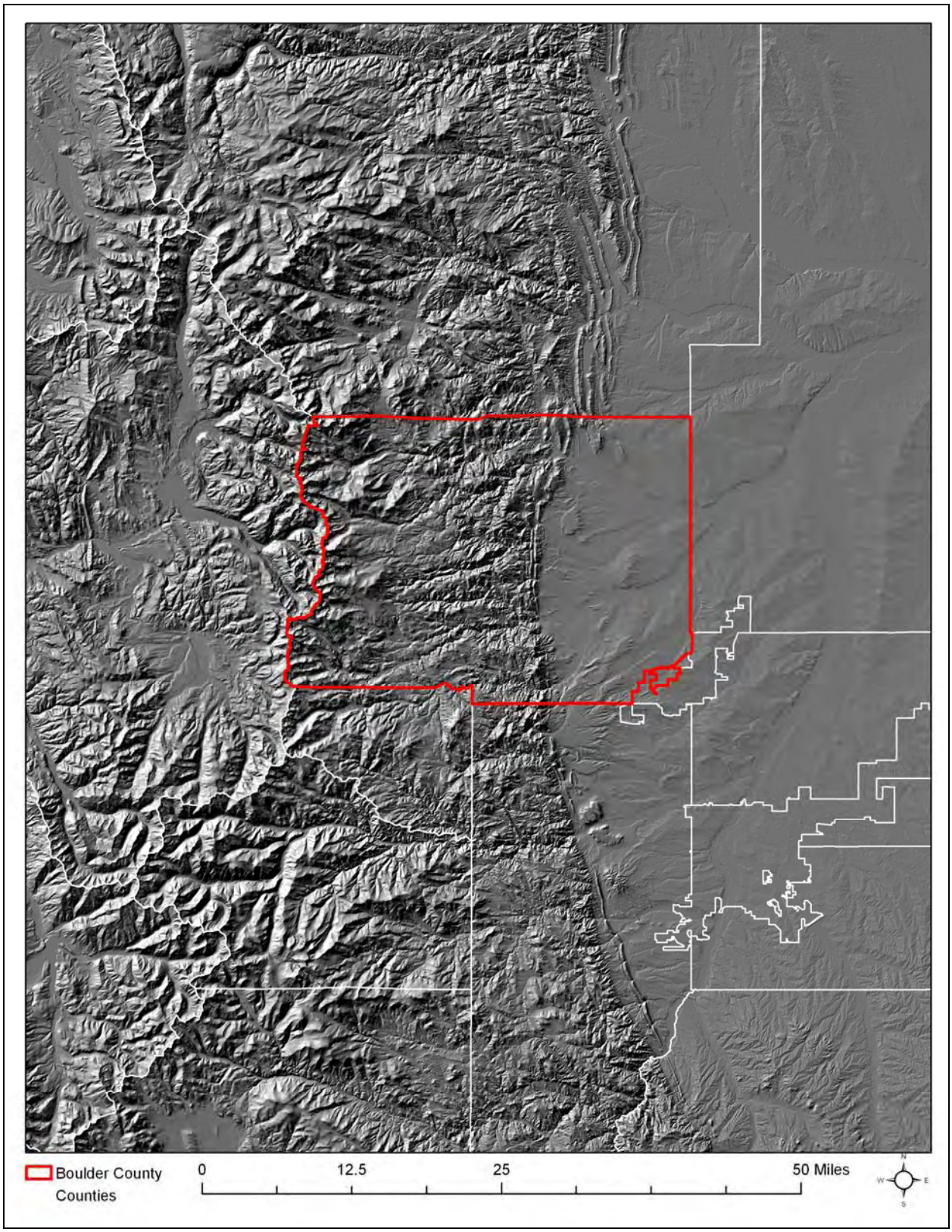



**Figure 2. Regional landscape of Boulder County and the Front Range.**

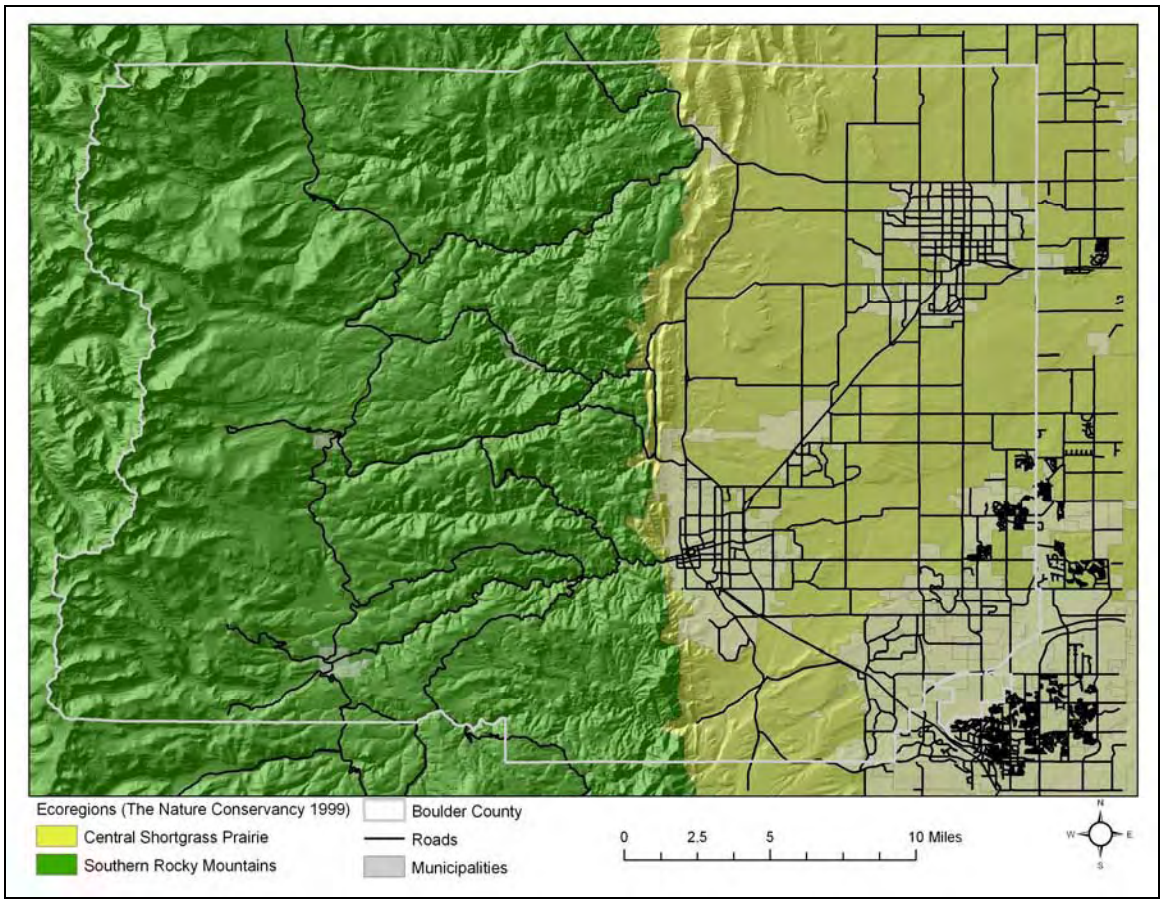



**Figure 3. Ecoregions (The Nature Conservancy 1999) in Boulder County.**

ecoregion and Boulder County occurs in approximately the latitudinal center of it. The ecoregion spans a large elevation range as it includes major mountain systems and the intervening valleys and parks. The Northern Parks and Ranges are characterized by an extensive continuum of alpine tundra and subalpine forest that grade into montane forests, including large stands of lodgepole pine (*Pinus contorta*), and mixed ponderosa pine (*Pinus ponderosa*) with Douglas-fir (*Pseudotsuga menziesii*). Within the Central Shortgrass Prairie ecoregion, Boulder County is within the Central High Plains section and has elements of the Foothills and Black Forest sections (Central Shortgrass Prairie Planning Team 2006).

Chapman et al. (2006) defined ecoregional subsections on the basis of vegetation and geologic substrate. Subsections of the northeastern zone of the Southern Rocky Mountain ecoregion are shown in Figure 4. These subsections display the extent of broad vegetation types within the county and the proportions of land area covered is shown in Figure 5 (pie chart). Alpine systems (or those above treeline) are tundra meadows and exposed rock; these comprise 10% of the land area in Boulder County. Subalpine forests are categorized as crystalline, sedimentary, and volcanic based on bedrock geology in Chapman et al. (2006). The bedrock geology influences soil development beneath these spruce-fir (*Picea-Abies*) forests. Only crystalline-based forests occur in Boulder County and they cover approximately 13% of the county. Mid-elevation forests similarly are

split by bedrock geology and are represented only by crystalline types in the County; these mixed conifer forests cover around 37% of the land area. The irregular terrain of the Foothill Shrubland ecoregional subsection is restricted to the north-central portion of the County (Figure 4) and occurs on about four percent of the land surface. The other prominent subsection in Boulder County is the Front Range Fans, which largely support grasslands and encompass about 34% of the land area in the county. The Front Range Fans are limited to the northern Front Range in Colorado and are characterized by outwash terraces, benches, and alluvial fans that skirt the mountains. The fans transition to a high plains landscape on the far eastern side of Boulder County represented by the Flat to Rolling Plains subsection. Soils on the Plains become finer textured with more wind-blown loess and less outwash character with distance from the mountain front.

***Rivers***

Boulder County is found entirely within the South Platte Basin (Figure 6). Boulder County's major drainages are Boulder Creek, Lefthand Creek, St. Vrain Creek, and the Little Thompson Creek in the extreme north central portion of the County. Perennial tributaries within the Boulder Creek watershed include Coal, South Boulder, Bear, Goose, and Four Mile Canyon creeks. Lefthand Creek watershed contains Lefthand, James, and Little James creeks and numerous small streams flow intermittently through the year. The St. Vrain Creek watershed is drained by the North and South St. Vrain creeks.

***Climate***

Climate along the Front Range is highly variable. It has a semi-arid, temperate, continental climate (warm, dry summers; cold, dry winters) modified by the Rocky Mountains. Elevation and orientation of mountain ranges affect general air movements in Colorado and these affect local climatic conditions (Doesken et al. 2003); the position of the Front Range on the far eastern edge of the Rocky Mountains influences climate features. Several categories of wind patterns affect the Boulder County area and they vary seasonally (Kittel et al. 2002). In general wind patterns are dominated by strong, consistent, continental westerly air flow (Paddock 1964). Air dries as it passes over the Intermountain West and is orographically uplifted over the Rocky Mountains, leaving the East Slope with low relative humidity (Doesken et al. 2003). In winter, storms result from moisture-laden flow from the Pacific Northwest and from the southwest. Thunderstorms are common in the mid- to late summer as wind patterns often shift to more southerly directions providing monsoonal moisture to convection storms (Doesken et al. 2003). Rain and snowfall can vary widely from year to year on both regional and local scales. The plains and foothills have additional wind patterns. Polar air masses from boreal Canada and maritime tropical air masses from the Gulf of Mexico are impeded by the mountains and can result in upslope storms that occur from an easterly direction. The rainshadow effect of the mountain range also sets the stage for periodic severe Chinook winds, which moderates the climate of the foothills.

Within Boulder County climate tends to vary with topography, which dictates elevation, slope, and aspect (exposure); the eastern plains have dramatically different climate parameters than the mountain areas to the west. Climate data for the past one hundred years was accessed via PRISM (Spatial Climate Analysis Service 2008) as well as from

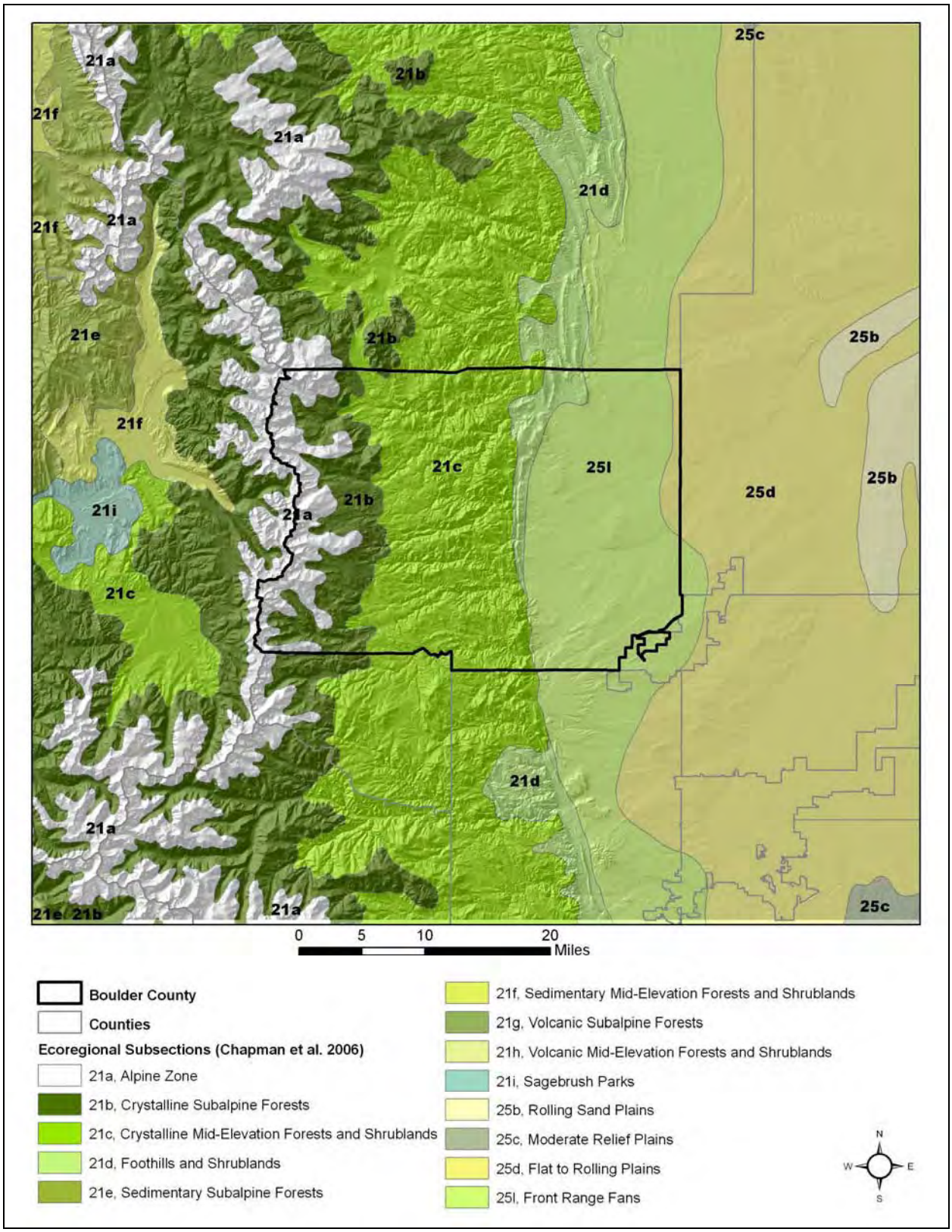



**Figure 4. EPA ecoregional subsections (Chapman et al. 2006) in the vicinity of Boulder County.**

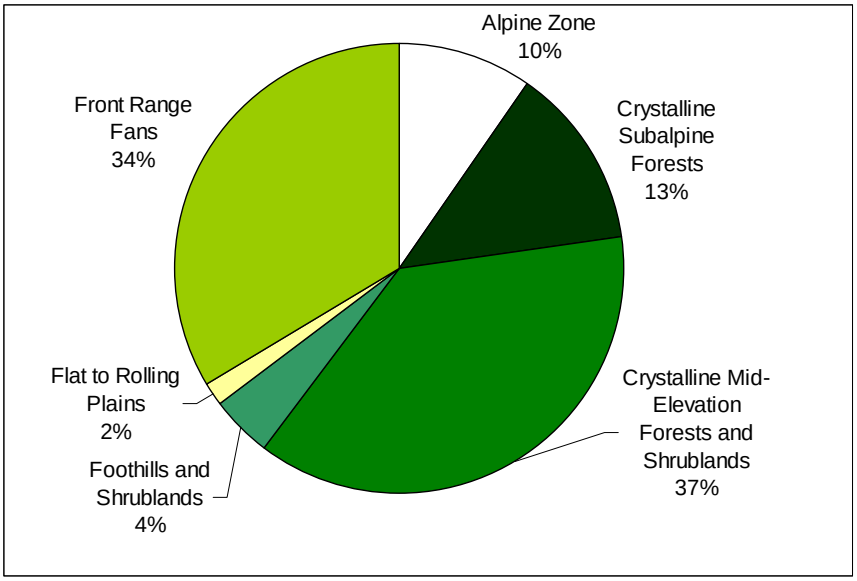



**Figure 5. Percentage of land area in Boulder County covered in EPA ecoregional subsections.**

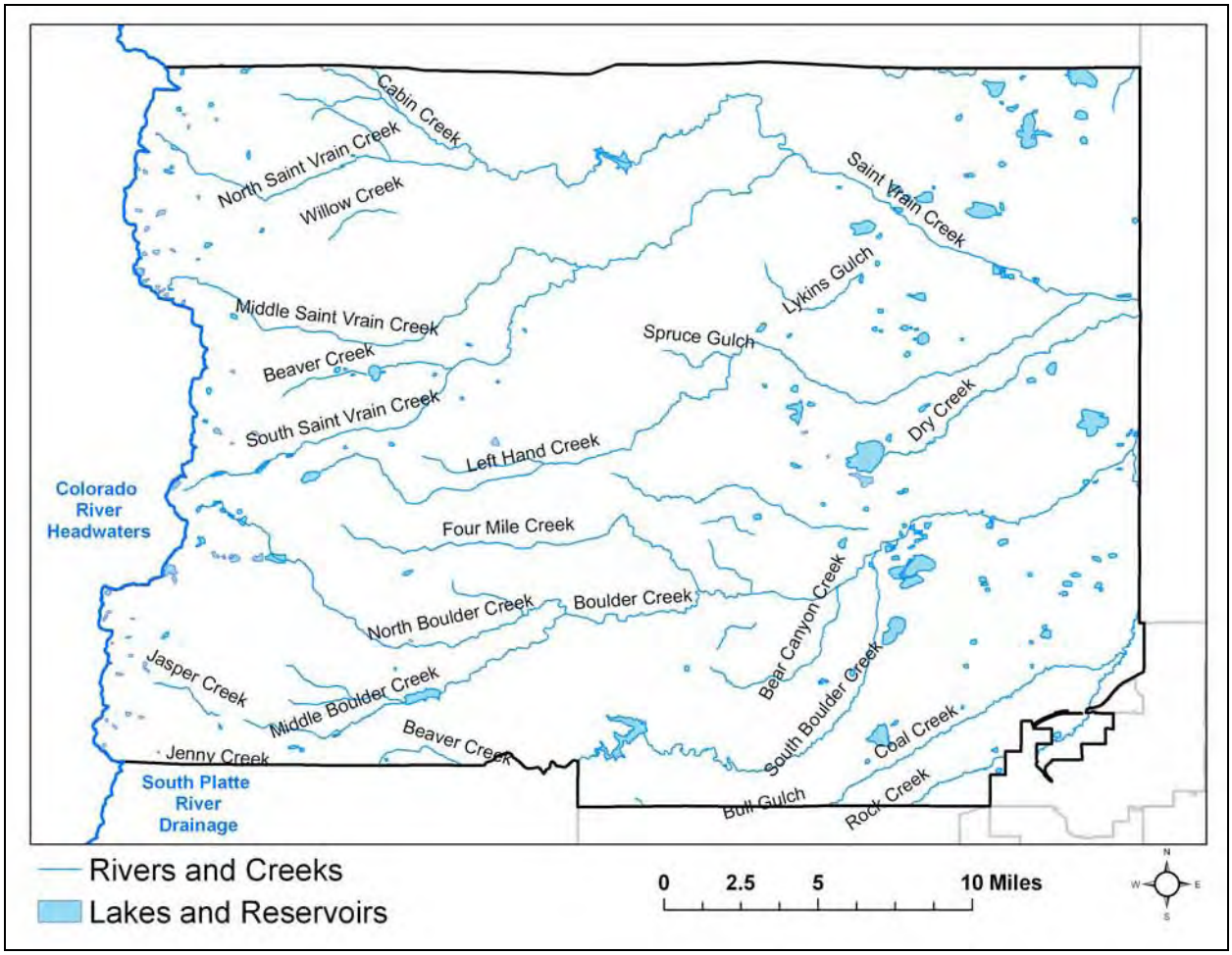



**Figure 6. Major tributaries and waterbodies of Boulder County.**

the Western Regional Climate Center (2008) and Niwot Ridge LTER (2008). In general total annual precipitation follows the elevation gradient in Boulder County with highest elevations along the Continental Divide receiving the most precipitation and lowest elevations on the eastern plains receiving the least (Figure 7); average annual precipitation in Boulder County ranges from greater than 50 inches (127 cm) in the mountains to approximately 13 inches (33 cm) on the plains (Spatial Climate Analysis Service 2008).

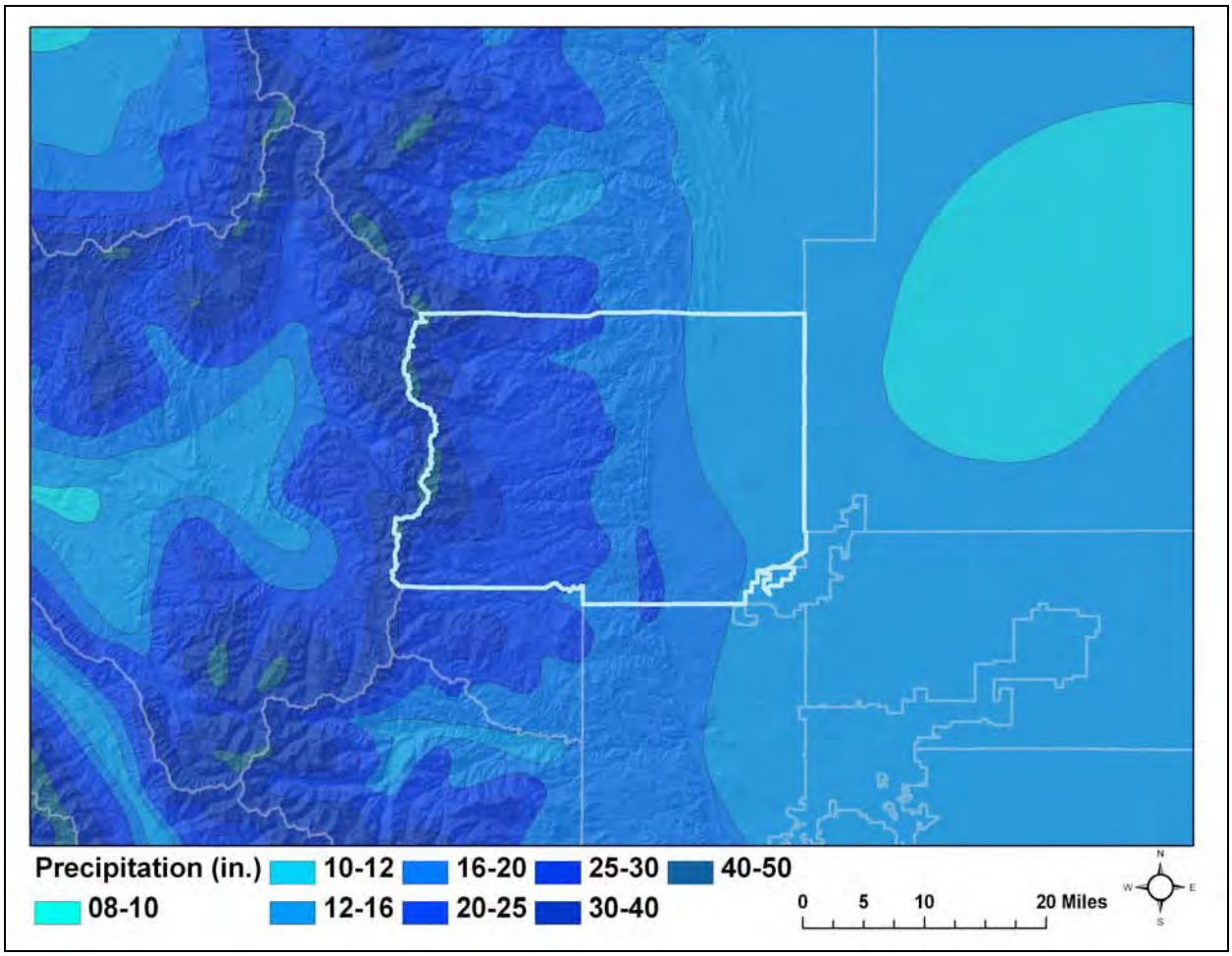



**Figure 7. Precipitation in the Boulder County area (Bureau of Land Management 1998).**

Temperature and precipitation parameters for different locations within Boulder County are shown in Figure 8. Average annual maximum temperature ranges from 64.5 ºF (18.1 ºC) in Longmont (with a monthly average range of 42.6 – 88.4 ºF [5.9 – 31.3 ºC]; Western Regional Climate Center 2008) to 25.3ºF (-3.7 ºC; with a range of 8.3 to 46.8 ºF [-12.1 to 11.0 ºC]) at Niwot Ridge (Niwot Ridge LTER 2008). Valleys in Boulder County tend to be cooler because of cold air drainage and deep shade. Summers are hot with July tending to be the hottest month. Average annual minimum temperatures range from 32.7 ºF (0.4 ºC) in Longmont (with a range of monthly averages of 11.6 – 54.7 ºF [[-11.3 – 12.6 ºC]) to 17.3 ºF (-8.2 ºC )at high elevations (with monthly averages ranging from (3.3 – 35.1 ºF [-16.6 – 5.0 ºC]). Lowest average temperatures occur in January (Western

Regional Climate Center 2008). Average annual precipitation varies from 13.5 inches (34.3 cm) in Longmont to 21 inches (53.3 cm) in Allenspark and 30.5 inches (77.5 cm) at Niwot Ridge LTER (Western Regional Climate Center 2008, Niwot Ridge LTER 2008). Climate parameters in south-central Boulder County (Gross Reservoir weather station) illustrate the anomaly in the general climate patterns (Figures 7 and 8). Relative to the plains to the east and to the mountains immediately west, this area receives higher annual precipitation, including much greater snowfall (Western Regional Climate Center 2008).

***Geology***

Bedrock types in Boulder County are diverse in age and composition ranging from Precambrian basement rocks to Quaternary alluvium (Figure 9, Table 1). Boulder County is in the tension zone at the edge of the mountain zone and the plains; it demonstrates many important features of Colorado's geologic history. The mountains and foothills are remnants of the series of mountain building processes with their uplift and erosion cycles. The Piedmont plains area, including the Denver Basin, is the deposition zone of eroded materials from the mountain building events as well as the site of the ebb and flow of the inland seaways that covered the interior of the continent millions of years ago. The pattern of bedrock geology in Boulder County parallels its topography. Ancient granitic rocks comprise the heart of the mountains (Ives 1980) whereas younger sedimentary layers blanket the piedmonts plains (Bridge 2004). Foothills as usual represent a transitional zone and exhibit rock types of intermediate age and composition.

Mountains in Boulder County exhibit some of the oldest rocks in Colorado. The core of the Front Range consists of Precambrian rocks that date from 1,800-900 million years old (Bridge 2004, Colorado Geological Survey 2003). These Precambrian rocks experienced intense folding and displacement (faulting) events and were periodically intruded with molten magma from the deep in the earth's crust (Rodeck 1964, Bridge 2004). The result is a large irregular mass of ancient granitic rocks that are durable and resistant to erosion. The two main granitic types are Boulder Creek granodiorite, which occurs in the southern half of the mountains in Boulder County (Gable 1980, Young 1991, Gable and Madole 1976, Moore et al. 1957) and Silver Plume granite, which roughly underlies the northern half (Braddock et al. 1988a, Punongbayan et al. 1989). Boulder Creek granodiorite formed at the edge of forming continents 1.7-1.8 billion years ago. Silver Plume granite is slightly younger and was formed from plutonic magma intruding into the continental mantle (Bridge 2004). The complex faults in these ancient rocks likely channeled magma during the series of mountain building events that occurred in what in now Boulder County. The uplift of the modern Rocky Mountains infused these faults with veins of mineral-rich fluids that consolidated into various ores and deposits that became the reason for settlement of Colorado and Boulder County in the late 1800's (Bridge 2004). Continual uplift during the Tertiary unleashed the erosive capacity of rivers and streams as their gradients steepened with the inexorable mountain building (Colorado Geological Survey 2003). Tributaries and mainstems of Boulder, Left Hand, and St. Vrain creeks became predominant erosive forces, carving deep and sinuous canyons.

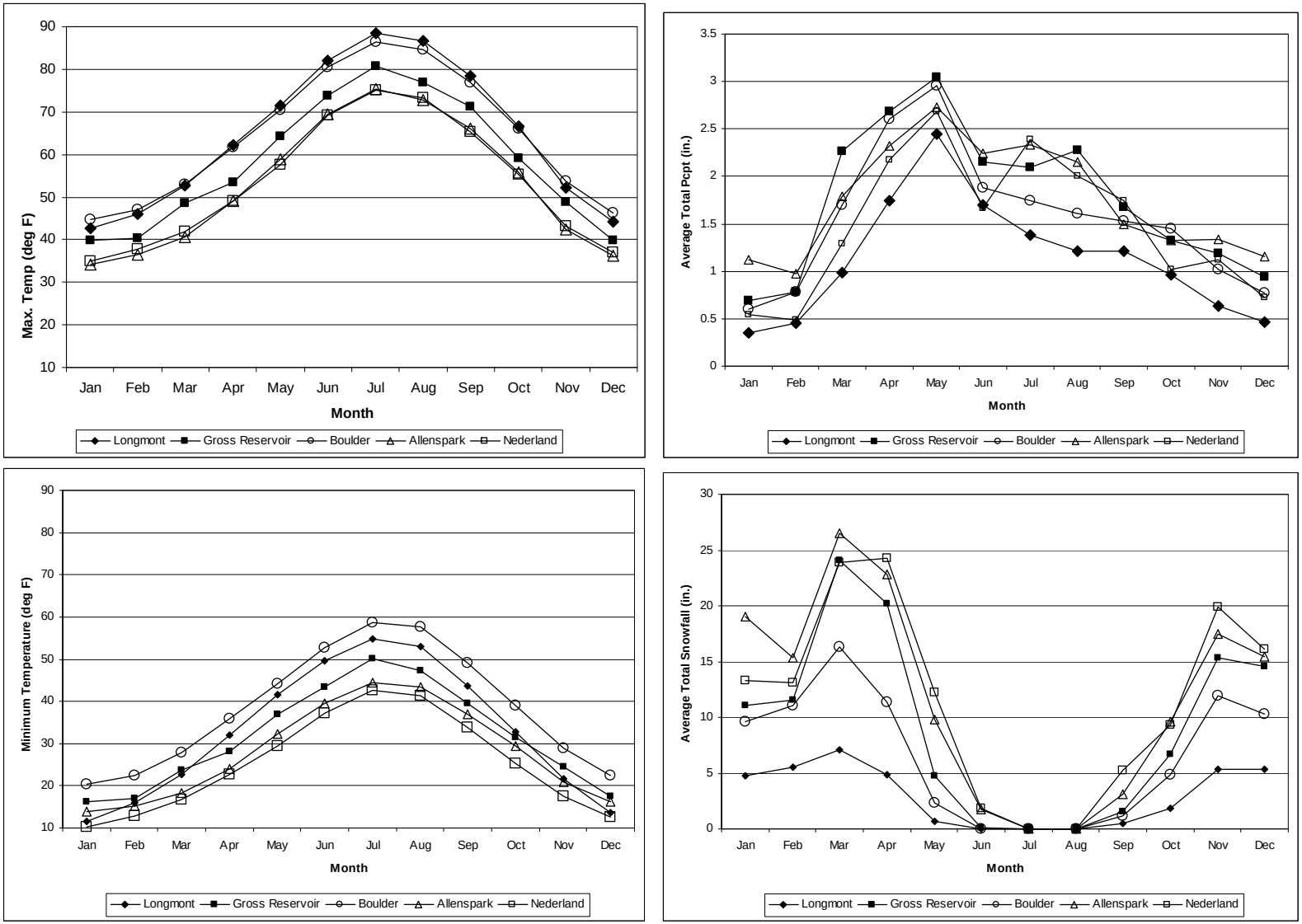



**Figure 8. Climate parameters (maximum temperature, minimum temperature, average total precipitation, average total snowfall) for four locations in Boulder County.**

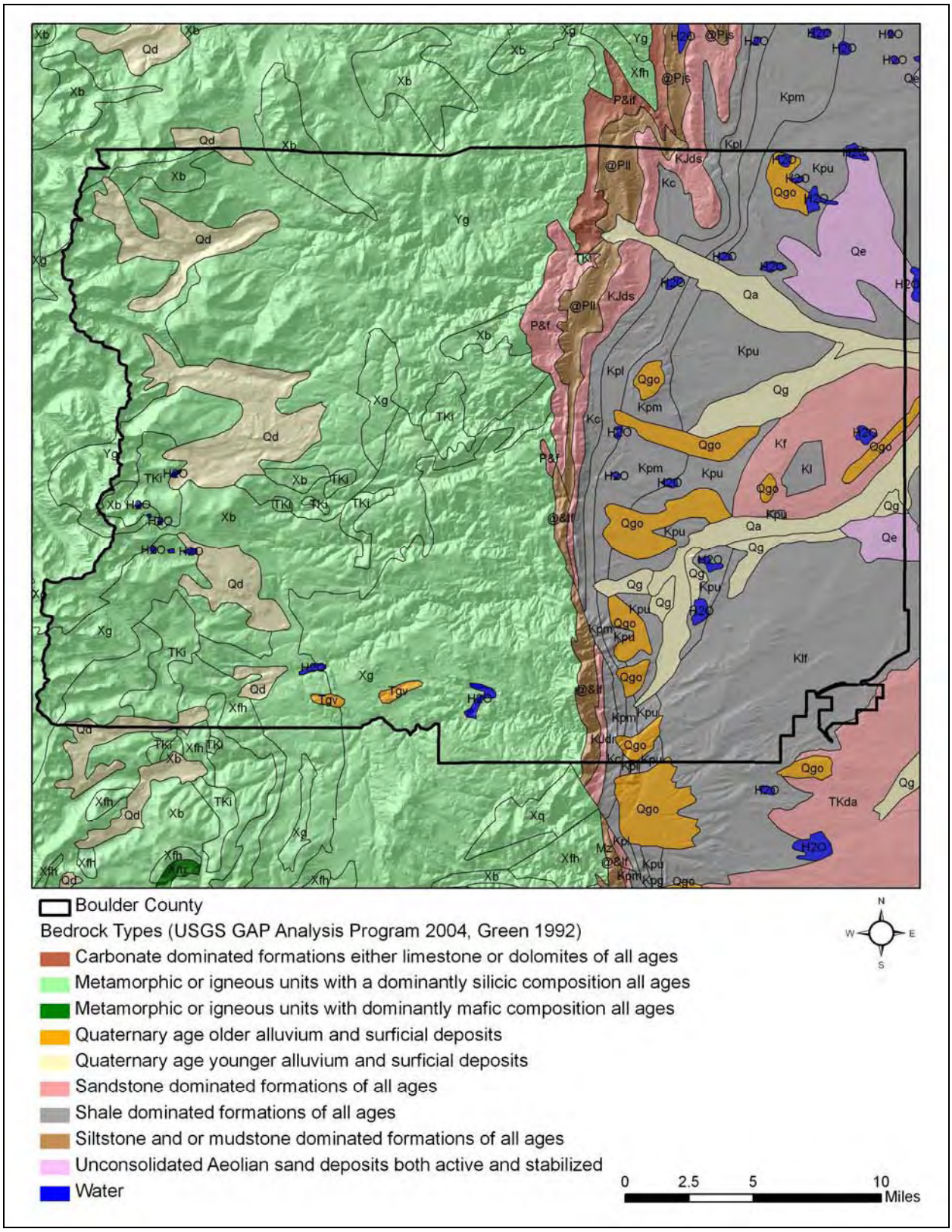



**Figure 9. Bedrock geology of Boulder County.**

**Table 1. List of bedrock geology types in Boulder County.**

| Symbol | Name and Description | Substrate Type |
|---|---|---|
| @&lf | LYKINS, LYONS, AND FOUNTAIN FORMATIONS--Red siltstone, sandstone, and conglomerate | Siltstone and or mudstone dominated formations of all ages |
| @Pjs | JELM, LYKINS, LYONS, AND SATANKA FORMATIONS--Red siltstone, shale, and sandstone | Siltstone and or mudstone dominated formations of all ages |
| @Pll | LYKINS FORMATION AND LYONS SANDSTONE | Siltstone and or mudstone dominated formations of all ages |
| H2O | | Water |
| Kc | COLORADO GROUP--Consists of Niobrara Formation (Kn) and either Benton Shale or Carlile, Greenhorn, and Graneros Formations (Kcg) | Shale dominated formations of all ages |
| Kd | DAKOTA SANDSTONE | Sandstone dominated formations of all ages |
| Kf | FOX HILLS SANDSTONE | Sandstone dominated formations of all ages |
| KJdm | DAKOTA AND MORRISON FORMATIONS | Sandstone dominated formations of all ages |
| KJdr | DAKOTA GROUP AND MORRISON AND RALSTON CREEK FORMATIONS AT MOUNTAIN FRONT BETWEEN BOULDER AND COLORADO SPRINGS DAKOTA, PURGATOIRE, MORRISON, AND RALSTON CREEK FORMATIONS IN CANON CITY AREA | Sandstone dominated formations of all ages |
| KJds | DAKOTA, MORRISON, AND SUNDANCE FORMATIONS | Sandstone dominated formations of all ages |
| Kl | LANCE FORMATION--Shale, sandstone, and minor coal beds; Fox Hills equivalent at base | Shale dominated formations of all ages |
| Klf | LARAMIE FORMATION AND FOX HILLS SANDSTONE | Shale dominated formations of all ages |
| Kmw | WINDY GAP MEMBER (UPPER CRETACEOUS?) OF MIDDLE PARK FORMATION--Andesitic breccia and conglomerate | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Kp | PIERRE SHALE, UNDIVIDED | Shale dominated formations of all ages |
| Kpg | PIERRE SHALE (Kp), NIOBRARA (Kn), AND CARLILE, GREENHORN, AND GRANEROS (Kcg) FORMATIONS, UNDIVIDED | Shale dominated formations of all ages |
| Kpl | PIERRE SHALE, Lower unit--Sharon Springs Member (organic-rich shale and numerous bentonite beds) in lower part | Shale dominated formations of all ages |
| Kpm | PIERRE SHALE, Middle unit--In Boulder-Fort Collins area, contains Richard, Larimer, Rocky Ridge, Terry, and Hygiene Sandstone Members; elsewhere, shale between zones of Baculites reesidei and B. scotti | Shale dominated formations of all ages |
| Kpu | PIERRE SHALE, Upper unit | Shale dominated formations of all ages |
| Mz | MESOZOIC ROCKS--Mainly Lower Cretaceous, Jurassic, and Triassic formations | Sandstone dominated formations of all ages |
| P&f | FOUNTAIN FORMATION--Arkosic sandstone and conglomerate | Sandstone dominated formations of all ages |
| P&if | INGLESIDE FORMATION (LIMESTONE AND CALCAREOUS SANDSTONE) AND FOUNTAIN | Carbonate dominated formations either limestone or dolomites of |

| Symbol | Name and Description | Substrate Type |
|---|---|---|
| | FORMATION | all ages |
| Qa | MODERN ALLUVIUM--Includes Piney Creek Alluvium and younger deposits | Quaternary age younger alluvium and surficial deposits |
| Qd | GLACIAL DRIFT OF PINEDALE AND BULL LAKE GLACIATIONS--Includes some unclassified glacial deposits | Quaternary age younger alluvium and surficial deposits |
| Qdo | OLDER GLACIAL DRIFT (PRE-BULL LAKE AGE) | Quaternary age older alluvium and surficial deposits |
| Qe | EOLIAN DEPOSITS--Includes dune sand and silt and Peoria Loess | Unconsolidated Aeolian sand deposits both active and stabilized |
| Qg | GRAVELS AND ALLUVIUMS (PINEDALE AND BULL LAKE AGE)--Includes Broadway and Louviers Alluviums | Quaternary age younger alluvium and surficial deposits |
| Qgo | OLDER GRAVELS AND ALLUVIUMS (PRE-BULL LAKE AGE)--Includes Slocum, Verdos, Rocky Flats, and Nussbaum Alluviums in east, and Florida, Bridgetimber, and Bayfield Gravels in southwest | Quaternary age older alluvium and surficial deposits |
| Ql | LANDSLIDE DEPOSITS--Locally includes talus, rock-glacier, and thick colluvial deposits | Quaternary age younger alluvium and surficial deposits |
| Taf | ASH-FLOW TUFF OF MAIN VOLCANIC SEQUENCE (AGE IN SAN JUAN MOUNTAINS 26-30 M.Y.; IN SOUTH PARK 29-32 M.Y.)--Includes many named units | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Tbb | BASALT FLOWS AND ASSOCIATED TUFF, BRECCIA, AND CONGLOMERATE OF LATE-VOLCANIC BIMODAL SUITE (AGE 3.5-26 M.Y.)--Includes basalts of Hinsdale Formation in San Juan Mountains, Servilleta Formation in San Luis Valley, and many other occurrences | Metamorphic or igneous units with dominantly mafic composition all ages |
| Tbr | RHYOLITIC INTRUSIVE ROCKS AND FLOWS OF LATE-VOLCANIC BIMODAL SUITE | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Tc | COALMONT FORMATION--Arkosic sandstone, conglomerate, and shale; coal in lower part; in North Park | Sandstone dominated formations of all ages |
| Tdv | BASALTIC FLOWS IN DENVER FORMATION NEAR GOLDEN (AGE 62-64 M.Y.) | Metamorphic or igneous units with dominantly mafic composition all ages |
| Tgv | BOULDERY GRAVEL ON OLD EROSION SURFACES IN FRONT RANGE AND NEVER SUMMER MOUNTAINS | Quaternary age older alluvium and surficial deposits |
| TKda | DENVER AND ARAPAHOE FORMATIONS--Sandstone, mudstone, claystone, and conglomerate; Denver is characterized by andesitic materials | Sandstone dominated formations of all ages |
| TKdl | DENVER FORMATION OR LOWER PART OF DAWSON ARKOSE--Arkosic sandstone, shale, mudstone, conglomerate, and local coal beds | Sandstone dominated formations of all ages |
| TKi | LARAMIDE INTRUSIVE ROCKS (AGE 40-72? M.Y.)--Mainly intermediate to felsic compositions; some mafic | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Tmi | MIDDLE TERTIARY INTRUSIVE ROCKS (AGE 20-40 M.Y.)--Intermediate to felsic compositions | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Tt | TROUBLESOME FORMATION--Sandstone and siltstone; in Middle Park | Sandstone dominated formations of all ages |

| Symbol | Name and Description | Substrate Type |
|---|---|---|
| Tv | VOLCANIC ROCKS IN NORTHWESTERN COLORADO (AGE <7-33 M.Y.)--Mainly of intermediate compositions | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Xb | BIOTITIC GNEISS, SCHIST, AND MIGMATITE--Locally contains minor hornblende gneiss, calc-silicate rock, quartzite, and marble. Derived principally from sedimentary rocks | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Xfh | FELSIC AND HORNBLENDIC GNEISSES, EITHER SEPARATE OR INTERLAYERED--Includes metabasalt, metatuff, and interbedded metagraywacke; locally contains interlayered biotite gneiss. Derived principally from volcanic rocks | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Xg | GRANITIC ROCKS OF 1,700-M.Y. AGE GROUP (AGE 1,650-1,730 M.Y.)?Includes Boulder Creek, Cross Creek, Denny Creek, Kroenke, Browns Pass, Powderhorn, Pitts Meadow, Bakers Bridge, and Tenmile Granites, Quartz Monzonites, or Granodiorites; also, unnamed granit | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Xm | MAFIC ROCKS OF 1,700-M.Y. AGE GROUP--Gabbro and mafic diorite and monzonite | Metamorphic or igneous units with dominantly mafic composition all ages |
| Xq | QUARTZITE, CONGLOMERATE, AND INTERLAYERED MICA SCHIST | Metamorphic or igneous units with a dominantly silicic composition all ages |
| Yg | GRANITIC ROCKS OF 1,400-M.Y. AGE GROUP (AGE 1,350-1,480 M.Y.)?Includes Silver Plume, Sherman, Cripple Creek, St. Kevin, Vernal Mesa, Curecanti, Eolus, and Trimble Granites or Quartz Monzonites; also, San Isabel Granite of Boyer (1962) and unnamed graniti | Metamorphic or igneous units with a dominantly silicic composition all ages |

The elevation achieved during the uplift of the mountains was high enough along the Front Range to harbor glacial ice during the Quaternary ice ages (Colorado Geological Survey 2003, Richmond 1960). Minor remnants of the vast glacial ice still occur today in the dwindling Arapahoe and St. Vrain glacier complexes high in the mountains on the far western side of the county (Waldrop 1964). Glacial activity carved the landforms of this mountain range with its characteristic jagged peaks and U-shaped valleys. As the glaciers melted, large amounts of water-transported rocks, gravel, and sand were distributed in the outwash zones below.

As the mountains rose to the west, the multiple sedimentary layers of the plains were tilted upwards. The diversity of sedimentary layers exposed in Boulder County include Fountain, Ingelside, Lyons, Jelm, Sundance, Morrison, and Lykins Formations, the Dakota Group, Carlile-Greenhorn-Graneros-Mawry shale-limestone complex, Niobrara Formation, and Pierre shale (Braddock et al. 1988a, Braddock et al. 1988b; Wrucke and Wilson 1957, Bridge 2004). The sequence of influx and draining of marine waters over this landscape led to an alternating pattern of the area forming a beach along the inland seas and supporting a broad, swampy floodplain as well as submerged beneath seas of various depths and extents. The various sandstone layers represent different depositional environments present when they were laid down. For example, Lyons sandstone formed

when the area was a sandy beach on the edge of an inland sea. Morrison Formation was derived from materials deposited in meandering streams and lakes. Niobrara shale formed from materials deposited in a shallow sea that covered the area, whereas Pierre shale from deposits in deep marine environments. Each of the rock layers has different characteristics and composition, and these characteristics influence the vegetation that occurs on them today. Differential erodability of the various layers created the modern hogback landforms that characterize the Front Range foothills today. Durable, erosion-resistant rock layers form the ridge crests and east-facing slopes of the hogbacks. West-facing slopes are steep and exhibit the myriad layers, often with contrasting colorful bands. These landforms are restricted to a narrow band in the southern half of the foothills in the southern half of Boulder County; the band broadens to the north and is at its widest point between Lyons and Longmont.

Piedmont bedrock geology also reflects the mountain building and erosion. Quaternary alluvium, water-transported cobbles and gravels, spilled out from the mountain drainages covered the thick layers of limestones and shales with deltaic fans that extended different distances from the mountain front (Scott 1960). Different Quaternary alluvia were extensively studied along the Front Range and are well-mapped in much of Boulder County (Scott 1960, Shroba and Carrara 1996, Trimble 1975, Madole et al. 1998, Braddock et al. 1988b, Malde 1955, Machette 1975). The different series of glaciations and inter-glacial periods brought temporal pulses of alluvium down from the mountains. The temporal difference in erosive patterns resulted in different characteristics of the different alluvial layers. The sequence of layers from oldest to youngest is as follows: Rocky Flats, Verdos, Slocum, Louviers, Broadway, pre-Piney Creek, Piney Creek, and post-Piney Creek (Scott 1960). Older alluvial layers (Rocky Flats through Louviers) formed a veneer-like coating on sedimentary pediments of the adjacent plains. Younger alluvia are found as stream terraces in entrenched valleys carved into the pediments and older alluvial surfaces (Scott 1960, Shroba and Carrara 1996, Wells 1967). The resulting landforms are the mesas like Table Mountain and flat-topped hills like Potato Hill and Haystack Mountain. The age and stability of these alluvial surfaces, ancient as they may be, affect the current biodiversity that occupies them (Birkeland et al. 1996, Buckner In prep).

The Denver Basin arcs through Boulder County and extends northeast through Weld County and southeast toward Littleton in Jefferson County (Colorado Geological Survey 2003, Chronic and Williams 2002). The Denver Basin is a landscape-scale depression that holds very thick sedimentary deposits (Johnson and Raynolds 2006). On the Plains Quaternary alluvium covers the deep sedimentary layers with variable thicknesses. Where alluvial caps are thin or have eroded, outcrops of dark gray Pierre shale are exposed. The differential erodability of some limestones, shales, and sandstones affects drainage patterns in this area. Drainages carving through sandstone hogbacks often have surficial water flow as they proceed through the gap in the hogback while the flow goes underground elsewhere during the dry seasons.

### *Soils*

Where mapped in the eastern half of Boulder County, soils are categorized by landform and the parent material from which they develop (Moreland and Moreland 1975). They are divided into foothills and mountain soils from granite and sandstone; soils of alluvial and colluvial fans against the foothills and derived from coarse alluvium; soils of level uplands formed in wind-blown loess; pockets of clay soils derived from shale or derived from clay; and mixed mosaic soils along modern stream channels. Mountain soils (Juget and Baller) support conifer forest and are shallow, forming on steep slopes. There is a high proportion of surface rock exposed. Texture is very coarse, very gravelly or cobbly, and the soils are highly susceptible to erosion when not in forest cover (Bovis 1978). Soils of old terraces (*e.g.*, Nederland and Valmont) are immediately adjacent to the foothills (Moreland and Moreland 1975). They vary with the complex textures and layers of materials lain down by ancient alluvial processes. These are deep soils of mixed texture (cobbly or very cobbly sandy loam or cobbly clay loam) and support mid-height and tall grasses. Farther from the mountain front are soils on rolling uplands formed from both finer alluvium transported out of the mountains and wind-blown deposits. These soils (like Weld, Colby, Ascalon, Manter) are on gentle slopes and have loamy textures and have generally been cultivated. Small areas have restricted use for cultivation because of high salt content that limits plant growth. These are scattered in pockets on the landscape and are clay soils (Nunn, Longmont) derived from shale or derived from clay that never hardened into rock. Soils in the modern stream channels and terraces (Niwot, Loveland, Calkins) are an intricate mosaic of textures developed in modern alluvial processes. Sand bars, back channels, and terraces generally have high water tables and support grasses and cottonwood trees (*Populus* spp.).

### *Ecological Systems/Vegetation*

The diversity of climate, geology, elevation, and soils within Boulder County leads to a wide range of ecological systems, spanning from mountains to plains (Marr 1967, Gable 1978). Ecological systems are dynamic assemblages of plant and animal communities that occur together on the landscape, unified by similar ecological processes (e.g. climate as moderated by elevation and natural disturbance processes) and/or underlying abiotic environmental factors or gradients (e.g. bedrock geology and hydrology; Comer et al. 2003). The spatial scale covered by these systems encompasses a range of variability but are identified based on dominant vegetation in the top structural layers of the vegetation type (e.g., forest, shrubland, grassland). The range of variability is captured by plant association concepts or natural communities, which are assemblages of plant species that repeat on the landscape. Plant associations are listed and defined in the National Vegetation Classification (NVC) maintained by NatureServe scientists (Grossman et al. 1998, Anderson et al. 1998, Jennings et al. 2003, NatureServe 2003). Certain plant associations are deemed rare and threatened while many are common.

The diversity of ecological systems in Boulder County is shown in Figure 10. They roughly occur in stepwise fashion down the elevation gradient. At the highest elevations, exposed rock forms a mosaic with alpine tundra. These communities of tiny shrubs, cushion plants, and grasses transition to wind-flagged krummholz before grading into subalpine forests dominated by Engelmann spruce (*Picea engelmannii*) and subalpine fir

(*Abies lasiocarpa*), which in turn grade into upper montane forests of lodgepole or limber pine (*Pinus flexilis*). Like most of the Front Range, Boulder County has a limited expression of quaking aspen (*Populus tremuloides*), which occurs in small pockets in the canopy of mixed conifer forests, especially in the southern half of the county. Lower montane forests are strongly dominated by ponderosa pine, especially on dry slopes, although Douglas-fir can intermingle on moister, often north-facing slopes. The foothills between the mountains and plains are characterized by mountain mahogany (*Cercocarpus montanus*) shrublands, which blanket the dry, shallow soils of hogbacks and slopes. Grasslands occupy lowland valleys and are scattered in areas of deeper soils throughout the montane areas in the county. Within the Piedmont plains on the eastern third of the county are small outcrops of shale barrens ecological system. Scattered throughout the county are wetland and riparian areas, which round out the ecological diversity.

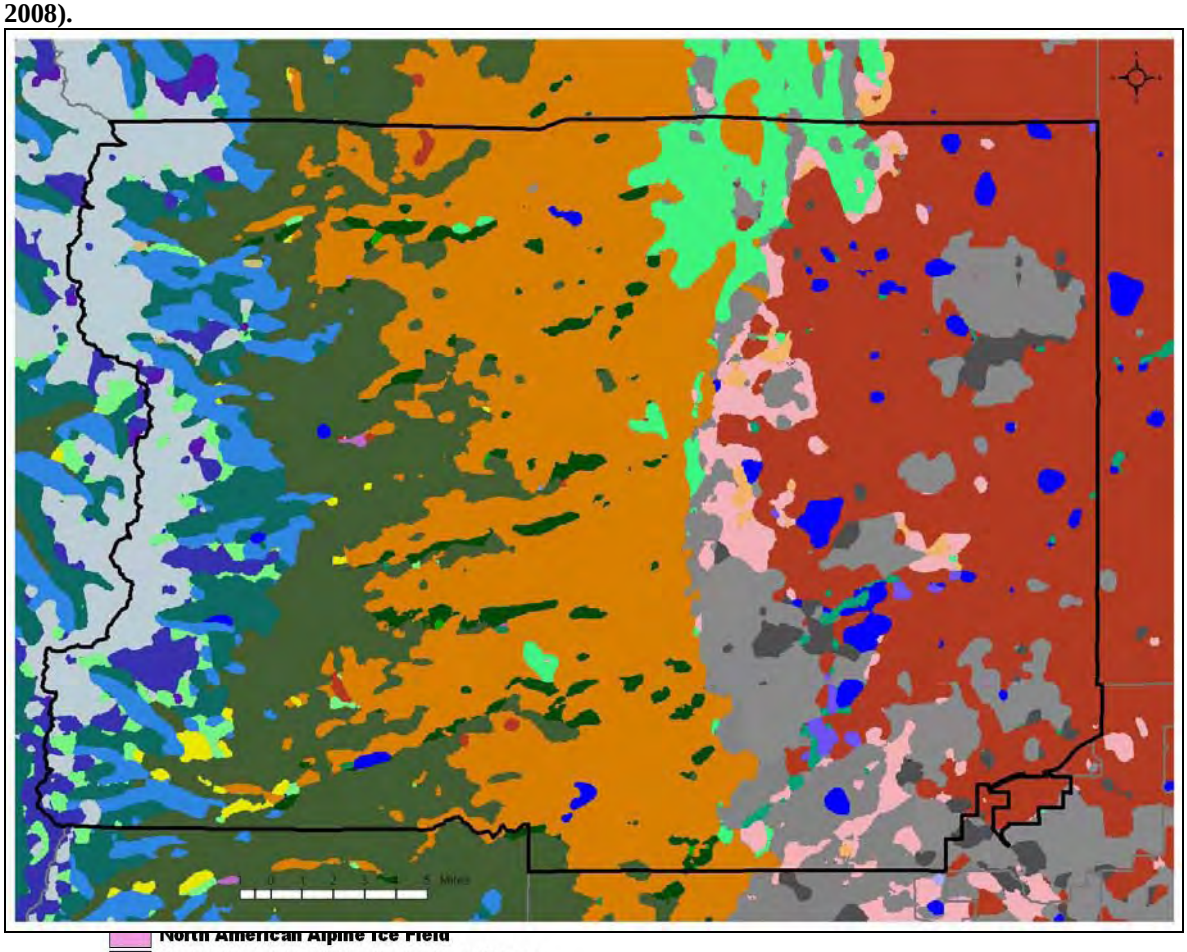
*Alpine*

Alpine systems span the final steep rise to the Indian Peaks in Boulder County. They are harsh environments where the physical threshold of temperature outweigh moisture as the main limiting factor to biological processes (Marchand 1996, Billings 1974). They occur on metamorphosed granite and glacial alluvium. Tundra is a mosaic of dwarf shrublands and turf. Plant associations are largely distributed according to small-scale spatial and temporal patterns of moisture and snow accumulation as influence by wind and topography (Komarkova and Webber 1978). Shrubs in alpine areas include alpine avens (*Geum rossii*), alpine dryas (*Dryas octopetala*), blueberry (*Vaccinium scoparium*), sibbaldia (*Sibbaldia procumbens*), and willow (*Salix reticulata*). Graminoids include turf-forming sedges like Pyrenian sedge (*Carex rupestris*) and bog sedge (*Kobresia myosuroides*) with scattered grasses. Myriad forbs occur, comprising the spectacular annual wildflower display that is ephemeral during the limited growing season in the alpine. Near treeline, the shrubland and turf grade into krummholz, stunted conifers in the transition zone. Extensive areas of alpine systems occur in Colorado; very few alpine plant associations are rare.

*Spruce-fir Forest*

Dense, dark forests of Engelmann spruce and subalpine fir are abundant generally from 10,000 – 11,000 feet (3,050-3,350 m) in Colorado. They occur on coarse soils derived from metamorphosed granite and glacial alluvium. Dense canopies of snow-shedding trees create deep shade that limits understory development. Drier forests have sparse herbs and mosses in the needle duff amidst sharp boulders. Other expressions of spruce-fir forests have large copses of blueberries (*Vaccinium scoparium, V. myrtilloides*). Major disturbances that affect spruce-fir forests include insect infestations, like western spruce budworm (*Choristoneura occidentalis*; Swetnam and Lynch 1993) and spruce beetle (*Dendroctonus rufipennis*), windthrow damage, and avalanches (Mutel and Emerick 1992). Like alpine systems, spruce-fir systems are extensive in Colorado and they have no known rare plant associations.

**Figure 10. Ecological systems in Boulder County (CNHP and TNC 2008).**



North American Alpine Ice Field
Rocky Mountain Alpine Bedrock and Scree
Rocky Mountain Alpine Fell-Field
Rocky Mountain Cliff and Canyon
Rocky Mountain Aspen Forest and Woodland
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
Rocky Mountain Lodgepole Pine Forest
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
Rocky Mountain Ponderosa Pine Woodland
Rocky Mountain Lower Montane-Foothill Shrubland
Western Great Plains Sandhill Shrubland
Southern Rocky Mountain Juniper Woodland and Savanna
Rocky Mountain Dry Tundra
Rocky Mountain Subalpine Mesic Meadow
Southern Rocky Mountain Montane-Subalpine Grassland
Western Great Plains Foothill and Piedmont Grassland
Central Mixedgrass Prairie
Western Great Plains Shortgrass Prairie
Rocky Mountain Subalpine-Montane Riparian Woodland
North American Arid West Emergent Marsh
Rocky Mountain Alpine-Montane Wet Meadow
Western Great Plains Floodplain Herbaceous Wetland
Western Great Plains Tallgrass Prairie
Open Water
Developed, Open Space - Low Intensity
Developed, Medium - High Intensity

*Lodgepole Forest*
Lodgepole pine forests are common between about 8,500 – 10,500 feet (2,590 – 3,200 m) depending on local site conditions. For example, below about 9,000 feet (2,743 m) they tend to occur only on north-facing slopes (Stohlgren and Bachand 1997, Mutel and Emerick 1992). These forests tend to occur in dense, even-aged stands, regenerating from catastrophic disturbance. Lodgepole forests are fire-dependent systems, trees have serotinous cones that are opened by the heat of forest fires and seeds germinate best on exposed mineral soil (Mutel and Emerick 1992). Other than fire, lodgepole pine are susceptible to windthrow damage and several pathogens, including mountain pine beetle (*Dendroctonus ponderosae*; Veblen and Lorenz 1991). Human use of these forests has been extensive; straight tree trunks were used for building structures, roads, and mines. There is often little or no understory species in the thick needle duff, although later successional and/or moister sites have greater understory plant diversity. Lodgepole forests have no rare plant associations, although moist expressions of them are relatively uncommon.

*Ponderosa Pine Woodland and Savanna*
Ponderosa Pine Woodland system is the most common woodland system of the foothills and montane elevations (6,000-9,000 feet [1,830-2,740 m]) on the Front Range. At higher elevation in this range, this system tends to occur on more south-facing aspects. At the lower elevations, the Ponderosa Pine system consists of widely spaced ponderosa pine trees over grassland parks or shrublands, forming a ponderosa pine savanna. Ponderosa pine grows on warm dry slopes, is intolerant of shade, and grows well in full sun from bare mineral soil for germination and establishment (Mutel and Emerick 1992). These trees are the sole dominant on dry slopes, but they intermingle with Douglas-fir on moister, often north-facing slopes. Historically, these systems likely incurred frequent, low intensity fires and sporadic catastrophic burns (Shinneman and Baker 1997, Huckaby *et al*. 2003). Additional disturbance agents include insects, including mountain pine beetle, and fungal pathogens like dwarf mistletoe (*Arceuthobium vaginatum*). Plant associations in this system are defined by understory structure; there are several ponderosa pine associations that are characterized by having a shrub component with species like bitterbrush (*Purshia tridentata*), common juniper (*Juniperus communis*), bearberry (*Arctostaphylos uva-ursi*), and mountain mahogany, whereas others have abundant grasses that define them. As ponderosa pine savannas occur at the tension zone between forests on higher slopes and grasslands in valley bottoms, it combines elements of each. Unique in this system is the presence of big bluestem (*Andropogon gerardii*), a tall grass species that abundantly occurs in the tallgrass prairie of the Plains states to the east, but is much less common in the foothills of the Arid West. There are several plant associations that are rare in ponderosa pine systems, including those that indicate old growth conditions and those that characterize the savanna transition zone.

*Lower Montane-Foothills Shrubland*
The Lower Montane-Foothill Shrubland system occupies the very dry, exceedingly shallow and rocky soils between 6,000 and 9,000 feet (1,830-2,740 m) in elevation. It is the most common ecological system on the sandstone hogbacks that span the east side of

the Front Range. This system is often a mosaic of mountain mahogany plant associations that are defined by different native grasses that are dominant in the understory. The different plant associations respond to differences in bedrock geology and elevation at a site. As this system is relatively rare in Colorado as well as globally, most plant associations that comprise it are also rare. Further, these shrublands are very restricted in Boulder County.

*Montane Grasslands*
Montane grassland expressions occur at mid-elevations and form meadow openings in a variety of forest types. These tend to occur on deeper, fine-textured soils. The variety of grass species that comprise the meadows tends to vary with elevation; characteristic species include Thurber fescue (*Festuca thruberi*), Parry's oatgrass (*Danthonia parryii*), poverty grass (*Danthonia spicata*), and mountain muhly (*Muhlenbergia montana*). At lower elevations, the grasslands grade into expressions with needle-and-thread (*Hesperostipa comata*), little bluestem (*Schizachyrium scoparium*), and big bluestem (*Andropogon gerardii*). Sometimes these grasslands are ephemeral on the landscape, the result of a fire or grazing impact and they slowly return to forest. Other expressions are more stable and persistent. Most grasslands have been impacted by grazing history, which has dramatically shifted species composition in certain locations. Thus, relictual occurrences in good condition are rare on the Front Range.

*Foothill and Piedmont Grasslands*
The Foothill and Piedmont Grassland system has two overlapping expressions in Boulder County due to the extensive outwash fans that occur adjacent to the foothills. Large grasslands blanket the mesa and valley landforms of the outwash fans. These are different in landform origin and species composition from the grasslands occupying the deeper soils in valleys and bottomlands within the foothills. Both expressions are characterized by prevalence of mid-height species, especially needle and thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), and blue grama (*Bouteloua gracilis*), with and without a component of tallgrass species that are more common and abundant on the Great Plains, like big bluestem, little bluestem, porcupine grass (*Hesperostipa spartea*), prairie dropseed (*Sporobolus heterolepis*), Indian grass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). New Mexico feathergrass (*Hesperostipa neomexicana*) forms unique swards on outwash mesas in Boulder County.

Grasslands of the foothills form a mosaic with ponderosa pine and lower montane-foothills shrubland systems and are one of the most severely altered systems in the Southern Rocky Mountains ecoregion (Rondeau 2001). Much of this system has been converted to agricultural land use or has been altered from its natural composition by livestock grazing in Colorado. This system is characterized by a mix of mid- and tallgrass plant associations, remnants of which are now relegated to shrubland, mountain parks, and edges of the ponderosa pine forest. Patches of this system still exist in valleys on rocky knolls that were likely too difficult to plow.

Piedmont grasslands of the outwash fans are well-studied (Baker and Galatowitsch 1985, Bock and Bock 1998, Buckner 1994, Moir 1969) and expressions in Boulder County are

some of the largest and most ecologically intact occurrences left. These grasslands are very diverse; they have some of the highest species richness of any habitat in Boulder County. Plant associations are defined by dominant species and floristics; but have overlapping concepts in the NVC. Within Colorado, piedmont and foothills ecological systems are relatively rare and are highly threatened (Rondeau 2001, Grunau et al. 2006).

*Shale Barrens*

Although expressions of shale barren communities are small in Boulder County, they represent unique habitats that harbor rare plant species, like Bell's twinpod (*Physaria bellii*). Barrens communities generally occupy Niobrara Formation and Pierre shale outcrops. In the northern portion of the county, these barrens have mountain mahogany shrublands with very sparse understory composition dominated by cushion plants. Other examples have three-leaved sumac (*Rhus trilobata*) or sand cherry (*Prunus pumila*).

***Flora***

The CU Herbarium lists 3,487 plant taxa occurring in Colorado. Of these, 1,649 are also documented from Boulder County; nearly 50% of the plant species known from the state occur in Boulder County, which represents about six percent of the land area in Colorado. Of the thousands of species known from Colorado, 33 are ranked G1 (including rounded ranks), 80 are ranked G2, and 250 have a G3 rank. Of species in Boulder County, there is one G1, six G2 plants, and seventeen G3 plants. These 24 plant species were the primary botany targets for data collection and inventory. However, a unique aspect of the Boulder County flora is that it has a concentration of plant species that are globally common, but rare in Colorado. These species include eastern woodland and prairie species. As the climate of Colorado is arid, occurrences of woodland species are thought to be relictual populations from the Pleistocene when climate conditions on the Front Range were colder (Weber 1995). These plant species are not common in Boulder County, and are relegated to north-facing slopes in steep canyons. Several occur in Boulder Mountain Park, in the area of the County that receives relatively high precipitation (Hogan 1993).

The flora of Colorado reflects three phytogeographic principles: a migration corridor along the mountains oriented north-south, a barrier to east-west migration leading to distinct characters of West Slope and East Slope floras, and the Southern Rocky Mountains represent an extensive high-altitude portion of the American Cordillera and its isolation from areas with similar climate (such as boreal regions) leads to a high degree of endemism (Weber 1964). Several plant species that occur in Boulder County are endemic to Colorado; these include Larimer aletes (*Aletes humilus*), Bell's twinpod, and Colorado columbine (*Aquilegia saximontana*). Larimer aletes is largely restricted to Silver Plume granite batholiths within a narrow elevation range in northern Colorado on the East Slope of the Front Range. Bell's twinpod is limited to shale outcrops between Boulder and Livermore. Colorado columbine occurs in subalpine to alpine areas in several mountain ranges in Colorado.

***Fauna***

As with the ecological systems, the varied topography and climate in Boulder County lead to a diversity of fauna. The Colorado Piedmont (the western edge of the High Plains with many low ridges, steep bluffs, and flat-topped mesas) supports a fauna representative of both the High Plains and the Southern Rocky Mountains. This diverse mixture of geology and biology contributes to Boulder County's ecological character. Transition zones like these tend to support higher levels of biological diversity than "non-transitional" areas (Odum 1972, Brewer 1990).

No vertebrates or invertebrates (at the species level) are endemic to the study area (Armstrong 1972, Ferris and Brown 1981, Woodling 1985, Kippenhan 1990, Andrews and Righter 1992, Hammerson 1999). On a wider scale, there are some species endemic to the Colorado Piedmont, including the globally imperiled hops feeding azure butterfly (*Celastrina humulus*). Opler (1995) has determined that the Front Range of Colorado is one of the nation's four most important areas for the conservation of lepidoptera (butterflies and moths) due to the area's very high species richness of that order.

Extirpations of large-sized and predaceous mammals are common in the study area. Black-footed ferret (*Mustela nigripes*), wolf (*Canis lupus*), grizzly bear (*Ursus arctos*) and bison (*Bison bison*) have been restricted throughout their range, and no longer occur here in natural populations (Fitzgerald *et al.* 1994). However, large ungulates such as mule deer (*Odocoileus hemionus*), elk (*Cervus elephus*), and antelope (*Antilocapra americana*) are all well known in the area, as are coyote (*Canis latrans*), black bear (*Ursus americanus*), and mountain lion (*Felis concolor*).

The mixture of bird species in Boulder County is very diverse. Species typical of prairies such as Mountain Plover (*Charadrius montanus*) and Western Meadowlark (*Sturnella neglecta*) are found in close proximity to species with montane affinities such as Steller's Jay (*Cyanocitta stelleri*), Pygmy Nuthatch (*Sitta pygmaea*), and Goshawk (*Accipiter gentilis*). A large number of passerine birds are known to breed in the study area. Raptors, including Northern Harrier, Prairie Falcon, Golden Eagle and many hawks are common. Shorebirds are less common, but Great Blue Heron (*Ardea herodius*) breed at dispersed rookeries throughout Boulder County.

The fish of Boulder County are similarly diverse in the transition zone streams typical of the study area. Such streams lie between headwaters and their cold-water environment and the warm waters of the eastern plains, and support fish species from both regions. Fish and their aquatic habitats have been highly impacted in Colorado due to water development and declines in water quality (Woodling 1985). Boulder County has the highest number of watersheds supporting Tier 1 aquatic species (Colorado Division of Wildlife 2006).

Amphibians are naturally rare in the study area due to the xeric conditions, although tiger salamanders (*Ambystoma mavortium*), chorus frogs (*Pseudacris maculata*), and northern leopard frogs (*Lithobates pipiens*) can be found in creeks, stock ponds and other pools. The invasive bullfrog (*Lithobates catesbeiana*) can also be found throughout the county

at lower elevations. Reptiles such as plains garter snake (*Thamnophis radix*), terrestrial garter snake (*Thamnophis elegans*), and prairie rattlesnake (*Crotalus viridis*) are common (Hammerson 1999; Crother 2008). The common garter snake (*Thamnophis sirtalis*), despite its name, is now relatively uncommon in the county.

### *Land Ownership*

Approximately half of the land within Boulder County is privately owned (Figure 11). Private lands are predominantly in eastern half as well as along major roads and towns in the western half. There are many scattered inholdings within federal land blocks. U.S. Forest Service lands occupy approximately 22 percent of the county. The Arapahoe-Roosevelt National Forest threads through the county in the mountains; it is all within the Boulder ranger district. The Indian Peaks Wilderness Area spans the western border of the county but is bisected by the Boulder Watershed and Niwot Ridge LTER site. The Bureau of Land Management holds approximately one percent of the county in disparate blocks around several historical mining districts. Rocky Mountain National Park occupies six percent of the northwest corner of the county. Other federal lands include the Table Mountain Antenna Site and the National Bureau of Standards in the east. State lands comprise less than one percent of the land in Boulder County with Eldorado Canyon State Park and several State Land Board sections. County and City Open space parcels comprise nearly 90,000 acres (Boulder County Parks and Open Space 2008). Open space parcels are throughout the county, but have concentrations in the foothills and around Boulder, Longmont, and Nederland.

### *Population*

Boulder County, with an estimated population size of 282,304, ranks seventh in the state for this statistic. The vast majority of the county's population is concentrated in the eastern half of the county in Boulder, Broomfield, Erie, Lafayette, Louisville, and Longmont. The population increased by 29.3% between 1990 and 2000 (U.S. Census Bureau 2008). In the county, development is occurring around the Highway 287 corridor and dispersed within the foothills. Residential development is occurring at all scales including high-density subdivisions and 35-acre parcels.

### *Land Use History*

Boulder County has had a long history of settlement and use. Although dispersed activity in the area occurred in the 1830's from fur trappers, the fur trade proved transient and early forts established in the area were quickly abandoned. This all changed when gold was discovered in Cherry Creek in 1858. Prospectors coming from the Northeast were sidetracked on their way to Auraria (now Denver), following the St. Vrain to Boulder Creek and settled below the Flatirons (Smith 1981). Gold was discovered twelve miles up the canyon shortly thereafter and the history of what is now Boulder County changed forever.

A rapid influx of prospectors and settlers arrived and mining camps were established in the mountains. In addition to the mineral extraction that was occurring in the mountains timber cutting for infrastructure (railroads, buildings, and mines, roads) to support the

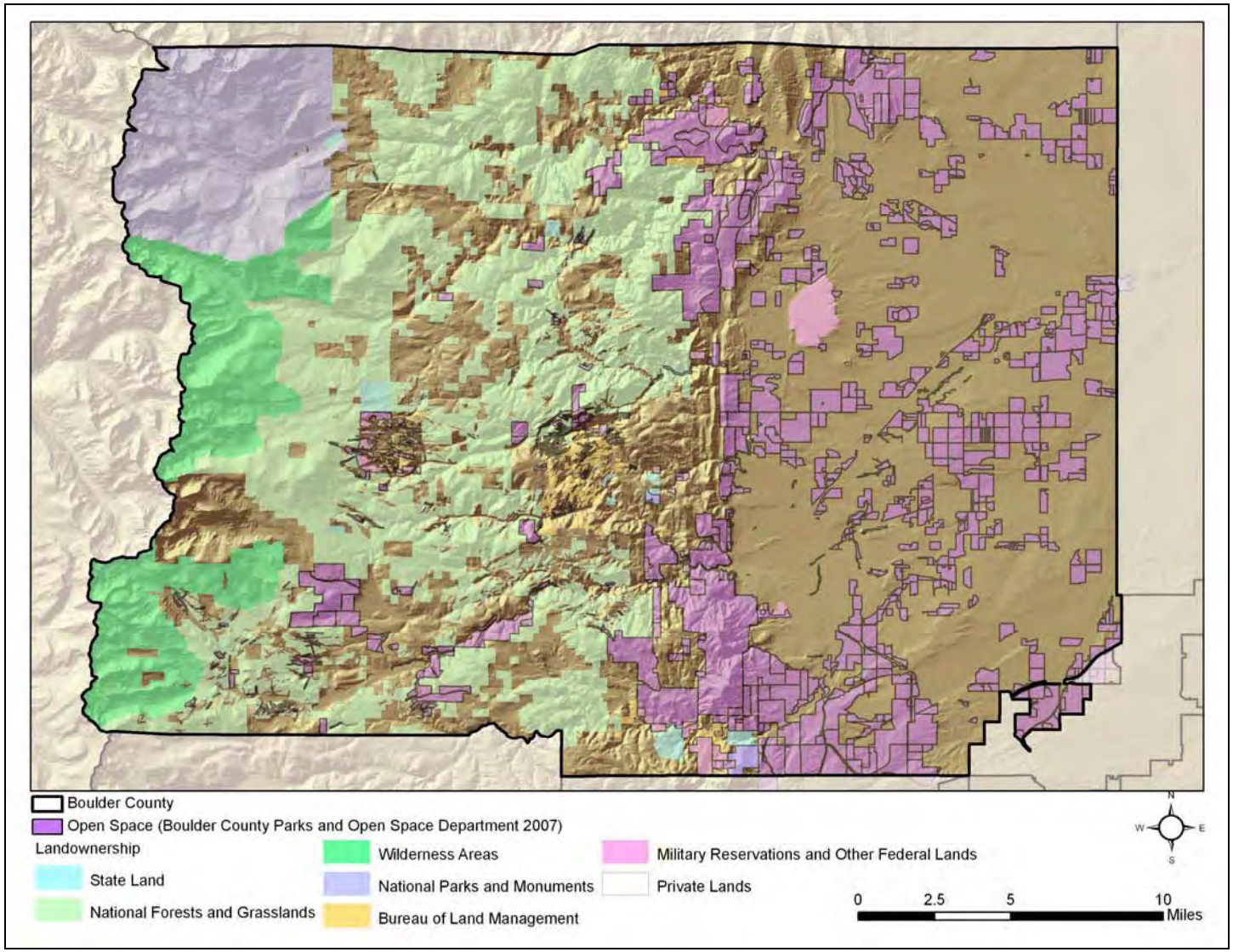



**Figure 11. Land ownership status in Boulder County.**

mining boom greatly increased (Veblen and Lorenz 1991). Additionally, prospectors would set fires to clear away leaves and brush in order to assess the rocks for ore potential. Catastrophic forest fires burned across much of south-central Boulder County; fires are well-documented from Ward, Gold Hill, Caribou, Nederland, and Eldora (Wolle 1949, Kemp 1960, Smith 1961, Veblen and Lorenz 1991). The effects of these activities are still visible on the landscape today. Extensive food production began on the plains, both agriculture and cattle ranching, to support the mining camps. Cattle ranching increased dramatically, and grazing pressure in the montane, piedmont, and foothill grasslands intensified (Baron 2002). The first irrigation ditch was dug in Boulder City in 1859 (Smith 1981). Episodes of catastrophic flooding impacted the infrastructure and economy of the region occurred in the late 1800's and early 1900's; natural runoff from high precipitation events was likely exacerbated by the hydrologic alterations from mining activity, extensive forest denudation, and intensive grazing in the region. As hard rock mining continued in the mountain, coal mining was already occurring on the plains, especially around Marshall and Valmont, providing the power to transport the mined metals from the mountains (Sampson 1995). All mines in Boulder County are shown in Figure 12.

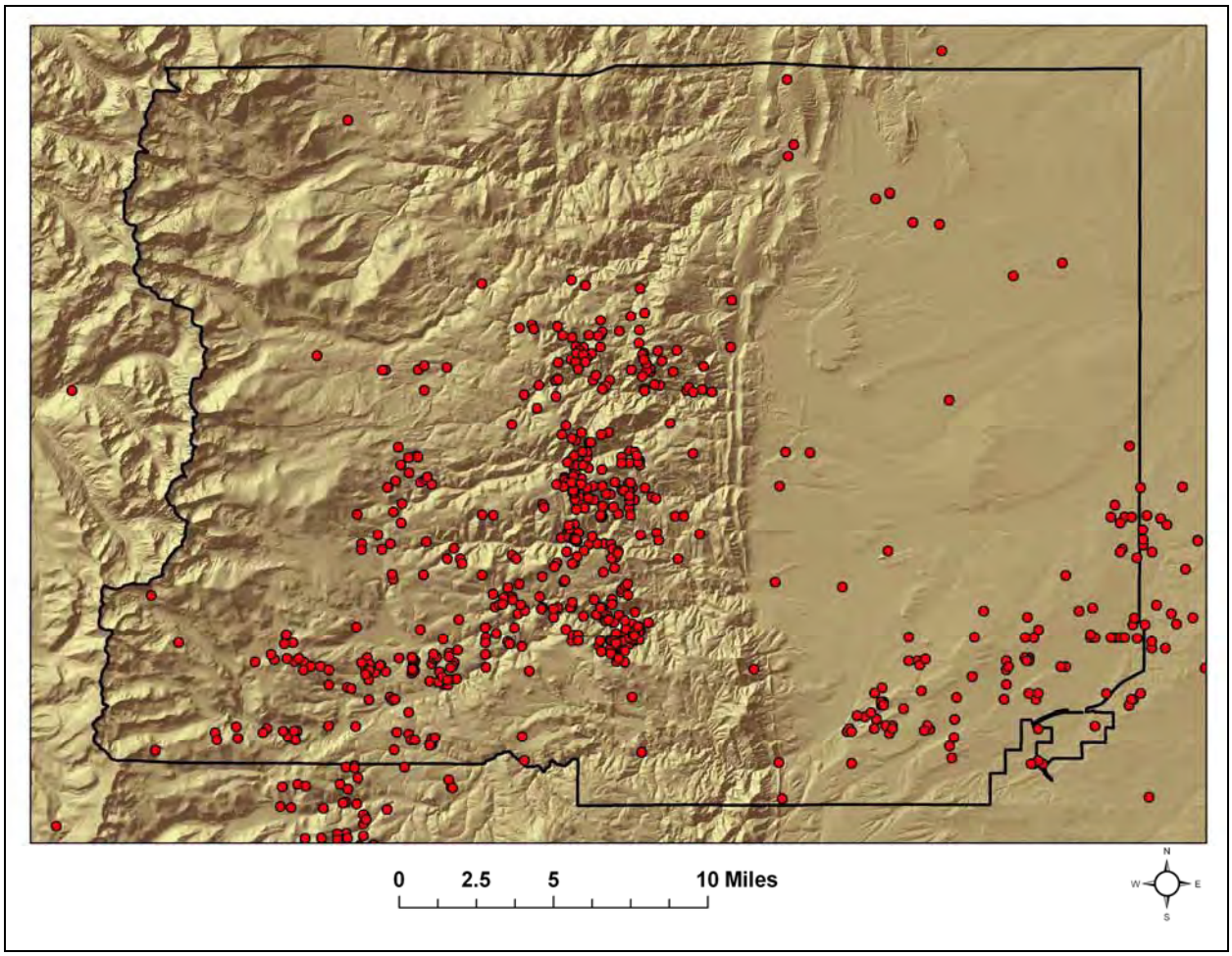



**Figure 12. Mines in Boulder County (data queried from Geographic Names Information System).**

Most of the mining towns did not last long. Many were destroyed by fires (both naturally and unnaturally ignited) or floods (Smith 1981). As the mining era passed its zenith, tourism remained. Various parks and open space property in Boulder County today are destinations for a wide variety of recreational opportunities.

Current land use in Boulder County is greatly influenced by topography and climate. Human use and development is highest in the eastern part of the county. This area contains many communities that are growing and serve as homes for people commuting to Denver. The rest of the county, however, still retains a semblance of rural or small-town character, although they too are being increasingly altered by growth. Irrigated croplands occur in the eastern half of the county.

Mineral extraction is still prominent in the area. Numerous oil and gas wells, limestone mines, and sand and gravel quarries exist. Sand and gravel mining occur along most of the major drainages in the northeastern part of the County.

# CONSERVATION ASSESSMENT

## *Potential Impacts to Biological Diversity in Boulder County*

General threats that may affect biodiversity on a large, landscape-level scale in Boulder County are summarized below. We understand that the issues discussed below are often important parts of a healthy economy and contribute to the well being of our society. We mention these general "impacts to biodiversity" with the hope that good planning can minimize the impacts where critical habitat resides.

### Development

Residential development is increasing in Boulder County, especially along the Highway 287 corridor, the Diagonal Highway, and in the foothills. Development creates a number of stresses, including habitat loss and fragmentation, introduction and proliferation of non-native species, fire suppression, and predation and disturbance from domestic animals (dogs and cats) (Oxley *et al*. 1974, Coleman and Temple 1994). Increasing human density in an area can lead to a change in the composition of wildlife populations (e.g., numbers of foxes and coyotes may increase, or number of bird species present may decrease), and may also alter movement patterns and behavior of wildlife. Loss of habitat to development is considered irreversible.

### Recreation

Recreation, once very local and perhaps even unnoticeable, is increasing and becoming a threat to natural ecosystems in Boulder County. Different types of recreation (e.g., motorized versus non-motorized activities), typically have different effects on ecosystem processes. All-terrain vehicles can disrupt migration and breeding patterns, and fragment habitat for native resident species. This activity can also threaten rare plants found in non-forested areas. ATVs have also been identified as a vector for the invasion of non-native plant species.

Non-motorized recreation, mostly hiking but also some mountain biking and rock climbing, presents a different set of issues (Cole and Knight 1990, Knight and Cole 1991; Miller *et al.* 1998, 2001). Wildlife behavior can be significantly altered by repeat visits of hikers or bicyclists. Trail placement should consider the range of potential impacts on the ecosystem. Considerations include minimizing fragmentation by leaving large undisturbed areas of wildlife habitat where possible (Colorado Department of Natural Resources 1998). Miller *et al.* (1998) found lower nest survival for grassland birds adjacent to trails; they also found that grassland birds were more likely to nest away from trails with a zone of influence approximating 250 feet (75 meters). Alpine areas, mountain lakes, and riparian zones are routes and destinations for many established trails. Thus, impacts to native vegetation (mainly trampling) in these areas can be high.

**Fragmentation and Edge Effects**

Edges are simply the outer boundary of an ecosystem that abruptly grades into another type of habitat (e.g., edge of a mountain mahogany shrubland adjacent to a grassland (Forman and Godron 1986). Edges are often created by naturally occurring processes such as floods, fires, and wind. Edges can also be created by human activities such as roads, trails, timber harvesting, agricultural practices, and rangeland management. Human induced edges are often dominated by plant and animal species that are adapted to disturbance. As the landscape is increasingly fragmented by large-scale, rapid anthropogenic conversion, these edges become increasingly abundant in areas that may have had few "natural" edges. The overall reduction of large landscapes jeopardizes the existence of specialist species, may increase non-native species, and may limit the mobility of species that require large landscapes or a diversity of landscapes for their survival (e.g., large mammals or migratory waterbirds).

**Roads**

There is a complex, dense network of roads in many parts of Boulder County due primarily to historical mining activities, agricultural uses, and urban and residential development. Expansion of the existing road network in some areas will detrimentally affect the biodiversity of the region. Roads are associated with a wide variety of impacts to natural communities, including invasion by non-native plant species, increased depredation and parasitism of bird nests, increased impacts of pets, fragmentation of habitats, erosion, pollution, and road mortality (Noss *et al*. 1997).

Roads function as conduits, barriers, habitats, sources, and sinks for some species and populations of species (Forman 1995). Road networks crossing landscapes can increase erosion and alter local hydrological regimes. Runoff from roads may impact local vegetation *via* contribution of heavy metals and sediments. Road networks interrupt horizontal ecological flows, alter landscape spatial patterns, and therefore inhibit important interior species (Forman and Alexander 1998).

Effects on wildlife can be attributed to road avoidance and mortality due to vehicular collisions (roadkill). Traffic noise appears to be the most important variable in road avoidance, although visual disturbance, pollutants, and predators moving along a road are alternative hypotheses as to the cause of avoidance (Forman and Alexander 1998).

Songbirds appear to be sensitive to remarkably low noise levels, even to noise levels similar to that of a library reading room (Reijnen *et al*. 1995).

**Non-native Species**

Although non-native species are mentioned repeatedly as stresses in the above discussions, because they may be introduced through so many activities, they are included here as a general threat as well. Non-native plants or animals can have wide-ranging impacts. Non-native plants can increase dramatically under the right conditions and dominate a previously natural area (e.g., scraped roadsides). This can generate secondary effects on animals (particularly invertebrates) that depend on native plant species for forage, cover, or propagation. Effects of non-native fishes include competition that can lead to local extinctions of native fishes and hybridization that corrupts the genetic stock of the native fishes.

**Livestock Grazing**

Boulder County has a long history of domestic livestock grazing that has left a broad and sometimes subtle impact on the landscape. Some range management practices can adversely affect the region's biological resources. Many riparian areas in Boulder County were used for rangeland. Because there is little surface water available in the county, riparian areas often serve as the only available water. Additionally, riparian areas are often areas of the highest production of grasses and forbs. Long-term, incompatible livestock use of wetland and riparian areas can potentially erode stream banks, cause streams to downcut, lower the water table, alter channel morphology, impair plant regeneration, establish non-native species, shift community structure and composition, degrade water quality, and diminish general riparian and wetland functions (Windell *et al*. 1986). Depending on grazing practices and local environmental conditions, impacts can be minimal and largely reversible (slight shifts in species composition) to severe and essentially irreversible (extensive gullying and introduction of non-native forage species).

**Hydrological Modifications**

River impoundment in the form of lakes, reservoirs, irrigation ditches, and canals can affect aquatic dependent plants and animals (Chien 1985, Friedman *et al.* 1998). Annual flooding is a natural ecological process that can be severely altered by the construction of dams, reservoirs, and other water diversions. These water diversions and impoundments have altered the normal high peak flows that were once a part of the natural hydrological regimes of the rivers and their tributaries. These periodic floods are necessary for continued viability of most riparian vegetation. For example, many plants, including cottonwood trees, reproduce primarily with flooding events (Rood and Mahoney 1993). As plant composition changes in response to alterations in the flooding regime, the composition of the aquatic and terrestrial fauna may also change.

In addition to impoundment, rivers have also been altered by stream bank stabilization projects (e.g., channelization) (Rosgen 1996). Most streams and rivers are dynamic and inherently move across the land. Stabilizing or channelizing stream banks forces the river to stay in one place and often leads to changes in riparian ecology and more serious destruction downstream. It is also well known that different plant communities require

different geomorphologic settings. For example, point bars are required for some species of willows to regenerate, terraces are required for mature cottonwood/shrubland forests, and old oxbow reaches may eventually provide habitat for many wetland communities. By stabilizing a river, the creation of these geomorphic settings is often eliminated. Thus, the plant communities that require such fluvial processes are no longer able to regenerate or survive. In general, the cumulative effects from dams, reservoirs, and channelization on plant communities have caused a gradual shift from diverse multi-aged riparian woodlands to mature single-aged forest canopies.

Many wetlands not associated with fluvial processes have been altered by irrigation practices, water diversions, and groundwater withdrawals. Many historical wetlands, such as seeps and springs, have been lost or altered due to water "development" projects, such as water diversions or impoundments. The number of species supported by a manmade pond with minimal edge habitat is generally less than the number supported by an extensive intact seep and spring wetland or naturally occurring pond.

**Logging**

Most logging operations require a network of roads. The impacts from roads can result in threats to biodiversity (see "Roads" for more detailed discussion). Other logging impacts include loss of wildlife habitat, habitat fragmentation, soil erosion, and lower water quality for aquatic species. The U.S. Forest Service monitors logging closely; nonetheless, problems can still occur (Husong and Alves 1998). The effects of logging on biodiversity have not been determined in Boulder County.

# METHODS

The methods for assessing and prioritizing conservation needs for the breadth of biodiversity elements over a large area are necessarily diverse. Natural Heritage ranking methodology was followed to identify which elements to target as rare, threatened and endangered in Boulder County. Further, the Colorado Natural Heritage Program follows a general methodology for county surveys that is continuously being honed for this specific scope and purpose. The Natural Heritage survey described in this report was conducted in several steps summarized below. Additionally, input from Boulder County Parks and Open Lands and the City of Boulder Open Space and Mountain Parks were sought at all stages.

### *Identify Rare or Imperiled Species and Significant Plant Communities with the Potential to Occur in the County*

Biodiversity information contained in CNHP's Biotics database, developed from ecoregional planning efforts and expert interviews were used to refine a list of potential rare, threatened, and endangered species and natural plant communities known from or with potential to occur in Boulder County. In general, species and plant communities that have been recorded from Boulder County or from adjacent counties are included in this list. Over 200 rare species and significant plant communities were targeted in this project and they are listed in Appendix B. Given the limited amount of time and funding for this research, a specific subset of species and communities were prioritized for data collection and field inventory efforts. The amount of effort given to the inventory for each of these elements was prioritized according to the element's global status rank. Globally rare (G1-G3) elements were given highest priority; globally common (G4 or G5) elements that are rare in the state (S1-S3) were of a lower priority.

### *Collect Available Information*

CNHP databases were updated with information regarding the known locations of species and significant plant communities within Boulder County. A variety of sources were searched for this information. The Colorado State University museums and herbarium were searched, as were plant and animal collections at the University of Colorado, Rocky Mountain Herbarium, and local private collections. The Colorado Division of Wildlife provided data on several species. Both general and specific literature sources were incorporated into CNHP databases, either in the form of locational information or as biological data pertaining to a species in general. Other information was gathered to help locate additional occurrences of natural heritage elements. Such information covers basic species and community biology including range, habitat, phenology (reproductive timing), food sources, and substrates. This information was also entered into CNHP databases.

### *Identify Targeted Inventory Areas for Field Survey*

Survey sites were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities. Previously documented locations were targeted, and additional potential areas were chosen using available information sources. Areas with

potentially high natural values were selected using aerial photographs, geology maps, vegetation surveys, personal recommendations from knowledgeable local residents, and numerous roadside surveys by our field scientists.

Using the biological information stored in the CNHP databases, areas having the highest potential for supporting specific elements were identified. Those chosen for survey sites appeared to be in the most natural condition. In general, this means those sites that are the largest, least fragmented, and relatively free of visible disturbances such as roads, trails, fences, and quarries were identified.

The above information was used to delineate Targeted Inventory Areas (TIAs) that were believed to have relatively high probability of harboring significant natural resources. These areas focused on private lands. Additional TIAs identified by Boulder County Parks and Open Space or City of Boulder Open Space and Mountain Parks staff were included.

Because there were limited resources to address a number of potential sites, surveys for all elements were prioritized by the degree of imperilment. For example, the species with Natural Heritage ranks of G1-G3 were the primary target of our inventory efforts. Although species with lower Natural Heritage ranks were not the main focus of inventory efforts, many of these species occupy similar habitats as the targeted species, and were searched for and documented if encountered.

***Contact Landowners***

Obtaining permission to conduct surveys on private property was essential to this project. Once survey sites were chosen, land ownership of these areas was determined using GIS land ownership coverage obtained from Boulder County GIS and Mapping Department within Parks and Open Space in spring of 2007. Landowners were then either contacted by phone or in person. If landowners could not be contacted, or if permission to access the property was denied, this was recorded and the site was not visited. Under no circumstances were private properties surveyed without landowner permission.

***Conduct Field Surveys***

Survey sites where access could be obtained were visited at the appropriate time as dictated by the seasonal occurrence (or phenology) of the individual elements. It was essential that surveys took place during a time when the targeted elements were detectable. For instance, breeding birds cannot be surveyed outside of the breeding season, and plants are often not identifiable without flowers or fruit that are only present during certain times of the year.

The methods used in the surveys vary according to the elements that were being targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion that would attempt to cover the area as thoroughly as possible in the given time. Some types of organisms require special techniques to document their presence. These are summarized below:

- Amphibians: visual observation and capture using aquatic dip nets
- Reptiles: visual observation
- Mammals: live traps, pitfall traps and mist nets
- Birds: visual observation or identification by song or call
- Insects: aerial net and visual observation
- Plants: visual observation
- Plant communities: visual observation

Where necessary and permitted, voucher specimens were collected and deposited in local university museums and herbaria.

When a rare species or significant plant community was discovered, its precise location and known extent was recorded with a global positioning system (GPS) unit. Other data recorded at each occurrence include numbers observed, breeding status, habitat description, disturbance features, observable threats, and potential protection and management needs. The overall significance of each occurrence, relative to others of the same element, was estimated by rating the size of the population or community, the condition or naturalness of the habitat, and the landscape context (its connectivity and its ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See Appendix A on Natural Heritage Methodology or NatureServe (2008) for more about element occurrence ranking.

Site visits and assessments were conducted on the following two levels:

(1) Roadside or adjacent land assessments. Many of the sites could be viewed at a distance from a public road. While on the ground the field scientist can see, even from a distance, many features not apparent on maps and aerial photos. The road assessments determined the extent of human and livestock impacts on the targeted inventory area (TIA), which can include ditching, adventive plant species, plant species indicative of intensive livestock use, stream bank destabilization, major hydrologic alterations, extensive cover of non-native plant species, or new construction. Sites with one or more of these characteristics were generally excluded as potential conservation areas and no extensive data were gathered at these areas.

(2) On-site assessments. On-site assessments was the preferred method, as it is the only technique that can yield high-confidence statements concerning the known or potential presence of rare and imperiled elements or excellent examples of common natural communities. On-site assessments are also the most resource intensive because of the effort required to contact landowners. In a few cases where on-site assessments were desired, they could not be conducted because either field personnel were denied access to the property by the landowner, or CHHP was unable to contact the landowner during the time frame of this study.

***Delineate Potential Conservation Areas***

Since the objective for this inventory was to prioritize specific areas for conservation efforts, Potential Conservation Area (PCA) boundaries were delineated. The goal of the PCA is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover, and current and potential land uses. In developing the boundaries of a PCA, CNHP scientists consider a number of factors that include, but are not limited to:

- ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the PCA and surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater;
- land intended to buffer the PCA against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

***Delineate Networks of Conservation Areas***

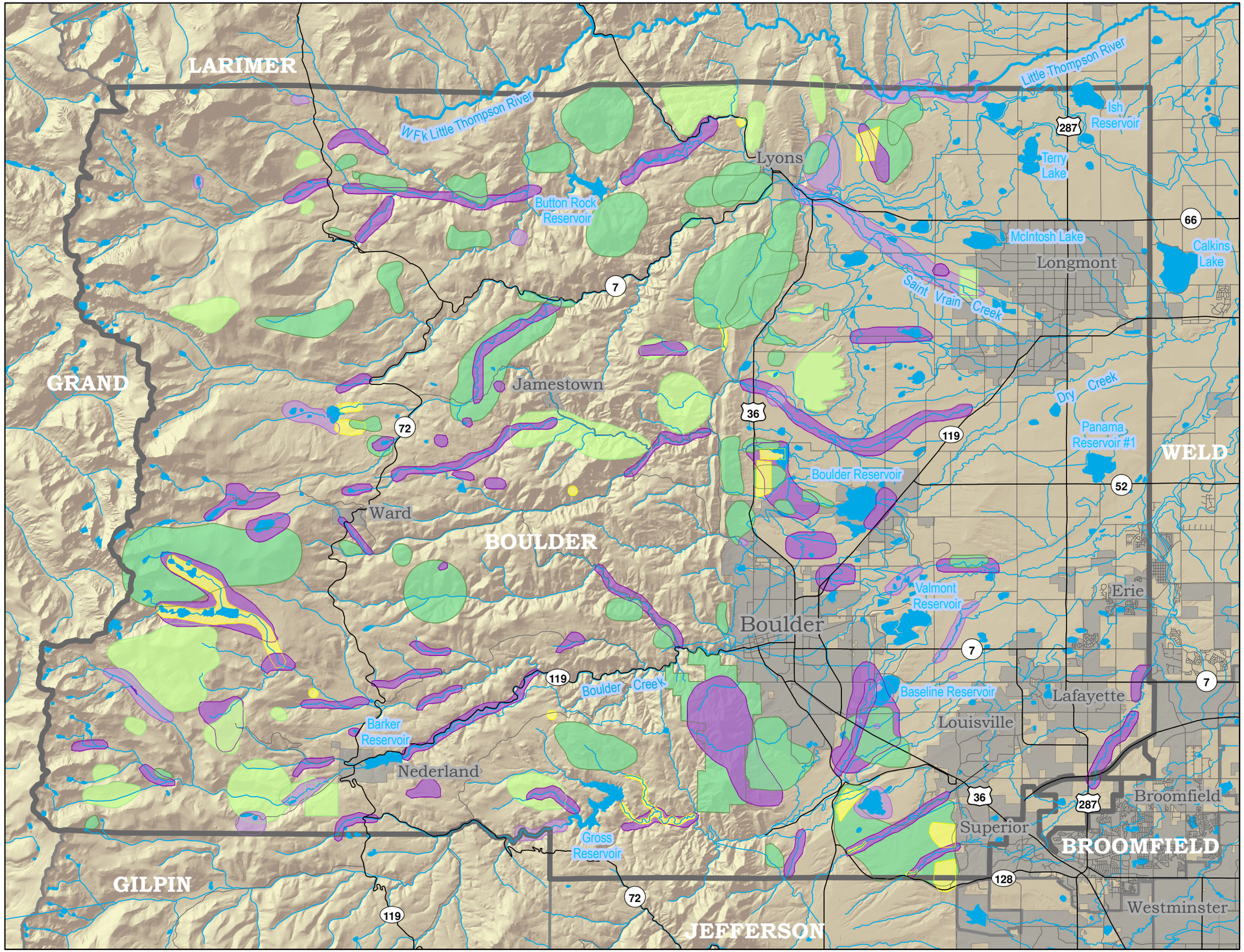
Occasionally a landscape area will encompass many Potential Conservation Areas that share similar species or natural communities and ecological processes or a landscape will stand out on a regional scale as a large and minimally fragmented area that is relatively intact ecologically. In these cases, a Network of Conservation Areas (NCA) is delineated. For example, in South Park, Park County, Colorado, there are numerous extreme rich fens that are physically isolated from one another, yet they all contain the same types of rare plants and plant communities. Each of the isolated fens has been included in its own PCA. Yet, when considering the "big picture" of the overall landscape, these fens probably interact with each other and influence each other on a larger scale. In order to capture this repeating pattern and higher-level interactions on the landscape scale, a NCA is delineated. An example of a relatively intact landscape on a regional scale is the Laramie Foothills in northeastern Larimer County. Most NCAs are drawn at a regional scale that may be best represented on a statewide map.

## RESULTS

One hundred eighty-one Targeted Inventory Areas (TIAs) were identified for field survey in 2007 and 2008 (Figure 13). Of these 74 were identified for upland plant and ecological elements, 90 were identified for wetland and/or riparian plants and plant communities, and seventeen TIAs were identified for additional zoological elements. An effort was made to select TIAs that potentially had natural processes, native species composition, and vegetation structure intact. Ninety-six TIAs (53%) were visited during 2007-2008 and an additional five were addressed with other data.

Significant amount of data from field surveys and those data submitted by myriad researches were incorporated in the Biotics database. The magnitude of these data exceeded that of any other county survey project to date. There were 319 element occurrence records known from Boulder County prior to this project. The breadth of these was re-evaluated for their accuracy. Some records were merged, deleted, and reclassified to reflect current data standards (NatureServe 2002). Other records were realigned according to recent population genetics studies (Kothera 2006). There were 75 new plant element occurrence records and an additional 81 plant records were updated. There were 42 new upland plant association records processed and 39 more were updated. Fifty zoology element occurrence records were processed including approximately two dozen were combined or merged. Additionally, forty observation records were processed for watch listed species. For wetland plant associations there were 26 new records, 21 updates, and three deletions.

The CNHP database currently houses more than 450 element occurrence records within Boulder County. As part of this project, at least 225 new element occurrence records from field surveys, herbarium and museum records, and various reports were identified. Many element occurrence records were re-evaluated and updated with occurrence ranking information that was previously lacking or out-of-date. These records can now be prioritized for their conservation value. Many element occurrence ranks improved because more individuals were documented or greater land area surround the occurrences was evaluated. Most of the reclassification of records occurred in plant association records and reflect forest succession filling in grassland openings. This occurred primarily in the foothills where ponderosa pine is encroaching on the landscape. Certain elements demonstrated downward trends, especially in piedmont grassland communities like needle and thread Colorado Front Range grasslands and inland saltgrass (*Distichlis spicata*) plant associations, which reflect encroachment by residential development. Boulder County currently has the highest density of element occurrence records of any county in Colorado (CNHP 2009), a reflection of the intensive survey efforts and research.

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## Targeted Inventory Areas

**Upland Ecology TIAs**
- Visited
- Not Visited

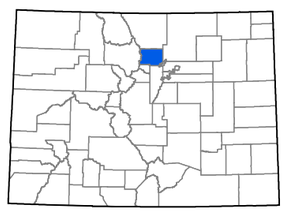
**Wetland Ecology TIAs**
- Visited
- Not Visited

**Zoology TIAs**
- Visited

**Base Data**
- Project Area
- Counties
- Municipalities
- Lakes, Reservoirs
- Rivers, Streams, Creeks
- Highways
- Major Roads

10m DEM Produced by the USGS

**Location in Colorado**



*Targeted Inventory Areas are believed to have a relatively high probability of harboring significant biological resources.*

0 1 2 4 Miles

N

Figure 13. CNHP Targeted Inventory Areas in Boulder County

Results of the 2007-2008 Boulder County biological survey confirm that there are many areas with high biological significance. Several rare plants and animals depend on these areas for survival. All together one amphibian, six birds, seven fish, ten insects, four mammals, four mollusks, 63 natural communities, and 58 imperiled plant species of concern were documented in element occurrence records in Boulder County in this report (Table 2). An additional seven species are covered by observations records (Table 3). As a result of the data gathered during this project several species may be down-listed, including clustered lady's slipper (*Cypripedium fasciculatum*), Mingan moonwort (*Botrychium minganense*), and western moonwort (*Botrychium hesperium*).

CNHP has identified 62 Potential Conservation Areas (PCAs) in or partially contained in Boulder County and are presented in this report. Additionally three Network of Conservation Areas (NCAs) were drawn and described. The distribution of the PCAs is shown in Figure 14, they are listed in Table 4, and profiled in Appendix C. The NCAs are profiled in Appendix D. Of the 65 PCAs presented in this report, three were of outstanding biodiversity significance (B1), twenty were of very high biodiversity significance (B2), 25 were of high biodiversity significance (B3), eleven were is of moderate biodiversity significance (B4), and three were of general biodiversity significance (B5).

Where ecological processes and spatial pattern of occurrence on the landscape is similar, additional element occurrences are attached to PCAs even though the PCA was drawn for a different element. However, some element occurrences are not represented in PCAs. For example, species that are tracked via Watch List are not attached to PCAs. Wide-ranging species like birds and large mammals (e.g. wolverine, *Gulo gulo*) are often not attached to PCAs.

**Table 2. List of biodiversity elements documented in element occurrence records in Boulder County.**

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| AMPHIBIANS | | | | |
| *Bufo boreas* pop. 1 | *Bufo boreas* pop. 1 | Boreal Toad (Southern Rocky Mountain Population) | G4T1Q | S1 |
| BIRDS | | | | |
| *Cypseloides niger* | *Cypseloides niger* | Black Swift | G4 | S3B |
| *Falco peregrinus anatum* | *Falco peregrinus anatum* | American Peregrine Falcon | G4T4 | S2B |
| *Haliaeetus leucocephalus* | *Haliaeetus leucocephalus* | Bald Eagle | G5 | S1B,S3N |
| *Himantopus mexicanus* | *Himantopus mexicanus* | Black-necked Stilt | G5 | S3B |
| *Leucosticte australis* | *Leucosticte australis* | Brown-capped Rosy-finch | G4 | S3B,S4N |
| *Pelecanus erythrorhynchos* | *Pelecanus erythrorhynchos* | American White Pelican | G3 | S1B |
| FISH | | | | |
| *Couesius plumbeus* | *Couesius plumbeus* | Lake Chub | G5 | S1 |
| *Hybognathus hankinsoni* | *Hybognathus hankinsoni* | Brassy Minnow | G5 | S3 |
| *Luxilus cornutus* | *Notropis cornutus* | Common Shiner | G5 | S2 |
| *Noturus flavus* | *Noturus flavus* | Stonecat | G5 | S1 |
| *Oncorhynchus clarkii stomias* | *Oncorhynchus clarkii stomias* | Greenback Cutthroat Trout | G4T2T3 | S2 |
| *Phoxinus eos* | *Phoxinus eos* | Northern Redbelly Dace | G5 | S1 |
| *Phoxinus erythrogaster* | *Phoxinus erythrogaster* | Southern Redbelly Dace | G5 | S1 |
| INSECTS | | | | |
| *Atrytone arogos* | *Atrytone arogos* | Arogos Skipper | G3 | S2 |
| *Callophrys mossii schryveri* | *Callophrys mossii schryveri* | Moss's Elfin | G4T3 | S2S3 |
| *Celastrina humulus* | *Celastrina humulus* | Hops Feeding Azure | G2G3 | S2 |
| *Erebia pawloskii* | *Erebia pawlowskii* | Theano Alpine | G5 | S3 |
| *Erynnis martialis* | *Erynnis martialis* | Mottled Dusky Wing | G3 | S2S3 |
| *Euphyes bimacula* | *Euphyes bimacula* | Two-spotted Skipper | G4 | S2 |
| *Hesperia ottoe* | *Hesperia ottoe* | Ottoe Skipper | G3G4 | S2 |
| *Oeneis jutta reducta* | *Oeneis jutta reducta* | Rocky Mountain Arctic Jutta | G5T4 | S1 |
| *Polites origenes* | *Polites origenes* | Cross-line Skipper | G5 | S3 |
| *Speyeria idalia* | *Speyeria idalia* | Regal Fritillary | G3 | S1 |
| MAMMALS | | | | |
| *Corynorhinus townsendii pallescens* | *Plecotus townsendii pallescens* | Townsend's Big-eared Bat Subsp | G4T4 | S2 |
| *Cynomys ludovicianus* | *Cynomys ludovicianus* | Black-tailed Prairie Dog | G4 | S3 |
| *Myotis thysanodes* | *Myotis thysanodes* | Fringed Myotis | G4G5 | S3 |
| *Zapus hudsonius preblei* | *Zapus hudsonius preblei* | Meadow Jumping Mouse Subsp | G5T2 | S1 |
| MOLLUSKS | | | | |
| *Acroloxus coloradensis* | *Acroloxus coloradensis* | Rocky Mountain | G3 | S1 |

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| | | Capshell | | |
| *Anodontoides ferussacianus* | *Anodontoides ferussacianus* | Cylindrical Papershell | G5 | S2 |
| *Promenetus exacuous* | *Promenetus exacuous* | Sharp Sprite | G5 | S2 |
| *Promenetus umbilicatellus* | *Promenetus umbilicatellus* | Umbilicate Sprite | G4 | S3 |
| NATURAL COMMUNITIES | | | | |
| *Alnus incana - Salix (monticola, lucida, ligulifolia)* Shrubland | *Alnus incana - Salix (monticola, lucida, ligulifolia)* Shrubland | Thinleaf Alder-Mixed Willow Species | G3 | S3 |
| *Alnus incana - Salix drummondiana* Shrubland | *Alnus incana - Salix drummondiana* Shrubland | Montane Riparian Shrubland | G3 | S3 |
| *Alnus incana /* Mesic Forbs Shrubland | *Alnus incana /* Mesic Forbs Shrubland | Thinleaf Alder/Mesic Forb Riparian Shrubland | G3 | S3 |
| *Andropogon gerardii - Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation | *Andropogon gerardii - Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation | Xeric Tallgrass Prairie | G2? | S2 |
| *Andropogon gerardii - Sorghastrum nutans* Western Great Plains Herbaceous Vegetation | *Andropogon gerardii - Sorghastrum nutans* Western Great Plains Herbaceous Vegetation | Mesic Tallgrass Prairie | G2 | S1S2 |
| *Andropogon gerardii - Sporobolus heterolepis* Western Foothills Herbaceous Vegetation | *Andropogon gerardii - Sporobolus heterolepis* Western Foothills Herbaceous Vegetation | Xeric Tallgrass Prairie | G2 | S1S2 |
| *Betula occidentalis / Maianthemum stellatum* Shrubland | *Betula occidentalis / Maianthemum stellatum* Shrubland | Foothills Riparian Shrubland | G4? | S2 |
| *Betula occidentalis /* Mesic Graminoids Shrubland | *Betula occidentalis /* Mesic Graminoids Shrubland | Lower Montane Riparian Shrublands | G3 | S2 |
| *Carex diandra* Wet Meadow Herbaceous Vegetation | *Carex diandra* Wet Meadow Herbaceous Vegetation | Quaking Fen | GNR | SU |
| *Carex lasiocarpa* Herbaceous Vegetation | *Carex lasiocarpa* Herbaceous Vegetation | Montane Wetland | G4? | S1 |
| *Carex utriculata* Herbaceous Vegetation | *Carex utriculata* Herbaceous Vegetation | Beaked Sedge Montane Wet Meadows | G5 | S4 |
| *Celtis laevigata var. reticulata / Pseudoroegneria spicata* Woodland | *Celtis laevigata var. reticulata / Pseudoroegneria spicata* Woodland | Hackberry | G2G3 | S1S2 |
| *Cercocarpus montanus - Rhus trilobata / Andropogon gerardii* Shrubland | *Cercocarpus montanus - Rhus trilobata / Andropogon gerardii* Shrubland | Mountain Mahogany - Skunkbush / Big Bluestem Shrubland | G2G3 | S2S3 |
| *Cercocarpus montanus / Achnatherum scribneri* Shrubland | *Cercocarpus montanus / Achnatherum scribneri* Shrubland | Foothills Shrubland | G3 | S3 |
| *Cercocarpus montanus /* | *Cercocarpus montanus /* | Mountain | GU | S3 |

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| *Elymus lanceolatus ssp. lanceolatus* Shrubland | *Elymus lanceolatus ssp. lanceolatus* Shrubland | Mahogany/Griffith's Wheatgrass Shrubland | | |
| *Cercocarpus montanus / Hesperostipa comata* Shrubland | *Cercocarpus montanus / Hesperostipa comata* Shrubland | Mixed Foothill Shrublands | G2 | S2 |
| *Cercocarpus montanus / Hesperostipa neomexicana* Shrubland | *Cercocarpus montanus / Hesperostipa neomexicana* Shrubland | Foothills Shrubland | G2G3 | S2S3 |
| *Corylus cornuta* Shrubland [Provisional] | *Corylus cornuta* Shrubland [Provisional] | Lower Montane Forests | G3 | S1 |
| *Danthonia parryi* Herbaceous Vegetation | *Danthonia parryi* Herbaceous Vegetation | Montane Grasslands | G3 | S3 |
| *Distichlis spicata* Herbaceous Vegetation | *Distichlis spicata* Herbaceous Vegetation | Salt Meadows | G5 | S3 |
| *Eleocharis quinqueflora* Herbaceous Vegetation | *Eleocharis quinqueflora* Herbaceous Vegetation | Alpine Wetlands | G4 | S3S4 |
| *Eleocharis rostellata* Herbaceous Vegetation | *Eleocharis rostellata* Herbaceous Vegetation | Emergent Wetland | G3 | S2 |
| *Festuca thurberi Subalpine* Grassland Herbaceous Vegetation | *Festuca thurberi Subalpine* Grassland Herbaceous Vegetation | | G3 | S3 |
| *Geum rossii - Trifolium* spp. Herbaceous Vegetation | *Geum rossii - Trifolium* spp. Herbaceous Vegetation | Alpine Meadows | G3 | S3 |
| *Hesperostipa comata* Colorado Front Range Herbaceous Vegetation | *Hesperostipa comata* Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 |
| *Hesperostipa neomexicana* Herbaceous Vegetation | *Hesperostipa neomexicana* Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 |
| *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation | *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation | | G3G4 | SNR |
| *Kobresia myosuroides - Carex rupestris var. drummondiana* Herbaceous Vegetation | *Kobresia myosuroides - Carex rupestris var. drummondiana* Herbaceous Vegetation | Dry Alpine Meadows | G3 | S3? |
| *Muhlenbergia montana - Danthonia parryi* Herbaceous Vegetation | *Muhlenbergia montana - Danthonia parryi* Herbaceous Vegetation | Montane Grasslands | G3G4 | S2? |
| *Muhlenbergia montana - Hesperostipa comata* Herbaceous Vegetation | *Muhlenbergia montana - Hesperostipa comata* Herbaceous Vegetation | Montane Grasslands | G1G2 | S1S2 |
| *Phippsia algida* Herbaceous Vegetation | *Phippsia algida* Herbaceous Vegetation | Alpine Wetlands | GU | SU |
| *Picea pungens / Alnus incana* Woodland | *Picea pungens / Alnus incana* Woodland | Montane Riparian Forests | G3 | S3 |
| *Picea pungens / Betula occidentalis* Woodland | *Picea pungens / Betula occidentalis* Woodland | Montane Riparian Woodland | G2 | S2 |
| *Pinus contorta / Shepherdia canadensis* Forest | *Pinus contorta / Shepherdia canadensis* Forest | Persistent Lodgepole Pine Forests | G3G4 | S3S4 |
| *Pinus ponderosa /* | *Pinus ponderosa /* | | GNR | SNR |

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| *Artemisia tridentata ssp. vaseyana* Woodland | *Artemisia tridentata ssp. vaseyana* Woodland | | | |
| *Pinus ponderosa / Carex rossii* Forest | *Pinus ponderosa / Carex rossii* Forest | Lower Montane Forests | G4G5 | S3S4 |
| *Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* Wooded Herbaceous Vegetation | *Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? |
| *Pinus ponderosa / Leucopoa kingii* Woodland | *Pinus ponderosa / Leucopoa kingii* Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 |
| *Pinus ponderosa / Muhlenbergia montana* Woodland | *Pinus ponderosa / Muhlenbergia montana* Woodland | Foothills Ponderosa Pine Savannas | G4G5 | S2S3 |
| *Pinus ponderosa / Purshia tridentata* Woodland | *Pinus ponderosa / Purshia tridentata* Woodland | Foothills Ponderosa Pine Scrub Woodlands | G3G5 | S3? |
| *Populus angustifolia / Betula occidentalis* Woodland | *Populus angustifolia / Betula occidentalis* Woodland | Montane Riparian Forest | G3 | S3 |
| *Populus angustifolia / Salix irrorata* Woodland | *Populus angustifolia / Salix irrorata* Woodland | Foothills Riparian Woodland | G2 | S2 |
| *Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior)* Woodland | *Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior)* Woodland | Plains Cottonwood Riparian Woodland | G3G4 | S3 |
| *Populus tremuloides / Acer glabrum* Forest | *Populus tremuloides / Acer glabrum* Forest | Montane Riparian Forests | G1G2 | S2 |
| *Populus tremuloides / Alnus incana* Forest | *Populus tremuloides / Alnus incana* Forest | Montane Riparian Forests | G3 | S3 |
| *Populus tremuloides / Betula occidentalis* Forest | *Populus tremuloides / Betula occidentalis* Forest | | G3 | S2 |
| *Populus tremuloides / Festuca thurberi* Forest | *Populus tremuloides / Festuca thurberi* Forest | Aspen Forests | G4 | S4 |
| *Populus tremuloides / Vaccinium myrtillus* Forest | *Populus tremuloides / Vaccinium myrtillus* Forest | Aspen Forests | G3 | S3 |
| *Potamogeton natans* Herbaceous Vegetation | *Potamogeton natans* Herbaceous Vegetation | Montane Floating/Submergent Wetland | G5? | S1 |
| *Pseudotsuga menziesii / Betula occidentalis* Woodland | *Pseudotsuga menziesii / Betula occidentalis* Woodland | Montane Riparian Forest | G3? | S3 |
| *Pseudotsuga menziesii / Jamesia americana* Forest | *Pseudotsuga menziesii / Jamesia americana* Forest | Lower Montane Forests | G3G4 | S3 |
| *Purshia tridentata / Muhlenbergia montana* Shrubland | *Purshia tridentata / Muhlenbergia montana* Shrubland | Mixed Foothill Shrublands | G2 | S2 |
| *Salix bebbiana* Shrubland | *Salix bebbiana* Shrubland | Montane Willow Carrs | G3? | S2 |
| *Salix drummondiana / Calamagrostis canadensis* Shrubland | *Salix drummondiana / Calamagrostis canadensis* Shrubland | Lower Montane Willow Carrs | G3 | S3 |

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| *Salix geyeriana - Salix monticola / Calamagrostis canadensis* Shrubland | *Salix geyeriana - Salix monticola / Calamagrostis canadensis* Shrubland | Montane Willow Carrs | G3 | S3 |
| *Salix geyeriana / Calamagrostis canadensis Shrubland* | *Salix geyeriana / Calamagrostis canadensis Shrubland* | Montane Riparian Willow Carr | G5 | S3 |
| *Salix monticola / Calamagrostis canadensis* Shrubland | *Salix monticola / Calamagrostis canadensis* Shrubland | Montane Willow Carr | G3 | S3 |
| *Salix monticola /* Mesic Graminoids Shrubland | *Salix monticola /* Mesic Graminoids Shrubland | Montane Riparian Willow Carr | G3 | S3 |
| *Salix planifolia / Carex aquatilis* Shrubland | *Salix planifolia / Carex aquatilis* Shrubland | Subalpine Riparian Willow Carr | G5 | S4 |
| *Salix planifolia / Carex scopulorum* Shrubland | *Salix planifolia / Carex scopulorum* Shrubland | Subalpine Riparian Willow Carr | G4 | S4 |
| *Spartina pectinata* Western Herbaceous Vegetation | *Spartina pectinata* Western Herbaceous Vegetation | Prairie Slough Grass | G3? | S3 |
| *Suaeda calceoliformis* Herbaceous Vegetation | *Suaeda calceoliformis* Herbaceous Vegetation | Pursh Seepweed | GU | S2 |
| *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation | *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation | Narrow-leaf Cattail Marsh | G5 | S4 |
| *VASCULAR PLANTS* | | | | |
| *Acorus calamus* | *Acorus calamus* | sweet flag | G4? | SH |
| *Aletes humilis* | *Aletes humilis* | Larimer aletes | G2G3 | S2S3 |
| *Amorpha nana* | *Amorpha nana* | dwarf wild indigo | G5 | S2S3 |
| *Apios americana* | *Apios americana* | American groundnut | G5 | S1 |
| *Aquilegia saximontana* | *Aquilegia saximontana* | Rocky Mountain columbine | G3 | S3 |
| *Argyrochosma fendleri* | *Argyrochosma fendleri* | Fendler cloak-fern | G3 | S3 |
| *Aristida basiramea* | *Aristida basiramea* | forktip three-awn | G5 | S1 |
| *Artemisia pattersonii* | *Artemisia pattersonii* | Patterson's wormwood | G3G4 | S3 |
| *Asclepias stenophylla* | *Asclepias stenophylla* | narrow-leaved milkweed | G4G5 | S2 |
| *Asplenium adiantum-nigrum* | *Asplenium adiantum-nigrum* | black spleenwort | G5 | S1 |
| *Astragalus sparsiflorus* | *Astragalus sparsiflorus* | Front Range milkvetch | G3? | S3? |
| *Betula papyrifera* | *Betula papyrifera* | paper birch | G5 | S1 |
| *Botrychium echo* | *Botrychium echo* | reflected moonwort | G3 | S3 |
| *Botrychium hesperium* | *Botrychium hesperium* | western moonwort | G4 | S2 |
| *Botrychium lineare* | *Botrychium lineare* | narrowleaf grapefern | G2? | S1 |
| *Botrychium minganense* | *Botrychium minganense* | Mingan's moonwort | G4 | S1 |
| *Botrychium pallidum* | *Botrychium pallidum* | pale moonwort | G3 | S2 |
| *Botrychium simplex* | *Botrychium simplex* | least moonwort | G5 | S1 |
| *Botrychium virginianum* | *Botrypus virginianus* ssp. *europaeus* | rattlesnake fern | G5 | S1 |
| *Carex diandra* | *Carex diandra* | lesser panicled sedge | G5 | S1 |
| *Carex lasiocarpa* | *Carex lasiocarpa* | slender sedge | G5 | S1 |
| *Carex oreocharis* | *Carex oreocharis* | a sedge | G3 | S1 |

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| *Carex saximontana* | *Carex saximontana* | Rocky Mountain sedge | G5 | S1 |
| *Carex sprengelii* | *Carex sprengelii* | Sprengel's sedge | G5? | S2S3 |
| *Carex sychnocephala* | *Carex sychnocephala* | many-headed sedge | G4 | S1 |
| *Carex torreyi* | *Carex torreyi* | Torrey sedge | G4 | S1 |
| *Castilleja puberula* | *Castilleja puberula* | downy indian-paintbrush | G2G3 | S2S3 |
| *Cheilanthes eatonii* | *Cheilanthes eatonii* | Eaton's lip fern | G5? | S2 |
| *Crataegus chrysocarpa* | *Crataegus chrysocarpa* | yellow hawthorn | G5 | S1 |
| *Crepis nana* | *Askellia nana* | dwarf hawksbeard | G5 | S2 |
| *Cypripedium fasciculatum* | *Cypripedium fasciculatum* | clustered lady's-slipper | G4 | S3 |
| *Draba exunguiculata* | *Draba exunguiculata* | clawless draba | G2 | S2 |
| *Draba fladnizensis* | *Draba fladnizensis* | arctic draba | G4 | S2S3 |
| *Draba porsildii* | *Draba porsildii* | Porsild's whitlow-grass | G3G4 | S1 |
| *Drymaria effusa var. depressa* | *Drymaria effusa* var. *depressa* | spreading drymaria | G4T4 | SNR |
| *Eriophorum gracile* | *Eriophorum gracile* | slender cottongrass | G5 | S2 |
| *Gaura neomexicana ssp. coloradensis* | *Gaura neomexicana* ssp. *coloradensis* | Colorado butterfly weed | G3T2 | S1 |
| *Helianthemum bicknellii* | *Crocanthemum bicknellii* | frostweed | G5 | S2 |
| *Juncus vaseyi* | *Juncus vaseyi* | Vasey bulrush | G5? | S1 |
| *Listera convallarioides* | *Listera convallarioides* | broad-leaved twayblade | G5 | S2 |
| *Luzula subcapitata* | *Luzula subcapitata* | Colorado wood-rush | G3? | S3? |
| *Malaxis brachypoda* | *Malaxis monophyllos* ssp. *brachypoda* | white adder's-mouth | G4Q | S1 |
| *Mentzelia sinuata* | *Nuttallia sinuata* | wavy-leaf stickleaf | G3 | S2 |
| *Mimulus gemmiparus* | *Mimulus gemmiparus* | budding monkeyflower | G1 | S1 |
| *Oligoneuron album* | *Unamia alba* | prairie goldenrod | G5 | S2S3 |
| *Oxytropis parryi* | *Oxytropis parryi* | Parry's crazy-weed | G5 | S1 |
| *Parnassia kotzebuei* | *Parnassia kotzebuei* | Kotzebue's grass-of-parnassus | G5 | S2 |
| *Phacelia denticulata* | *Phacelia denticulata* | Rocky Moutain phacelia | G3? | S3? |
| *Phippsia algida* | *Phippsia algida* | snow grass | G5 | S2 |
| *Physaria bellii* | *Physaria bellii* | Bell's twinpod | G2G3 | S2S3 |
| *Polypodium saximontanum* | *Polypodium saximontanum* | | G3? | S3? |
| *Potamogeton diversifolius* | *Potamogeton diversifolius* | waterthread pondweed | G5 | S1 |
| *Potentilla rupincola* | *Potentilla rupincola* | Rocky Mountain cinquefoil | G2 | S2 |
| *Rotala ramosior* | *Rotala ramosior* | toothcup | G5 | S1 |
| *Saxifraga cespitosa ssp. monticola* | *Muscaria monticola* | tundra saxifrage | G5T5 | S1 |
| *Spiranthes diluvialis* | *Spiranthes diluvialis* | Ute ladies' tresses | G2G3 | S2 |
| *Utricularia minor* | *Utricularia minor* | | G5 | S2 |

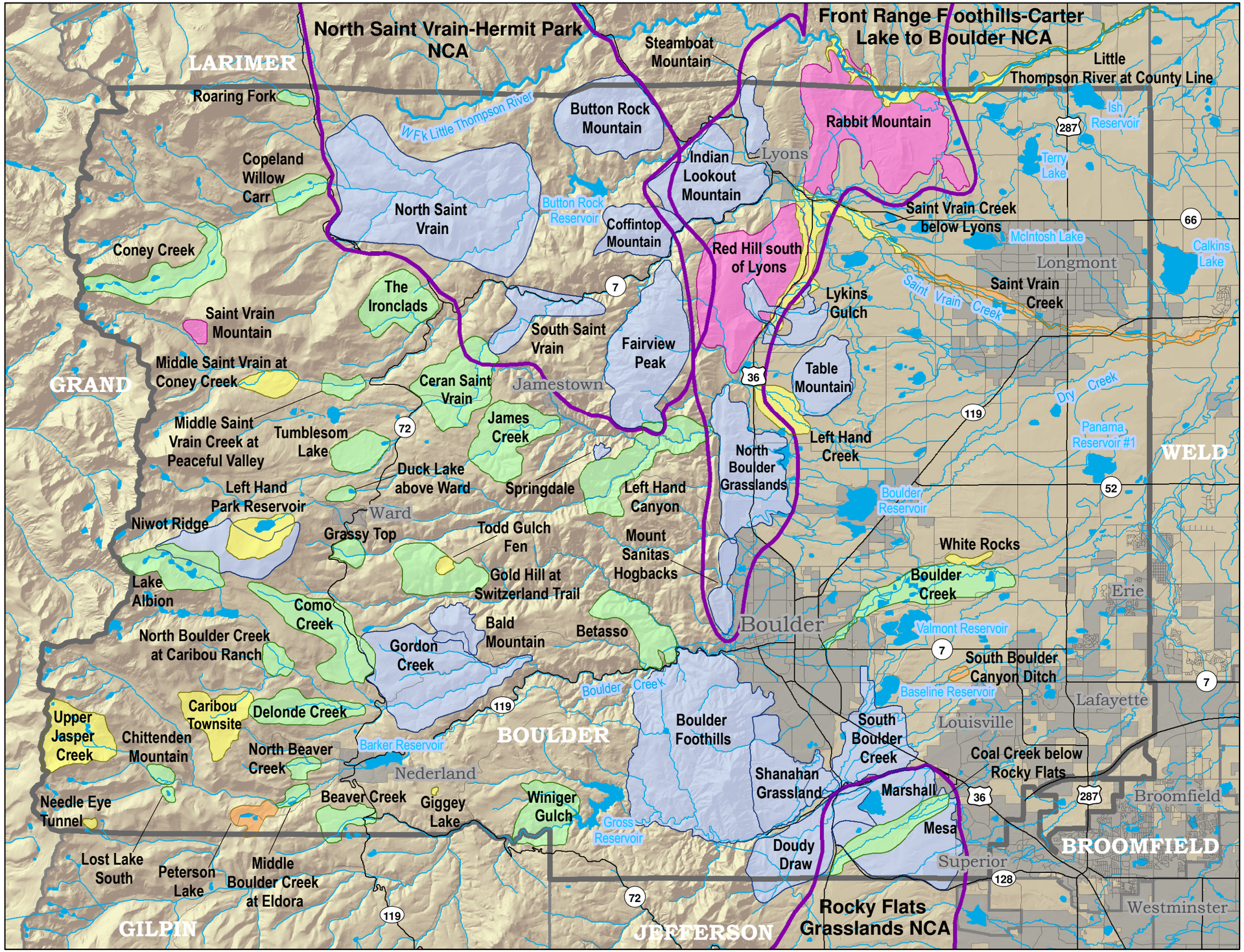
**Table 3. List of watch list species for which observation data were processed.**

| Global Scientific Name | State Scientific Name | Common Name | Grank | Srank |
|---|---|---|---|---|
| *Accipiter gentilis* | *Accipiter gentilis* | Northern Goshawk | G5 | S3B |
| *Athene cunicularia* | *Athene cunicularia* | Burrowing Owl | G4 | S4B |
| *Catharus fuscescens* | *Catharus fuscescens* | Veery | G5 | S3B |
| *Cratogeomys castanops* | *Pappogeomys castanops* | Yellow-faced Pocket Gopher | G5 | S4 |
| *Falco mexicanus* | *Falco mexicanus* | Prairie Falcon | G5 | S4B,S4N |
| *Glaucidium gnoma* | *Glaucidium gnoma* | Northern Pygmy-owl | G5 | S3B |
| *Rana pipiens* | *Rana pipiens* | Northern Leopard Frog | G5 | S3 |

**Table 4. List of Potential Conservation Areas in Boulder County**

| Name | Protection Urgency | Management Urgency |
|---|---|---|
| B1: Outstanding Biodiversity Significance | | |
| Rabbit Mountain | P3 | M3 |
| Red Hill south of Lyons | P4 | M3 |
| Saint Vrain Mountain | P5 | M5 |
| B2: Very High Biodiversity Significance | | |
| Bald Mountain | P4 | M4 |
| Boulder Foothills | P4 | M3 |
| Button Rock Mountain | P4 | M4 |
| Coffintop Mountain | P5 | M4 |
| Doudy Draw | P5 | M3 |
| Fairview Peak | P4 | M3 |
| Gordon Creek | P3 | M4 |
| Indian Lookout Mountain | P3 | M2 |
| Lykins Gulch | P3 | M3 |
| Marshall Mesa | P5 | M3 |
| Mount Sanitas Hogbacks | P4 | M3 |
| Niwot Ridge | P5 | M5 |
| North Boulder Grasslands | P3 | M2 |
| North Saint Vrain | P4 | M3 |
| Shanahan Grassland | P5 | M3 |
| South Boulder Creek | P3 | M3 |
| South Saint Vrain | P4 | M4 |
| Springdale | P4 | M4 |
| Steamboat Mountain | P4 | M3 |
| Table Mountain | P4 | M3 |
| B3: High Biodiversity Significance | | |
| Beaver Creek | P4 | M4 |
| Betasso | P4 | M3 |
| Boulder Creek | P2 | M2 |
| Ceran Saint Vrain | P4 | M4 |
| Chittenden Mountain | P4 | M4 |
| Coal Creek below Rocky Flats | P4 | M3 |
| Como Creek | P4 | M4 |
| Coney Creek | P5 | M? |

| | | |
|---|---|---|
| Copeland Willow Carr | P3 | M4 |
| Delonde Creek | P4 | M4 |
| Duck Lake above Ward | P4 | M4 |
| Gold Hill at Switzerland Trail | P4 | M4 |
| Grassy Top | P4 | M4 |
| James Creek | P3 | M3 |
| Lake Albion | P4 | M4 |
| Left Hand Canyon | P3 | M4 |
| Lost Lake South | P? | M? |
| Middle Boulder Creek at Eldora | P4 | M4 |
| Middle Saint Vrain Creek at Peaceful Valley | P4 | M4 |
| North Beaver Creek | P3 | M4 |
| North Boulder Creek at Caribou Ranch | P4 | M4 |
| Roaring Fork | P4 | M4 |
| The Ironclads | P3 | M3 |
| Tumblesom Lake | P4 | M4 |
| Winiger Gulch | P2 | M2 |
| B4: Moderate Biodiversity Significance | | |
| Caribou Townsite | P4 | M4 |
| Giggey Lake | P4 | M3 |
| Left Hand Creek | P2 | M2 |
| Left Hand Park Reservoir | P4 | M3 |
| Little Thompson River at County Line | P2 | M2 |
| Middle Saint Vrain at Coney Creek | P4 | M4 |
| Needle Eye Tunnel | P2 | M2 |
| Saint Vrain Creek below Lyons | P? | M? |
| Todd Gulch Fen | P4 | M2 |
| Upper Jasper Creek | P5 | M5 |
| White Rocks | P4 | M2 |
| B5: General Biodiversity Interest | | |
| Peterson Lake | P3 | M3 |
| Saint Vrain Creek | P2 | M2 |
| South Boulder Canyon Ditch | P5 | M2 |

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Map Date: 01/29/2009

**Potential Conservation Areas by Biodiversity Significance Rank**

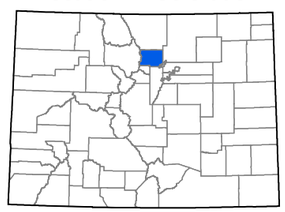
- B1: Outstanding Biodiversity Significance
- B2: Very High Biodiversity Significance
- B3: High Biodiversity Significance
- B4: Moderate Biodiversity Significance
- B5: General Biodiversity Interest
- Networks of Conservation Areas

**Base Data**

- Project Area
- Counties
- Municipalities
- Lakes, Reservoirs
- Rivers, Streams, Creeks
- Highways
- Major Roads

10m DEM Produced by the USGS

**Location in Colorado**



*Potential Conservation Areas represent CNHP's best estimate of the primary area supporting the long-term survival of targeted species, subspecies and natural communities.*

0 1 2 4 Miles

N

Figure 14. CNHP Potential Conservation Areas and Networks of Conservation Areas in Boulder County

# DISCUSSION

Boulder County is truly unique and has a remarkable richness of rare fauna and flora and their habitats; it is well worth preserving for future generations. Overall, the concentration and quality of imperiled elements and habitats attest to the fact that proactive conservation efforts to date in Boulder County have both statewide and global significance. This is substantiated by conservation assessments conducted by other agencies. For example, The Nature Conservancy has completed assessments of the Central Shortgrass Prairie (Central Shortgrass Prairie Planning Team 2006) and Southern Rocky Mountain (Neely *et al.* 2001) ecoregions and outlined eight TNC priority areas with important conservation values in Boulder County. The Colorado Division of Wildlife has identified x priority habitats that intersect with Boulder County (Colorado Division of Wildlife 2006). The Southern Rocky Mountain Ecosystem Project has identified six wildlife linkages in Boulder County (Southern Rockies Ecosystem Project 2004). Boulder County overlaps with priority landscapes identified by the Colorado Conservation Partnership (Colorado Conservation Partnership 2008).

## *Potential Conservation Areas*

As a result of this survey, areas with the highest biodiversity significance based on rare, threatened, and endangered species and habitats were identified. The foothills of Boulder County harbor the highest concentration of globally rare biodiversity elements. There are two foothills PCAs with outstanding biodiversity significance (B1), Rabbit Mountain and Red Hill South of Lyons, which achieve B1 ranks due to their concentration of four or more globally critically imperiled to globally imperiled (G1-G2) element occurrences that are in excellent or good (A- or B-ranked) condition. These elements include foothills natural communities, several mountain mahogany shrublands, and two Piedmont grassland communities. Additionally, embedded within these areas are shale outcrops with globally imperiled Bell's twinpod, which will be discussed below. Rabbit Mountain and Red hill South of Lyons are the only areas in Boulder County where foothill shrublands contribute significantly to the vegetation mosaic on the landscape. The spatial juxtaposition of these shrublands with extensive ponderosa pine savanna is further discussed below. The remainder of the Boulder County foothills transition is reflected in potential conservation areas with very high biodiversity significance (B2). Many of these contain several biodiversity elements that are globally rare (G3) and several harbor species that are common globally (G4 or G5) but rare within Colorado. These unique state rare elements will also be discussed below.

## *Bell's Twinpod*

Bell's twinpod is known only from the hogbacks and shale outcrops along the eastern edge of the Front Range within Larimer, Boulder, and Jefferson counties (Figure 15). A significant portion of this species' global range is located on private lands in Boulder and Larimer counties, in areas that are experiencing rapid development pressures (Doyle et al. 2005). It is considered globally imperiled (G2G3) due to its restricted range and high level of threats to its habitat. There are three PCAs within Boulder County supporting Bell's twinpod. Two of the three PCAs with Bell's twinpod were impacted by residential

development; consequently the boundary of the PCAs were diminished since their original design. An additional twelve PCAs supporting this plant occur in Larimer and Jefferson counties. Bell's twinpod is known primarily from Niobrara Formation limestones and shales with a few locations on red sandstone hogbacks. The Bell's twinpod in Boulder County are largely known primarily from the Pierre shale outcrops as well as Lyons and Ingelside Formations. Outcrops of Niobrara shale (which are limited in Boulder County) similar to known occurrences in Larimer County are not occupied by Bell's twinpod in Boulder County.

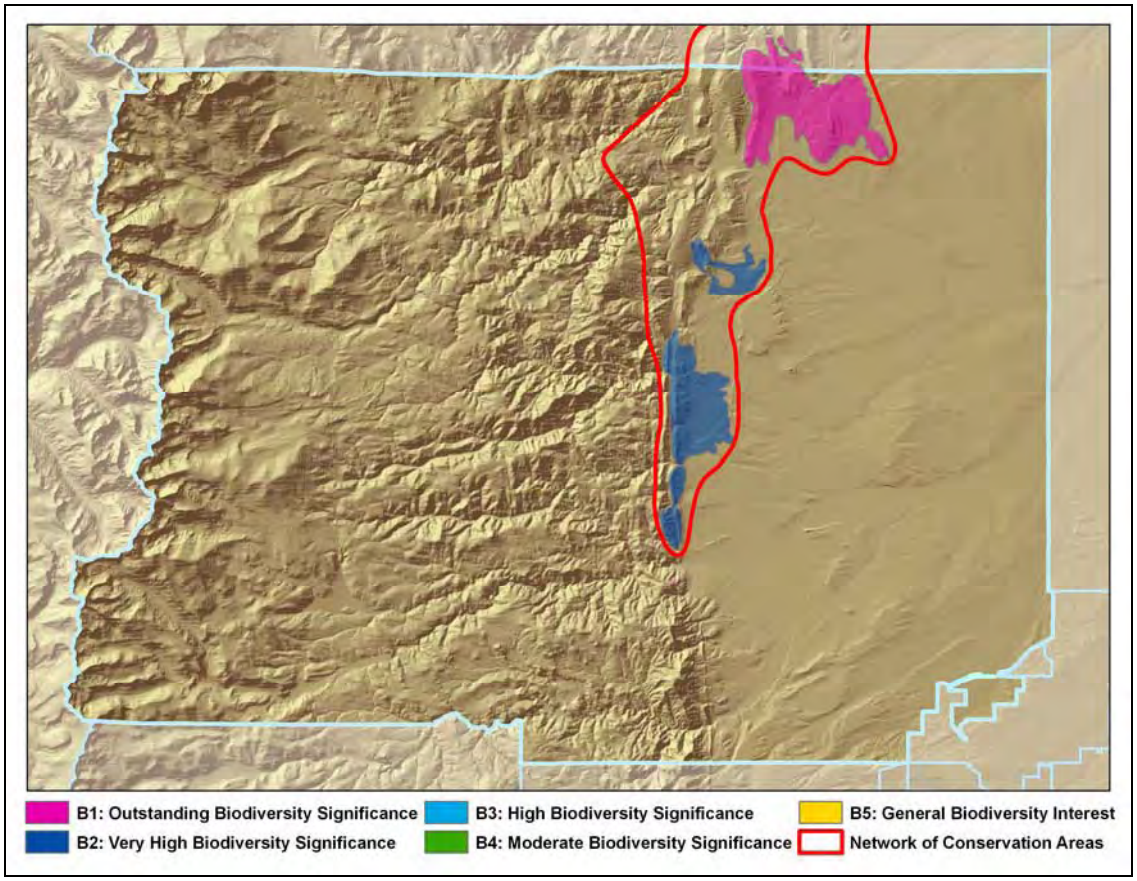



**Figure 15. PCAs and NCAs supporting Bell's twinpod in Boulder County**

## *Larimer Aletes and Rocky Mountain Cinquefoil*

Larimer aletes (*Aletes humilus*; G2G3) is only known from the Front Range of Colorado. It only occurs in Larimer and Boulder counties (CNHP 2009), and is known primarily from areas with large outcrops of Silver Plume granite. The relatively inaccessible nature of most of the known locations of Larimer aletes affords them some level of protection (CNHP and TNC 2008). There are seven PCAs within Boulder County supporting one or both of these regional endemics. These seven PCAs and two additional PCAs in Larimer County are the basis for the North Sain Vrain-Hermit Park Network of Conservation Area. This NCA is based on the Silver Plume batholith that defines the landscape of northern Boulder County and southern Larimer County (see Appendix D).

It is questionable whether Rocky Mountain cinquefoil (*Potentilla rupincola*) (G2) occurs in Boulder County. The single known location of Rocky Mountain cinquefoil from Boulder County that is documented in herbarium specimens has been repeatedly searched for by many botanists who have been unable to relocate it. Location information on the herbarium label is obscure and significant forest succession has occurred in the area. Habitat may no longer exist for the species due to land use changes or it is yet to be re-discovered. During the 2007 field season, additional locations for Rocky Mountain cinquefoil were discovered near Allenspark. However, these are very likely hybrid expressions (A. Childs, personal communication).

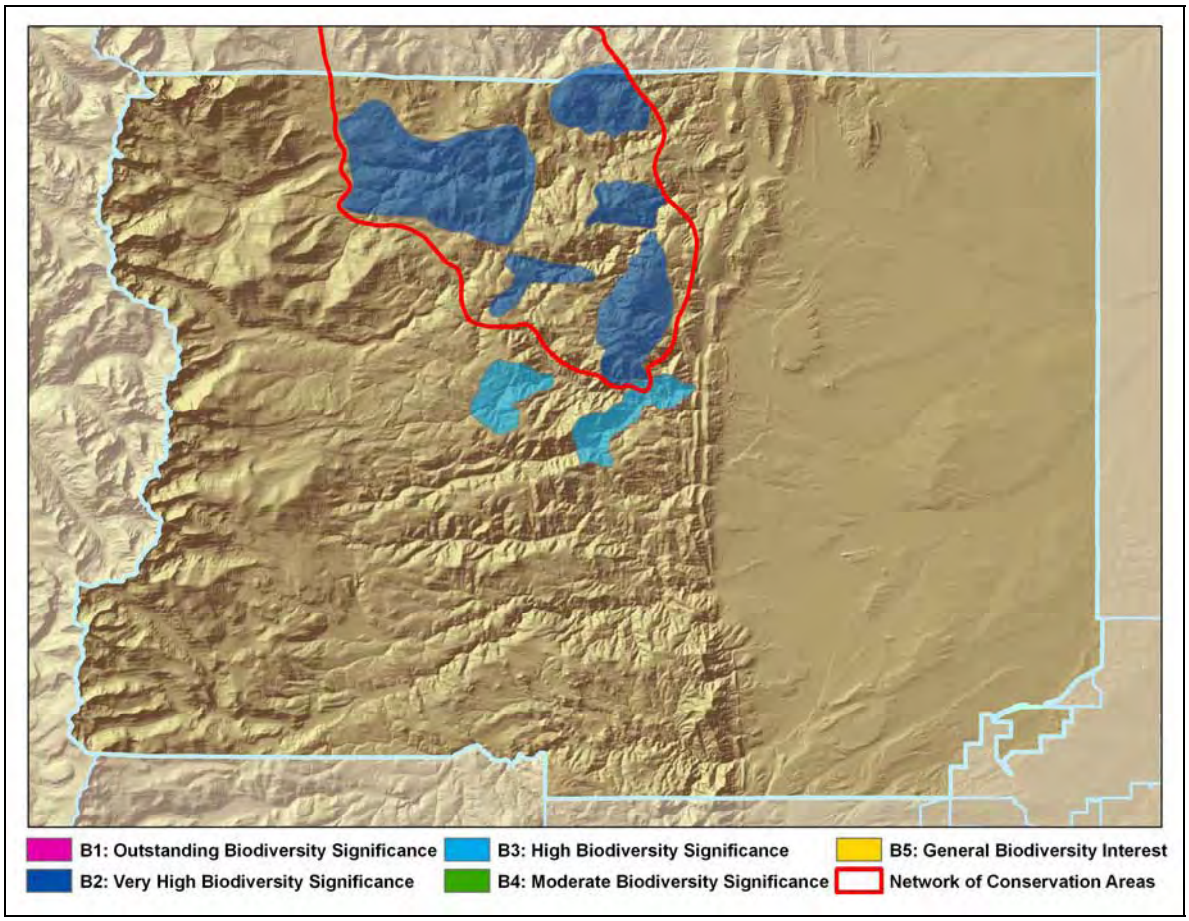



**Figure 16. PCAs and NCAs supporting Larimer aletes in Boulder County.**

## *Foothill Hogbacks*

The foothills transition zone on the Colorado Front Range is among the rarest and most threatened areas in Colorado. The biological diversity of this zone is highlighted in two of the three B1-ranked PCAs in Boulder County, Rabbit Mountain and Red Hill South of Lyons. These are also contained within the Front Range Foothills-Carter Lake to Boulder NCA, which is comprised by the series of hogbacks that extend from Loveland in Larimer County south to Boulder. Mountain mahogany plant associations that occur include mountain mahogany / needle and thread (*Cercocarpus montanus / Hesperostipa comata*) shrublands (G2/S2) that tends to occupy toeslopes on Quaternary deposits and colluvium; mountain mahogany / New Mexico feathergrass (*Cercocarpus montanus /*

*Hesperostipa neomexicana*) shrublands (G2G3/S2S3), which tend to occur near outcrops of Ingelside Formation; and mountain mahogany / Griffith's wheatgrass (*Cercocarpus montanus / Elymus lanceolatus* ssp. *lanceolatus*) shrublands (GU/SU), which occupy high slopes immediately below the hogback ridgeline. Ponderosa pine savannas often occupy the ridgelines and are defined by ponderosa pine / mountain mahogany / big bluestem (*Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii*) wooded herbaceous vegetation. The vegetation structure of these landforms is diverse and thus is habitat for a wide range of birds and animals. A primary trend in this system is conversion to ponderosa pine savanna and woodland (CNHP 2009).

### *Piedmont Grasslands*

Boulder County and adjacent Jefferson County to the south have some of the largest occurrences of Piedmont grasslands in Colorado. The extensive occurrences of these grasslands harbor some of the richest species diversity in Boulder County. In general, grasslands are regarded as among the most imperiled ecosystems in North America (Knopf and Samson 1997). Major threats include housing and urban development, agricultural conversion, altered fire regimes, and incompatible grazing regimes (Central Shortgrass Prairie Planning Team 2006). Additional threats in the Boulder area include surface mining and invasive species. Moir (1969) identified twelve tallgrass tracts in Boulder and Jefferson counties in the late 1960's. These included big bluestem plant communities as well as needlegrass types (including *Nasella* and *Hesperostipa* dominated expressions). Bock and Bock (1998) reported that of the twelve tallgrass sites, only five remained. These have been purchased as open space by the City of Boulder (Bock and Bock 1998, Open Space and Mountain Parks 2008). Of the other seven, five were lost to urbanization or incompatible grazing and two were in marginal condition. Additional needle-and-thread grasslands have been lost or demonstrate a downward trend in element occurrence rank due to residential development, prairie dog impacts, or incompatible grazing regime (CNHP 2009). The City of Boulder Open Space and Mountain Parks (2008) are in planning stages for managing and protecting grassland open space parcels for biological integrity and for public enjoyment.

The grassland-forest ecotone is dynamic (Mast et al. 1998, League and Veblen 2006). Decadal trends show encroachment of ponderosa pine into areas formerly dominated by grasses. These prairies, now savanna, harbor occurrences of relictual populations of eastern woodland and boreal plants (Hogan 1993, Weber 1995). Many of these occurrences are new to the CNHP Biotics database so trends in ecological integrity cannot yet be determined. However, none of these occurrences reach excellent (A) ranks, all are compromised by the trend toward forest encroachment, prevalence of non-native species, and/or proximity to roads, trails, or other infrastructure. Additionally there are several species known from this habitat elsewhere in Colorado but are not found in Boulder County. These include ironweed (*Vernonia fasciculata*), Richardson's alumroot (*Heuchera richardsonii*), and prairie goldenrod (*Unamia alba*). There are herbarium records for strap-leaved blazingstar (*Liatris ligulistylus*), but this species has not been seen since the collection in 1906. Other species that occur to the north and south of, but not within Boulder County include silkyleaf cinquefoil (*Potentilla ambigens*) and Front Range alumroot (*Heuchera hallii*) among others.

## *State Rare Species*

There are many plant species in Boulder County that are rare in Colorado but common elsewhere. These are the species that are ranked G4 or G5 but S1 or S2 in Colorado. Several of these species are alpine or subalpine plants, like Parry's locoweed (*Oxytropis parryi*) and dwarf alpine hawksbeard (*Crepis nana*), that occur in the western portion of the county. Other species are common in the eastern deciduous forest region of the United States, like rattlesnake fern (*Botrychium virginianum*) and American groundnut (*Apios americana*), or boreal species like Torrey's sedge (*Carex torreyi*), Rocky Mountain sedge (*Carex saximontana*), paper birch (*Betula papyrifera*), and beaked hazelnut (*Corylus cornuta*). These species are common in the northern tier of states and in Canada and tend to follow the spine of the Rocky Mountains south into Colorado (Hogan 1993). In Boulder County, they often occur on steep, north-facing slopes or in deep canyons where conditions are relatively cool and moist. Boulder Mountain Park and its immediate vicinity harbor the greatest known diversity of these species in Colorado (Hogan 1993, CNHP 2009), making it an important area for biodiversity conservation (see the Boulder Foothills PCA for more information on this biodiversity hotspot in Boulder County). Finally, a large segment of these state rare/globally common species are primarily found to the east on the Great Plains. Species like dwarf indigo (*Amorpha nana*), birdsfoot violet (*Viola pedatifida*), prairie goldenrod (*Oligoneuron album*), slimleaf milkweed (*Asclepias stenophylla*), and hoary frostweed (*Helianthemum bicknellii*) are found at the ponderosa pine savanna-grassland ecotone in Boulder County (CNHP 2009). Front Range occurrences of these species are thought to be relicts of the Pleistocene when climate conditions were cooler. Many of the occurrences are at the edge of the range for the species. As such they often represent unique genetic variability. Climate change and other impacts threaten the persistence of these species in Boulder County.

## *Wetland Trends*

As with many major water basins in the west, watershed and wetland health has been on a downward trend in Boulder County. Many issues contribute to the decline of watershed viability. Perhaps the most eminent threat in the County is population growth. Increase in population growth from 2000 to 2030 for the northern portion of the South Platte Basin is predicted to be 83% (CWCB 2008). From 2000 to 2006 alone, Boulder County has experienced a population increase of 4.6% with the majority of the growth in the towns of Lyons, Longmont, Lafayette, and Superior. This growth poses a significant threat to riparian areas and wetlands within the County. For example, Rock Creek, which originates in springs on the northern edge of the Rocky Flats Mesa, runs past the Town of Superior. Only a decade ago, Superior was a sleepy community on Coal Creek, but between 1990 and 1998 population growth for the Town of Superior boomed 2234% (BASIN 2008), and the town has annexed land along Rock Creek to the south and east. . Urban growth has caused other impacts on the local riparian system; with the towns of Superior, Lafayette, Louisville and Erie discharging their treated waste water into Rock or Coal Creeks, the majority of flow in the creeks downstream of development is often treated waste water (BASIN 2008).

Front Range cities' demand for drinking water has increased with population growth. Boulder Creek Watershed headwaters, located on Middle Boulder Creek along the Continental Divide near Arapahoe Pass and Diamond and Jasper Lakes, was dammed in 1906 by the Public Service Company of Colorado, storing water in Barker Reservoir for hydroelectric generation and drinking water. Today, about 40% of the City of Boulder's drinking water supply comes from Barker Reservoir (BASIN 2008). South Boulder Creek, which begins along the Continental Divide from James Peak to near Corona Pass, drains some 30% of the entire Boulder Creek Watershed. Via the Moffit Tunnel, Denver Water Department transports West Slope water to be stored in Gross Reservoir, and South Boulder Creek is the main conduit for moving water from one basin to another. Below Gross Reservoir, South Boulder Creek cuts through what is now Eldorado Canyon State Park and then passes through the Town of Eldorado Springs. Here a series of diversion ditches begin, including the Community Ditch that provides drinking water to communities to the east (BASIN 2008).

Hydrologic modifications obviously impact the rivers and streams in the County. Currently there are 238 lakes and reservoirs located within Boulder County (CDOW 2008). Additionally, there are 955 water diversions (ditches, culverts, and pipelines) (CWCB 1996). The Colorado Water Conservation Board (1996) has identified an additional 28 potential reservoirs planned for the County. Over the years these diversions have irreversibly impacted the wetlands in the County. During this project, several previously identified alkaline wetlands (dominated by salt grass *Distichlis spicata*) were surveyed. CNHP documented that this wetland type has been severely impaired, mainly due to the drop in groundwater levels likely caused by channelization and diversion of streams, as well as loss of habitat from development and invasion of non-native plants.

Invasion of non-native and aggressive species and their replacement of native species on wetland and riparian areas are also increasing. Non-native plants can outcompete the native plants for resources or change the soil chemistry altogether. Riparian areas are prime habitat for non-native plants to invade due to the increased moisture. One example from the 2008 field season was the documentation of a List A species from the Colorado noxious weed list, myrtle spurge (*Euphorbia myrsinites*) along the Little Thompson Creek. Throughout the County, several List B noxious weeds were documented within wetlands: bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), common teasel (*Dipsacus fullonum*), dame's rocket (*Hesperis matronalis*), diffuse knapweed (*Centaurea diffusa*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), oxeye daisy (*Chrysanthemum leucanthemum*), Russian olive (*Elaegagnus angustifolia*), salt cedar *(Tamarix ramosissima*), spotted knapweed (*Centaurea maculosa*), and yellow toadflax (*Linaria vulgaris*). List C non-native species include: common burdock (*Arctium minus*), common mullein (*Verbascum thapsus*), and downy brome (*Bromus tectorum*).

Contamination of the County's waters has contributed to the downward trend of overall watershed health. Many of the towns in the upper reaches of the South Platte watershed (e.g. Ward and Jamestown) owe their existence to the mining legacy of the area.

Mining began soon after the first Europeans arrived and continued through the late 1980s. In the 19th century, the area was one of the richest gold and silver producing regions in the country. More recently tungsten, copper, fluorospar or fluorite and uranium deposits were mined and processed. A Forest Service survey found 230 mine openings and 186 waste rock piles in the watershed. This mining legacy has created modern water quality concerns as the mines have contributed to the acidification of the water increased the amount of heavy metals entering the streams (LWOG 2008). The Little Thompson Creek, from the Culver Ditch to Big Thompson River, is listed as impaired by EPA due to Total Maximum Daily Loads of copper, *E. coli*, and selenium (EPA 2008).

Climate change is affecting the entire west; in Colorado, temperatures have increased by approximately 2° F between 1977 and 2006 (CWCB 2008). Therefore, increased temperatures are affecting the State's water resources. One of the more immediate effects is the spring runoff. Between 1978 and 2004, the spring pulse in Colorado has shifted earlier by two weeks. Other implications include increased water demands for agriculture and outdoor watering, water quality, shifting of mountain habitats toward higher elevation, changes in stream flow that ultimately affects riparian habitats and fisheries.

## *Wetland Highlights*

Boulder County contains numerous wetlands with high ecological value for both the county and the state. Because of its position on the Front Range, Boulder County contains a wide range of wetland types, from lower montane riparian woodlands and relictual tall grass prairie wet meadows on the plains surrounding the county's major cities, to pristine high elevation fens in the Indian Peaks Wilderness. Highlights from field surveys include wetlands from across this elevation range. We surveyed Todd Gulch Fen, located at 8,460 feet in elevation on National Forest Service land outside the small community of Gold Hill. Todd Gulch Fen is a quaking, floating mat fen dominated by lesser panicled sedge (*Carex diandra*), a tall sedge species with numerous rhizomes that is found in floating mat fens throughout the northern hemisphere. Along with lesser panicled sedge, the site contains a significant population of wool-fruit or slender sedge (*Carex lasiocarpa*). The site is hundreds or even thousands of years old and is likely the result of successional in-filling of a pond. It is unusual to find a floating mat fen of this kind in the montane zone of the Front Range. Fens are far more frequent at higher elevations, where there is considerably more groundwater influx from snowmelt. In addition, both lesser panicled sedge and wool fruit sedge are known to occur in only a handful of sites across the state. They are both ranked as G5S1 species by CNHP. Though these species are far more common at northern latitudes, they appear to reach their southern extent in Colorado. The populations at Todd Gulch Fen are very robust and healthy, making Todd Gulch Fen an important site for regional biodiversity. We were also able to survey several pristine fens in the high subalpine of Boulder County, including one site located on a private in-holding within the Indian Peaks Wilderness and several fens within the City of Boulder Watershed. These wetlands contain a number of important plant communities, some of which are common and some of which are uncommon and not well understood. The most common plant communities in Boulder County fens are

Planeleaf Willow / Aquatic Sedge (*Salix planifolia / Carex aquatilis*) Shrubland, a G5S4 community, and Few-flower Spikerush (*Eleocharis quinqueflora*) Herbaceous Vegetation, a G4S3S4 community. However, we also found communities of False Uncinia Sedge (*Carex microglochin*) Herbaceous Vegetation, ranked GUSU, and Small-head Sedge (*Carex illota*) Herbaceous Vegetation, ranked GUQS2. The GU ranking indicates that not enough information is known about these communities to assign a rank. Finding more sites with these communities helps add to the current knowledge of their distribution.

In cooperation with ecologists at the City of Boulder, we visited a handful of sites on City of Boulder Open Space land along South Boulder Creek that contain the federally listed species Ute ladies' tresses (*Spiranthes diluvialis*). This species occurs along the floodplain of several creeks in the Boulder Valley, including large populations along South Boulder Creek. It is a beautiful white orchid that is specially adapted to growing in floodplains, where soils and vegetation are frequently disturbed by seasonal flushing of water and sediments. This species is ranked G2G3S2 by CNHP, and Boulder County contains some of the most important habitat for this species in the state of Colorado.

## *Fauna*

### *Small mammals*

Three small mammal species were of concern for this project, the meadow jumping mouse (*Zapus hudsonius*), the olive-backed pocket mouse (*Perognathus fasciatus*), and the black-tailed prairie dog (*Cynomys ludovicianus*). The federally threatened subspecies *Zapus hudsonius preblei* is found along five stream systems in the county. This effort documented a new occurrence along Tom Davis Gulch on the Walker Ranch. Trapping was conducted at five different locations for *Perognathus fasciatus*, but no captures were made. *Zapus hudsonius preblei* is represented in four PCAs and *Cynomys ludovicianus* in six.

### *Bats*

The diversity of landforms in Boulder County supports numerous bat species, two of which were of concern for this project: Townsend's big-eared bat (*Corynorhinus townsendii*) and fringed myotis (*Myotis thysanodes*). A new roosting site of *Corynorhinus townsendii* was documented at mine on private property. *Myotis thysanodes* was not captured during this effort, but four occurrences, each comprised of multiple observations, exist throughout the county.

### *Fish*

There are less than 15 populations of greenback cutthroat trout (*Oncorhynchus clarkii stomias*) in Boulder County. However, a recent genetic analysis (Metcalf et al. 2007) has called into question the origin of many of the populations within this subspecies' range. Como Creek in Boulder County is one of four pure greenback cutthroat sites within its native range, but the population found there may have originated in the Arkansas River drainage (Metcalf et al. 2007). The other populations of cutthroat trout are considered management or recreation populations that are supplemented by stocking efforts and are maintained for the purpose of recreational fishing.

The Saint Vrain Creek PCA contains records of four state-rare fish species including brassy minnow (*Hybognathus hankinsoni*), common shiner (*Notropis cornutus*), stonecat (*Noturus flavus*), and southern redbelly dace (*Phoxinus erythrogaster*).

### *Amphibians*

Northern leopard frogs (*Lithobates pipiens*) are found throughout Boulder County, but their status may be threatened by the non-native bullfrog (*Lithobates catesbeiana*). The western toad (*Anaxyrus boreas*), previously known as the boreal toad (*Bufo boreas*), was once common in many parts of Colorado. However, this amphibian has been steadily declining for the past twenty years (Hammerson 1999; Jackson 2005). There are around 71 breeding sites known in Colorado that comprise 38 separate populations (Boreal Toad Recovery Team 2006). However, only two of these populations are considered viable. There are no known breeding populations remaining for the western toad in Boulder County (Boreal Toad Conservation Strategy Team 1997). Lost Lake was the last known breeding location in the county and was a reintroduction site of western toads in 1996-1997. No toads have been observed since 1998, despite repeated monitoring (Jackson 2005).

### *Rocky Mountain capshell*

The Rocky Mountain capshell (*Acroloxus coloradoensis*) is known from six locations in Colorado, four of which are in Boulder County (Riebesell et al. 2001). This species is found in the Coney Creek, Middle Saint Vrain at Coney Creek, Lost Lake South, and Peterson Lake PCAs.

## *Recommendations for preserving zoological elements*

The Colorado Natural Heritage Program (CNHP) provides information to assist land managers in conserving plants, animals, and natural communities. The variety of land use patterns and the mosaic of biodiversity within and among areas present decision makers with complex challenges. Because of the diversity of plants and animals and their unique life histories, multiple approaches are necessary to preserve the full suite of species and communities. One such tool for the conservation of biodiversity is the Potential Conservation Area (PCA). A PCA is "CNHP's best estimate of the primary area required to support the long-term survival of targeted species or natural communities" and the following points are taken from CNHP's PCA Methodology Manual:

- The size and configuration of a PCA will be dictated by the conservation targets (i.e., those species, communities, or systems we seek to conserve at a given location) and their sustaining physical features and/or ecological processes.
- PCA refers to the ability of a conservation area to maintain healthy, viable targets over the long term (100 + years), including the ability of the targets to respond to natural or human-caused environmental change.
- PCAs do not necessarily preclude human activities, but their ability to function naturally may be greatly influenced by them.
- PCAs at all scales may require ecological management or restoration to maintain their functionality and long term persistence.

In an effort to prioritize PCAs and highlight areas that support elements of global significance, Biodiversity significance ranks (B-ranks) are applied. This rank summarizes the global rank and element occurrence rank of the driving element(s).

Biodiversity Ranks

**B1** – Outstanding biodiversity significance (irreplaceable)
**B2** – Very high biodiversity significance (nearly irreplaceable)
**B3** – High biodiversity significance
**B4** – Moderate biodiversity significance
**B5** – General or local biodiversity significance

The conservation of animal species presents certain issues that are not encountered when considering most plants or natural communities, including prioritization based upon global rarity (G-rank), mobility, and scale. When elements of biodiversity are prioritized by global rarity, plants will outnumber animals (especially vertebrate animals). For instance, Boulder County supports 25 G1-G3 plant species compared with seven G1-G3 animals. This difference is due to many factors, but one result of this prioritization based on global rarity is that plants tend to receive higher conservation ranks than animals. Another issue is the mobility of animals, which creates additional complexity in making recommendations about what areas are required "to support the long-term survival of targeted species." For some species, the geographic scale at which PCAs would need to be drawn would be so large as to make them impractical for effective conservation as well as obscure areas essential to other elements of biodiversity. PCAs of this size, although ecologically realistic, would not be appropriate for the scale at which most land-management agencies work.

The Zoology section of CNHP recommends and provides data for three broad approaches when considering the conservation of zoological elements: Coarse-filter habitat preservation, animal-based PCAs, and disturbance buffers around sensitive zoological features.

**Coarse-filter habitat preservation** for animals is typically best accomplished in association with another element, often globally-rare plants or plant communities. Data product: plant- or community-driven PCAs with associated animal EORs.

**Animal-based Potential Conservation Areas** are useful when the scale at which the animal lives is appropriate for the land-management organization and when there are no other coincident targets of concern that may be rarer on a global scale. Data product: animal-driven PCAs.

**Disturbance buffers** are appropriate when the scale at which the animal lives is too broad to be effectively managed in its entirety by any one organization. Data product: animal EORs and observation source features.

## *Recommended Conservation Strategies*

Conservation Strategies can be classified as three major types:

1. Land protection accomplished through conservation easements, land exchanges, long term leases, purchase of mineral or grazing rights, acquisition, or government regulation;

2. Management of the land influenced so that significant resources are protected; and

3. Public education about the significant ecological values of the county to engender support for land use decisions that protect these values.

The first step in facilitating any of the conservation strategies suggested above is to identify the significant elements of biodiversity and their locations in the county. This report and the accompanying GIS data provide information necessary for this first step. The next step is to use this information to conserve these elements and the areas that support them. The PCA descriptions within this report provide protection and management suggestions for most areas identified during the inventory. However, some general recommendations for conservation of biological diversity in Boulder County are given here.

**1. Develop and implement a plan for protecting the Potential Conservation Areas profiled in this report, with most attention directed toward areas with a biodiversity rank of B1, B2 and B3.** The PCAs in this report provide a basic framework for implementing a comprehensive conservation program. The B1, B2 and B3 sites, because they have global biological significance, are in need of priority attention. Consider incentive-based programs such as purchasing development rights or outright purchase from willing owners of land for significant sites that are in need of protection. Support local organizations, such as land trusts, in purchasing or acquiring conservation easements for protection of biological diversity or open space. Explore opportunities to form partnerships to access state and federal funding for conservation projects, such as those offered through the Colorado Division of Wildlife or the Farm Bill. Continue to promote cooperation among local entities to preserve the county's biodiversity. Encourage county leadership to institutionalize consideration of significant biological resources in land use planning.

**2. Use this report in the review of proposed activities in or near Potential Conservation Areas to determine whether or not activities adversely affect elements of biodiversity.** All of the PCAs presented contain elements of biodiversity of state or global significance. Weighing the biodiversity represented by PCAs should allow planners and biologists to consider natural resource conservation when making land use decisions.

Certain land uses on or near a site may affect the element(s) present there. Range-restricted species may be especially vulnerable to habitat destruction, while wetland and

riparian areas are particularly susceptible to impacts from off-site activities if the activities affect water quality or hydrologic regimes. In addition, cumulative impacts from many small changes can have effects as profound and far-reaching as one large change. As proposed land use changes are considered, they should be compared to the maps presented herein (also available in GIS format). If a proposed project has the potential to impact a site, planning personnel should contact persons, organizations, or agencies with the appropriate biological expertise for input in the planning process. The Colorado Natural Heritage Program routinely conducts site-specific environmental reviews and should be considered a valuable resource. Also, CNHP is continually updating biodiversity data throughout the state and can provide up-to-date information in the area of concern. To contact CNHP's Environmental Review Coordinator call (970) 491-7331. Other key partners, such as the Colorado Division of Wildlife, can be valuable resources as well, particularly in evaluating potential impacts to biological resources not tracked by CNHP (e.g., game species).

**3. Recognize the importance of larger, contiguous natural communities.** While the PCAs identified in this report contain known locations of significant elements of natural diversity, protection of large areas in each vegetation type, especially where these are connected, may ensure that we do not lose species that have not yet been located. Work to protect large blocks of land in each of the major vegetation types in the county, and avoid fragmenting large natural areas unnecessarily with roads, trails, etc. Although large migrating animals like deer and elk are not tracked by CNHP as rare species, they are part of our natural diversity, and their needs for winter range and access to protected corridors to food and water should be taken into consideration. Fragmentation of the landscape also affects smaller animals and plants, opening more edge habitats and introducing exotic species. Encourage cluster developments that designate large common areas for preservation of natural communities, as an alternative to scattering residences over the landscape with a house on each 35-acre parcel. Work with developers early in the planning process to educated them about the benefits of retaining natural areas. Locate trails and roads to minimize impacts on native plants and animals. See Forman and Alexander (1998) for an excellent review of the literature on the ecological effects of roads. See *Planning Trails with Wildlife in Mind* published by the State Trails Program (Colorado Department of Natural Resources 1998) for suggestions regarding planning trails with minimum impacts to wildlife.

**4. Increase efforts to protect biodiversity by promoting cooperation and incentives among landowners, pertinent government agencies, and non-profit conservation organizations.** Involve all stakeholders in land use planning. The long-term protection of natural diversity in Boulder County will be facilitated by the cooperation of private landowners, businesses, government agencies, and non-government organizations. Efforts to provide stronger ties among federal, state, local, and private interests involved in the protection or management of natural lands will increase the chance of success. By developing incentives that encourage biodiversity considerations in land-use planning, the likelihood of conserving biodiversity should increase. Such incentives will make planning for conservation a higher priority for private and public entities.

**5. Promote wise management of the biodiversity resources that exist within Potential Conservation Areas.** Development of a site-specific conservation plan is a necessary component of the long-term protection of a PCA. Because some of the most serious impacts to Boulder County's ecosystems are at a large scale (e.g., altered hydrology, residential encroachment, and non-native species invasion), considering each area in the context of its surroundings is critical. Several organizations and agencies are available for consultation in the development of conservation plans, including the Colorado Natural Heritage Program, the Colorado Division of Wildlife, the Natural Resources Conservation Service, The Nature Conservancy, and various academic institutions. With the current rate of population growth in Colorado, rare and imperiled species will likely decline if not given appropriate protection or management attention.

Coordinate with managers of public parks or other public lands that support sensitive biological resources. Engage local citizens, groups, and organizations (e.g., schools, 4-H clubs, Native Plant Society) in assisting with management and monitoring projects on public lands. Make a concerted effort to involve individual landowners in conservation dialogue, as applicable.

**6. Stay informed and involved in public land management decisions**. Approximately 50 percent of Boulder County is publicly owned. The U.S. Forest Service owns approximately 22 percent and the National Park Service approximately six percent. The State and the Bureau of Land Management own approximately four percent and two percent, respectively. Many of the PCAs in Boulder County are on public land and may be protected from development, but not from incompatible uses. Even ownership is not always secure, since federal and state agencies are becoming more and more involved in land exchanges. Encourage protection for the most biologically significant sites on public lands by implementing compatible management activities designated in Forest Management Plans, Grazing Management Plans, etc.

**7. Commit to a comprehensive, centralized database for biodiversity data management.** Prior to this survey project, biodiversity information for rare, threatened, and endangered species was in disparate sources without uniform data standards or documentation. This survey effort compiled historical and current information into a standard format. Maintaining these data in light of continued monitoring and survey will require a data exchange mechanism that is cost-effective and efficient.

**8. Continue inventories and monitoring where necessary, including inventories for species that cannot be surveyed adequately in one field season and continue inventories on lands that CNHP could not access in 2007-2008.** Despite decades of investigations there are still new discoveries to be made. Not all targeted inventory areas can be surveyed in one field season due to several factors, including lack of access, phenology of species, or time constraints. Because some species are ephemeral or migratory, completing an inventory in one field season is often difficult. Despite the best efforts during one field season, it is likely that some elements were not documented

during the survey. Thus, it is recommended that this report and the data included within it serve as a guide for subsequent surveys of Boulder County.

Continuing to refine the classification of plant associations will allow assessing appropriate conservation targets. There are unique expressions of plant assemblages that occur in Boulder County that do not have a strong connection to current NVC descriptions. Continuing to gather data to support refined descriptions is warranted. Enough information is likely known for piedmont grassland communities to encapsulate expression in Boulder County relative to other geographic areas. Additional observations may be needed for other vegetation types like hackberry (*Celtis laevigata*) and hazelnut (*Corylus cornuta*) to further elucidate their pattern on the landscape.

**9. Continue to take a proactive approach to weed and exotic species control.** Recognize that weeds affect both agriculture and native plant communities. Discourage the introduction and/or sale of non-native species that are known to significantly impact natural areas. These include, but are not limited to, exotic, invasive species such as tamarisk (*Tamarix ramosissimum*), Russian olive (*Elaeagnus angustifolia*), dalmation toadflax (*Linaria dalmatica*), purple loosestrife (*Lythrum salicaria*), and non-native fish species. Further, natural area managers, public agencies, and private landowners should be encouraged to remove these species from their properties. Enforce the use of weed-free forage on horse trails. Encourage the use of native species for revegetation and landscaping efforts. Ideally, seed should be locally harvested. This includes any seeding done on county road right-of-ways. The Colorado Natural Areas Program has published a book entitled *Native Plant Revegetation Guide for Colorado* that describes appropriate species to be used for revegetation. This resource is available on the World Wide Web at http://www.parks.state.co.us/home/publications.asp#CNAP.

**10. Encourage public education functions and publications.** A significant early step in the process of conserving biodiversity is educating local citizens and other stakeholders on the value that such areas offer the public. As described in this report, Boulder County is rich in animal and plant diversity and includes some of the most unique environments in Colorado. Conveying the value and function of these habitats and the species that inhabit them to the public can generate greater interest in conserving lands. Conducting forums or presentations that highlight the biodiversity of Boulder County should increase awareness of the uniqueness of the habitats within the county. Similarly, providing educational pamphlets or newsletters that explain why these areas are so valuable can increase public interest and support for biodiversity conservation. Consider developing a community conservation website to provide information on natural resource, biological diversity, and conservation opportunities in Boulder County. Enlist the assistance of local media in public education efforts.

**11. Develop and implement comprehensive program to address loss of wetlands**. In conjunction with the information contained in this report, information regarding the degree and trend of loss for all wetland types (i.e., salt meadows, emergent marshes, riparian forests, seeps/springs, etc.) should be sought and utilized to design and implement a comprehensive approach to the management and protection of Boulder

County wetlands. Encourage and support statewide wetland protection efforts such as CDOW's Wetlands Program. County governments are encouraged to support research efforts on wetlands to aid in their conservation. Countywide education on the importance of wetlands could be implemented through the county extension service or other local agencies. Encourage communication and cooperation with landowners regarding protection of wetlands in Boulder County.

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## APPENDIX A. Natural Heritage Methodology


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# THE NATURAL HERITAGE NETWORK RANKING SYSTEM AND BIOLOGICAL DIVERSITY

Just as ancient artifacts and historic buildings represent our cultural heritage, a diversity of plant and animal species and their habitats represent our "natural heritage." Colorado's natural heritage encompasses a wide variety of ecosystems from tallgrass prairie and shortgrass high plains to alpine cirques and rugged peaks, from canyon lands and sagebrush deserts to dense subalpine spruce-fir forests and wide-open tundra.

These very diverse habitats are determined by water availability, temperature extremes, altitude, geologic history, and land use history. The species that inhabit each of these ecosystems have adapted to the specific set of conditions found there. Because human influence today touches every part of the Colorado environment, we are responsible for understanding our impacts and carefully planning our actions to ensure our natural heritage persists for future generations.

Recognition and protection of rare and imperiled species and their habitat is crucial to preserving Colorado's diverse natural heritage. Some generalist species, like house finches, have flourished over the last century, having adapted to habitats altered by humans. However, many other species are specialized to survive in rare and/or vulnerable Colorado habitats; among them are Bell's twinpod (a wildflower), the greenback cutthroat trout, and the Pawnee montane skipper (a butterfly). These species have special requirements for survival that may be threatened by incompatible land management practices and competition from non-native species. Many of these species have become imperiled not only in Colorado, but also throughout their range of distribution. Some species exist in less than five populations in the entire world. A decline of these specialized species often indicates disruptions that could permanently alter entire ecosystems.

Colorado is inhabited by some 800 vertebrate species and subspecies, and tens of thousands of invertebrate species. In addition, the state has approximately 4,600 species of plants (vascular and nonvascular) and more than 450 recognized plant communities that represent terrestrial and wetland ecosystems. It is this rich natural heritage that has provided the basis for Colorado's diverse economy. Some components of this heritage have always been rare, while others have become imperiled with human-induced changes in the landscape. This decline in biological diversity 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 biological diversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country were not based upon preserving biological diversity; instead, they primarily focused on preserving game animals, striking scenery, and locally favored open spaces. To address the absence of a methodical, scientifically-based approach to preserving biological

diversity Dr. Robert Jenkins of The Nature Conservancy pioneered the Natural Heritage Methodology in the early 1970s.

Recognizing that rare and imperiled species are more likely to become extinct than common ones, the Natural Heritage Methodology ranks species according to their rarity or degree of imperilment from extinction. The ranking system is scientifically based upon the number of known locations of the species as well as its biology and known threats. 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 the prioritization of conservation efforts so the most rare and imperiled species may be preserved first. As the scientific community realized that plant communities are equally important as individual species, this methodology has been applied to ranking and preserving rare plant communities, as well as the best examples of common communities.

The Natural Heritage Methodology is used by Natural Heritage Programs throughout North, Central, and South America, forming an international database network. The 85 Natural Heritage Network data centers are located in each of the fifty U.S. states, eleven Canadian provinces and territories, and many countries in Latin America and the Caribbean. This network enables scientists to monitor the status of species from a state, national, and global perspective. Information collected by the Natural Heritage Programs can provide a means to protect species before the need for legal endangerment status arises. It can also enable 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 single-celled organisms such as bacteria and protists through the multicellular kingdoms of plants and animals. At finer levels of organization, biological diversity includes the genetic variation within species, both among geographically separated populations and among individuals within a single population. On a wider scale, diversity includes variations in the biological communities in which species live, the ecosystems in which communities exist, and the interactions between these levels. All levels are necessary for the continued survival of species and plant communities, and many are important for the well being of humans.

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

**Genetic Diversity** — the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species varies between populations 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. Once lost, this unique genetic information cannot be reclaimed.

**Species Diversity** — the total number and abundance of plant and animal species and subspecies in an area.

**Community Diversity** — the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic of or even restricted to an area. The U.S. National Vegetation Classification (USNVC) is the accepted national standard for vegetation and it defines a community as an "assemblage of species that co-occur in defined areas at certain times and that have the potential to interact with one another" (Anderson et al. 1998).

**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 also may 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.

The conservation of biological diversity should 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 and the results of their activities are also closely linked to all levels of this hierarchy and are integral parts of most landscapes. We at the Colorado Natural Heritage Program believe that a healthy natural environment and a healthy human environment go hand in hand, and that recognition of the most imperiled species is an important step in comprehensive conservation planning.

## 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 the Colorado Division of Parks and Outdoor Recreation for fourteen years, the Program was relocated to the University of Colorado Museum in 1992, and then to the College of Natural Resources at Colorado State University in 1994, where it has operated since.

The multi-disciplinary team of scientists, planners, and information managers at CNHP gathers comprehensive information on the rare, threatened, and endangered species and significant plant communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system. Data maintained in the CNHP's database are an integral part of ongoing research at Colorado State University and reflect the observations of many scientists, institutions and our current state of knowledge. These data are acquired from various sources, with vary levels of accuracy, and are continually being updated and revised. 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.

All Natural Heritage Programs house data about imperiled species and plant associations and are implementing use of the Biodiversity Tracking and Conservation System (BIOTICS) developed by NatureServe. This database includes taxonomic group, global and state rarity ranks, federal and state legal status, observation source, observation date, county, township, range, watershed, and other relevant facts and observations. BIOTICS also has an ArcView based mapping program for digitizing and mapping occurrences of rare plants, animals, and plant communities. These rare species and plant communities are referred to as "elements of natural diversity" or simply "elements."

Concentrating on site-specific data for each element enables CNHP to evaluate the significance of each location for the conservation of biological diversity in Colorado and in the nation. By using species imperilment ranks and quality ratings for each location, priorities can be established to guide conservation action. A continually updated locational database and priority-setting system such as that maintained by CNHP provides an effective, proactive land-planning tool.

To assist in biological diversity conservation efforts, CNHP scientists strive to answer questions like the following:

- What species and ecological communities exist in the area of interest?
- Which are at greatest risk of extinction or are otherwise significant from a conservation perspective?
- What are their biological and ecological characteristics, and where are these priority species or communities found?
- What is the species' condition at these locations, and what processes or activities are sustaining or threatening them?
- Where are the most important sites to protect?
- Who owns or manages those places deemed most important to protect, and what may be threatening the biodiversity at those places?
- What actions are needed for the protection of those sites and the significant elements of biological diversity they contain?
- How can we measure our progress toward conservation goals?

CNHP has effective working relationships with several state and federal agencies, including the Colorado Department of Natural Resources, the Colorado Division of Wildlife, the Bureau of Land Management, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the Department of Defense. Numerous local governments and private entities, such as consulting firms, educators, landowners, county commissioners, and non-profit organizations, also work closely with CNHP. Use of the data by many

different individuals and organizations encourages a cooperative and proactive approach to conservation, thereby reducing the potential for conflict.

### The Natural Heritage Ranking System

Key to the functioning of Natural Heritage Programs is the concept of setting priorities for gathering information and conducting inventories. The number of possible facts and observations that can be gathered about the natural world is essentially limitless. The financial and human resources available to gather such information are not. Because biological inventories tend to be under-funded, there is a premium on devising systems that are both effective in providing information that meets users' needs and efficient in gathering that information. The cornerstone of Natural Heritage inventories is the use of a ranking system to achieve these twin objectives of effectiveness and efficiency.

Ranking species and ecological communities according to their imperilment status provides guidance for where Natural Heritage Programs should focus their information-gathering activities. For species and communities deemed secure, only general information needs to be maintained by Natural Heritage Programs. Fortunately, these constitute the majority of most groups of organisms. On the other hand, for those species and communities that are by their nature rare, more detailed information is needed. Because of their rarity, gathering comprehensive and detailed data can be less daunting than gathering similarly comprehensive information on more abundant species.

To determine the status of species within Colorado, CNHP gathers information on plants, animals, and plant communities. Each of these elements of natural diversity is assigned a rank that indicates its relative degree of imperilment on a five-point scale (for example, 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences (in other words, the number of known distinct localities or populations). This factor is weighted more heavily than other factors because an element found in one place is more vulnerable to extinction than something found in twenty-one places. Also of importance are the size of the geographic range, the number of individuals, the trends in both population and distribution, identifiable threats, and the number of protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State-rank or S-rank) and the element's imperilment over its entire range (its Global-rank or G-rank). Taken together, these two ranks indicate the degree of imperilment of an element. For example, the lynx, which is thought to be secure in northern North America but is known from less than five current locations in Colorado, is ranked G5 S1 (globally-secure, but critically imperiled in this state). The Rocky Mountain Columbine, which is known only in Colorado from about 30 locations, is ranked a G3 S3 (vulnerable both in the state and globally, since it only occurs in Colorado and then in small numbers). Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1 S1 (critically imperiled both in the state and globally, because it exists in a single location). CNHP actively collects, maps, and electronically processes specific occurrence information for animal and plant species considered extremely imperiled to vulnerable in

the state (S1 - S3). Several factors, such as rarity, evolutionary distinctiveness, and endemism (specificity of habitat requirements), contribute to the conservation priority of each species. Certain species are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 1.

Table 1. Definition of Natural Heritage Imperilment Ranks

| | |
|---|---|
| **G/S1** | Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or 1,000 or fewer individuals), or because some factor of its biology makes it especially vulnerable to extinction. |
| **G/S2** | Imperiled globally/state because of rarity (6 to 20 occurrences, or 1,000 to 3,000 individuals), or because other factors demonstrably make 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, or 3,000 to 10,000 individuals). |
| **G/S4** | Apparently secure globally/state, though it may be quite rare in parts of its range, especially at the periphery. Usually more than 100 occurrences and 10,000 individuals. |
| **G/S5** | Demonstrably secure globally/state, though it may be quite rare in parts of its range, especially at the periphery. |
| **G/SX** | Presumed extinct globally, or extirpated within the state. |
| **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 usually not verified for an extended period of time. |
| **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 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 (for example, S2S3), the actual rank of the element is uncertain, but falls within the stated range.

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," for example S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N," for example 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.

## Legal Designations for Rare Species

Natural Heritage imperilment 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 abbreviations used by CNHP.

## Element Occurrences and their Ranking

Actual locations of elements, whether they are 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. To prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to the ecological quality of the occurrences whenever sufficient information is available. This ranking system is designed to indicate which occurrences are the healthiest and ecologically the most viable, thus focusing conservation efforts where they will be most successful. The EO-Rank is based on three factors:

**Size** – a measure of the area or abundance of the element's occurrence. This factor takes into account aspects such as area of occupancy, population abundance, population density, population fluctuation, and minimum dynamic area (which is the area needed to ensure survival or re-establishment of an element after natural disturbance). This factor for an occurrence is evaluated relative to other known, and/or presumed viable, examples.

**Condition/Quality** – an integrated measure of the composition, structure, and biotic interactions that characterize the occurrence. This includes measures such as reproduction, age structure, biological composition (such as the presence of exotic versus native species), structure (for example, canopy, understory, and ground cover in a forest community), and biotic interactions (such as levels of competition, predation, and disease).

**Landscape Context** – an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the element, and connectivity. Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes, and many kinds of natural disturbances. Connectivity includes aspects such as a species having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and systems, and the ability of the species to respond to environmental change through dispersal, migration, or re-colonization.

Table 2. Federal and State Agency Special Designations for Rare Species

| | |
|---|---|
| **Federal Status:** | |
| **1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)** | |
| LE | Listed Endangered: defined as a species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range. |
| LT | Listed Threatened: defined as a species, subspecies, or variety likely to become endangered in the foreseeable future throughout all or a significant portion of its range. |
| P | Proposed: taxa formally proposed for listing as Endangered or Threatened (a proposal has been published in the Federal Register, but not a final rule). |
| C | Candidate: taxa for which substantial biological information exists on file to support proposals to list them as endangered or threatened, but no proposal has been published yet in the Federal Register. |
| PDL | Proposed for delisting. |
| XN | Nonessential experimental population. |
| **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:<br>Significant current or predicted downward trends in population numbers or density.<br>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. The protection provided for sensitive species is the same as that provided for C (candidate) species. |
| **4. State Status:** | |
| The Colorado Division of Wildlife has developed categories of imperilment for non-game species (refer to the Colorado Division of Wildlife's Chapter 10 – Nongame Wildlife of the Wildlife Commission's regulations). The categories being used and the associated CNHP codes are provided below. | |
| E | Endangered: those species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy, as determined by the Commission. |
| T | Threatened: those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct. |
| SC | Special Concern: those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or are a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado. |

Each of these factors is rated on a scale of A through D, with A representing an excellent rank and D representing a poor rank. These ranks for each factor are then averaged to determine an appropriate EO-Rank for the occurrence. If not enough information is available to rank an element occurrence, an EO-Rank of E is assigned. EO-Ranks and their definitions are summarized in Table 3.

Table 3. Element Occurrence Ranks and their Definitions

| | |
|---|---|
| **A** | Excellent viability. |
| **B** | Good viability |
| **C** | Fair viability. |
| **D** | Poor viability. |
| **H** | Historic: known from historical record, but not verified for an extended period of time. |
| **X** | Extirpated (extinct within the state). |
| **E** | Extant: the occurrence does exist but not enough information is available to rank. |
| **F** | Failed to find: the occurrence could not be relocated. |

## Potential Conservation Areas

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

The PCA is designed to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover; and current and potential land uses. In developing the boundaries of a PCA, CNHP scientists consider a number of factors that include, but are not limited to:

- ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the PCA and the surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater;
- land intended to buffer the PCA against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

The boundaries presented are meant to be used for conservation planning purposes and have no legal status. The proposed boundary does not automatically recommend exclusion of all activity. Rather, the boundaries designate ecologically significant areas in which land managers may wish to consider how specific activities or land use changes within or near the PCA affect the natural heritage resources and sensitive species on which the PCA is based. Please note that these boundaries are based on our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. A thorough analysis of the human context and potential stresses has not been conducted. However, CNHP's conservation planning staff is available to assist with these types of analyses where conservation priority and local interest warrant additional research.

## Off-Site Considerations

Frequently, all necessary ecological processes cannot be contained within a PCA of reasonable size. For example, taken to the extreme, the threat of ozone depletion could expand every PCA to include the entire planet. The boundaries described in this report indicate the immediate, and therefore most important, area to be considered for protection. Continued landscape level conservation efforts that may extend far beyond PCA boundaries are necessary as well. This will involve regional efforts in addition to coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

## Ranking of Potential Conservation Areas

CNHP uses element and element occurrence ranks to assess the overall biological diversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a biological diversity rank (or B-rank). See Table 4 for a summary of these B-ranks.

## Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the timeframe in which it is recommended that conservation protection occur. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Table 5 summarizes the P-ranks and their definitions.

A protection action involves increasing the current level of protection accorded one or more tracts within 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. Situations that may require a protection action may include the following

- Forces that threaten the existence of one or more element occurrences at a PCA. For example, development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence; or timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;

- The inability to undertake a management action in the absence of a protection action; for example, obtaining a management agreement;

- In extraordinary circumstances, a prospective change in ownership or management that will make future protection actions more difficult.

Table 4. Natural Heritage Program Biological Diversity Ranks and their Definitions

| | |
|---|---|
| **B1** | Outstanding Significance (indispensable):<br>only known occurrence of an element<br>A-ranked occurrence of a G1 element (or at least C-ranked if best available occurrence)<br>concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more) |
| **B2** | Very High Significance:<br>B- or C-ranked occurrence of a G1 element<br>A- or B-ranked occurrence of a G2 element<br>One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element.<br>Concentration of A- or B-ranked G3 elements (four or more)<br>Concentration of C-ranked G2 elements (four or more) |
| **B3** | High Significance:<br>C-ranked occurrence of a G2 element<br>A- or B-ranked occurrence of a G3 element<br>D-ranked occurrence of a G1 element (if best available occurrence)<br>Up to five of the best occurrences of a G4 or G5 community (at least A- or B-ranked) in an ecoregion (requires consultation with other experts) |
| **B4** | Moderate Significance:<br>Other A- or B-ranked occurrences of a G4 or G5 community<br>C-ranked occurrence of a G3 element<br>A- or B-ranked occurrence of a G4 or G5 S1 species (or at least C-ranked if it is the only state, provincial, national, or ecoregional occurrence)<br>Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more)<br>D-ranked occurrence of a G2 element<br>At least C-ranked occurrence of a disjunct G4 or G5 element<br>Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more) |
| **B5** | General or State-wide Biological Diversity Significance: good or marginal occurrence of common community types and globally secure S1 or S2 species. |

Table 5. Natural Heritage Program Protection Urgency Ranks and their Definitions

| | |
|---|---|
| **P1** | Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the elements in the PCA within 1 year. |
| **P2** | Protection actions may be needed within 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA within this approximate timeframe. |
| **P3** | Protection actions may be needed, but probably not within the next 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA if protection action is not taken. |
| **P4** | No protection actions are needed in the foreseeable future. |
| **P5** | Land protection is complete and no protection actions are needed. |

### Management Urgency Ranks

Management urgency ranks (M-ranks) indicate the timeframe in which it is recommended that a change occur in management of the PCA. This rank refers to the need for management in contrast to protection (for example, increased fire frequency,

decreased grazing, 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, re-routing 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. Table 6 summarizes M-ranks and their definitions.

Table 6. Natural Heritage Program Management Urgency Ranks and their Definitions

| | |
|---|---|
| **M1** | Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded. |
| **M2** | New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. |
| **M3** | New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. |
| **M4** | Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. |
| **M5** | No management needs are known or anticipated in the PCA. |

## Network of Conservation Areas (NCA)

A network of conservation areas (NCA) encompasses two types of landscape areas, 1) a landscape area that encompasses Potential Conservation Areas that share similar species or natural communities as well as ecological processes, and 2) a mostly intact (maintained as natural vegetation), lightly fragmented landscape that supports wide-ranging species and large scale disturbances. In the first category NCAs contain PCAs with an obvious repeating pattern (that is, the same species or natural communities are in each attached PCA). The second category NCAs represent a contiguous land area and can contain PCAs that may occur at a variety of ecological scales. All NCAs include unoccupied or unsurveyed areas that are within the same ecological system that the species or natural communities require. Most NCAs will be drawn at a regional scale that may be best represented on state-wide maps. NCAs are not assigned ranks.

## Site of Local Significance (SLS)

A Site of Local Significance (SLS) is a site which includes good examples of species or natural communities that are too small or whose biological or ecological significance is not great enough to be considered exemplary in a statewide context. However, they do contribute to the character of the local area and the overall local diversity of plants and communities present, and therefore warrant consideration at some level when planning management activities.

Sites of Local Significance are biologically significant at the local level, but do not meet CNHP's criteria for a Potential Conservation Area and are not maintained in CNHP's database (BIOTICS). SLS may include sites that were surveyed at the client's request

due to needs for management or threats but do not contain tracked species or communities. In some cases they are based on plot data where the full extent of a community is not known and the surveyed areas does not meet the minimum size requirement for an occurrence.

**Appendix B. Lists of elements targeted for data collection and/or field survey in Boulder County in 2007-2008.**

Table B-1. Botany target elements..... 90
Table B-2. Ecology (ecological system and plant association) targets, queried by potential to occur in Boulder County..... 93
Table B-3. Zoology targets identified by priority..... 105

Table B-1. Botany target elements.

| GLOBALNAME | STATENAME | S_PRIMARY_COMMON_NAME | G_RANK | S_RANK |
|---|---|---|---|---|
| Acorus calamus | Acorus calamus | sweet flag | G4? | SH |
| Agastache foeniculum | Agastache foeniculum | lavender hyssop | G4G5 | S1 |
| Aletes humilis | Aletes humilis | Larimer aletes | G2G3 | S2S3 |
| Amorpha nana | Amorpha nana | dwarf wild indigo | G5 | S2S3 |
| Anagallis minima | Anagallis minima | chaffweed | G5 | S1 |
| Apios americana | Apios americana | American groundnut | G5 | S1 |
| Aquilegia saximontana | Aquilegia saximontana | Rocky Mountain columbine | G3 | S3 |
| Argyrochosma fendleri | Argyrochosma fendleri | Fendler cloak-fern | G3 | S3 |
| Aristida basiramea | Aristida basiramea | forktip three-awn | G5 | S1 |
| Artemisia pattersonii | Artemisia pattersonii | Patterson's wormwood | G3G4 | S3 |
| Asclepias hallii | Asclepias hallii | | G3 | S3 |
| Asclepias stenophylla | Asclepias stenophylla | narrow-leaved milkweed | G4G5 | S2 |
| Asclepias uncialis ssp. uncialis | Asclepias uncialis ssp. uncialis | dwarf milkweed | G3G4T2T3 | S2 |
| Asplenium adiantum-nigrum | Asplenium adiantum-nigrum | black spleenwort | G5 | S1 |
| Asplenium trichomanes-ramosum | Asplenium trichomanes-ramosum | green spleenwort | G4 | S1S2 |
| Aster alpinus var. vierhapperi | Aster alpinus var. vierhapperi | alpine aster | G5T5 | S1 |
| Astragalus plattensis | Astragalus plattensis | Platte River milkvetch | G5 | S1 |
| Astragalus sparsiflorus | Astragalus sparsiflorus | Front Range milkvetch | G3? | S3? |
| Betula papyrifera | Betula papyrifera | paper birch | G5 | S1 |
| Botrychium echo | Botrychium echo | reflected moonwort | G3 | S3 |
| Botrychium hesperium | Botrychium hesperium | western moonwort | G3G4 | S2 |
| Botrychium lanceolatum var. lanceolatum | Botrychium lanceolatum var. lanceolatum | lance-leaved moonwort | G5T4 | S3 |
| Botrychium lineare | Botrychium lineare | narrowleaf grapefern | G1 | S1 |
| Botrychium minganense | Botrychium minganense | Mingan's moonwort | G4 | S1 |
| Botrychium multifidum | Botrychium multifidum | leathery grape fern | G5 | S1 |
| Botrychium pallidum | Botrychium pallidum | pale moonwort | G3 | S2 |
| Botrychium simplex | Botrychium simplex | least moonwort | G5 | S1 |
| Botrychium virginianum | Botrypus virginianus ssp. europaeus | rattlesnake fern | G5 | S1 |
| Carex diandra | Carex diandra | lesser panicled sedge | G5 | S1 |
| Carex oreocharis | Carex oreocharis | a sedge | G3 | S1 |
| Carex saximontana | Carex saximontana | Rocky Mountain sedge | G5 | S1 |
| Carex sprengelii | Carex sprengelii | Sprengel's sedge | G5? | S2S3 |
| Carex sychnocephala | Carex sychnocephala | many-headed sedge | G4 | S1 |
| Carex torreyi | Carex torreyi | Torrey sedge | G4 | S1 |
| Castilleja puberula | Castilleja puberula | downy indian-paintbrush | G2G3 | SNR |
| Crataegus chrysocarpa | Crataegus chrysocarpa | yellow hawthorn | G5 | S1 |

| GLOBALNAME | STATENAME | S_PRIMARY_COMMON_NAME | G_RANK | S_RANK |
|---|---|---|---|---|
| Crepis nana | Askellia nana | dwarf hawksbeard | G5 | S2 |
| Cypripedium fasciculatum | Cypripedium fasciculatum | clustered lady's-slipper | G4 | S3 |
| Draba exunguiculata | Draba exunguiculata | clawless draba | G2 | S2 |
| Draba fladnizensis | Draba fladnizensis | arctic draba | G4 | S2S3 |
| Draba grayana | Draba grayana | Gray's Peak whitlow-grass | G2 | S2 |
| Draba porsildii | Draba porsildii | Porsild's whitlow-grass | G3G4 | S1 |
| Drymaria effusa var. depressa | Drymaria effusa var. depressa | spreading drymaria | G4T4 | SNR |
| Eriophorum gracile | Eriophorum gracile | slender cottongrass | G5 | S2 |
| Gaura neomexicana ssp. coloradensis | Gaura neomexicana ssp. coloradensis | Colorado butterfly weed | G3T2 | S1 |
| Gymnocarpium dryopteris | Gymnocarpium dryopteris | oak fern | G5 | S3 |
| Heuchera richardsonii | Heuchera richardsonii | Richardson alum-root | G5 | S1 |
| Juncus brachycephalus | Juncus brachycephalus | small-headed rush | G5 | S1 |
| Juncus brevicaudatus | Juncus brevicaudatus | narrow-panicled rush | G5 | S1 |
| Juncus vaseyi | Juncus vaseyi | Vasey bulrush | G5? | S1 |
| Liatris ligulistylis | Liatris ligulistylis | gay-feather | G5? | S1S2 |
| Listera convallarioides | Listera convallarioides | broad-leaved twayblade | G5 | S2 |
| Lomatium nuttallii | Aletes nuttallii | dog parsley | G3 | S1 |
| Luzula subcapitata | Luzula subcapitata | Colorado wood-rush | G3? | S3? |
| Lysimachia thyrsiflora | Naumburgia thyrsiflora | tufted loosestrife | G5 | SH |
| Malaxis brachypoda | Malaxis monophyllos ssp. brachypoda | white adder's-mouth | G4Q | S1 |
| Mentzelia sinuata | Nuttallia sinuata | wavy-leaf stickleaf | G3 | S2 |
| Mimulus gemmiparus | Mimulus gemmiparus | budding monkeyflower | G1 | S1 |
| Oligoneuron album | Unamia alba | prairie goldenrod | G5 | S2S3 |
| Oxytropis parryi | Oxytropis parryi | Parry's crazy-weed | G5 | S1 |
| Parnassia kotzebuei | Parnassia kotzebuei | Kotzebue's grass-of-parnassus | G5 | S2 |
| Phacelia denticulata | Phacelia denticulata | Rocky Moutain phacelia | G3? | S3? |
| Phippsia algida | Phippsia algida | snow grass | G5 | S2 |
| Physaria bellii | Physaria bellii | Bell's twinpod | G2G3 | S2S3 |
| Potamogeton diversifolius | Potamogeton diversifolius | waterthread pondweed | G5 | S1 |
| Potentilla ambigens | Potentilla ambigens | southern Rocky Mountain cinquefoil | G3 | S1S2 |
| Potentilla rupincola | Potentilla rupincola | Rocky Mountain cinquefoil | G2 | S2 |
| Ribes americanum | Ribes americanum | American currant | G5 | S2 |
| Rotala ramosior | Rotala ramosior | toothcup | G5 | S1 |
| Salix serissima | Salix serissima | autumn willow | G4 | S1 |
| Saxifraga cespitosa ssp. monticola | Muscaria monticola | tundra saxifrage | G5T5 | S1 |
| Schoenoplectus saximontanus | Schoenoplectus saximontanus | Rocky Mountain bulrush | G5 | S1 |
| Sisyrinchium pallidum | Sisyrinchium pallidum | pale blue-eyed grass | G2G3 | S2 |
| Spiranthes diluvialis | Spiranthes diluvialis | Ute ladies' tresses | G2 | S2 |

| GLOBALNAME | STATENAME | S_PRIMARY_COMMON_NAME | G_RANK | S_RANK |
|---|---|---|---|---|
| Viola pedatifida | Viola pedatifida | prairie violet | G5 | S2 |

Table B-2. Ecology (ecological system and plant association) targets, queried by potential to occur in Boulder County.

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| *Central Mixedgrass Prairie* | | | |
| | Schizachyrium scoparium - Bouteloua curtipendula Western Great Plains Herbaceous Vegetation | CO, KS?, NM?, OK, TX | G3 |
| | Sarcobatus vermiculatus / Sporobolus airoides Shrubland | CO, OR, UT, WY | G3? |
| | Schizachyrium scoparium - Bouteloua curtipendula Loess Mixedgrass Herbaceous Vegetation | CO, KS, ND, NE, SD | G3? |
| | Pascopyrum smithii Herbaceous Vegetation | AB, AZ, CO, ID, MT, NE, SD, SK, UT, WY | G3G5Q |
| *Inter-Mountain Basins Active and Stabilized Dune* | | | |
| | Populus angustifolia Sand Dune Forest | CO | G1 |
| | Pinus ponderosa / Achnatherum hymenoides Sparse Vegetation | CO, NM | G1 |
| | Redfieldia flexuosa - (Psoralidium lanceolatum) Herbaceous Vegetation | CO | G1? |
| | Achnatherum hymenoides - Psoralidium lanceolatum Herbaceous Vegetation | CO, ID, SK?, UT, WY | G3Q |
| *Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland* | | | |
| | Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia Forest | CO, ID, UT, WY | G3? |
| | Populus tremuloides - Pinus ponderosa Rocky Mountain Forest | CO, UT, WY? | G3G4 |
| | Populus tremuloides - Picea pungens Forest | CO, UT | G3G4 |
| | Populus tremuloides - Pseudotsuga menziesii / Juniperus communis Forest | CO, NV, UT | G3G4 |
| | Populus tremuloides - Abies lasiocarpa / Juniperus communis Forest | CO, UT | G3G4 |
| *Inter-Mountain Basins Big Sagebrush Shrubland* | | | |
| | Artemisia tridentata ssp. tridentata / Leymus cinereus Shrubland | CA, CO, ID, MT, NV?, OR, WA, WY | G2 |
| | Artemisia tridentata ssp. wyomingensis / Leymus ambiguus Shrubland | CO | G2 |
| | Artemisia tridentata ssp. tridentata / Pascopyrum smithii - (Elymus lanceolatus) Shrubland | CO, ID?, MT, NV, OR?, UT, WA?, WY? | G3? |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Artemisia tridentata ssp. vaseyana / Pascopyrum smithii Shrubland | CO, MT, WY | G3? |
| | Artemisia tridentata ssp. wyomingensis / Hesperostipa comata Colorado Plateau Shrubland | CO, UT, WY? | GNR |
| | Artemisia tridentata ssp. wyomingensis / Sparse Understory Shrubland | CO, UT | GNR |
| | Artemisia tridentata ssp. wyomingensis / Poa fendleriana Shrubland | CO, UT | GNR |
| *Inter-Mountain Basins Mixed Salt Desert Scrub* | | | |
| | Atriplex canescens / Bouteloua gracilis Shrubland | AZ, CO, KS, NM?, TX?, UT | G3 |
| | Atriplex canescens / Pleuraphis jamesii Shrubland | AZ, CA?, CO, NM?, TX?, UT | G3G4 |
| | Atriplex canescens / Achnatherum hymenoides Shrubland | CO, UT | G3G5 |
| *Inter-Mountain Basins Montane Sagebrush Steppe* | | | |
| | Artemisia tridentata ssp. vaseyana / Carex geyeri Shrub Herbaceous Vegetation | CO, ID, NV?, OR, WY | G3 |
| | Artemisia tridentata ssp. vaseyana / Leucopoa kingii Shrubland | CO, ID, NV?, WY | G3 |
| | Artemisia tridentata ssp. vaseyana / Pascopyrum smithii Shrubland | CO, MT, WY | G3? |
| | Artemisia tridentata ssp. vaseyana / Festuca thurberi Shrubland | CO | G3G4 |
| | Artemisia tridentata ssp. vaseyana / Poa fendleriana Shrubland | CO, UT | GNR |
| | Artemisia tridentata ssp. vaseyana / Balsamorhiza sagittata Shrubland | CO | GNR |
| | Artemisia tridentata ssp. vaseyana / Achnatherum lettermanii Shrubland | CO | GNR |
| | Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) - Amelanchier utahensis Shrubland | CO, UT, WY? | GNR |
| | Artemisia tridentata ssp. vaseyana / Hesperostipa comata Shrubland | CO, ID, MT, NV, UT, WY | GNR |
| *Inter-Mountain Basins Wash* | | | |
| | Sarcobatus vermiculatus / Sporobolus airoides Shrubland | CO, OR, UT, WY | G3? |
| | Sarcobatus vermiculatus / Suaeda moquinii Shrubland | CO, OR | GUQ |
| *North American Arid West Emergent Marsh* | | | |
| | Potamogeton diversifolius Herbaceous Vegetation | CO, OR | G1? |
| | Salicornia rubra Herbaceous Vegetation | AB, CA?, CO, MB, MN, MT, ND, NV?, SD, SK | G2G3 |
| | Potamogeton foliosus Herbaceous Vegetation | CO | G3? |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Spartina pectinata Western Herbaceous Vegetation | CO, MT, OR, UT, WA, WY | G3? |
| | Schoenoplectus pungens Herbaceous Vegetation | AB, BC, CO, ID, KS, MT, ND, NM, NV, SD, UT, WY | G3G4 |
| | Schoenoplectus americanus - Eleocharis spp. Herbaceous Vegetation | CO, NM, OK, TX? | GNR |
| | Schoenoplectus americanus - Carex spp. Herbaceous Vegetation | CO, OK | GNR |
| | Stuckenia filiformis Herbaceous Vegetation | CO, NV? | GU |
| | Spartina gracilis Herbaceous Vegetation | CA, CO, ID, MT?, NV, UT, WA?, WY | GU |
| | Triglochin maritima Herbaceous Vegetation | CO | GU |
| | Ranunculus aquatilis - Callitriche palustris Herbaceous Vegetation | CO, OR? | GU |
| | Myriophyllum sibiricum Herbaceous Vegetation | AB, CO, WY? | GUQ |
| *Rocky Mountain Alpine Bedrock and Scree* | | | |
| | Polemonium viscosum Herbaceous Vegetation | CO | G3G4 |
| | Sparse Nonvascular Vegetation (on rock and unconsolidated substrates) | CO | GNR |
| | Aquilegia caerulea - Cirsium scopulorum Scree Sparse Vegetation | CO | GU |
| *Rocky Mountain Alpine Fell-Field* | | | |
| | Geum rossii - Minuartia obtusiloba Herbaceous Vegetation | CO, MT | G3? |
| | Sibbaldia procumbens - Polygonum bistortoides Herbaceous Vegetation | CO, WY | G3? |
| | Trifolium parryi Herbaceous Vegetation | CO, WY? | GU |
| | Rubus idaeus Scree Shrubland | CO | GU |
| *Rocky Mountain Alpine Turf* | | | |
| | Geum rossii - Trifolium spp. Herbaceous Vegetation | CO, WY | G3 |
| | Kobresia myosuroides - Carex rupestris var. drummondiana Herbaceous Vegetation | CO | G3 |
| | Festuca thurberi Subalpine Grassland Herbaceous Vegetation | CO, NM | G3 |
| | Sibbaldia procumbens - Polygonum bistortoides Herbaceous Vegetation | CO, WY | G3? |
| | Geum rossii - Minuartia obtusiloba Herbaceous Vegetation | CO, MT | G3? |
| | Carex rupestris - Trifolium dasyphyllum Herbaceous Vegetation | CO, UT? | G3G4 |
| | Saxifraga chrysantha Sparse Vegetation | CO | GU |
| | Carex vernacula Herbaceous Vegetation | CO | GU |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Carex siccata - Geum rossii Herbaceous Vegetation | CO | GU |
| | Artemisia arctica ssp. arctica Herbaceous Vegetation | CO | GU |
| | Ribes montigenum Shrubland | CO | GU |
| | Festuca brachyphylla - Geum rossii var. turbinatum Herbaceous Vegetation | CO, NM | GUQ |
| *Rocky Mountain Alpine-Montane Wet Meadow* | | | |
| | Glyceria grandis Herbaceous Vegetation | CO, ID, MT, OR, WA | G2? |
| | Eleocharis rostellata Herbaceous Vegetation | CO, ID, MT, OR, WA, WY | G3 |
| | Carex pellita Herbaceous Vegetation | BC, CA, CO, ID, MT?, NM, OR, UT, WA, WY | G3 |
| | Carex saxatilis Herbaceous Vegetation | CO, ID?, MT, UT, WA, WY? | G3 |
| | Deschampsia caespitosa - Carex nebrascensis Herbaceous Vegetation | CO, MT?, NV, OR, UT?, WY | G3?Q |
| | Betula nana / Mesic Forbs - Mesic Graminoids Shrubland | CO, WY | G3G4 |
| | Carex praegracilis Herbaceous Vegetation | CO, ID, MT, NM, OR, WY | G3G4 |
| | Caltha leptosepala - Rhodiola rhodantha Herbaceous Vegetation | CO | GNRQ |
| | Carex nebrascensis Slope Herbaceous Vegetation | CO? | GU |
| | Rorippa alpina Herbaceous Vegetation | CO | GU |
| | Phippsia algida Herbaceous Vegetation | CO, NM, NV | GU |
| | Saxifraga odontoloma Herbaceous Vegetation | CO, OR | GU |
| | Cardamine cordifolia - Caltha leptosepala Herbaceous Vegetation | CO | GU |
| | Carex pyrenaica Herbaceous Vegetation | CO | GU |
| | Calamagrostis stricta Herbaceous Vegetation [Provisional] | CO | GU |
| | Geum rossii - Sibbaldia procumbens Herbaceous Vegetation | CO | GU |
| | Deschampsia caespitosa - Ligusticum tenuifolium Herbaceous Vegetation | CO | GU |
| | Carex duriuscula Herbaceous Vegetation | CO, WY | GUQ |
| | Carex illota Herbaceous Vegetation | CO, OR, WY | GUQ |
| *Rocky Mountain Aspen Forest and Woodland* | | | |
| | Populus tremuloides / Acer glabrum Forest | CO | G1G2 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Populus tremuloides / Ribes montigenum Forest | CO | G2 |
| | Populus tremuloides / Ceanothus velutinus Forest | CO, WY | G2 |
| | Populus tremuloides / Mahonia repens Forest | CO, MT, ND, SD, WY | G3 |
| | Populus tremuloides / Corylus cornuta Forest | CO, ND, SD, SK, WY | G3 |
| | Populus tremuloides / Vaccinium myrtillus Forest | CO | G3 |
| | Populus tremuloides / Lonicera involucrata Forest | CO | G3 |
| | Populus tremuloides / Symphoricarpos oreophilus / Festuca thurberi Forest | CO?, UT | G3? |
| | Populus tremuloides / Juniperus communis / Lupinus argenteus Forest | CO, UT, WY | G3G4 |
| | Populus tremuloides / Shepherdia canadensis Forest | CO, ID, WY | G3G4 |
| | Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus Forest | CO, NM, UT | GNR |
| *Rocky Mountain Cliff, Canyon and Massive Bedrock* | | | |
| | Ribes cereum / Leymus ambiguus Shrubland | CO | G2 |
| | Pseudotsuga menziesii / Holodiscus dumosus Scree Woodland | AZ, CO, NM | G3G4 |
| | Jamesia americana Rock Outcrop Shrubland | CO | GNR |
| | Sparse Nonvascular Vegetation (on rock and unconsolidated substrates) | CO | GNR |
| | Rubus idaeus Scree Shrubland | CO | GU |
| | Saxifraga rivularis Herbaceous Vegetation | CO | GU |
| *Rocky Mountain Gambel Oak-Mixed Montane Shrubland* | | | |
| | Amelanchier utahensis - Mixed Shrub / Carex geyeri Shrubland | CO, UT?, WY | G2G3 |
| | Amelanchier utahensis / Pseudoroegneria spicata Shrubland | CO, UT | G2G3 |
| *Rocky Mountain Lodgepole Pine Forest* | | | |
| | Pinus contorta / Shepherdia canadensis Forest | CO, ID, MT?, WA, WY | G3G4 |
| | Ceanothus velutinus Shrubland | CO, SD, WY | GNR |
| *Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland* | | | |
| | Populus angustifolia / Salix ligulifolia - Shepherdia argentea Woodland | CO | G1 |
| | Populus angustifolia Sand Dune Forest | CO | G1 |
| | Forestiera pubescens Shrubland | AZ, CO, NM?, UT? | G1G2 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Salix exigua / Mesic Forbs Shrubland | CO, ID, NV, UT, WY | G2 |
| | Acer negundo - Populus angustifolia / Cornus sericea Forest | CO | G2 |
| | Pinus ponderosa / Alnus incana Woodland | AZ?, CO, NM? | G2 |
| | Populus deltoides ssp. wislizeni / Rhus trilobata Woodland | CO, UT | G2 |
| | Populus angustifolia / Salix irrorata Woodland | CO, NM | G2 |
| | Populus angustifolia / Salix drummondiana - Acer glabrum Woodland | CO | G2? |
| | Populus angustifolia / Crataegus rivularis Woodland | CO | G2? |
| | Salix exigua - Salix ligulifolia Shrubland | CO, NM? | G2G3 |
| | Populus deltoides / Symphoricarpos occidentalis Woodland | CO, MT, ND, SD, WY | G2G3 |
| | Populus angustifolia - Juniperus scopulorum Woodland | CO, NM, UT, WY | G2G3 |
| | Populus angustifolia / Rosa woodsii Forest | CO, NV, UT, WY | G2G3 |
| | Populus angustifolia / Prunus virginiana Woodland | CO, NM, WY | G2Q |
| | Populus angustifolia / Symphoricarpos (albus, occidentalis, oreophilus) Woodland | CO, ID, MT, WY | G2Q |
| | Salix amygdaloides Woodland | AB, CO, ID, MT, SD, WY? | G3 |
| | Populus angustifolia - Picea pungens / Alnus incana Woodland | CO | G3 |
| | Populus angustifolia / Betula occidentalis Woodland | CO, ID, NV, UT, WY | G3 |
| | Populus angustifolia / Salix (monticola, drummondiana, lucida) Woodland | CO, NV, UT | G3 |
| | Rhus trilobata Intermittently Flooded Shrubland | CO, ID, UT | G3 |
| | Populus angustifolia / Rhus trilobata Woodland | CO, ID, NV, UT, WY | G3 |
| | Populus angustifolia / Alnus incana Woodland | CO, NM, OR, WY | G3 |
| | Populus angustifolia - Pseudotsuga menziesii Woodland | CO, NV?, UT | G3 |
| | Populus deltoides (ssp. wislizeni, ssp. monilifera) / Salix exigua Woodland | CO, ND, NE, NM, OK, SD, TX, UT | G3 |
| | Pseudotsuga menziesii / Betula occidentalis Woodland | CO, NV?, OR, UT | G3? |
| | Acer negundo / Cornus sericea Forest | CO, ID, UT | G3? |
| | Shepherdia argentea Shrubland | AB, CO, MT, ND, SD, SK, WY | G3G4 |
| | Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior) Woodland | CO, KS, MB, ND, NE, NM, OK?, SD, SK?, TX?, WY | G3G4 |
| | Acer negundo / Disturbed Understory Woodland | AZ, CO, UT | GNR |
| | Populus angustifolia - Populus deltoides - Salix amygdaloides Forest | CO | GUQ |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| *Rocky Mountain Lower Montane-Foothill Shrubland* | | | |
| | Purshia tridentata / Artemisia frigida / Hesperostipa comata Shrubland | CO | G1G2 |
| | Cercocarpus montanus / Hesperostipa comata Shrubland | CO | G2 |
| | Rhus trilobata Rocky Mountain Shrub Herbaceous Vegetation | CO | G2 |
| | Purshia tridentata / Muhlenbergia montana Shrubland | CO | G2 |
| | Ribes cereum / Leymus ambiguus Shrubland | CO | G2 |
| | Amelanchier (utahensis, alnifolia) - Cercocarpus montanus Shrubland | CO, NV, UT | G2? |
| | Cercocarpus montanus / Hesperostipa neomexicana Shrubland | CO | G2G3 |
| | Cercocarpus montanus - Rhus trilobata / Andropogon gerardii Shrubland | CO | G2G3 |
| | Cercocarpus montanus / Achnatherum scribneri Shrubland | CO | G3 |
| | Artemisia frigida / Bouteloua gracilis Dwarf-shrubland [Provisional] | CO | GNR |
| | Cercocarpus montanus / Muhlenbergia montana Shrubland | CO | GU |
| | Cercocarpus montanus / Elymus lanceolatus ssp. lanceolatus Shrubland | CO | GU |
| *Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland* | | | |
| | Picea engelmannii / Trifolium dasyphyllum Forest | CO | G2? |
| | Picea engelmannii / Vaccinium scoparium Forest | CO, MT?, NM, OR, UT, WY | G3G5 |
| *Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland* | | | |
| | Populus tremuloides - Abies lasiocarpa / Juniperus communis Forest | CO, UT | G3G4 |
| | Abies lasiocarpa - Picea engelmannii / Salix (brachycarpa, glauca) Krummholz Shrubland | CO, UT? | GUQ |
| | Abies lasiocarpa - Picea engelmannii Ribbon Forest | CO, WY | GUQ |
| *Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland* | | | |
| | Pinus aristata / Trifolium dasyphyllum Woodland | CO | G2 |
| | Pinus aristata / Ribes montigenum Woodland | AZ, CO, NM, UT? | G3 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Pinus flexilis / Leucopoa kingii Woodland | CO, ID, MT, WY | G3 |
| | Pinus aristata / Juniperus communis Woodland | CO | GU |
| | Pinus aristata / Vaccinium myrtillus Woodland | CO | GU |
| *Rocky Mountain Subalpine-Montane Mesic Meadow* | | | |
| | Geum rossii - Trifolium spp. Herbaceous Vegetation | CO, WY | G3 |
| | Trifolium parryi Herbaceous Vegetation | CO, WY? | GU |
| | Ligusticum tenuifolium - Trollius laxus ssp. albiflorus Herbaceous Vegetation | CO | GU |
| | Deschampsia caespitosa - Ligusticum tenuifolium Herbaceous Vegetation | CO | GU |
| *Rocky Mountain Subalpine-Montane Riparian Shrubland* | | | |
| | Salix planifolia / Deschampsia caespitosa Shrubland | CO, UT, WY | G2G3 |
| | Salix ligulifolia Shrubland | CO, NM? | G2G3 |
| | Salix brachycarpa / Carex aquatilis Shrubland | CO, UT? | G2G3 |
| | Salix monticola / Calamagrostis canadensis Shrubland | CO, NM? | G3 |
| | Alnus incana - Salix (monticola, lucida, ligulifolia) Shrubland | CO, NM, WY? | G3 |
| | Salix geyeriana / Carex aquatilis Shrubland | CO, ID, MT?, UT, WY? | G3 |
| | Salix monticola / Carex aquatilis Shrubland | CO | G3 |
| | Corylus cornuta Shrubland [Provisional] | CO | G3 |
| | Salix monticola / Carex utriculata Shrubland | CO | G3 |
| | Betula occidentalis / Cornus sericea Shrubland | CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY | G3 |
| | Alnus incana / Mesic Forbs Shrubland | CA, CO, ID, MT, NV, OR?, UT, WA, WY | G3 |
| | Salix boothii / Mesic Forbs Shrubland | CA, CO, ID, MT, NV, OR, UT, WY | G3 |
| | Salix geyeriana - Salix monticola / Mesic Forbs Shrubland | CO | G3 |
| | Betula occidentalis / Mesic Graminoids Shrubland | CO, NV, UT | G3 |
| | Salix geyeriana / Mesic Forbs Shrubland | CO, ID, MT, UT, WY | G3 |
| | Salix wolfii / Mesic Forbs Shrubland | CO, ID, UT, WY | G3 |
| | Salix monticola / Mesic Graminoids Shrubland | CO, NM?, UT? | G3 |
| | Alnus incana / Mesic Graminoids Shrubland | CO, ID, NV, UT, WY | G3 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Alnus incana / Equisetum arvense Shrubland | BC?, CA?, CO, ID, OR, UT, WA, WY | G3 |
| | Salix drummondiana / Calamagrostis canadensis Shrubland | AB?, BC?, CO, ID, MT, WA | G3 |
| | Salix geyeriana - Salix monticola / Calamagrostis canadensis Shrubland | CO | G3 |
| | Salix wolfii / Deschampsia caespitosa Shrubland | CO, ID, MT, UT, WY | G3 |
| | Alnus incana - Salix drummondiana Shrubland | CO, NM?, WY | G3 |
| | Salix bebbiana / Mesic Graminoids Shrubland | AZ?, CO, ID, MT, NM?, NV, UT, WA?, WY? | G3 |
| | Salix bebbiana Shrubland | AB, CO, ID, MT, NM, SD, WY | G3? |
| | Salix boothii / Mesic Graminoids Shrubland | CO, ID, MT, UT, WY | G3? |
| | Salix geyeriana / Mesic Graminoids Shrubland | CO, ID, NV, UT, WY | G3? |
| | Alnus incana / Cornus sericea Shrubland | CA, CO, ID, MT, NM, NV, OR, UT, WA, WY | G3G4 |
| | Betula nana / Mesic Forbs - Mesic Graminoids Shrubland | CO, WY | G3G4 |
| | Betula occidentalis Shrubland | AB, CO, ID, MT, NV?, UT, WA, WY | G3G4 |
| | Salix boothii / Calamagrostis canadensis Shrubland | CO, ID, MT?, NV, OR, UT, WA?, WY | G3G4Q |
| | Salix lucida ssp. caudata Shrubland [Provisional] | CA?, CO, MT, WA | G3Q |
| | Salix monticola / Angelica ampla Shrubland | CO | GNR |
| *Rocky Mountain Subalpine-Montane Riparian Woodland* | | | |
| | Populus tremuloides / Senecio bigelovii var. bigelovii Forest | CO | G1? |
| | Picea pungens / Betula occidentalis Woodland | CO, NM? | G2 |
| | Abies concolor - Picea pungens - Populus angustifolia / Acer glabrum Forest | CO, NM? | G2 |
| | Populus tremuloides / Ribes montigenum Forest | CO | G2 |
| | Populus tremuloides / Corylus cornuta Forest | CO, ND, SD, SK, WY | G3 |
| | Populus tremuloides / Alnus incana Forest | CO | G3 |
| | Populus tremuloides / Betula occidentalis Forest | CO, NV, UT? | G3 |
| | Picea pungens / Alnus incana Woodland | CO, NM?, WY | G3 |
| | Abies lasiocarpa / Trautvetteria caroliniensis Forest | CO, ID, OR, WA | G3 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Picea engelmannii / Cornus sericea Woodland | AB?, CO, ID, MT, OR, UT?, WA, WY | G3 |
| | Populus tremuloides / Calamagrostis canadensis Forest | AB, CO, ID, MT, OR, WA, WY? | G3 |
| | Picea engelmannii / Caltha leptosepala Forest | CO, ID?, MT?, UT, WY | G3? |
| | Populus tremuloides / Veratrum californicum Forest | CA, CO, ID, NV, OR, UT | G3? |
| | Picea pungens / Equisetum arvense Woodland | CO, UT, WY | G3? |
| | Populus tremuloides / Salix drummondiana Forest | CO | G3G4 |
| | Picea engelmannii - Populus angustifolia / Heracleum maximum Forest | CO, NM | G3G4 |
| | Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus Forest | CO, NM, UT | GNR |
| *Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland* | | | |
| | Pseudotsuga menziesii / Paxistima myrsinites Forest | BC?, CO | G2G3 |
| | Pseudotsuga menziesii / Amelanchier alnifolia Forest | CO, MT, WY | G2Q |
| | Pseudotsuga menziesii / Leucopoa kingii Woodland | CO, ID, WY | G3G4 |
| | Pseudotsuga menziesii / Holodiscus dumosus Scree Woodland | AZ, CO, NM | G3G4 |
| | Pseudotsuga menziesii / Jamesia americana Forest | CO, WY | G3G4 |
| | Pseudotsuga menziesii / Poa fendleriana Woodland | AZ, CO, UT | GNR |
| | Abies concolor / Galium triflorum Woodland | CO, NM | GU |
| *Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland* | | | |
| | Picea pungens / Betula occidentalis Woodland | CO, NM? | G2 |
| | Abies concolor - Picea pungens - Populus angustifolia / Acer glabrum Forest | CO, NM? | G2 |
| | Picea pungens / Alnus incana Woodland | CO, NM?, WY | G3 |
| | Pseudotsuga menziesii / Betula occidentalis Woodland | CO, NV?, OR, UT | G3? |
| | Picea pungens / Equisetum arvense Woodland | CO, UT, WY | G3? |
| | Abies concolor / Galium triflorum Woodland | CO, NM | GU |
| *Southern Rocky Mountain Montane-Subalpine Grassland* | | | |
| | Muhlenbergia montana - Hesperostipa comata Herbaceous Vegetation | CO | G1G2 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Pseudoroegneria spicata Herbaceous Vegetation | CO, UT, WY | G2 |
| | Muhlenbergia filiculmis Herbaceous Vegetation | CO | G2 |
| | Festuca idahoensis - Geranium viscosissimum Herbaceous Vegetation | CO, WY | G2G3 |
| | Danthonia intermedia Herbaceous Vegetation | CO, UT, WA | G2G3 |
| | Leymus cinereus Herbaceous Vegetation | CA, CO, ID, MT, OR, WA, WY | G2G3Q |
| | Festuca thurberi Subalpine Grassland Herbaceous Vegetation | CO, NM | G3 |
| | Festuca arizonica - Muhlenbergia montana Herbaceous Vegetation | AZ?, CO, NM?, TX | G3 |
| | Danthonia parryi Herbaceous Vegetation | CO, WY | G3 |
| | Festuca idahoensis - Festuca thurberi Herbaceous Vegetation | CO | G3G4 |
| | Muhlenbergia montana Herbaceous Vegetation | AZ, CO, UT | G3G4 |
| | Pascopyrum smithii Herbaceous Vegetation | AB, AZ, CO, ID, MT, NE, SD, SK, UT, WY | G3G5Q |
| | Poa fendleriana Herbaceous Vegetation | CO, UT | GU |
| | Festuca arizonica - Muhlenbergia filiculmis Herbaceous Vegetation | CO | GU |
| *Southern Rocky Mountain Ponderosa Pine Woodland* | | | |
| | Pinus ponderosa / Physocarpus monogynus Forest | CO, SD, WY | G3 |
| | Pinus ponderosa / Leucopoa kingii Woodland | CO, WY | G3 |
| | Pinus ponderosa / Carex geyeri Woodland | CO, MT?, OR, UT, WY | G3G4 |
| | Pinus ponderosa / Carex inops ssp. heliophila Woodland | CO, MT, SD, WY | G3G4 |
| | Pinus ponderosa / Schizachyrium scoparium Woodland | CO, MT, NE, NM?, OK?, SD, WY | G3G4 |
| | Pinus ponderosa / Purshia tridentata Woodland | CA, CO, ID, MT, UT | G3G5 |
| | Pinus ponderosa / Ribes cereum Forest | CO | GNR |
| *Western Great Plains Cliff and Outcrop* | | | |
| | Arenaria hookeri Barrens Herbaceous Vegetation | CO | GU |
| *Western Great Plains Foothill and Piedmont Grassland* | | | |
| | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | CO | G1G2 |
| | Andropogon gerardii - Sorghastrum nutans Western Great Plains Herbaceous Vegetation | CO, KS, NE, OK | G2 |

| SYSTEM NAME | PLANT ASSOCIATION NAME | STATE DISTRIBUTION | G RANK |
|---|---|---|---|
| | Andropogon gerardii - Sporobolus heterolepis Western Foothills Herbaceous Vegetation | CO, OK? | G2 |
| | Pseudoroegneria spicata Herbaceous Vegetation | CO, UT, WY | G2 |
| | Andropogon gerardii - Schizachyrium scoparium Western Great Plains Herbaceous Vegetation | CO, MT, OK, SD, WY | G2? |
| | Hesperostipa comata - Achnatherum hymenoides Herbaceous Vegetation | CO, UT, WY | G2? |
| | Schizachyrium scoparium - Bouteloua curtipendula Western Great Plains Herbaceous Vegetation | CO, KS?, NM?, OK, TX | G3 |
| | Hesperostipa neomexicana Herbaceous Vegetation | CO | G3 |
| | Bouteloua gracilis - Bouteloua hirsuta Herbaceous Vegetation | CO, NM, OK, TX? | G3G4 |
| | Nassella viridula Herbaceous Vegetation | CO | GU |
| *Western Great Plains Riparian Woodland and Shrubland* | | | |
| | Populus deltoides / Panicum virgatum - Schizachyrium scoparium Woodland | CO, KS, NE, OK, SD?, TX | G2 |
| | Populus deltoides (ssp. wislizeni, ssp. monilifera) / Salix exigua Woodland | CO, ND, NE, NM, OK, SD, TX, UT | G3 |
| *Western Great Plains Sandhill Steppe* | | | |
| | Artemisia filifolia / Andropogon hallii Shrubland | CO, KS, NE, NM?, OK, TX?, WY? | G3? |
| *Western Great Plains Shortgrass Prairie* | | | |
| | Bouteloua gracilis - Pleuraphis jamesii Herbaceous Vegetation | CO, NM, UT | G2G4 |
| | Bouteloua gracilis - Bouteloua hirsuta Herbaceous Vegetation | CO, NM, OK, TX? | G3G4 |
| | Sporobolus airoides Southern Plains Herbaceous Vegetation | AZ, CA?, CO, KS, MXCO, NM, TX, UT | G3Q |
| | Aristida purpurea Herbaceous Vegetation | AZ, CO, NM?, UT? | GNR |

Table B-3. Zoology targets identified by priority.

| PRIORITY | MAJOR GROUP | COMMON NAME | SCIENTIFIC NAME | G_RANK | S_RANK |
|---|---|---|---|---|---|
| High | | | | | |
| | Amphibians | | | | |
| | | Northern Leopard Frog | Rana pipiens | G5 | S3 |
| | Birds | | | | |
| | | American Peregrine Falcon | Falco peregrinus anatum | G4T3 | S2B |
| | | Black Swift | Cypseloides niger | G4 | S3B |
| | | Brown-capped Rosy-finch | Leucosticte australis | G4 | S3B,S4N |
| | | Burrowing Owl | Athene cunicularia | G4 | S4B |
| | | Ferruginous Hawk | Buteo regalis | G4 | S3B,S4N |
| | Insects | | | | |
| | | Arogos Skipper | Atrytone arogos | G3 | S2 |
| | | Hops Feeding Azure | Celastrina humulus | G2G3 | S2 |
| | | Mottled Dusky Wing | Erynnis martialis | G3G4 | S2S3 |
| | | Regal Fritillary | Speyeria idalia | G3 | S1 |
| | Mammals | | | | |
| | | Dwarf Shrew | Sorex nanus | G4 | S2 |
| | | Fringed Myotis | Myotis thysanodes | G4G5 | S3 |
| | | Olive-backed Pocket Mouse Subsp | Perognathus fasciatus infraluteus | G5TNR | S2? |
| | | Pygmy Shrew | Sorex hoyi montanus | G5T2T3 | S2 |
| | | Townsend's Big-eared Bat | Corynorhinus townsendii | G4 | S2 |
| | Mollusks | | | | |
| | | Cylindrical Papershell | Anodontoides ferussacianus | G5 | S2 |
| | | Rocky Mountain Capshell | Acroloxus coloradensis | G3 | S1 |
| Medium | | | | | |
| | Birds | | | | |
| | | Black-necked Stilt | Himantopus mexicanus | G5 | S3B |
| | | Northern Goshawk | Accipiter gentilis | G5 | S3B |
| | | Northern Pygmy-owl | Glaucidium gnoma | G5 | S3B |
| | | Prairie Falcon | Falco mexicanus | G5 | S4B,S4N |
| | | Willow Flycatcher | Empidonax traillii | G5 | S4 |
| | Insects | | | | |
| | | Hudsonian Emerald | Somatochlora hudsonica | G5 | S2S3 |
| | | Two-spotted Skipper | Euphyes bimacula | G4 | S2 |
| | Mammals | | | | |
| | | Black-tailed Prairie Dog | Cynomys ludovicianus | G4 | S3 |
| | Mollusks | | | | |
| | | Sharp Sprite | Promenetus exacuous | G5 | S2 |
| | | Umbilicate Sprite | Promenetus umbilicatellus | G4 | S3 |
| | Reptiles | | | | |
| | | Common Garter Snake | Thamnophis sirtalis | G5 | S3 |
| Low | | | | | |
| | Amphibians | | | | |

| PRIORITY | MAJOR GROUP | COMMON NAME | SCIENTIFIC NAME | G_RANK | S_RANK |
|---|---|---|---|---|---|
| | | Boreal Toad (Southern Rocky Mountain Population) | Bufo boreas pop. 1 | G4T1Q | S1 |
| | Birds | | | | |
| | | American White Pelican | Pelecanus erythrorhynchos | G3 | S1B |
| | | Bobolink | Dolichonyx oryzivorus | G5 | S3B |
| | | Boreal Owl | Aegolius funereus | G5 | S2 |
| | | Forster's Tern | Sterna forsteri | G5 | S2B,S4N |
| | | Lewis's Woodpecker | Melanerpes lewis | G4 | S4 |
| | | Ovenbird | Seiurus aurocapilla | G5 | S2B |
| | | Snowy Egret | Egretta thula | G5 | S2B |
| | | Veery | Catharus fuscescens | G5 | S3B |
| | | White-tailed Ptarmigan | Lagopus leucura | G5 | S4 |
| | | White-winged Crossbill | Loxia leucoptera | G5 | S1B |
| | | Willet | Catoptrophorus semipalmatus | G5 | S1B |
| | | Wilson's Phalarope | Phalaropus tricolor | G5 | S4B,S4N |
| | | Yellow-billed Cuckoo | Coccyzus americanus | G5 | S3B |
| | Insects | | | | |
| | | A Tiger Beetle | Cicindela nebraskana | G4 | S1? |
| | | Cross-line Skipper | Polites origenes | G5 | S3 |
| | | Moss's Elfin | Callophrys mossii schryveri | G4T3 | S2S3 |
| | | Ottoe Skipper | Hesperia ottoe | G3G4 | S2 |
| | | Rocky Mountain Arctic Jutta | Oeneis jutta reducta | G5T4 | S1 |
| | | Snow's Skipper | Paratrytone snowi | G5 | S3 |
| | | Theano Alpine | Erebia pawloskii | G5 | S3 |
| | | Two-banded Skipper | Pyrgus ruralis | G5 | S3 |
| | Mammals | | | | |
| | | Meadow Jumping Mouse Subsp | Zapus hudsonius preblei | G5T2 | S1 |
| | | Northern River Otter | Lontra canadensis | G5 | S3S4 |

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# Rabbit Mountain

**Biodiversity Rank - B1: Outstanding Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Carter Lake Reservoir, Pinewood Lake, Hygiene, Lyons

**Size:** 7,806 acres (3,159 ha) **Elevation:** 5,151 - 6,578 ft. (1,570 - 2,005 m)

**General Description:** This site comprises the southern extent of the major series of north-south trending hogbacks that span much of Larimer County to the north. Rabbit Mountain and Indian Mountain to the west are the southern terminus, to the south of which the landscape changes to the broad, flat Denver Basin. Rabbit and Indian Mountains are both remnants of anticlines, broad geologic foldings. The hogbacks are composed of multiple sedimentary bedrock layers; the different bedrock layers exert a strong influence on the vegetation patterns that occur on the site. Bedrock layers from bottom to top include Fountain Formation (conglomerate sandstone), Ingelside, Lyons, Lykins, Sundance-Jelm, Morrison, and Dakota Groups. These are primarily sandstones with intervening layers and inclusions of shales, siltstones, mudstones, and limestones (Braddock et al. 1988). These hogbacks have an extensive mosaic of piedmont grassland, foothill shrubland, and ponderosa pine savanna habitat over hogbacks and cliffs. Ponderosa pine (*Pinus ponderosa*) savanna tends to occur on ridgecrests and west-facing slopes. Mountain mahogany (*Cercocarpus montanus*) shrublands occur on rocky, shallow soils of steeper slopes. Broad, open meadows occupy valleys and toeslopes of the hogbacks in areas of deep soil accumulation. The ponderosa pine savanna is variable in cover and maturity. There are patches of very old, widely-spaced ponderosa pine as well as areas where the mature trees are growing with large cohorts of younger trees. The tree canopy overarches large shrub copses of mountain mahogany and/or skunkbush (*Rhus trilobata*) as dominant species. Shrub diversity is high with several other species scattered throughout. Grassland openings are variable and often comprised by weed establishment, especially cheatgrass (*Bromus tectorum*) and alyssum (*Alyssum minus*) among others. Weeds often obscure native species composition, which is dominated by grasses like needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), and western wheatgrass (*Pascopyrum smithii*). Big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*) form small patches amidst shrubland areas especially near rock outcrops. Needle-and-thread dominated grasslands are predominant with patches of New Mexico feathergrass (*Hesperostipa neomexicana*), porcupine grass (*Hesperostipa spartea*) and big bluestem (*Andropogon gerardii*) sporadically occurring. Graminoid diversity is high throughout the site. Additional species include sideoats grama (*Bouteloua curtipendula*), purple three awn

(*Aristida purpurea*), junegrass (*Koeleria macrantha*), and blue wildrye (*Elymus glaucus*). The grasslands have mixed condition and some areas have been compromised by weeds similar to the ponderosa pine savanna openings. However, there are patches with rich forb diversity. Common species include blanket flower (*Gaillardia aristata*), bigflower cinquefoil (*Drymocallis fissa*), wild onion (*Allium textile*), prickly pear cactus (*Opuntia polyacantha*), blazing star (*Liatris punctata*), goldenrod (*Solidago simplex*), purple prairie clover (*Dalea purpurea*), Mexican hat (*Ratibida columnifera*), soapweed (*Yucca glauca*), Porter aster (*Aster porteri*), and many others. Shale outcrops are scattered along the east side and tend to have sparse herbaceous vegetation. Mountain mahogany tends to occur on the shale barrens with Indian ricegrass (*Achnatherum hymenoides*), New Mexico feathergrass, and many cushion plants. These outcrops support several rare plant species including Bell's twinpod (*Physaria bellii*) and wavy-leaf stickleaf (*Nuttallia sinuata*). Ephemeral drainages along the slopes are unique and tend to have diverse shrublands with American plum (*Prunus americana*), chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier utahensis*), and skunkbush. Rabbit Mountain has an east-facing cliff with nesting raptors. On the west-facing slope of Rabbit Mountain, there are small springs and seepage areas that also support netleaf hackberry (*Celtis laevigata*), which is uncommon on the Front Range. Bottomlands support cottonwoods (*Populus deltoides, P. angustifolia*), coyote willow (*Salix exigua*), and patches of cattails (*Typha* sp.). Embedded within the grasslands are extensive prairie dog (*Cynomys ludovicianus*) towns.

**Key Environmental Factors:** Lower montane-foothills elevation zone; sandstone and shale bedrock layers

**Cultural Features:** Archeological findings have been discovered in this area; humans have used this area for at least 5,000 years

**Biodiversity Significance Rank Comments (B1):** This site merits an outstanding biodiversity significance rank due to its concentration of globally rare communities and plants in excellent and good condition. Significant plant communities include two excellent to good (AB-ranked) occurrences of a globally imperiled (G1G2/S1S2) *Hesperostipa comata* Great Plains mixed grass prairie, an excellent (A-ranked) and a good to fair (BC-ranked) occurrence of the globally imperiled (G2/S2) *Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* foothills ponderosa pine scrub woodland, a good (B-ranked) occurrence of a globally imperiled (G2G3/S2S3) *Cercocarpus montanus - Rhus trilobata / Andropogon gerardii* shrubland, an excellent to good (AB-ranked) occurrence of the globally imperiled (G2G3/S2S3) *Cercocarpus montanus / Hesperostipa neomexicana* foothills shrubland, a fair (C-ranked) occurrence of the globally imperiled (G2G3/S2S3) hackberry community, *Celtis laevigata* var. *reticulata / Pseudoroegneria spicata*, a fair (C-ranked) occurrence of the globally imperiled (G2/S2) *Cercocarpus montanus / Hesperostipa comata* mixed foothills shrubland and excellent (A-ranked) and good (B-ranked) occurrences of the globally vulnerable (G3/S3) *Hesperostipa neomexicana* Great Plains mixed grass prairie. Rare plants include excellent (A-ranked) and fair (C-ranked) occurrences of the globally

imperiled (G2G3/S2S3) Bell's twinpod (*Physaria bellii*), a good (B-ranked) occurrence of the globally vulnerable (G3/S2) wavy-leaf stickleaf (*Nuttallia sinuata*) and an extant occurrence of the state imperiled (G5/S1) forktip three-awn (*Aristida basiramea*). Black-tailed prairie dogs (*Cynomys ludovicianus*), a state rare (G4/S3) mammal, are scattered throughout.

Natural Heritage element occurrences at the Rabbit Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Mammals | Cynomys ludovicianus | Black - tailed Prairie Dog | G4 | S3 | | SC | USFS | E | 2006-99-99 |
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | AB | 2007-07-03 |
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | AB | 2007-08-01 |
| Natural Communities | Cercocarpus montanus / Hesperostipa comata Shrubland | Mixed Foothill Shrublands | G2 | S2 | | | | C | 2007-09-10 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | BC | 2007-08-01 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | A | 2007-07-03 |
| Natural Communities | Celtis laevigata var. reticulata / Pseudoroegneria spicata Woodland | Hackberry | G2G3 | S1S2 | | | | C | 2007-05-24 |
| Natural Communities | Cercocarpus montanus - Rhus trilobata / Andropogon gerardii Shrubland | Mountain Mahogany - Skunkbush / Big Bluestem Shrubland | G2G3 | S2S3 | | | | B | 1991-10-08 |
| Natural Communities | Cercocarpus montanus / Hesperostipa neomexicana Shrubland | Foothills Shrubland | G2G3 | S2S3 | | | | AB | 2007-08-01 |

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | B | 2007-08-01 |
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | A | 2007-06-28 |
| Vascular Plants | Physaria bellii | Bell's twinpod | G2G3 | S2S3 | | | | A | 2007-07-03 |
| Vascular Plants | Physaria bellii | Bell's twinpod | G2G3 | S2S3 | | | | C | 2003-10-15 |
| Vascular Plants | Nuttallia sinuata | wavy - leaf stickleaf | G3 | S2 | | | | B | 2007-09-10 |
| Vascular Plants | Aristida basiramea | forktip three - awn | G5 | S1 | | | | E | 2007-03-09 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The site encompasses a broad landscape area with an extensive mosaic of piedmont grassland, foothill shrubland, and ponderosa pine savanna habitat over hogbacks and cliffs. The boundary includes the hogbacks of Indian Mountain and Rabbit Mountain in Boulder County, drawn to include habitat dominated by native species. Fringes along Dowe Flats and Table Top Mountain were included to encompass current extent of prairie dogs on the landscape.

**Protection Urgency Rank Comments (P3):** The majority of this site has been targeted by Boulder County Parks and Open Space through purchase in fee and conservation easements over the years. However, the northwestern portion of this site is privately owned by multiple landowners with parcel size generally about 100 acres. Development pressure is high in this area. Additionally, the construction of a reservoir on Little Thompson River have been proposed, which would impact this site.

**Management Urgency Rank Comments (M3):** Much of the grassland habitat is degraded or compromised by weed establishment at the expense of native species. Grazing management or prescribed fire may be useful in addressing the weed infestations. The impact of prairie dogs on their immediate habitat is relatively severe on this site; prairie dog towns have little to no native vegetation remaining and are dominated by bindweed (*Convolvulus arvensis*) and cheatgrass (*Bromus tectorum*). At the north end of the site, the potential for reservoir construction, subdivision, and management of non-native plants are the primary management concerns. Some areas are degraded with patches of Russian thistle (*Salsola australis)*, spotted knapweed (*Acosta maculosa*), Dalmation toadflax (*Linaria dalmatica*), and

mullein (*Verbascum thapsus*). Control of these species, especially knapweed, will alleviate their impact on the site. A major eletrical transmission line crosses the site and right-of-way management may impact the site.

**Land Use Comments:** The site contains a large open space parcel that has recreation trails. Some of the open space has no public access and about half is closed seasonally for natural resource protection. A portion of the site is slated for 35-acre lot development.

**Exotic Species Comments:** Some areas are degraded with patches of Russian thistle (*Salsola australis)*, spotted knapweed (*Acosta maculosa*), Dalmation toadflax (*Linaria dalmatica*), musk thistle (*Carduus nutans*), Russian olive (*Elaeagnus angustifolia*), toadflax (*Linaria dalmatica*), apple (*Malus pumila*), and mullein (*Verbascum thapsus*).

**Off-Site Considerations:** Much of the surrounding area is heavily grazed by cattle. The Little Thompson River, a gaging station, and a few scattered houses with horse pastures lie north of the site. Several quarries are in close proximity to this site.

**Information Needs:** Long-term monitoring of Bell's twinpod would inform the population biology of this species at the site. There is an old specimen record from 1948 of narrow-leaved milkweed (*Asclepias stenophylla*), a state rare plant. Addtional field efforts could locate this species.

## References

Braddock, William A., Prinya Nutalaya, and Roger B. Colton. 1988. Geologic Map of the Carter Lake Reservoir Quadrangle, Boulder and Larimer Counties, Colorado.

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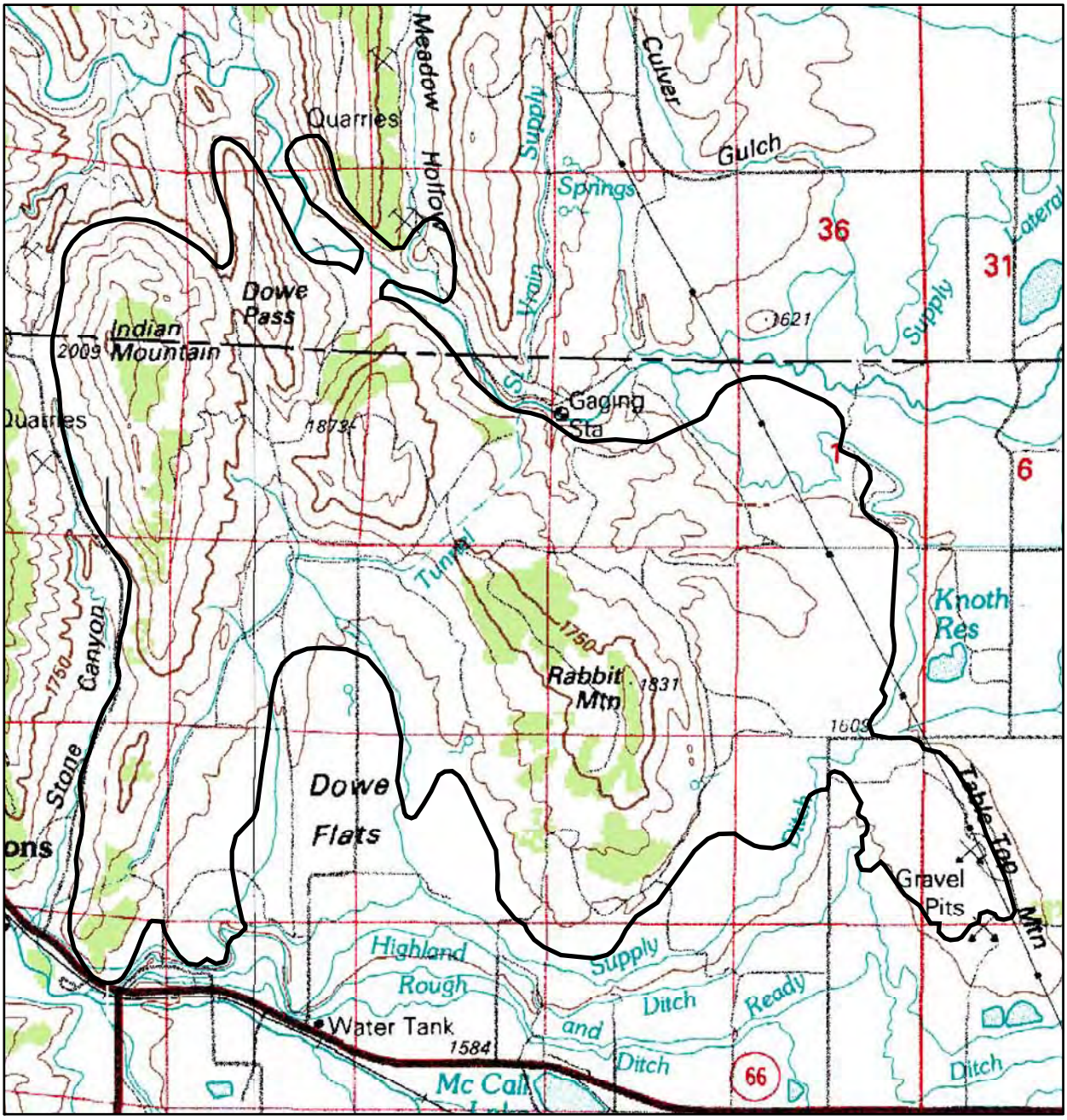
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/16/2008

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Map Date: 10/30/2008

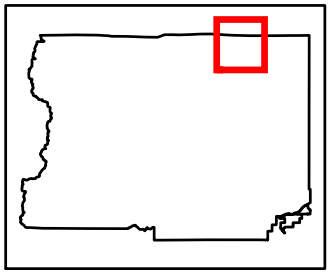
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Rabbit Mountain Potential Conservation Area, B1: Outstanding Biodiversity Significance

# Red Hill south of Lyons

**Biodiversity Rank - B1: Outstanding Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Lyons

**Size:** 6,651 acres (2,692 ha) **Elevation:** 5,400 - 6,570 ft. (1,646 - 2,003 m)

**General Description:** This site is part of the Front Range Hogback system and exemplifies the foothills transition zone. The diverse geology primarily includes sandstones with smaller areas of limestone, claystone, and siltstone (Braddock et al. 1988). The major plant communities present at the site are coniferous woodlands, deciduous shrublands, and grasslands. Bedrock geology is an important influence on the major plant communities. The striking red sandstone hogbacks on the east side of the site are primarily characterized by mountain mahogany (*Cercocarpus montanus*) shrublands although there is significant ponderosa pine (*Pinus ponderosa*) establishment and encroachment in small areas, especially on east-facing hogback slopes. Although mountain mahogany is relatively uniform across the bedrock layers that are exposed on west-facing hogback slopes, the characteristic grass understory tends to shift in correlation with bedrock geology. At lower elevations on Quaternary deposits, needle-and-thread (*Hesperostipa comata*) is characteristic. Lower and mid-slopes, where Fountain, Lyons, Ingelside, and Lykins Formations have more sparse herbaceous cover, New Mexico feathergrass (*Hesperostipa neomexicana*) and/or Scribner's needlegrass (*Achnatherum scribneri*) are characteristic. On Morrison and Dakota formations on high slopes, blue wildrye (*Elymus glaucus*) is common and abundant. Forb diversity is variable within these shrublands, cushion plants tend to be common where other vegetation is sparse. Valley grasslands are compromised and obscured by extensive weed infestation of cheatgrass (*Bromus tectorum*), Jim Hill mustard (*Sisymbrium altissimum*), and alyssum (*Alyssum minimus*). Needle and thread and western wheatgrass (*Pascopyrum smithii*) generally form the current expression of these grasslands. Big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*) are infrequent but do form large swards in places. Small areas of calcareous soils are embedded within the valley grasslands, often at toeslopes; these support New Mexico feathergrass grasslands and the globally rare Bell's twinpod (*Physaria bellii*). Granitic bedrock to the west of the sandstone hogbacks support ponderosa pine savanna. This savanna has large patches of trees occurring at various canopy density ranging from 5-25%, which is high for savanna habitat. There is a notable subcanopy of Douglas-fir (*Pseudotsuga menziesii*) and Rocky Mountain juniper (*Juniperus scopulorum*) in certain places. Mountain mahogany is a common shrub beneath the tree canopy and in openings. Other shrubs include wax currant (*Ribes cereum*), skunkbush (*Rhus trilobata*), rabbitbrush (*Chrysothamnus nauseosus*), and others. Graminoid diversity is variable,

but needle-and-thread is the most constant throughout. Tallgrasses like big bluestem and little bluestem are sporadic and often around rock outcrops. Other grasses include junegrass (*Koeleria macrantha*), Indian ricegrass (*Achnatherum hymenoides*), and sideoats grama (*Bouteloua curtipendula*). Forb diversity is also variable but tends to be high in meadow openings and around rock outcrops.

**Key Environmental Factors:** Tertiary sandstone bedrock layers adjacent to granite massif; foothills-lower montane elevation zone.

**Land Use History:** The Heil Ranch was acquired during the 1940's. Cultivation of the land occurred at one time and silo structures on the property still attest to this fact. Since the 1940's, the ranch has been utilized for the grazing of livestock. The ranch has several quarry sites which were mined for the Lyons Red Sandstone that was key in the building of many structures in both Lyons and Boulder.

**Biodiversity Significance Rank Comments (B1):** This site merits an outstanding biodiversity significance rank due to its concentration of globally rare communities and invertebrates in excellent and good condition. Significant plant communities include an excellent to good (AB-ranked) occurrence of the globally imperiled (G2/S2) ponderosa pine savanna (*Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii*), two good (B-ranked) examples of the globally imperiled (G2/S2) mountain mahogany / needle-and-thread (*Cercocarpus montanus / Hesperostipa comata*) shrubland, an excellent to good (AB-ranked) occurrence of the globally imperiled (G2G3/S2S3) mountain mahogany / New Mexico feathergrass (*Cercocarpus montanus / Hesperostipa neomexicana*) shrubland, a good (B-ranked) occurrence of the globally critically imperiled (G1G2/S1S2) needle-and-thread grassland (*Hesperostipa comata* Colorado Front Range Herbaceous Vegetation), a good (B-ranked) occurrence of the globally imperiled foothills narrowleaf cottonwood / bluestem willow (*Populus angustifolia / Salix irrorata*) riparian woodland, and a good (B-ranked) occurrence of the globally imperiled (G2G3/S2) butterfly, the hops feeding azure (*Celastrina humulus*). Also within the site are a good to fair (BC-ranked) occurrence of globally vulnerable (G3/S3) mountain mahogany / Scribner's needlegrass (*Cercocarpus montanus / Achnatherum scribneri*) shrubland, a good (B-ranked) occurrence of the globally vulnerable (G3/S3) New Mexico feathergrass (*Hesperostipa neomexicana*) grassland, occurrences of several rare butterflies including a fair (C-ranked) occurrence of the globally vulnerable (G3G4/S2) Ottoe skipper (*Hesperia ottoe*), a good (B-ranked) occurrence of the globally vulnerable (G3/S2) Arogos skipper (*Atrytone arogos*), and a fair (C-ranked) occurrence of the state rare (G4/S3) Cross-line skipper (*Polites origenes*). There is also an occurrence of black-tailed prairie dog (*Cynomys ludovicianus*). The globally imperiled Bell's twinpod (*Physaria bellii*) occurs within the confines of this site, but is part of the overlapping Lykins Gulch site, which is drawn for the concentration of Bell's twinpod occurrences in the area.

Natural Heritage element occurrences at the Red Hill south of Lyons PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Insects | Celastrina humulus | Hops Feeding Azure | G2G3 | S2 | | | | B | 2006-06-13 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | B | 1995-07-21 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | C | 1995-08-03 |
| Insects | Hesperia ottoe | Ottoe Skipper | G3G4 | S2 | | | USFS | C | 1995-07-21 |
| Insects | Polites origenes | Cross - line Skipper | G5 | S3 | | | | C | 1995-07-21 |
| Mammals | Cynomys ludovicianus | Black - tailed Prairie Dog | G4 | S3 | | SC | USFS | E | 2005-99-99 |
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | AB | 2007-09-25 |
| Natural Communities | Cercocarpus montanus / Hesperostipa comata Shrubland | Mixed Foothill Shrublands | G2 | S2 | | | | B | 2007-09-25 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | D | 1995-08-03 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | AB | 2007-09-25 |
| Natural Communities | Populus angustifolia / Salix irrorata Woodland | Foothills Riparian Woodland | G2 | S2 | | | | B | 2008-09-04 |
| Natural Communities | Cercocarpus montanus / Hesperostipa neomexicana Shrubland | Foothills Shrubland | G2G3 | S2S3 | | | | C | 1995-08-25 |

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Cercocarpus montanus / Hesperostipa neomexicana Shrubland | Foothills Shrubland | G2G3 | S2S3 | | | | AB | 2007-09-25 |
| Natural Communities | Cercocarpus montanus / Achnatherum scribneri Shrubland | Foothills Shrubland | G3 | S3 | | | | BC | 2007-09-25 |
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | B? | 2007-07-03 |
| Vascular Plants | Cheilanthes eatonii | Eaton's lip fern | G5? | S2 | | | | C | 2007-09-25 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences of plant communities and imperiled butterflies, but also encompasses an area within which management activities consistent with historic natural processes (fire and herbivory and the resulting habitat mosaic) could be employed to increase the habitat quantity and/or quality for the plant communities and butterflies. The boundary generally includes the eastern slope of the hogback which provides or potentially provides habitat for the tallgrass prairie species and butterflies. Since several of the dominant species in the plant communities serve as food plants for the imperiled butterflies, management actions will affect both.

**Protection Urgency Rank Comments (P4):** The majority of this site is owned and managed by Boulder County Parks and Open Space with minor inholdings in private ownership. Much of the open space property is closed to the public.

**Management Urgency Rank Comments (M3):** Several exotic species occur in the plant communities in various quantities. The most common of these include smooth brome (*Bromus tectorum*), Japonese brome (*Bromus japonicus*), musk thistle (*Carduus nutans*), Kentucky bluegrass (*Poa pratensis)*, Canada bluegrass (*Poa compressa*), Dalmation toadflax (*Linaria dalmatica*), alyssum (*Alyssum minus*), and knapweed (*Centaurea* species). Careful consideration should be given to butterfly species of concern when using herbicides to control exotic species (Moffat and McPhillips 1993). Early season grazing, burning, or mowing may be effective management tools to control many of the cool season exotic plants and favor warm season dominant native plants. However, such treatments should seek to maintain patchiness since butterflies that specialize on tallgrass prairie are seriously impacted by fire (Swengel and Swengel 1995). Consider prescribed burning or logging in woodland to thin tree

canopy.

**Exotic Species Comments:** Several exotic species occur in the plant communities in various quantities. The most common of these include smooth brome (*Bromus tectorum*), Japonese brome (*Bromus japonicus*), musk thistle (*Carduus nutans*), Kentucky bluegrass (*Poa pratensis)*, Canada bluegrass (*Poa compressa*), Dalmation toadflax (*Linaria dalmatica*), alyssum (*Alyssum minus*), and knapweed (*Centaurea* species).

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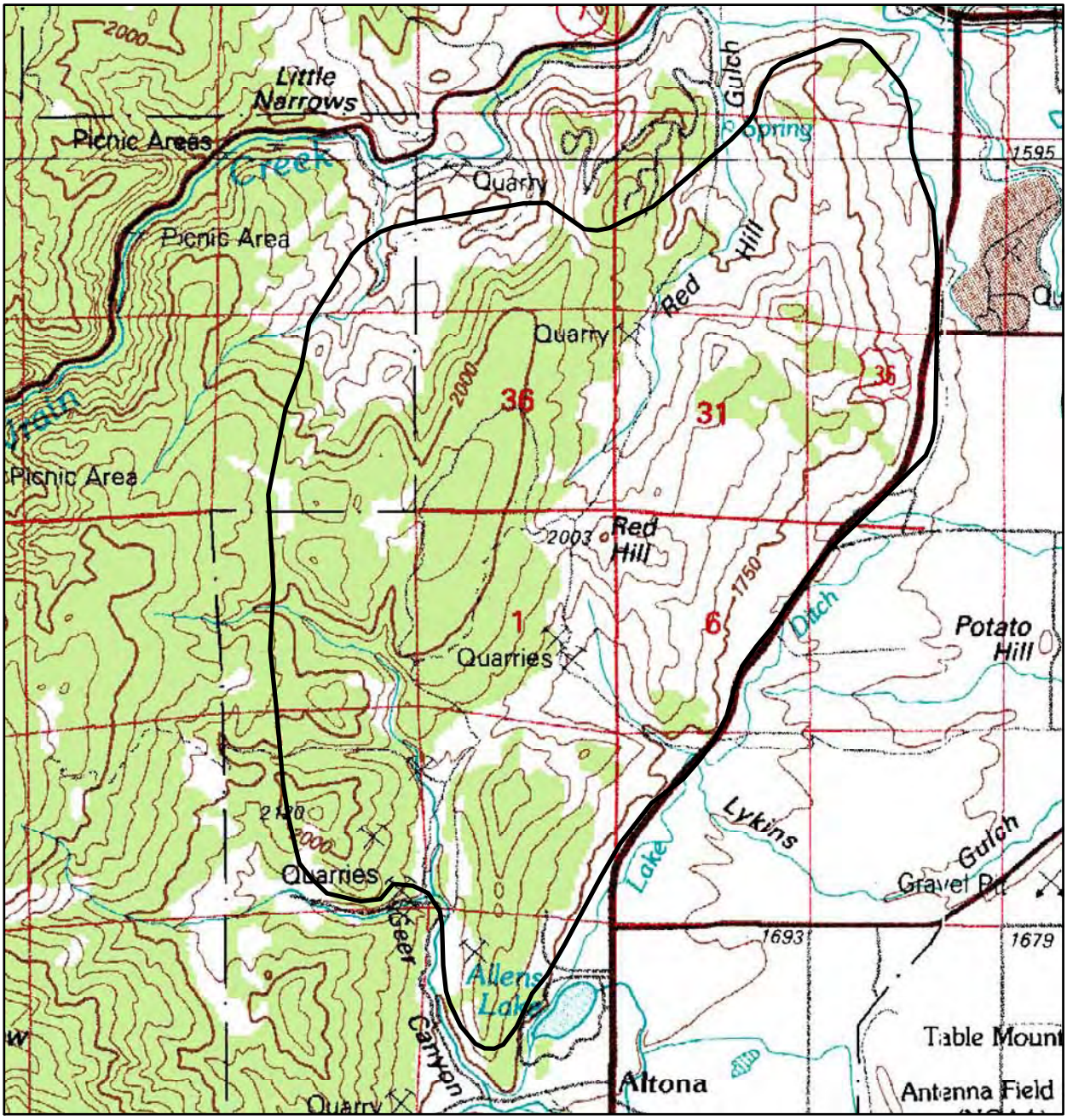
**Version Author:** Neid, S.L.

**Version Date:** 10/23/2008

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Map Date: 11/02/2008

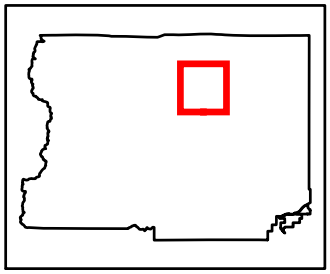
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Red Hill south of Lyons Potential Conservation Area, B1: Outstanding Biodiversity Significance

# Saint Vrain Mountain

**Biodiversity Rank - B1: Outstanding Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M5: Not Needed; No Threats Anticipated**

**U.S.G.S. 7.5-minute quadrangles:** Allens Park

**Size:** 256 acres (104 ha) **Elevation:** 10,213 - 11,800 ft. (3,113 - 3,597 m)

**General Description:** This location is near the lower end of an enormous south-facing mountainside consisting of slabs and cliff bands interspersed with forested benches and several gulleys. The rare plants occur mostly on scattered shady ledges, but a few were in a sunny exposure on the talus at the very base of a cliff. Plants on ledges include pygmy sagifrage (*Saxifraga hyperborea*), nodding saxifrage (*Saxifraga cernua*), brittle bladderfern (*Cystopteris fragilis*), mountain tansymustard (*Descurainia incisa* ssp. *viscosa*), shootingstar (*Dodecathon*), and hairy rockcress (*Arabis hirsuta*). Plants on talus (sunny exposure) include mountain meadowrue (*Thalictrum fendleri*) and nettle (*Urtica gracilis*). Voucher specimens of the associated pygmy sagifrage, brittle bladderfern, tansymustard and rockcress were deposited in the University of Colorado Herbarium. This is a steep valley wall with 50-67% slope. Aspect is southwest. Parent material is Biotite schist. This site was not visited during 2007-2008.

**Biodiversity Significance Rank Comments (B1):** The site supports an excellent (A-ranked) occurrence of the globally critically imperiled (G1/S1) Weber's monkey-flower (*Mimulus gemmiparus*) and an unranked occurrence of the globally vulnerable (G3/S3) Rocky Mountain columbine (*Aquilegia saximontana*).

Natural Heritage element occurrences at the Saint Vrain Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Mimulus gemmiparus | budding monkeyflower | G1 | S1 | | | USFS | A | 2005-07-29 |
| Vascular Plants | Aquilegia saximontana | Rocky Mountain columbine | G3 | S3 | | | | E | 1998-07-12 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Boundaries are drawn to encompass the rock ledges of immediate occupancy of the rare plants and potential habitat within same aspect and elevational range.

**Protection Urgency Rank Comments (P5):** The site is located in the Indian Peaks

Wilderness Area within the Arapaho-Roosevelt National Forest.

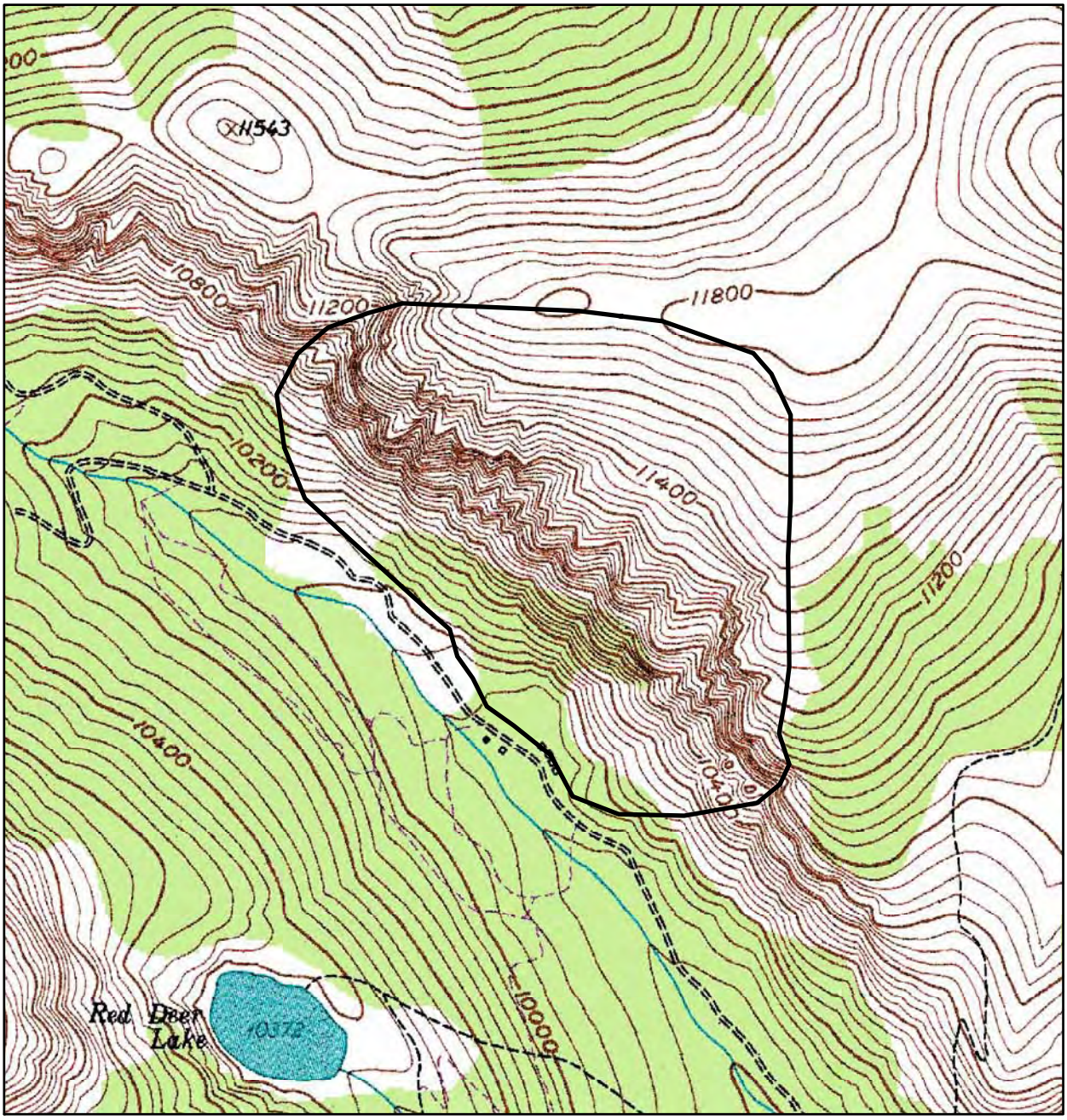
**Management Urgency Rank Comments (M5):** The most likely threats are fire and drought. Many patches occur on very shallow soil and likely rely on surface flow of water from rain or snowmelt, making this population susceptible to drought.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Culver, D.R.

**Version Date:** 11/01/2006

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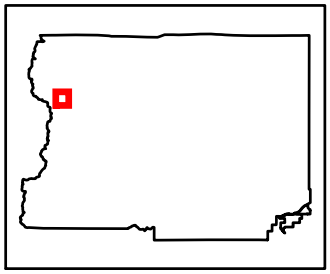
## Legend

PCA Boundary

Allens Park, 40105-B5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Saint Vrain Mountain Potential Conservation Area, B1: Outstanding Biodiversity Significance

# Bald Mountain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Gold Hill

**Size:** 1,021 acres (413 ha) **Elevation:** 7,780 - 9,147 ft. (2,371 - 2,788 m)

**General Description:** This site encompasses Bald Mountain, a 9,147 ft ( 2,788 m), east-west trending ridgeline and series of hills composed of metamorphic gneiss bedrock with intrusions of volcanic rock. It is in the heart of a major historical mining district in Boulder County, between Sunset and Sugarloaf. The vegetation of Bald Mountain is a mosaic of pine forest interspersed with large meadows. The site is in a transition zone between a large ponderosa pine (*Pinus ponderosa*) ecological system downslope to the east and a lodgepole pine (*Pinus contorta*) forest uphill to the west. North-facing slopes have dense-canopied mixed conifer forest with lodgepole pine, Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine. South-facing slopes tend to have more open canopies of ponderosa pine and pockets of aspen (*Populus tremuloides*) with more extensive meadows. The extensive meadows have a diverse mix of montane grassland species including mountain muhly (*Muhlenbergia montana*) and spike fescue (*Leucopoa kingii*) with lower montane-foothills species like needle-and-thread (*Hesperostipa comata*) and squirreltail (*Elymus elymoides*). The large meadows have very high forb diversity and patches of shrubs throughout with Fendler's ceanothus (*Ceanothus fendleri*) and chokecherry (*Prunus virginiana*) common and abundant in places. Stream valleys on either side of Bald Mountain are deep and narrow with perennial streams. The landscape in this area experienced several catastrophic fires during historical mining activity.

**Key Environmental Factors:** Upper montane elevation zone; metamorphic bedrock.

**Biodiversity Significance Rank Comments (B2):** The site supports an excellent to good (AB-ranked) occurrence of the globally critically imperiled (G1G2/S1S2) *Muhlenbergia montana - Hesperostipa comata* montane grassland and an excellent to good (AB-ranked) occurrence of the globally vulnerable (G3/S3) *Pinus ponderosa / Leucopoa kingii* foothills ponderosa pine savanna.

Natural Heritage element occurrences at the Bald Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Muhlenbergia montana - Hesperostipa comata Herbaceous Vegetation | Montane Grasslands | G1G2 | S1S2 | | | | AB | 2007-08-30 |
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | AB | 2007-08-30 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes a landscape mosaic of pine woodlands, mixed conifer forest, and grassland meadows that contain the element occurrences and adjacent suitable habitat.

**Protection Urgency Rank Comments (P4):** This site is primarily within the Arapaho-Roosevelt National Forest with minor private inholdings of old mining claims.

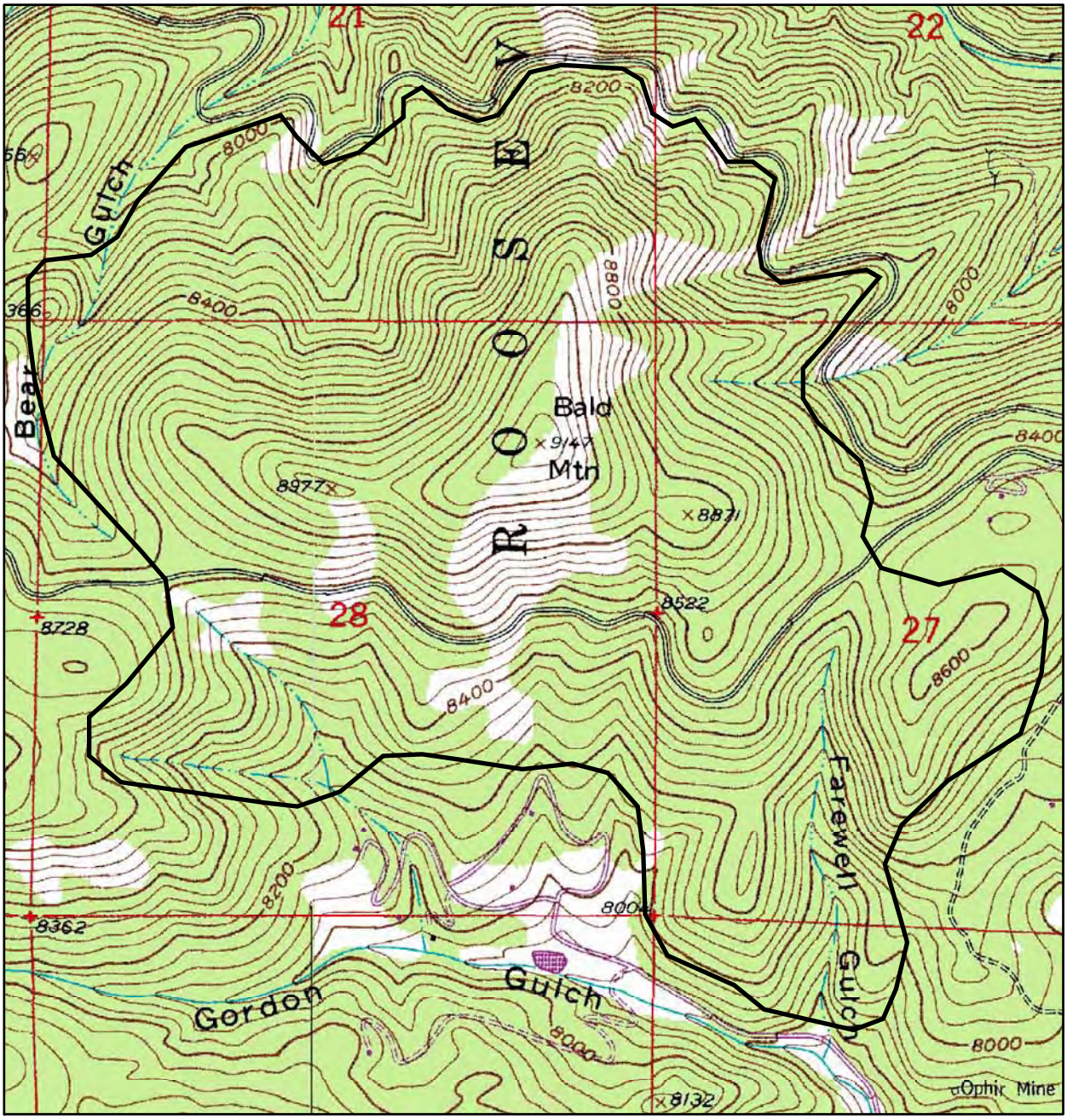
**Management Urgency Rank Comments (M4):** This landscape has undergone several catastrophic fires in the last century; the forest-meadow mosaic is likely a result of those disturbances. However, the forest is invading some of the grassland meadows, which will limit the extent of the globally rare montane grasslands. Maintaining a natural fire regime will likely perpetuate the vegetation mosaic in this landscape.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/21/2008

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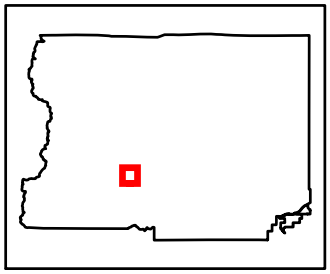
**Legend**

PCA Boundary

Gold Hill, 40105-A4

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Bald Mountain Potential Conservation Area, B2: Very High Biodiversity Significance

# Boulder Foothills

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Eldorado Springs, Boulder

**Size:** 12,257 acres (4,960 ha) **Elevation:** 5,570 - 8,400 ft. (1,698 - 2,560 m)

**General Description:** The Boulder Foothills site is unique within the context of the Front Range. It encompasses the mountains immediately southwest of the city of Boulder. It encompasses steep, rugged, granitic slopes of Flagstaff Mountain, Green Mountain, Bear Peak, and South Boulder Peak. The upthrust Flatirons form a steep eastern boundary and are comprised of arkosic sandstone and conglomerate bedrock in stark contrast to the adjacent peaks. Soils are mainly stony sandy loam, gravelly sandy loam, colluvial outwash, and rock outcrop, with red sandstone substrates at lower end and crumbly granitic soils at upper end. Canyons within this site are deep, narrow, and characterized by bedrock and boulder-strewn streambeds, with dense, shady, riparian growth on canyon bottoms. These mountains have distinct vegetation patterns due to the steep terrain and contrasting aspects. The slopes are primarily forested with ponderosa pine (*Pinus ponderosa*) at low elevations and on south-facing slopes and with mixed conifer forest codominated by Douglas-fir (*Pseudotsuga menziesii*) on north-facing slopes. Exposed, craggy rock outcrops can have sporadic groves of limber pine (*Pinus flexilis*). The ponderosa pine forest tends to have a more open understory with sparse shrubs and grasses like spike fescue (*Leucopoa kingii*) and sun-loving sedge (*Carex heliophila*). Mixed conifer forests tend to have a more consistent shrub layer, creeping barberry (*Mahonia repens*), and many small herbs like white-veined pyrola (*Pyrola picta*), pipsissewa (*Chimaphila umbellata*). Cliffs, rock outcrops, and talus slopes are frequent with sparse vegetation including stonecrop (*Sedum lanceolatum*) and several ferns. Small grassland openings are infrequent. Grasslands at lower elevations on south-facing slopes consist of big bluestem (*Andropogon gerardii*), blue grama (*Bouteloua gracilis*), junegrass (*Koeleria macrantha*), and shrubby patches of Fendler's ceanothus (*Ceanothus fendleri*). At higher elevations, mountain muhly (*Muhlenbergia montana*) and Parry's oatgrass (*Danthonia parryi*) are common. Vegetation in canyon riparian zone includes cottonwood (*Populus deltoides, Populus angustifolia*) and Douglas-fir in the canopy with some aspen (*Populus tremuloides*). Moist, spring-fed drainages also have well-developed copses of hazelnut (*Corylus cornuta*), birch (*Betula occidentalis* and the state rare *Betula papyrifera*). Other areas have bluestem willow (*Salix irrorata*), skunkbush (*Rhus trilobata*), American plum (*Prunus americana*), chokecherry (*Prunus virginiana*), and hawthorn (including taxonomically indistinct species of *Crateagus erythropoda* and *C. chrysocarpa*). Vines are common and include woodbine (*Parthenocissus vitacea*), grape (*Vitis riparia*), virgin's bower

(*Clematis ligusticifolia*), hops (*Humulus lupulus*), and poison ivy (*Toxicodendron rydbergii*). The herbaceous understory tends to be quite lush with mosses, ferns, and other shade-tolerant forbs. A unique feature of these moist drainages is a long list of plant species with affinity to eastern North America, species like hazelnut, black snakeroot (*Sanicula marilandica*), wild sarsaparilla (*Aralia nudicaulis*), enchanter's nightshade (*Circaea alpina*), dwarf red blackberry (*Rubus pubescens*), rattlesnake fern (*Botrychium virginianum*), and others. Grassland openings support globally rare butterflies like mottled duskywing (*Erynnis martialis*), Arogos skipper (*Atrytone arogos*), Moss' elfin (*Callophrys mossii schryveri*), and hops azure (*Celastrina humulus*). The site supports uncommon plants like narrowleaf milkweed (*Asclepias stenophylla*), wavy-leaf stickleaf (*Nuttallia sinuata*), Front Range milkvetch (*Astragalus sparsiflorus*), wood lily (*Lilium philadelphicum*), Wright's cliffbrake (*Pellaea wrightiana*), Rocky Mountain polypody (*Polypodium saximontanum*), wintergreen (*Pyrola picta*), cat briar (*Smilax lasioneuron*), and Rocky Mountain spike-moss (*Selaginella weatherbiana*). Cliffs and forests support fringed myotis (*Myotis thysanoldes*), northern goshawk (*Accipiter gentilis*), peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), and ovenbird (*Seiurus aurocapillus*).

**Key Environmental Factors:** Lower montane-foothills ecotone; moist climate parameters; steep slopes of Fountain Formation and Boulder Creek granodiorite

**Climate Description:** Annual precipitation is 18-24 inches. Mean annual air temperature is 43 degrees F., and the frost-free season is about 80-120 days. The steepness of the mountain front above Boulder creates an orographic effect where the mountains above the Flatirons receive greater precipitation and moisture than the surrounding area (Hogan 1993). The Denver Basin landform funnels upslope storms toward the hills. Locally humid conditions are also sustained by a cloud veil that infrequently forms over the peaks (Weber 1965).

**Biodiversity Significance Rank Comments (B2):** The site contains good (B-ranked) occurrences of a globally imperiled (G2G3/S2) invertebrate species, hops feeding azure (*Celastrina humulus*). Multiple invertebrates, plants and plant communities are also within the site.

Natural Heritage element occurrences at the Boulder Foothills PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Falco peregrinus anatum | American Peregrine Falcon | G4T4 | S2B | | SC | USFS | D | 2000-99-99 |
| Birds | Falco peregrinus anatum | American Peregrine Falcon | G4T4 | S2B | | SC | USFS | B | 2007-99-99 |
| Insects | Celastrina humulus | Hops Feeding Azure | G2G3 | S2 | | | | B | 1998-06-27 |
| Insects | Celastrina humulus | Hops Feeding Azure | G2G3 | S2 | | | | B | 1997-06-20 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | H | 1958-07-04 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | H | 1980-07-02 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | H | 1975-07-26 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | H | 1924-07-01 |
| Insects | Erynnis martialis | Mottled Dusky Wing | G3 | S2S3 | | | | E | 2002-05-03 |
| Insects | Erynnis martialis | Mottled Dusky Wing | G3 | S2S3 | | | | H | 1953-06-15 |
| Insects | Erynnis martialis | Mottled Dusky Wing | G3 | S2S3 | | | | B | 1997-06-19 |
| Insects | Callophrys mossii schryveri | Moss's Elfin | G4T3 | S2S3 | | | | B | 1996-04-26 |
| Mammals | Myotis thysanodes | Fringed Myotis | G4G5 | S3 | | | BLM/ USFS | E | 2000-09-02 |
| Mammals | Plecotus townsendii pallescens | Townsend's Big - eared Bat Subsp | G4T4 | S2 | | SC | BLM/ USFS | E | 1993-06-99 |
| Mammals | Zapus hudsonius preblei | Meadow Jumping Mouse Subsp | G5T2 | S1 | LT | ST | | C | 2007-07-20 |
| Mammals | Zapus hudsonius preblei | Meadow Jumping Mouse Subsp | G5T2 | S1 | LT | ST | | E | 2000-07-99 |
| Natural Communities | Populus angustifolia / Salix irrorata Woodland | Foothills Riparian Woodland | G2 | S2 | | | | A | 2007-07-13 |

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Populus angustifolia / Salix irrorata Woodland | Foothills Riparian Woodland | G2 | S2 | | | | A | 2007-06-22 |
| Natural Communities | Corylus cornuta Shrubland [Provisional] | Lower Montane Forests | G3 | S1 | | | | AB | 2007-07-19 |
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | B | 1992-07-31 |
| Natural Communities | Pseudotsuga menziesii / Betula occidentalis Woodland | Montane Riparian Forest | G3? | S3 | | | | B | 1995-08-09 |
| Natural Communities | Betula occidentalis / Maianthemum stellatum Shrubland | Foothills Riparian Shrubland | G4? | S2 | | | | B | 2007-06-04 |
| Vascular Plants | Polypodium saximontanum | | G3? | S3? | | | | E | 2001-10-25 |
| Vascular Plants | Carex torreyi | Torrey sedge | G4 | S1 | | | | C | 2007-06-26 |
| Vascular Plants | Carex torreyi | Torrey sedge | G4 | S1 | | | | H | 1973-06-18 |
| Vascular Plants | Malaxis monophyllos ssp. brachypoda | white adder's - mouth | G4Q | S1 | | | USFS | H | 1970-07-17 |
| Vascular Plants | Malaxis monophyllos ssp. brachypoda | white adder's - mouth | G4Q | S1 | | | USFS | D | 1990-07-14 |
| Vascular Plants | Betula papyrifera | paper birch | G5 | S1 | | | | C | 2007-07-13 |
| Vascular Plants | Botrypus virginianus ssp. europaeus | rattlesnake fern | G5 | S1 | | | | C | 2007-07-19 |
| Vascular Plants | Carex saximontana | Rocky Mountain sedge | G5 | S1 | | | | E | 2002-08-02 |
| Vascular Plants | Carex saximontana | Rocky Mountain sedge | G5 | S1 | | | | B | 2002-07-19 |
| Vascular Plants | Crataegus chrysocarpa | yellow hawthorn | G5 | S1 | | | | E | 1986-09-05 |
| Vascular Plants | Listera convallarioides | broad - leaved twayblade | G5 | S2 | | | | A | 2007-07-19 |

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Carex sprengelii | Sprengel's sedge | G5? | S2S3 | | | | B | 2007-06-26 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Includes numerous elements and a buffer including Green Mountain and 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 beginning foothills bordering the city of Boulder. Most ecological processes are protected within the boundary, but fire or tree thinning may be needed to maintain the long-term integrity of the site.

**Protection Urgency Rank Comments (P4):** Most of area is protected as designated open space area. It is the basis of a designated state natural area.

**Management Urgency Rank Comments (M3):** Forestry management is a significant managment concern within this site and in adjacent Forest Service lands; canopy cover has increased dramatically due to fire suppression. City of Boulder Open Space and Mountain Parks has been implementing its Forest Ecosystem Management Plan since its completion in 1999. Major activities outlined in this plan include prescribed forest stand thinning, prescribed burning, pre- and post-treament monitoring, and priority weed species management, which are ongoing. Weed species of concern include Dalmation toadflax (*Linaria dalmatica*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), garlic mustard (*Alliaria petiolata*), myrtle spurge (*Euphorbia myrsinites*), sulfur cinquefoil (*Potentilla recta*), bladder senna (*Coletea arborescens*), tall oatgrass (*Arrhenatherum elatius*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), Canada thistle (*Cirsium arvensis*), houndstongue (*Cynoglossum officianale*), and others including many horticultural escapees.

**Exotic Species Comments:** Exotics are limited to mostly *Bromopsis inermis*, *Bromus tectorum, Alyssum*, *Cirsium arvense*, and Verbascum thapsus. Observed some *Centaurea* (knapweed), however, unless the topsoil is disturbed, the knapweed may fail to propagate.

**Off-Site Considerations:** Subdivisions and other housing developments are occurring on all boundaries of the site, which may affect fire control regime because of danger to personal property and life. At least three major roads cut through steep slopes. Other smaller dirt roads criss-cross site, and may encourage spread of exotics. Adjacent areas to northwest, west, are managed by State Parks and the National Forest.

**Information Needs:** Monitor burn sites of *Andropogon gerardii* for recolonization of

*Atrytone arogos*, and for possible location of associated species *Hesperia ottoe* and *Polites origenes*.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Pineda, Phyllis M. 1996. Field Survey (Butterflies) to the City of Boulder Open Space and Mountain Parks, Larimer County and Cheesman Reservoir. Field Season 1996.

**Version Author:** Neid, S.L.

**Version Date:** 09/12/1994

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Map Date: 11/13/2008

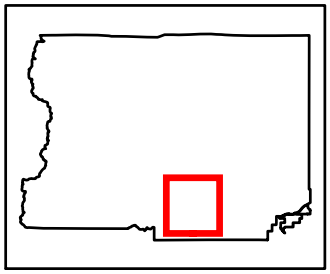
## Legend

PCA Boundary

Denver West, 39105-E1
Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Boulder Foothills Potential Conservation Area, B2: Very High Biodiversity Significance

# Button Rock Mountain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Panorama Peak, Pinewood Lake, Raymond, Lyons

**Size:** 3,908 acres (1,581 ha) **Elevation:** 6,138 - 8,450 ft. (1,871 - 2,576 m)

**General Description:** Button Rock Mountain is part of a large pluton of Silver Plume granite at lower montane elevations in the North St. Vrain watershed west of Lyons. The hills and peaks in this area are steep and rugged, creating different microclimates on various aspects and in drainages. Soils are shallow, gravelly, and not well-developed. This site is part of an extensive ponderosa pine (*Pinus ponderosa*) woodland that extends for tens of miles north and west. The woodland grades into ponderosa pine savanna to the east. Mixed conifer forest dominated by Douglas-fir (*Pseudotsuga menziesii*) is embedded within the ponderosa forest on cool, moist, north-facing slopes. Ponderosa pine is primarily dominant throughout on steep, south- and west-, and east-facing slopes and rocky tors and ridgelines. The woodland has variable canopy cover, there are several patches of old growth ponderosa pine trees (to 20-22" dbh). Shrub understory is well-developed with bitterbrush (*Purshia tridentata*) usually with greatest cover and creeping juniper (*Juniperus communis*), bearberry (*Arctostaphylos uva-ursi*), and wax currant (*Ribes cereum*) common and constant throughout. Herbaceous cover is diverse with multiple graminoids like mountain muhly (*Muhlenbergia montana*), spike fescue (*Leucopoa kingii*), and needle-and-thread (*Hesperostipa comata*). Forbs are diverse co-dominants, especially around rock outcrops, which are prevalent. North-facing slopes are densely canopied with Douglas-fir forest. These slopes are likewise steep and have a well-developed shrub layer with waxflower (*Jamesia americana*), Rocky Mountain maple (*Acer glabrum*), and chokecherry (*Prunus virginiana*). Creeping juniper, bearberry, and Oregon grape (*Mahonia repens*) are common dwarf shrubs as well. The rocky tors and adjacent sparsely-vegetated gravelly flats are primary habitat for the globally rare Larimer aletes (*Aletes humilis*). This site is on the edge of the Big Elk fire, which ignited in July 2002 and primarily burned in adjacent Larimer County.

**Key Environmental Factors:** Silver Plume granite; lower montane elevation zone.

**Biodiversity Significance Rank Comments (B2):** This rank is based on an excellent (A-ranked) occurrence of a globally rare (G2G3/S2S3) plant species, Larimer aletes (*Aletes humilis*). The site also supports an excellent (A-ranked) occurrence of the

globally vulnerable (G3G4/S3) *Pseudotsuga menziesii / Jamesia americana* lower montane forest, a fair (C-ranked) occurrence of the globally vulnerable (G3/S3) *Pinus ponderosa / Leucopoa kingii* foothills ponderosa pine savanna, an excellent (A-ranked) occurrence of the globally rare to common (G3G5/S3?) *Pinus ponderosa / Purshia tridentata* foothills ponderosa pine scrub woodland and an excellent to good (AB-ranked) occurrence of the state rare (G4G5/S3S4) *Pinus ponderosa / Carex rossii* lower montane forest.

Natural Heritage element occurrences at the Button Rock Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | C | 1994-10-01 |
| Natural Communities | Pseudotsuga menziesii / Jamesia americana Forest | Lower Montane Forests | G3G4 | S3 | | | | A | 2008-07-31 |
| Natural Communities | Pinus ponderosa / Purshia tridentata Woodland | Foothills Ponderosa Pine Scrub Woodlands | G3G5 | S3? | | | | A | 2008-07-31 |
| Natural Communities | Pinus ponderosa / Carex rossii Forest | Lower Montane Forests | G4G5 | S3S4 | | | | AB | 1994-08-17 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | A | 2007-07-31 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the elements and the granite outcrops.

**Protection Urgency Rank Comments (P4):** The majority of the site's interior is on public land. Private parcels are on the north, northeast, and south peripheries. The site is part of a USFS Research Natural Area, an area of National Forest specially designated for protection and maintenance in natural condition. It is within a large roadless area.

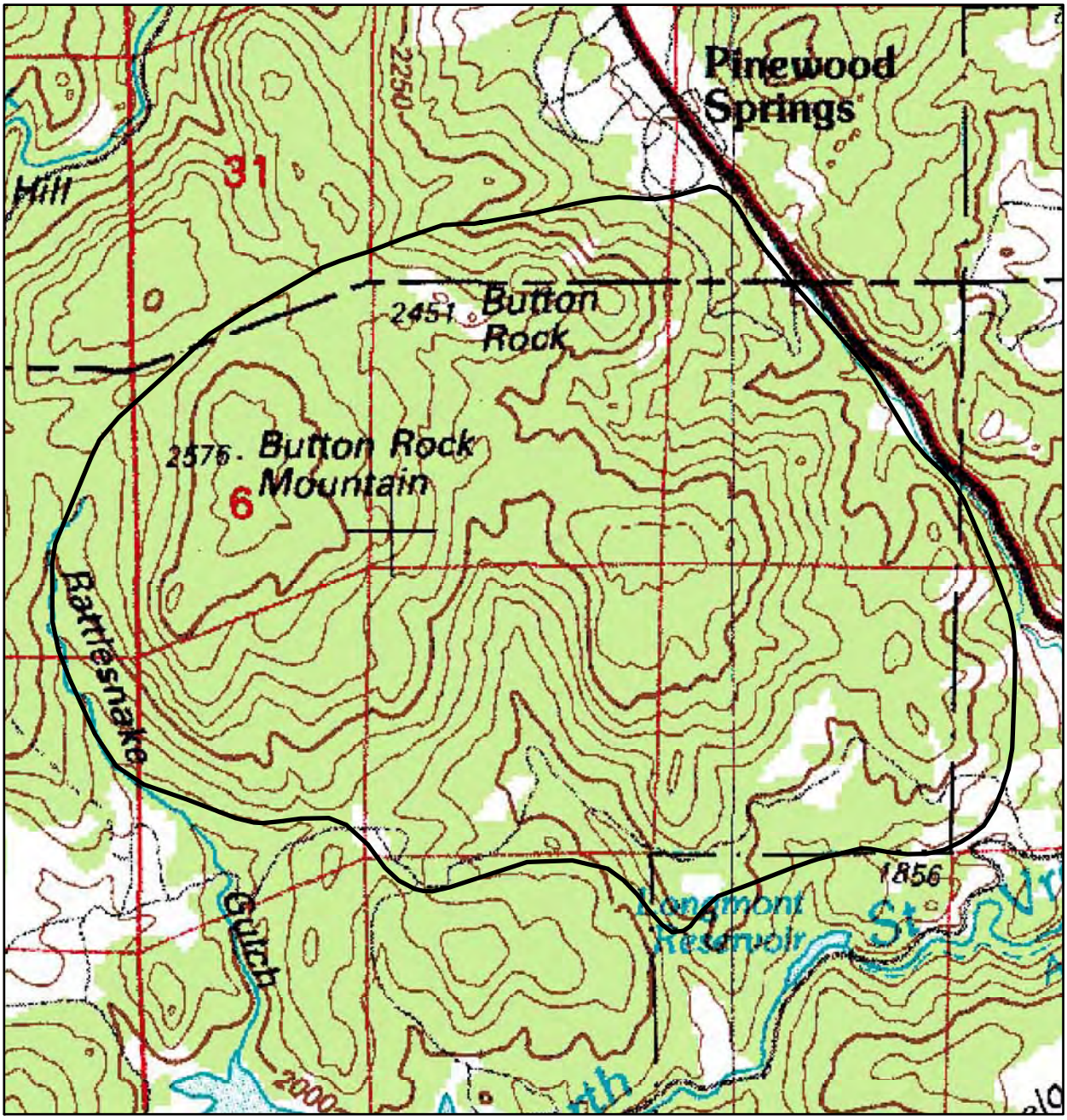
**Management Urgency Rank Comments (M4):** Recreational use is very light - little hiking, dispersed camping, and hunting. There is no timber activity. Bighorn sheep, elk, and deer use the area, but adverse impacts are not expected. Management may become necessary in the future if climbing activity becomes a problem. Road closures in the area should protect the site.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/21/2008

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Map Date: 11/02/2008

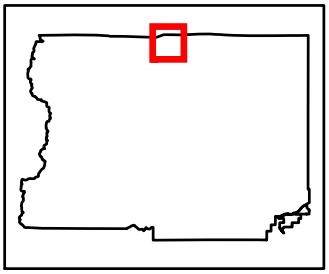
**Legend**

PCA Boundary

Eastes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Button Rock Mountain Potential Conservation Area, B2: Very High Biodiversity Significance

# Coffintop Mountain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Lyons

**Size:** 2,013 acres (815 ha) **Elevation:** 5,643 - 8,049 ft. (1,720 - 2,453 m)

**General Description:** An extensive ponderosa pine (*Pinus ponderosa*) woodland covers rugged, granitic hills in the North St. Vrain watershed adjacent to Highway 7 west of Lyons. The steep, rocky and bouldery slopes, tors, and ridgelines support ponderosa pine woodland with multiple age classes, but it is primarily a young forest with evidence of past logging. Associated canopy species, especially on north-facing slopes include Douglas-fir (*Pseudotsuga menziesii*) and Rocky Mountain juniper (*Juniperus scopulorum*). A short shrub layer is a mosaic of species patches with bitterbrush (*Purshia tridentata*) being the most constant but also with wax currant (*Ribes cereum*), creeping juniper (*Juniperus communis*), and bearberry (*Arctostaphylos uva-ursi*). Herbaceous understory is variable and ranges from sparse where gravel and needle duff are common to more cover elsewhere. Species richness is high with both a variety of graminoids like Scribner's needlegrass (*Achnatherum scribneri*) and forbs like stemless Indian parsley (*Aletes acaulis*), littleleaf alumroot *(Heuchera parvifolia*), and spearleaf stonecrop (*Sedum lanceolatum*). There are several boulder-strewn ephemeral drainages that have pockets of seepage or where surface water collects. Drier drainages are often densely vegetated with willow (*Salix*), skunkbush (*Rhus trilobata*), and vines like virgin's bower (*Clematis ligusticifolia*) and poison ivy (*Toxicodendron radicans*). Drainages with more seepage tend to have more shrubs like waxflower (*Jamesia americana*) and Rocky Mountain maple (*Acer glabrum*) and small areas of relatively high forb cover including bracken fern (*Pteridium aquilinum*), smooth aster (*Aster laevis*), fringed brome (*Bromus ciliatus*), geranium (*Geranium richardsonii*), and willow herb (*Epilobium* species). Spring wetlands and associated wet meadows occur in the northeast portion of the site. The rocky tors and adjacent sparsely-vegetated gravelly flats are primary habitat for the globally rare Larimer aletes (*Aletes humilis*). There are portions of occurrences of additional rare plants in the site: forktip three-awn (*Aristida basiramea*) and Fendler's false cloak fern (*Argyrochosma fendleri*).

**Key Environmental Factors:** Silver Plume granite; lower montane elevation zone.

**Biodiversity Significance Rank Comments (B2):** The site supports an excellent (A-ranked) occurrence of a globally rare (G2G3/S2S3) plant species, Larimer aletes (*Aletes humilis*) and an excellent (A-ranked) occurrence of a globally rare to common

(G3G5/S3?) foothills ponderosa pine scrub woodlands, *Pinus ponderosa / Purshia tridentata*.

Natural Heritage element occurrences at the Coffintop Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Pinus ponderosa / Purshia tridentata Woodland | Foothills Ponderosa Pine Scrub Woodlands | G3G5 | S3? | | | | A | 2007-08-16 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | A | 2007-08-16 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the elements and the entire peak of the mountain to provide for protection of ecosystem processes.

**Protection Urgency Rank Comments (P5):** The site is part of a USFS Research Natural Area, an area of National Forest specially designated for protection and maintenance in natural condition. This site is within a roadless area.

**Management Urgency Rank Comments (M4):** Minimal threats exist. There is no transportation access and very little public use. Predominant land use is recreation. Very limited exotic species occurrence, mostly cheatgrass (*Bromus tectorum*) and Jim Hill mustard (*Sisymbrium altissimum*) along Highway 7.

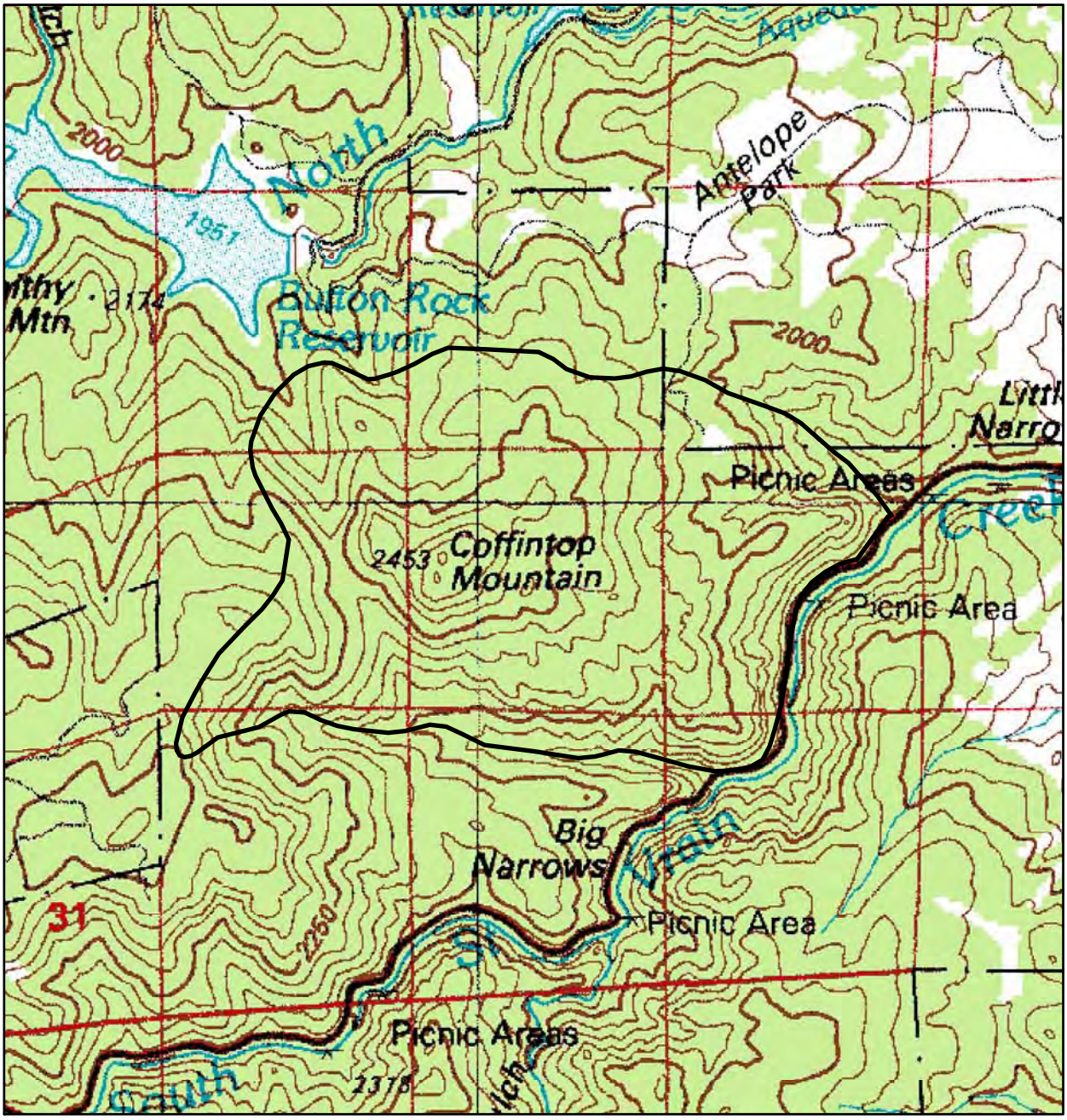
**Exotic Species Comments:** Very few exotics occur but there is some cheatgrass (*Bromus tectorum*) and Jim Hill mustard (*Sisymbrium altissimum*) along the highway.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/21/2008

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PCA Boundary

Estes Park, 40105-A1

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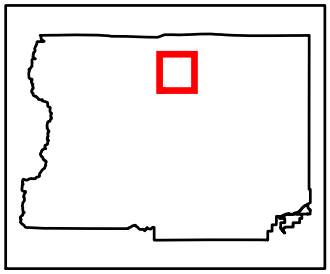
Location in Boulder County



Coffintop Mountain Potential Conservation Area, B2: Very High Biodiversity Significance

# Doudy Draw

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Eldorado Springs, Louisville

**Size:** 3,663 acres (1,483 ha) **Elevation:** 5,640 - 5,760 ft. (1,719 - 1,756 m)

**General Description:** The Doudy Draw site is located about 1 mile east of Eldorado Springs and is part of a large contiguous piedmont grassland. It supports important habitat for several rare species. This site is on the apron of alluvial and colluvial deposits below the Flatirons. It is characterized generally by southwest to northeast trending fingers of Quaternary alluvium that have ponderosa pine (*Pinus ponderosa*) savanna. The savanna quickly grades into grassland habitat off the pediments. Perennial and intermittent drainages dissect the area, which is also traversed by the South Boulder Diversion Canal. Soils are mostly very cobbly sandy loam and terrace escarpments. The majority of the site is City of Boulder Open Space. The savanna has a relatively dense canopy, especially near the mountain front and the ditch. Young ponderosa pine trees generally range from 10-14" dbh. There are sparse shrubs beneath the canopy. Skunkbush (*Rhus trilobata*) and mountain mahogany (*Cercocarpus montanus*) are most common. Herbaceous cover is variable depending on canopy cover. Grassland openings have needle-and-thread (*Hesperostipa comata*), big bluestem (*Andropogon gerardii*), blue wildrye (*Elymus glaucus*), squirreltail (*Elymus elymoides*), and others. Forbs are frequent but diversity is relatively low. The grasslands below the savanna are on the mesa tops and intervening valleys. Grasses are diverse and include big bluestem and prairie dropseed (*Sporobolus heterolepis*) in a mosaic with needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), mountain muhly (*Muhlenbergia montana*), and little bluestem (*Schizachyrium scoparium*) plant associations. Forb diversity is high with porter aster (*Aster porteri*), buckwheat (*Eriogonum umbellatum*), false goldenaster (*Heterotheca villosa*), small sunflower (*Helianthus pumilus*), and soapweed (*Yucca glauca*) being common. Shrubs like skunkbush, chokecherry (*Prunus virginiana*), American plum (*Prunus americana*), hawthorn (*Crataegus erythropoda*), and prickly rose (*Rosa sayi*), form inclusions or scattered copses in the grassland and on the edge of the savanna, often near seeps. Non-natives are prevalent, especially annuals like cheatgrass (*Bromus tectorum*) and alyssum (*Alyssum parviflorum*). Mesa tops are fairly unweedy except for early spring occurrences of *Alyssum*, and areas of dalmation toadflax (*Linaria dalmatica*). Valley bottoms are somewhat weedy with smooth brome (*Bromus inermis*), cheatgrass, chicory (*Cichorium intybus*), and knapweed (*Centaurea diffusa*). This site contains habitat for northern leopard frog (*Rana pipiens*). It also provides nest sites and foraging area for Northern Goshawk (*Accipiter gentilis*), Peregrine Falcon (*Falco peregrinus*), and Northern Pygmy-owl (*Glaucidium gnoma*). Bats use the

site including fringed myotis (*Myotis thysanodes*), and Townsend's big-eared bat (*Plecotus townsendii*). A prairie dog (*Cynomys ludovicianus*) colony is within the site.

**Key Environmental Factors:** Quaternary alluvium

**Climate Description:** Annual precipitation is 15-20 inches. Mean annual air temperature is 48-52 degrees F., and the frost-free season is about 140-155 days.

**Land Use History:** Doudy Draw had one of the original settlements of Boulder City before Colorado gained statehood. It was grazed and farmed for hay and wheat.

**Biodiversity Significance Rank Comments (B2):** The site supports a good (B-ranked) occurrence of the globally imperiled (G2/S1S2) *Andropogon gerardii - Sporobolus heterolepis* xeric tallgrass prairie, a good to fair (BC-ranked) occurrence of a globally critically imperiled (G1G2/S1S2) *Hesperostipa comata* Great Plains mixed grass prairie and a good (B-ranked) occurrence of the globally imperiled (G2/S2?) *Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* foothills ponderosa pine scrub woodland. Rare invertebrates include two good (B-ranked) occurrences of the globally vulnerable (G3/S2S3) mottled dusky wing (*Erynnis martialis*), a good (B-ranked) occurrence of the globally vulnerable (G3G4/S2) Ottoe skipper (*Hesperia ottoe*) and a good (B-ranked) occurrence of the globally vulnerable (G3/S2) Arogos skipper (*Atrytone arogos*). Rare plants include a poor (D-ranked) occurrence of the globally imperiled (G2G3/S2) and Federally Threatened Ute ladies' tresses (*Spiranthes diluvialis*), a good (B-ranked) occurrence of the state rare (G5/S2) prairie violet (*Viola pedatifida*) and extant occurrences of the state rare (G5/S1) Rocky Mountain sedge (*Carex saximontana*), the state rare (G5/S2) frostweed (*Crocanthemum bicknellii*) and the state rare (G5/S2S3) dwarf wild indigo (*Amorpha nana*). Preble's meadow jumping mouse (*Zapus hudsonius preblei*) (G5T2/S1) has been documented in poor condition, but is not contained in the boundary and not a target for this particular site.

Natural Heritage element occurrences at the Doudy Draw PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Falco peregrinus anatum | American Peregrine Falcon | G4T4 | S2B | | SC | USFS | B | 2007-99-99 |
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | B | 1997-07-17 |
| Insects | Erynnis martialis | Mottled Dusky Wing | G3 | S2S3 | | | | B | 2008-07-01 |
| Insects | Erynnis martialis | Mottled Dusky Wing | G3 | S2S3 | | | | B | 1996-06-20 |
| Insects | Hesperia ottoe | Ottoe Skipper | G3G4 | S2 | | | USFS | B | 1997-07-17 |
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | BC | 2007-07-20 |
| Natural Communities | Andropogon gerardii - Sporobolus heterolepis Western Foothills Herbaceous Vegetation | Xeric Tallgrass Prairie | G2 | S1S2 | | | | B | 2007-07-20 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | B | 2007-07-20 |
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | D | 2006-99-99 |
| Vascular Plants | Amorpha nana | dwarf wild indigo | G5 | S2S3 | | | | | 1993-09-14 |
| Vascular Plants | Carex saximontana | Rocky Mountain sedge | G5 | S1 | | | | E | 2007-07-20 |
| Vascular Plants | Crocanthemum bicknellii | frostweed | G5 | S2 | | | | E | 1997-08-28 |
| Vascular Plants | Viola pedatifida | prairie violet | G5 | S2 | | | | | 1993-05-16 |
| Vascular Plants | Viola pedatifida | prairie violet | G5 | S2 | | | | B | 1993-05-27 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Boundary is drawn to include occurrences and adjacent areas of suitable habitat within City of Boulder Open Space. Boundary will protect occurrences from direct surface disturbances. This site is part of a large contiguous grassland with similar processes.

**Protection Urgency Rank Comments (P5):** The majority of this site is protected as open space. It is part of a very large (nearly 15,000 acres) contiguous grassland with minimal roads and infrastructure. There are several trails in the open space that exist and in development.

**Management Urgency Rank Comments (M3):** High recreation use occurs in this area. The ditch on the west side of the site alters the hydrologic connectivity with the adjacent foothills. Non-native species are prevalent in many areas, including smooth brome (*Bromus inermis*), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), leafy spurge (*Euphorbia esula*), myrtle spurge (*Euphorbia myrsinites*), cheatgrass (*Bromus tectorum*), Dalmation toadflax (*Linaria dalmatica*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), and St. Johnswort (*Hypericum perforatum*) among others. Russian olive (*Elaeagnus angustifolia*) and houndstongue (*Cynoglossum officinale*) occur in the drainage bottoms. There are several ornamental escapees that occur on the site.

**Exotic Species Comments:** Non-native species include smooth brome (*Bromus inermis*), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), leafy spurge (*Euphorbia esula*), myrtle spurge (*Euphorbia myrsinites*), cheatgrass (*Bromus tectorum*), Dalmation toadflax (*Linaria dalmatica*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), and St. Johnswort (*Hypericum perforatum*). Russian olive (*Elaeagnus angustifolia*) and houndstongue (*Cynoglossum officinale*) occur in the drainage bottoms.

**Off-Site Considerations:** Highway 170 (Eldorado Springs Rd) is to the north. Housing developments are to the northeast and southwest (along South Boulder Creek). An electrical substation is immediately adjacent to the west. Eldorado Springs State Park is to the west which receives a high volume of traffic during the summer months.

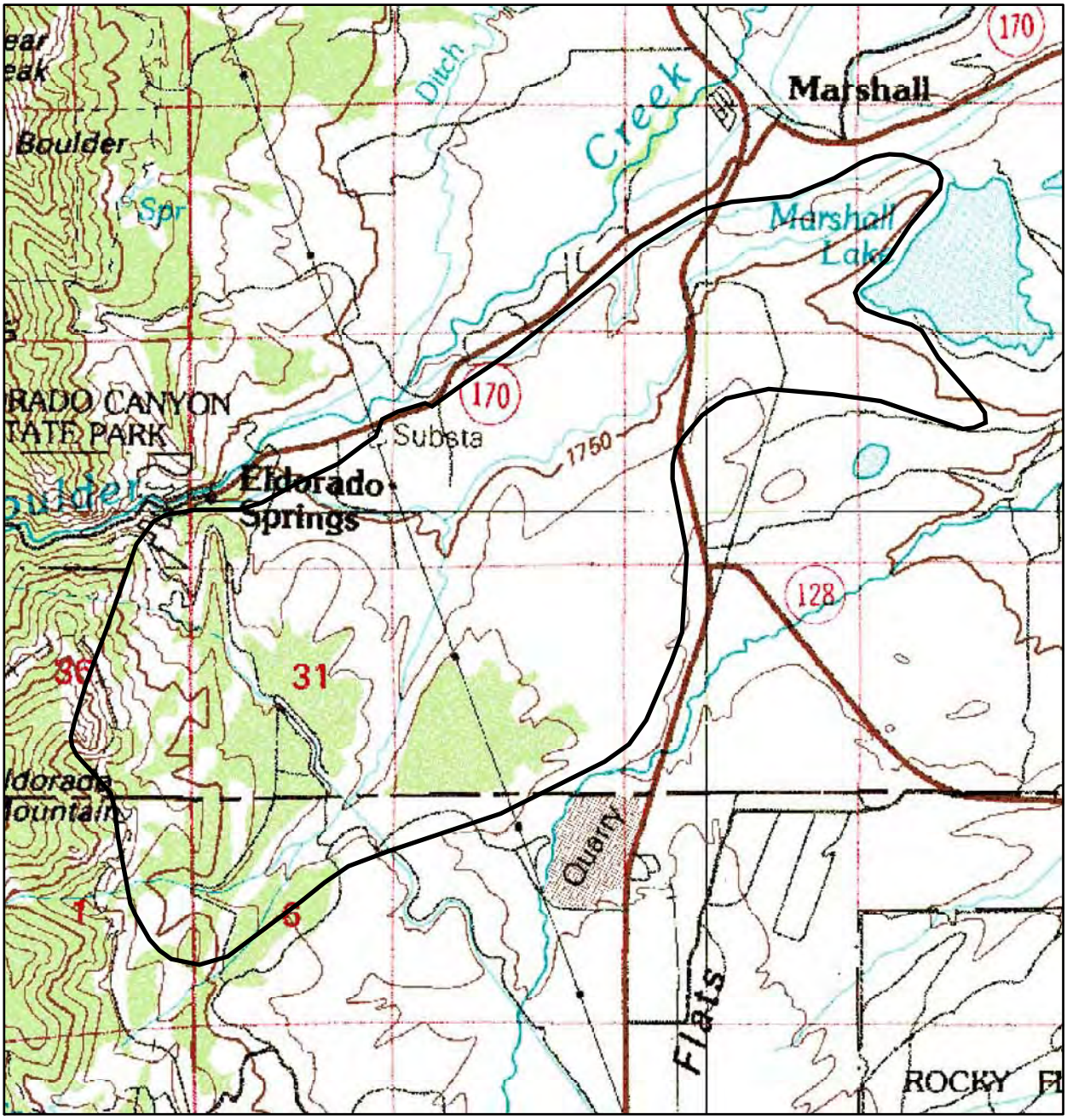
**Information Needs:** A 1984 field survey located a globally rare sedge, *Carex oreocharis*. More field work is needed to search for this plant.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Pineda, Phyllis M. 1996. Field Survey (Butterflies) to the City of Boulder Open Space and Mountain Parks, Larimer County and Cheesman Reservoir. Field Season 1996.

**Version Author:** Neid, S.L.
**Version Date:** 10/29/2008

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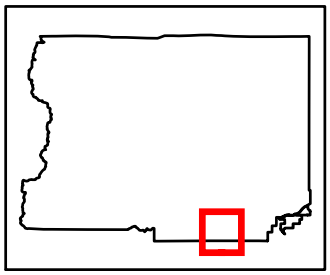
## Legend

PCA Boundary

Denver West, 39105-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Doudy Draw Potential Conservation Area, B2: Very High Biodiversity Significance

# Fairview Peak

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Lyons, Boulder

**Size:** 5,381 acres (2,177 ha) **Elevation:** 6,299 - 8,136 ft. (1,920 - 2,480 m)

**General Description:** This rugged mountainous region is within a large area of ponderosa pine (*Pinus ponderosa*) woodland that is just behind the foothills northwest of Boulder. Well-drained, gravelly, sandy loam soils derived from Silver Plume granite underlie the conifer forest that cover the steep hillslopes. Rock outcrops are frequent. South-facing slopes have ponderosa pine and north-facing slopes have mixed conifers with Douglas-fir (*Pseudotsuga menziesii*) and a more well-developed shrub layer. A catastrophic fire killed the tree canopy in portions of the site (the Overland Fire in October 2003); there is some regeneration of tree species occurring. Within the site, the condition of the ponderosa pine woodland is variable throughout. Some areas have relatively dense young forest, some have more mixed age classes in the tree canopy, and some areas have relatively mature trees. Closer to the ridgeline, trees are short but older. There is regeneration of ponderosa pine and Douglas-fir near the hilltop, especially near the burn margin. The open tree canopy on the south-facing slopes allows for frequent shrub copses of species like currant (*Ribes cereum*), common juniper (*Juniperus communis*), and Fendler's ceanothus (*Ceanothus fendleri*) typical of lower montane-foothills elevation. Herbaceous species are variable with areas of high species richness to those that are more depauperate with greater needle duff. Graminoids are characteristic but variable in cover and composition, but include spike fescue (*Leucopoa kingii*) along with Scribner needlegrass (*Achnatherum scribneri*), mountain muhly (*Muhlenbergia montana*), blue wildrye (*Elymus glaucus)*, Ross' sedge (*Carex rossii*), little bluestem (*Schizachyrium scoparium*), and others. Forbs are likewise variable and can be diverse and include Front Range beardtongue (*Penstemon virens*), Fendler ragwort (*Packera fendleri*), hairy goldenaster (*Heterotheca foliosa*), little sunflower (*Helianthus pumilus*), and stiff blazing star (*Liatris punctata*). The interior forest is largely non-weedy although there are some areas in the adjacent burn with abundant cheatgrass (*Bromus tectorum*) and Jim Hill mustard (*Sisymbrium altissimum*). There are populations of several bat species in the area and within the site including fringed myotis (*Myotis thysanodes*) and pale lump-nosed bat (*Corynorhinus townsendii pallescens*). This site serves as habitat for mountain lion and black bears, and is part of a migration corridor for elk. It is potential nesting habitat for goshawk.

**Key Environmental Factors:** Lower montane-foothills elevation zone; fire disturbance regime.

**Biodiversity Significance Rank Comments (B2):** This site contains an excellent to good (AB-ranked) and a good (B-ranked) occurrence of the globally imperiled (G2G3/S2S3) Larimer aletes (*Aletes humilis*), good (B-ranked) occurrences of a globally vulnerable (G3/S3) ponderosa pine / spike fescue (*Pinus ponderosa / Leucopoa kingii*) woodland and a good (B-ranked) occurrence of a state rare (G4?/S2) river birch / mesic forbs (*Betula occidentalis / Maianthemum stellatum*) foothills riparian shrubland.

Natural Heritage element occurrences at the Fairview Peak PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | B | 2008-07-28 |
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | B | 2008-07-22 |
| Natural Communities | Betula occidentalis / Maianthemum stellatum Shrubland | Foothills Riparian Shrubland | G4? | S2 | | | | B | 2007-09-14 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | AB | 1993-05-31 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | B | 1996-05-04 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** This site encompasses montane slopes within an extensive ponderosa pine (*Pinus ponderosa*) woodland system with sporadic granitic summits and tors.

**Protection Urgency Rank Comments (P4):** This site is mostly contained in the Arapaho-Roosevelt National Forest although there are some mining claim inholdings in private ownership.

**Management Urgency Rank Comments (M3):** The site is adjacent to and partially within the Left Hand ORV Area; monitoring for off-trail use will limit impact to the forest. The site is also adjacent to a large area that was burned in a catastrophic fire. Recovery is occurring, but there are large weed infestations of cheatgrass (*Bromus tectorum*), Jim Hill mustard (*Sisymbrium altissimum*), mullein (*Verbascum thapsus*), and Kentucky bluegrass (*Poa pratensis*).

**Exotic Species Comments:** Non native species include redtop (*Agrostis gigantea*),

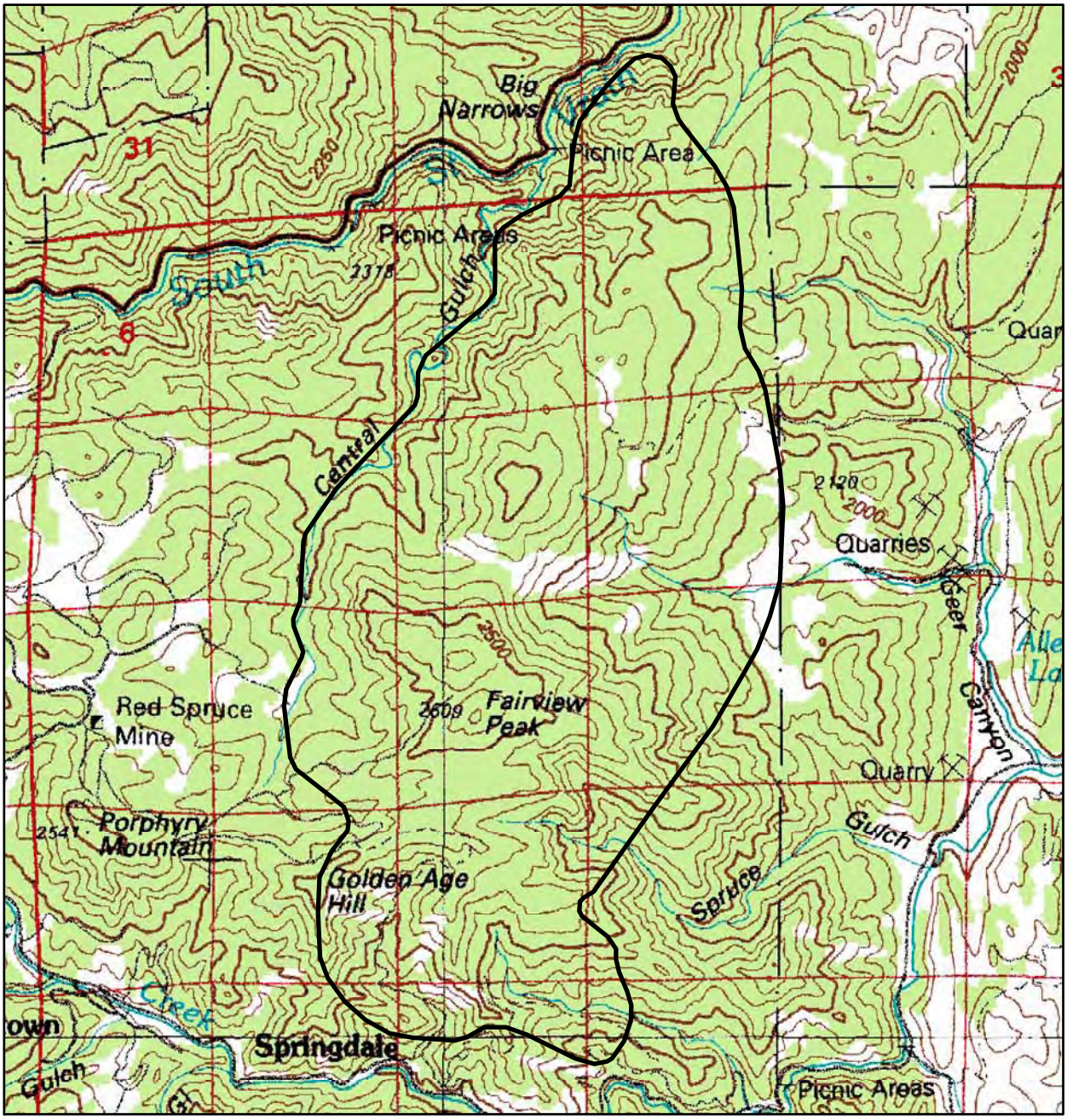
smooth brome (*Bromus inermis*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), prickly lettuce (*Lactuca serriola*), toadflax (*Linaria dalmatica*), timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), curly dock (*Rumex crispus*), dandelion (*Taraxacum officinale*), and common mullein (*Verbascum thapsus*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/21/2008

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Map Date: 11/02/2008

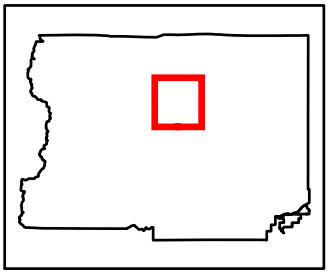
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Fairview Peak Potential Conservation Area, B2: Very High Biodiversity Significance

# Gordon Creek

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Tungsten, Ward, Nederland, Gold Hill

**Size:** 5,882 acres (2,380 ha) **Elevation:** 7,600 - 9,080 ft. (2,316 - 2,768 m)

**General Description:** The Gordon Creek site is located in southwestern Boulder County, about 8 miles due west of Boulder. It encompasses a group of small, shaded canyons separated by forested low ridges. Included are the headwaters of Gordon Gulch and Gordon Creek, as well portions of North Boulder Creek directly to the south and stretching to Boulder Falls. Together, these drainages form the lower portion of the North Boulder Creek catchment above Boulder Canyon. North-facing slopes are dominated by dense mixed forest of Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), and Rocky Mountain juniper (*Juniperus scopulorum*). South-facing slopes are more open with ponderosa pine over common juniper (*Juniperus communis*) and needle-and-thread grass (*Hesperostipa comata*). The watercourses support a set of characteristic montane riparian vegetation. Along North Boulder Creek, a deeply shaded riparian corridor is dominated by blue spruce (*Picea pungens*) over a dense tall shrub layer and thick herbaceous understory. The conifers are rooted in the low gradient stream bank and overhang the creek. Water birch (*Betula occidentalis*) dominates the tall shrub layer and is accompanied by alder (*Alnus incana*), Bebb willow (*Salix bebbiana*), and Drummond's willow (*Salix drummondiana*). The herbaceous understory is thick, diverse, and primarily dominated by native species, such as bluejoint reedgrass (*Calamagrostis canadensis*), cutleaf coneflower (*Rudbeckia laciniata* var. *ampla*), and horsetail (*Equisetum arvense*). Gordon Gulch supports a scattered tree overstory dominated by aspen (*Populus tremuloides*) at approximately 20% cover, with occasional Douglas-fir, ponderosa pine and blue spruce. In some areas, mixed conifers from the surrounding slope overhang the riparian corridor. The tall shrub (6.4 ft-16.4 ft/2-5 m tall) layer is well represented and dominated by water birch (40% cover) and alder (10% cover). The understory contains high cover of short shrubs e.g., common juniper, Woods' rose (*Rosa woodsii*), honeysuckle (*Lonicera involucrata*), alder, and numerous herbs. Gordon Creek supports a montane riparian shrubland characterized by park willow (*Salix monticola*) as the constant dominant along the stream, though its cover is variable. The understory is a lush carpet of grasses with mixed mesic forbs. Bluejoint reedgrass is the most dominant understory species in the riparian area, and beaked sedge (*Carex utriculata*) is found in wet swales. This site is within winter elk range.

**Key Environmental Factors:** Water flows vary seasonally in Gordon Gulch and Gordon Creek.

**Land Use History:** The area shows evidence of historic mining and grazing. There are also numerous roads, utility corridors, and a diversion pipeline within the site.

**Biodiversity Significance Rank Comments (B2):** This site supports a good (B-ranked) occurrence of a globally imperiled (G2/S2) *Picea pungens / Betula occidentalis* montane riparian woodland, a good (B-ranked) occurrence of the globally vulnerable (G3/S3) *Picea pungens / Alnus incana* montane riparian forest, a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix monticola / Calamagrostis canadensis* montane willow carr and a good (B-ranked) occurrence of a globally vulnerable (G3/S2) quaking aspen (*Populus tremuloides*) / water birch (*Betula occidentalis*) forest.

Natural Heritage element occurrences at the Gordon Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Picea pungens / Betula occidentalis Woodland | Montane Riparian Woodland | G2 | S2 | | | | B | 2007-08-20 |
| Natural Communities | Picea pungens / Alnus incana Woodland | Montane Riparian Forests | G3 | S3 | | | | B | 1995-09-12 |
| Natural Communities | Populus tremuloides / Betula occidentalis Forest | | G3 | S2 | | | | B | 2007-07-09 |
| Natural Communities | Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carr | G3 | S3 | | | | B | 2007-08-07 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary encompasses the immediate watershed supporting the riparian vegetation, allowing for the operation of normal hydrological and ecological processes that support the riparian communities, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and offsite activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P3):** The area is more-or-less evenly divided

between private and federal (USFS) ownership. USFS lands are managed for natural vegetation, and receive light recreational use. The private lands, especially the southern portion includes extensive ex-urban development and subdivision, primarily on Cold Springs and Ridge roads.

**Management Urgency Rank Comments (M4):** Natural hydrology of the area is largely intact; any modifications are likely to impact the riparian communities. Weeds may become a problem along roads if not controlled.

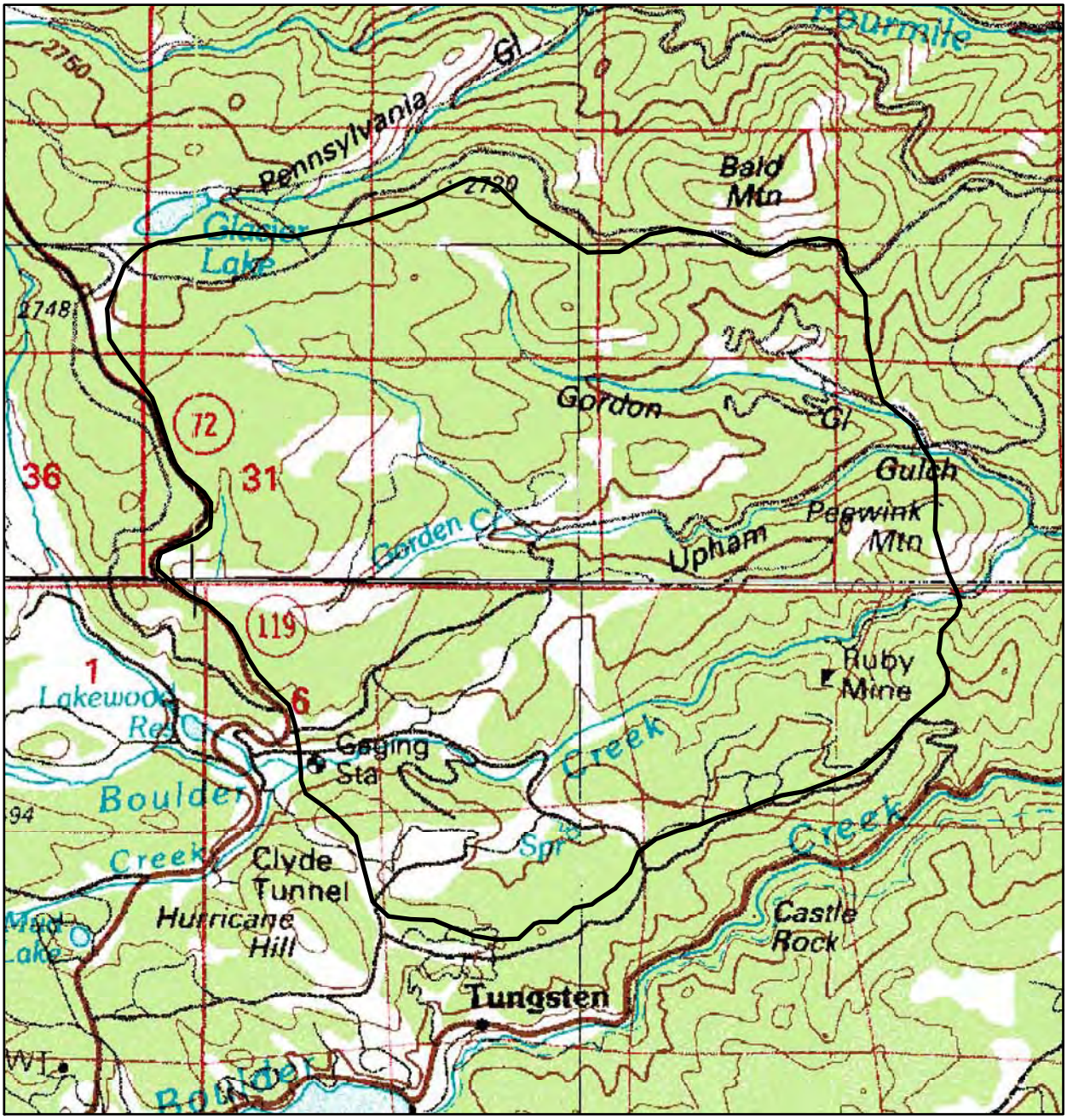
**Exotic Species Comments:** In addition to non-native hay grasses (*Phleum pratense, Poa pratensis, and Dactylis glomerata*), the site contains other weed species including Canada thistle (*Cirsium arvense*) and musk thistle (*Carduus nutans*), primarily in areas that have been grazed.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/17/2008

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Map Date: 06/05/2008

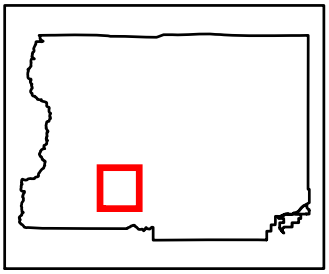
## Legend

PCA Boundary

Denver West, 39105-E1
Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Gordon Creek Potential Conservation Area, B2: Very High Biodiversity Significance

# Indian Lookout Mountain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Lyons

**Size:** 3,869 acres (1,566 ha) **Elevation:** 5,480 - 6,533 ft. (1,670 - 1,991 m)

**General Description:** This site spans the transition zone between the montane and foothills zones. The vegetation is characteristic of the transition zone. The ponderosa pine (*Pinus ponderosa*) savanna that defines this site flows from an extensive ponderosa pine woodland in the montane zone to the west. The savanna has typical pockets of ponderosa trees with or without shrub understory that form a mosaic with large grassland meadows. The savanna occupies valley and ridge tops with mountain mahogany (*Cercocarpus montanus*) shrublands occurring on the steep hogback slopes that intervene. The ponderosa pine savanna on the west side of the site blankets rolling, granitic hills and has a more open character with widely-spaced variably-sized clusters of trees in a mosaic with grassland openings and scattered granitic rock outcrops. Portions of the grasslands were cultivated, but remnants of native meadows remain. Characteristic species in the grassland openings include needle-and-thread (*Hesperostipa comata*) and western wheatgrass (*Pascopyrum smithii*). Small patches of big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*) occur, especially around rock outcrops or slopes with rocky soils. Forktip three-awn (*Aristida basiramea*) has also been documented in this site. The grassland is compromised and obscured in many areas by exotic species, especially Japanese brome (*Bromus japonicus*), cheatgrass (*Bromus tectorum* ), and Canada bluegrass (*Poa compressa*). There is a very large prairie dog town in the middle of the largest grassland area. Vegetation in the town is degraded and dominated by bindweed (*Convolvulus arvensis*). Indian Lookout Mountain is the defining feature of the east side of the site. It is a curvilinear portion of hogback landform sculpted by the North and South St. Vrain drainages whose canyons isolated Indian Lookout Mountain from the sections of the same hogback to the north and south. Indian Lookout Mountain is composed of layers of sandstone and has a characteristic flat-topped appearance; it is primarily comprised of Fountain Formation and is capped with Ingelside Formation. The west-facing slopes are characteristically steep. Lyons sandstone and some Quaternary colluvium are exposed on the east-facing slope (Braddock et al. 1988). The geology is an important influence on the major plant communities on Indian Lookout Mountain. Although mountain mahogany is characteristic across the entire hogback, the dominant and characteristic grass species in the understory change with bedrock geology and elevation; New Mexico feathergrass (*Hesperostipa neomexicana*) and Scribner

needlegrass (*Achnatherum scribneri*) are characteristic on the steep, red Fountain Formation sandstones. The top of the hill has ponderosa pine and needle-and-thread amidst the mountain mahogany with patches of big bluestem.

**Key Environmental Factors:** Transition from montane to foothills life zones; sandstone hogback landforms.

**Land Use History:** The Hall Ranch was divided up as five homesteads; cultivation of the land occurred at one time and silo structures on the property still attest to this fact. Since the 1940's, the ranch has been utilized for the grazing of livestock. The Hall Ranch has several quarry sites, mainly in the eastern part of the site.

**Biodiversity Significance Rank Comments (B2):** The site contains a good to excellent (AB-ranked) occurrence of the globally imperiled Foothills Ponderosa Pine Scrub Woodlands plant association (*Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* Wooded Herbaceous Vegetation, G2/S2?). It also contains several occurrences of globally imperiled and vulnerable (G2 or G3) Foothills Shrubland (*Cercocarpus montanus*) plant associations, and two occurrences of globally imperiled (G2) Xeric Tallgrass Prairie (*Andropogon gerardii-Schizachyrium scoparium*). A Black-tailed Prairie Dog colony (*Cynomys ludovicianus,* G4/S3) and a Cross-line Skipper (*Polites origenes*, G5/S3) occurrence have also been documented in this site.

Natural Heritage element occurrences at the Indian Lookout Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Insects | Polites origenes | Cross - line Skipper | G5 | S3 | | | | C | 1995-07-20 |
| Mammals | Cynomys ludovicianus | Black - tailed Prairie Dog | G4 | S3 | | SC | USFS | E | 2006-99-99 |
| Natural Communities | Cercocarpus montanus / Hesperostipa comata Shrubland | Mixed Foothill Shrublands | G2 | S2 | | | | C | 1995-09-13 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | AB | 2008-09-11 |
| Natural Communities | Andropogon gerardii - Schizachyrium scoparium Western Great Plains Herbaceous Vegetation | Xeric Tallgrass Prairie | G2? | S2 | | | | CD | 1995-08-31 |
| Natural Communities | Andropogon gerardii - Schizachyrium scoparium Western Great Plains Herbaceous Vegetation | Xeric Tallgrass Prairie | G2? | S2 | | | | C | 2008-09-11 |
| Natural Communities | Cercocarpus montanus / Hesperostipa neomexicana Shrubland | Foothills Shrubland | G2G3 | S2S3 | | | | D | 2007-09-11 |
| Natural Communities | Cercocarpus montanus / Achnatherum scribneri Shrubland | Foothills Shrubland | G3 | S3 | | | | C | 2007-09-11 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundaries are intended to identify the area needed to support the significant elements and the ecological processes needed for their

continued persistence. In general the plant associations present at the site historically have been influenced by fire, herbivory, and more recently by logging (Veblin and Lorenz 1991). These associations occur together in a mosaic that is affected by similar ecological processes and similar management issues. The boundaries presented here are intended to encompass an area that will allow these natural ecological processes to function or be mimicked through management practices. Included are some areas that are heavily degraded but thought to have the potential of recovery with proper management and the mosaic of plant communities with similar ecological needs and influences.

**Protection Urgency Rank Comments (P3):** Most of the site is owned and managed by Boulder County Parks and Open Space. The remainder is in private ownership.

**Management Urgency Rank Comments (M2):** The grassland portions of the vegetation mosaic are degraded with significant cover of exotic weeds including musk thistle (*Carduus nutans*), Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*Poa compressa*), Dalmation toadflax (*Linaria dalmatica*), alyssum (*Alyssum minus*), diffuse knapweed (*Centaurea diffusa*), and spotted knapweed (*Centaurea maculosa*). Early season grazing, burning, or mowing may be effective management tools to control many of the cool season exotic plants and favor warm season native plants. Aggressive management (herbicide application, manual cutting, etc.) may be necessary to control these species.

## References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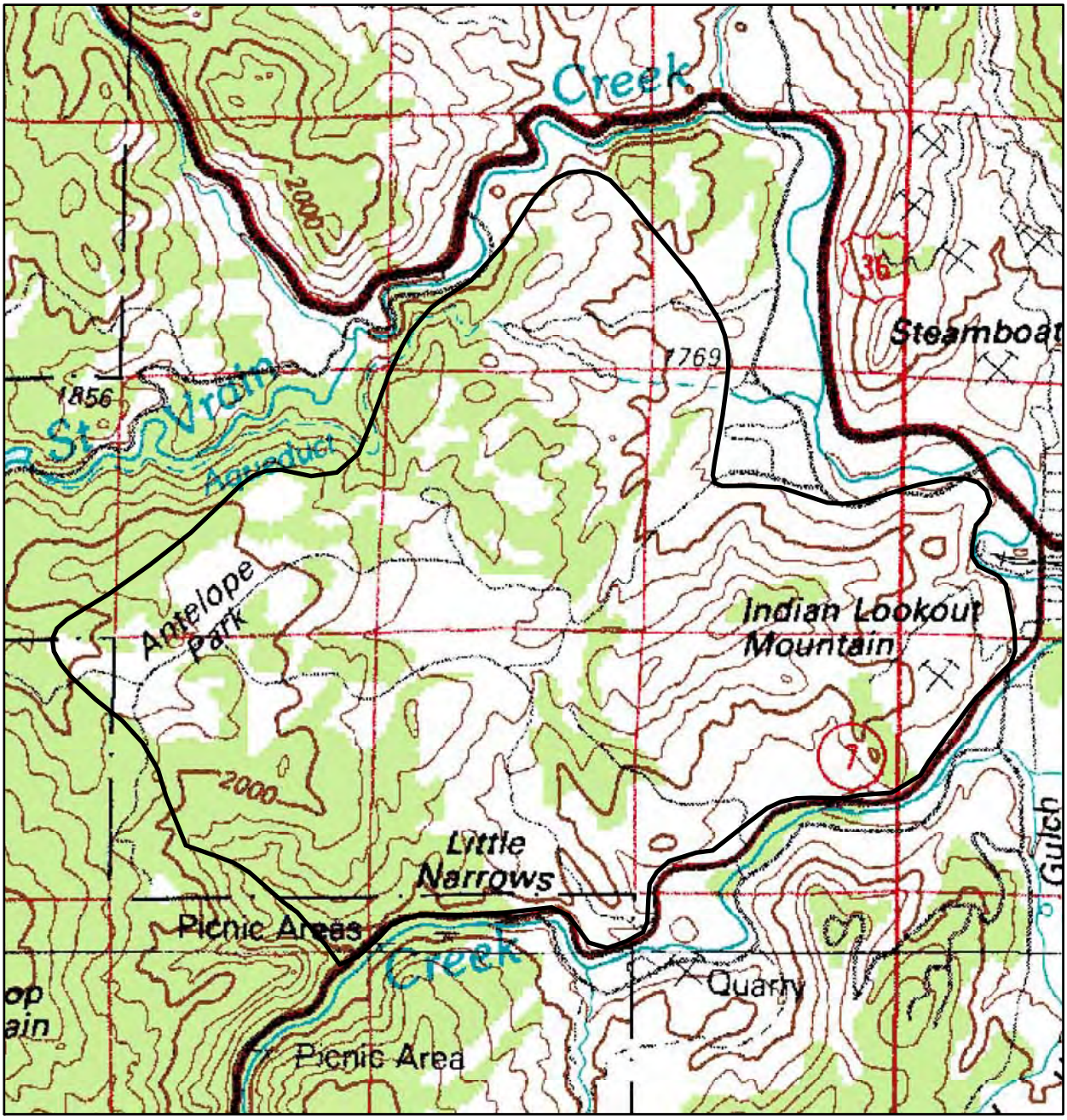
**Version Author:** Neid, S.L.


**Version Date:** 10/17/2008

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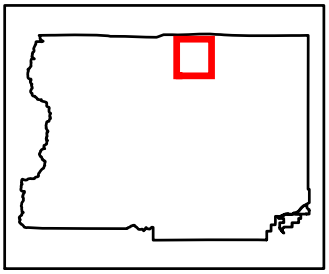
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Indian Lookout Mountain Potential Conservation Area, B2: Very High Biodiversity Significance

# Lykins Gulch

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Hygiene, Lyons

**Size:** 1,434 acres (580 ha) **Elevation:** 5,282 - 6,496 ft. (1,610 - 1,980 m)

**General Description:** This site contains the native grassland areas on slopes of the dissected, rolling hills below the foothills east of the North Foothills Highway west of Longmont. It is generally within the broad, flat Denver Basin where it abuts the foothills in northern Boulder County. Landforms are generally benches, terraces, and pediments with various erosional downcutting from ephemeral tributary streams of Lykins Gulch. The underlying bedrock of the area is Pierre shale. Surficial exposures of Pierre shale are interspersed among a mosaic of Quaternary alluvium gravel deposits. The various Quaternary gravels include Verdos Alluvium that formed as a broad veneer over the flat shale pediments and more recent (Pleistocene and Holocene) terrace deposits within the drainage systems. Soils are clays and clay loams as well as gravelly or cobbly clay or sandy loams, reflecting their bedrock origins. Grasslands dominate the landscape although the native expression is fragmented by agricultural fields and pockets of low-intensity residential development. The needle-and-thread (*Hesperostipa comata*) Colorado Front Range grassland forms the matrix expression in this landscape and has inclusions of New Mexico feathergrass (*Hesperostipa neomexicana*) grassland and small areas of mountain mahogany (*Cercocarpus montanus*) shrubland embedded within it. The needle-and-thread grassland is generally dominated by needle-and-thread or codominated with blue wildrye (*Elymus glaucus*). Additional graminoids are numerous and include native bluegrass (*Poa agassizensis*), squirreltail (*Elymus elymoides*), junegrass (*Koeleria macrantha*), Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), and little bluestem (*Schizachyrium scoparium*). Forbs are very diverse and include wild onion (*Allium textile*), larkspur (*Delphinium nuttalianaum*), little sunflower (*Helianthus pumilus*), scurfpea (*Psoralidium tenuifolium*), buckwheat (*Eriogonum brevicaule*), Drummond's milkvetch (*Astragalus drummondii*), mariposa lily (*Calochortus gunnisonii*), sweetvetch (*Hedysarum boreale*), blazing star (*Liatris punctata*), purple prairie clover (*Dalea purpurea*), and many others. There are bands of shrubs that follow contours, especially just below north-facing slope crests. Shrub species include skunkbush (*Rhus trilobata*), serviceberry (*Amelanchier utahensis*), prickly rose (*Rosa sayi*), and Parry rabbitbrush (*Chrysothamnus parryi*). New Mexico feathergrass occurs on slope crests having less graminoid diversity, but similar forb composition. Drainages have riparian vegetation including cottonwood (*Populus deltoides*) and

willows (*Salix* species) over sedges and pasture grasses. Exposures of Pierre shale tend to be sparsely vegetated. Bell's twinpod (*Physaria bellii*) and wavy-leaf stickleaf (*Nuttallia sinuata*) occur in several shale barrens areas throughout the site.

**Key Environmental Factors:** Mosaic of shale outcrops (Pierre and Niobrara) and Quaternary alluvium deposits. Piedmont zone.

**Biodiversity Significance Rank Comments (B2):** This site includes a good (B-ranked) and a fair to poor (CD-ranked) occurrence of a globally imperiled (G2G3/S2S3) plant species, Bell's twinpod (*Physaria bellii*), which is restricted to the Front Range of Colorado. The habitat for this species is quickly being developed throughout its range. There is also a good to fair (BC-ranked) occurrence of the globally critically imperiled (G1G2/S1S2) *Hesperostipa comata* Great Plains mixed grass prairie. A healthy population of wavy-leaf stickleaf (*Nuttallia sinuata*), a globally rare (G3/S2) plant, was documented here but this annual tends to be mobile from year to year and, while significant, is not the focus of this particular site.

Natural Heritage element occurrences at the Lykins Gulch PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | BC | 2007-07-02 |
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | B | 2007-06-22 |
| Vascular Plants | Physaria bellii | Bell's twinpod | G2G3 | S2S3 | | | | B | 2003-05-08 |
| Vascular Plants | Physaria bellii | Bell's twinpod | G2G3 | S2S3 | | | | CD | 2007-06-22 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the full extent of the occurrences, some adjacent potential habitat and some representation of the local mosaic of plant communities.

**Protection Urgency Rank Comments (P3):** About half of this site is on open space or on lands with conservation easements. The remaining area is private land with multiple parcels and owners.

**Management Urgency Rank Comments (M3):** Multiple patches in various ownership (private and city/county open space) will require coordinated efforts to

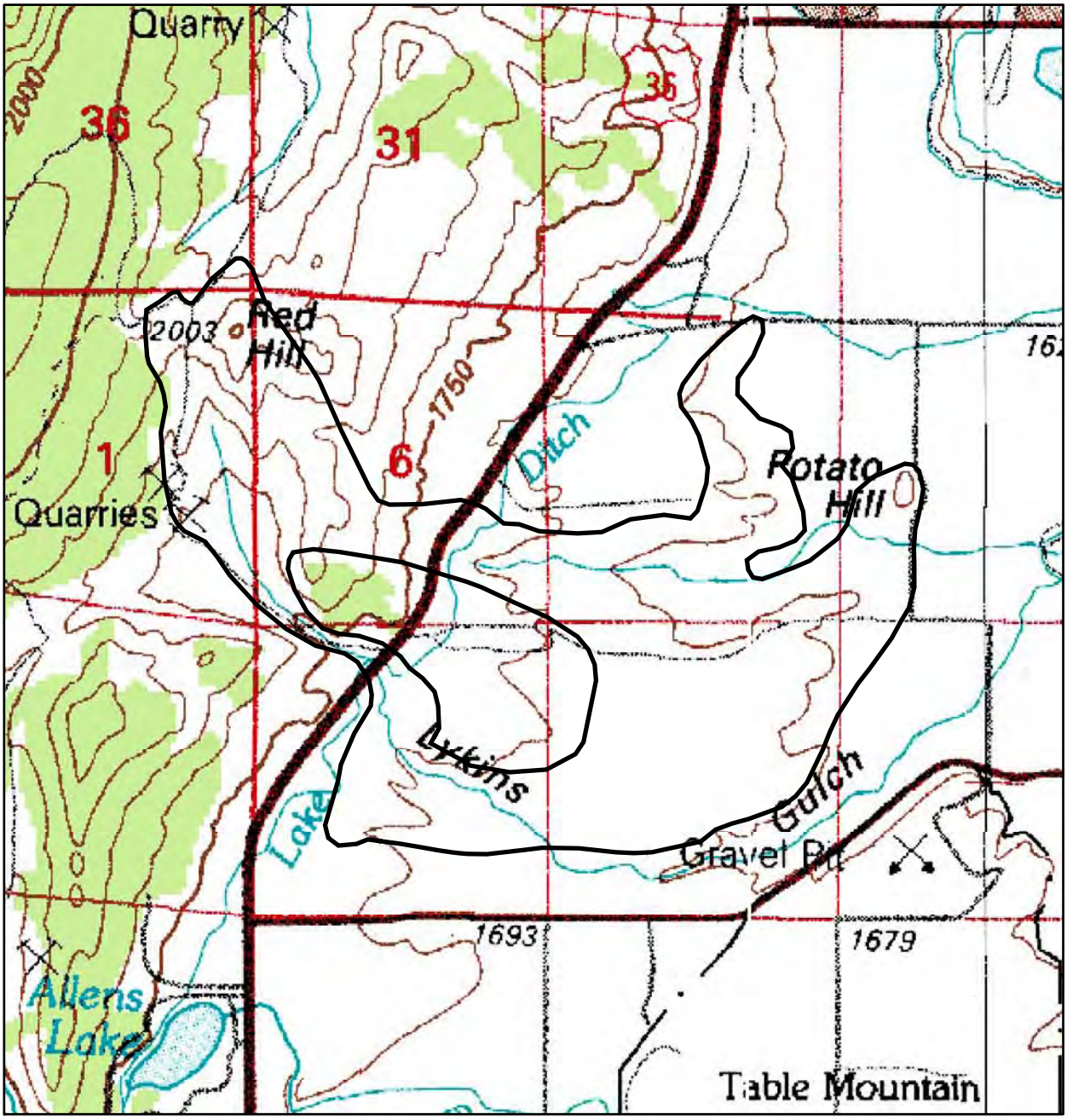
manage weeds and maintain species richness. Many areas are in excellent condition, others have some weed establishment within or nearby. Weeds include Mediterranean sage (*Salvia aegilops*), diffuse knapweed (*Centaurea diffusa*), dalmation toadflax (*Linaria dalmatica*), cheatgrass (*Bromus tectorum*), horehound (*Marrubium vulgare*), and Jim Hill mustard (*Sisymbrium altissimum*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/17/2008

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Map Date: 10/30/2008

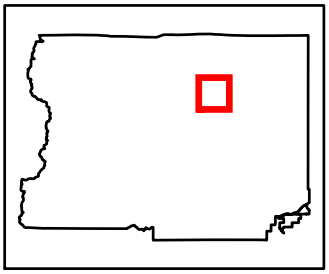
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Lykins Gulch Potential Conservation Area, B2: Very High Biodiversity Significance

# Marshall Mesa

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Louisville

**Size:** 6,760 acres (2,736 ha) **Elevation:** 5,600 - 5,800 ft. (1,707 - 1,768 m)

**General Description:** The Marshall Mesa site is part of the large outwash plain of the foothills of the Colorado Front Range below Eldorado Mountain. It consists of large, rolling mesas and swales bisected by the Coal and Rock creek drainages--southwest to northeast trending tributaries of Boulder Creek. Bedrock geology of the mesa is Cretaceous shale (Laramie Formation) capped with a mosaic of Quaternary alluvium (Machette 1975, Malde 1955). The surficial alluvium deposits are a mosaic of Rocky Flats, Verdos, and Slocum deposits interspersed with Piney Creek terrace deposits. All of the bedrock layers have differing proportions of calcium carbonate; the soils in the area tend to be enriched (Moreland and Moreland 1975). This site is strongly dominated by grassland systems. There are some relatively small patches of ponderosa pine (*Pinus ponderosa*) savanna on north-facing slopes on the north side. The savanna has a variable expression with some areas of scattered ponderosa pine and/or Rocky Mountain juniper (*Juniperus scopulorum*) and others supporting scrubby copses of skunkbush (*Rhus trilobata*), mountain mahogany (*Cercocarpus montanus*), ceanothus (*Ceanothus herbaceous, C. fendleri*), and occasional shrubby cinquefoil (*Dasiphora fruticosa*). The gravelly, well-drained soils of the mesa tops are covered with grassland mosaic dominated by mid- and tallgrass species. On the west end, the species composition is characterized by big bluestem (*Andropogon gerardii*), porcupine grass (*Hesperostipa spartea*), prairie dropseed (*Sporobolus heterolepis*), sideoats grama (*Bouteloua curtipendula*), needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), purple threeawn (*Aristida purpurea*), junegrass (*Koeleria macrantha*), mountain muhly (*Muhlenbergia montana*), little bluestem (*Schizachyrium scoparium*), and others. Forbs are very diverse and include soapweed (*Yucca glauca*), wavy-leaved thistle (*Cirsium undulatum*), scurfpea (*Psoralea tenuiflora*), blanketflower (*Gaillardia aristata*), hedgehog cactus (*Echinocereus viridiflorus*), prickly pear cactus (*Opuntia* spp.), mariposa lily (*Calochortus gunnisonii*), fringed sage (*Artemesia frigida*), blazing star (*Liatris punctata*), and many others. Dwarf indigo (*Amorpha nana*) and slimleaf milkweed (*Asclepias stenophylla*) occur in the grasslands. Farther east along the mesas, the tallgrass species become much less common and the matrix grassland is characterized by needle-and-thread. Within this area are small patches of New Mexico feathergrass (*Hesperostipa neomexicana*) on north-facing slope crests. These grasslands support some of the highest concentrations of grassland nesting birds in the Piedmont; while more common elsewhere in the state, this site reflects a substantial eedge-of-range

habitat for these species. Within the grassland are large prairie dog towns. These towns can be very weedy and dominated by bindweed (*Convolvulus arvensis*). However, they also support burrowing owl (*Athene cunicularia*). This also supports northern leopard frog (*Rana pipiens*) and wavy-leaf stickleaf (*Nuttallia sinuata*). The portion of this site that overlaps with Doudy Draw historically contained ottoe skipper (*Hesperia ottoe*), crossline skipper (*Polites origenes*), Arogos skipper (*Atrytone arogos*), and dusted skipper (*Atrytonopsis hianna*).

**Key Environmental Factors:** Outwash mesa of Quaternary alluvium

**Climate Description:** Annual precipitation is 12 to 18 inches. Mean annual air temperature is 48-52 degrees F., and the frost-free season is about 140-155 days.

**Land Use History:** Grazing, coal mining.

**Biodiversity Significance Rank Comments (B2):** The site supports an excellent to good (AB-ranked) occurrence of the globally imperiled (G2?/S2) *Andropogon gerardii - Schizachyrium scoparium* xeric tallgrass prairie, a good and a good to fair (BC-ranked) occurrence of the globally vulnerable (G3/S3) *Hesperostipa neomexicana* Great Plains mixed grass prairie, a fair (C-ranked) occurrence of the state rare (G5/S2) prairie violet (*Viola pedatifida*), a poor (D-ranked) occurrence of the state rare (G5/S2S3) dwarf wild indigo (*Amorpha nana*) and an extant occurrence of the state rare (G4/S3) black-tailed prairie dog (*Cynomys ludovicianus*).

Natural Heritage element occurrences at the Marshall Mesa PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Mammals | Cynomys ludovicianus | Black - tailed Prairie Dog | G4 | S3 | | SC | USFS | E | 2006-99-99 |
| Natural Communities | Andropogon gerardii - Schizachyrium scoparium Western Great Plains Herbaceous Vegetation | Xeric Tallgrass Prairie | G2? | S2 | | | | AB | 2007-08-28 |
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | BC | 2007-07-02 |
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | B | 2007-07-02 |
| Vascular Plants | Amorpha nana | dwarf wild indigo | G5 | S2S3 | | | | D | 2000-08-17 |
| Vascular Plants | Viola pedatifida | prairie violet | G5 | S2 | | | | C | 1995-05-29 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Site includes extensive mesa tops, swales, and sideslope scrubby ponderosa pine savanna. The boundary was drawn to contain biodiversity occurrences with some buffer.

**Protection Urgency Rank Comments (P5):** Area protected as designated open space.

**Management Urgency Rank Comments (M3):** Noxious and exotic weeds impact the ecological integrity of the site. Species include diffuse knapweed (*Centaurea diffusa*), cheatgrass (*Bromus tectorum*), chicory (*Cichorium intybus*), teasel (*Dipsacus fullonum*), Dalmation toadflax (*Linaria dalmatica*), jointed goatgrass (*Aegilops cylindrica*), musk thistle (*Carduus nutans*), scotch thistle (*Onopordium acanthium*), sulfur cinquefoil (*Potentilla recta*), and bindweed (*Convolvulus arvensis*) among others.

**Exotic Species Comments:** Weeds include diffuse knapweed (*Centaurea diffusa*), cheatgrass (*Bromus tectorum*), chicory (*Cichorium intybus*), teasel (*Dipsacus fullonum*), Dalmation toadflax (*Linaria dalmatica*), jointed goatgrass (*Aegilops cylindrica*), musk thistle (*Carduus nutans*), scotch thistle (*Onopordium acanthium*), sulfur cinquefoil (*Potentilla recta*), and bindweed (*Convolvulus arvensis*).

**Off-Site Considerations:** Housing developments; industrial sites; Superfund waste site; Community and Davidson Ditches bisect property; highways define boundaries of the site.

## References


Machette, M.N. 1975. Geologic map of the Lafayette quadrangle, Adams, Boulder, and Jefferson counties, Colorado. U.S. Government Printing Office, Washington, D.C.

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Moreland, D.C. and Moreland, R.E. 1975. Soils Survey of the Boulder County Area, Colorado. United States Department of Agriculture, Soil Conservation Service, in cooperation with the Colorado Agricultural Experiment Station. Soil Conservation Service , Washington, D.C.

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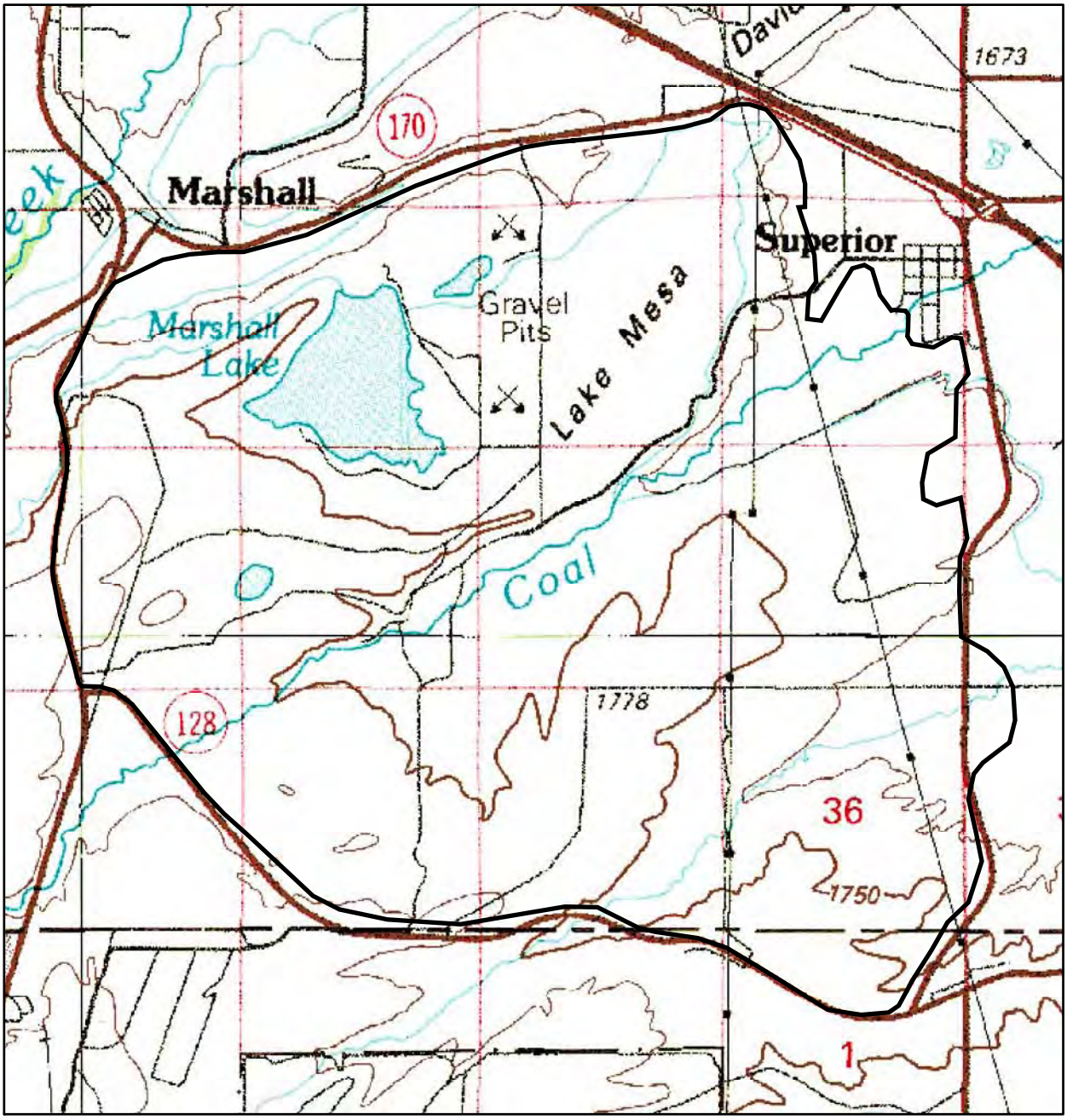
Pineda, Phyllis M. 1996. Field Survey (Butterflies) to the City of Boulder Open Space and Mountain Parks, Larimer County and Cheesman Reservoir. Field Season 1996.


**Version Author:** Neid, S.L.

**Version Date:** 10/31/2008

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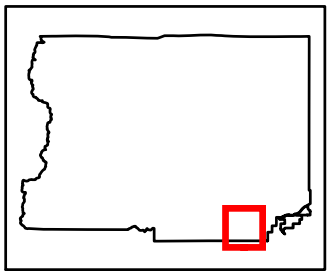
**Legend**

PCA Boundary

Denver West, 39105-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Marshall Mesa Potential Conservation Area, B2: Very High Biodiversity Significance

# Mount Sanitas Hogbacks

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Boulder

**Size:** 918 acres (372 ha) **Elevation:** 5,577 - 6,841 ft. (1,700 - 2,085 m)

**General Description:** This site contains a series of hogbacks immediately west of Boulder between Sunshine Canyon and Lee Hill Road. It is bounded to the east by city neighborhoods and to the west by subdivisions and lower intensity residential development. The hogbacks are very compressed with steep faces on both east and west aspects, montane and foothill elements are both prevalent; this area likely has the most mixed montane-foothills expression within the county. Bedrock geology of the hogbacks is comprised of sandstones. Bedrock layers from bottom to top include Fountain Formation (conglomerate sandstone), Ingelside, Lyons, Lykins, Sundance-Jelm, Morrison, and Dakota Groups. Cliffs formed by the hogbacks harbor Prairie Falcons (*Falco mexicanus*). Vegetation of the hogbacks is ponderosa pine (*Pinus ponderosa*) woodland and savanna. Woodlands have montane species like spike fescue (*Leucopoa kingii*), and Colorado wildrye (*Leymus ambiguus*). Canopy cover is relatively dense on ridgelines, but becomes sparse at lower elevations along the east-facing slopes, especially at the north end of the site. Shrub copses are common although widely-spaced. Skunkbush (*Rhus trilobata*) is the most common shrub with American plum (*Prunus americana*) forming thickets along drainages. Hackberry (*Celtis reticulata*) occurs in small copses at the south end of the site. At the north end, grassland openings rapidly increase in size downslope. Needle-and-thread (*Hesperostipa comata*) and western wheatgrass (*Pascopyrum smithii*) are the most common and abundant grasses although there are large swards of big bluestem (*Andropogon gerardii*) and small patches of native bluegrass (*Poa agassizensis*) throughout. Forb diversity is moderate with hairy goldenaster (*Heterotheca villosa*), scurfpea (*Psoralidium tenuifolium*), white sagebrush (*Artemisia ludoviciana*), and fringed sage (*Artemisia frigida*) common. Other species include prickly pear cactus (*Opuntia* species), branched noseburn (*Tragia ramosa*), soapweed (*Yucca glauca*), bigflower cinquefoil (*Drymocallis fissa*), blazing star (*Liatris punctata*), and snakeweed (*Guiterrezia sarothrae*). At the south end of the site, grasslands are narrower and more linear forming in the valley bottom between hogbacks or on toeslopes. Alyssum (*Alyssum parviflorum*) and cheatgrass (*Bromus tectorum*) are common and abundant. Roadsides bounding the site have wavy-leaf stickleaf (*Nuttallia sinuata*) occurrences.

**Key Environmental Factors:** Lower montane-foothills elevation zone.

**Land Use History:** Historically, the grassland portions of this site were grazed by various livestock, likely intensively. No grazing has occurred over the last two decades or more. In 2002, a wildfire burned about 200 acres of grassland on the slopes to the west of Wonderland Lake.

**Biodiversity Significance Rank Comments (B2):** This site supports a good to fair (BC-ranked) and a fair (C-ranked) occurrence of the globally imperiled (G2?/S2) *Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* foothills ponderosa pine scrub woodland, as well as a good to fair (BC-ranked) occurrence of the globally critically imperiled (G1G2/S1S2) *Hesperostipa comata* Great Plains mixed grass prairie

Natural Heritage element occurrences at the Mount Sanitas Hogbacks PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | BC | 2007-07-02 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | C | 2007-09-08 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | BC | 2007-07-02 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** This site includes the narrow Dakota sandstone hogback just west of Boulder. It encompasses the ponderosa pine savanna and grassland occurrences with a small buffer.

**Protection Urgency Rank Comments (P4):** This site is mostly open space at the north end (Wonderland) and south end (Mt. Sanitas). These parcels are separated by subdivisions accessed via Linden Drive.

**Management Urgency Rank Comments (M3):** Noxious and exotic weeds are a significant threat to the ecological integrity of this site. Species include Dalmation toadflax (*Linaria dalmatica*), chicory (*Cichorium intybus*), diffuse knapweed (*Centaurea*

*diffusa*), jointed goatgrass (*Aegilops cylindrica*), leafy spurge (*Euphorbia esula*), myrtle spurge (*Euphorbia myrsinites*), tall oatgrass (*Arrhenatherum elatius* var. *bulbosum*), Canada thistle (*Cirsium arvensis*), scotch thistle (*Onopordium acanthium*), bladder senna (*Coletea arborescens*), and many others occur. This site receives heavy recreational use due to its proximity to Boulder.

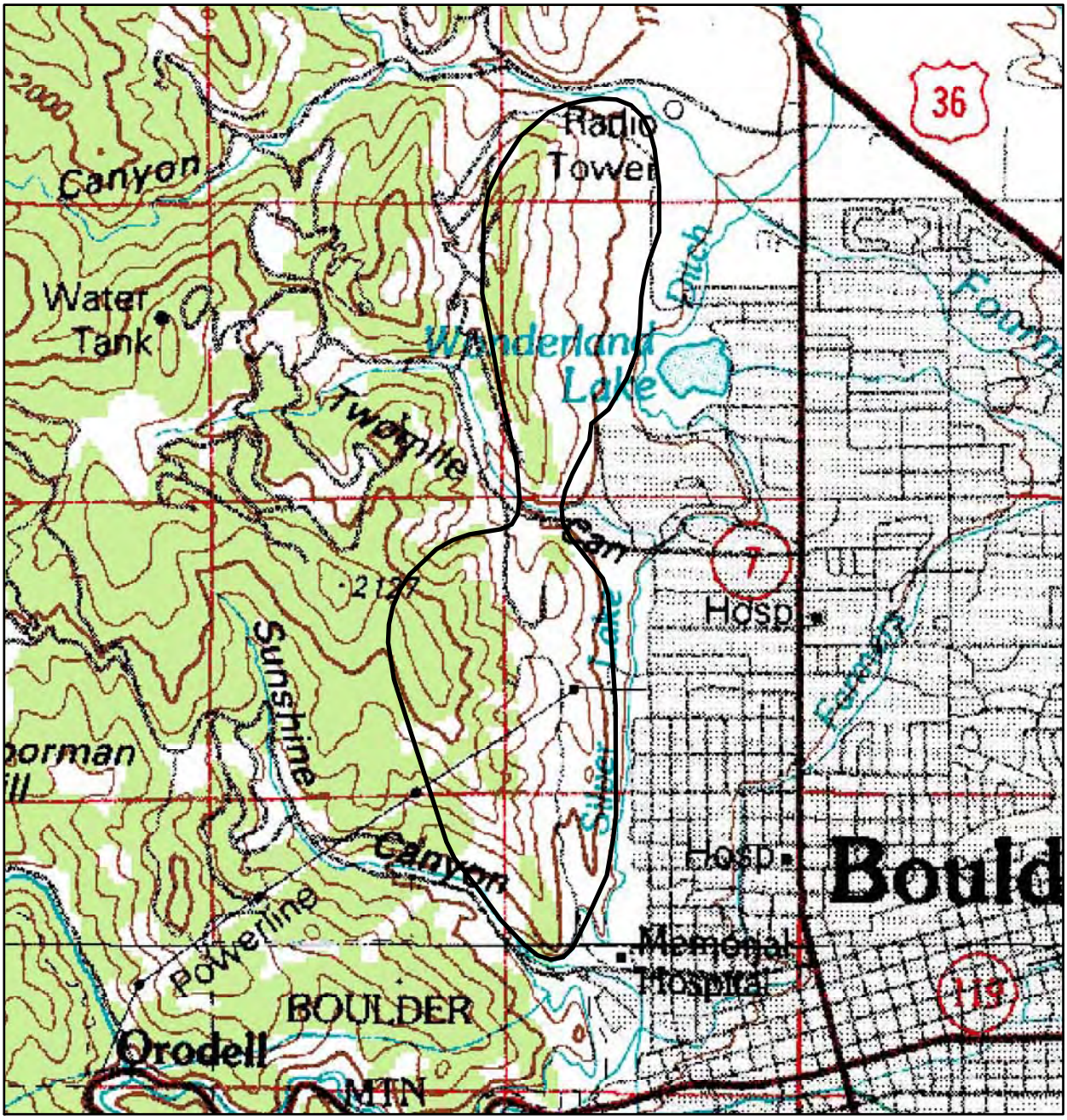
**Exotic Species Comments:** Exotics include Dalmation toadflax (*Linaria dalmatica*), chicory (*Cichorium intybus*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), leafy spurge (*Euphorbia esula*), myrtle spurge (*Euphorbia myrsinites*), tall oatgrass (*Arrhenatherum elatius* var. *bulbosum*), Canada thistle (*Cirsium arvensis*), scotch thistle (*Onopordium acanthium*), and bladder senna (*Coletea arborescens*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/23/2008

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Map Date: 11/01/2008

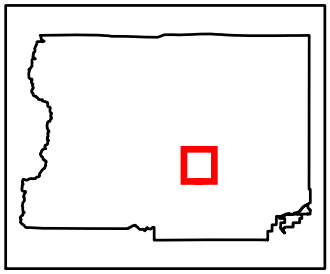
**Legend**

PCA Boundary

Eastes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Mount Sanitas Hogbacks Potential Conservation Area, B2: Very High Biodiversity Significance

# Niwot Ridge

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M5: Not Needed; No Threats Anticipated**

**U.S.G.S. 7.5-minute quadrangles:** Ward

**Size:** 2,822 acres (1,142 ha) **Elevation:** 10,663 - 12,385 ft. (3,250 - 3,775 m)

**General Description:** Niwot Ridge is an east-west trending alpine ridge near the Continental Divide in southwest Boulder County. It is characterized by glacial landforms including sharp ridges and glacial cirques, moraines, glacial lakes, and talus slopes. The site is entirely above 10,000 feet (3,050 m) in the alpine zone. There is both permafrost and patterned ground. The alpine area was studied intensively by Komarkova and Webber (1978) who mapped the vegetation mosaic. Vegetation follows patterns of moisture and snow accumulation and persistence, which is largely driven by wind and topography. The majority of the ridge is a mosaic of alpine turf and wet meadow vegetation. Alpine turf is a diverse mix of creeping sibbaldia (*Sibbaldia procumbens*), Ross' avens (*Geum rossii*), tufted hairgrass (*Deschampsia caespitosa*), curly sedge (*Carex rupestris*), alpine dryad (*Dryas octopetala*), Bellardi bog sedge (*Kobresia myosuroides*), dwarf bilberry (*Vaccinium caespitosum*) and whortleberry (*V. scoparium*). Treeline occurs at approximately 11,150 ft (3,400 m) depending on exposure and aspect. Engelmann spruce (*Picea engelmannii*) krummholz transitions to subalpine forest below.

**Key Environmental Factors:** Alpine environment; glaciated landforms.

**Climate Description:** Due to its alpine elevations, Niwot Ridge has relatively low temperatures throughout the year. Annual mean temperature at high elevation is 25.3 degrees F (-3.7 degrees C) with a January mean temperature of 8.2 degrees F (-13.2 degrees C) and a July mean of 46.8 degrees F (8.2 degrees C). There is high solar radiation (and thus high levels of ultraviolet radiation), high wind velocities, and a very short growing season. Precipitation is highly variable annually, spatially, and seasonally. Mean annual precipitation is about 3.75 inches (930 mm). Most of the precipitation occurs as snow falling in winter and spring months. Summer precipitation occurs as brief convective storms. One-third of annual precipitation is lost via evapotranspiration and the rest leaves as runoff. Snow accumulation patterns result from interaction between precipitation, wind, and topography. The mosaic of snow accumulation creates variability in the quantity and timing of meltwater release.

**Land Use History:** Niwot Ridge has been a site of scientific research for decades; it became a designated Long-Term Ecological Research (LTER) site in 1980.

Meteorological data have been collected from a network of stations that span 8,500-12,275 feet (2590-3742 m) since 1953. Ongoing major research topics include pattern, depth, and chemical composition of snow accumulation and its impacts on biological and biogeochemical questions; climate change; and ecosystem processes such as atmospheric nitrogen deposition.

**Biodiversity Significance Rank Comments (B2):** This site is drawn for an excellent (A-ranked) occurrence of the globally imperiled (G2G3/S2S3) downy indian-paintbrush (*Castilleja puberula*), an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) alpine tundra community, *Kobresia myosuroides - Carex rupestris* var. *drummondiana*, and a good (B-ranked) occurrence of the globally vulnerable (G3G4/S3) Patterson's wormwood (*Artemisia pattersonii*). There are presumed extant occurrences of the state imperiled (G4/S2S3) arctic draba (*Draba fladnizensis),* state critically imperiled (G3G4/S1) Porsild's whitlow-grass (*Draba porsildii*), and state critically imperiled (G5T5/S1) tundra saxifrage (*Saxifraga cespitosa* ssp. *monticola)* but these occurrences are imprecise and field surveys are needed to verify the populations.

Natural Heritage element occurrences at the Niwot Ridge PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Kobresia myosuroides - Carex rupestris var. drummondiana Herbaceous Vegetation | Dry Alpine Meadows | G3 | S3? | | | | A | 2007-08-09 |
| Vascular Plants | Castilleja puberula | downy indian - paintbrush | G2G3 | S2S3 | | | | A | 2007-08-15 |
| Vascular Plants | Artemisia pattersonii | Patterson's wormwood | G3G4 | S3 | | | | B | 2007-08-15 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** This site encompasses the alpine tundra area of Niwot Ridge with some of the adjacent treeline and subalpine forest as a buffer.

**Protection Urgency Rank Comments (P5):** This site is within the Arapaho-Roosevelt National Forest and is designated an Experimental Ecology Reserve by the USDA Forest Service. It has also been designated a Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Green Lakes valley to the south is within the City of Boulder Watershed, which is closed to public access.

**Management Urgency Rank Comments (M5):** Niwot Ridge is a designated research

area. There are on-going experiments studying atmospheric nitrogen deposition, climate change, and others.

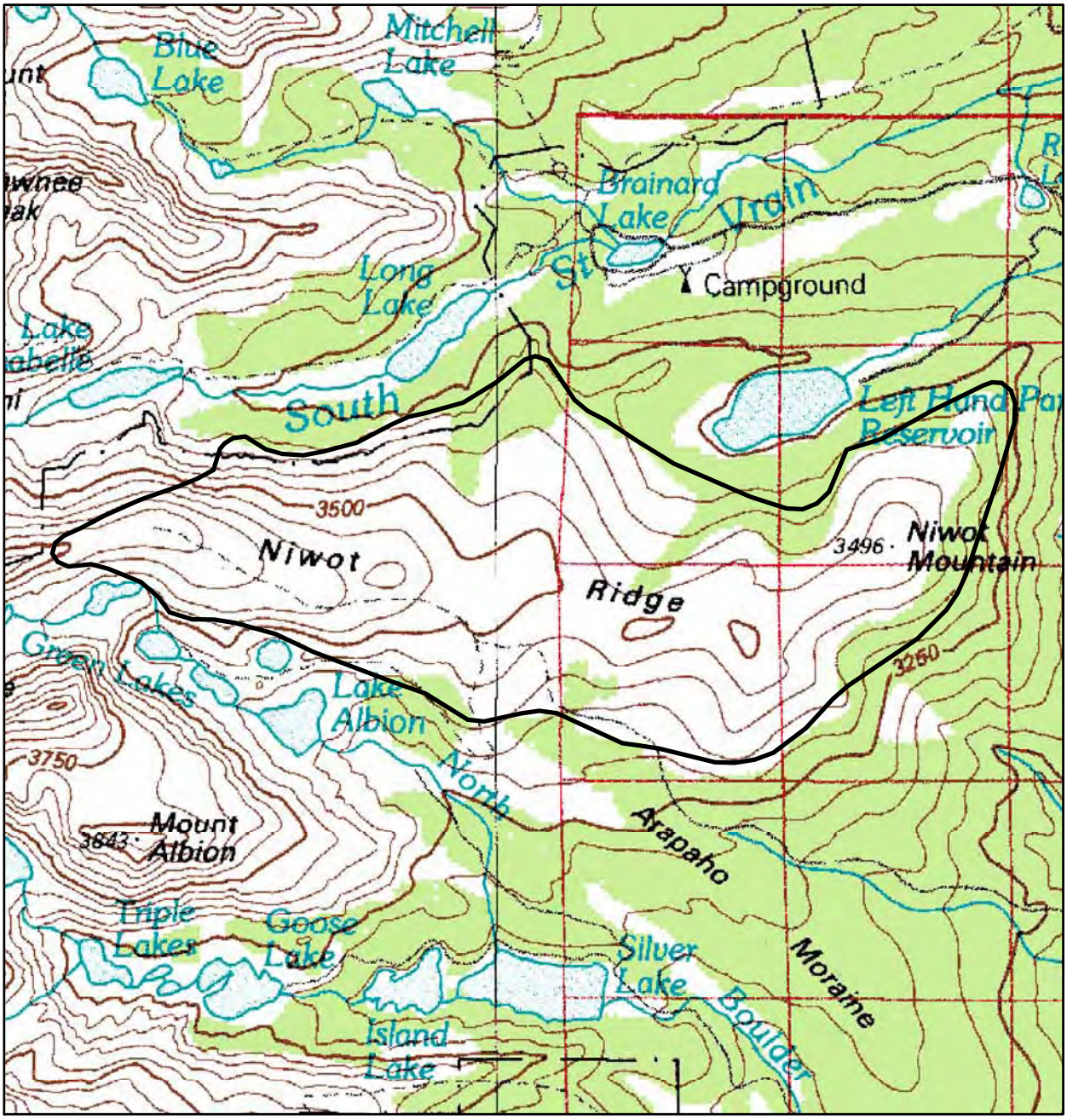
**Information Needs:** Field surveys are needed to verify extent and quality of rare plant populations.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/30/2008

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Map Date: 11/13/2008

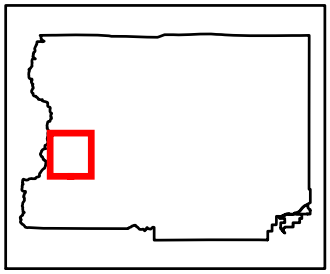
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Niwot Ridge Potential Conservation Area, B2: Very High Biodiversity Significance

# North Boulder Grasslands

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Lyons, Boulder

**Size:** 4,370 acres (1,768 ha) **Elevation:** 5,360 - 6,200 ft. (1,634 - 1,890 m)

**General Description:** This foothill hogback area north of Boulder is an example of the abrupt transition between the mountains and plains, it is a compressed foothills area with significant mixing of montane and prairie species. This site spans the North Foothills Highway (Hwy 36) as there are significant areas of native grassland east of the road that are a continuation of the habitat gradient. Bedrock geology of the series of hogbacks is comprised of relatively thin layers of Lyons, Lykins, Dakota, Morrison, Sundance Formations, with various thickness of sandstone interbedded with shales, limestones, mudstones, and siltstones. This site contains one of the largest shale outcrops in Boulder County. Below the hogbacks are broad alluvial fans and terrace deposits of Quaternary alluvium that cap the underlying shale. The compressed hogback formations form a wide arc that is the boundary of the broad, flat Denver Basin landform to the east. The hogbacks are steep-sided and relatively narrow; they support ponderosa pine (*Pinus ponderosa*) savanna that spills down from the ridges. There are widely-spaced, mature ponderosa pine as well as intervening clusters of younger trees. There are broad patches of shrubs embedded within the savanna on sideslopes. These are largely composed of mountain mahogany (*Cercocarpus montanus*), but skunkbush (*Rhus trilobata*) and wax currant (*Ribes cereum*) are common. These habitats transition to grassland systems at the toeslopes and are predominantly needle-and-thread (*Hesperostipa comata*) and western wheatgrass (*Pascopyrum smithii*) with inclusions of New Mexico feathergrass (*Hesperostipa neomexicana*). Additional taller-statured grass species like Indiangrass (*Sorgastrum nutans*), green needlegrass (*Nassella viridula*), wildrye (*Elymus albicans*), big bluestem (*Andropogon gerardii*), porcupine grass (*Hesperostipa spartea*), prairie dropseed (*Sporobolus heterolepis*), mountain muhly (*Muhlenbergia montana*), sideoats grama (*Bouteloua curtipendula*), and are scattered throughout with variable cover. These grassland openings are the primary habitat for several rare butterflies known from the site. Further, the east-facing toeslopes have exposures of dark gray Pierre shale that tend to have sparse barrens vegetation. The globally rare Bell's twinpod (*Physaria bellii*) occurs on the shale barrens and in adjacent rich New Mexico feathergrass grasslands. Barrens support additional species not found in the adjacent grasslands like sweetvetch (*Hedysarum boreale*), prince's plume (*Stanleya pinnata*), and shortstem buckwheat (*Eriogonum brevicaule*). The grassland expanse east of the highway blankets the dissected, east-west trending mesas and swales. The

grasslands are a mosaic of New Mexico feathergrass grasslands on high slopes and slope crests, needle-and-thread Colorado Front Range grassland on sideslopes, and western wheatgrass dominated grasslands in swales. Forb diversity is remarkably high in the needlegrass grassland associations. There are inclusions of shrublands, especially below slope crests that include skunkbush, prickly rose (*Rosa sayi*), and Parry's rabbitbrush (*Chrysothamnus parryi*). Prairie dog towns are embedded within this grassland system, primarily in the landscape swales, but they are expanding upslope to some mesa tops. These towns have degraded vegetation dominated by bindweed (*Convolvulus arvensis*) and with knapweed (*Centaurea* spp.). Prairie dogs also impact some shale barrens habitat. At the south end of the site is the only known location for Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*); it is historical in this location and not seen since 1984. The entirety of this site was burned in the Olde Stage Road fire on January 7-8, 2009.

**Climate Description:** Annual precipitation is 12 to 18 inches. Mean annual air temperature is 48 to 52 deg. F. and the frost-free season is about 140-155 days.

**Land Use History:** Cultivation of non-native perennial grasses like smooth brome (*Bromus inermis*) and desert wheatgrass (*Agropyron desertorum*) occurred in many of the low-lying swales on the east side of the site. Livestock grazing also occurred on the site, but has not occurred on the west side of Highway 36 for more than fifteen years and has occurred infrequently (less than once in five years) on the east side of Highway 36. A small area in the southern portion of the site was mined historically.

**Biodiversity Significance Rank Comments (B2):** The site contains two good (B-ranked) occurrences of the globally imperiled (G2G3/S2S3) Bell's twinpod (*Physaria bellii*), a good (B-ranked) occurrence of a globally imperiled (G1G2/S12) Great Plains mixed grass prairie (*Hesperostipa comata*), a good (B-ranked) occurrence of a globally imperiled (G2/S2?) foothills ponderosa pine scrub woodland (*Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii*) and numerous healthy populations of global and state rare invertebrates. The federally Threatened Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and the federally Threatened Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) were historically known from the site.

Natural Heritage element occurrences at the North Boulder Grasslands PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | B | 1997-07-12 |
| Insects | Hesperia ottoe | Ottoe Skipper | G3G4 | S2 | | | USFS | B | 1997-07-12 |
| Insects | Euphyes bimacula | Two - spotted Skipper | G4 | S2 | | | | B | 1997-07-12 |
| Insects | Euphyes bimacula | Two - spotted Skipper | G4 | S2 | | | | C | 1996-07-02 |
| Insects | Polites origenes | Cross - line Skipper | G5 | S3 | | | | B | 1996-07-03 |
| Mammals | Cynomys ludovicianus | Black - tailed Prairie Dog | G4 | S3 | | SC | USFS | E | 2006-99-99 |
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | B | 2007-06-25 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | B | 2007-09-04 |
| Natural Communities | Hesperostipa neomexicana Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G3 | S3 | | | | B | 2007-07-25 |
| Vascular Plants | Physaria bellii | Bell's twinpod | G2G3 | S2S3 | | | | B | 2007-06-27 |
| Vascular Plants | Physaria bellii | Bell's twinpod | G2G3 | S2S3 | | | | B | 2007-07-02 |
| Vascular Plants | Nuttallia sinuata | wavy - leaf stickleaf | G3 | S2 | | | | E | 2007-06-27 |
| Vascular Plants | Viola pedatifida | prairie violet | G5 | S2 | | | | B | 1997-05-29 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** For botanical occurrences, the roadside and the exposed limestone soils are included, as well as the adjacent grassland, even though crossed by roads. For invertebrate (*Hesperiidae*) occurrences, the mixed-prairie is included in between actual documented occurrences because the habitat and hostplant are

contiguous. In addition, the linkages between the sites are included to provide for genetic exchange between occurrences, and to buffer against weedy invasions. Wetland meadow includes area containing *Carex*, presumably *Carex nebrascensis*, which is the Colorado host plant for *E. bimacula* (Stanford pers. comm.), and the surrounding, more xeric areas for management of exotic flora.

**Protection Urgency Rank Comments (P3):** Protection is complete in most of site, as the area is designated open space. Private inholding appears to have good management. On the north end of site, there is a horse ranch which appears to be heavily grazed and invaded by many noxious exotics and native increasers.

**Management Urgency Rank Comments (M2):** Exotic and noxious weeds pose a threat to the integrity of this site. Mediterranean sage (*Salvia aethiopis*), jointed goatgrass (*Aegilops cylindrica*), Dalmation toadflax (*Linaria dalmatica*), yellow toadflax (*Linaria vulgaris*), diffuse knapweed (*Centaurea diffusa*), musk thistle (*Carduus nutans*), Scotch thistle (*Onopordium acanthium*), bull thistle (*Cirsium vulgare*), chicory (*Cichorium intybus*), burdock (*Arctium minus*), sulfur cinquefoil (*Potentilla recta*), and many others occur. Wetland areas are heavily invaded by houndstongue (*Cynoglossum officianale*), Canada thistle (*Cirsium arvense*) and teasel (*Dipsacus sylvestris*); although the Canada thistle is used profusely by nectaring insects, it appears to be choking out much of the native wetland vegetation, like sedges (*Carex* spp.). Russian olive trees are sprouting up, which also pose an invasive threat to this wetland area. Monitor for noxious weed invasions. Caution should be exercised in the use of broadleaf herbicides so that damage to nectaring sources is minimized. Enforce use of leashes on unrestrained pets (leash requirements are posted but often ignored). Discourage building of additional trails until weed management can eradicate current infestations.

**Exotic Species Comments:** Exotics include Mediterranean sage (*Salvia aethiopis*), jointed goatgrass (*Aegilops cylindrica*), Dalmation toadflax (*Linaria dalmatica*), yellow toadflax (*Linaria vulgaris*), diffuse knapweed (*Centaurea diffusa*), musk thistle (*Carduus nutans*), Scotch thistle (*Onopordium acanthium*), bull thistle (*Cirsium vulgare*), chicory (*Cichorium intybus*), burdock (*Arctium minus*) and sulfur cinquefoil (*Potentilla recta*). Wetland areas are heavily invaded by houndstongue (*Cynoglossum officianale*), Canada thistle (*Cirsium arvense*), Russian olive (*Elaeagnus angustifolia*) and teasel (*Dipsacus sylvestris*).

**Off-Site Considerations:** Neva Road crosses E-W through site. Highway 36 also crosses N-S through site. To west, over the ridge and at bottom of slope is a paved road and housing development. Subdivisional development at Hwy 36 and Lee Hill Rd. Small cement plant on Hwy 36. Unknown activity taking place in Section 36 in and about warehouse areas. During 1996 field season, undeveloped road leading to warehouse was widened considerably. There are reservoirs to northeast (Left Hand Valley), east (Boulder Res.), and to south (Wonderland Lake). Horse corrals, breeding, training, grazing to north. Road and trails leading to site may increase

spread of exotic flora.

**Information Needs:** Investigate the impact of prairie dogs on shale barrens habitat, the dynamics of prairie dog disturbance, effects on population dynamics of Bell's twinpod, and restoration and recovery trajectories in light of prairie dog activity. Survey grasslands in subsequent field seasons for *Hesperia ottoe*, as 1996 was a poor year for this species (Stanford pers. comm). Flies with *Atrytone arogos* in July. One individual of Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) was documented along a road in 1984 at the southern tip of the site. It was searched for, but not located, in 2008. Further field surveys could locate this Federally Threatened plant.

## References


Carpenter, Alan. 1993. Rare plants of Colorado questionnaire.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Pineda, P. M and A.R. Ellingson. 1998. A systematic inventory for rare and imperiled butterflies on the City of Boulder Open Space and Mountain Parks. Unpublished Report to the City of Boulder Open Space and City of Boulder Mountain Parks. 95 pp.

Pineda, P. M., A. R. Ellingson, C. A. Pague. 1997. A systematic inventory for rare and imperiled butterflies on the City of Boulder Open Space and Mountain Parks, and recommendations for their management.

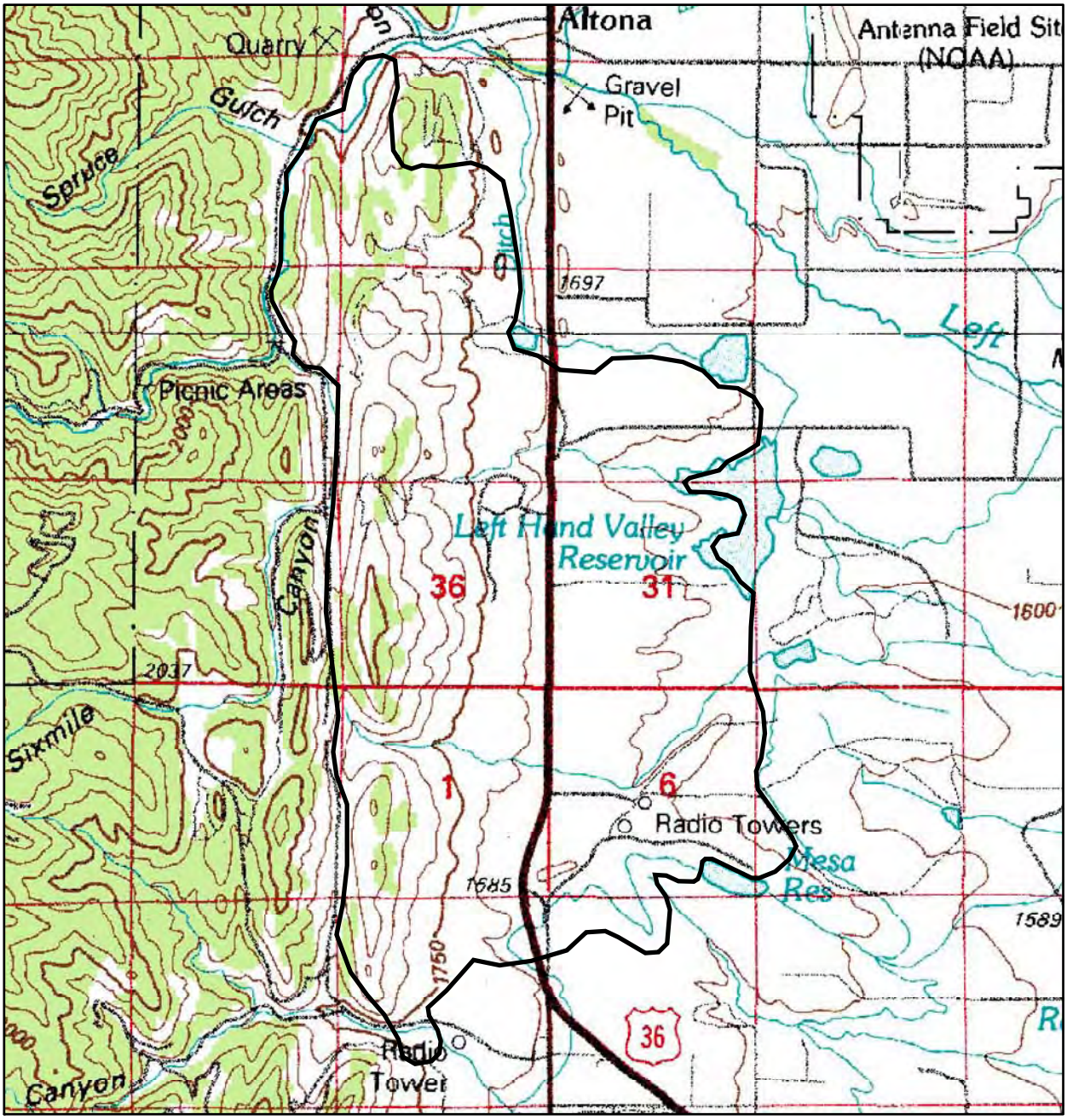
Pineda, Phyllis M. 1996. Field Survey (Butterflies) to the City of Boulder Open Space and Mountain Parks, Larimer County and Cheesman Reservoir. Field Season 1996.

Stanford, Ray E. 1996. Personal communication with Phyllis M. Pineda during field season of 1996.



**Version Author:** Neid, S.L.


**Version Date:** 10/21/2008

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Map Date: 11/13/2008

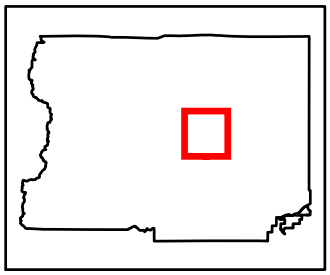
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



North Boulder Grasslands Potential Conservation Area, B2: Very High Biodiversity Significance

# North Saint Vrain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Raymond, Allens Park

**Size:** 13,118 acres (5,309 ha) **Elevation:** 6,562 - 8,858 ft. (2,000 - 2,700 m)

**General Description:** The North St. Vrain site is in northwestern Boulder County east of Allenspark. The North St. Vrain watershed is one of the few remaining roadless canyons along the Front Range, and likely the only one with a perennial stream the size of the North St. Vrain. Its rugged, granitic hills are carved by North St. Vrain Creek and its tributaries including Rock Creek, Horse Creek, Cabin Creek, and Coulson Gulch. The moderate to high energy streams have formed deep, narrow canyons and starkly contrasting aspects on the hillslopes with an extensive mosaic of conifer forest, shrublands, grassland openings, riparian corridors, and cliffs and rock outcrops. This rough, craggy landscape supports an extensive ponderosa pine (*Pinus ponderosa*) woodland system. Ponderosa pine is primarily dominant throughout on steep, south-, west-, and east-facing slopes as well as on the many rocky tors and ridgelines. Understory shrubs in the ponderosa pine woodland are dominated by bitterbrush (*Purshia tridentata*) with some creeping juniper (*Juniperus communis*), bearberry (*Arctostaphylos uva-ursi*), and Fendler's ceanothus (*Ceanothus fendleri*). Flatter areas with deeper soils have more grassland openings with mountain muhly (*Muhlenbergia montana*) and Parry's oatgrass (*Danthonia parryi*). Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*) are co-dominant or dominant on north-facing slopes, which also have denser shrub cover of waxflower (*Jamesia americana*) and Rocky Mountain maple (*Acer glabrum*). In the steepest areas of the south-facing slopes there is little soil development and ponderosa pine are very stunted and sparse; these areas primarily support bitterbrush shrubland habitat. The ridgelines and rocky tors of the North St. Vrain watershed support one of the two highest concentrations of known Larimer aletes (*Aletes humilis*) locations in the world. This species is narrowly endemic to Silver Plume granite in the montane zone of the Colorado Front Range. Larimer aletes thrives in the shallow, gravelly surface soils around rock outcrops. This habitat also supports Rocky Mountain cinquefoil (*Potentilla rupincola*), although only hybrid specimens (*P. rupincola x P. effusa*) are known from the area. North St. Vrain Creek and its tributaries support well-developed montane riparian vegetation that is a mosaic of woodlands, shrublands, and wet meadows. The banks of the high energy reaches support dense shrublands dominated by river birch (*Betula occidentalis*). Alder (*Alnus incana*) and hazelnut (*Corylus cornuta*) are common to codominant in places. The riparian tree canopy is sporadic due to the well-developed shrub layer and steep valley slopes. Narrowleaf cottonwood (*Populus angustifolia*) provides

moderate, but consistent cover, especially in lower reaches. Engelmann spruce (*Picea engelmannii*) occurs in upper reaches. The presence of *Picea engelmannii* in this reach of the North St. Vrain may be attributed to the steep walls of the North St. Vrain Canyon, which create a cool climate at the canyon floor and may allow for cold-tolerant *Picea engelmannii* to thrive at lower elevations. Tributary drainages support saturated willow carrs in open, but narrow valleys. These communities are dominated by tall willows (2-5 m tall) interspersed with short willows (1-2 m tall), open sedge and grass inclusions, and open water beaver ponds. Scattered throughout this upper North St. Vrain drainage are small, isolated glacial pothole ponds. These have no outflow, but are possibly spring-fed in addition to having surface flow inputs. These ponds support pondweeds (*Potamogeton natans*) and water starwort (*Callitriche* spp.), and green algae like chara. The ponds have narrow rings of emergent marsh vegetation including mannagrass (*Glyceria borealis*), beaked sedge (*Carex utriculata*), and spikerushes (*Eleocharis* species). There are old roads and a few isolated cabins within the site.

**Key Environmental Factors:** Montane elevation zone; Silver Plume granite; moderate to high gradient stream drainages.

**Land Use History:** Small portions of the site were former ranches; there is evidence of past human activity, including the remains of old structures, a watering pond for cattle, and old road grades

**Biodiversity Significance Rank Comments (B2):** This site includes excellent (A-ranked) occurrences of Larimer aletes (*Aletes humilis*), a globally rare (G2G3/S2S3) plant species, a good (B-ranked) occurrence of wavy-leaf stickleaf (*Nuttallia sinuata*), a globally vulnerable (G3/S2) plant, and a good to fair (BC-ranked) occurrence of the globally imperiled (G2/S2) Rocky Mountain cinquefoil (*Potentilla rupincola*). In addition, there is an excellent (A-ranked) occurrence of globally imperiled (G2/S2) bitterbrush / mountain muhly (*Purshia tridentata / Muhlenbergia montana*) shrubland, an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) Parry's oatgrass (*Danthonia parryii*) meadow, an excellent (A-ranked) occurrence of a globally vulnerable (G3/S2) *Betula occidentalis* / mesic graminoid riparian shrubland, an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) *Populus angustifolia / Betula occidentalis* riparian forest, a good (B-ranked) occurrence of a globally vulnerable (G3/S3) thinleaf alder (*Alnus incana*) - mixed willow (*Salix* (*monticola, lucida, ligulifolia*)) shrubland and a good (B-ranked) occurrence of globally rare (G3/S3) montane riparian willow carr (*Salix monticola* / mesic graminoids). There are also several elements significant to Colorado. These include excellent (A-ranked) and good (B-ranked) occurrences of the state rare (G3G5/S3) ponderosa pine / bitterbrush (*Pinus ponderosa / Purshia tridentata*) woodland, two excellent (A-ranked) occurrences of the state imperiled (G5/S1) floating pondweed (*Potamogeton natans*) marsh, a good (B-ranked) occurrence of a state vulnerable (G5/S3) *Salix geyeriana / Calamagrostis canadensis* montane riparian willow carr and an extant occurrence of the state imperiled

(G5/S1) lake chub (*Couesius plumbeus*).

Natural Heritage element occurrences at the North Saint Vrain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Fish | Couesius plumbeus | Lake Chub | G5 | S1 | | SE | USFS | E | 1989-09-17 |
| Natural Communities | Purshia tridentata / Muhlenbergia montana Shrubland | Mixed Foothill Shrublands | G2 | S2 | | | | A | 2007-09-05 |
| Natural Communities | Alnus incana - Salix (monticola, lucida, ligulifolia) Shrubland | Thinleaf Alder - Mixed Willow Species | G3 | S3 | | | | B | 2007-09-18 |
| Natural Communities | Betula occidentalis / Mesic Graminoids Shrubland | Lower Montane Riparian Shrublands | G3 | S2 | | | | A | 2007-09-18 |
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | A | 2007-08-21 |
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | A | 2007-09-06 |
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | A | 2007-07-24 |
| Natural Communities | Populus angustifolia / Betula occidentalis Woodland | Montane Riparian Forest | G3 | S3 | | | | A | 2007-09-05 |
| Natural Communities | Salix monticola / Mesic Graminoids Shrubland | Montane Riparian Willow Carr | G3 | S3 | | | | B | 2007-09-11 |
| Natural Communities | Pinus ponderosa / Purshia tridentata Woodland | Foothills Ponderosa Pine Scrub Woodlands | G3G5 | S3? | | | | A | 2007-08-21 |
| Natural Communities | Pinus ponderosa / Purshia tridentata Woodland | Foothills Ponderosa Pine Scrub Woodlands | G3G5 | S3? | | | | B | 2007-08-22 |
| Natural Communities | Salix geyeriana / Calamagrostis canadensis Shrubland | Montane Riparian Willow Carr | G5 | S3 | | | | B | 2007-08-16 |

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Potamogeton natans Herbaceous Vegetation | Montane Floating / Submergent Wetland | G5? | S1 | | | | A | 2008-07-25 |
| Vascular Plants | Potentilla rupincola | Rocky Mountain cinquefoil | G2 | S2 | | | USFS | BC | 2007-09-06 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | A | 2007-09-06 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | A | 1996-08-03 |
| Vascular Plants | Nuttallia sinuata | wavy - leaf stickleaf | G3 | S2 | | | | B | 2007-09-05 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the elements and their adjacent habitats. The entire area includes many of the ecological processes necessary for the site protection.

**Protection Urgency Rank Comments (P4):** The majority of the site is on USFS land. The remainder of the site is comprised of clusters of private land. Much of the eastern portion of the canyon is part of the North St. Vrain Research Natural Area, an area of National Forest specially designated, protected, and maintained in natural condition.

**Management Urgency Rank Comments (M3):** Most activity is camping, hunting, and hiking. Attention to weeds would help reduce the risks of nonnative species further into this site. Non-native pasture grasses are present in areas historically grazed. Dalmatian toadflax (*Linaria dalmatica*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), common mullein (*Verbascum thaspus*), myrtle spurge (*Euphorbia myrsinites*) and cheatgrass (*Bromus tectorum*) are present in the canyon. Private land to the west, northwest, and southwest have been subdivided.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/31/2008

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Map Date: 10/29/2008

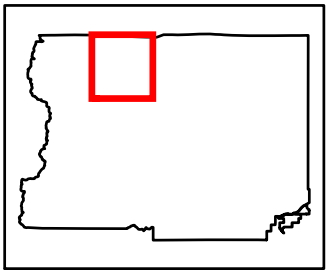
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



North Saint Vrain Potential Conservation Area, B2: Very High Biodiversity Significance

# Shanahan Grassland

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Eldorado Springs, Louisville

**Size:** 3,316 acres (1,342 ha) **Elevation:** 5,600 - 6,000 ft. (1,707 - 1,829 m)

**General Description:** This site is at the toeslope of the Flatirons and west and south of Boulder residential neighborhoods. The site contains the small hogbacks (Morrison Formation and Dakota sandstone) just east of the Flatirons (Fountain Formation) and the adjacent terraces, colluvium, and outwash (Rocky Flats, Slocum, and Verdos Alluvium; Quaternary). The outwash skirt off the Flatirons supports ponderosa pine (*Pinus ponderosa*) savanna that transitions to open grassland farther from the immediate slope of the mountain front. The savanna is comprised of dense patches of young ponderosa pine with considerable regeneration forming a tall shrub layer. Short shrubs are sporadic in the understory; skunkbush (*Rhus trilobata*) is most common and mountain mahogany (*Cercocarpus montanus*) and woods rose (*Rosa woodsii*) are also frequent. Graminoids dominate the understory, with needle-and-thread (*Hesperostipa comata*), prairie dropseed (*Sporobolus heterolepis*), big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), porcupine grass (*Hesperostipa spartea*), and native bluegrass (*Poa agassizensis*) commonly occurring. Rocky Mountain sedge (*Carex saximontana*) occurs as well. Forb richness is very high in the savanna and includes prairie relict species like birds foot violet (*Viola pedatifida*), dwarf indigo (*Amorpha nana*), hoary frostweed (*Crocanthemum bicknellii*), and New Jersey tea (*Ceanothus herbaceus*). As the tree canopy dwindles, the grassland becomes dominant and big bluestem (*Andropogon gerardii*), indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), switchgrass (*Panicum virgatum*), needle-and-thread (*Hesperostipa comata*), and western wheatgrass (*Pascopyrum smithii*) are common and abundant. Drainage gulches contains scrubby vegetation, like skunkbush, hackberry (*Celtis occidentalis*), snowberry (*Symphoricarpos*), cat briar (*Smilax lasioneuron*) with understory forbs such as geranium (*Geranium caespitosum*), wild licorice (*Glycyrrhiza lepidota*), Mexican hat (*Ratibida columnifera*), wavy-leaved thistle (*Cirsium undulatum*), and beebalm (*Monarda fistulosa*). Pockets of wet meadow vegetation occur in the drainages, some of which support northern leopard frog (*Rana pipiens*). Ute's ladies-tresses (*Spiranthes diluvialis*) are also present. This grassland mosaic supports several rare butterflies. Similarly it has a rich ground-nesting bird community including dense populations of Grasshopper Sparrows (*Ammodramus savannarum*), Vesper Sparrows (*Pooecetes gramineus*), Meadowlarks (*Sterna neglecta*), and Ovenbird (*Seiurus aurocapillus*). Although more common elsewhere in the state, this site offers significant edge-of-range habitat that is important for the persistance of the breadth of genetic

variability for these species. The site is also utilized by fringed myotis (*Myotis thysanodes*) and there is a portion of a Preble's meadow jumping mouse (*Zapus hudsonius preblei*) occurrence within the boundary.

**Climate Description:** Annual precipitation is 15-20 inches. Mean annual air temperature is 48-52 degrees F., and the frost-free season is about 140-155 days.

**Land Use History:** Livestock grazing and fire suppression have been important influences on the composition of these grasslands and encroaching ponderosa pine savanna.

**Biodiversity Significance Rank Comments (B2):** This site supports a good (B-ranked) occurrence of a globally imperiled (G2/S2?) *Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii* foothills ponderosa pine scrub woodland. In addition, there are good (B-ranked) occurrences of rare skippers including the globally vulnerable (G3G4/S2) Ottoe skipper (*Hesperia ottoe*), the globally vulnerable (G3/S2) Arogos skipper (*Atrytone arogos*) and the state rare (G5/S3) cross-line skipper (*Polites origenes*). An extant occurrence of the globally vulnerable (G3/S1) regal fritillary (*Speyeria idalia*) was documented in 1997, but monitoring is needed confirm the presence of a colony. Known plant occurrences include a fair (C-ranked) occurrence of the state rare (G5/S2) prairie violet (*Viola pedatifida*), a fair (C-ranked) occurrence of the state rare (G5/S2S3) dwarf wild indigo (*Amorpha nana*), a fair (C-ranked) occurrence of the state rare (G4G5/S2) narrow-leaved milkweed (*Asclepias stenophylla*) and an extant occurrence of the state rare (G5/S2) frostweed (*Crocanthemum bicknellii*).

Natural Heritage element occurrences at the Shanahan Grassland PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Insects | Atrytone arogos | Arogos Skipper | G3 | S2 | | | | B | 1997-07-18 |
| Insects | Speyeria idalia | Regal Fritillary | G3 | S1 | | | USFS | E | 1997-07-18 |
| Insects | Hesperia ottoe | Ottoe Skipper | G3G4 | S2 | | | USFS | B | 1997-07-18 |
| Insects | Polites origenes | Cross - line Skipper | G5 | S3 | | | | B | 1997-07-18 |
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | B | 2007-08-27 |
| Vascular Plants | Asclepias stenophylla | narrow - leaved milkweed | G4G5 | S2 | | | | C | 2007-06-29 |
| Vascular Plants | Asclepias stenophylla | narrow - leaved milkweed | G4G5 | S2 | | | | H | 1984-07-08 |
| Vascular Plants | Amorpha nana | dwarf wild indigo | G5 | S2S3 | | | | C | 2007-08-27 |
| Vascular Plants | Crocanthemum bicknellii | frostweed | G5 | S2 | | | | E | 1994-06-22 |
| Vascular Plants | Viola pedatifida | prairie violet | G5 | S2 | | | | C | 1990-05-04 |
| Vascular Plants | Viola pedatifida | prairie violet | G5 | S2 | | | | E | 2002-06-27 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Boundaries include all adjacent areas of suitable grassland habitat and drainages. Includes occurrences and a buffer into adjacent grassland and other community types.

**Protection Urgency Rank Comments (P5):** Protected as designated open space area. Portions of the site are within designated state natural areas (Colorado Tallgrass Prairie and Boulder Mountain Park). NCAR manages greater than 400 acres of the site.

**Management Urgency Rank Comments (M3):** This site receives high recreational use by the public; maintaining a proper balance between protection and use is difficult. The ground-nesting birds are sensitive to disturbance, seasonal trail

closures will protect avian biodiversity. This site has a dense trail network with some redundancy; consider closing some trails to maintain larger blocks of unfragmented and undisturbed grassland habitat. Ponderosa pine is showing a tendency to encroach onto previously open light prairie habitat; this will impact the grassland habitat, such as altering soil composition such that the native grasses and forbs can no longer flourish, and thus impacting the habitat suitability for ground-nesting birds and grassland butterflies. Noxious and exotic weed infestations seriously threaten the ecological integrity of the area. Species include Dalmatian toadflax (*Linaria dalmatica*), myrtle spurge (*Euphorbia myrsinites*), scotch thistle (*Onopordium acanthium*), sulfure cinquefoil (*Potentilla recta*), musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), chicory (*Cichorium intybus*), bladder senna (*Coletea arborescens*), tall oatgrass (*Arrhenatherum elatius*), St. Johnswort (*Hypericum perforatum*), jointed goatgrass (*Aegilops cylindrica*), Russian olive (*Elaeagnus angustifolia*), Canada thistle (*Cirsium arvensis*), teasel (*Dipsacus fullonum*), and many others. Addressing these infestations will facilitate improving the ecological health of the grasslands and savanna.

**Exotic Species Comments:** Exotics include Dalmatian toadflax (*Linaria dalmatica*), myrtle spurge (*Euphorbia myrsinites*), scotch thistle (*Onopordium acanthium*), sulfure cinquefoil (*Potentilla recta*), musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), chicory (*Cichorium intybus*), bladder senna (*Coletea arborescens*), tall oatgrass (*Arrhenatherum elatius*), St. Johnswort (*Hypericum perforatum*), jointed goatgrass (*Aegilops cylindrica*), Russian olive (*Elaeagnus angustifolia*), Canada thistle (*Cirsium arvensis*), and teasel (*Dipsacus fullonum*).

**Off-Site Considerations:** Northeast of the site is the Shanahan subdivision. Power line transects area. Housing exists along Boulder Creek to south. Most of the area to the west is designated open space.

**Information Needs:** Need further surveys for butterflies (*Hesperia ottoe* and *Atrytone arogos*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Pineda, P. M., A. R. Ellingson, C. A. Pague. 1997. A systematic inventory for rare and imperiled butterflies on the City of Boulder Open Space and Mountain Parks, and recommendations for their management.

Pineda, Phyllis M. 1996. Field Survey (Butterflies) to the City of Boulder Open Space and Mountain Parks, Larimer County and Cheesman Reservoir. Field Season 1996.

**Version Author:** Neid, S.L.
**Version Date:** 10/31/2008

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Map Date: 11/05/2008

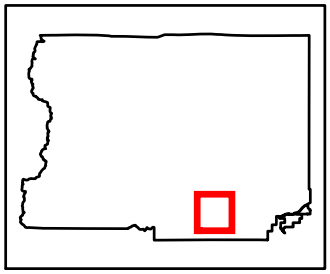
**Legend**

PCA Boundary

Denver West, 39105-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Shanahan Grassland Potential Conservation Area, B2: Very High Biodiversity Significance

# South Boulder Creek

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Niwot, Eldorado Springs, Louisville

**Size:** 3,464 acres (1,402 ha) **Elevation:** 5,266 - 5,679 ft. (1,605 - 1,731 m)

**General Description:** This site encompasses the floodplain of South Boulder Creek and Davidson Mesa, an outwash feature. It occurs narrowly to the west of Highway 93 and widens east of the highway. Bedrock geology is a mosaic of Pierre shale and modern alluvium like Piney Creek and Post-Piney Creek. As is common in floodplains along the foothills there are series of low terraces of the differing alluvium. Vegetation along the creek is dominated by cottonwoods (*Populus deltoides*) and crack willow (*Salix fragilis*). Shrub development is variable; there are dense copses of coyote willow (*Salix exigua*), alder (*Alnus incana*), hawthorn (*Crataegus* spp.), and vines like river grape (*Vitis riparia*). Wet and mesic meadow vegetation occurs within the floodplain. Tallgrasses like big bluestem (*Andropogon gerardii*), Indian grass (*Sorgastrum nutans*), swichgrass (*Panicum virgatum*), prairie cordgrass (*Spartina pectinata*) are common forming dense stands. Beaked spikerush (*Eleocharis rostellata*) is also present and unusual in this landscape setting. Mesic forbs are likewise common and abundant. Unique forbs in this area include great blue lobelia (*Lobelia siphilitica*), winged lythrum (*Lythrum alatum*), and slender false foxglove (*Agalinis tenuifolia*). Irrigated hay fields support an extensive bobolink (*Dolichonyx oryzivorus*) community. Floodplain pools are northern leopard frog (*Rana pipiens*) habitat. This floodplain supports federally listed species including Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and Ute ladies' tresses (*Spiranthes diluvialis*). It also has populations of eastern relictual species like American groundnut (*Apios americana*) and toothcup (*Rotala ramosior*). Davidson Mesa supports prairie relict species like dwarf indigo (*Amorpha nana*) and tall grass grasslands. It also has a prairie dog (*Cynomys ludoviciana*) colony with burrowing owl (*Athene cunicularia*), and an occurrence of the forktip three-awn grass (*Aristidia basiramea*). The western portion of the site supports part of a narrow-leaved milkweed (*Asclepias stenophylla*) occurrence. There is a significant amount of Russian olive (*Elaeagnus angustifolia*) and other noxious and exotic weeds in area.

**Key Environmental Factors:** Floodplain, Quaternary alluvium

**Biodiversity Significance Rank Comments (B2):** Biodiversity rank is based on an excellent to good (AB-ranked) occurrence of the globally imperiled (G2/S2) Ute ladies' tresses (*Spiranthes diluvialis*) and a good (B-ranked) occurrence of the globally

imperiled (G2?/S2) xeric tallgrass prairie (*Andropogon gerardii - Schizachyrium scoparium*). The site also supports a fair (C-ranked) occurrence of the globally imperiled (G2/S1S2) mesic tallgrass prairie (*Andropogon gerardii - Sorghastrum nutans*) and a good to fair (BC-ranked) occurrence of the globally vulnerable (G3?/S3) prairie slough grass (*Spartina pectinata*).

Natural Heritage element occurrences at the South Boulder Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Mammals | Zapus hudsonius preblei | Meadow Jumping Mouse Subsp | G5T2 | S1 | LT | ST | | C | 1999-07-10 |
| Natural Communities | Andropogon gerardii - Sorghastrum nutans Western Great Plains Herbaceous Vegetation | Mesic Tallgrass Prairie | G2 | S1S2 | | | | B | 2007-08-28 |
| Natural Communities | Andropogon gerardii - Schizachyrium scoparium Western Great Plains Herbaceous Vegetation | Xeric Tallgrass Prairie | G2? | S2 | | | | B | 2007-08-28 |
| Natural Communities | Spartina pectinata Western Herbaceous Vegetation | Prairie Slough Grass | G3? | S3 | | | | BC | 2007-09-10 |
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | AB | 2007-99-99 |
| Vascular Plants | Apios americana | American groundnut | G5 | S1 | | | | | 2000-08-03 |
| Vascular Plants | Apios americana | American groundnut | G5 | S1 | | | | C | 2000-08-07 |
| Vascular Plants | Apios americana | American groundnut | G5 | S1 | | | | B | 2000-08-03 |
| Vascular Plants | Apios americana | American groundnut | G5 | S1 | | | | C | 2000-08-03 |
| Vascular Plants | Aristida basiramea | forktip three - awn | G5 | S1 | | | | E | 2007-12-05 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to include all occurrences within

the area and all adjacent habitat. The area is dissected by US 36 and Colorado 93. Note that upstream areas are important to the long term viability of this site through the management of hydrological processes.

**Protection Urgency Rank Comments (P3):** The majority of this site is owned or managed by City of Boulder Open Space and Mountain Parks with limited public access (dogs not allowed). The remainder is in private ownership. The western portion of the site is part of a designated state natural area.

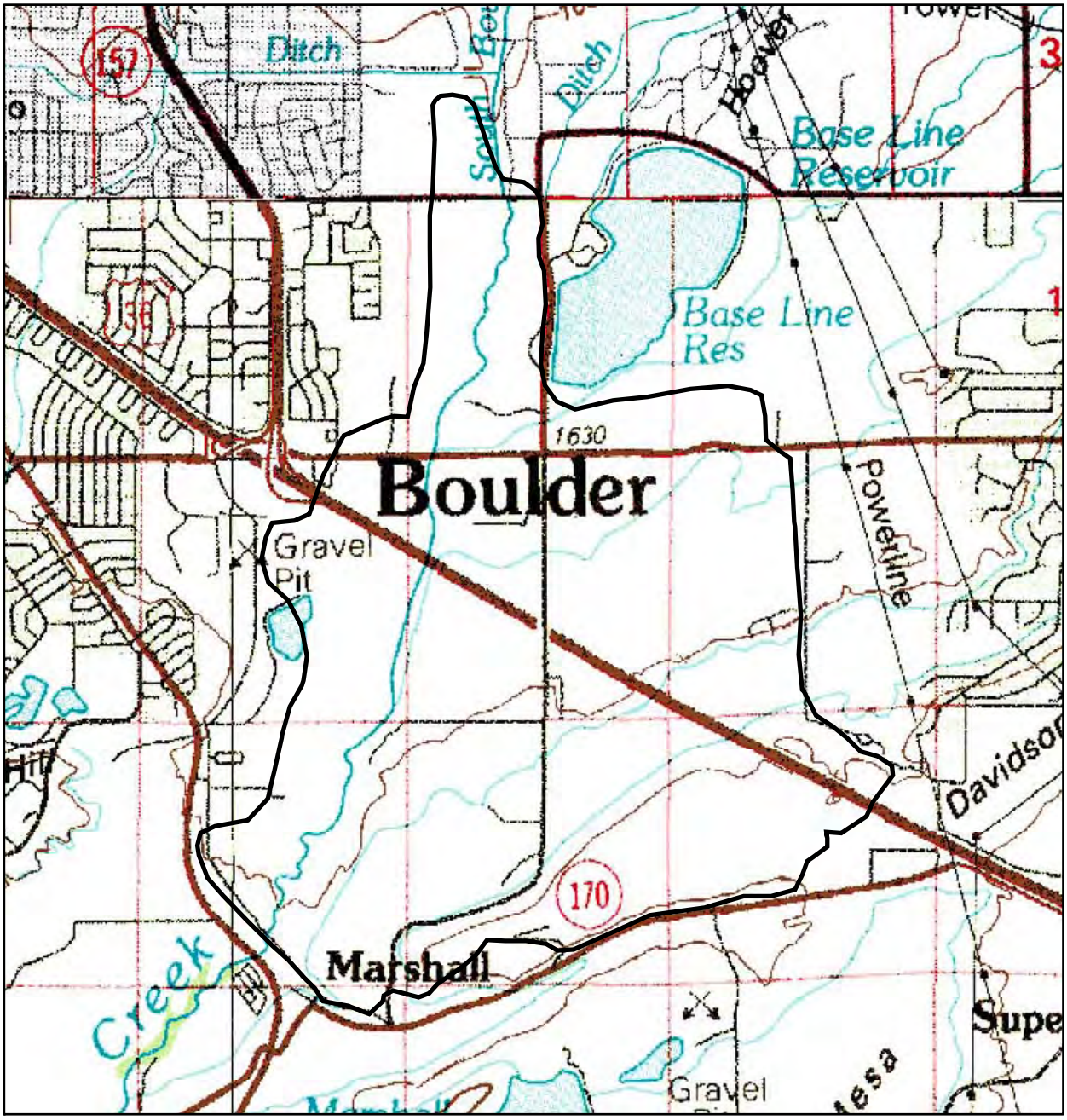
**Management Urgency Rank Comments (M3):** Noxious and exotic species are prevalent in this site and compromise the ecological integrity of the rare biodiversity elements. Species like Russian olive (*Elaeagnus angustifolia*), bull thistle (*Cirsium vulgare*), Scotch thistle (*Onopordium acanthium*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvensis*), chicory (*Cichorium intybus*), houndstongue (*Cynoglossum officianale*), teasel (*Dipsacus fullonum*), burdock (*Arctium minus*), myrtle spurge (*Euphorbia myrsinites*), diffuse knapweed (*Centaurea diffusa*), and sulfur cinquefoil (*Potentilla recta*) co-occur with rare species. There are many other exotic species and horticultural escapees. Continuing to employ grazing management to address weed infestations may reduce this threat. A heavily used walking/hiking trail exists within the site; limiting use to on-trail only will prevent trampling of the rare plants, and will minimize disturbance of zoological species. The land has been leased for agricultural purposes since its inclusion as City of Boulder Open Space land in 1978. Hay is harvested in winter and portions of the site are grazed in the winter. Grazing management that prevents impact to plant community structure (*i.e.*, monitor grazing impacts to shrubs) will maintain the habitat for rare species.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Pague, C.A.

**Version Date:** 09/12/1994

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Map Date: 11/05/2008

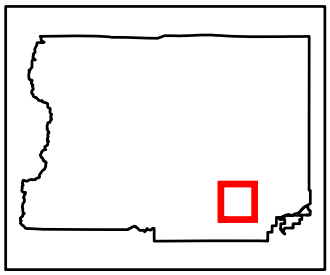
## Legend

PCA Boundary

Denver West, 39105-E1
Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



South Boulder Creek Potential Conservation Area, B2: Very High Biodiversity Significance

# South Saint Vrain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Raymond, Lyons

**Size:** 1,806 acres (731 ha)

**General Description:** Exposed gravelly ridges of Silver Plume Granite within the South St. Vrain Canyon support mixed conifer woodlands and shrublands. Much of the site supporting the rare Larimer aletes *(Aletes humilis*) is bare ground with small amounts of woodland, shrubland, forbs and mosses. Other common species in the site include ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), common juniper (*Juniperus communis*) and cliffbush (*Jamesia americana*). Fruticose lichen was noted on the gravel in some areas.

**Biodiversity Significance Rank Comments (B2):** The site supports excellent (A-ranked) and good (B-ranked) occurrences of a globally imperiled (G2G3/S2S3) plant, Larimer aletes (*Aletes humilis*) and a fair (C-ranked) occurrence of the globally vulnerable (G3/S2) wavy-leaf stickleaf (*Nuttallia sinuata*).

Natural Heritage element occurrences at the South Saint Vrain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | A | 2003-06-26 |
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | B | 2007-06-27 |
| Vascular Plants | Nuttallia sinuata | wavy - leaf stickleaf | G3 | S2 | | | | C | 2007-06-27 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to protect the occurrences and surrounding similar habitat. There is unsurveyed habitat within and outside of the site boundary.

**Protection Urgency Rank Comments (P4):** Most of the site is within the Roosevelt National Forest but private inholdings are also included. There is no evidence of threats or disturbance. Existing ownership appears to provide adequate protection. The steep barren slopes upon which the Larimer aletes grows provides some natural

protection for the plant.

**Management Urgency Rank Comments (M4):** Context within Forest Service Management plan is unknown. Light to moderate 4WD vehicle use and limited dispersed camping occur within USFS lands. The plants grow primarily on cliffs so there are not many threats. At least in the eastern portion of the site, there is no grazing and no trails and public access is extremely limited. The rank could change if impacts from Calwood Ranch and the Environmental Center begin to threaten the quality of the occurrences.

**Information Needs:** More habitat exists along the ridgetop which should be surveyed for *A. humilis*.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Scully, R.W. and M.J. Howell. 1993. Field Surveys.

Van Huysen, T. and L. Cavaille. 2003. USFS field surveys.

**Version Author:** Doyle, G.A.

**Version Date:** 12/22/2005

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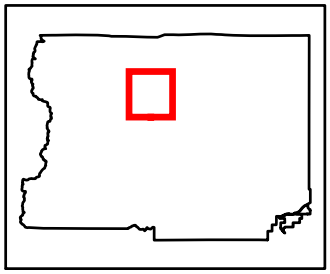
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



South Saint Vrain Potential Conservation Area, B2: Very High Biodiversity Interest

# Springdale

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Boulder

**Size:** 105 acres (42 ha) **Elevation:** 8,040 - 8,080 ft. (2,451 - 2,463 m)

**General Description:** The site includes outcrops of Silver Plume Granite, pine forests, and meadow openings. Associated species include branched cinquefoil (*Potentilla effusa*), stemless aletes (*Aletes acaulis*), *Ciliaria,* buckwheat (*Eriogonum*), Douglas-fir (*Pseudotsuga menziesii*), ponderosa and limber pines (*Pinus ponderosa* and *P. flexilis*), cliffbush (*Jamesia*), currant (*Ribes*), and alumroot (*Heuchera*).

**Biodiversity Significance Rank Comments (B2):** The site supports an excellent (A-ranked) occurrence of a globally rare (G2G3/S2S3) plant species, Larimer aletes (*Aletes humilis*).

Natural Heritage element occurrences at the Springdale PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Aletes humilis | Larimer aletes | G2G3 | S2S3 | | | | A | 1996-06-02 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The site includes the occurrence surrounded by similar habitat to act as a buffer against direct disturbance. The boundary is taken to the top of the cliffs to protect from erosion.

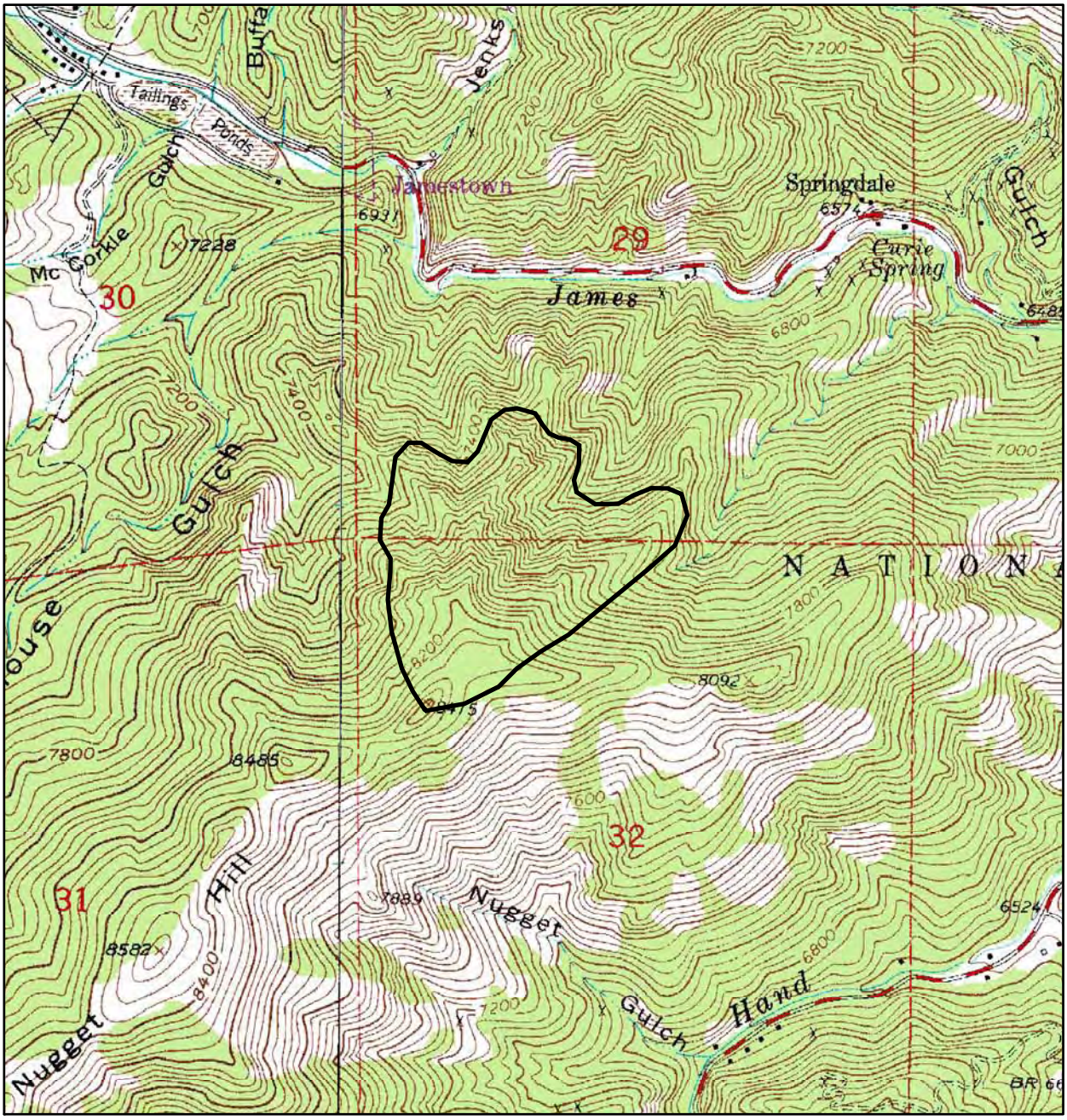
**Protection Urgency Rank Comments (P4):** Site is located in Roosevelt National Forest, and no protection needs are expected at this time.

**Management Urgency Rank Comments (M4):** No threats were reported at the site.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Fayette, K.K.
**Version Date:** 02/04/1997

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## Legend

PCA Boundary

Boulder, 40105-A3

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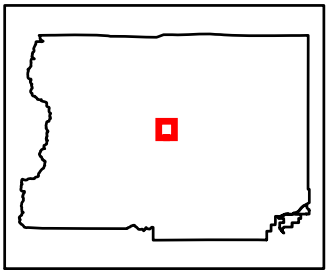
Location in Boulder County



Springdale Potential Conservation Area, B2: Very High Biodiversity Interest

# Steamboat Mountain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Pinewood Lake, Lyons

**Size:** 773 acres (313 ha) **Elevation:** 5,545 - 6,152 ft. (1,690 - 1,875 m)

**General Description:** Steamboat Mountain is the southern end of a long hogback that is separated from the northern section via movement along geologic fault lines to the north. It is separated from adjacent sections of the hogback to the south by downcutting from the North St. Vrain River, forming a gap. Steamboat Mountain has significant west-facing cliffs that harbor raptor nests and activity. The west-facing slopes of the hogback are dominated by mountain mahogany (*Cercocarpus montanus*) shrublands. There are small areas of talus and grassland that punctuate the hillslope. The graminoid understory of the shrubland shifts with elevation and bedrock geology; needle-and-thread (*Hesperostipa comata*) is characteristic along the toeslope in Quaternary deposits, New Mexico feathergrass (*Hesperostipa neomexicana*) and Scribner needlegrass (*Achnatherum scribneri*) are dominant at midslope on Fountain Formation, and wildrye (*Elymus albicans*) is characteristic above the latter and tends to occur on Ingleside Formation. Forbs are somewhat diverse but sparse in the mountain mahogany shrublands. Ponderosa pine (*Pinus ponderosa*) savanna occupies the toeslope of the west-facing aspect as well as the ridgetop and east-facing side of the hogback.There is a state highway and county road at the base of the slope on the west side with some residential development and there is quarrying activity and minor development on the east-facing slope. The area is a movement corridor for wildlife. The quarries have some water source value for wildlife.

**Key Environmental Factors:** Lower montane-foothills elevation zone; sandstone bedrock geology.

**Biodiversity Significance Rank Comments (B2):** This site is drawn for a good to fair (BC-ranked) occurrence of a globally imperiled (G2/S2?) ponderosa pine / mountain mahogany / big bluestem (*Pinus ponderosa* / *Cercocarpus montanus* / *Andropogon gerardii*) foothills ponderosa pine scrub woodland, an excellent to good (AB-ranked) occurrence of the globally imperiled (G2G3/S2S3) mountain mahogany / New Mexico feathergrass (*Cercocarpus montanus* / *Hesperostipa neomexicana*) foothills shrubland, and a good (B-ranked) occurrence of a state rare (GU/S3) mountain mahogany / Griffith's wheatgrass (*Cercocarpus montanus* / *Elymus lanceolatus* ssp. *lanceolatus*) foothills shrubland.

Natural Heritage element occurrences at the Steamboat Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii Wooded Herbaceous Vegetation | Foothills Ponderosa Pine Scrub Woodlands | G2 | S2? | | | | BC | 2008-07-14 |
| Natural Communities | Cercocarpus montanus / Hesperostipa neomexicana Shrubland | Foothills Shrubland | G2G3 | S2S3 | | | | AB | 2008-07-14 |
| Natural Communities | Cercocarpus montanus / Elymus lanceolatus ssp. lanceolatus Shrubland | Mountain Mahogany / Griffith's Wheatgrass Shrubland | GU | S3 | | | | AB | 2008-07-14 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes a landscape mosaic of ponderosa pine (*Pinus ponderosa*) savanna and mountain mahogany (*Cercocarpus montanus*) shrublands, and grassland meadows that contain the element occurrences and adjacent suitable habitat.

**Protection Urgency Rank Comments (P4):** The site is partially managed by Boulder County Parks and Open Space, and is managed primarily for wildlife although a public trail will likely be constructed in the future.

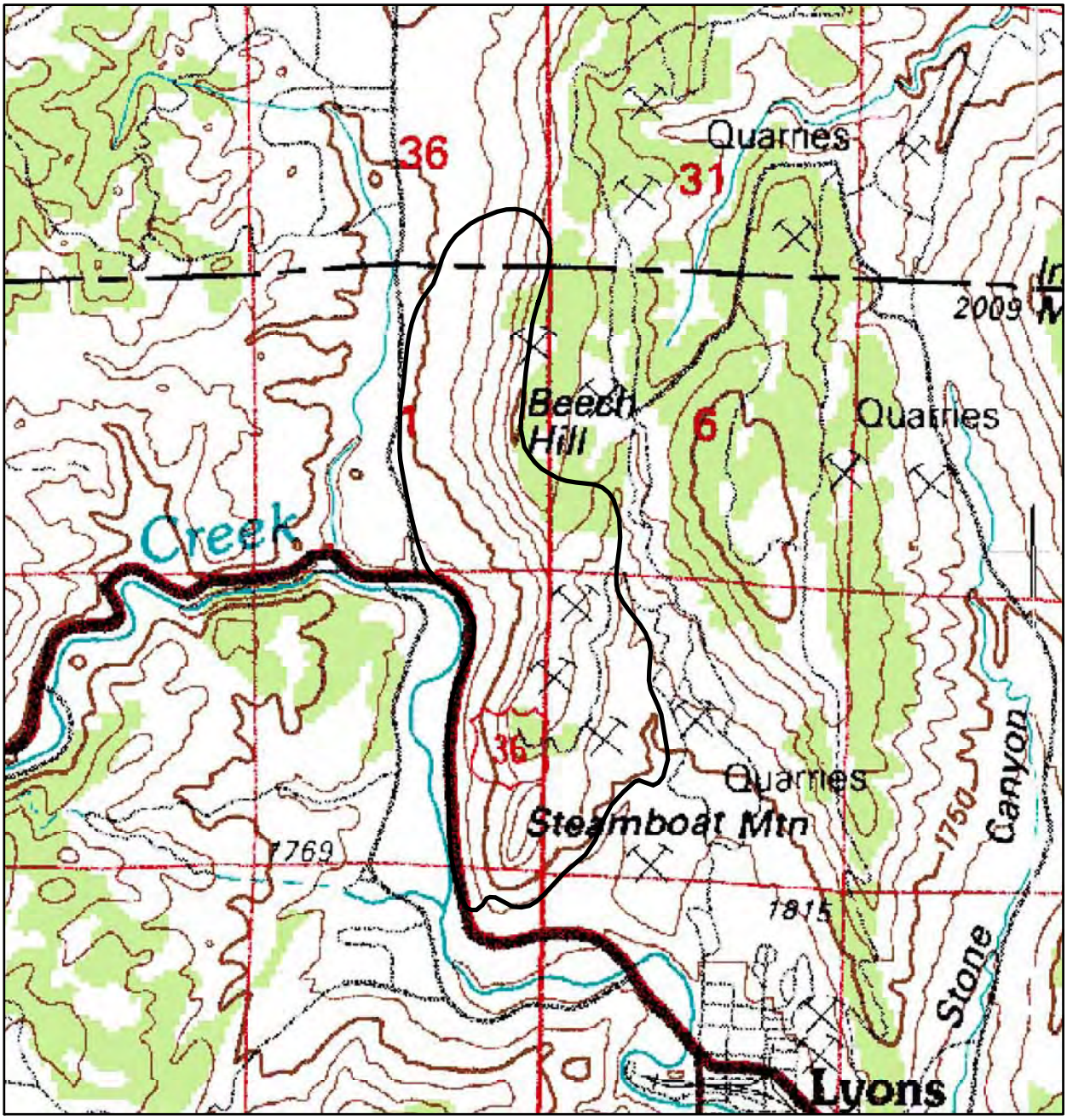
**Management Urgency Rank Comments (M3):** There is some weed establishment within and anthropogenic landscape alteration adjacent to this site. Exotic weeds include cheatgrass (*Bromus tectorum*), Jim Hill mustard (*Sisymbrium altissimum*), and flixweed (*Descurainea sophia*). Grazing management (by goats or sheep) may be able to stem the extent of weed infestation.

**Exotic Species Comments:** Exotics include cheatgrass (*Bromus tectorum*), Jim Hill mustard (*Sisymbrium altissimum*), and flixweed (*Descurainea sophia*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.
**Version Date:** 10/17/2008

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Map Date: 11/02/2008

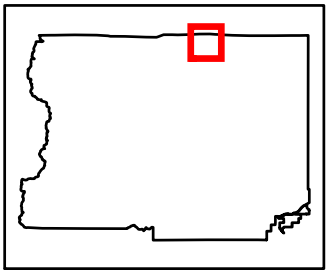
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Steamboat Mountain Potential Conservation Area, B2: Very High Biodiversity Significance

# Table Mountain

**Biodiversity Rank - B2: Very High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Niwot, Hygiene, Lyons, Boulder

**Size:** 2,075 acres (840 ha) **Elevation:** 5,348 - 5,545 ft. (1,630 - 1,690 m)

**General Description:** The site is a large mesa rising out of the broad, flat Denver Basin abutting the foothills of the Front Range. It is the largest of several landforms (hills and mesas) that punctuate the basin locally. The bedrock of Table Mountain is Pierre Shale capped with Quaternary alluvium (Verdos), which formed as a broad veneer over the flat shale pediments. The top of the mesa is covered by mid-height grassland. The sideslopes below the mesa top are generally steep and erodible with several areas of sparsely-vegetated shale barrens. The grassland is predominantly characterized by needle-and-thread (*Hesperostipa comata*) with areas codominated by big bluestem (*Andropogon gerardii*) and western wheatgrass (*Pascopyrum smithii*). Threadleaf sedge (*Carex filifolia*) and little bluestem (*Schizachyrium scoparium*) occasionally occur. The grassland has a patchy expression with large areas obscured by abundant weeds like cheatgrass (*Bromus tectorum*), Canada bluegrass (*Poa compressa*), tarragon (*Artemisia dracunculus*), bindweed (*Convolvulus arvensis*), and other non-native species. Forb diversity is also patchy and diverse, with greater diversity where surface soils tend to have more gravel. Hopi tea greenthread (*Thelesperma megapotamica*), dotted blazing star (*Liatris punctata*), slimflower scurfpea (*Psoralidium tenuiflorum*), wavyleaf thistle (*Cirsium undulatum*), hedgehog cactus (*Echinocereus viridiflorus*), and blanket flower (*Gaillardia aristata*) are common, but infrequent. Additional forb diversity and prevalence of native grasses occurs on slopes below the mesa top although there are different weed issues on these landform positions. Wavy-leaf stickleaf (*Nuttallia sinuata*) occurs in these areas. The top of the mesa is used by the Department of Commerce for experiments with communication antennas and towers. Numerous towers, antennas, and wire arrays are located on the site as are several access roads and structures. Due to the nature of the work done on Table Mountain, the grassland has not been grazed or burned since the Department of Commerce established its experiments. There is a gravel mine at the north end.

**Key Environmental Factors:** Gravelly soils of Verdos Alluvium (Quaternary)

**Biodiversity Significance Rank Comments (B2):** The site supports a good to fair (BC-ranked) occurrence of a globally imperiled (G1G2/S1S2) *Hesperostipa comata* Great Plains mixed grass prairie. This natural community is the largest area of intact grassland in Boulder County. There is also a healthy population of wavy-leaf

stickleaf (*Nuttallia sinuata*), which is globally vulnerable (G3/S2), but the occurrence is not restricted to the mesa.

Natural Heritage element occurrences at the Table Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Hesperostipa comata Colorado Front Range Herbaceous Vegetation | Great Plains Mixed Grass Prairie | G1G2 | S1S2 | | | | BC | 2008-08-15 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Includes the entire top of the mesa and its immediate slopes.

**Protection Urgency Rank Comments (P4):** The majority of this site is owned by the U.S. Department of Commerce, although its long-term future is unknown. It has no public access.

**Management Urgency Rank Comments (M3):** Fire or grazing may be needed with care to the ongoing experiments on site. Currently there is very heavy litter buildup and some invasion by woody species (*Rosa*). Numerous exotics occur on the site including cheatgrass (*Bromus tectorum*), Japanese brome (*B. japonicus*), bindweed (*Convolvulus arvensis*), dalmation toadflax (*Linaria dalmatica*), and others.

**Land Use Comments:** The nature of the experiments and work that occur on site preclude ease of regular management activities for grasslands in this area (grazing, fire).

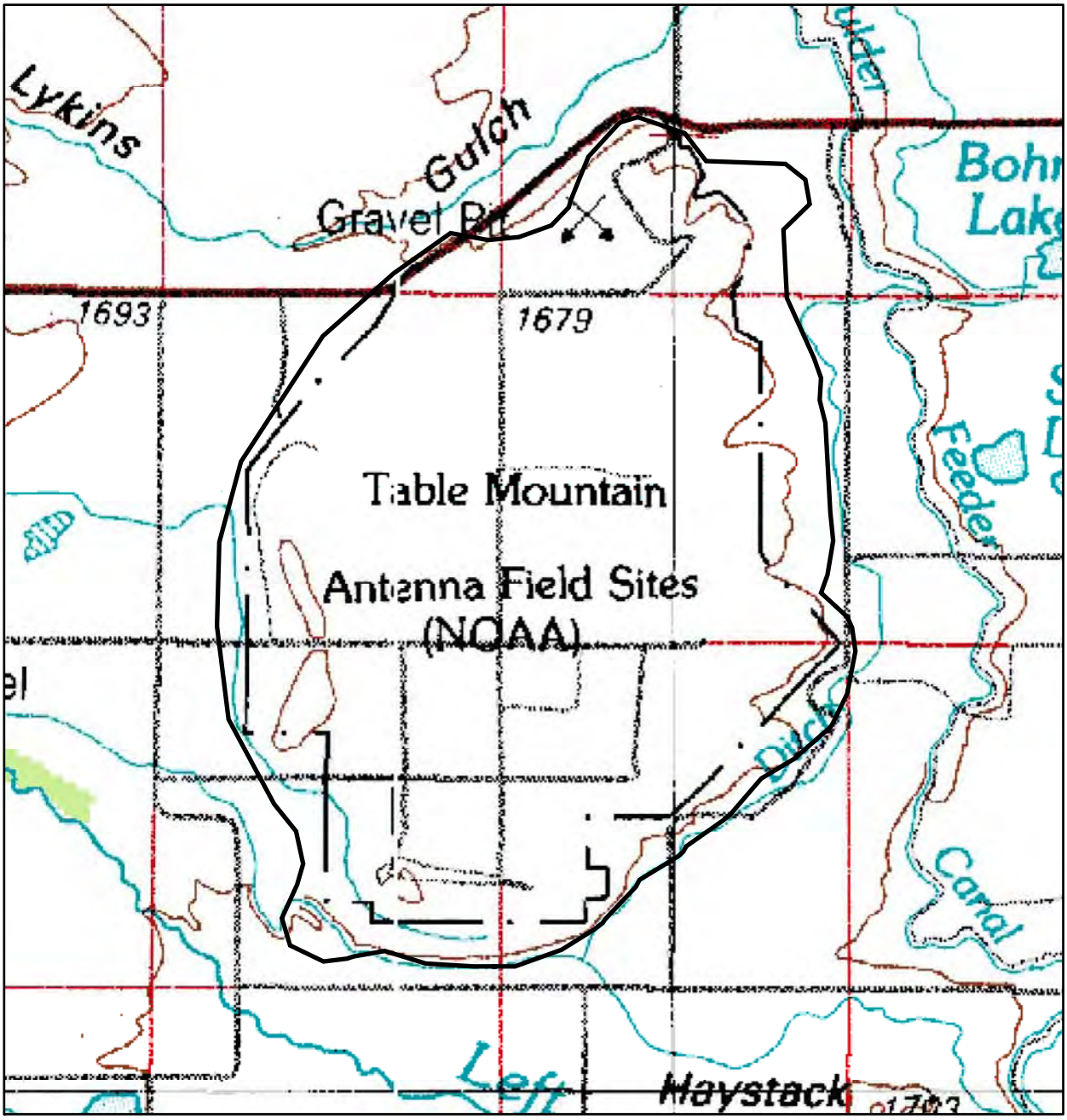
**Exotic Species Comments:** Numerous exotics occur on the site including cheatgrass (*Bromus tectorum*), Japanese brome (*B. japonicus*), bindweed (*Convolvulus arvensis*), dalmation toadflax (*Linaria dalmatica*), and others.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/21/2008

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**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County

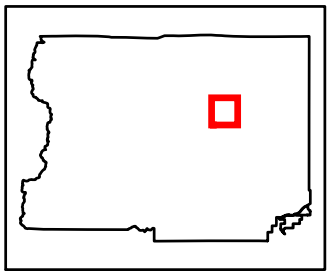


Table Mountain Potential Conservation Area, B2: Very High Biodiversity Significance

# Beaver Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Tungsten, Nederland

**Size:** 813 acres (329 ha) **Elevation:** 8,320 - 9,000 ft. (2,536 - 2,743 m)

**General Description:** This site straddles the boundary between Boulder and Gilpin counties south of Nederland. Beaver Creek originates on the eastern flank of Buckeye Mountain, in Gilpin County about 1.75 miles south of the town of Eldora. The creek flows in a generally eastward direction to its confluence with South Boulder Creek some 2.5 miles east of the site. The site encompasses Beaver Creek and the surrounding slopes in the area north of Los Lagos Reservoirs. Beaver Creek flows into the site within a narrow and moderately steep-walled valley. In this stretch, quaking aspen (*Populus tremuloides*) forms a consistent canopy of 40% cover over a dense layer of tall shrubs. Thinleaf alder (*Alnus incana*) dominates the tall shrub layer, which also included Drummond's willow (*Salix drummondiana*), Rocky Mountain maple (*Acer glabrum*), Bebb willow (*Salix bebbiana*), and many other woody species. The understory is a lush mix of graminoids and forbs dominated by bluejoint reedgrass (*Calamagrostis canadensis*), cowparsnip (*Heracleum maximum*), fowl mannagrass (*Glyceria striata*), and horsetail (*Equisetum arvense*). A moist moss carpet covers 20-30% of the understory and includes *Plagiomnium ellipticum, Climacium dendroides,* and *Brachythecium* spp. The riparian vegetation is 131 ft - 197 ft (40-60 m) wide and overhangs the creek, creating a cool, shaded corridor filled with native species. Continuing to the northeast, Beaver Creek is joined by an un-named tributary and flows through a more open valley. Here the riparian community is a mix of willow species, both tall and short. The stand is primarily dominated by park willow (*Salix monticola*) at 40% cover, but contains high diversity of shrubs, including nine species of willow. Diamondleaf willow (*Salix planifolia*), shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*), and thinleaf alder each contribute 10% cover to the shrub layer, while all other shrubs occur with <5% cover. The understory is a lush carpet of grasses and sedges. Native species, including bluejoint reedgrass, water sedge (*Carex aquatilis*), and beaked sedge (*Carex utriculata*), dominate the wettest areas, but nonnative pasture grasses also contribute high cover and dominate the drier edges. Beneath the vascular plants, the stand contains a healthy moss layer in moist and wet areas. Moss species observed include *Helodium blandowii, Climacium dendroides, Tomenthypnum nitens, Drepanocladus aduncus, Bryum pseudotriquetrum,* and *Plagiomnium ellipticum.* The riparian corridor is a mosaic of small patch communities. Where groundwater discharge from the surrounding

slopes is strong, there are small patches of organic soil accumulation where low willows, diamondleaf willow and Wolf's willow (*Salix wolfii*) dominate. Where the stream is entrenched and the water table is lower, the understory is a mix of native and non-native grasses. As a whole, the riparian vegetation is dominated by park willow / bluejoint reedgrass, which is typical of low gradient, upper montane streams in Boulder County. Surrounding slopes are densely forested with lodgepole pine (*Pinus contorta*) and ponderosa pine (*Pinus ponderosa*).

**Key Environmental Factors:** Montane elevations and a gentle gradient help shape the species community. Water levels vary seasonally with snowmelt. Past beaver activity probably contributed to maintaining water levels in the valley.

**Land Use History:** The meadows within the site were historically grazed. Cattle were removed from sections of the valley within the last decade, but grazing still continues on other portions. The hydrology of Beaver Creek is somewhat modified through diversions and cattle ponds, but there is no major dam on the creek. There are a few scattered family homes.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix monticola / Calamagrostis canadensis* montane willow carr community and a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Populus tremuloides / Alnus incana* montane riparian forest.

Natural Heritage element occurrences at the Beaver Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Populus tremuloides / Alnus incana Forest | Montane Riparian Forests | G3 | S3 | | | | B | 2007-08-21 |
| Natural Communities | Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carr | G3 | S3 | | | | B | 2007-08-21 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and the immediate watershed, allowing for the operation of normal hydrological and ecological processes that support the wetland communities, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P3):** The western portion of the site is USFS

land, but the majority of the area is privately owned, with some parcels under conservation easement. Protection efforts on adjacent private lands are unknown.

**Management Urgency Rank Comments (M4):** Continued efforts to control non-native species will help preserve the value of this site.

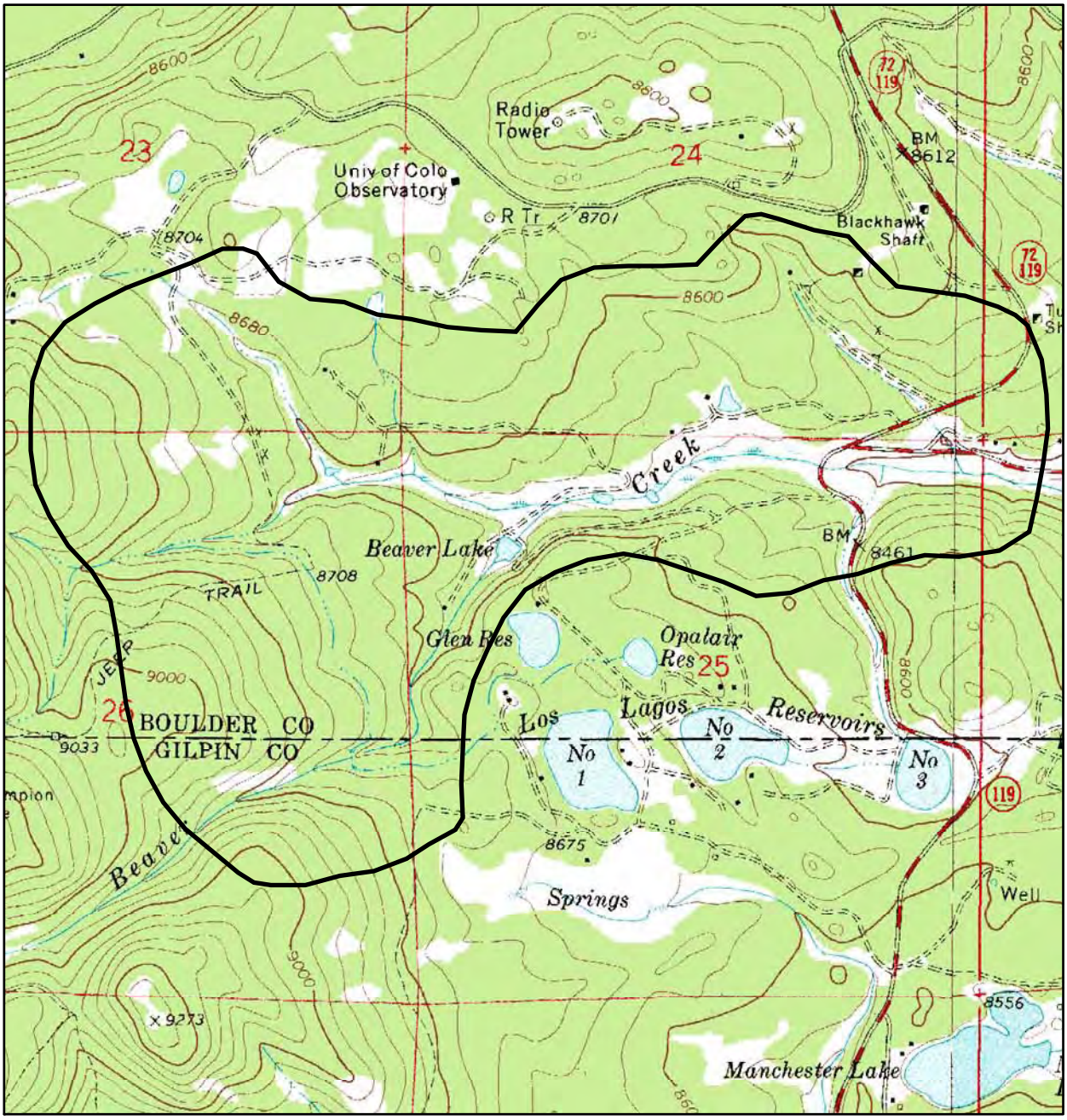
**Exotic Species Comments:** Cover of non-native species in the understory is high, including pasture grasses redtop (*Agrostis gigantea*), smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), and Kentucky bluegrass (*Poa pratensis*), as well as Canada thistle (*Breea arvensis*), musk thistle (*Carduus nutans*), common mullein (*Verbascum thapsus*), and ox-eye daisy (*Leucanthemum vulgare*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/02/2008

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Map Date: 06/05/2008

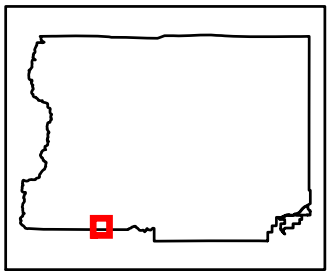
## Legend

PCA Boundary

Tungsten, 39105-H4
Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Beaver Creek Potential Conservation Area, B3: High Biodiversity Significance

## Betasso

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Boulder, Gold Hill

**Size:** 1,749 acres (708 ha) **Elevation:** 5,758 - 7,710 ft. (1,755 - 2,350 m)

**General Description:** This site is in the lower montane zone immediately above the foothills west of Boulder and just north of Boulder Mountain Park. The granitic hills are dissected by west-east flowing creeks forming very deep, narrow, steep-sided drainages including Fourmile Creek to the north. The area is embedded within a large ponderosa pine (*Pinus ponderosa*) ecological system with erodible, gravelly, loamy sand and sandy loam soils in mosaic with rock outcrops. Due to their proximity to Boulder Mountain Park, this area is occasionally blanketed in clouds that linger in the hills and create a relatively moist climate. North-facing hillslopes are generally comprised of dense mixed conifer forest with Douglas-fir (*Pseudotsuga menziesii*) and some ponderosa pine and lodgepole pine (*Pinus contorta*). There are seeps along the north-facing slopes above Fourmile Creek that have unique assemblages of species including hazelnut (*Corylus cornuta*), wild sarsaparilla (*Aralia nudicaulis*), and black snakeroot (*Sanicula marilandica*). These species are very uncommon in Colorado. South-facing slopes are predominantly characterized by ponderosa pine savanna where large grassland meadows are interspersed with variable patches of trees. Grasslands have a general lower montane character with needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), and sun-loving sedge (*Carex heliophila*) with minor quantities of foothills species like big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*). Much of the grassland character is obscured by non-native species, especially cheatgrass (*Bromus tectorum*), which is abundant and prolific, and Jim Hill mustard (*Sisymbrium altissimum*) among others. This area historically had Townsend's big-eared bat (*Plecotus townsendii*). There are several areas of low intensity residential development and roads through the canyons on either side of the site.

**Key Environmental Factors:** Lower montane elevation; granitic bedrock.

**Biodiversity Significance Rank Comments (B3):** The site supports a good (B-ranked) occurrence of the globally vulnerable (G3G4/S3) *Pseudotsuga menziesii / Jamesia americana* lower montane forest and a good to fair (BC-ranked) occurrence of the globally vulnerable (G3/S3) *Pinus ponderosa / Leucopoa kingii* foothills ponderosa pine savanna.

Natural Heritage element occurrences at the Betasso PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | BC | 2007-08-08 |
| Natural Communities | Pseudotsuga menziesii / Jamesia americana Forest | Lower Montane Forests | G3G4 | S3 | | | | B | 2007-11-19 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary encompasses a landscape mosaic of ponderosa pine savanna and woodland, mixed conifer forest, and grassland meadows that contain the element occurrences and adjacent suitable habitat.

**Protection Urgency Rank Comments (P4):** The eastern portion of this site contains one of the oldest parcels of open space that is managed and maintained by Boulder County. It is managed for recreation and wildlife habitat and is open to the public. The west portion was recently acquired by the county and is undergoing management planning.

**Management Urgency Rank Comments (M3):** There is significant weed establishment throughout the eastern portion of the site; addressing this through grazing management may alleviate some of the weed abundance. Slopes on the west side of the site and along the periphery throughout are very steep and erodible; extreme care in trail placement is recommended to avoid resource damage. There is a series of ephemeral drainages with isolated seepage on the north-facing slopes above Fourmile Creek. Avoid activity in these drainages to maintain soil stability and hydrologic integrity.

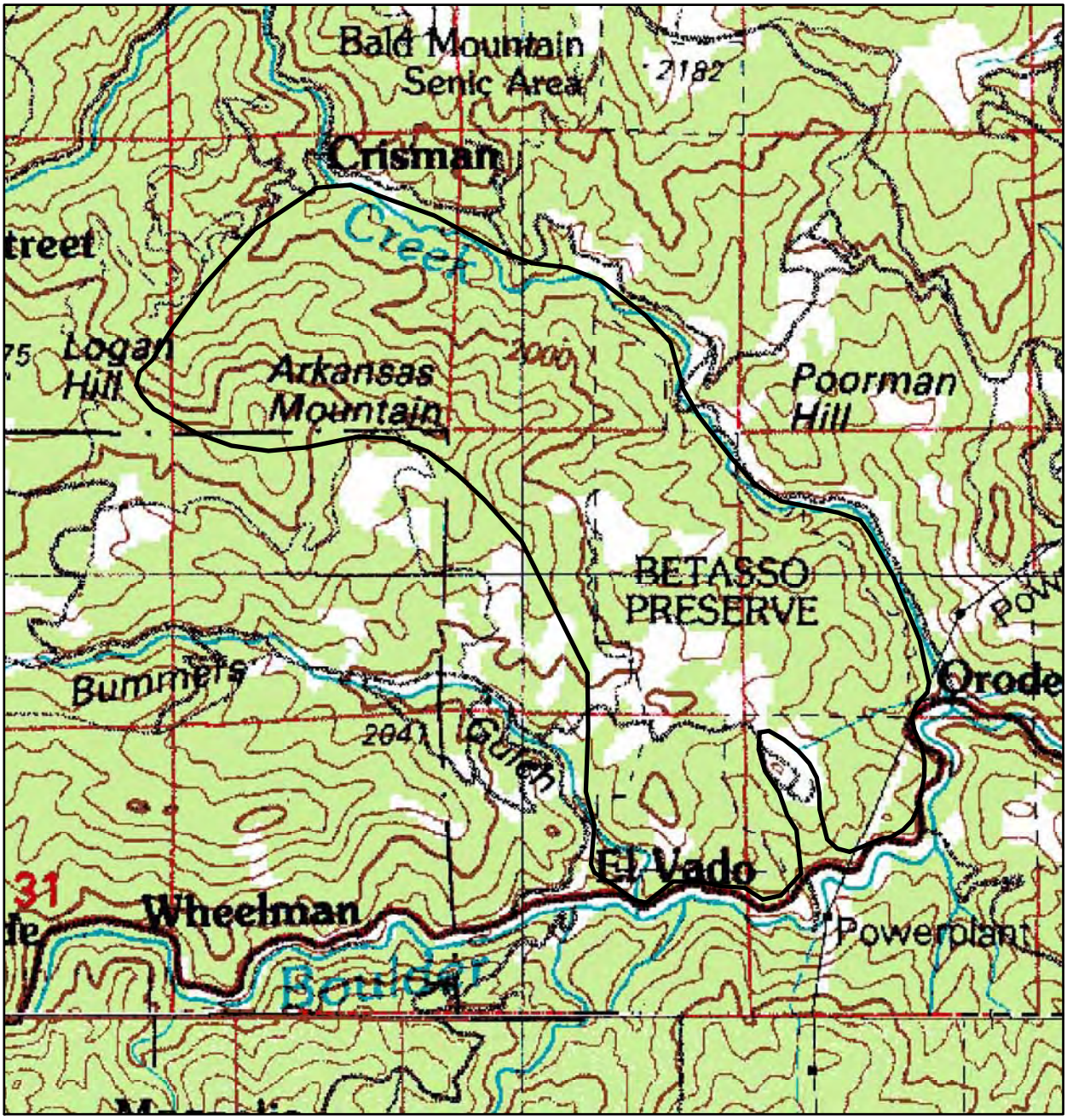
**Exotic Species Comments:** Much of the grassland character is obscured by non-native species, especially cheatgrass (*Bromus tectorum*) and Jim Hill mustard (*Sisymbrium altissimum*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/21/2008

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Map Date: 10/30/2008

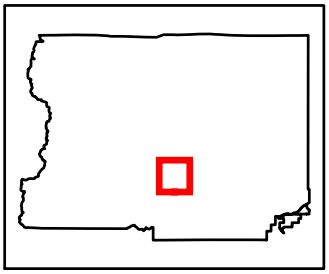
**Legend**

PCA Boundary

Estes Park, 40105-A4

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Betasso Potential Conservation Area, B3: High Biodiversity Significance

# Boulder Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P2: Threat/Opportunity within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Niwot

**Size:** 2,683 acres (1,086 ha)

**General Description:** This site includes a series of wet meadows, gravelly floodplains, and hay meadows adjacent to Fourmile Creek. Associated species include broom sedge (*Carex scoparia*), Canada bluegrass (*Poa compressa*), reed mannagrass (*Glyceria maxima*), curly dock (*Rumex crispus*), Torrey's rush (*Juncus torreyi*), foxtail barley (*Hordeum jubatum*), wild mint (*Mentha arvensis*), narrowleaf willow *(Salix exigua*), roundleaf monkeyflower (*Mimulus glabratus*), bulrush (*Scirpus americanus*) and reed canarygrass (*Phalaris arundinacea*).

**Biodiversity Significance Rank Comments (B3):** This site includes a fair (C-ranked), fair to poor (CD-ranked) and poor (D-ranked) occurrence of a globally vulnerable (G2G3/S2) plant species, Ute ladies' tresses (*Spiranthes diluvialis*). This species is listed as Theatened under the federal Endangered Species Act. There is also a good (B-ranked) occurrence of Bald Eagle (*Haliaeetus leucocephalus*). Cylindrical papershell (*Anodontoides ferussacianus*), a state rare (G5/S2) invertebrate, was sighted in the early 1900s.

Natural Heritage element occurrences at the Boulder Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Haliaeetus leucocephalus | Bald Eagle | G5 | S1B,S3N | | ST | USFS | B | 2006-99-99 |
| Mollusks | Anodontoides ferussacianus | Cylindrical Papershell | G5 | S2 | | SC | | H | 1912-07-02 |
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | C | 2007-99-99 |
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | CD | 2001-99-99 |
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | D | 1990-09-01 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the wet meadows where the rare plants are known exist, as well as adjacent potential habitat identified using an aerial

photograph.

**Protection Urgency Rank Comments (P2):** This site is located within a highly fragmented landscape. Species and habitat are threatened by potential hydrological alterations and changes in current management.

**Management Urgency Rank Comments (M2):** Canada thistle may present a management challenge.

**Land Use Comments:** Gravel mining, grazing.

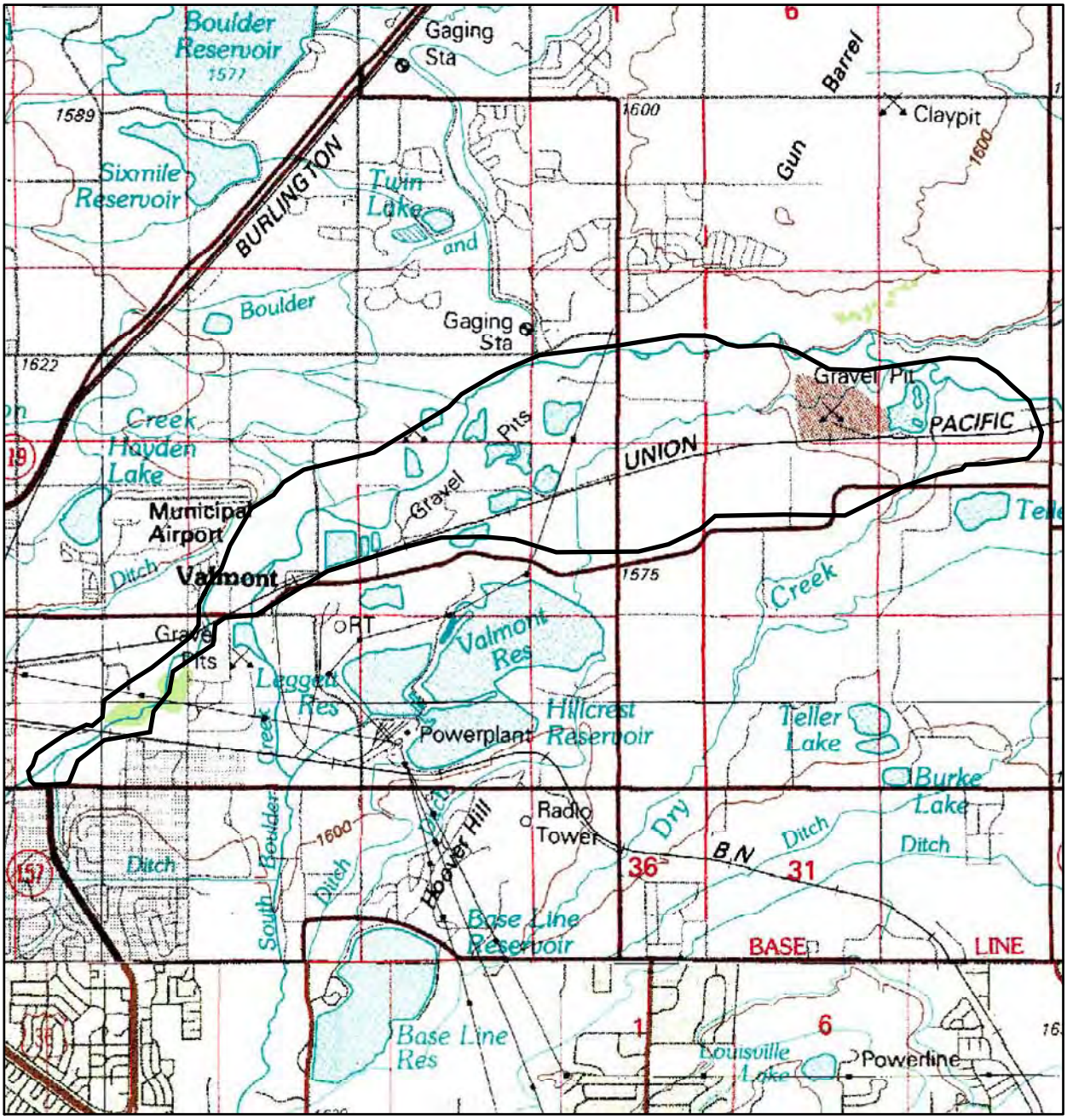
**Exotic Species Comments:** Canada thistle (*Cirsium arvense*) is present.

**Information Needs:** Search for cylindrical papershell (*Anodontoides ferussacianus*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Panjabi, S.S.
**Version Date:** 10/30/2008

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Map Date: 11/03/2008

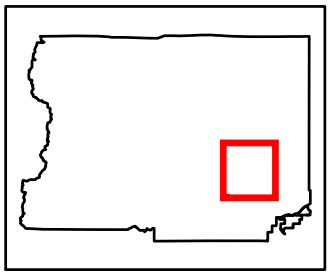
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Boulder Creek Potential Conservation Area, B3: High Biodiversity Significance

# Ceran Saint Vrain

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Raymond, Gold Hill

**Size:** 2,890 acres (1,170 ha) **Elevation:** 7,920 - 8,940 ft. (2,414 - 2,725 m)

**General Description:** The Ceran Saint Vrain site is located in west-central Boulder County, about three miles west of Jamestown. South St. Vrain Creek originates below Isabelle Glacier in the Indian Peaks Wilderness, eleven miles to the southwest, and flows through the site before joining Middle St. Vrain Creek some three miles northeast of the site. Just below Highway 72, the creek flows through an open, flat-bottomed valley before descending into a narrow canyon. Along the lower stretch of the creek, the channel and associated riparian vegetation is constrained by the surrounding topography. The stream gradient is not steep (<5%), but the surrounding slopes rise quickly from the stream channel. The creek itself is 23 ft-39 ft (7-12 m wide), clear and fast moving. The riparian corridor is 66-98 ft (20-30 m) wide, supporting a narrow, mixed riparian shrubland. The tall shrub 7-16 ft (2-5 m) layer is dominated by 20% cover each of alder (*Alnus incana*) and Drummond's willow (*Salix drummondiana*), but contains numerous other shrub species at 10% cover or less. Associated tall shrubs include Pacific willow (*Salix lucida* ssp. *lasiandra*), Rocky Mountain maple (*Acer glabrum*), Bebb willow (*Salix bebbiana*), and park willow (*Salix monticola*). The understory is also diverse and contains mixed graminoids and forbs. The most prevalent species is bluejoint reedgrass (*Calamagrostis canadensis*) at 20% cover. Other important herbaceous species include cowparsnip (*Heracleum maximum*), fireweed (*Chamerion angustifolium*), and horsetail (*Equisetum arvense*). This riparian shrubland is quite narrow, 10-20 ft (3-6 m) wide on either side of the creek, and transitions quickly into the surrounding upland forest. Slopes to both the east and west contain Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and ponderosa pine (*Pinus ponderosa*), with occasional unvegetated rocky crags.

**Key Environmental Factors:** Moderate seasonal variation in water flow.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Alnus incana - Salix drummondiana* montane riparian shrubland and an excellent to good (AB-ranked) occurrence of a globally vulnerable (G3G4/S3S4) lodgepole pine forest, *Pinus contorta / Shepherdia canadensis*.

Natural Heritage element occurrences at the Ceran Saint Vrain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Alnus incana - Salix drummondiana Shrubland | Montane Riparian Shrubland | G3 | S3 | | | | B | 2007-08-02 |
| Natural Communities | Pinus contorta / Shepherdia canadensis Forest | Persistent Lodgepole Pine Forests | G3G4 | S3S4 | | | | AB | 2007-08-02 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrence and the immediate watershed below Hwy 72, allowing for the operation of normal hydrological and ecological processes that support the wetland community, and providing a buffer against direct disturbance. These natural processes are not completely contained in the boundary, and offsite activities within the larger watershed have the potential to impact the significant biological resources in the area.

**Protection Urgency Rank Comments (P3):** The lower portion of the creek, and some surrounding area, is USFS land, but the majority of the area is privately owned, with some parcels under conservation easements (easements not held by Boulder County). Private lands include a large church camp and three subdivisions.

**Management Urgency Rank Comments (M4):** Attention to weed management and off trail travel would help the condition of this site.

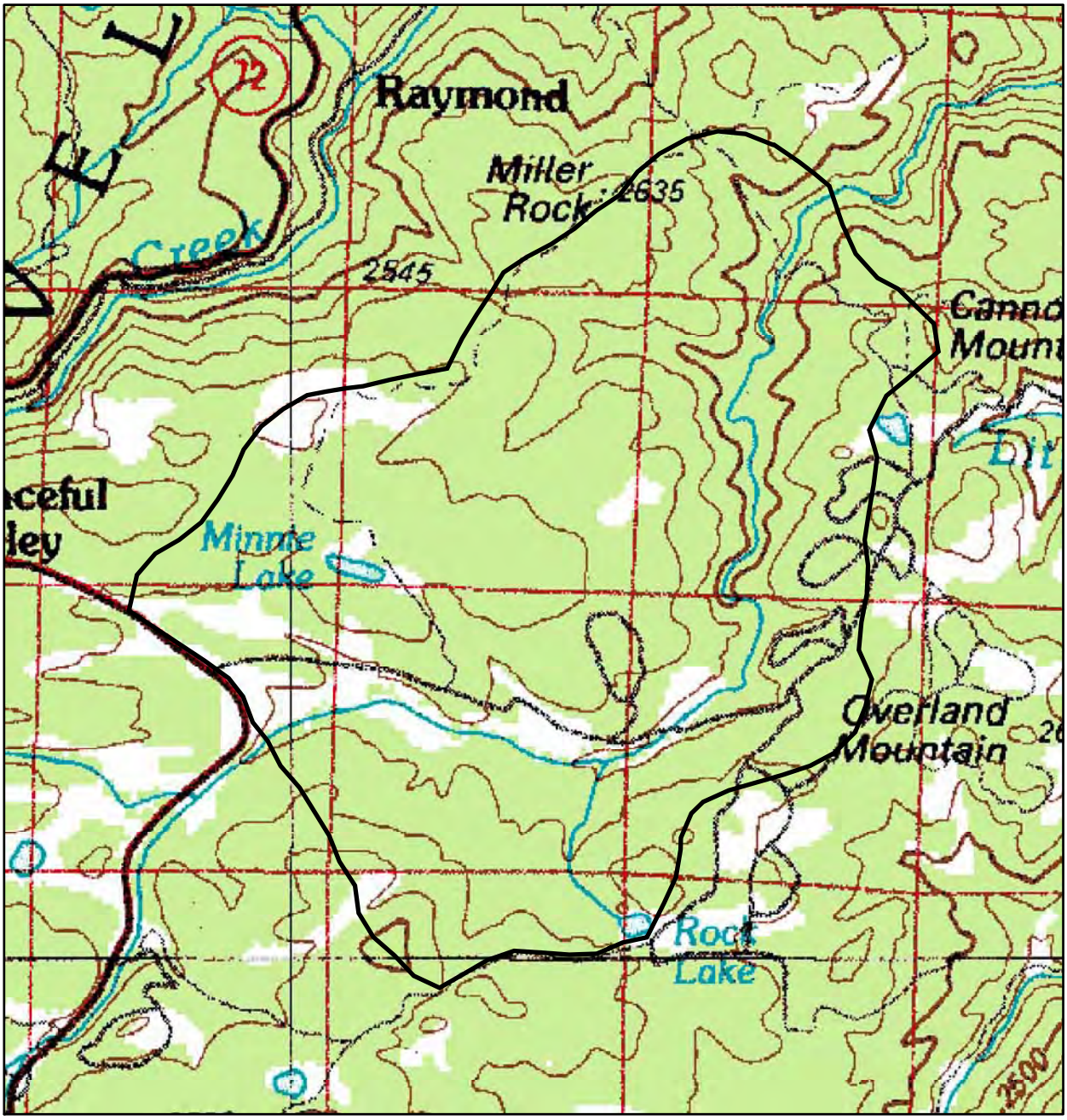
**Land Use Comments:** The trail following the creek is heavily used for hiking, camping, and fishing. Because of heavy use, there is a noticeable impact on the stream bank. Numerous social trails split off from the main trail and follow close to the bank. There are also several well established campsites with fires rings along the creek. There is evidence of some human manipulation of the channel bed, including logs placed in the stream and some bank stabilization.

**Exotic Species Comments:** There are nonnative species within the understory, but they contribute low cover and are primarily along the trail. Species include: Canada thistle (*Cirsium arvense*), timothy (*Phleum pratense*), and Kentucky bluegrass (*Poa pratensis*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly
**Version Date:** 06/10/2008

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Map Date: 06/10/2008

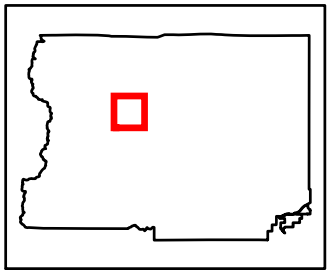
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Ceran Saint Vrain Potential Conservation Area, B3: High Biodiversity Significance

# Chittenden Mountain

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Nederland, East Portal

**Size:** 239 acres (97 ha) **Elevation:** 9,564 - 10,312 ft. (2,915 - 3,143 m)

**General Description:** This site is in the lower subalpine elevation zone at the Wilderness Area boundary above Hessie. Vegetation in the area is a mosaic of aspen (*Populus tremuloides*) groves and patches of spruce - fir (*Picea engelmannii - Abies lasiocarpa*) forest on the east-west trending ridges and slopes with grassland meadows in the valleys. North-facing slopes are predominantly spruce - fir with areas of cliff and talus and south-facing slopes have mixed spruce - fir - aspen forests. The vegetation transitions to alpine tundra within 0.5-1 mile from the site. Aspen occurs in smaller stands on the Front Range rather than as a wide-ranging matrix system. Aspen stands tend to have very high herbaceous diversity, like this stand, which means they contain a disproportionately high percentage of the biodiversity of forests for their size on the Front Range. This site has excellent regeneration beneath a dense canopy of aspen, although there are several spruce trees that emerge well above the aspen. The stand transitions to a subalpine grassland in the meadow at the toeslope of the ridge. The grassland has abundant Parry's oatgrass (*Danthonia parryii*) and Thurber's fescue (*Festuca thurberi*), two species that indicate good habitat quality. Additional grasses include poverty oatgrass (*Danthonia intermedia*), junegrass (*Koeleria macrantha*), and sedges (*Carex* species). Forb diversity is very high. The meadow is dotted with small clusters of young spruce, aspen, and limber pine (*Pinus flexilis*), especially around rock outcrops. Swales in the meadow tend to have shrubby cinquefoil (*Dasiphora fruticosa*) and baltic rush (*Juncus balticus*). There is significant pocket gopher activity in both the meadow and adjacent aspen forest and minor amounts of Canada bluegrass (*Poa compressa*), likely introduced from the pack trail that runs through the meadow. The riparian corridor of the South Fork of Middle Boulder Creek is a moderately-wide valley with several anastamosing channels. The riparian vegetation is a mosaic of spruce - fir forest and diamond-leaf willow (*Salix planifolia*) shrublands with lush herbs along the stream channels.

**Key Environmental Factors:** Subalpine elevation zone; metamorphic bedrock.

**Biodiversity Significance Rank Comments (B3):** This site is drawn for an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) Thurber's fescue (*Festuca thurberi*) subalpine grassland herbaceous vegetation and a good (B-ranked)

occurrence of the globally apparently secure (G4/S4) aspen / Thurber's fescue (*Populus tremuloides / Festuca thurberi*) forest. There is a common (G5/S4) *Salix planifolia / Carex aquatilis* subalpine riparian willow carr in excellent condition, but this community is not the focus of the site.

Natural Heritage element occurrences at the Chittenden Mountain PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Festuca thurberi Subalpine Grassland Herbaceous Vegetation | | G3 | S3 | | | | A | 2007-08-22 |
| Natural Communities | Populus tremuloides / Festuca thurberi Forest | Aspen Forests | G4 | S4 | | | | B | 2007-08-22 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary contains a landscape mosaic of spruce - fir forest, aspen stands, and grassland meadows that contain element occurrences and adjacent suitable habitat.

**Protection Urgency Rank Comments (P4):** This site spans the boundary of the Indian Peaks Wilderness Area and Arapaho-Roosevelt National Forest. There is a small, private mining claim at the top of the ridge above the occurrences that are within the site.

**Management Urgency Rank Comments (M4):** There is a pack/hiking trail through the meadow at this site. Some Canada bluegrass (*Poa compressa*) has established along the trail and in small gopher disturbance areas in the forest above. These are not large, but could be monitored and expansion of non-natives mitigated. Encouraging a single trail rather than multiple parallel trails through the valley will likely reduce the opportunity for weed infestation and expansion.

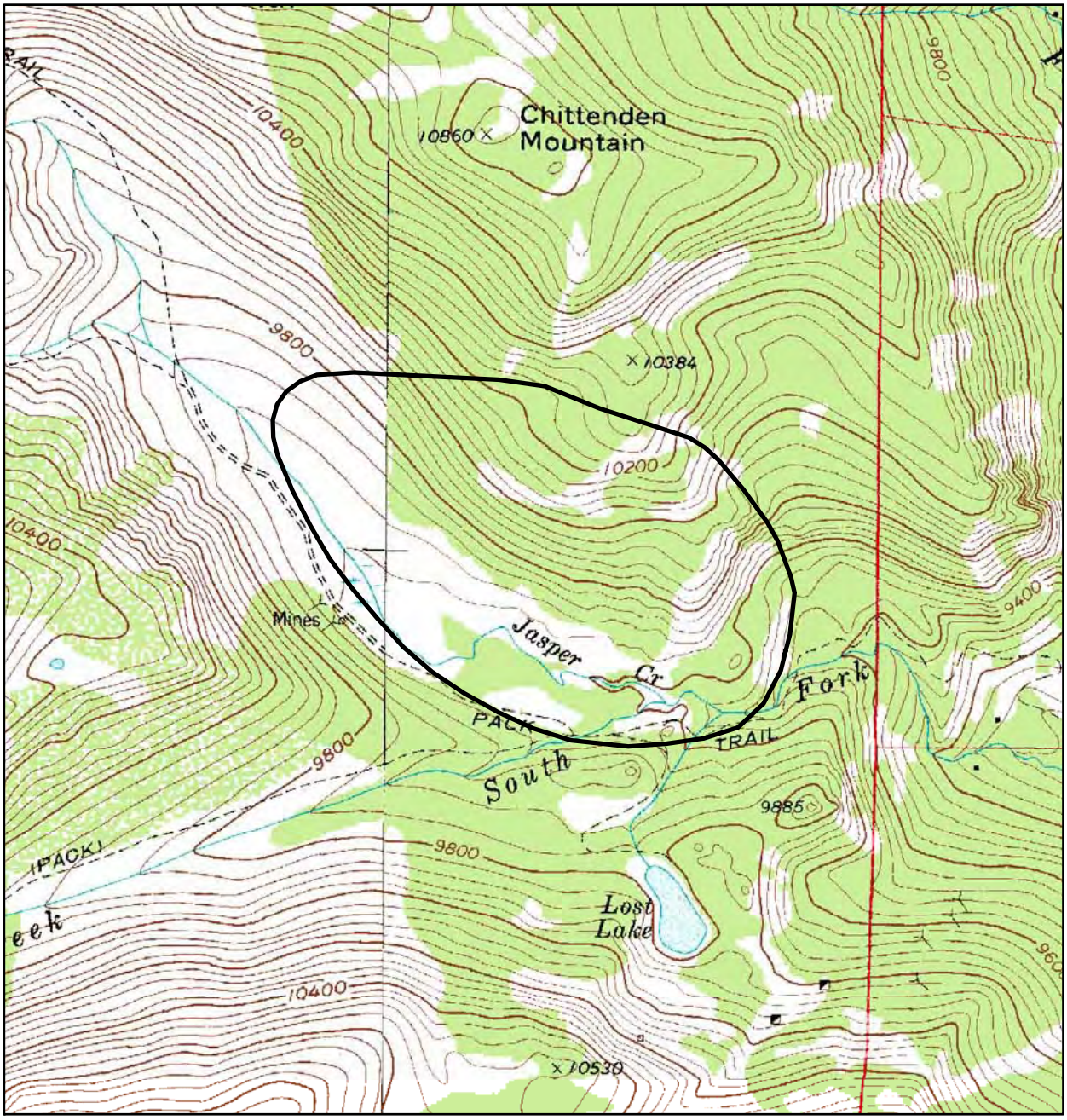
**Exotic Species Comments:** Some Canada bluegrass (*Poa compressa*) has established along the trail.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/20/2008

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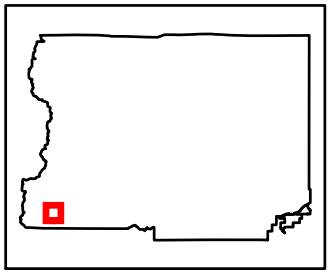
## Legend

PCA Boundary

Nederland, 39105-H5
East Portal, 39105-H6

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Chittenden Mountain Potential Conservation Area, B3: High Biodiversity Significance

# Coal Creek below Rocky Flats

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Louisville

**Size:** 1,504 acres (609 ha) **Elevation:** 5,500 - 6,050 ft. (1,676 - 1,844 m)

**General Description:** This site is located in southeastern Boulder County, immediately north of the boundary with Jefferson County, southwest of the town of Superior. Coal Creek originates in the southwestern corner of Boulder County, near the town of Wondervu. It makes a southward loop into Jefferson County, emerging onto the Rocky Flats terrace, and then turning north to re-enter Boulder County at the northern edge of Rocky Flats. In southern Boulder County, Coal Creek runs through open grasslands below mesas. Historically, the floodplain was likely somewhat wide and meandering, but is now entrenched within low terraces. The creek itself is only 10-20 ft. (3-6 m) across. Water levels are probably never very high in this creek, because there are numerous diversions along the creek. The riparian vegetation is between 164-410 ft. (50-125 m) across, including low shrubs on terraces above the creek. These vegetated terraces may be remnants of when the floodplain was wider, or they may be able to access groundwater recharging from the stream. Within the site, Coal Creek contains a long, continuous stretch of foothills riparian vegetation extending from near the Boulder/Jefferson county line downstream to the town of Superior. The riparian vegetation includes a continuous overstory of mature and regenerating cottonwood trees over dense tall shrubs. Both plains cottonwood (*Populus deltoides*) and narrowleaf cottonwood (*Populus angustifolia*) contribute to the cottonwood overstory, and though the association name is *Populus angustifolia / Salix irrorata* woodland, this occurrence contains higher cover of plains cottonwood than narrowleaf cottonwood since it is located at a lower elevation than most occurrences. Dominant shrubs within the riparian channel include bluestem willow (*Salix irrorata*) and narrowleaf willow (*Salix exigua*), though upper terraces contain more cerro hawthorn (*Crataegus erythropoda*) and American plum (*Prunus americana*). Yellow hawthorn *(Crataegus chrysocarpa)* has been documented here as well. The surrounding dry grasslands are strongly dominated by non-native species.

**Land Use History:** Historic land use includes grazing, gravel mining, and water diversions.

**Biodiversity Significance Rank Comments (B3):** This site supports a fair (C-ranked) occurrence of a globally imperiled (G2/S2) *Populus angustifolia / Salix irrorata* riparian woodland, two occurrences of the federally Threatened and globally imperiled (G5T2/S1) Preble's meadow jumping mouse (*Zapus hudsonius preblei*) in

fair condition, and a fair to poor (CD-ranked) occurrence of the state imperiled (G5/S1B) Bald Eagle (*Haliaeetus leucocephalus*). Additionally, Boulder County has documented Ferruginous Hawk (*Buteo regalis*) nests and an occurrence of the state rare plant (G5/S2S3) fragrant indigobush (*Amorpha nana*), but these are not in the CNHP database at this time.

Natural Heritage element occurrences at the Coal Creek below Rocky Flats PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Haliaeetus leucocephalus | Bald Eagle | G5 | S1B,S3N | | ST | USFS | CD | 2006-99-99 |
| Mammals | Zapus hudsonius preblei | Meadow Jumping Mouse Subsp | G5T2 | S1 | LT | ST | | E | 1999-06-17 |
| Mammals | Zapus hudsonius preblei | Meadow Jumping Mouse Subsp | G5T2 | S1 | LT | ST | | C | 1997-08-12 |
| Natural Communities | Populus angustifolia / Salix irrorata Woodland | Foothills Riparian Woodland | G2 | S2 | | | | C | 2007-09-06 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and a buffer against direct disturbance. The natural processes are not completely contained within the boundary, and off-site activities within the larger watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** The site is almost entirely in joint ownership of City of Boulder and Boulder County as open space.

**Management Urgency Rank Comments (M3):** An increase in non-native species is degrading this site, management and monitoring plans should be re-evaluated.

**Land Use Comments:** Cattle grazed the area for decades and likely grazed right into the riparian corridor. In addition, there were gravel mining operations in the floodplain.

**Exotic Species Comments:** The upland grasslands are strongly dominated by non-native hay grasses and invasive weeds e.g., Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), cheatgrass (*Anisantha tectorum*), jointed goatgrass (*Aegilops cylindrical*) and smooth brome (*Bromus inermis*), as well as the following non-native forbs: Canada thistle (*Cirsium arvense*), bouncing bet (*Saponaria officinalis*), and bull thistle (*Cirsium vulgare*), chicory (*Cichoruim intybus*), common mullein (*Verbascum thaspus*), common teasel (*Dipsacus fullonum*),

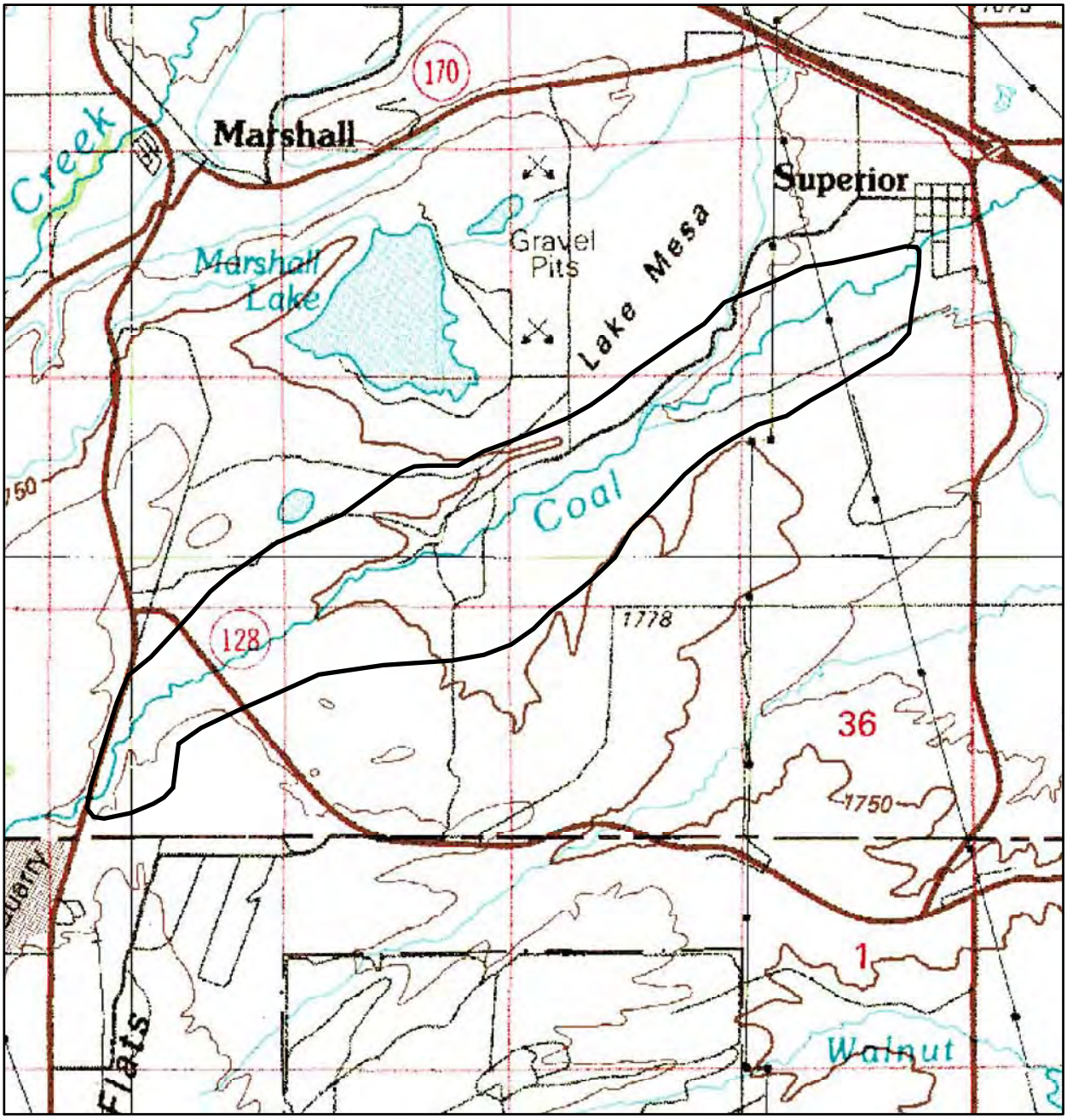
cut-leaved teasel (*Dipsacus laciniatus*), diffuse knapweed (*Centaurea diffusa*), musk thistle (*Carduus nutans*), poison hemlock (*Conium maculatum*), Russian olive (*Elaeagnus angustifolia*), Scotch thistle (*Onopordum acanthium*), and sulphur cinquefoil (*Potentilla recta*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/03/2008

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Map Date: 10/30/2008

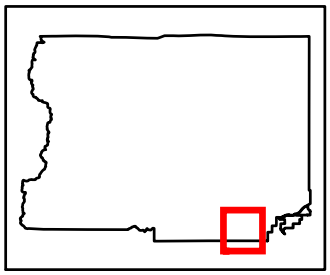
**Legend**

PCA Boundary

Denver West, 39105-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Coal Creek below Rocky Flats Potential Conservation Area, B3: High Biodiversity Significance

# Como Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward, Nederland, Gold Hill

**Size:** 2,944 acres (1,191 ha) **Elevation:** 8,350 - 10,800 ft. (2,545 - 3,292 m)

**General Description:** Flowing east out of the Indian Peaks Wilderness, Como Creek stretches approximately seven miles to its junction with North Boulder Creek. The creek is dominated by willow (*Salix* spp), alder (*Alnus* spp), blue spruce (*Picea pungens*), and aspen (*Populus tremuloides*). There are large hay meadows adjacent also. The uplands are predominantly lodgepole pine (*Pinus contorta*) with some ponderosa pine (*Pinus ponderosa*). There are many water diversions in the area, including pipelines and reservoirs. All of these disturbances are below the element occurrences; however, they do fall in the site. Roads, trails and highways also occur within the site boundaries.

**Biodiversity Significance Rank Comments (B3):** The globally imperiled (G4T2T3/S2) and federally threatened greenback cutthroat trout (*Oncorhynchus clarkii stomias*) is one of three native subspecies of trout in Colorado. This site has a fair (C-ranked) and historic occurrence of this rare trout. Additional locations of greenback cutthroat trout in Colorado are restricted to the Front Range and are few in number. A recent genetic analysis by Metcalf et al. (2007) indicates that Como Creek is one of four pure greenback cutthroat sites within its native range, although the population found there may have originated in the Arkansas River drainage. Three specimens of the state rare (G4/S3) umbilicate sprite (*Promenetus umbilicatellus*) were documented in the 1930s.

Natural Heritage element occurrences at the Como Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Fish | Oncorhynchus clarkii stomias | Greenback Cutthroat Trout | G4T2T3 | S2 | LT | ST | | C | 1996-11-22 |
| Fish | Oncorhynchus clarkii stomias | Greenback Cutthroat Trout | G4T2T3 | S2 | LT | ST | | H | 1986-08-30 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The water quality and flow of Como Creek is important to the survival of the elements found here. The site takes in the headwaters and the

uplands directly adjacent to the creek in response to this need.

**Protection Urgency Rank Comments (P4):** This site is partially owned by a private landowner but is mostly covered by a county-held conservation easement. A small portion is owned by the state, and used by the University of Colorado for field research. The rest of the site is publicly owned and managed by the Forest Service. City of Boulder Utilities has a pipeline through adjacent land, and maintenance and expansion may be destructive to the elements along this creek.

**Management Urgency Rank Comments (M4):** The Peak to Peak Highway, several dirt roads, powerlines, pipelines, reservoirs and houses are within or very near to this site. Expansion, further development, and maintenance of these structures may be a threat to the elements within this site. Hiking, biking, horse-back riding, and cross-country skiing occur on the public land. There is limited snowmobile use and dispersed camping along the creek. There is a small mining claim that operates above the creek, but there is no placer activity. The elements within the site are dependent on the creek for survival. Water quality and quantity of the creek must be maintained to protect the elements over the long-term. Exotic plant species are established in the area from the roads and hay meadows. Exotic fish (brook trout) occur in the stream as well and have been known to out-compete natives.

**Exotic Species Comments:** Brook trout (*Salvelinus fontinalis*) occur in the stream.

**Information Needs:** A boreal toad recorded at this site was last observed in 1963. Need to survey to determine whether or not this occurrence is extant at this site.

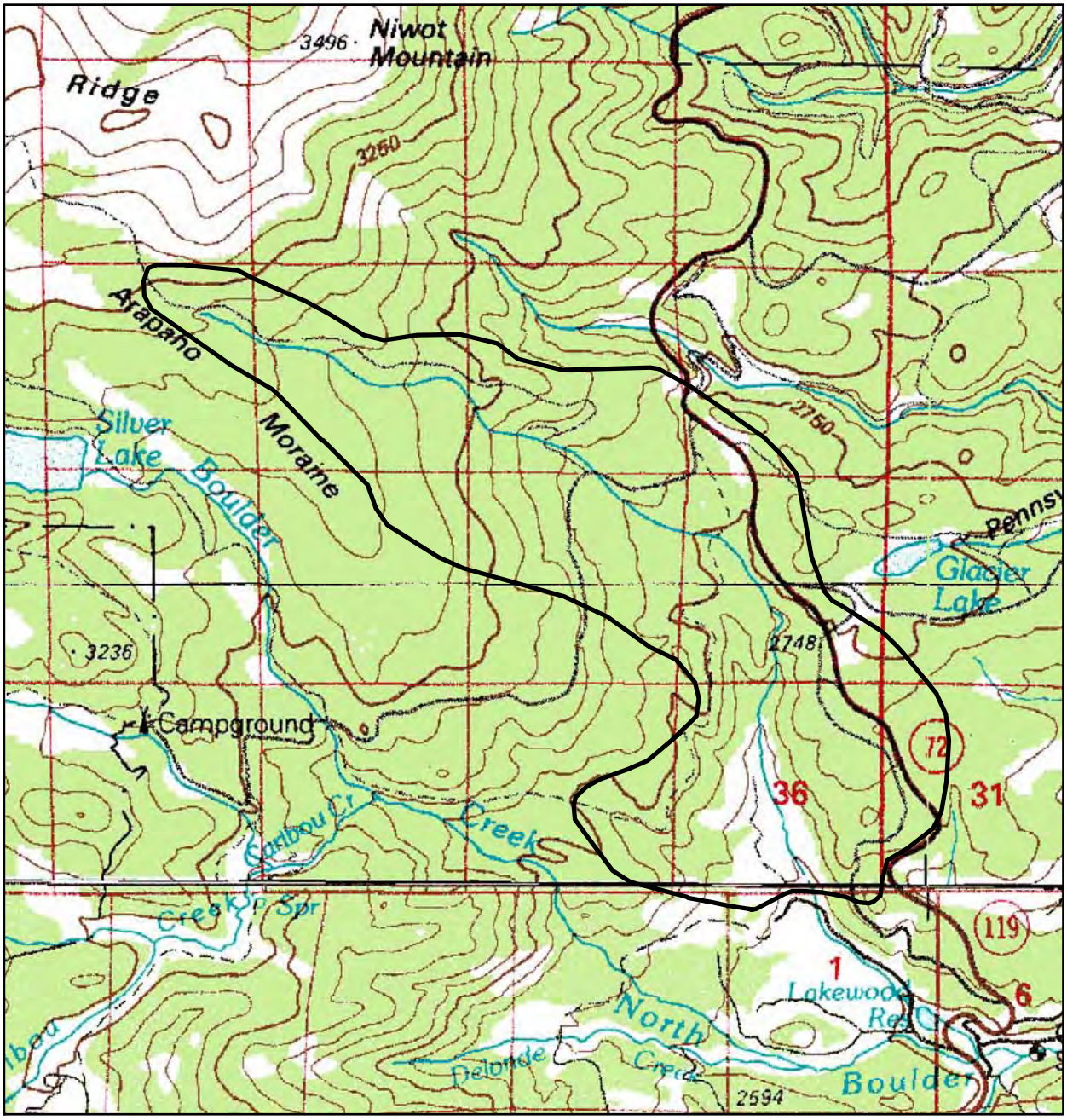
## References

Metcalf, J. L., V. L. Pritchard, S. M. Silvestri, J. B. Jenkins, J. S. Wood, D. E. Cowley, R. P. Evans, D. K. Shiozawa, and A. P. Martin. 2007. Across the great divide: genetic forensics reveals misidentification of endangered cutthroat trout populations. Molecular Ecology 16:4445-4454.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Siemers, J.L.

**Version Date:** 01/28/2009

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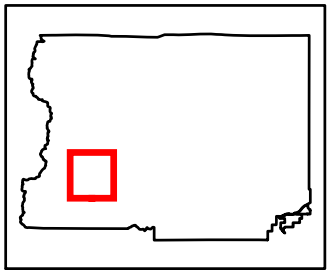
## Legend

PCA Boundary

Denver West, 39105-E1
Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Como Creek Potential Conservation Area, B3: High Biodiversity Significance

# Coney Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M?: Unknown**

**U.S.G.S. 7.5-minute quadrangles:** Isolation Peak, Allens Park

**Size:** 2,409 acres (975 ha) **Elevation:** 9,000 - 12,440 ft. (2,743 - 3,792 m)

**General Description:** This site includes the headwater reaches of a stream that penetrates from the subalpine to the alpine. Coney Creek contains greenback cutthroat trout and the Rocky Mountain capshell is found in a connected lake. Within the alpine areas in the upper part of the site, Kotzebue's grass-of-parnassus is found. Black Swift colonies are located at waterfalls near the termini of Coney Creek and nearby Ouzel Creek. The site is mostly within Rocky Mountain National Park and is contained in designated wilderness

**Biodiversity Significance Rank Comments (B3):** The site supports extant occurrences of a globally rare (G4T2T3/S2) subspecies, greenback cutthroat trout (*Oncorhynchus clarkii stomias*), an extant occurrence of the globally vulnerable (G3/S1) Rocky Mountain capshell (*Acroloxus coloradensis*) and a fair (C-ranked) occurrence of the state rare (G4/S3B) Black Swift (*Cypseloides niger*).

Natural Heritage element occurrences at the Coney Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Cypseloides niger | Black Swift | G4 | S3B | | | USFS | C | 2005-08-01 |
| Fish | Oncorhynchus clarkii stomias | Greenback Cutthroat Trout | G4T2T3 | S2 | LT | ST | | E | 1988-99-99 |
| Fish | Oncorhynchus clarkii stomias | Greenback Cutthroat Trout | G4T2T3 | S2 | LT | ST | | E | 1990-99-99 |
| Fish | Oncorhynchus clarkii stomias | Greenback Cutthroat Trout | G4T2T3 | S2 | LT | ST | | E | 1991-99-99 |
| Mollusks | Acroloxus coloradensis | Rocky Mountain Capshell | G3 | S1 | | SC | USFS | E | 1993-07-05 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to include all occurrences of cutthroat trout and Rocky Mountain capshell within the creek and includes upslope buffers. Forested areas are buffered more broadly than alpine areas and the boundary is extended to the terminus of Ouzel Creek to include all nest sites of the

Black Swift occurrence .

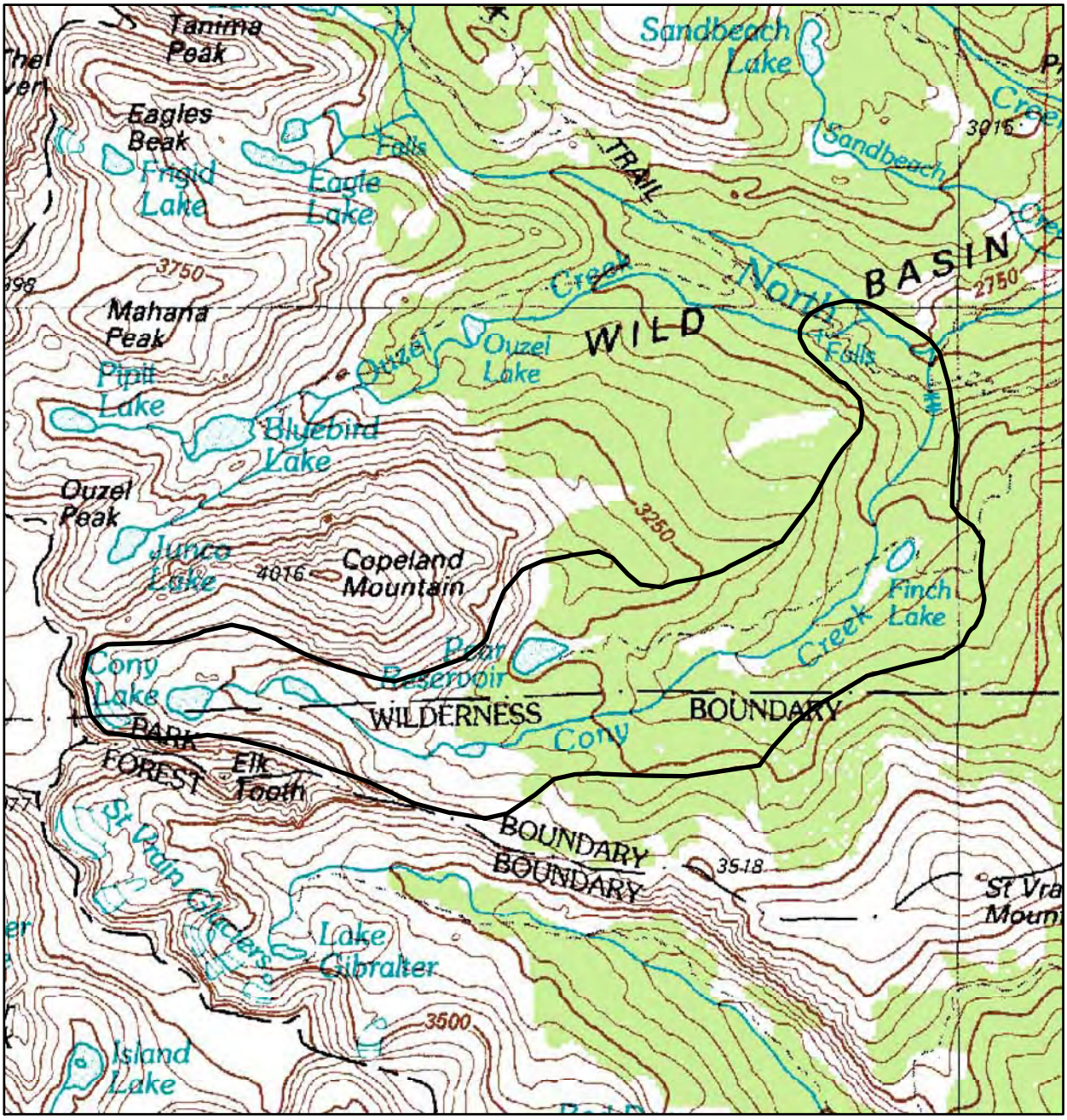
**Protection Urgency Rank Comments (P5):** Site is contained within Rocky Mountain National Park and Indian Peaks Wilderness Area.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Siemers, J. L.

**Version Date:** 10/28/2008

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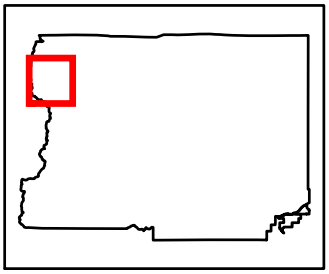
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Coney Creek Potential Conservation Area, B3: High Biodiversity Significance

# Copeland Willow Carr

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Allens Park

**Size:** 766 acres (310 ha) **Elevation:** 8,320 - 9,160 ft. (2,536 - 2,792 m)

**General Description:** The Copeland willow carr is located on North St. Vrain Creek, about 1.5 miles northwest of Allenspark. North St. Vrain Creek drains most of the northwestern corner of Boulder County, from Ogalalla Peak on the Continental Divide to the southern flank of Longs Peak. Numerous steep, snow-fed tributaries join along the upper reaches of the creek as it passes through Rocky Mountain National Park's Wild Basin. Once the creek reaches the Copeland willow carr, the valley widens and the stream gradient is reduced to <1% slope. The valley is broad and long, and is bordered by lateral glacial moraines that rise above the willow carr. The creek itself is 50-66 ft (15-20 m) wide through the valley and contains many meanders, back channels, and oxbows. In addition, there are numerous deep beaver ponds, mostly on the north side of the creek. Riparian vegetation extends far beyond the creek banks and fills the valley bottom. The site encompasses the flat-bottomed valley bounded by Copeland Moraine just above Hwy 72. The Copeland willow carr is the most extensive willow carr in Boulder County, stretching along approximately 1.3 miles (2,000 m) of North St. Vrain Creek, and covering well over 100 acres. At its widest, the willow carr is approximately 1,148 ft (350 m) wide, and contains dense, tall willows (2-5 m tall) interspersed with shorter willows, open sedge and grass inclusions, and open water beaver ponds. The most dominant tall shrub species are park willow (*Salix monticola*) and Geyer willow (*Salix geyeriana*), each providing 20-30% cover. The area also contains high cover of water birch (*Betula occidentalis*), which is frequent along North St. Vrain Creek from the Copeland willow carr downstream to Lyons. The understory is primarily dominated by bluejoint reedgrass (*Calamagrostis canadensis*), but contains localized patches of beaked sedge (*Carex utriculata*), water sedge (*Carex aquatilis*), and fowl mannagrass (*Glyceria striata*) depending on local hydrology. Surrounding slopes are dominated by mixed conifer and aspen. Geology in the valley underlying the willow carr is mapped as glacial drift of Pinedale and Bull Lake glaciations.

**Key Environmental Factors:** The entire valley is wet throughout the summer, likely due to beaver activity that redirects and captures both surface and groundwater flows.

**Land Use History:** Now the site of the Wild Basin entrance to Rocky Mountain National Park. The area is used for recreation.

**Biodiversity Significance Rank Comments (B3):** The site supports an excellent to good (AB-ranked) occurrence of a globally vulnerable (G3/S3) *Salix geyeriana - Salix monticola / Calamagrostis canadensis* montane willow carr and an excellent (A-ranked) occurrence of the state rare (G5/S2) broad-leaved twayblade (*Listera convallarioides*). This site is the location for the highest bird densities of any mountain site in the County (Hallock et al. 1986).

Natural Heritage element occurrences at the Copeland Willow Carr PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix geyeriana - Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carrs | G3 | S3 | | | | AB | 2007-08-16 |
| Vascular Plants | Listera convallarioides | broad - leaved twayblade | G5 | S2 | | | | A | 2007-08-16 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the willow carr and adjacent habitats of the immediate watershed. Note that upstream origins of ecological processes, outside of the site boundaries, must be managed to protect the hydrological integrity of the area.

**Protection Urgency Rank Comments (P3):** The majority of the site is within Rocky Mountain National Park (RMNP). Most of the Copeland willow carr is owned by the City of Longmont, which reserves the right to use the area for water retention, but the City has chosen to not exercise that right and the wetland is managed by RMNP. The City of Longmont appears to have no plans to use the area for water development, but the National Park Service could buy the land and ensure that it is maintained as a natural willow carr into the future. The far eastern end of the occurrence in privately owned. This land could also be purchased or placed into conservation easement. The site is also a state registered natural area. Full designation should be pursued.

**Management Urgency Rank Comments (M4):** The Copeland willow carr is cooperatively managed by the National Park Service and the City of Longmont for recreation and native vegetation. Managers should pay attention to areas heavily impacted by repeated human trampling. Certain areas may need to be closed periodically. Management decisions should include maintenance of the on-site beaver population, which is an important hydrologic driver in the valley. A three

acre historic gravel pit should be restored. Non-native weeds include toadflax (*Linaria genistifolis* ssp. *dalmatica*) and Canada thistle (*Breea arvensis*).

**Exotic Species Comments:** Non-native plants present in low cover include redtop (*Agrostis gigantea*) and timothy (*Phleum pratense*).

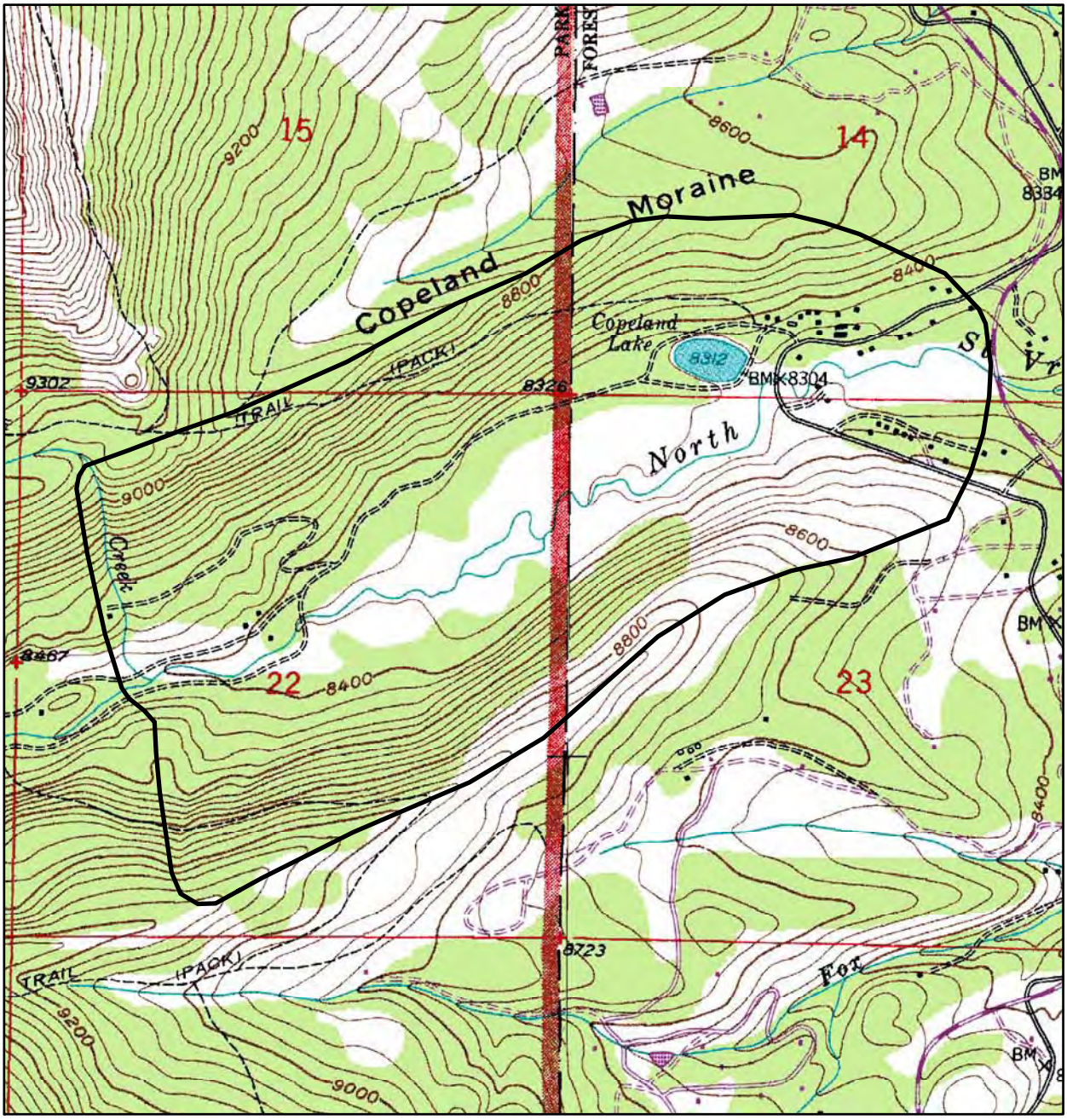
## References

Hallock, D., N. Lederer, and M. Figgs. 1986. Ecology, status and avifauna of willow carrs in Boulder County. Boulder County Nature Association Publication No. 4. Boulder, CO. 38 pp.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/12/2008

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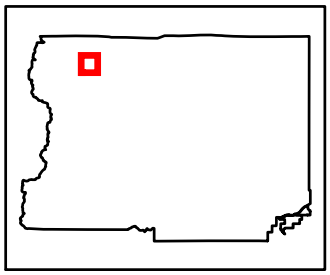
## Legend

PCA Boundary

Allens Park, 40105-B5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Copeland Willow Carr Potential Conservation Area, B3: High Biodiversity Significance

# Delonde Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Nederland

**Size:** 1,652 acres (669 ha) **Elevation:** 8,240 - 10,200 ft. (2,512 - 3,109 m)

**General Description:** The Delonde Creek site is located in southwestern Boulder County, northwest of the town of Nederland, beginning about six miles east of the Continental Divide. Delonde Gulch is an east-facing drainage that heads on the east side of a ridge forming the eastern boundary of Caribou Park. Boulder County Hill forms the highest point on this ridge, at the southwest corner of the drainage. Delonde Creek runs from west to east through a large open valley surrounded by wooded hillsides, joining North Boulder Creek at the lower, eastern end of the site. The head of the valley forms an open bowl >985 ft (300 m) wide. As the stream flows east, it flows through a comparatively narrow valley, then enters a lower-gradient reach where beaver dams have created a series of large open ponds surrounded by saturated willow carr. There are active beaver in the creek, which maintain ponded and saturated soils that help maintain the willow community. Here the stream gradient is <5% and the channel bottom is primarily sand and some gravel. Where not inundated, the ground surface is covered with litter and moss. Surrounding slopes are forested by ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), Douglas-fir (*Pseudotsuga menziesii*), and large pockets of quaking aspen (*Populus tremuloides*). The riparian community is dominated by tall willows (6.5 -16.5 ft/2-5 m tall) interspersed with large open water beaver ponds. The most dominant tall shrub species is park willow (*Salix monticola*) at 50% cover. The stand also includes several other tall and short shrub species, including Bebb willow (*Salix bebbiana*), Geyer willow (*Salix geyeriana*), and alder (*Alnus incana*). The understory is primarily dominated by bluejoint reedgrass (*Calamagrostis canadensis*), but contains localized patches of beaked sedge (*Carex utriculata*) and water sedge (*Carex aquatilis*) depending on local hydrology. Numerous other herbaceous species provide low cover. There is a healthy moss layer beneath the vascular plants and litter. Moss species include *Drepanocladus aduncus, Climacium dendroides*, and *Plagiomnium* spp. Most of the creek drainage and willow community is located on glacial drift from the Bull Lake and Pindale glaciation. The southern boundary of the valley and slopes to the south of the occurrence are either Boulder Creek granodiorite or earlier metamorphic rocks, both of which date back to the Precambrian (Tweto 1979). Soils within the Delonde Creek riparian corridor are mapped at a coarse level as Cryaquolls-Gateview complex, 0 to 15 percent slope. Cryaquolls occur on floodplains and soils from the Gateview family occur on terraces. Both are derived

from gravelly alluvium and/or gravelly glaciofluvial deposits from mixed parent material (USDA 2007).

**Key Environmental Factors:** Active beaver activity retains water in the drainage and maintains the saturated soils necessary for the willow carr.

**Land Use History:** The surrounding meadows were historically used for cattle grazing and are primarily dominated by hay grasses. However, the majority of the site is now Boulder County Parks and Open Space land or in conservation easements, and grazing has been removed. Hay grasses extend to the edges of the wetlands, but the understory is predominately native in the wettest areas. Water may have been diverted to irrigate meadows, but this is not apparent today. Today the area is mainly used for recreation, including hiking and horseback riding (mountain bikes are not allowed on the trails), and the wetland itself is off limits to the public. The downstream section of the occurrence is located on private land where there are a few scattered homes.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix geyeriana - Salix monticola / Calamagrostis canadensis* montane willow carr.

Natural Heritage element occurrences at the Delonde Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix geyeriana - Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carrs | G3 | S3 | | | | B | 2007-07-31 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrence and the immediate watershed of Delonde Creek above it, allowing for the operation of normal hydrological and ecological processes that support the wetland community, and providing a buffer against direct disturbance.

**Protection Urgency Rank Comments (P4):** Edges of the western half of the site are USFS land. Most of the central portion of the site is within Boulder County's Caribou Ranch Open Space. The eastern half of the occurrence is privately owned, but held in a joint conservation easement between the City of Boulder and Boulder County.

**Management Urgency Rank Comments (M4):** Continued attention to weed species would help preserve the value of this site.

**Land Use Comments:** There are several old roads and trails in the lower portion of

the site, and some small culverts beneath these constitute minor diversions. On the lower, privately owned lands there are a few scattered homes.

**Exotic Species Comments:** Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), and smooth brome (*Bromus inermis*), as well as exotic forbs oxeye daisy (*Leucanthemum vulgare*), common St. Johnswort (*Hypericum perforatum*), and Canada thistle (*Cirsium arvense*) were observed.

## References

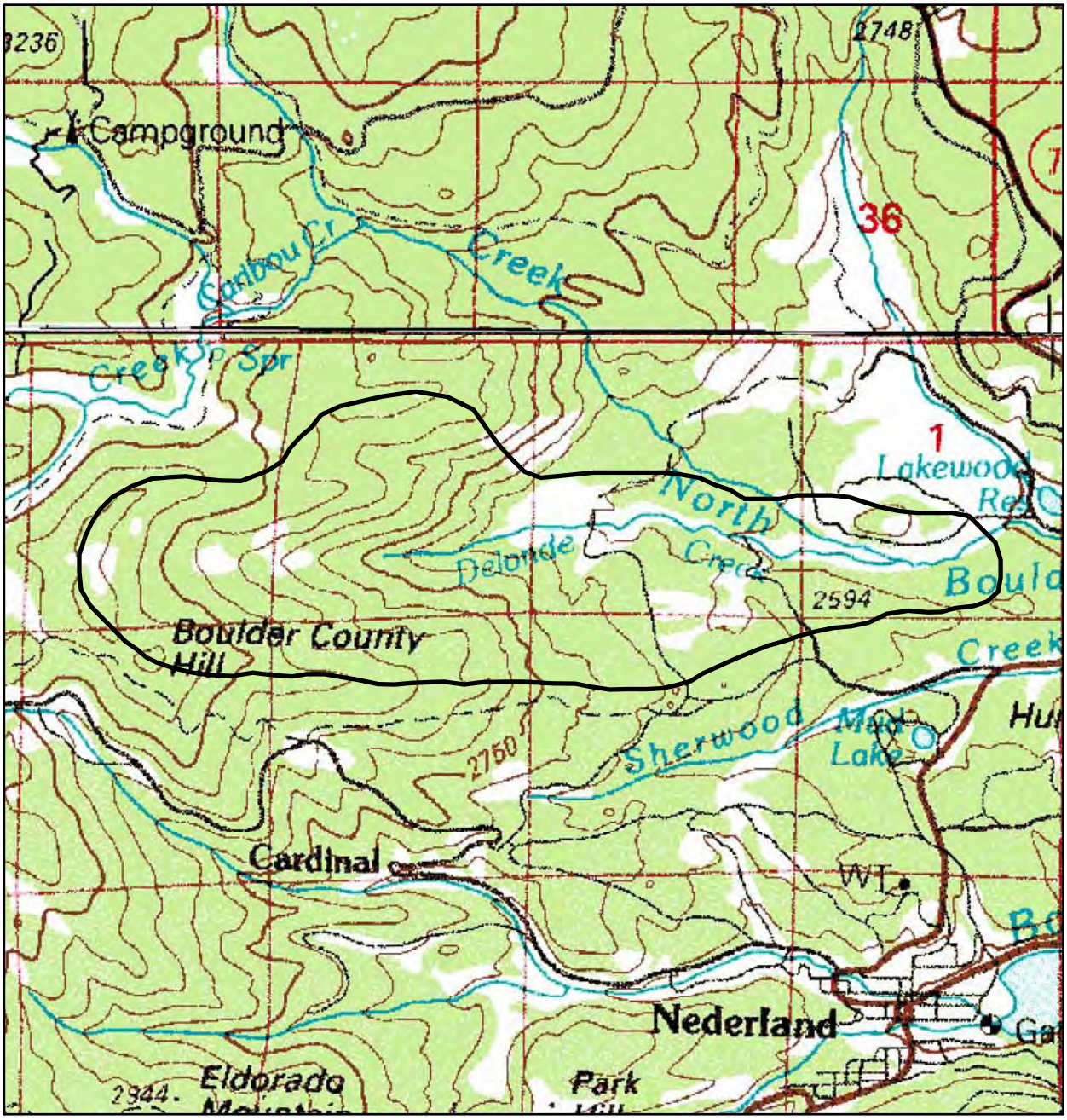

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Tweto, O. 1979. Geologic Map of Colorado, 1:500,000. United States Geological Survey, Department of Interior, and Geologic Survey of Colorado, Denver, CO.

USDA. 2007a. Soil Survey Geographic (SSURGO) database for Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park, and Larimer Counties. USDA Natural Resources Conservation Service, Fort Worth, Texas. URL: . Downloaded on October 16, 2007.


**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/11/2008

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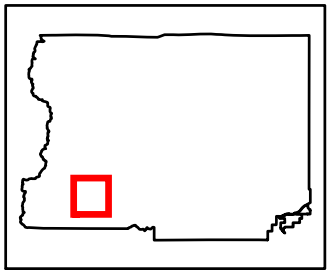
## Legend

PCA Boundary

Denver West, 39105-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Delonde Creek Potential Conservation Area, B3: High Biodiversity Significance

# Duck Lake above Ward

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward

**Size:** 210 acres (85 ha) **Elevation:** 9,400 - 10,040 ft. (2,865 - 3,060 m)

**General Description:** The site is located in west-central Boulder County, about six miles east of the Continental Divide. Duck Lake itself is about half a mile northwest of the town of Ward, at the head of a small, east-facing drainage forming the head of Chipmunk Gulch. Chipmunk Gulch flows into James Creek some 1.5 miles below the lake. Surrounding north-facing slopes contain mixed conifers, including Engelmann spruce (*Picea engelmannii*), lodgepole pine (*Pinus contorta*), limber pine (*Pinus flexilis*), and subalpine fir (*Abies lasiocarpa*). South-facing slopes are covered by a large stand of quaking aspen (*Populus tremuloides*). The lake is set within a depression formed by glacial lateral moraines and drains to the east. There is no clear inlet, but a series of small seeps form small inflow channels through the adjoining wetland, which supports a large willow carr fen on the southwestern edge of the lake. There is also likely considerable groundwater discharging into the wetland from the slopes above, which are primarily glacial till. The wetland appears to have a stable groundwater table at or near the ground surface. This stable water table maintains saturated soil, slowing decomposition and allowing the accumulation of a thick layer of organic matter over hundreds and thousands of years. There was no clear evidence of beaver in the wetland currently, but the hummocky topography and mixed bands of vegetation may have been caused by beaver activity in the past. The majority of the willow carr is dominated by tall (2-5 m) willows, primarily park willow (*Salix monticola*) and Drummond's willow (*Salix drummondiana*) with occasional thinleaf alder (*Alnus incana*) and Engelmann spruce interspersed. At the lake edge, however, low (3.28-6.6 ft/1-2 m) willows dominate, notably diamondleaf willow (*Salix planifolia*), before the vegetation transitions into open beaked sedge (*Carex utriculata*) on the border of the lake. The understory contains high species diversity of herbaceous vascular plants and a lush carpet of moss. The most dominant understory graminoid is bluejoint reedgrass (*Calamagrostis canadensis*) with 30% cover overall, but beaked sedge is also present with high cover in many spots. Moss species observed within the wetland include *Climacium dendroides, Drepanocladus aduncus, Aulacomnium palustre,* and species in the genera *Staminergon, Calliergon, Plagiomnium,* and *Polytrichum.* A minor boardwalk cuts through the tall willows, providing access to two small cabins on the north shore of the lake. The lake itself is filled with pond lily (*Nuphar lutea* spp. *polysepala*).

**Key Environmental Factors:** The willow carr is a groundwater-fed fen formed at a toeslope and not along a linear stream.

**Land Use History:** There is evidence of extensive historic mining activity to the southeast around Ward.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix monticola / Calamagrostis canadensis* montane willow carr.

Natural Heritage element occurrences at the Duck Lake above Ward PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carr | G3 | S3 | | | | B | 2007-08-27 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the entire local catchment of Duck Lake, allowing for the operation of normal hydrological and ecological processes that support the wetland community, and providing a buffer against direct disturbance. Some natural processes are not completely contained in the boundary, and off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** The western portion of the site is on USFS land. Most of the property where the willow carr is located is under conservation easement with Boulder County, and much of the surrounding land is owned by Boulder County. However, there are a number of private parcels in the immediate vicinity, including one parcel that contains a small portion of the wetland.

**Management Urgency Rank Comments (M4):** Some attention to weeds would help protect this site, particularly around the cabins on the edge of the wetland. Because this wetland is groundwater driven, groundwater pumping near the wetland would adversely affect the wetland community. In addition, any artificial ditches through the wetland that would channel water to the lake rather than allowing it to move slowly through the peat soil would tend to dry out the soil. When a peat soil dries, it will begin to decompose. The US Forest Service has proposed a major campground immediately adjacent to the site on the west.

**Land Use Comments:** There are two small cabins around the lake and a boardwalk through the wetland, but these appear to have little impact on the wetland.

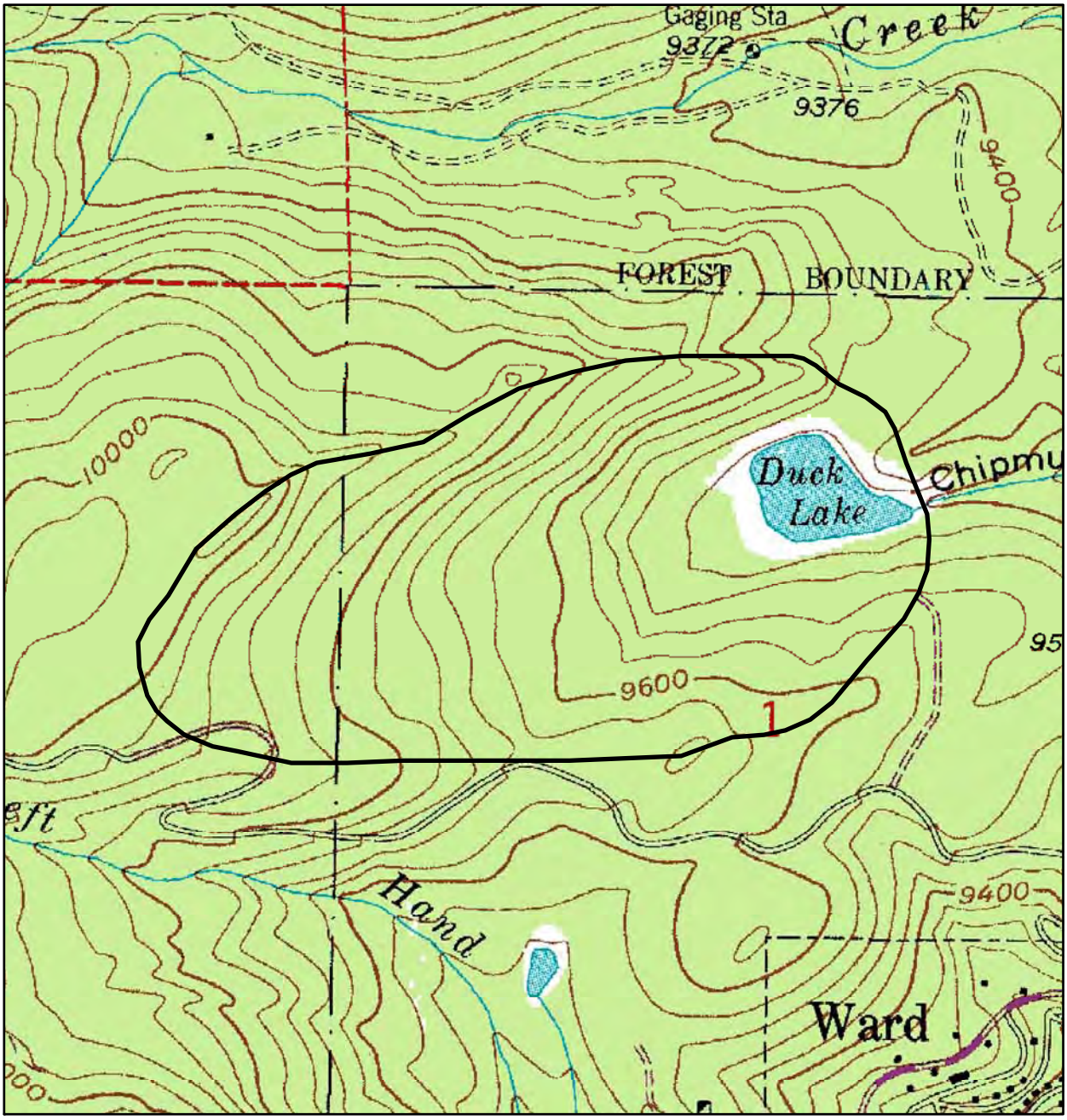
**Exotic Species Comments:** There are only a few non-native species present in the wetland and they represent very little cover. Exotics include Canada thistle (*Cirsium arvense*), timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), and clover (*Trifolium repens*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/11/2008

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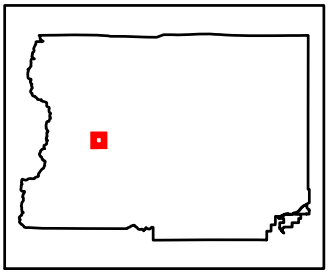
**Legend**

PCA Boundary

Ward, 40105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Duck Lake above Ward Potential Conservation Area, B3: High Biodiversity Significance

# Gold Hill at Switzerland Trail

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Gold Hill

**Size:** 2,039 acres (825 ha) **Elevation:** 8,940 - 9,055 ft. (2,725 - 2,760 m)

**General Description:** This site is in the heart of one of the major historical mining districts in Boulder County, between Sunset and Gold Hill. It is a mosaic of forest interspersed with large expansive meadows that cover rugged, granitic hills that are dissected by deep, narrow stream valleys. The site is at the upper elevation of a large ponderosa pine (*Pinus ponderosa*) ecological system that extends eastward to the foothills. Forest vegetation transitions to lodgepole pine (*Pinus contorta*) higher in elevation to the west. North-facing slopes have dense-canopied mixed conifer forest with lodgepole pine, Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine. South-facing slopes tend to have more open canopies of ponderosa pine and pockets of aspen (*Populus tremuloides*) with more extensive meadows. The meadows have a diverse mix of montane grassland species including Parry's oatgrass (*Danthonia parryii*), mountain muhly (*Muhlenbergia montana*), and spike fescue (*Leucopoa kingii*) with lower montane-foothills species like needle-and-thread (*Hesperostipa comata*). There are small fen wetlands in the limited areas of relatively flat topography along headwater areas of streams. The landscape in this area experienced several catastrophic fires during historical mining activity (Veblen and Lorenz 1991, Smith 1981).

**Key Environmental Factors:** Montane life zone; granitic bedrock

**Biodiversity Significance Rank Comments (B3):** This site contains both plant and natural community occurrences. It contains one good (B-ranked) occurrence of the globally vulnerable (G3/S3) wavy-leaf stickleaf (*Nuttallia sinuata*), two excellent to good (AB-ranked) occurrences of the globally vulnerable (G3/S3) Parry's oatgrass (*Danthonia parryii*) montane grassland, one good (B-ranked) and one fair (C-ranked) occurrence of a globally vulnerable (G3/S3) ponderosa pine / spike fescue (*Pinus ponderosa / Leucopoa kingii*) woodland, a good (B-ranked) occurrence of the state rare (G4G5/S2S3) ponderosa pine / mountain muhly (*Pinus ponderosa / Muhlenbergia montana*) woodland, and a good (B-ranked) occurrence of a globally unranked (GNR/SNR) ponderosa pine / mountain big sagebrush (*Pinus ponderosa / Artemisia tridentata* ssp. *vaseyana*) woodland.

Natural Heritage element occurrences at the Gold Hill at Switzerland Trail PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | AB | 2007-08-23 |
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | AB | 2007-08-30 |
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | C | 2007-08-30 |
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | B | 2007-08-30 |
| Natural Communities | Pinus ponderosa / Muhlenbergia montana Woodland | Foothills Ponderosa Pine Savannas | G4G5 | S2S3 | | | | B | 2007-08-30 |
| Natural Communities | Pinus ponderosa / Artemisia tridentata ssp. vaseyana Woodland | | GNR | SNR | | | | B | 2007-08-23 |
| Vascular Plants | Nuttallia sinuata | wavy - leaf stickleaf | G3 | S2 | | | | B | 2008-08-30 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary contains a landscape mosaic of ponderosa pine (*Pinus ponderosa*) woodland, mixed conifer forest, and grassland meadows that contain the element occurrences and adjacent suitable habitat.

**Protection Urgency Rank Comments (P4):** This site contains a patchwork of USFS lands and private property that consists of large tracts and narrow mining claims.

**Management Urgency Rank Comments (M4):** There is some recreation that occurs in this area including 4WD roads and hiking trails; use is limited due to steep, rugged terrain. The Switzerland Trail itself is an historic railroad and currently a backcountry road. Monitoring for and controlling weed infestations is a priority in this landscape.

## References

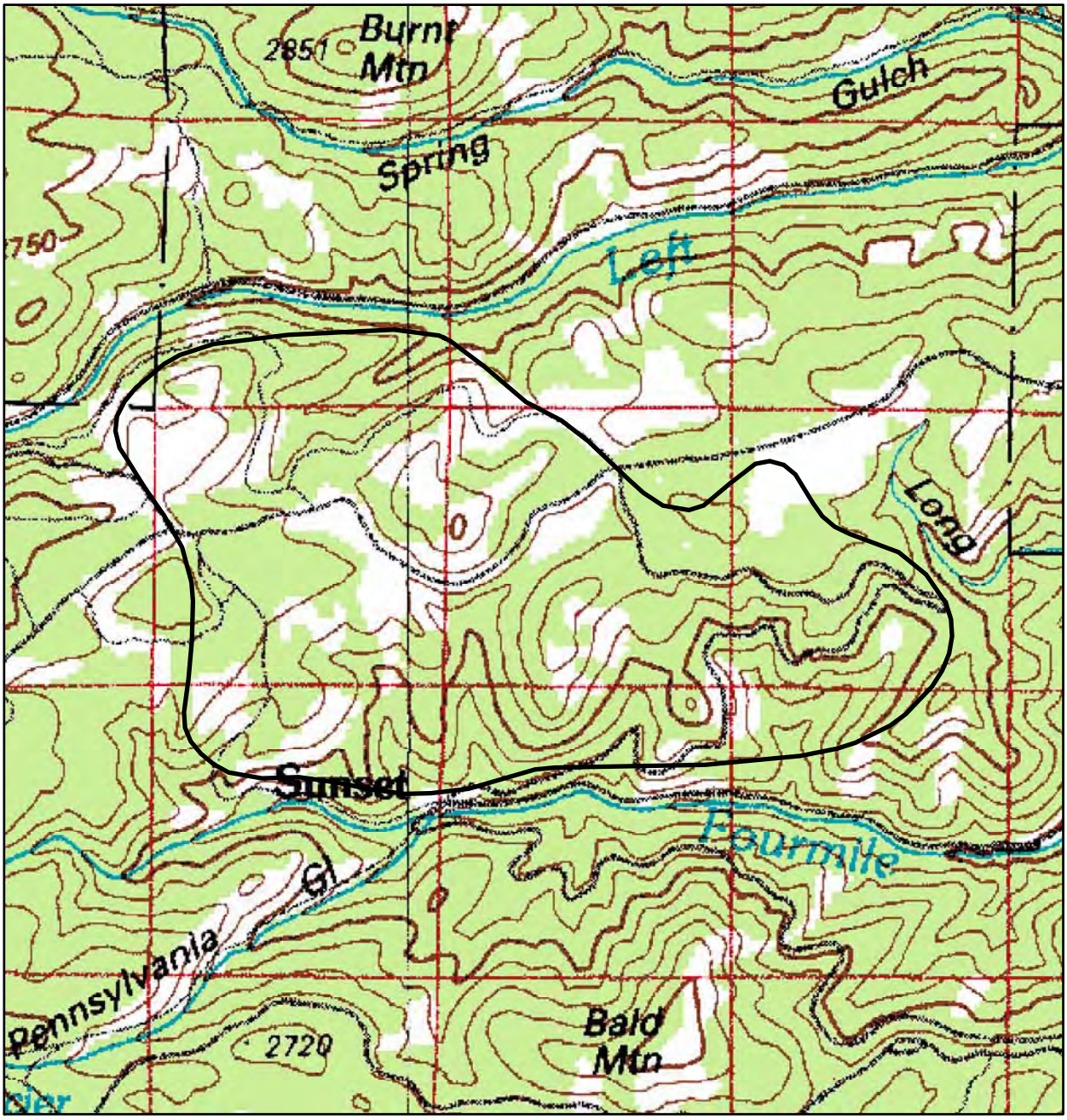
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Smith, P. 1981. A Look At Boulder: From Settlement to City. Pruett Publishing Company, Boulder, CO.

Veblen, T.T. and Lorenz, D.C. 1991. The Colrado Front Range: A Century of Ecological Change. University of Utah Press, Salt Lake City, UT.

**Version Author:** Neid, S.L.

**Version Date:** 10/23/2008

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Map Date: 11/01/2008

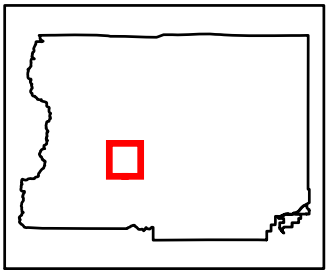
**Legend**

PCA Boundary

Eastes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Gold Hill at Switzerland Trail Potential Conservation Area, B3: High Biodiversity Significance

# Grassy Top

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward

**Size:** 403 acres (163 ha) **Elevation:** 8,573 - 9,386 ft. (2,613 - 2,861 m)

**General Description:** This site is a large grassy knoll in the upper montane elevation zone. It is embedded within a narrow band of mixed aspen (*Populus tremuloides*) and lodgepole pine (*Pinus contorta*) forest that is transitional between upper limits of ponderosa pine (*Pinus ponderosa*) woodland to the east and spruce - fir (*Picea engelmannii - Abies lasiocarpa*) to the west. The transition through spruce - fir is rapid; vegetation quickly transitions to the alpine zone in less than 2 miles from the site. The granitic hills are sculpted by deep, narrow, V-shaped stream valleys. North-facing slopes in the area have dense-canopied mixed conifer forest with lodgepole pine, Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine. South-facing slopes tend to have more open canopies of aspen (*Populus tremuloides*) with a grassland mosaic. Ridgetops also have small clusters of limber pine (*Pinus flexilis*). This site contains a particularly large grassland that occupies steep, south-facing slopes. It is a diverse mix of montane species with Parry's oatgrass (*Danthonia parryi*) forming large swards. Additional grass species include Rocky Mountain fescue (*Festuca saximontana*), slender wheatgrass (*Elymus lanceolatus*), squirreltail (*Elymus elymoides*), mountain muhly (*Muhlenbergia montana)*, junegrass (*Koeleria macrantha*), and wildrye (*Elymus albicans*) among others. Forb diversity is also very high. There are patches of shrubs in the rockier soils near the top of the hill; species include serviceberry (*Amelanchier utahensis*), snowberry (*Symphoricarpos* cf. *rotundifolia*), and chokecherry (*Prunus virginiana*). There are minor infestations of smooth brome (*Bromus inermis*) along the disturbed area of the former railroad that winds around the hill on the south side.

**Key Environmental Factors:** Upper montane elevation zone; historical (>100 year old) defunct transportation corridor.

**Biodiversity Significance Rank Comments (B3):** This site is drawn for an excellent to good (AB-ranked) occurrence of the globally vulnerable (G3/S3) montane grassland, Parry's oatgrass (*Danthonia parryi*) herbaceous vegetation, a good (B-ranked) occurrence of the globally vulnerable (G3/S3) reflected moonwort (*Botrychium echo*) and a good (B-ranked) occurrence of the state rare (G4/S2) western moonwort (*Botrychium hesperium*).

Natural Heritage element occurrences at the Grassy Top PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | AB | 2007-08-23 |
| Vascular Plants | Botrychium echo | reflected moonwort | G3 | S3 | | | | B | 2007-06-12 |
| Vascular Plants | Botrychium hesperium | western moonwort | G4 | S2 | | | | B | 2007-06-12 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary contains a landscape mosaic of pine woodlands, mixed conifer forest, and grassland meadows that contain the element occurrences and adjacent suitable habitat.

**Protection Urgency Rank Comments (P4):** The majority of this site is owned and managed by Boulder County Parks and Open Space and the U.S. Forest Service (Arapaho-Roosevelt National Forest).

**Management Urgency Rank Comments (M4):** There are minor infestations of smooth brome (*Bromus inermis*) along the old railroad bed. Monitoring these and mitigating any expansion will maintain the character and quality of the grassland occurrence at the site. The grassland was impacted by extensive 4x4 trails in the 1970's; impact from this has largely healed since closure to ORV's.

**Exotic Species Comments:** There are minor infestations of smooth brome (*Bromus inermis*) along the old railroad bed.

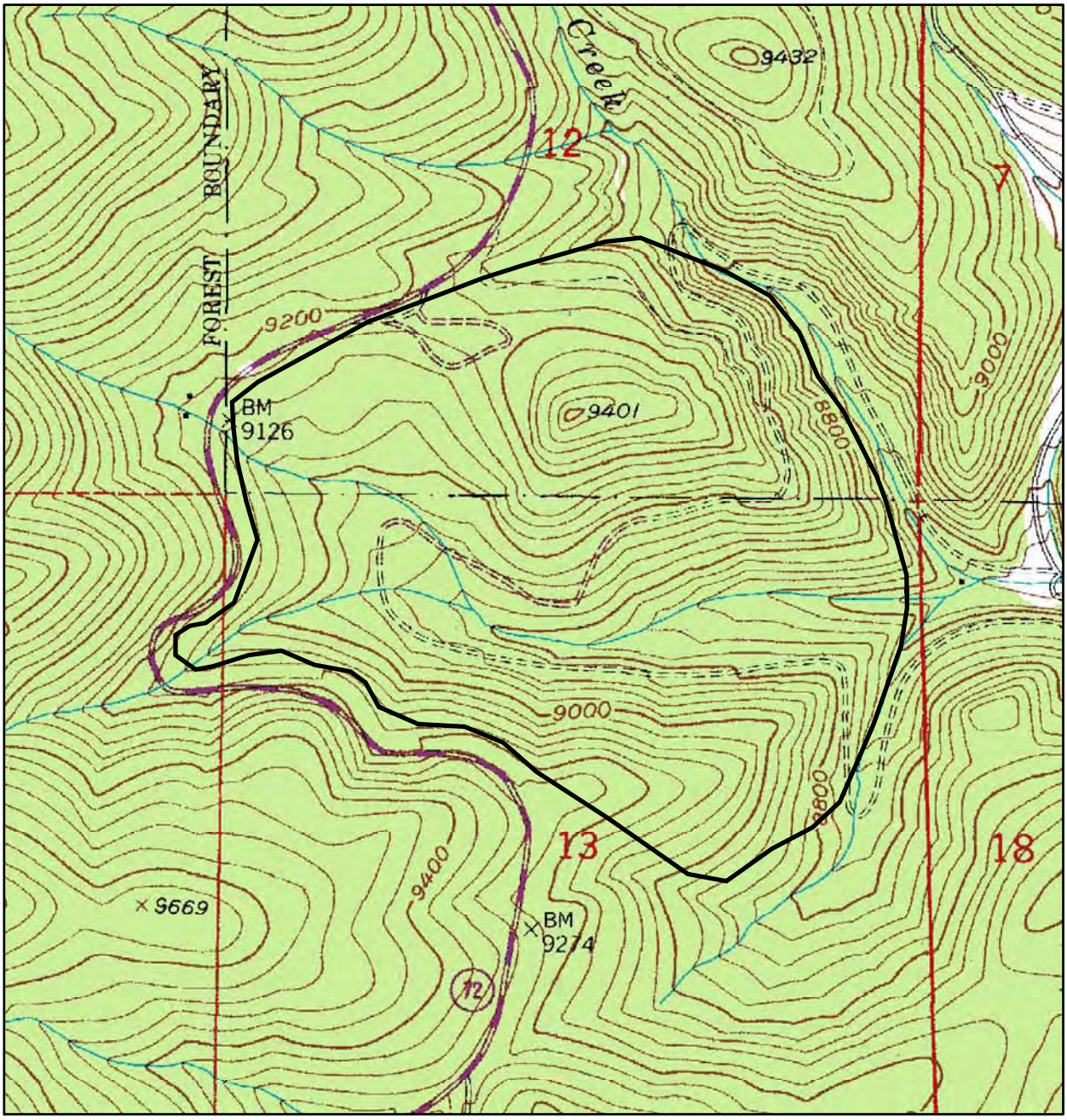
**Off-Site Considerations:** A hazardous waste mine reclamation is occurring just northeast of the site.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/20/2008

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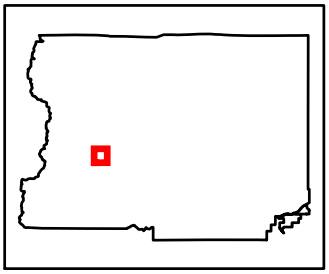
**Legend**

PCA Boundary

Ward, 40105-A5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Grassy Top Potential Conservation Area, B3: High Biodiversity Significance

# James Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Gold Hill

**Size:** 2,525 acres (1,022 ha) **Elevation:** 7,060 - 8,800 ft. (2,152 - 2,682 m)

**General Description:** The James Creek site is located in west-central Boulder County, just west of Jamestown. The site is overlooked by the summits of Overland and Bueno Mountains to the north, and Walker Mountain to the south. James Creek originates in a small gulch west of Highway 72, about 1.5 miles north of the town of Ward. Before reaching the site, James Creek is subject to diversion by the Gold Lake Fill Ditch, which pulls water to the lake, south of the creek. The creek is joined by Little James Creek at Jamestown, and eventually flows into Left Hand Creek. Within the site, just upstream from Jamestown, James Creek flows through a steep, narrow canyon where the creek is 13-23 ft (4-7 m) wide and very fast moving. Here the riparian vegetation is 66-98 ft (20-30 m) across and is composed of dense shrubs and trees overhanging the creek. The stand contains high diversity of woody species, both shrubs and trees, but the most consistent dominants are narrowleaf cottonwood (*Populus angustifolia*) and water birch (*Betula occidentalis*). Several other tree species from the surrounding slopes, Douglas-fir (*Pseudotsuga menziesii*), quaking aspen (*Populus tremuloides*), ponderosa pine (*Pinus ponderosa*), and Rocky Mountain juniper (*Juniperus scopulorum*), extend into the riparian zone and are more important in the steep upstream end of the site. The shrub layer is mixed and contains high cover of tall shrubs Rocky Mountain maple (*Acer glabrum*), Bebb willow (*Salix bebbiana*), and beaked hazel (*Corylus cornuta*), and short shrub red-osier dogwood (*Cornus sericea*). The mixed mesic understory is well developed and contains a diverse array of species such as bluejoint reedgrass (*Calamagrostis canadensis*), cowparsnip (*Heracleum sphondylium* ssp. *montanum*), horsetail (*Equisetum arvensis*), and wild sarsaparilla (*Aralia nudicaulis*). Upstream, past the point where a side tributary enters the drainage, the narrowleaf cottonwood community gives way to a mixed tall (7-16 ft/2-5 m) shrubland. Thinleaf alder (*Alnus incana*) is the dominant shrub with 30% cover, accompanied by 20% cover of Drummond's willow (*Salix drummondiana*) and numerous other tall and short shrub species. James Creek is 16-33 ft (5-10 m) wide through this reach and the riparian vegetation stretches 30-40 m across the floodplain. In many places, tall shrubs and occasional trees overhang the banks and shade the creek. Both Engelmann spruce (*Picea engelmannii*) and quaking aspen add 10% cover to the stand, often extending down to the riparian area from slopes above the creek. The mixed mesic understory is well developed and contains a diverse array of species such as bluejoint reedgrass, cutleaf

coneflower (*Rudbeckia ampla*), horsetail, and cowparsnip. Northwest-facing slopes above the creek are dominated by dense Douglas-fir, ponderosa pine and quaking aspen. Exposed southeast-facing slopes are open and rocky with low cover of ponderosa pine, Rocky Mountain juniper, and xeric shrubs.

**Key Environmental Factors:** Water flows are seasonally variable.

**Land Use History:** This reach of James Creek contains evidence of historical mining activity at several locations, which is common in this part of Boulder County. Most significantly, restoration of a historic mine site is currently underway on a tributary at the downstream end of the occurrence. Several other artifacts of mining, including old cement walls, small buildings, machinery, and waste rock piles are located along the creek.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Populus angustifolia / Betula occidentalis* montane riparian forest and a fair (C-ranked) occurrence of a globally vulnerable (G3/S3) *Alnus incana - Salix drummondiana* montane riparian shrubland. There is a healthy population of the globally rare (G2G/S2S3) Larimer aletes (*Aletes humilis*) within the boundary, but the site was not designed for this species.

Natural Heritage element occurrences at the James Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Alnus incana - Salix drummondiana Shrubland | Montane Riparian Shrubland | G3 | S3 | | | | C | 2007-09-17 |
| Natural Communities | Populus angustifolia / Betula occidentalis Woodland | Montane Riparian Forest | G3 | S3 | | | | B | 2007-07-03 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and the immediate watershed, allowing for the operation of normal hydrological and ecological processes that support the riparian communities, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P3):** Though much of James Creek is managed by the Forest Service, there are several private parcels along the creek. One parcel is under conservation easement with Boulder County. Additional parcels

could be placed under easement or purchased by the Forest Service. The James Creek Watershed Initiative has a management plan in place for the James Creek corridor, which may include future protection of these parcels. For further information contact the Town Clerk at Jamestown.

**Management Urgency Rank Comments (M3):** There are several important management efforts currently underway in the James Creek corridor. Forest Service employees were spraying for weeds along this stretch of the creek during the site visit. Continuation of this effort will help to reduce the weed population along the road. Restoration is also underway for one mine in a small tributary at the downstream end of the occurrence. Additional restoration would improve the site's condition

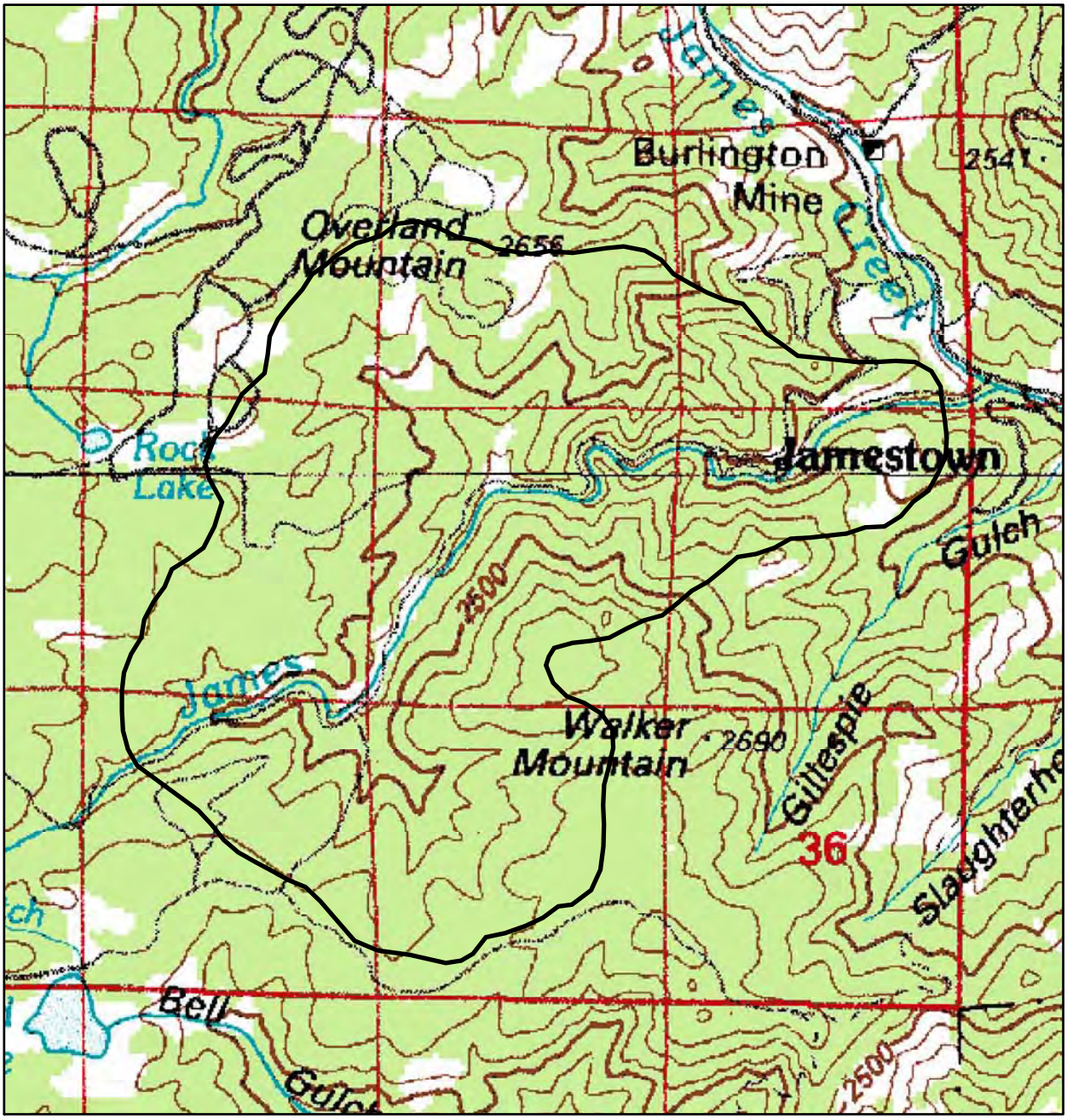
**Exotic Species Comments:** Non-natives are present along the road, but the steep, rocky nature of the canyon and the creek has kept cover low. Non-native plants include redtop (*Agrostis gigantea*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), musk thistle (*Carduus nutans*), yellow toadflax (*Linaria vulgaris*), timothy (*Phleum pratense*), Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), alsike clover (*Trifolium hybridum*), and mullein (*Verbascum thapsus*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/11/2008

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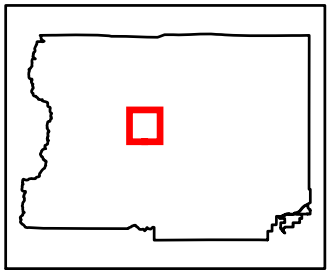
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



James Creek Potential Conservation Area, B3: High Biodiversity Significance

# Lake Albion

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward, Monarch Lake

**Size:** 1,880 acres (761 ha)

**General Description:** The Lake Albion site is located at the western edge of Boulder County, just south of Niwot Ridge. From its beginning at the Continental Divide west of the town of Boulder, Niwot Ridge extends eastward some 3.7 miles (6 km) to its terminus at Niwot Mountain. In the east-facing glacial valley on the south side of this prominent alpine ridge, a series of paternoster lakes linked by a small stream descends from Arikaree Glacier at the valley head. The five Green Lakes and Lake Albion, together with the Arapahoe Glacier and the chain of lakes above Silver Lake in the adjoining valley to the south, form the headwaters of North Boulder Creek. A prominent glaciated step separates the upper two Green Lakes from the lower lakes. The site is essentially a high alpine valley, with subalpine forest only at its lower, eastern end. At the upper end, the valley is bounded by aretes between glaciated cirques and the horn of Kiowa Peak. A rock glacier is located at the base of the north-facing side of Kiowa Peak. The upper basin is dominated by steep rock walls and talus slopes, numerous permanent snowpatches, and a valley floor of glaciated bedrock (Caine 1995). This area is almost completely devoid of vegetation, with the exception of the startling green wetlands between the upper lakes. This community is dominated by low (<0.5 m) diamondleaf willow (*Salix planifolia*) over dense tufts of Rocky Mountain sedge (*Carex scopulorum*). Associated wetland species are clustered around pools and streamlets that flow among the rocky substrate. Major associated species include white marsh marigold (*Caltha leptosepala*), redpod stonecrop (*Rhodiola* [*Clementsia*] *rhodantha*), alpine bistort (*Polygonum viviparum*), and American bistort (*Polygonum bistortoides*). The lower basin, bounded by the slopes of Niwot Ridge to the north and Mount Albion to the south, is the site of the former mining camp of Albion; here both soils and vegetation are more well developed. The lower portions of the site (below Lake Albion) support subalpine wetlands and a small tract of spruce - fir forest on the south-facing slopes of Niwot Ridge. Here wetland vegetation is dominated by low shrubs, primarily diamondleaf willow and bog birch (*Betula glandulosa*), with open sedge patches. Most of the wetland has organic soil >40 cm, which makes it a fen, but the edges have mineral soil. In areas where the soil is not organic, diamondleaf willow is very dense and the understory is dominated by bluejoint reedgrass (*Calamagrostis canadensis*) and many tall forbs. In the center of the wetland, diamondleaf willow and bog birch occur with more open cover over water sedge (*Carex aquatilis*), rock sedge (*Carex saxatilis*), fewflower

spikerush (*Eleocharis quinqueflora*) and a dense moss layer. Typical fen species redpod stonecrop, elephanthead (*Pedicularis groenlandica*), star gentian (*Swertia perennis*), and white marsh marigold are all present. Moss species include *Sphagnum russowii, Aulacomnium palustre, Drepanocladus aduncus, Tomenthypnum nitens, Polytrichum commune,* and *Climacium dendroides*. The ground surface is very hummocky, providing a mosaic of microtopographic and hydrologic settings for a diverse array of plants. The site extends to a section of wetland separated by a dirt road. This section contains a dense patch of bog sedge (*Carex microglochin*) and cottongrass (*Eriophorum angustifolium*) surrounded by low willows.

**Key Environmental Factors:** Though North Boulder Creek runs through the valley, the wetland is permanently saturated by groundwater discharge and snowmelt from the surrounding slopes that eventually drain into the creek. The wetland is not strongly associated with overflow from the active creek channel, and is not a true riparian area. Instead, it is a sloping fen with organic soil formed over hundreds and thousands of years.

**Land Use History:** The site of the former mining camp of Albion has a history of anthropogenic disturbance. Several small dams are located in the watershed, and an unpaved access road leads to the lower lakes and Lake Albion is dammed. The site is now off limits to public access and is preserved by the City of Boulder as part of its drinking water supply. The only people allowed in the watershed are City of Boulder employees and researchers from the University of Colorado's Mountain Research Station. The site is part of a National Science Foundation Long-Term Ecological Research site (along with Niwot Ridge).

**Biodiversity Significance Rank Comments (B3):** This site supports an excellent (A-ranked) occurrence of the globally vulnerable (G3?/S3?) Colorado wood-rush (*Luzula subcapitata*); a Colorado endemic, and an excellent (A-ranked) occurrence of the globally vulnerable (G3G4/SNR) *Juncus parryi / Sibbaldia procumbens* herbaceous vegetation. In addition, there are high quality examples of two globally common riparian communities, *Salix planifolia / Carex scopulorum* and *Salix planifolia / Carex aquatilis*, and an extant occurrence of the state rare (G5/S2) snow grass (*Phippsia algida*). There are also historical records of the artic draba (*Draba fladnizensis* G4/S2S3) and tundra saxifrage (*Muscaria monticola* G5T5/S1) within the vicinity of this site.

Natural Heritage element occurrences at the Lake Albion PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Juncus parryi / Sibbaldia procumbens Herbaceous Vegetation | | G3G4 | SNR | | | | A | 2007-08-09 |
| Natural Communities | Salix planifolia / Carex scopulorum Shrubland | Subalpine Riparian Willow Carr | G4 | S4 | | | | A | 2007-08-09 |
| Natural Communities | Salix planifolia / Carex aquatilis Shrubland | Subalpine Riparian Willow Carr | G5 | S4 | | | | AB | 2007-08-09 |
| Vascular Plants | Luzula subcapitata | Colorado wood-rush | G3? | S3? | | | | A | 2007-08-09 |
| Vascular Plants | Phippsia algida | snow grass | G5 | S2 | | | | E | 2000-07-11 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the entire watershed of the Green Lakes / Lake Albion valley, from the Continental Divide down to the point where the slopes of Albion and Niwot Ridge form the lower "lip" of the valley. This area is believed to be sufficient to allow the operation of normal hydrological and ecological processes that support the wetland communities, and provide a buffer against direct disturbance.

**Protection Urgency Rank Comments (P4):** The entire watershed is closed to public access. Development and recreation are not foreseeable threats, but maintenance of roads and dams in the area could affect the site.

**Management Urgency Rank Comments (M4):** Changes in hydrology due to work on the Lake Albion dam could affect the integrity of the site.

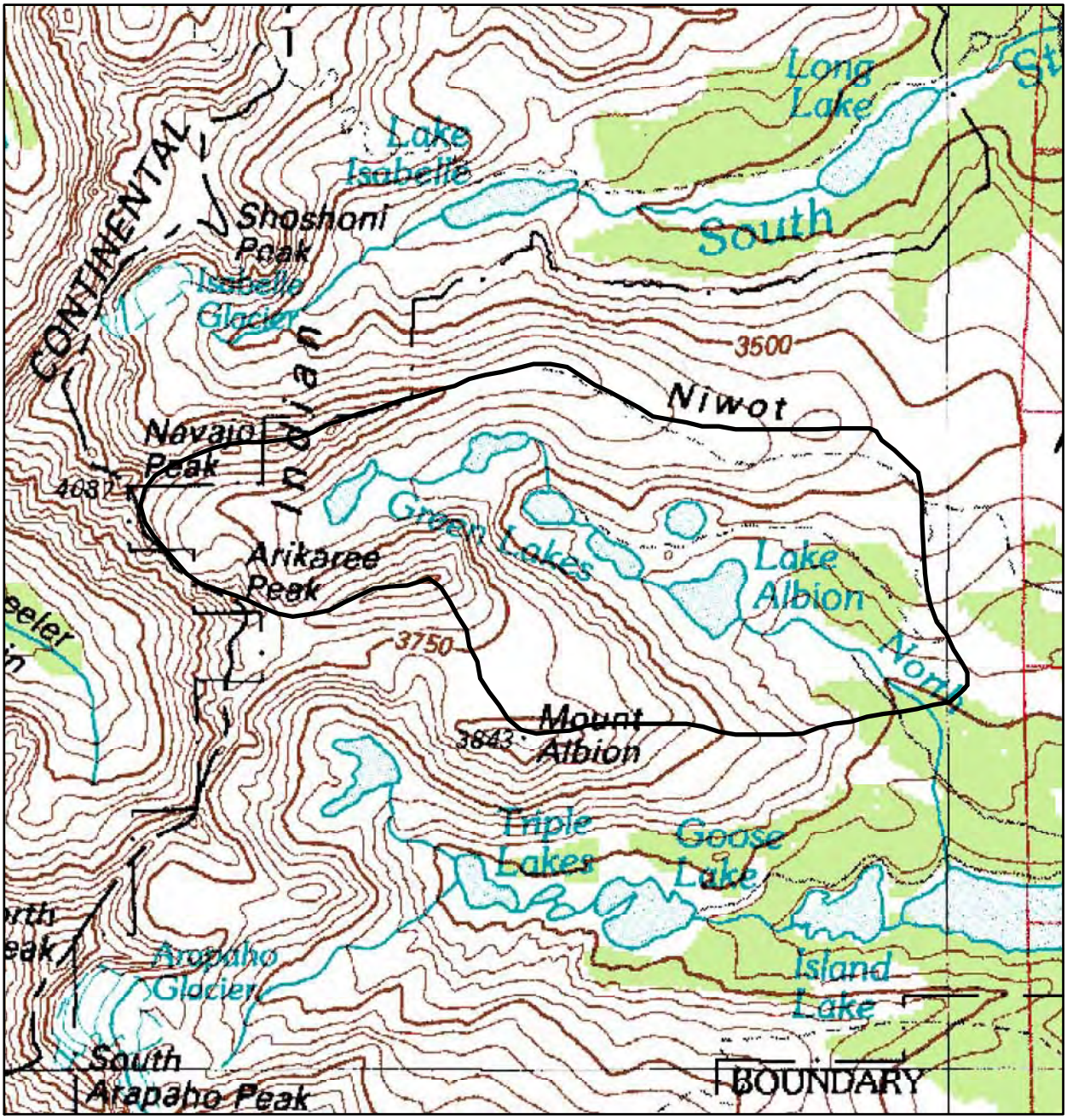
**Information Needs:** There are historical records of the rare Rocky Mountain columbine (*Aquilegia saximontana*) and clawless draba (*Draba exunguiculata*) from the 1970s. Further field surveys could locate these plants.

## References

Caine, N. 1995. Snowpack influences on geomorphic processes in Green Lakes Valley, Colorado Front Range. Geographical Journal 161:55-68.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly
**Version Date:** 06/10/2008

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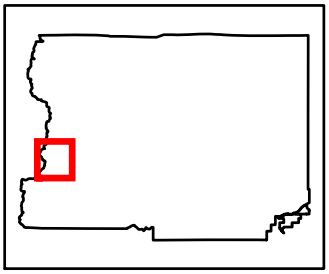
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Lake Albion Potential Conservation Area, B3: High Biodiversity Significance

# Left Hand Canyon

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Boulder, Gold Hill

**Size:** 2,943 acres (1,191 ha) **Elevation:** 5,900 - 8,580 ft. (1,798 - 2,615 m)

**General Description:** The Left Hand Canyon site is located in central Boulder County, some five miles northwest of Boulder. The site encompasses the lower reaches of Left Hand Canyon, west of the hogbacks at the mountain front. Left Hand Creek originates below Niwot Mountain, in the basin which hold Left Hand Park Reservoir. As it flows eastward from the foot of Niwot Ridge, the creek is joined by several tributaries, including James Creek. At Buckingham Park, at the eastern end of the site, the creek turns abruptly to the north to flow along the hogback, eventually exiting the foothills at a gap opposite Table Mountain north of Boulder. Within the site, Left Hand Creek flows through a steep, narrow canyon where dense shrubs and scattered trees overhang the creek. The creek is 16.4-26 ft (5-8 m) wide and fast moving, with a gradient of 5-10%. Steep canyon walls rise above the creek. North-facing slopes are dominated by dense Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), and quaking aspen (*Populus tremuloides*). Exposed south-facing slopes are open and rocky with low-cover ponderosa pine, Rocky Mountain juniper (*Juniperus scopulorum*), and dry shrubs. The riparian corridor contains high diversity of woody species, both shrubs and trees, but the most consistent dominants are narrowleaf cottonwood (*Populus angustifolia*) and water birch (*Betula occidentalis*). Several other tree species from the surrounding slopes, including Douglas-fir, quaking aspen, ponderosa pine, and Rocky Mountain juniper, extend into the riparian zone. The shrub layer is mixed and contains high cover of tall shrubs thinleaf alder (*Alnus incana*), Rocky Mountain maple (*Acer glabrum*), Bebb's willow (*Salix bebbiana*), and beaked hazel (*Corylus cornuta*) as well as water birch. The mixed mesic understory is well developed and contains a diverse array of species such as bluejoint reedgrass (*Calamagrostis canadensis*), cowparship (*Heracleum maximum*), and horsetail (*Equisetum arvensis*).

**Land Use History:** A well-used paved road runs along Left Hand Creek and is the main route to the town of Ward on the Peak-to-Peak Hwy. There are houses scattered along the road. Evidence of historic mining is minimal within the site but common upstream.

**Biodiversity Significance Rank Comments (B3):** This site supports a good

(B-ranked) occurrence of a globally vulnerable (G3/S3) *Populus angustifolia / Betula occidentali*s montane riparian forest. Boulder County also has documented records for the state imperiled (G5/S1) northern redbelly dace (*Phoxinus eos*), found in pond near OSMP property, and an occurrence for the state rare (G5/S3) Theano alpine butterfly (*Erebia pawlowskii*) but these records are not in the CNHP database at this time.

Natural Heritage element occurrences at the Left Hand Canyon PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Populus angustifolia / Betula occidentalis Woodland | Montane Riparian Forest | G3 | S3 | | | | B | 2007-06-07 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrence and the surrounding canyon, with a buffer of approximately 1 mile upstream. These boundaries are believed to be sufficient to maintain the normal hydrological and ecological processes supporting the riparian vegetation. These natural processes are not completely contained within the boundary, and off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P3):** Ownership is very mixed and includes USFS, City of Boulder, and numerous private owners. The riparian corridor is largely in private ownership and vulnerable to development.

**Management Urgency Rank Comments (M4):** The easy access provided by the road, and corresponding heavy recreational use, may facilitate the spread of those weed species which are already present, or introduce new ones.

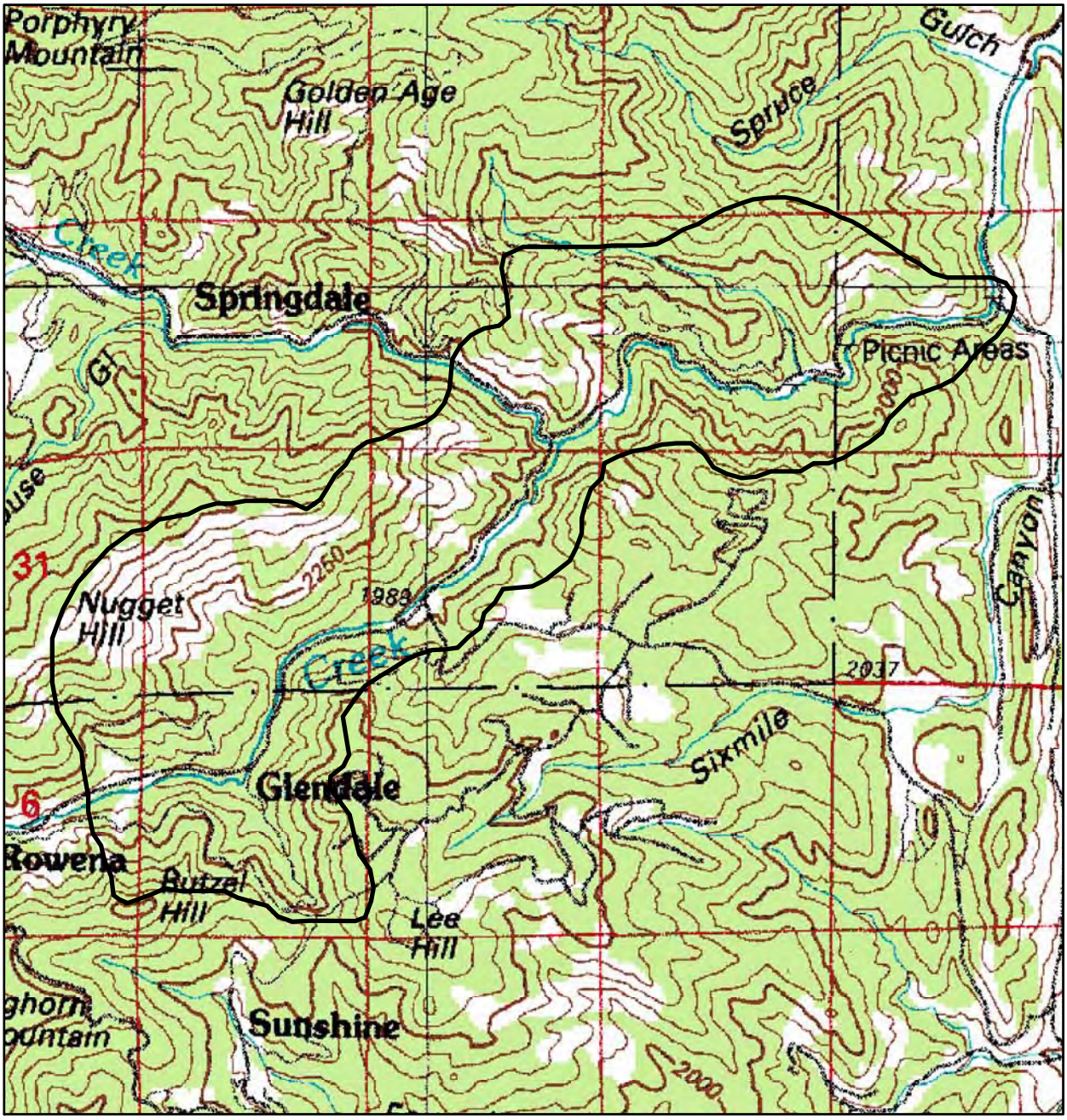
**Exotic Species Comments:** Non-native plants are present along the road, but the steep, rocky nature of the canyon and the creek has kept cover relatively low. Non-native plants include smooth brome (*Bromus inermis*), orchardgrass (*Dactylis glomerata*), crack willow (*Salix fragilis*), and dandelion (*Taraxacum officinale*).

**Information Needs:** Complete element occurrence records for northern redbelly dace (*Phoxinus eos*) and Theano alpine butterfly (*Erebia pawlowskii*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly
**Version Date:** 06/03/2008

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Map Date: 06/05/2008

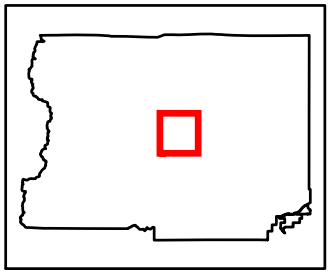
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Left Hand Canyon Potential Conservation Area, B3: High Biodiversity Significance

# Lost Lake South

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P?: Unknown**

**Management Urgency Rank - M?: Unknown**

**U.S.G.S. 7.5-minute quadrangles:** Nederland

**Size:** 99 acres (40 ha) **Elevation:** 9,680 - 10,200 ft. (2,950 - 3,109 m)

**General Description:** The site surrounds a moderate-sized subalpine lake at the edge of the Indian Peaks Wilderness Area that contains a population of the Rocky Mountain capshell (*Acroloxus coloradensis*) and a historical breeding record of the boreal toad (*Bufo boreas*). Boreal toads were last documented breeding at this site in 1998.

**Biodiversity Significance Rank Comments (B3):** This site contains a good (B-ranked) occurrence of the globally vulnerable (G3/S1) Rocky Mountain capshell (*Acroloxus coloradensis*).

Natural Heritage element occurrences at the Lost Lake South PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Mollusks | Acroloxus coloradensis | Rocky Mountain Capshell | G3 | S1 | | SC | USFS | B | 1993-07-20 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the lake and approximately 300 meter buffer to protect local processes.

**Protection Urgency Rank Comments (P?):** Insufficient data to rank.

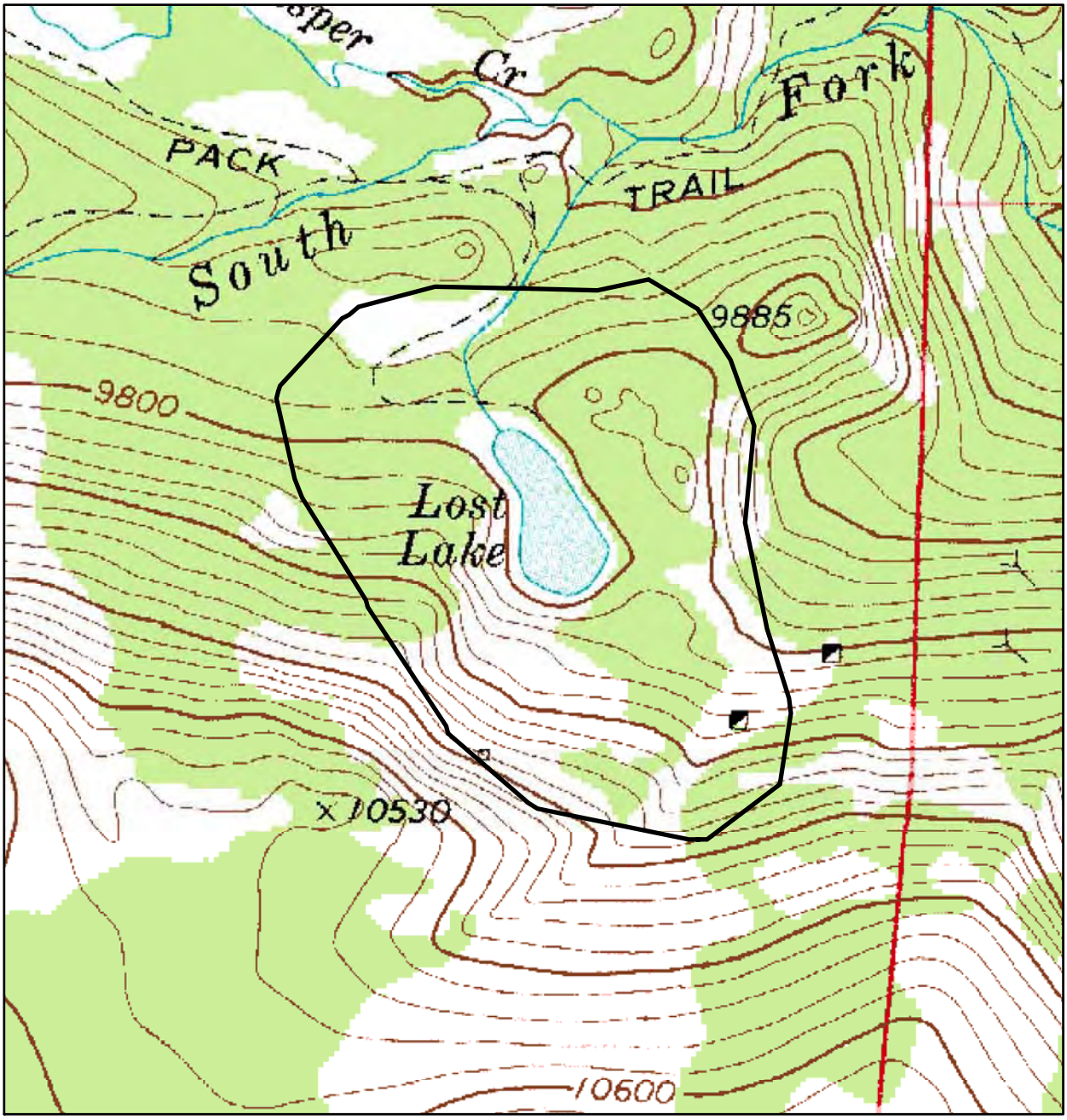
**Management Urgency Rank Comments (M?):** Insufficient data to rank.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Seimers, J.L.

**Version Date:** 10/31/2008

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Map Date: 10/29/2008

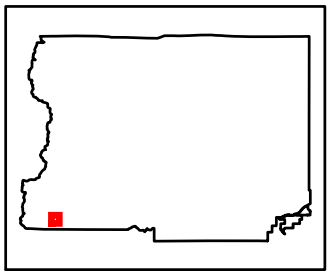
**Legend**

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Lost Lake South Potential Conservation Area, B3: High Biodiversity Significance

# Middle Boulder Creek at Eldora

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Nederland

**Size:** 255 acres (103 ha)

**General Description:** The site consists of a flat open floodplain terrace and a montane grassland which supports mountain muhly (*Muhlenbergia montana*), Parry's oatgrass (*Danthonia parryi*), needle-and-thread grass (*Hesperostipa comata*), thickspike wheatgrass (*Elymus lanceolatus*), fringed sage (*Artemisia frigida*), hairy false goldenaster (*Heterotheca villosa*), and sulphur-flower buckwheat (*Eriogonum umbellatum*). Additional associated plant species include sun sedge (*Carex heliophila*), Rocky Mountain fescue (*Festuca saximontana*) and lesser spikemoss (*Selaginella densa*). The parent material is igneous, silver plume granite decomposing to a gravelly sandy loam within a glaciated mountain valley.

**Biodiversity Significance Rank Comments (B3):** This site includes a good (B-ranked) occurrence of a globally vulnerable (G3/S1) sedge, *Carex oreocharis*, and an unranked occurrence of a globally vulnerable (G3G4/S2?) *Muhlenbergia montana - Danthonia parryi* montane grassland.

Natural Heritage element occurrences at the Middle Boulder Creek at Eldora PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Danthonia parryi Herbaceous Vegetation | Montane Grasslands | G3 | S3 | | | | E | 1995-08-24 |
| Vascular Plants | Carex oreocharis | a sedge | G3 | S1 | | | | B | 1995-08-24 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to include the occurrences, adjacent potential habitat, and the local mosaic of plant communities.

**Protection Urgency Rank Comments (P4):** Conservation easement precludes housing and other development.

**Management Urgency Rank Comments (M4):** The hydrology of the site should be maintained and the occurrence should be considered during modifications within

the watershed. Light horse and elk grazing. No threats to the occurrence reported.

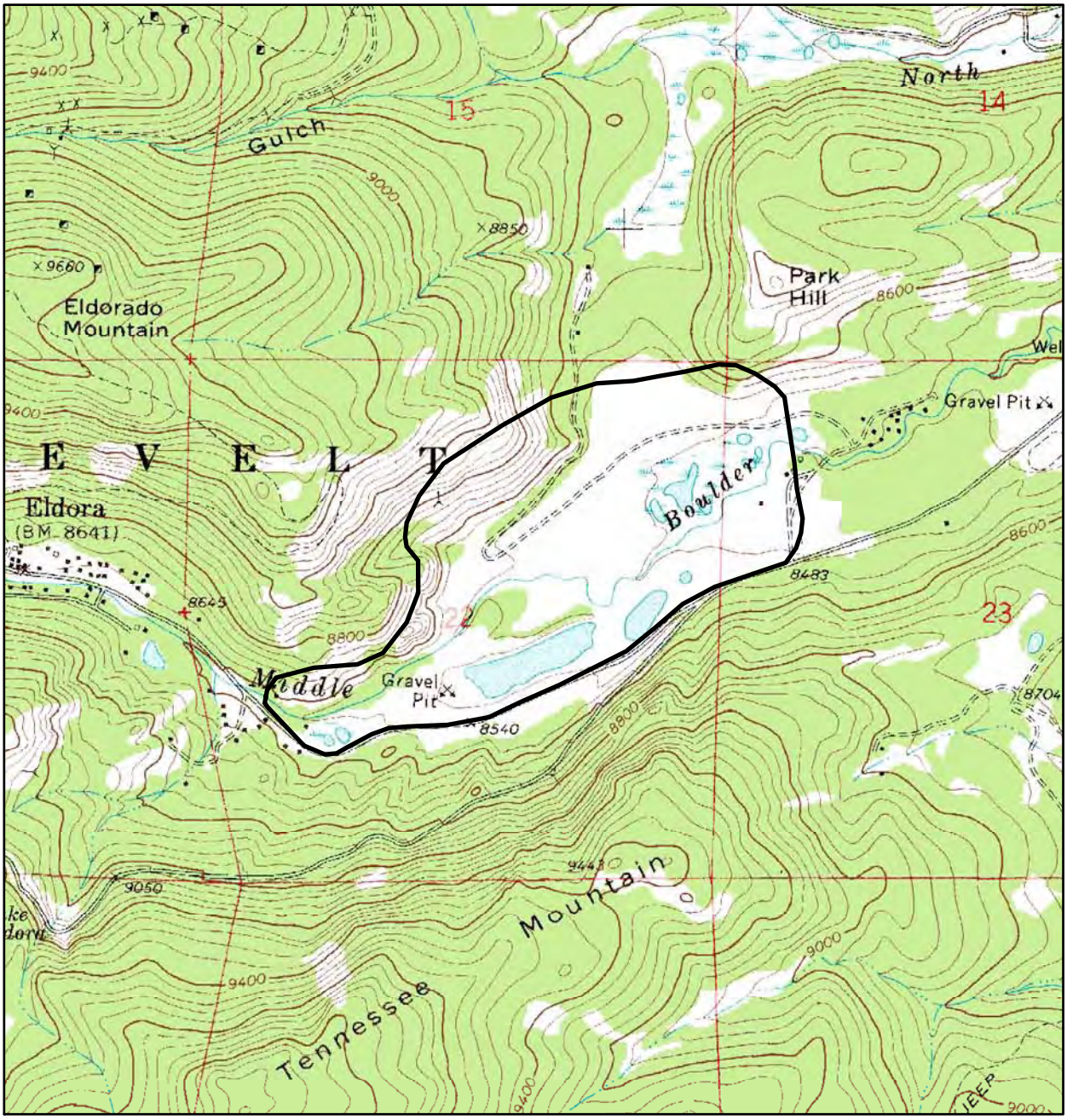
**Off-Site Considerations:** Two large, partially-restored gravel mines are immediately south of the site.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Fayette, K.K.

**Version Date:** 02/10/1997

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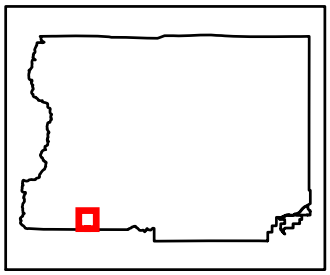
## Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Middle Boulder Creek at Eldora Potential Conservation Area, B3: High Biodiversity Significance

# Middle Saint Vrain Creek at Peaceful Valley

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward, Allens Park

**Size:** 470 acres (190 ha) **Elevation:** 8,560 - 9,300 ft. (2,609 - 2,835 m)

**General Description:** The site is located in west-central Boulder County, about 3.5 miles north of the town of Ward. Middle St. Vrain Creek originates below the St. Vrain glaciers in a cirque on the Continental Divide approximately five miles west of the site. The creek and its upper tributaries flow east from the Indian Peaks Wilderness through a steep-walled valley, crossing Highway 72 at Peaceful Valley just east of the site. The valley walls are formed in glacial drift and rock outcrop. At Camp Dick Campground, the valley widens and the stream gradient decreases; here beaver activity has filled the valley with standing water ponds and lush riparian vegetation. The valley is 125-200 m wide and the stream gradient is 5-10%. The creek itself is 16.4-32.8 ft (5-10 m) wide and is located mainly along the western edge of the willow carr. Extensive beaver activity has created side channels and stagnant pools that divert surface and groundwater across the valley floor. Numerous seeps from the southern valley wall feed these beaver ponds. Where not inundated, the ground surface is covered with litter and moss. Surrounding north-facing slopes are steep and dominated by dense, moist Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) with occasional limber pine (*Pinus flexilis*). South-facing slopes are more open and rocky with moderate cover of lodgepole pine (*Pinus contorta*) and many standing dead trees. The valley floor between the campgrounds supports a dense willow carr dominated by tall (6.6-16.4 ft/2-5 m) shrubs. The most dominant tall shrub is Drummond's willow (*Salix drummondiana*) at 40% cover. Other prominent shrubs include park willow (*Salix monticola*) at 20% cover, diamondleaf willow (*Salix planifolia*) at 10% cover, and thinleaf alder (*Alnus incana*) at 10% cover. The stream channel itself is shaded by Engelmann spruce, but much of the wetland is open willow carr over beaver ponds. The understory contains many herbaceous species, but is primarily dominated by bluejoint reedgrass (*Calamagrostis canadensis*), fowl mannagrass (*Glyceria striata*), softleaf sedge (*Carex disperma*), and cowparsnip (*Heracleum maximum*). A lush moss layer occurs beneath the vascular plants and litter and includes *Aulacomnium palustre, Climacium dendroides, Drepanocladus aduncus,* and *Brachythecium* spp. Upstream from the willow carr, Drummond's willow also occurs along the narrower forested reaches of the creek as part of a subalpine fir - Engelmann spruce/Drummond's willow community. The geology of the area is mapped as glacial drift of the Pinedale and Bull Lake glaciations (Tweto 1979). Soils within the occurrence are mapped at a coarse level as

Cryaquolls-Leighcan family, till substratum complex, 0 to 15 percent slope. Cryaquolls occur on floodplains and are derived from gravelly glaciofluvial deposits and/or gravelly till from igneous, metamorphic, and sedimentary rock. Soils from the Leighcan family occur on mountain slopes and are derived from residuum and/or till from igneous and metamorphic rock (USDA 2007).

**Key Environmental Factors:** Water levels in the creek fluctuate seasonally, but the extensive ponds maintained by a thriving beaver population are essential to providing the hydrologic setting for the wetland community.

**Land Use History:** There are two campgrounds in the site. Camp Dick, now a USFS campground, was once the site of a Civilian Conservation Corps camp, established in the 1930s. The area currently receives fairly heavy recreational use.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix drummondiana / Calamagrostis canadensis* lower montane willow carr and a good (B-ranked) occurrence of the state imperiled (G5/S2) broad-leaved twayblade (*Listera convallarioides*). Clustered lady's-slipper (*Cypripedium fasciculatum*), a plant on CNHP's watch list, was documented in 2001.

Natural Heritage element occurrences at the Middle Saint Vrain Creek at Peaceful Valley PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix drummondiana / Calamagrostis canadensis Shrubland | Lower Montane Willow Carrs | G3 | S3 | | | | B | 2007-09-11 |
| Vascular Plants | Listera convallarioides | broad - leaved twayblade | G5 | S2 | | | | B | 2007-07-17 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the valley of the Middle St. Vrain above and below the occurrence. Although this area provides a buffer against some disturbance and contributes to the hydrological and ecological processes maintaining the willow carr, off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** The site is located within the Roosevelt National Forest.

**Management Urgency Rank Comments (M4):** A management plan that gives attention to controlling weeds and recreation pressures will help protect the values

of this site.

**Land Use Comments:** The site is currently used for recreation, including hiking, backpacking, horseback riding, mountain biking, 4x4 and off-highway vehicle use, and fishing.

**Exotic Species Comments:** The vegetation does show some evidence of disturbance, including some invasive species such as smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), and Canada thistle (*Cirsium arvense*).

## References

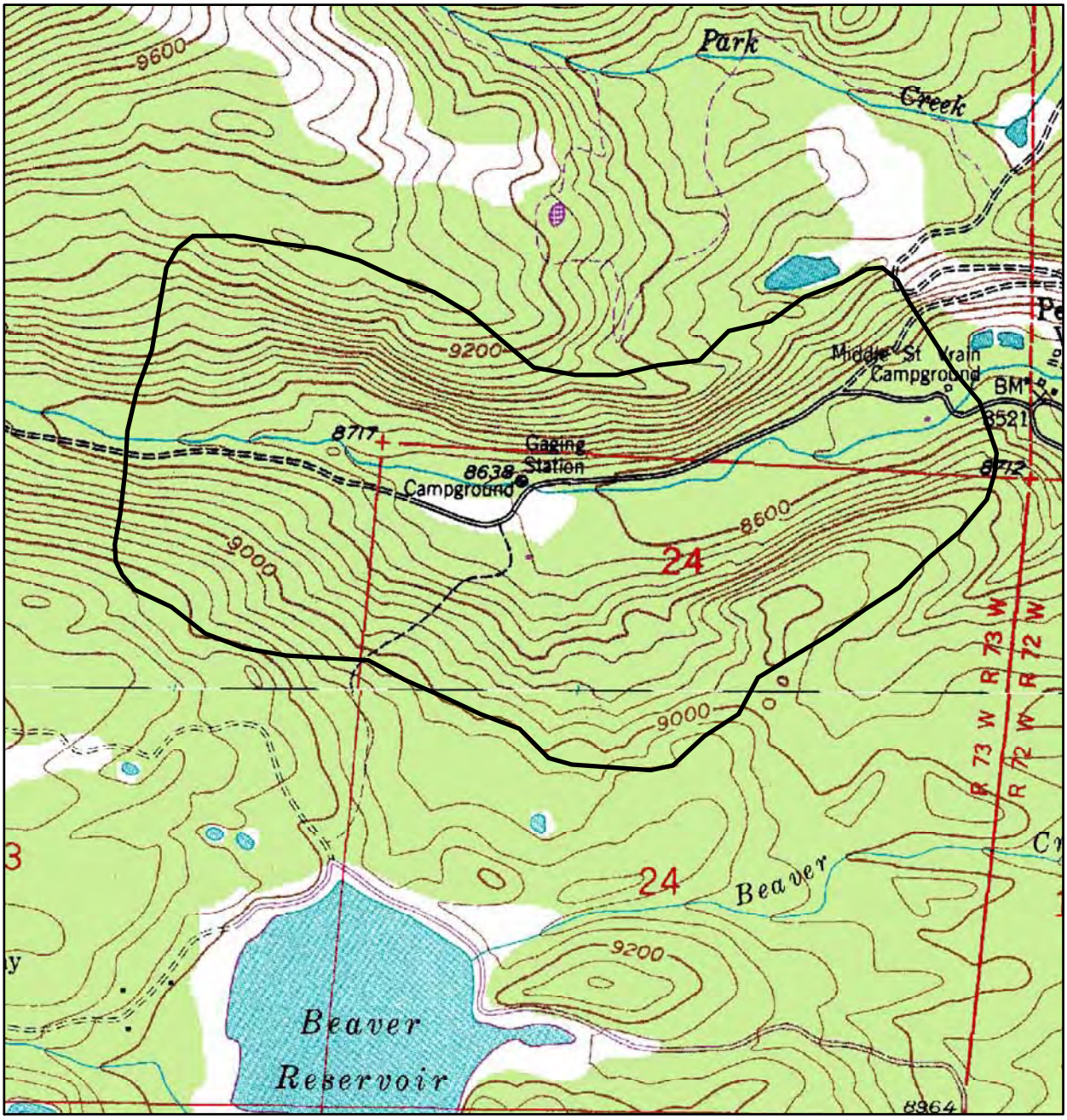
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Tweto, O. 1979. Geologic Map of Colorado, 1:500,000. United States Geological Survey, Department of Interior, and Geologic Survey of Colorado, Denver, CO.

USDA. 2007a. Soil Survey Geographic (SSURGO) database for Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park, and Larimer Counties. USDA Natural Resources Conservation Service, Fort Worth, Texas. URL: . Downloaded on October 16, 2007.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/12/2008

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Map Date: 12/22/2008

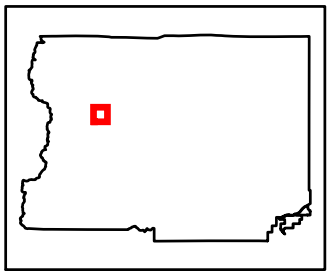
## Legend

PCA Boundary

Ward, 40105-A5
Allens Park, 40105-B5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Middle Saint Vrain Creek at Peaceful Valley Potential Conservation Area, B3: High Biodiversity Significance

# North Beaver Creek

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Nederland

**Size:** 322 acres (130 ha) **Elevation:** 8,400 - 8,840 ft. (2,560 - 2,694 m)

**General Description:** The North Beaver Creek site is located west of the town of Nederland. This site encompasses a large open valley where Coon Track Creek and Hicks Gulch join to form North Beaver Creek. East of the site, the creek flows through Nederland and into Barker Reservoir. The floor of the valley supports an extensive, dense willow carr dominated by park willow (*Salix monticola*) at 60% cover. There are emergent blue spruce (*Picea pungens*) scattered throughout the wetland, as well as 10% cover of thinleaf alder (*Alnus incana*). Willows within the stand are mainly 3-4 m tall and the alder reach 5 m tall. CNHP did not receive landowner permission, but from the roadside it appears that native species, including bluejoint reedgrass (*Calamagrostis canadensis*), water sedge (*Carex aquatilis*), and beaked sedge (*Carex utriculata*), dominate the understory along with typical forbs such as cowparsnip (*Heracleum maximum*), fringed bluebells (*Mertensia ciliata*), and fireweed (*Chamerion angustifolium*). Surrounding slopes are forested with Engelmann spruce (*Picea engelmannii*), limber pine (*Pinus flexilis*), ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), and several pockets of quaking aspen (*Populus tremuloides*).

**Key Environmental Factors:** There may be enough groundwater discharge from the surrounding hillsides to maintain high water tables for healthy willow growth in the absence of beaver activity.

**Land Use History:** There is a history of mining activity in the Caribou area that continues today. There are several old mines near the creeks and at least one active mine near the Caribou Townsite. The area was likely grazed in the past.

**Biodiversity Significance Rank Comments (B3):** The site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix monticola / Calamagrostis canadensis* montane willow carr.

Natural Heritage element occurrences at the North Beaver Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carr | G3 | S3 | | | | B | 2007-09-12 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrence and a buffer encompassing the surrounding hillsides. Although this area provides a buffer against disturbance and contributes to the hydrological and ecological processes maintaining the willow carr, off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P3):** Over 200 acres of this site is in private ownership, with multiple owners and no known protection in place.

**Management Urgency Rank Comments (M4):** The road is immediately adjacent to the willow carr and is a likely source of erosion into the wetland.

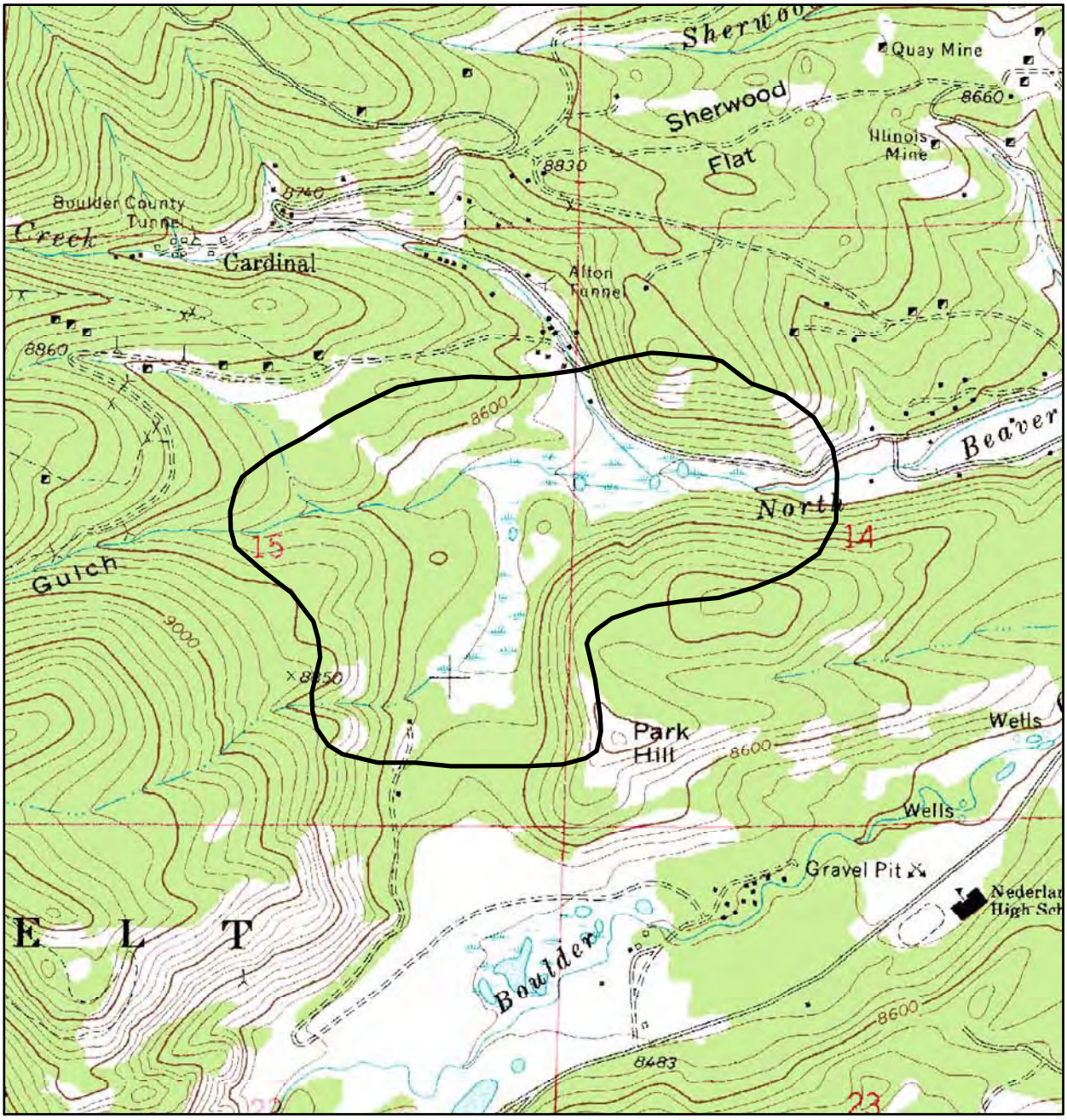
**Exotic Species Comments:** There are non-native species, e.g. redtop (*Agrostis gigantea*) and smooth brome (*Bromus inermis*), along the road and some observed in the wetland understory, though they do not contribute high cover

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/11/2008

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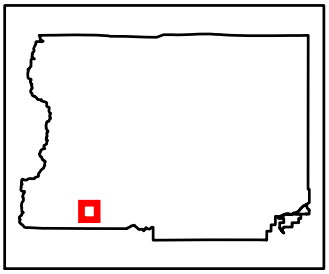
## Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



North Beaver Creek Potential Conservation Area, B3: High Biodiversity Significance

# North Boulder Creek at Caribou Ranch

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward

**Size:** 463 acres (187 ha) **Elevation:** 9,240 - 9,920 ft. (2,816 - 3,024 m)

**General Description:** The site is located in southwestern Boulder County at the junction of Caribou Creek with North Boulder Creek some 3.5 miles northwest of Nederland. Caribou Creek is formed by three tributaries draining the eastern slopes of Caribou Peak, while North Boulder Creek arises from a pair of glaciated valleys heading on the Continental Divide northwest of the site. Within the site, Caribou Creek pours down a moderately sloping hillside of glacial till from a flat valley above. The slope has considerable groundwater discharge and supports a large sloping fen located on glacial till and draining into North Boulder Creek. The vegetation is dominated by tall (6.5-16.5 ft/2-5 m) shrubs, primarily Drummond's willow (*Salix drummondiana*) at approximately 50% cover, with occasional park willow (*Salix monticola*) and alder (*Alnus incana*) at approximately 10% cover each. Beneath the shrub layer, there is dense graminoid cover dominated by bluejoint reedgrass (*Calamagrostis canadensis*), fowl mannagrass (*Glyceria striata),* beaked sedge (*Carex utriculata*), and water sedge (*Carex aquatilis*). There are numerous pools formed on flat benches within the slope and numerous small channels flowing through the wetland. The ground surface is uneven and hummocky, which combined with tall shrubs and deep pools of water, makes for difficult navigation through the site. Heavy litter and dense moss carpet the ground, where not covered in water. Moss genera observed in the wetland include *Drepanocladus, Bryum,* and *Brachythecium.* At the bottom of the slope, the banks of North Boulder Creek support a narrow, mixed riparian shrubland. The tall shrub (2-5 m) layer is dominated by 30% cover of Drummond's willow and 20% cover of alder. The understory is diverse and contains mixed graminoids and forbs. The most prevalent species include bluejoint reedgrass, softleaf sedge (*Carex disperma*), fowl mannagrass, cowparsnip (*Heracleum maximum*), and arrowleaf ragwort (*Senecio triangularis*). Several forest tree species overhang and integrate into the riparian vegetation, including Engelmann spruce (*Picea engelmannii*), lodgepole pine (*Pinus contorta*), and quaking aspen (*Populus tremuloides*). The surrounding valley walls are densely forested by a mix of Engelmann spruce, subalpine fir (*Abies lasiocarpa*), limber pine (*Pinus flexilis*), and lodgepole pine.

**Key Environmental Factors:** A sloping fen fed by groundwater, and a riparian corridor with seasonally variable flows.

**Land Use History:** There was historic mining, grazing, and possibly forestry in the area.

**Biodiversity Significance Rank Comments (B3):** The site supports an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) *Salix drummondiana / Calamagrostis canadensi*s montane willow carr and a fair (C-ranked) occurrence of a globally vulnerable (G3/S3) *Alnus incana - Salix drummondiana* montane riparian shrubland. Several individuals of the globally rare (G3/S3) reflected moonwort (*Botrychium echo*) were documented in the area in the 1990s, but locational information is imprecise.

Natural Heritage element occurrences at the North Boulder Creek at Caribou Ranch PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Alnus incana - Salix drummondiana Shrubland | Montane Riparian Shrubland | G3 | S3 | | | | C | 2007-08-23 |
| Natural Communities | Salix drummondiana / Calamagrostis canadensis Shrubland | Lower Montane Willow Carrs | G3 | S3 | | | | A | 2007-08-23 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and the immediate watershed, allowing for the operation of normal hydrological and ecological processes that support the fen and riparian communities, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and offsite activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** A large portion of the site is within Boulder County's Caribou Ranch Open Space; another large portion is on City of Boulder watershed lands, on the north and south. The remainder is USFS land. The county has a thorough management plan for the property, which includes restrictions on public access. The general public must stay on designated trails within the open space and there are no trails in this northern section, making this area off limits to recreational visitors. However, the City of Boulder operates a pipeline that runs through the open space adjacent to the creek, and the well-used Rainbow Lakes Road traverses the site. Ongoing maintenance to the road and pipeline has the potential to impact the site.

**Management Urgency Rank Comments (M4):** Road and pipeline maintenance efforts could have an adverse impact on the value of this site unless care is taken to minimize the effects to the wetlands.

**Land Use Comments:** There are no obvious diversions within the site, but the upper watershed is dammed for City of Boulder municipal water use and diverted out of the creek through a substantial underground pipeline, which runs adjacent to the creek. Along with the pipeline, there is an adjacent dirt road for pipeline access and maintenance.

**Exotic Species Comments:** There are only a few nonnative species present in the wetland and they represent very little cover. These plants include redtop (*Agrostis gigantea*), oxeye daisy (*Leucanthemum vulgare*), timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), and white clover (*Trifolium repens*).

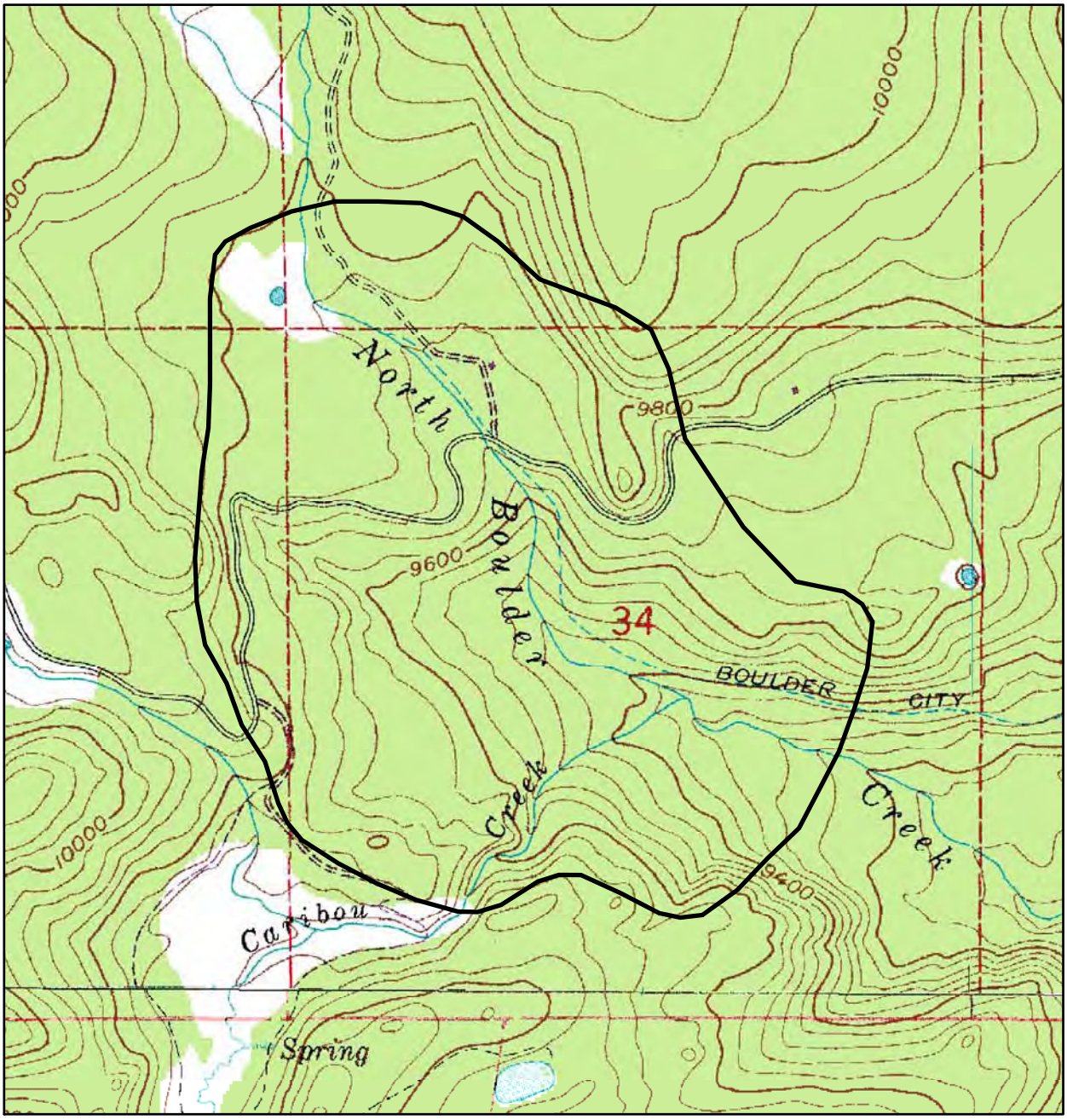
**Information Needs:** Search for reflected moonwort (*Botrychium echo*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/12/2008

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Map Date: 06/19/2008

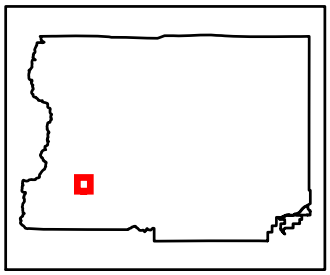
**Legend**

PCA Boundary

Ward, 40105-A5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



North Boulder Creek at Caribou Ranch Potential Conservation Area, B3: High Biodiversity Significance

# Roaring Fork

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Longs Peak

**Size:** 203 acres (82 ha) **Elevation:** 8,840 - 9,400 ft. (2,694 - 2,865 m)

**General Description:** The Roaring Fork site is in northwestern Boulder County, about 4 miles north of Allenspark. A tributary of Cabin Creek, which is itself a tributary of the North St. Vrain, the Roaring Fork originates in Chasm Lake below the east face of Longs Peak, and descends through an east-facing glacial valley. The site is located on the southern lobe of the terminal moraine bisected by Roaring Fork, on the lower slopes of Mount Meeker. Here Roaring Fork cascades through a series of alternating steep and flat reaches as it flows southeast. South of the creek, a series of ponds and associated wetlands that may represent old beaver activity support a large park willow (*Salix monticola*) / bluejoint reedgrass (*Calamagrostis canadensis*) carr, and a wet meadow dominated by beaked sedge (*Carex utriculata*). Additional species present include bog birch (*Betula glandulosa*), shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*), water sedge (*Carex aquatilis*), and woolly sedge (*Carex lanuginosa*). Surrounding forested areas are dominated by a mix of lodgepole pine (*Pinus contorta*) and Engelmann spruce (*Picea engelmannii*).

**Land Use History:** The site may have been grazed in the past. Currently it is used for recreation. A few houses are present at the eastern end.

**Biodiversity Significance Rank Comments (B3):** This site supports an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) *Salix monticola / Calamagrostis canadensis* montane willow carr and an excellent (A-ranked) occurrence of a globally common (G5/S4) beaked sedge (*Carex utriculata*) montane wet meadow.

Natural Heritage element occurrences at the Roaring Fork PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carr | G3 | S3 | | | | A | 1996-07-10 |
| Natural Communities | Carex utriculata Herbaceous Vegetation | Beaked Sedge Montane Wet Meadows | G5 | S4 | | | | A | 1996-07-10 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and the adjacent stretch of Roaring Fork, allowing for the operation of normal hydrological and ecological processes that support the wetland community, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** The western three quarters of the site are within Rocky Mountain National Park and the eastern end is privately owned. The area is not easily accessed by the public.

**Management Urgency Rank Comments (M4):** Disturbance is minimal.

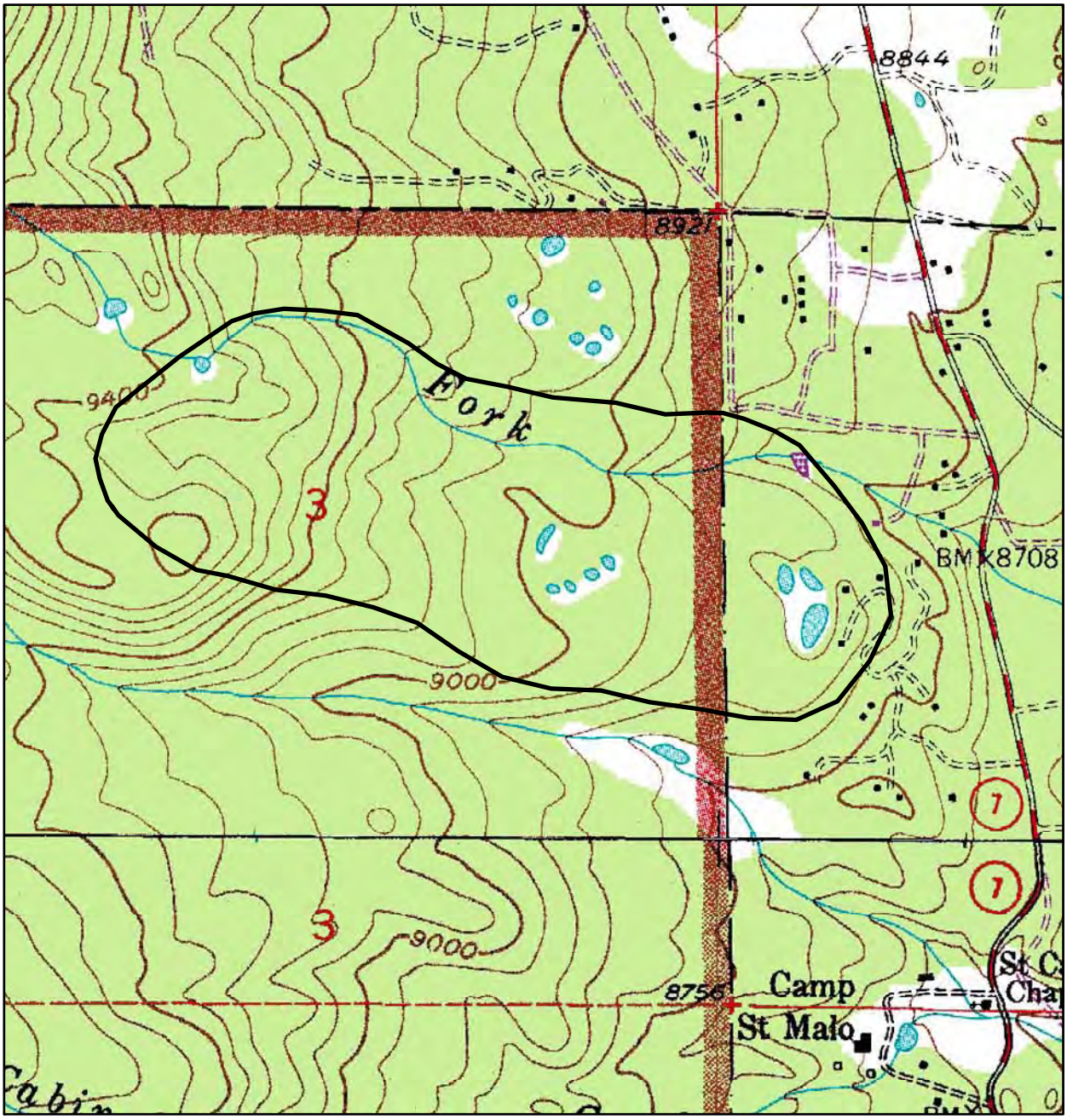
**Exotic Species Comments:** Minimal amount of Kentucky bluegrass (*Poa pratensis*) and dandelion (*Taraxacum officinale*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/02/2008

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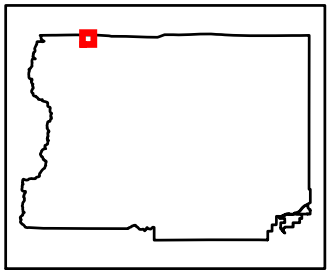
## Legend

PCA Boundary

Longs Peak, 40105-C5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Roaring Fork Potential Conservation Area, B3: High Biodiversity Significance

# The Ironclads

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Raymond, Allens Park

**Size:** 2,019 acres (817 ha) **Elevation:** 8,117 - 9,908 ft. (2,474 - 3,020 m)

**General Description:** The Ironclads are a large area of granitic rock pavement, smooth tors, and outcrops south of Allenspark along the Peak to Peak Highway in northwest Boulder County. The ponderosa pine (*Pinus ponderosa*) woodland of The Ironclads is near the upper elevational limits for the system. Forest cover shifts rapidly from mixed conifer, including lodgepole pine (*Pinus contorta*) and Douglas-fir (*Pseudotsuga menziesii*), to spruce - fir (*Picea engelmannii - Abies lasiocarpa*) forest within 0.5 miles. The extensive rock pavement is sparsely vegetated by stunted ponderosa pine and limber pine (*Pinus flexilis*). Dwarf birch (*Betula nana*) occurs sporadically in crevices across the broad slope. Bog birch is most often found in fen wetlands in Colorado, so its presence is unusual in this setting. Off the pavement there are shallow, well-drained, gravelly soils that support a mixed age class woodland with many large, mature ponderosa pine. There are minor amounts of Douglas-fir, especially in protected pockets or crevices. Aspen (*Populus tremuloides*) is present in the subcanopy in limited areas. Dwarf shrubs are common and abundant and form large copses in the gravel surface soils. Species include bearberry (*Arctostaphylos uva-ursi*), Fendler's ceanothus (*Ceanothus fendleri*), and bitterbrush (*Purshia tridentata*). The herbaceous layer is well-developed and diverse. It is dominated by graminoids, especially spike fescue (*Leucopoa kingii*), which forms large swards. Needle duff and sand comprise the unvegetated surface. There is a network of ORV roads surrounding the main outcrops, but the rocky nature appears to limit some use.

**Key Environmental Factors:** Upper montane elevation zone; granite bedrock.

**Biodiversity Significance Rank Comments (B3):** The site supports a good (B-ranked) occurrence of the globally vulnerable (G3/S3) *Pinus ponderosa / Leucopoa kingii* foothills ponderosa pine savanna.

Natural Heritage element occurrences at the The Ironclads PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Pinus ponderosa / Leucopoa kingii Woodland | Foothills Ponderosa Pine Savannas | G3 | S3 | | | | B | 2007-07-18 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** This site includes The Ironclads, a notable landscape feature, and its immediate surrounding watershed. It is drawn for occurrences of rare ponderosa pine plant communities and includes enough area to support a mixed fire regime.

**Protection Urgency Rank Comments (P3):** The majority of the site is on the Arapaho-Roosevelt National Forest although there are significant areas of private land. The private land is subdivided into roughly 50 acre parcels, many of which are undeveloped.

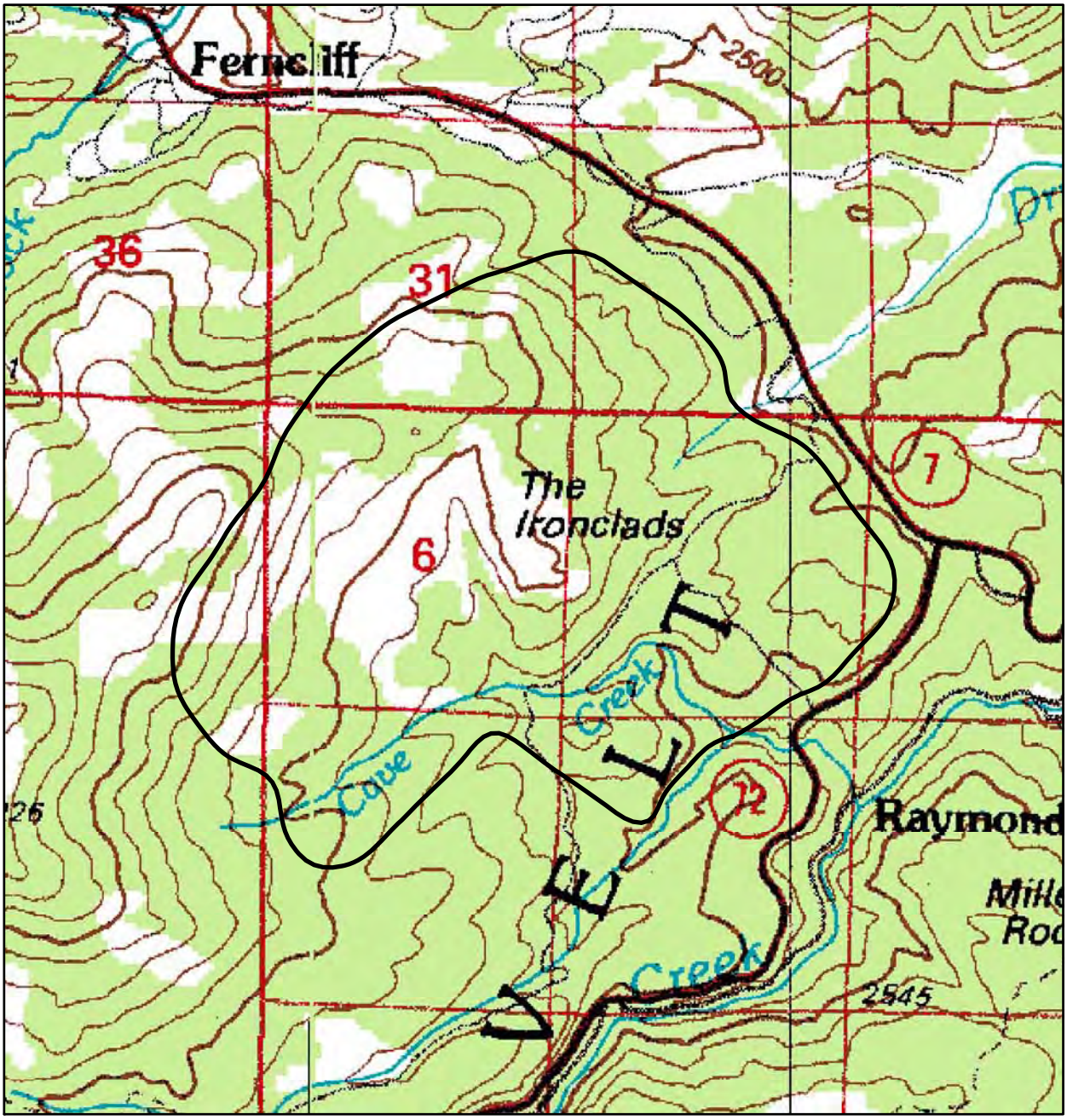
**Management Urgency Rank Comments (M3):** Discourage additional roads from being established.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 10/20/2008

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Map Date: 11/01/2008

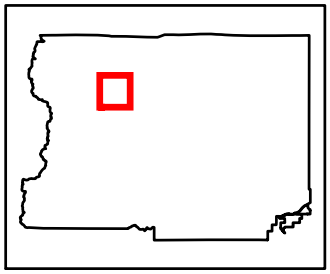
**Legend**

PCA Boundary

Eastes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



The Ironclads Potential Conservation Area, B3: High Biodiversity Significance

# Tumblesom Lake

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward, Gold Hill

**Size:** 1,039 acres (420 ha) **Elevation:** 8,800 - 9,200 ft. (2,682 - 2,804 m)

**General Description:** The Tumblesom Lake site is located in west-central Boulder County, about 6 miles east of the Continental Divide, north of the town of Ward. The lake occupies a small basin at the foot of the long slope of glacial drift deposited around the foot of Mount Audubon. This gently sloping basin is perched above the adjacent South St. Vrain Creek drainage, and the outlet stream from Tumblesom Lake joins the creek several hundred yards below the site boundary. Slopes above the lake are forested, and generally dominated by lodgepole pine (*Pinus contorta*), with ponderosa pine (*Pinus ponderosa*), limber pine (*Pinus flexilis*), Engelmann spruce (*Picea engelmannii*), and subalpine fir (*Abies lasiocarpa*). Stands of quaking aspen (*Populus tremuloides*) are also interspersed. The lake has no clear inlet, but a series of small seeps and springs discharge groundwater into the lake and adjacent wetland from the slopes above. The west side of Tumblesom Lake supports a dense tall-willow carr. The stand contains a diverse array of shrub species, dominated primarily by park willow (*Salix monticola*) and thinleaf alder (*Alnus incana*). Willow (*Salix* spp) individuals range from 6.5-13 ft (2-4 m) tall and form a closed canopy over the diverse understory. Within the *Salix* matrix, alder reach over 13-16.5 ft (4-5 m) high and extend above the main canopy. A few old beaver ponds occur within the wetland, creating a mosaic of microtopographic positions. The understory vegetation changes based on the hydrologic differences between moist and saturated soil. At the far northwest corner of the lake in the wetland is dominated by low (4 ft/1 m) shrubs, notably diamondleaf willow (*Salix planifolia*) and short park willow. Here the understory is typical of fen vegetation, including water sedge (*Carex aquatilis*), redpod stonecrop (*Rhodiola* [*Clementsia*] *rhodantha*), and elephanthead (*Pedicularis groenlandica*) with very dense moss cover including *Climacium dendroides, Drepanocladus aduncus, Aulacomnum palustre, Helodium blandowii, Bryum pseudotriquitrum,* and *Plagiomnium* spp. Immediately on the lake edge, the ground is very soft and may even be a floating mat extending over the lake. This area supports a small population of the state-rare lesser panicled sedge (*Carex diandra*). The upslope side of the wetland transitions from saturated peat soil to drier mineral soil and the vegetation composition changes as well. There is more Bebb willow (*Salix bebbiana*) in this area and the understory contains high cover of nonnative pasture grasses.

**Key Environmental Factors:** Geology is mapped as glacial drift of Pinedale and Bull Lake glaciations (Tweto 1979). Soils are predominantly Leighcan family till, with moderate to high permeability and low run-off, providing groundwater recharge for the wetland area downslope. The center of the wetland appears to have a stable groundwater table at or near the ground surface, which maintains saturated soil, slowing decomposition and allowing the accumulation of a thick layer of organic matter over hundreds and thousands of years.

**Land Use History:** The area has been grazed in the past. The lake has been dredged and raised by a small outlet dam to enhance recreation. A Boy Scout camp is located on the lake at the eastern edge of the site.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) *Salix monticola / Calamagrostis canadensis* montane willow carr and a good (B-ranked) occurrence of the state critically imperiled (G5/S1) lesser panicled sedge (*Carex diandra*).

Natural Heritage element occurrences at the Tumblesom Lake PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix monticola / Calamagrostis canadensis Shrubland | Montane Willow Carr | G3 | S3 | | | | B | 2007-08-29 |
| Vascular Plants | Carex diandra | lesser panicled sedge | G5 | S1 | | | USFS | B | 2007-08-29 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the lake and its immediate drainage basin, allowing for the operation of normal hydrological and ecological processes that support the wetland community, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and off-site activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** The wetland is owned by the Boy Scouts of America, Denver Area Council. Most of the upland watershed is either federal, state or county lands. An additional portion is protected by a private conservation easement.

**Management Urgency Rank Comments (M4):** Some attention to weeds would help protect this site, particularly at the upslope (western) edge of the wetland that was grazed in years past. Because this wetland is groundwater driven, groundwater pumping near the wetland would adversely affect the wetland community. In

addition, any artificial ditches through the wetland that would channel water to the lake rather than allowing it to move slowly through the peat soil would tend to dry out the soil. When a peat soil dries, it will begin to decompose.

**Exotic Species Comments:** Non-native plants include: redtop (*Agrostis gigantea*), Canada thistle (*Cirsium arvense*), timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), and clovers (*Trifolium hybridum, T. repens*).

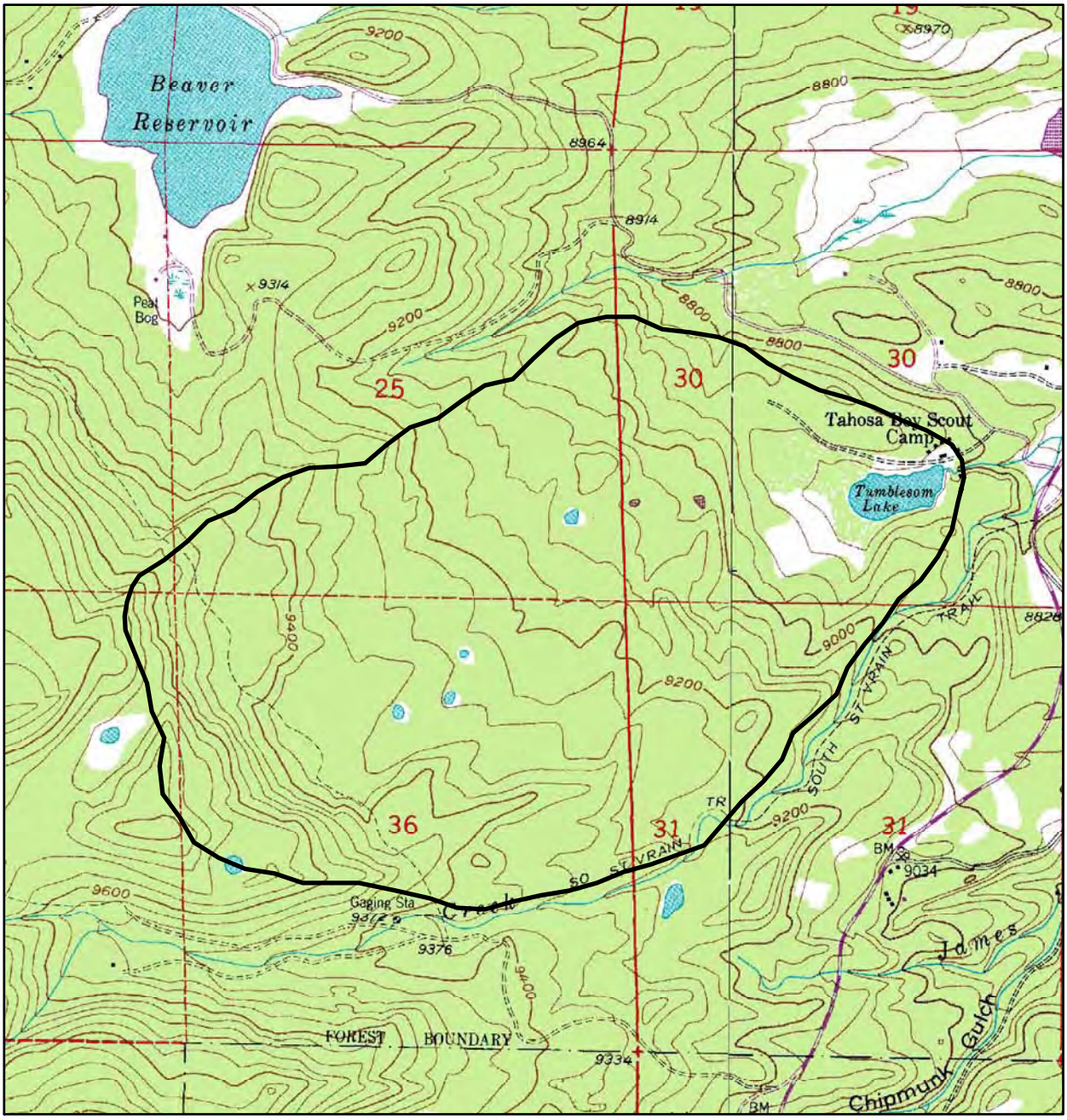
## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Tweto, O. 1979. Geologic Map of Colorado, 1:500,000. United States Geological Survey, Department of Interior, and Geologic Survey of Colorado, Denver, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/11/2008

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Map Date: 06/05/2008

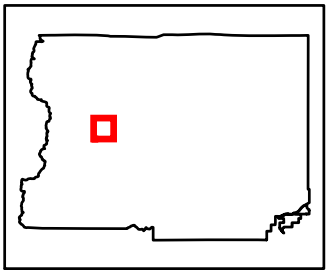
## Legend

PCA Boundary

Gold Hill, 40105-A4
Ward, 40105-A5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Tumblesom Lake Potential Conservation Area, B3: High Biodiversity Significance

# Winiger Gulch

**Biodiversity Rank - B3: High Biodiversity Significance**

**Protection Urgency Rank - P2: Threat/Opportunity within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Tungsten

**Size:** 1,907 acres (772 ha) **Elevation:** 7,320 - 8,340 ft. (2,231 - 2,542 m)

**General Description:** The site is located just west of Gross Reservoir, in southwestern Boulder, northeastern Gilpin, and northwestern Jefferson counties. Winiger Gulch is a small, foothills stream that originates 3 miles upstream from the reservoir and runs through a narrow V-shaped gulch. A dirt road follows the creek down to the reservoir. The stream itself is <16.5 ft (5 m) wide through the gulch and the riparian vegetation extends 10-26 ft (3-8 m) out from either bank within the site. South Boulder Creek also flows into Gross Reservoir. This creek is wider, swift and flat bottomed with a narrow riparian area. A boulder creek bed provides rapids along most of the length of the creek. The Denver and Salt Lake Railroad runs near, but above South Boulder Creek, and the Town of Wondervu is southeast of the site. An immediate floodplain is adjacent to creek flow. Winiger Gulch supports a dense, diverse mix of tall shrubs, within a narrow gulch, that overhang the stream banks and provide shade. The overstory is dominated by thinleaf alder (*Alnus incana*) and water birch (*Betula occidentalis*) at 20-30% cover each. Throughout the length of the stream, cover of individual species varies. In some places, thinleaf alder is the clear dominant. In other locations, water birch provides greater cover. Additional tall shrubs include Rocky Mountain maple (*Acer glabrum*), Bebb's willow (*Salix bebbiana*), and park willow (*Salix monticola*). Low cover of narrowleaf cottonwood (*Populus angustifolia*), quaking aspen (*Populus tremuloides*), Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine (*Pinus ponderosa*) is scattered along the creek. The mixed mesic understory has no dominant species, but is primarily native. Northwest-facing slopes are steep and dominated by dense Douglas-fir and ponderosa pine, with thick low shrubs. Exposed southeast-facing slopes are open and rocky with low-cover ponderosa pine and xeric shrubs. South Boulder Creek is also a steep V-shaped valley thickly forested on both sides. The riparian area is narrow and patchy, dominated by water birch (20-70% cover in places) with thinleaf alder also present. Steeper rocky slopes are dominated with Engelmann spruce (*Picea engelmannii*), Douglas-fir, subalpine fir (*Abies lasiocarpa*) and ponderosa pine. Midcanopy varies along the stream with young plains cottonwood (*Populus deltoides*), thinleaf alder, Rocky Mountain juniper (*Juniperus scopulorum*) and wax currant (*Ribes cereum*). There is a mixed understory along the stream with mesic forbs dominating in some areas and a sparse graminoid cover throughout.

**Key Environmental Factors:** Evidence on banks and vegetation indicate water levels

fluctuate some, but the drainage area feeding Winiger Creek is rather small and it is likely that flows are never very high. The channel bottom is primarily sand and occasional cobbles on Winiger Gulch and mostly boulders and cobble along South Boulder Creek. Small diameter woody debris crosses the channel in many locations. The floodplain is only 15-25 m wide and the stream gradient is 5-10%.

**Biodiversity Significance Rank Comments (B3):** This site supports a good (B-ranked) occurrence of a globally rare (G3/S3) thinleaf alder (*Alnus incana*) / mesic forb community, an excellent (A-ranked) occurrence of the state rare (G5?/S2S3) Sprengel's sedge (*Carex sprengelii*) and a good (B-ranked) occurrence of a state rare (G4?/S2) *Betula occidentalis / Maianthemum stellatum* riparian shrubland.

Natural Heritage element occurrences at the Winiger Gulch PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Alnus incana / Mesic Forbs Shrubland | Thinleaf Alder / Mesic Forb Riparian Shrubland | G3 | S3 | | | | B | 2007-07-02 |
| Natural Communities | Betula occidentalis / Maianthemum stellatum Shrubland | Foothills Riparian Shrubland | G4? | S2 | | | | B | 1995-07-18 |
| Vascular Plants | Carex sprengelii | Sprengel's sedge | G5? | S2S3 | | | | A | 2007-07-02 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and the immediate watershed (top of slopes), allowing for the operation of normal hydrological and ecological processes that support the wetland community, and providing a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and off-site activities within the watershed have the potential to impact the significant biological resources present in the area.

**Protection Urgency Rank Comments (P2):** The site is located almost entirely on U.S. Forest Service land, however, pending expansion of Gross Reservoir will significantly impact both drainages. The alder plant association on Winiger Gulch may be lost. The road adjacent to the creek is gated, but the area is open to motorized and non-motorized recreation that may impact the values of the site.

**Management Urgency Rank Comments (M2):** Attention to weeds is advised. Limiting motorized travel on the road would lessen erosion.

**Land Use Comments:** In addition to the main dirt road that follows the creek and

the railroad line, there are numerous trails in the area that are used by horses, hikers, mountain bikers, and dirt bikes. A small portion to the south is in Gilpin County.

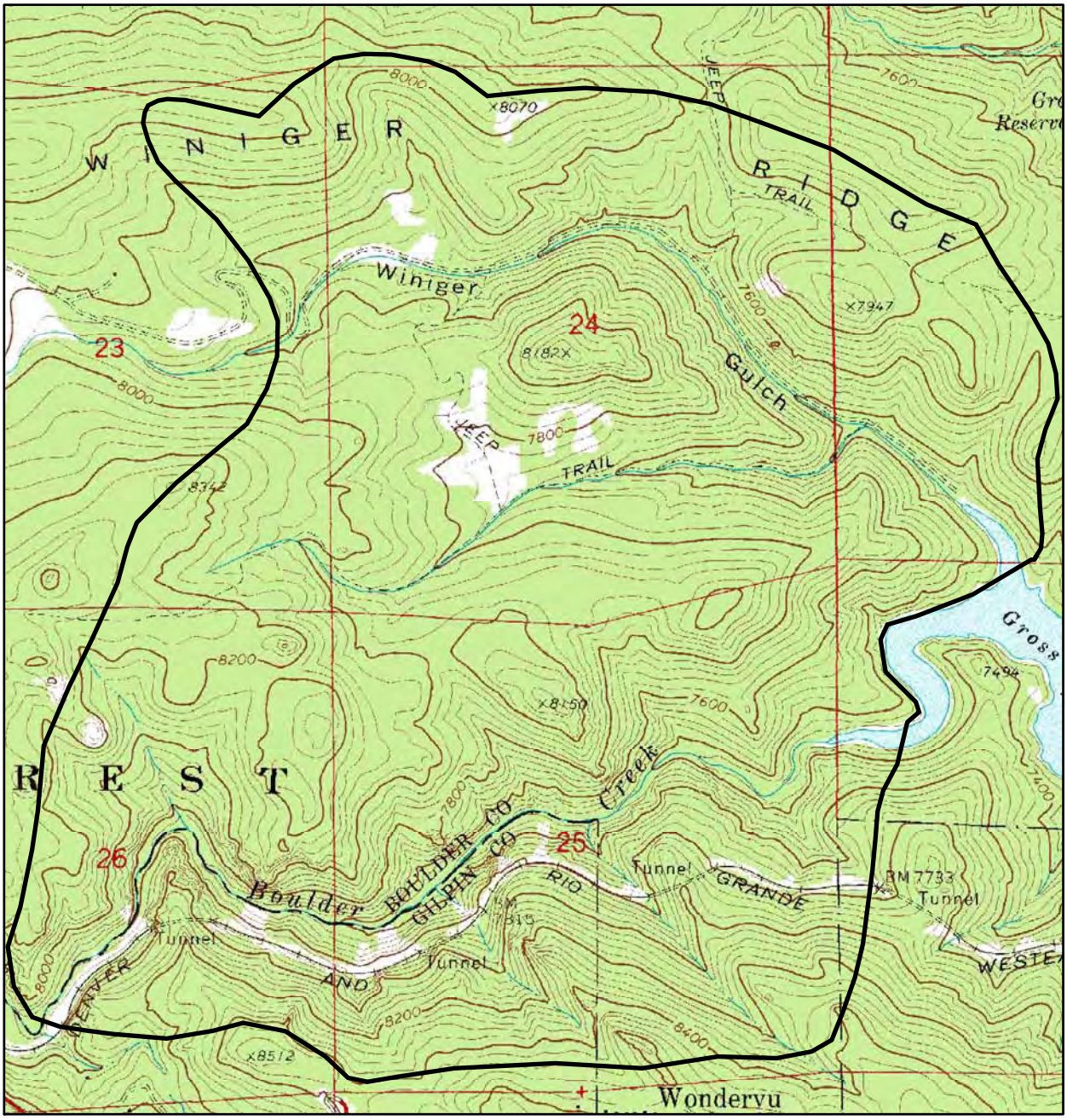
**Exotic Species Comments:** Canada thistle (*Cirsium arvense*), common mullein (*Verbascum thapsus*) and hay grasses such as Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*) and smooth brome (*Bromus tectorum*) are evident along the road, but less common close to the stream.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/12/2008

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Map Date: 06/19/2008

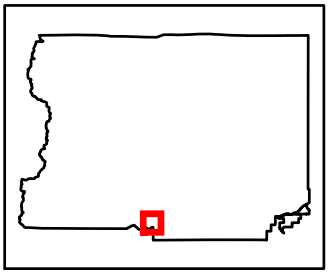
## Legend

PCA Boundary

Tungsten, 39105-H4

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Winiger Gulch Potential Conservation Area, B3: High Biodiversity Significance

# Caribou Townsite

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Nederland

**Size:** 1,743 acres (705 ha)

**General Description:** The site is located in southwestern Boulder County, about four miles northwest of Nederland. The site encompasses the area around Caribou Hill, including Caribou Flat to the south, and the open valley of Caribou Park to the north. Within the site, Caribou Creek and Coon Track Creek originate in glacial drift at the southeast foot of Caribou Peak. The area supports three separate, large wetlands located within 0.5 miles of Caribou Hill. Each wetland is slightly different, but they are all primarily dominated by diamondleaf willow (*Salix planifolia*) and water sedge (*Carex aquatilis*), and are all sloping, groundwater-fed fens with thick organic soil and a dense ground layer of moss. 1) Northwest wetland (Upper Caribou Creek). This wetland is located at the headwaters of Caribou Creek and is a diverse wetland that includes multiple plant communities. One section of the wetland along the creek hosts an active beaver colony with several dams along the creek. The soil beneath these dams is not organic, but accumulated silt and clay. Tall willows, primarily park willow (*Salix monticola*) and beaked sedge (*Carex utriculata*) grow around the beaver dams. Above these dams, the wetland is nearly level and dominated by a mix of diamondleaf willow and bog birch (*Betula glandulosa*), both growing approximately 1m tall. The understory is dominated by water sedge over a dense moss layer that includes *Aulacomnium palustre, Sphagnum warnstorfii, Tomenthypnum nitens, Climacium dendroides, Helodium blandowii,* and species of *Drepanocludus, Plagiomnium,* and *Calliergon.* All around the edges of this open shrub fen, the wetland contains a perimeter of forested fen with Engelmann spruce (*Picea engelmannii*) and very high species diversity. 2) Northeast wetland (Caribou Park). This wetland is located lower on Caribou Creek, but the hydrology is driven more by groundwater discharge from the surrounding slopes than by the creek itself. This wetland is dominated by a mix of low shrubs, including diamondleaf willow, resin birch, and wolf's willow (*Salix wolfii*). Water sedge dominates the understory with a diverse array of wetland herbs and a dense moss layer. This wetland was historically mined for peat and one section of the wetland remains highly disturbed. 3) South wetland (Caribou Flat). This wetland is at the headwaters of Coon Track Creek, which drains east towards North Beaver Creek and Nederland, and not into Caribou Creek. This wetland has the steepest slope (5-7%) and contains dense willow cover of diamondleaf willow and bog birch. Willows in this wetland are

taller, growing to 2m tall. The understory is dominated by a mix of water sedge and beaked sedge along with mixed forbs. The surrounding slopes contain a mix of subalpine fir (*Abies lasiocarpa*), Engelmann spruce, limber pine (*Pinus flexilis*), and lodgepole pine (*Pinus contorta*).

**Key Environmental Factors:** Though creeks runs through the valleys, the wetlands are permanently saturated by groundwater discharge from the surrounding slopes that eventually drains into the creek, and are not necessarily associated with overflow from the active creek channel. Because of this hydrologic distinction, the wetlands are not true riparian areas. Instead, they are sloping fens with organic soil formed over hundreds and thousands of years.

**Land Use History:** The surrounding uplands have been used heavily in the past 150 years for mining. There is a network of dirt roads that cross the landscape and there are small piles of tailings and other evidence of mining. There are also old structures, either from the mines or the old historic town. The northwest wetland was mined for peat in the 1940s and a crane left over from mining remains in the wetland. In this section of the wetland, the peat is thin or scraped down to the underlying mineral soil. The vegetation is disturbed and differs from the rest of the wetland. To further compound the impact of past disturbance, there was a large, illegal gathering of 4x4 vehicles in 2002 that drove in and around the wetland and tore up the soil. Restoration efforts have mitigated some of the effects.

**Biodiversity Significance Rank Comments (B4):** This site contains an excellent (A-ranked) occurrence of a globally common (G5/S4) riparian willow carr, *Salix planifolia / Carex aquatilis* shrubland. The presence of such an excellent example of this plant association indicates that the hydrologic processes in this site are intact. The wetlands are primarily ground-fed fens. There are also several historical and extant occurrences of globally and state rare moonworts (*Botrychium pallidum, B. echo, B. minganense,* and *B. hesperium*). More precise and current information is needed to confirm the specific locations and qualities of the rare plant populations. In 1999, CNHP zoologists documented 3 northern leopard frog (*Rana pipiens*) tadpoles, a species on CNHP's "watch list".

Natural Heritage element occurrences at the Caribou Townsite PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Insects | Oeneis jutta reducta | Rocky Mountain Arctic Jutta | G5T4 | S1 | | | | E | 1990-06-30 |
| Natural Communities | Salix planifolia / Carex aquatilis Shrubland | Subalpine Riparian Willow Carr | G5 | S4 | | | | A | 2007-08-01 |
| Vascular Plants | Botrychium echo | reflected moonwort | G3 | S3 | | | | E | 1989-06-29 |
| Vascular Plants | Botrychium pallidum | pale moonwort | G3 | S2 | | | | H | 1984-08-03 |
| Vascular Plants | Botrychium hesperium | western moonwort | G4 | S2 | | | | E | 1989-06-29 |
| Vascular Plants | Botrychium minganense | Mingan's moonwort | G4 | S1 | | | | E | 1989-06-29 |
| Vascular Plants | Oxytropis parryi | Parry's crazy - weed | G5 | S1 | | | | H | 1962-07-28 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrences and the immediate watershed, allowing for the operation of normal hydrological and ecological processes that support the wetlands, and providing a buffer against direct disturbance. The boundary includes all of the known occurrences and a significant downslope buffer. The amphibians documented in the boundary may leave the area.

**Protection Urgency Rank Comments (P3):** The area is predominantly in federal (USFS) ownership, but there are numerous small private inholdings. National Forest Service land around the old Caribou Townsite is primarily used for recreation. The Caribou Mine is still active. The mine operators are conscious of environmental protections and try to limit the mine's impact.

**Management Urgency Rank Comments (M4):** Current management limits off-road vehicles to certain roads. However, severe trespass incidents have occurred in the past. Roads need to be managed and campsites identified in order to concentrate impacts away from sensitive species. Preventing vehicle access to the wetlands is essential to maintaining their integrity. Additionally, this site falls within patented mining claims. The extent and location of mining impacts need to be evaluated and mitigated.

**Land Use Comments:** No evidence of grazing was noted.

**Exotic Species Comments:** Invasive species are absent from the wetlands.

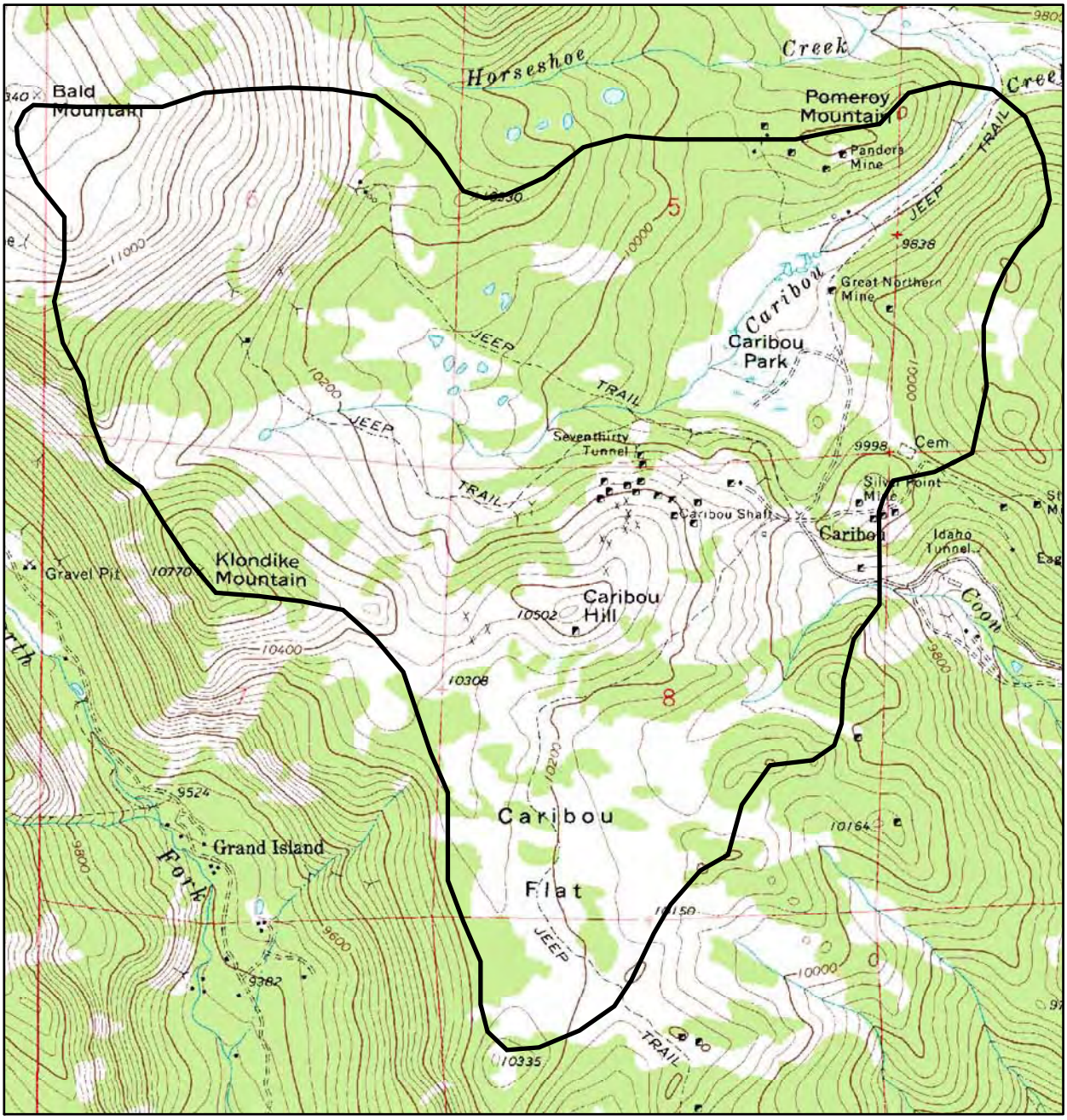
**Information Needs:** Need additional field work to evaluate rare plants populations.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/10/2008

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Map Date: 11/03/2008

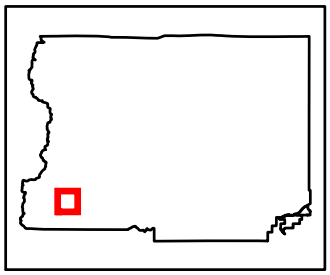
## Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Caribou Townsite Potential Conservation Area, B4: Moderate Biodiversity Significance

# Giggey Lake

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Tungsten

**Size:** 25 acres (10 ha) **Elevation:** 8,480 - 8,560 ft. (2,585 - 2,609 m)

**General Description:** Located in southern Boulder County, southeast of Nederland, Giggey Lake is a spring-fed, natural lake located off of Magnolia Road. The center of the lake contains open water, while wetland vegetation is filling in from the edges. Small bur-reed (*Sparganium minima)* and lesser bladderwort (*Utricularia minor*) are found within the open water. Tall cottongrass (*Eriophorum angustifolia*), marsh arrowgrass (*Triglochin palustris*), and slender sedge (*Carex lasiocarpa*) occur in patches within the shallow standing water. The wet meadow surrounding the open water is dominated by beaked sedge (*Carex utriculata*)

**Key Environmental Factors:** The lake is likely fed by groundwater discharge that has created a dense, fibrous organic peat in the top layer.

**Land Use History:** Open meadows surrounding Giggey Lake are leased for grazing.

**Biodiversity Significance Rank Comments (B4):** This site supports a good (B-ranked) occurrence of the state imperiled (G5/S1) slender sedge (*Carex lasiocarpa*) and an excellent (A-ranked) occurrence of the state rare (G5/S2) lesser bladderwort (*Utricularia minor*). Additionally, there is a historical occurrence for the state rare (G5/S2) sharp sprite (*Promenetus exacuous*) from 1967 and a Southern Rocky Mountain boreal toad (*Bufo boreas boreas*) (G4TQ1/S1) record from 1968, but field surveys have not located current populations, therefore the occurrences are not referenced in the table.

Natural Heritage element occurrences at the Giggey Lake PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Carex lasiocarpa | slender sedge | G5 | S1 | | | | B | 2007-07-12 |
| Vascular Plants | Utricularia minor | lesser bladderwort | G5 | S2 | | | USFS | A | 2007-07-12 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the immediate watershed above

Giggey Lake. It encompasses the known wetland plants that are supported by the hydrologic processes within the site.

**Protection Urgency Rank Comments (P4):** The immediate area is owned by Boulder County Open Space, but grazing rights for the property are leased each summer. The surrounding area is mostly U.S. Forest Service.

**Management Urgency Rank Comments (M3):** The lake and wetland are fenced off from cattle, but this is a recent practice instituted by Boulder County in 1997. Historically, cattle were allowed to graze in the wetland. In addition, Magnolia Road is <100 m from the wetland. The road is well traveled and may introduce sediment or run-off into the wetland.

**Exotic Species Comments:** There are nonnative species, such as Canada thistle (*Cirsium arvense*) and hay grasses, in the area surrounding the wetland.

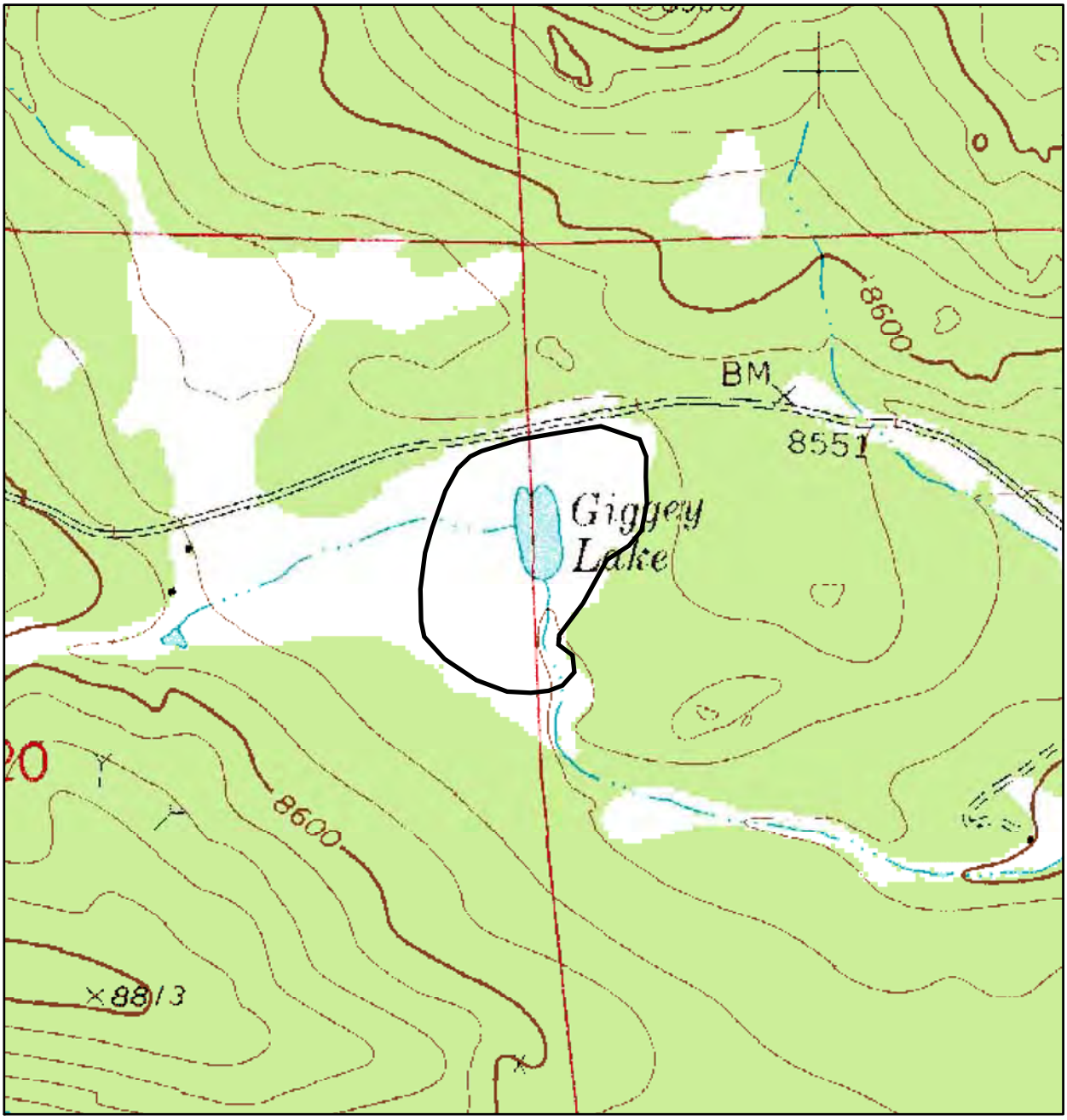
**Off-Site Considerations:** Search for populations of sharp sprite (*Promenetus exacuous*) and Southern Rocky Mountain boreal toad (*Bufo boreas boreas*).

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Culver, D.R. and J.M. Lemly

**Version Date:** 10/24/2008

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Map Date: 10/28/2008

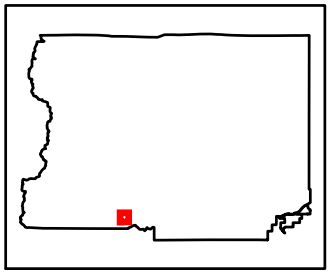
**Legend**

PCA Boundary

Tungsten, 39105-H4

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Giggey Lake Potential Conservation Area, B4: Moderate Biodiversity Significance

# Left Hand Creek

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P2: Threat/Opportunity within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Niwot, Lyons, Boulder

**Size:** 1,016 acres (411 ha)

**General Description:** The Left Hand Creek site is located along Left Hand Creek in the plains about one mile east of the Front Range foothills. The riparian area is characterized by cottonwood (*Populus angustifolia*) forests and wet meadows in a developed and fragmented area of Boulder County. A small population of Ute ladies' tresses orchids (*Spiranthes diluvialis*) has been documented on a small branch of the creek. Further inventory is warranted to determine the full extent and size of the threatened plant population.

**Biodiversity Significance Rank Comments (B4):** The site supports a poor quality (D-ranked) occurrence of a globally rare (G2G3/S2), and federally Threatened plant species, Ute ladies' tresses (*Spiranthes diluvialis*).

Natural Heritage element occurrences at the Left Hand Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | D | 1994-08-25 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Boundary is drawn to protect occurrences and provide some adjacent suitable habitat. A larger boundary may need to be considered to protect the hydrology and other ecological processes at this site.

**Protection Urgency Rank Comments (P2):** Owner indicated in 1994 that she would be interested in protecting the plants and restoring adjacent plant communities. Inventory work is needed to precisely document the extent of this occurrence.

**Management Urgency Rank Comments (M2):** Numerous exotic plants have been reported at this site. Further inventory is urgent to determine the current condition of this occurrence.

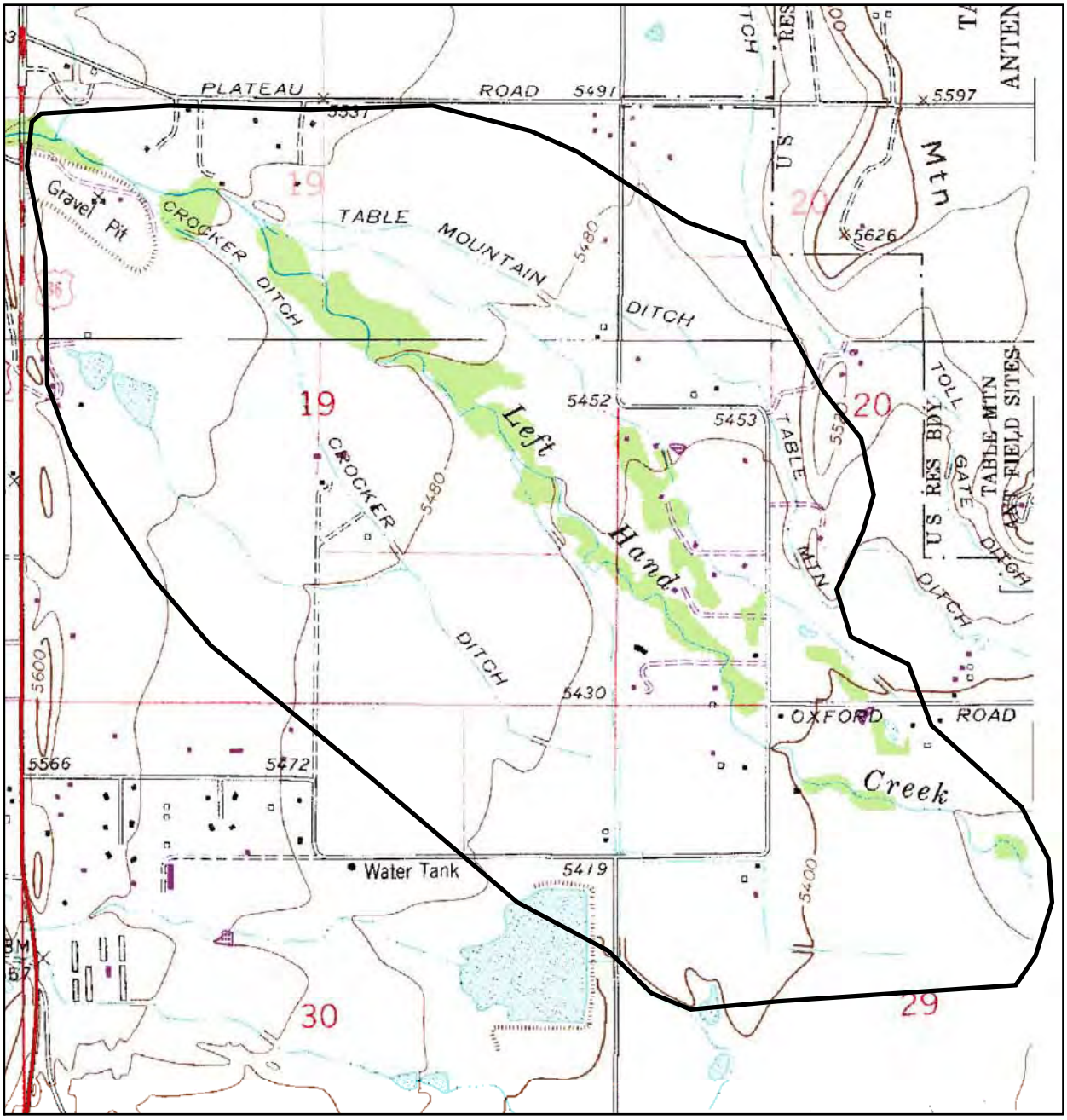
**Information Needs:** Field inventory is needed to precisely document the extent and quality of this occurrence.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Spackman, S.C.

**Version Date:** 02/07/1996

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Map Date: 01/22/2009

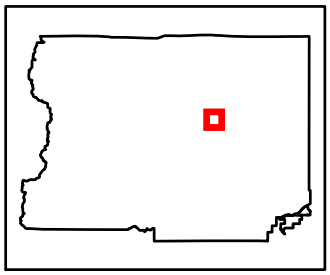
## Legend

PCA Boundary

Boulder, 40105-A3
Lyons, 40105-B3

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Left Hand Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

# Left Hand Park Reservoir

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Ward

**Size:** 1,304 acres (528 ha) **Elevation:** 10,500 - 11,470 ft. (3,200 - 3,496 m)

**General Description:** The Left Hand Park Reservoir site is located near the western boundary of Boulder County, about 3.5 miles east of the Continental Divide. Niwot Ridge extends eastward from the Continental Divide some 2 mi (6 km) to its terminus at Niwot Mountain. Left Hand Park Reservoir lies on the northern flank of the eastern end of this prominent alpine ridge, in a large, open valley immediately below Niwot Mountain. The site forms the headwaters of Left Hand Creek above the town of Ward. The northern boundary of the basin is formed in glacial till of the Pinedale and Bull Lake glaciations (upper Pleistocene), while the slopes of Niwot Ridge are unglaciated Precambrian gneiss. Slopes immediately southwest of the wetland are covered by solifluction deposits. Loosely consolidated material that has sloughed off the slopes above (Gable and Madole 1976). The lower slopes of the valley are dominated by forests of Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and limber pine (*Pinus flexilis*). The trees are robust immediately surrounding the lake, but transition into krummholz and banded strips on the upper slopes. The outlet to the lake is at the east end and was dammed in the late 1950s or early 1960s. The 90-acre reservoir is just below treeline, and covers most of what was probably at one time an extensive peatland. The remaining wetland is a gently sloping fen located on the west end of the reservoir, and wrapping around the south shore. There are small channels through the wetland, but no inlet stream. The remaining fen is dominated by low shrubs, primarily diamondleaf willow (*Salix planifolia*) and bog birch (*Betula glandulosa*), over a moderate cover of water sedge (*Carex aquatilis*) and dense cover of *Sphagnum* moss. The ground surface is very hummocky, providing a mosaic of microtopographic and hydrologic settings for a diverse array of plants. The wetland as a whole is heterogeneous, with dense shrub patches, open water tracks and pools dominated by sedges, and large raised *Sphagnum* hummocks with stunted spruce trees. Several other typical fen species are found throughout the wetlands, including fewflower spikerush (*Eleocharis quinqueflora*), bog sedge (*Carex microglochin*), cottongrass (*Eriophorum angustifolium*), redpod stonecrop (*Rhodiola rhodantha*), elephanthead (*Pedicularis groenlandica*), and white marsh marigold (*Caltha leptosepala*). Beside the *Sphagnum,* additional moss species include *Drepanocladus aduncus, Polytrichum commune, Campyllium stellatum, Climacium dendroides,* and *Tomenthypnum nitens.* There are few non-native species, except in the most disturbed areas, and the primarily dominant species are characteristic of pristine subalpine fens in the Front Range. Soils within the

occurrence are mapped at a coarse level as Cryaquolls-Leighcan family, till substratum complex, 0 to 15 percent slope. Cryaquolls occur on floodplains and are derived from gravelly glaciofluvial deposits and/or gravelly till from igneous. Soils from the Leighcan family occur on mountain slopes and are derived from residuum and/or till from igneous and metamorphic rock (USDA 2007). Soils observed within the wetland were primarily hemic Histosols (organic peat), though the edges of the wetland were mineral and likely match the mapped description. The accumulated organic soil likely formed on top of the glacial material over thousand of years. Soil pits throughout the wetland revealed at least 40 cm of partially decomposed organic material.

**Key Environmental Factors:** The wetland is fed by groundwater discharge that originates as snowmelt in the high peaks and flows through the surrounding bedrock.

**Land Use History:** The site was mined for peat in the early 1900s; patches of exposed peat are visible in the water in the southwest corner of the lake, and bare areas near the lake edge are probably where peat was stripped off to the underlying bedrock. The outlet was dammed to form the reservoir. The hydrology of the surrounding area, however, appears unaltered. The site is currently used for light recreation, and there are a few social trails.

**Biodiversity Significance Rank Comments (B4):** This site supports a good (B-ranked) occurrence of a globally common (G5/S4) *Salix planifolia / Carex aquatilis* subalpine riparian willow carr. At 35 acres, this occurrence is large for its type. The original community, however, may at one time have been the largest fen in Boulder County before being reduced by peat mining and the formation of the reservoir. What remains of the fen is in excellent condition.

Natural Heritage element occurrences at the Left Hand Park Reservoir PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Salix planifolia / Carex aquatilis Shrubland | Subalpine Riparian Willow Carr | G5 | S4 | | | | B | 2007-08-28 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to encompass the local watershed around the reservoir, terminating approximately 3,280 ft (1,000 m) downstream from the outlet. This area should allow the operation of normal hydrological and ecological processes that support the wetland community, and provide a buffer against direct disturbance.

**Protection Urgency Rank Comments (P4):** The reservoir is owned by the Left Hand

Ditch Company; the remainder of the site is on Arapaho-Roosevelt National Forest. There are no known protection plans, aside from the collaborative management of the trail system between the owners.

**Management Urgency Rank Comments (M3):** The majority of the occurrence is located on U.S. Forest Service land and is within the Brainard Lake Recreation Area for planning purposes. In 2005, the USFS approved a package of projects for development and management of the recreation area, including a plan to create a more official trail around the lake and limit the proliferation of social trails. This will help steer hikers out of the wetland areas.

**Land Use Comments:** Site of a privately owned reservoir, currently also used for recreation such as hiking, fishing, and camping.

**Exotic Species Comments:** Very few non-native species are present.

**Off-Site Considerations:** To the south and west of the site, the Indian Peaks Wilderness and the Niwot Ridge Biosphere Reserve are managed for native vegetation, light recreation, and research. Dam and access road maintenance both in and near the site are likely to involve heavy machinery. The roads, campgrounds and trails of the rest of the Brainard Lake Recreation Area are heavily used.

**Information Needs:** Nonbreeding boreal toads (*Bufo boreas* pop 1) were documented in the 1970s but no current sightings have been reported.

## References

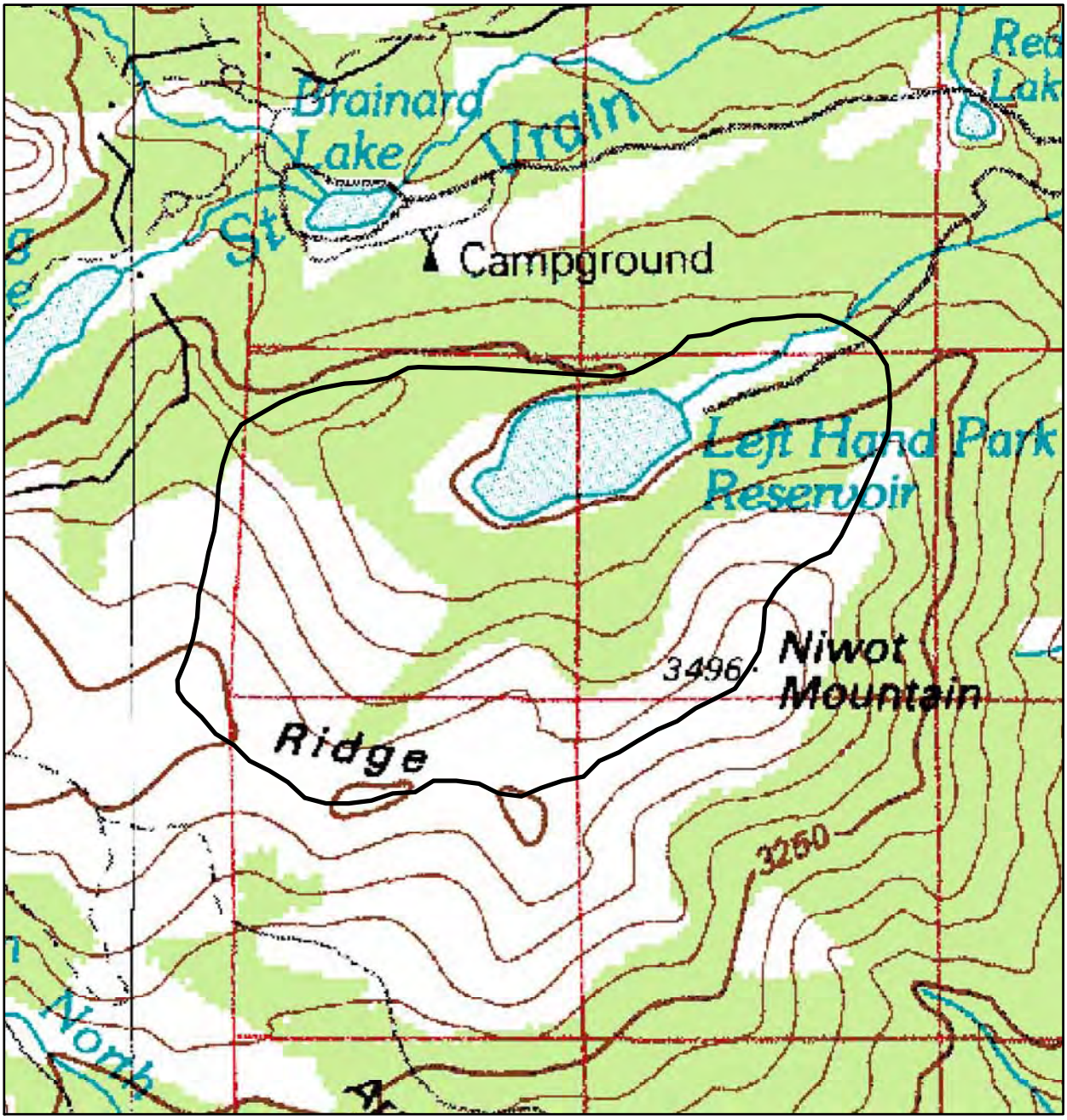
Gable, D.J., and R.F. Madole. 1976. Geologic Map of the Ward Quadrangle, Boulder County, Colorado. Map GQ-1277. U.S. Geologic Survey, Reston, Virginia.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

USDA. 2007a. Soil Survey Geographic (SSURGO) database for Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park, and Larimer Counties. USDA Natural Resources Conservation Service, Fort Worth, Texas. URL: . Downloaded on October 16, 2007.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/10/2008

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Map Date: 11/03/2008

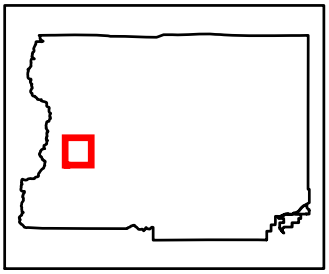
**Legend**

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Left Hand Park Reservoir Potential Conservation Area, B4: Moderate Biodiversity Significance

# Little Thompson River at County Line

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P2: Threat/Opportunity within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Carter Lake Reservoir, Berthoud

**Size:** 1,949 acres (789 ha) **Elevation:** 4,900 - 5,740 ft. (1,494 - 1,750 m)

**General Description:** Little Thompson Creek begins within the foothills of the Rocky Mountains a few miles south of Estes Park. The low elevation, low gradient river flows through foothills, agricultural lands, and the Town of Berthoud and joins the Big Thompson River near the town of Milliken. The river supports a plains cottonwood (*Populus deltoides*) riparian woodland, once widespread throughout the Great Plains, and a rare relict assemblage of aquatic macroinvertebrate species that probably closely resembles communities found in small transitional (linking foothills and plains) Front Range streams prior to agricultural and residential development (Kondratieff and Baumann 2002). Although most of the lower Little Thompson watershed has been developed for agricultural use, there are no major upstream modifications (e.g., dense urbanization, wastewater treatment plants, dams) in the transitional zone portion of the basin. In contrast, most Front Range watersheds (e.g., Boulder Creek, St. Vrain, Big Thompson, Cache la Poudre) have been modified to an extent that has drastically changed the stream fauna from their historical condition. Examples of the results of these modifications include the reduction in distribution of the South Platte transitional zone fishes northern redbelly dace (*Phoxinus eos*), common shiner (*Notropis cornutus*), brassy minnow (*Hybognathus hankinsoni*), plains topminnow (*Fundulus sciadicus*), Iowa darter (*Etheostoma exile*), lake chub (*Couesius plumbeus*), greenback cutthroat trout (*Oncorhynchus clarkii stomias*), and the extirpation of hornyhead chub (*Nocomis biguttatus*), and blacknose shiner (*Notropis heterolepis*). It is accepted that macroinvertebrates can be used as indicators of stream health. In particular, the numbers of three groups of species. Mayflies (*Ephemeroptera* spp.), stoneflies (*Plecoptera* spp.), and caddisflies (*Trichoptera* spp.), found at a stream site are commonly used as a measure of stream health since many members of these groups are sensitive to human-induced disturbance. All three of these groups are present within the Little Thompson. The mayflies known from the Little Thompson are widely distributed and are typical of low elevation, low-flow streams. Five stonefly species are known from the Little Thompson River, a remarkable number for a Front Range stream of this size. It is likely that many of our Front Range streams historically supported similar fauna. Stoneflies are rarely encountered in Front Range streams at the distance from the foothills that they are in the Little Thompson. The lack of stoneflies in other streams is likely due to siltation, organic enrichment, and other human-induced modifications caused by urbanization. A recent study of

streams in Boulder and Fort Collins determined that stoneflies have been extirpated from the small streams of these cities (Zuellig 2001). Additionally, researchers in Denver reported similar results (Alan Polonsky). One of the stonefly species in particular, *Mesocapnia frisoni* (Baumann and Gaufin 1970), is known from relatively few low elevation streams near the Southern Rocky Mountains of Utah, Colorado, and New Mexico and from Kansas and Texas (Baumann and Gaufin 1970, Opler and Kondratieff 1997). In Colorado, the species is only known to occur in the Little Thompson River. It likely that historically *Mesocapnia frisoni* was widely distributed in Colorado but it has undergone severe range reduction due to stream modifications associated with agricultural and urban development. Similarly, two species of caddisflies rarely encountered in Front Range streams, at distances from the foothills found in the Little Thompson (*Helicopsyche borealis* and *Oecetis inconspicua*), are known from the Little Thompson. It is highly likely that future surveys, if conducted during different seasons, will discover additional species as many life history attributes of the species involved inhibit detection during certain seasons. Because stoneflies distribute only via connected waterways, populations are unable to reestablish once local extirpation has occurred. Therefore, survival of *Mesocapnia frisoni* in Colorado is dependent upon the Little Thompson River population. The Little Thompson is considered a potential candidate for use as a reference stream to compare to other streams along the Front Range to assess regional stream health.

**Key Environmental Factors:** *Mesocapnia frisonii*, plains stonefly, is a winter-emerging stonefly that spends its larval (immature) stage in sediments beneath and adjacent to the creek (hyporheic zone). Therefore, siltation of the creek could result in clogging these sediments resulting in extirpation of the stonefly from this reach.

**Land Use History:** Unfortunately little is known about the historic distribution of aquatic macroinvertebrates of this region prior to irrigated agriculture, which began in the 1860s. It is likely that the effects of urbanization on aquatic macroinvertebrates in the region are similar to the severe effects on the fishes.

**Biodiversity Significance Rank Comments (B4):** This site contains a fair (C-ranked) and only known Colorado occurrence of a globally common (G5) but state imperiled (S1) plains snowfly (*Mesocapnia frisoni*). The global distribution of this species is not known. Currently it is documented to occur only in Colorado, Utah, and New Mexico (NatureServe2008). The *Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior)* plains cottonwood riparian woodland is a globally vulnerable (G3G4/S3) riparian woodland that is in fair (C-ranked) condition. Historically, this plant community dominated the Great Plains riparian systems, but is now found in patches. The surrounding landscape has been utilized for agriculture and ranching for decades. The riparian corridor has been significantly affected by grazing impacts and introduction of non-native plants, several of which are on List A and B of the Colorado Noxious Weed List.

Natural Heritage element occurrences at the Little Thompson River at County Line PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Insects | Mesocapnia frisoni | A Stonefly | G5 | S1 | | | | C | 2005-01-08 |
| Natural Communities | Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior) Woodland | Plains Cottonwood Riparian Woodland | G3G4 | S3 | | | | C | 2008-07-16 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary encompasses the portion of the Little Thompson Creek above Meadow Hollow. This includes the portion of the creek known to support *Mesocapnia frisoni* as well as the cottonwood riparian forest. Several private properties were visited during the fieldwork, however digital orthophoto quads were used to delineate the site boundary. The full areal extent of the stonefly population is not known and likely extends upstream from the known occurrence.

**Protection Urgency Rank Comments (P2):** The land is primarily privately owned, several parcels have conservation easements in place. However, this portion of Larimer and Boulder counties is under a great deal of development pressure.

**Management Urgency Rank Comments (M2):** Management concerns are minimization of siltation, maintenance of water quality, maintaining flow in the river during the winter, and maintenance of the natural flooding regime to flush accumulated fine-grained sediments from the stream sands and gravels. Water diversions from the creek are a concern as winter stoneflies such as *Mesocapnia frisoni* require flowing water in the winter. Additionally, weed control, in particular diffuse knapweed, leafy spurge, Mediterranean sage, and myrtle spurge, needs to happen immediately.

**Land Use Comments:** The plant diversity and composition along the Little Thompson River has been modified during the long agricultural history of the area. The understory is dominated by smooth brome (*Bromus inermis*), a European pasture grass planted for grass hay, and by other non-native species including cheatgrass (*Bromus tectorum*) and whitetop (*Cardaria* sp.). Also present are native wetland plants including horsetail (*Equisetum arvense* and *Hippochaete* sp.), spikerush (*Eleocharis* sp.), and bulrush (*Schoenoplectus acutus*). The overstory includes native plains cottonwood (*Populus deltoides*) and many non-native trees including Siberian elm (*Ulmus pumila*), crack willow (*Salix fragilis*), and Russian olive (*Elaeagnus angustifolia*). Native shrubs present at low percent cover include coyote willow (S*alix exigua*) and

snowberry (*Symphoricarpos* sp.).

**Exotic Species Comments:** Leafy and myrtle spurge, diffuse and spotted knapweed, Canada and musk thistle, common and moth mullein, houndstongue, and dalmation toadflax were documented during CNHP's field survey in 2008.

**Off-Site Considerations:** The adjacent uplands are primarily agricultural or have recently been converted to residential use. The dominant grass in the area is smooth brome with other introduced, non-native pasture grasses. Vertebrate wildlife using the Little Thompson River and surrounding uplands include Red-tailed Hawk, Swainson's Hawk, Bald Eagle (winter), Great Blue Heron, black-tailed prairie dog, red fox, coyote, deer, beaver, and raccoon.

## References


Baumann, R.W. and A.R. Gaufin. 1970. The Capnia Projecta Complex of Western North America (Plecoptera: Capniidae). From the Transactions of the American Entomological Society 96: 435-468.

Doyle, G.A., S.L. Neid and R.J. Rondeau. 2005. Final Report: Survey of Critical Biological Resources, Larimer County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Kondratieff, B. C. and R. W. Baumann. 2002. A review of the stoneflies of Colorado with description of a new species of Capnia (Plecoptera: Capniidae). Transactions of the American Entomological Society 128(3):385-401.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: 2008 ).

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Opler, Dr. P.A., and Dr. B.C. Kondratieff. 1994. Status of special concern or sensitive species of Colorado Lepidoptera and aquatic insects. Completion report to Colorado Natural Areas Program, contract 530-854.

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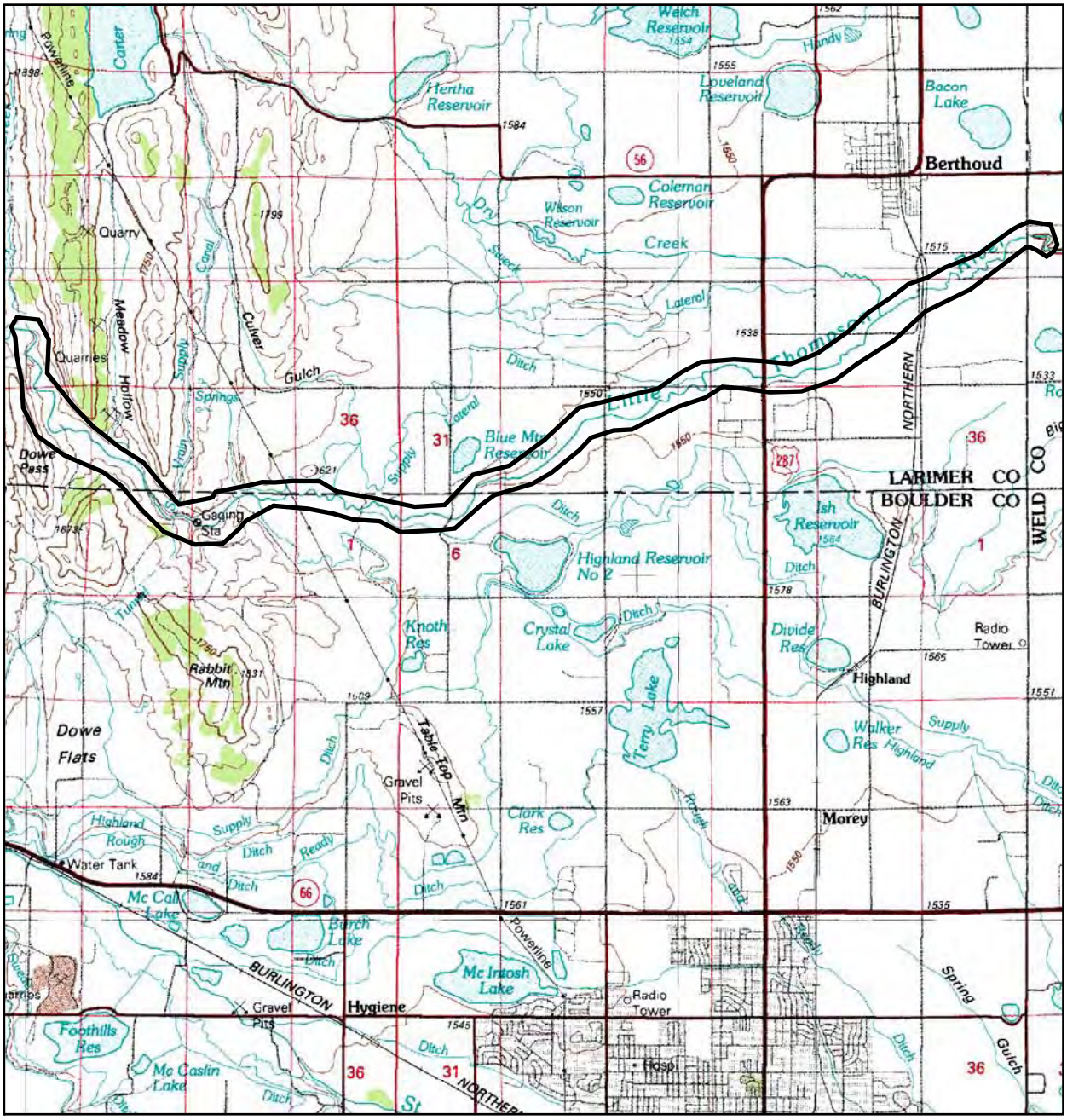
Zuellig, R.E. 2001. Macroinvertebrate and fish communities along the Front Range of Colorado and their relationship to habitat in the urban environment. M.S. Thesis. Colorado State University. 316 pp.


**Version Author:** Culver, D.R.

**Version Date:** 10/21/2008

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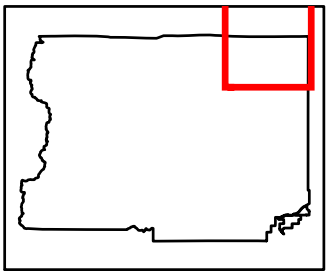
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Little Thompson River at County Line Potential Conservation Area, B4: Moderate Biodiversity Significance

# Middle Saint Vrain at Coney Creek

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Ward, Allens Park

**Size:** 686 acres (277 ha) **Elevation:** 8,950 - 9,960 ft. (2,728 - 3,036 m)

**General Description:** The site surrounds numerous kettle ponds in spruce - fir forest, one of which contains a population of Rocky Mountain capshell (*Acroloxus coloradensis*). Predominant surface geology is till of Pinedale age (Riebesell et al. 2001).

**Biodiversity Significance Rank Comments (B4):** This site supports an extant occurrence of the globally vulnerable (G3/S1) Rocky Mountain capshell (*Acroloxus coloradensis*).

Natural Heritage element occurrences at the Middle Saint Vrain at Coney Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Mollusks | Acroloxus coloradensis | Rocky Mountain Capshell | G3 | S1 | | SC | USFS | E | 1997-06-27 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to include the pond in which the Rocky Mountain capshell is found, its outflow stream, and other nearby ponds.

**Protection Urgency Rank Comments (P4):** Most of the site occurs on U.S. Forest Service property.

## References

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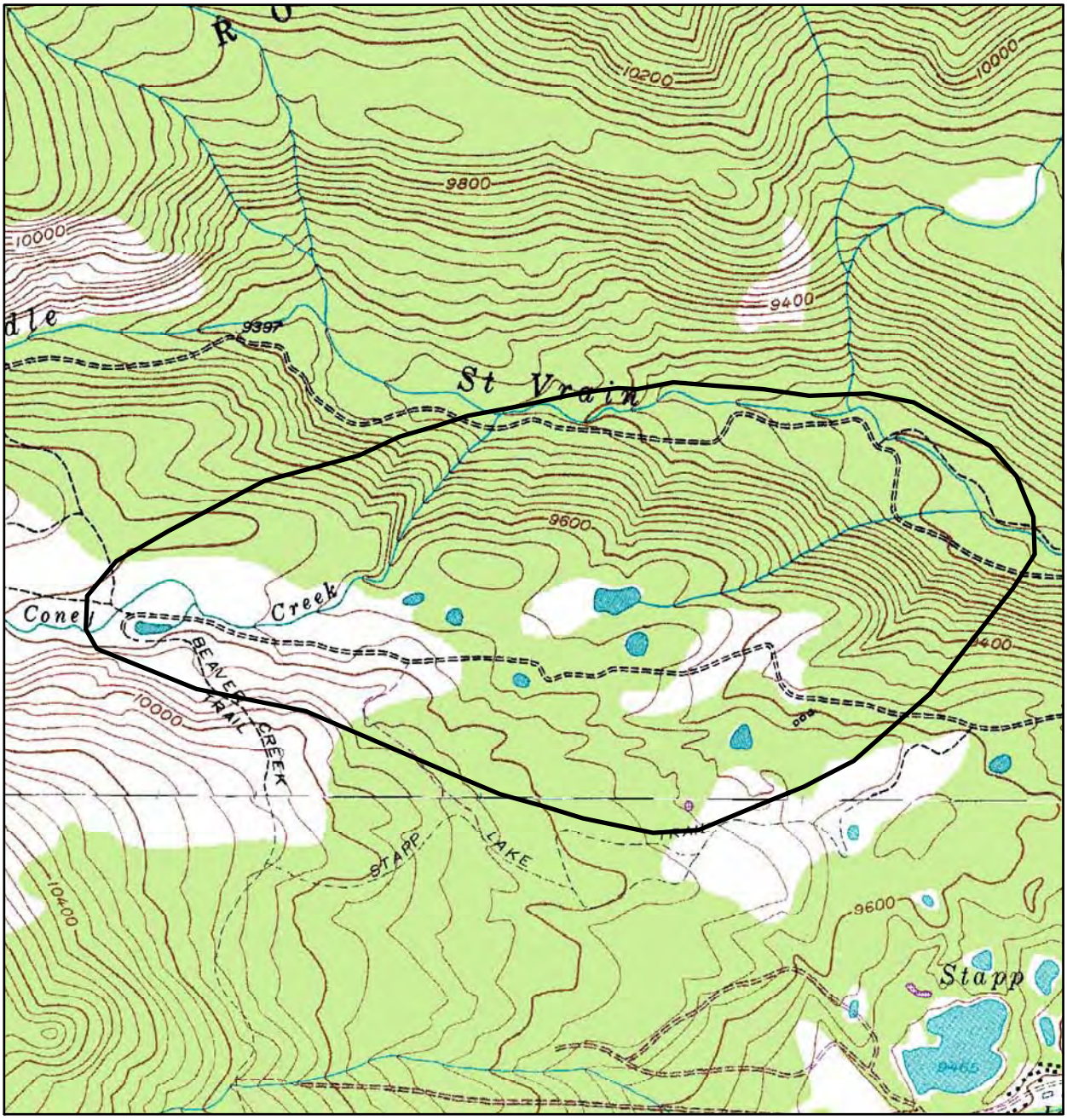
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Riebesell, J.F., T.L. Thrasher, A. Bazzi, and W.P. Kovalak. 2001. Habitat characteristics of Rocky Mountain (Colorado) populations of *Acroloxus coloradensis*. American Malacological Bulletin, 16(1/2): 33-40.

**Version Author:** Siemers, J. L.

**Version Date:** 10/28/2008

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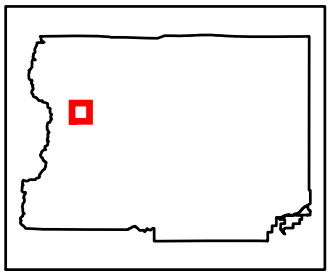
## Legend

PCA Boundary

Ward, 40105-A5
Allens Park, 40105-B5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Middle Saint Vrain at Coney Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

# Needle Eye Tunnel

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P2: Threat/Opportunity within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** East Portal

**Size:** 70 acres (28 ha) **Elevation:** 10,958 - 11,647 ft. (3,340 - 3,550 m)

**General Description:** The site is found above treeline, and includes rock outcrops, talus, and fellfield habitats interspersed with alpine tundra. Tundra is a mosaic of alpine avens (*Geum rossii*), alpine clover (*Trifolium dasyphyllum*), alpine dryas (*Dryas octopetala*), tufted hairgrass (*Deschampsia ceaspitosa*), sibbaldia (*Sibbaldia procumbens*), Pyrenian sedge (*Carex rupestris*), and myriad forbs including Parry's bellflower (*Campanula parryi*), western Indian paintbrush (*Castilleja occidentalis*), and old man of the mountain (*Hymenoxys grandiflora*). Talus areas include Colorado columbine (*Aquilegia coerulea*), stonecrop (*Sedum lanceolatum*), silky phacelia (*Phacelia sericea*), mountain thistle (*Cirsium scopulorum*), and harebell (*Campanula rotundifolia*). Pikas (*Ochotona princeps*) and yellow-bellied marmots (*Marmota faviventris*) are common.

**Key Environmental Factors:** Alpine environment

**Biodiversity Significance Rank Comments (B4):** The site supports a fair (C-ranked) occurrence of a globally vulnerable (G3/S3) plant species, Rocky Mountain columbine (*Aquilegia saximontana*).

Natural Heritage element occurrences at the Needle Eye Tunnel PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Aquilegia saximontana | Rocky Mountain columbine | G3 | S3 | | | | C | 2007-07-23 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the occurrence, adjacent potential habitat, and the local mosaic of plant communities.

**Protection Urgency Rank Comments (P2):** Although the site is within the Indian Peaks Wilderness Area, the closing of the Needle Eye tunnel has caused traffic to be re-routed through the site.

**Management Urgency Rank Comments (M2):** The Needle Eye tunnel closing causes people to hike around. Spaghetti trails are appearing on talus slopes. In addition, the steepness of the slope forces people to "dig in", worsening the impacts. There is a fair

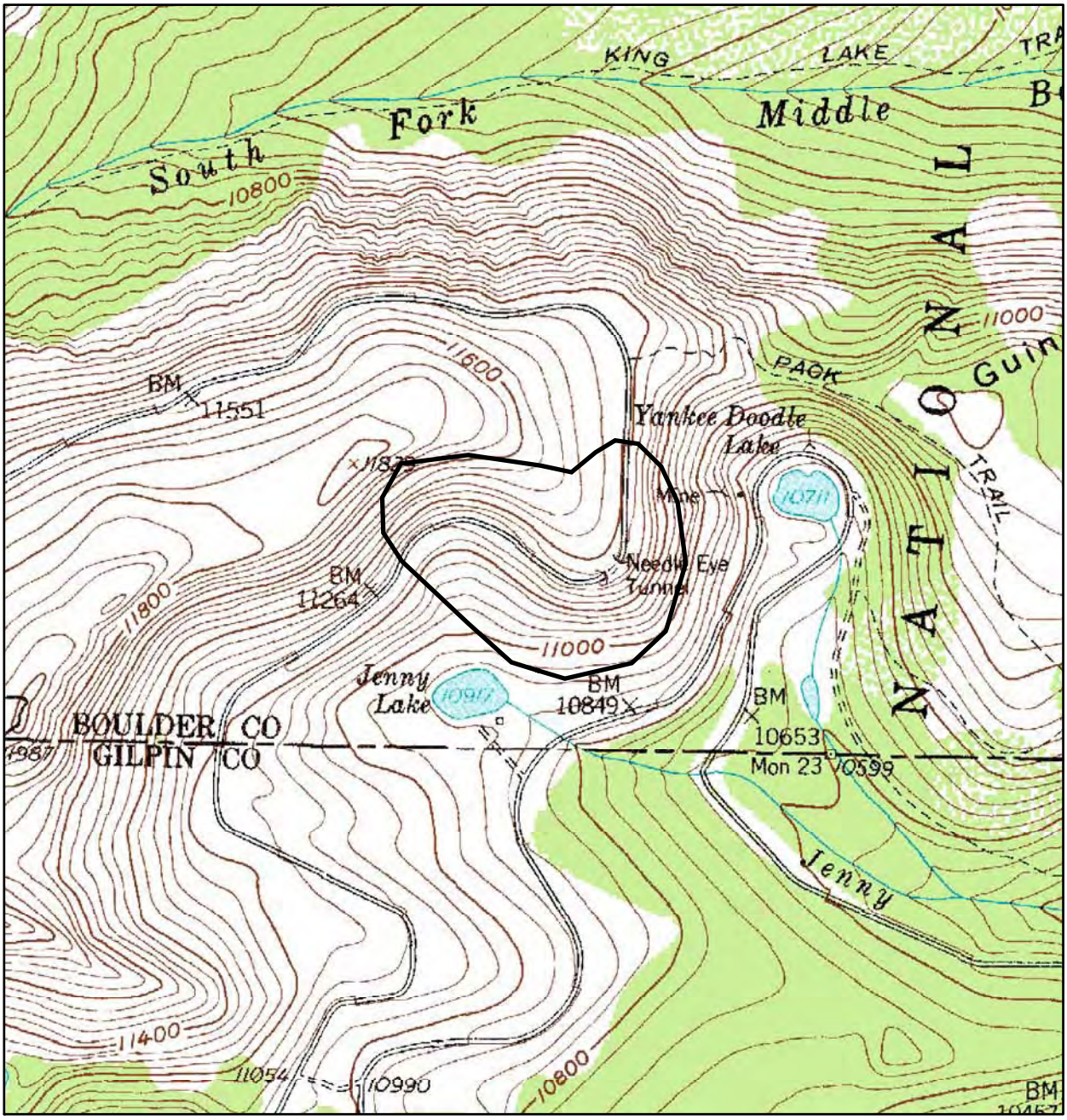
amount of use of the area. When (or if) the tunnel will re-open is unknown. Recommend construction of designated trail to concentrate impacts.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 01/23/2009

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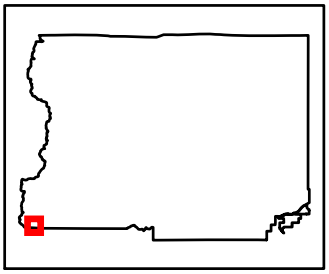
**Legend**

PCA Boundary

East Portal, 39105-H6

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boundary County



Needle Eye Tunnel Potential Conservation Area, B4: Moderate Biodiversity Significance

# Saint Vrain Creek below Lyons

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future**

**U.S.G.S. 7.5-minute quadrangles:** Hygiene, Lyons

**Size:** 2,637 acres (1,067 ha) **Elevation:** 5,040 - 5,700 ft. (1,536 - 1,737 m)

**General Description:** Half of this site is characterized by numerous ditches near the main St. Vrain creekbed. It is a relatively flat, wide floodplain with scattered trees, few shrubs and a very open understory dominated by grasses and sedges. Dominating grasses include native sandreed and sedges as well as the non-native smooth brome and Kentucky bluegrass. Trees include the white willow (*Salix alba*), an introduced willow, and narrowleaf / plains cottonwoods. The shrub layer is represented by coyote willow and peach-leaf willow. The general plant community consists of the riparian corridor and floodplains with a mixed open canopy. The streambank is primarily a grassland with a high species diversity. The stream course, with bank, terraces, and floodplain, is bounded by irrigated pastures and irrigated cropland. There is generally natural seasonal flooding with additional fluctuations typically related to irrigation diversion. The soils are Niwot soil which are gray-brown, sandy-clay loams of alluvial origin over a coarse gravelly sand subsoil. The water table is evidently close to the surface in many areas. The southern half of the site consists of the east-facing slope of the hogback with shallow intermittent drainages vegetated with shrubs. The Northern Leopard Frog (*Rana pipiens*) and Veery (*Catharus fuscenscens*) have been documented in the area, and Bald Eagles nest in the vicinity.

**Biodiversity Significance Rank Comments (B4):** The site supports a fair (C-ranked) occurrence of the globally imperiled (G5T2/S1) and federally threatened Preble's meadow jumping mouse (*Zapus hudsonius preblei*) as well as a poor (D-ranked) occurrence of the globally imperiled (G2G3/S2) and federally threatened Ute's ladies' tresses (*Spiranthes diluvialis*) and Bald Eagle (*Haliaeetus leucocephalus*).

Natural Heritage element occurrences at the Saint Vrain Creek below Lyons PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Haliaeetus leucocephalus | Bald Eagle | G5 | S1B,S3N | | ST | USFS | E | 2008-99-99 |
| Mammals | Zapus hudsonius preblei | Meadow Jumping Mouse Subsp | G5T2 | S1 | LT | ST | | C | 1999-09-17 |
| Vascular Plants | Spiranthes diluvialis | Ute ladies' tresses | G2G3 | S2 | LT | | | D | 1993-08-03 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to include the riparian areas and supporting the occurrences of the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and Ute ladies' tresses (*Spiranthes diluvialis*). There is minimal extension beyond the narrow riparian area as the surrounding habitat is not suitable for either species.

**Protection Urgency Rank Comments (P4):** Land ownership is a mix of private, county open space properties, and conservation easements.

**Management Urgency Rank Comments (M4):** Maintain water quality and riparian vegetation.

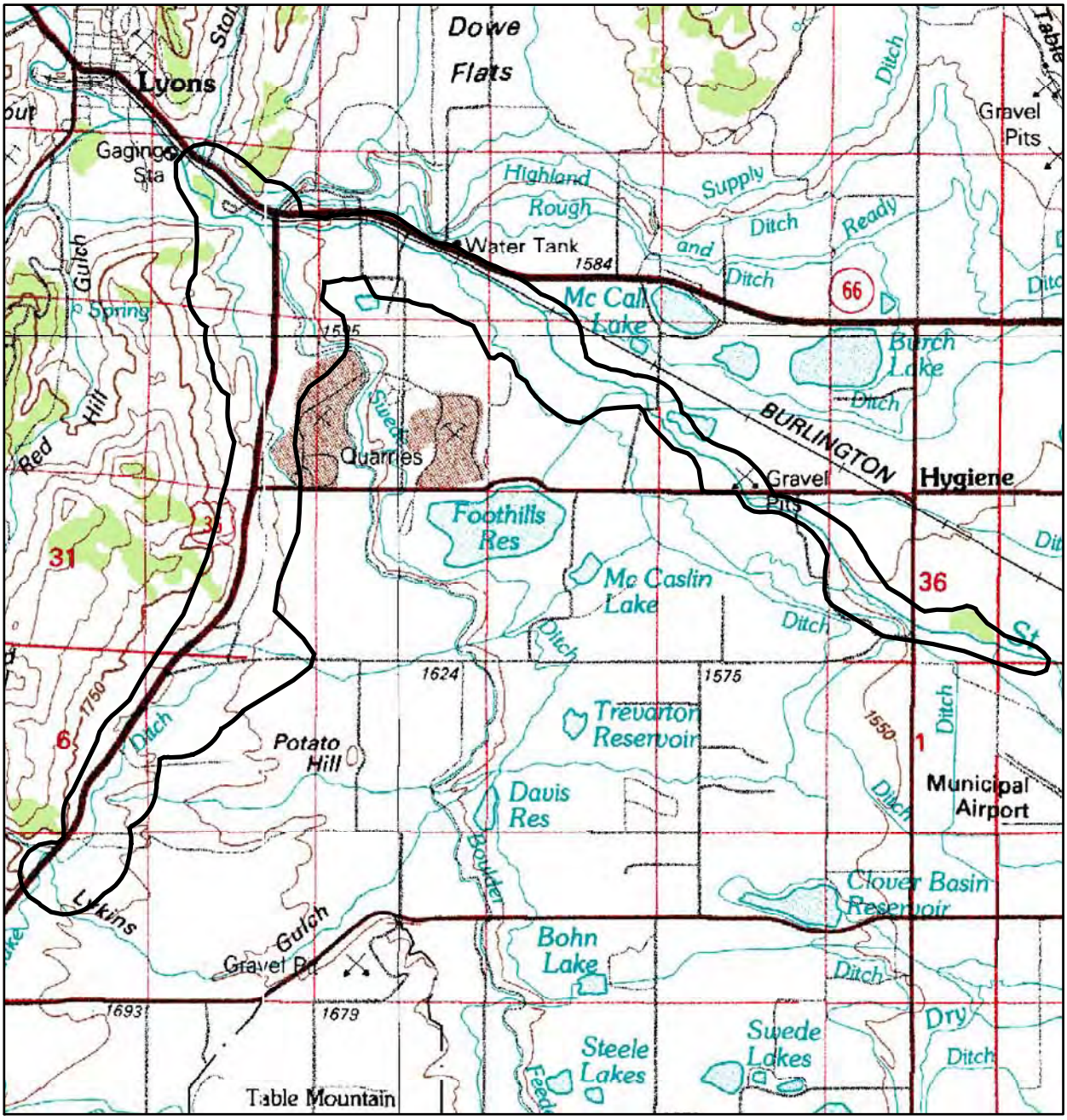
## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Peterson,S. 1993. Ute Ladies Tresses orchid (*Spiranthes diluvialis*) survey southern water supply project for Boulder, Larimer and Weld Counties prepared for Northern Colorado Water Conservancy District by Western Resources Development.

**Version Author:** Siemers, J.L.

**Version Date:** 10/30/2008

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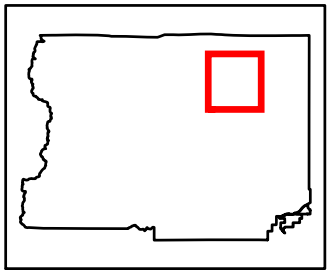
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Saint Vrain Creek below Lyons Potential Conservation Area, B4: Moderate Biodiversity Significance

# Todd Gulch Fen

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Gold Hill

**Size:** 148 acres (60 ha) **Elevation:** 8,520 - 8,600 ft. (2,597 - 2,621 m)

**General Description:** Todd Gulch Fen is a quaking, floating mat fen located within a small valley surrounded by dry slopes in the montane zone of Boulder County. The site is groundwater-fed from seeps and springs and there is no inlet. At the southeast end, the wetland drains into Todd Gulch, a short, intermittently flowing tributary to Fourmile Creek. The fen is dominated by the lesser panicled sedge (*Carex diandra*), a coarse sedge species with short rhizomes found in floating mat fens throughout the northern hemisphere. The *Carex diandra* community is located within wet areas of the fen on thick, fibrous organic soil, but gives way to a woollyfruit sedge (*Carex lasiocarpa*) community in the very center of the fen. Species occurring with *Carex diandra* include beaked sedge (*Carex utriculata*), silvery sedge (*Carex canescens*), and small bur-reed (*Sparganium minimum*). The surface of the fen is very uneven, with raised hummocks formed by clumps of sedge culms interspersed with small open pools containing *Sparganium minimum*. Many areas are carpeted by fen mosses, including *Drepanocladus aduncus, Bryum pseudotriquetrum, Aulacominum palustre,* and *Climacium dendroides.* Upstream from the fen are several depressions that perhaps once supported the same rare plants and communities. Presently, they are drying ponds that are dominated by leafy spurge (*Tithymalus esula*) and Canada thistle (*Breea arvensis*). The center of these ponds do support beaked sedge and tufted hairgrass *(Deschampsia cespitosa*), but northwest-facing slopes are dominated by dense Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*). Exposed southeast-facing slopes are open and rocky with low-cover ponderosa pine and dry-site shrubs.

**Land Use History:** The site is all U.S. Forest land. Though the matrix of the surrounding landscape is largely managed for natural vegetation, there are numerous roads that crisscross the slopes, running up drainages, on ridges, and between drainages. This causes a certain amount of fragmentation, introduces weed populations, and leads to sediment erosion. There is also a long history of mining in the area which may have affected groundwater hydrology.

**Biodiversity Significance Rank Comments (B4):** The site supports excellent (A-ranked) occurrences of a state rare (G5/S1) plant, lesser panicled sedge (*Carex diandra*), and the state rare (G5/S1) slender sedge (*Carex lasiocarpa*). There are also excellent (A-ranked) occurrences of the state rare (G4?/S1) *Carex lasiocarpa* montane

wetland community and the *Carex diandra* quaking fen, which is currently unranked (GNR/SU). As a whole, this wetland was one of the best observed in 2007 and 2008. It is unusual to find a floating mat fen of this kind in the montane zone of the Front Range. Only one other similar fen has been found in Boulder County, but the area occupied by floating mat in that site is much smaller. Fens are far more frequent at higher elevations, where there is considerably more groundwater influx from snowmelt. In addition, both *Carex diandra* and *Carex lasiocarpa* are known to occur in only a handful of sites across the state. Though these species are far more common at northern latitudes, they appear to reach their southern extent in Colorado. Todd Gulch Fen is an important site for regional biodiversity.

Natural Heritage element occurrences at the Todd Gulch Fen PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Carex lasiocarpa Herbaceous Vegetation | Montane Wetland | G4? | S1 | | | | A | 2007-07-10 |
| Natural Communities | Carex diandra Wet Meadow Herbaceous Vegetation | Quaking Fen | GNR | SU | | | | A | 2007-07-10 |
| Vascular Plants | Carex diandra | lesser panicled sedge | G5 | S1 | | | USFS | A | 2007-07-10 |
| Vascular Plants | Carex lasiocarpa | slender sedge | G5 | S1 | | | | A | 2007-07-10 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to encompass this fen and its immediate watershed to protect hydrologic processes and the wetland elements and provide a buffer against direct disturbance. These natural processes are not completely contained within the boundary, and offsite activities within the watershed have the potential to impact the elements of biodiversity present in the area.

**Protection Urgency Rank Comments (P4):** The site is currently managed by the Arapaho-Roosevelt National Forest, which is aware of its significance and has designated the site a Special Interest Area (Theobald 2005).

**Management Urgency Rank Comments (M2):** The surrounding slopes should remain unlogged. Attention to weeds, especially the leafy spurge, along the road and upstream would lessen the pressure on the outer edges of the fen.

**Exotic Species Comments:** Leafy spurge (*Euphorbia* [*Tithymalus] esula*) and Canada thistle (Cirsium *arvensis*) are present upstream of Todd Gulch Fen along the Switzerland Trail access road.

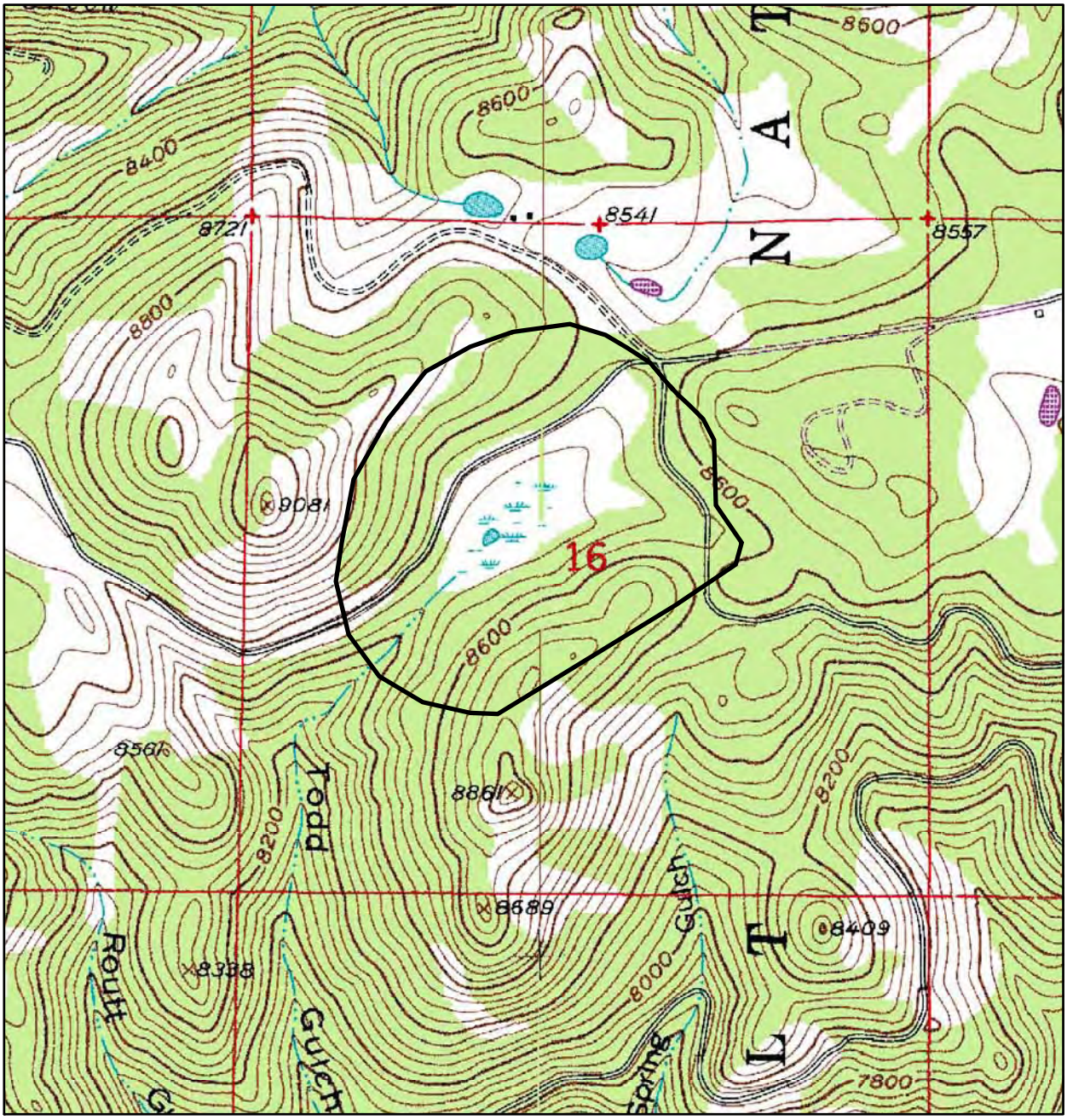
## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Theobald, D.M., N. Peterson, and G. Wilcox. 2005. Colorado Ownership, Management, and Protection v4 database. Natural Resource Ecology Lab, Colorado State University, Fort Collins, CO. 30 June 2005. www.nrel.colostate.edu/projects/comap

**Version Author:** Culver, D.R. and J.M. Lemly

**Version Date:** 10/23/2008

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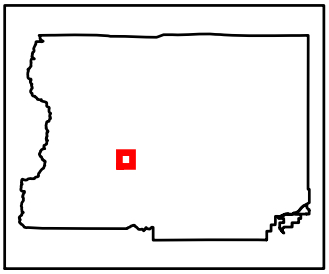
## Legend

PCA Boundary

Gold Hill, 40105-A4

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Todd Gulch Fen Potential Conservation Area, B4: Moderate Biodiversity Significance

# Upper Jasper Creek

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M5: Not Needed; No Threats Anticipated**

**U.S.G.S. 7.5-minute quadrangles:** East Portal

**Size:** 2,243 acres (908 ha) **Elevation:** 10,300 - 12,400 ft. (3,139 - 3,780 m)

**General Description:** The Upper Jasper Creek site is located in the headwaters of Jasper Creek at the western edge of Boulder County. The upper forks of Jasper Creek descend over glacial valley-steps from a group of cirque lakes below the promontory of Devil's Thumb on the Continental Divide. The streams from the cirque lakes meet on the floor of a large, open subalpine valley to form Jasper Creek, which eventually joins Middle Boulder Creek to the east of the site. Rocky outcrops interspersed with alpine vegetation dominate the benches and ridges above the valley floor, while lower slopes are cloaked in dense spruce - fir forest. The valley floor is filled with groundwater-fed fens. There are scattered trees of Engelmann spruce *(Picea engelmannii)* throughout the fens, as well as dense cover of diamondleaf willow (*Salix planifolia*) along the banks of Jasper Creek. The sloping valley sides above the creek are densely vegetated by herbaceous species. The most dominant herbaceous vegetation is fewflower spikerush (*Eleocharis quinqueflora*) growing in shallow standing water on organic soil. In the most dense stands, fewflower spikerush can have up to 50% cover and is accompanied by only a few species, namely water sedge (*Carex aquatilis*) at 10% cover and elephanthead (*Pedicularis groenlandica*), redpod stonecrop (*Rhodiola rhodantha*), cottongrass (*Eriophorum angustifolia*), and bog sedge (*Carex magellanica*) at <5% total cover. In drier areas where the water table is just below the soil surface, species diversity is far greater and contains a higher cover of species such as small headed sedge (*Carex illota*), black sedge (*Carex nova*), alpine bentgrass (*Agrostis humilis*), and white marsh marigold (*Caltha leptosepala*). Throughout the valley, there is a dense layer of moss beneath the vascular plants. Moss species include *Aulacomnium palustre, Climacium dendroides, Tomenthypnum nitens,* and species of *Drepanocladus, Warnstorfii,* and *Calliergon.* Geology within the valley is mapped as glacial deposits. The surrounding peaks are mapped as Boulder Creek granodiorite (Young 1991). Soils of the valley floor are mapped as Cryaquolls-Leighcan family, till substratum complex, 0 to 15 percent slopes. Cryaquolls occur on floodplains and are wetland soils derived from gravelly alluvium and/or glaciofluvial deposits of mixed origin. Soils in the Leighcan family occur on moraines and are derived from glacial till (USDA 2007). However, soil maps often underestimate the extent of organic soil. Soil pits in the wetland revealed predominantly hemic Histosols with >40 cm organic matter.

**Key Environmental Factors:** Although Jasper Creek runs through the valley, the fen

wetlands are not strongly associated with overflow from the active creek channel, and are not true riparian areas. Instead, they are sloping fens permanently saturated by groundwater discharge and snowmelt from the surrounding slope, with organic soil formed over hundreds and thousands of years. Vegetation within the valley is heterogeneous and changes on a small scale depending on microtopography, hydrology, and soil type.

**Land Use History:** The site is in excellent condition. The natural hydrologic regime is intact. There is no trail leading to the main Jasper Creek valley, although a well-used trail does cross the site. There is no sign of mining, grazing, draining, ditching, or other anthropogenic disturbance. No exotic species were observed and no evidence of anthropogenic nutrient inputs.

**Biodiversity Significance Rank Comments (B4):** This site supports an excellent (A-ranked) occurrence of a state rare (G4/S3S4) alpine wetland (*Eleocharis quinqueflora*).

Natural Heritage element occurrences at the Upper Jasper Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Natural Communities | Eleocharis quinqueflora Herbaceous Vegetation | Alpine Wetlands | G4 | S3S4 | | | | A | 2007-08-22 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary is drawn to encompass the entire watershed or Jasper Creek above the fen wetlands, terminating at approximately 1,000 m below the point where the upper forks join. This area is intended to allow the operation of normal hydrological and ecological processes that support the wetland community, and provide a buffer against direct disturbance.

**Protection Urgency Rank Comments (P5):** The lower valley is a private inholding within the Indian Peaks Wilderness, but was acquired by the County in 2008. The surrounding landscape is essentially pristine and used only for low-impact recreation. The wetlands occur near the headwaters of Jasper Creek and there is no alteration to the watershed.

**Management Urgency Rank Comments (M5):** The site is in excellent condition, with no exotic species and no evidence of anthropogenic alteration.

**Land Use Comments:** The area may receive light recreational use, but there is no evidence of any other land use.

## References

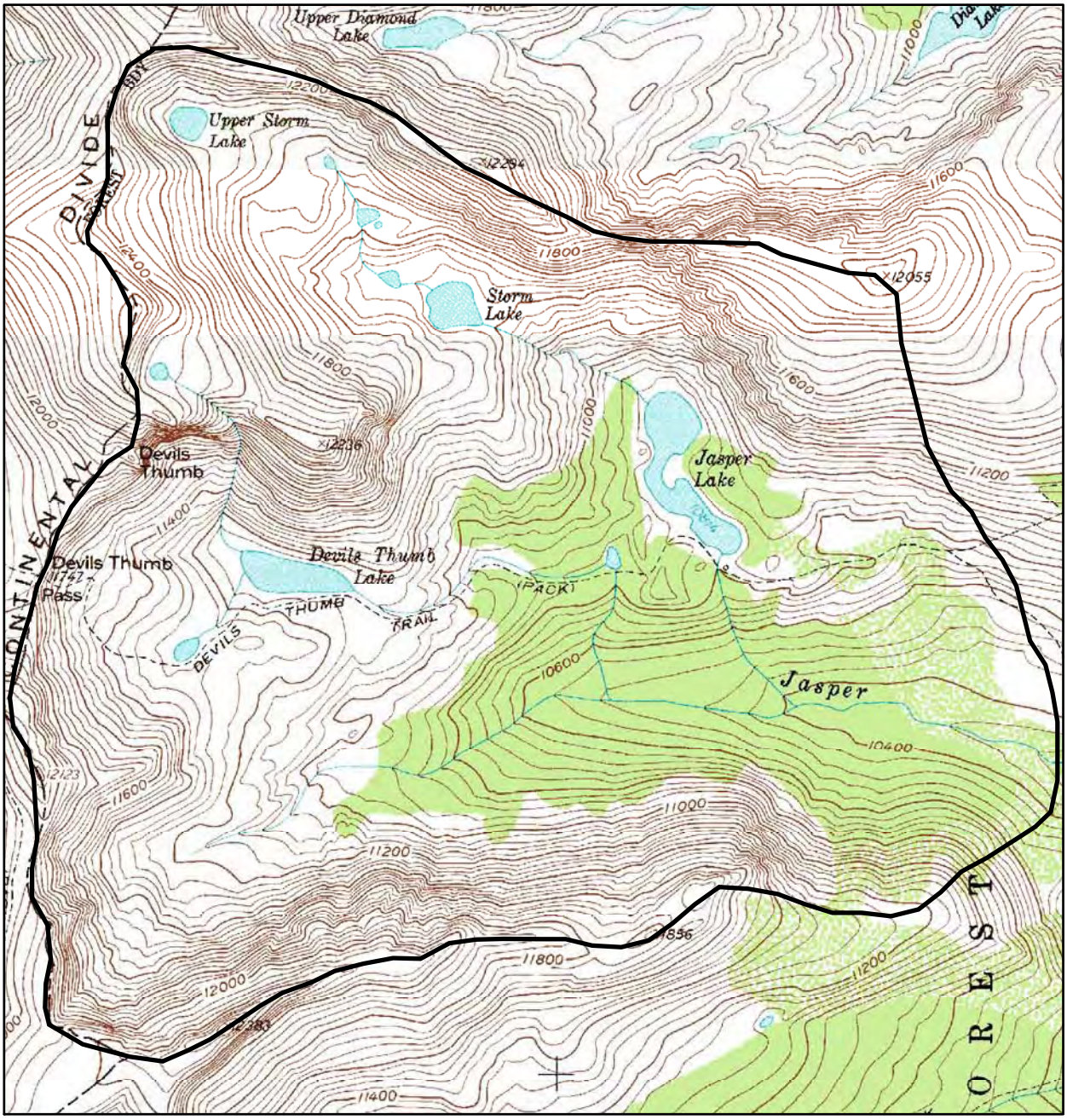
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

USDA. 2007a. Soil Survey Geographic (SSURGO) database for Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park, and Larimer Counties. USDA Natural Resources Conservation Service, Fort Worth, Texas. URL: . Downloaded on October 16, 2007.

Young, E.Y. 1991. Geologic Map of the East Portal Quadrangle, Boulder, Gilpin, and Grand Counties, Colorado. Map I-2212. U.S. Geologic Survey, Reston, Virginia.

**Version Author:** Decker, K.L. and J.M. Lemly

**Version Date:** 06/10/2008

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Map Date: 06/05/2008

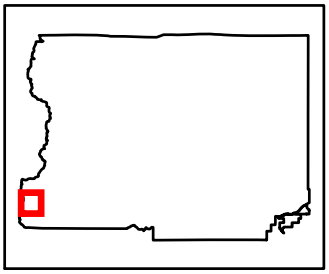
## Legend

PCA Boundary

Gold Hill, 40105-A4
Ward, 40105-A5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Upper Jasper Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

# White Rocks

**Biodiversity Rank - B4: Moderate Biodiversity Significance**

**Protection Urgency Rank - P4: No Threat or Special Opportunity**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Niwot

**Size:** 197 acres (80 ha) **Elevation:** 5,085 - 5,249 ft. (1,550 - 1,600 m)

**General Description:** The White Rocks are sandstone exposures and cliffs out on the plains of eastern Boulder County. The cliffs are comprised of Fox Hills sandstone carved by Boulder Creek. Water seeps through the porous sandstone supporting wetland vegetation beneath overhangs. In addition to the American groundnut (*Apios americana*), these wet areas support chokecherry (*Prunus virginiana*), joe-pye weed (*Eupatorium maculatum*), and Canada goldenrod (*Solidago canadensis*). The moist alcoves are contrast with the dry rock outcrops above, although water pools in shallow depressions on the surfaces in places. These pools support fairy shrimp. The sandstone outcrops emerge from grassland habitat. Grasses are characteristic on the outcrops include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), few-flowered panic grass (*Dicanthelium oligosanthes*), needle-and-thread (*Hesperostipa comata*), Indian grass (*Sorgastrum nutans*), and blue grama (*Bouteloua gracilis*). Rock crevices also harbor scurfpea (*Psoralidium lanceolatum*), silky sophora (*Sophora nuttalliana*), and black nightshade (*Solanum nigrum*), species more common on the plains (Clark et al. 2001). This unique area also supports a small stand of sand sage (*Artemisia filifolia*), which is very rare in Boulder County. Boulder Creek winds through the site and is lined by riparian woodland with plains cottonwood (*Populus deltoides*) and crack willow (*Salix fragilis*) with swards of Nebraska sedge (*Carex nebrascensis*), prairie cordgrass (*Spartina pectinata*), threesquare (*Schoenoplectus pungens*), and saltgrass (*Distichlis spicata*) and alkali muhly (*Muhlenbergia asperifolia*) on terraces. Wet meadows in the floodplain support noxious and exotic weeds which are a severe problem at this site. Jim Hill mustard (*Sisymbrium altissimum*) forms nearly impenetrable thickets and cheatgrass (*Bromus tectorum*) and sowthistle (*Sonchus arvensis*) are abundant. Russian olive (*Elaeagnus angustifolia*), teasel (*Dipsacus fullonum*) and Canada thistle (*Cirsium arvensis*) are prevalent in the floodplain and wet meadows. Unique fauna persist at White Rocks, including fairy shrimp in the pools on the sandstone, rare ant species (*Aphaenogaster fulva, A. huachucana, Formica criniventris*, and *Lasius occidentalis*), and a mining bee (*Perdita opuntiae*), which feeds on prickly pear cactus (*Opuntia* spp.) and carves holes in the sandstone bedrock for nests.

**Key Environmental Factors:** Fox Hills sandstone

**Land Use History:** The surrounding area is primarily in irrigated agricultural

production. The area was historically grazed by cattle, but grazing has decreased since it was designated as a natural area and held under conservation easement by the City of Boulder Open Space and Mountain Parks.

**Biodiversity Significance Rank Comments (B4):** This site is based on a state rare (G5/S1) fern species, black spleenwort (*Asplenium adiantum-nigrum*) which is known from only this location in the state. It also contains an excellent (A-ranked) occurrence of the state rare (G5/S1) American groundnut (*Apios americana*) and an unranked occurrence of a state imperiled (G5/S1) grass species, forktip three-awn (*Aristida basiramea*). This location needs to be revisited and more information collected.

Natural Heritage element occurrences at the White Rocks PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Apios americana | American groundnut | G5 | S1 | | | | A | 2000-08-28 |
| Vascular Plants | Aristida basiramea | forktip three - awn | G5 | S1 | | | | E | 2008-10-17 |
| Vascular Plants | Asplenium adiantum - nigrum | black spleenwort | G5 | S1 | | | | H | 1976-10-24 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** This site was drawn for the state rare fern which occurs on the slopes above Boulder Creek.

**Protection Urgency Rank Comments (P4):** Much of this site is under conservation easement. It is a designated state natural area.

**Management Urgency Rank Comments (M2):** Noxious and exotic weeds are a serious threat. Species include Jim Hill mustard (*Sisymbrium altissimum*), cheatgrass (*Bromus tectorum*), chicory (*Cichorium intybus*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), leafy spurge (*Euphorbia esula*), and sowthistle (*Sonchus arvensis*). Russian olive (*Elaeagnus angustifolia*), tamarisk (*Tamarix ramosissimum*), teasel (*Dipsacus fullonum*), Canada thistle (*Cirsium arvensis*), purple loosestrife (*Lythrum salicaria*), and Eurasian water milfoil (*Myriophyllum spicatum*) are in the stream channel, floodplain, and wet meadows.

**Exotic Species Comments:** Weedy plants include include Jim Hill mustard (*Sisymbrium altissimum*), cheatgrass (*Bromus tectorum*), chicory (*Cichorium intybus*), diffuse knapweed (*Centaurea diffusa*), jointed goatgrass (*Aegilops cylindrica*), leafy spurge (*Euphorbia esula*), and sowthistle (*Sonchus arvensis*). Russian olive (*Elaeagnus angustifolia*), tamarisk (*Tamarix ramosissimum*), teasel (*Dipsacus fullonum*), Canada

thistle (*Cirsium arvensis*), purple loosestrife (*Lythrum salicaria*), and Eurasian water milfoil (*Myriophyllum spicatum*)

**Information Needs:** This site needs to be surveyed for the rare black spleenwort (*Asplenium adiantum-nigrum*). This is the only documented location of this plant in Colorado and it was last observed in the 1970s.

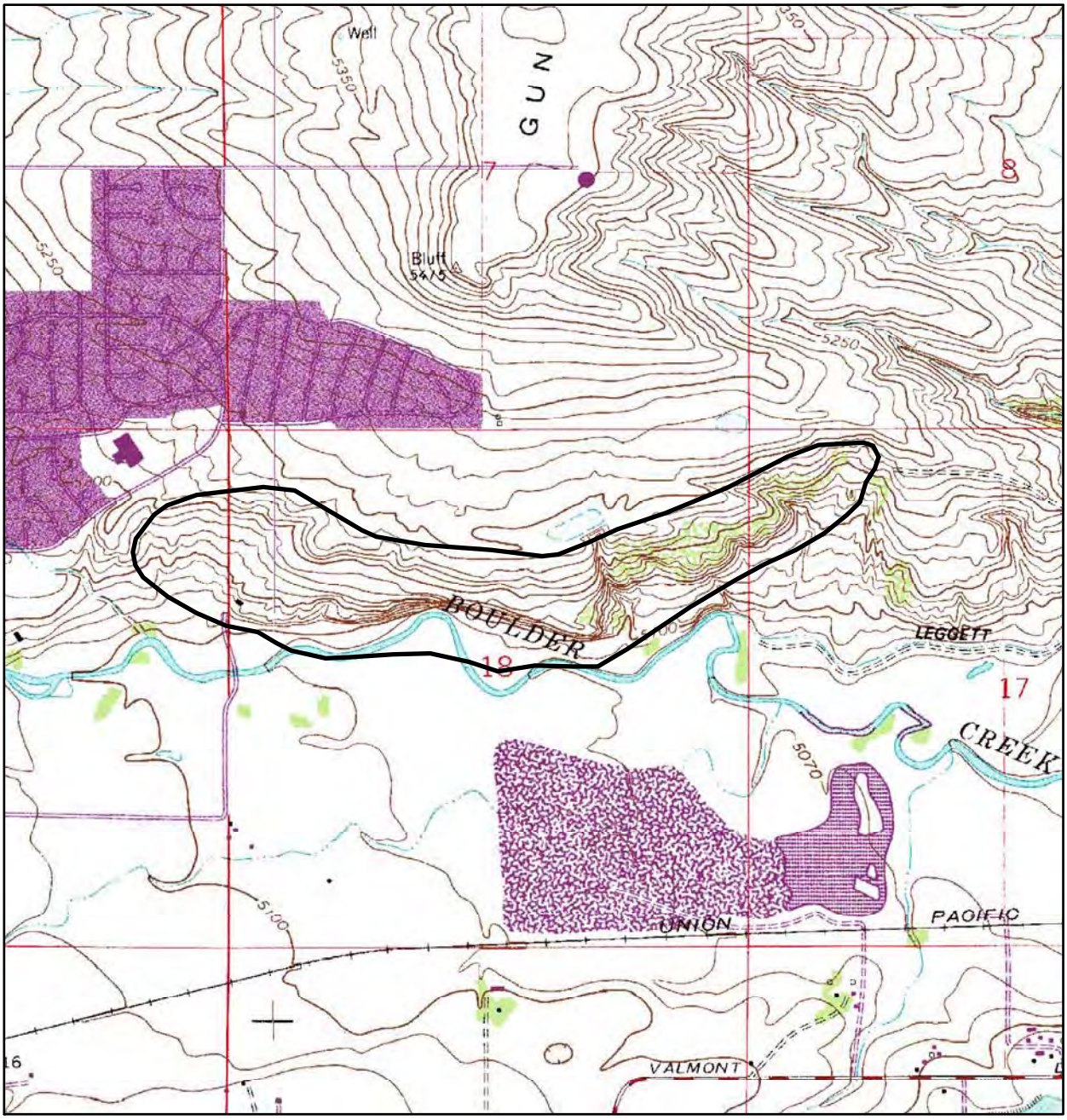
## References

Clark, D.A., Crawford, C., and Jennings, W.F. 2001. Draft baseline plant survey of White Rocks and Surrounding Area in Eastern Boulder County. Unpublished report prepared for the City of Boulder Open Space and Mountain Parks Department.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 01/23/2009

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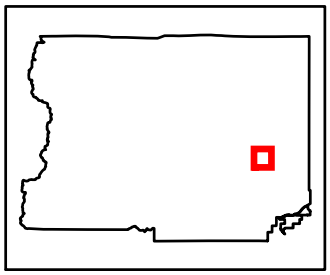
**Legend**

PCA Boundary

Niwot, 40105-A2

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



White Rocks Potential Conservation Area, B4: Moderate Biodiversity Significance

# Peterson Lake

**Biodiversity Rank - B5: General Biodiversity Interest**

**Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years**

**Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality**

**U.S.G.S. 7.5-minute quadrangles:** Nederland

**Size:** 566 acres (229 ha) **Elevation:** 8,600 - 9,600 ft. (2,621 - 2,926 m)

**General Description:** The site is a wetland complex within the subalpine zone on the east slope of the Front Range. It contains Peterson Lake, Lake Eldora and nearby associated wetlands which support the Rocky Mountain capshell (*Acroloxus coloradensis*) as well as the broad-leaved twayblade (*Listera convallarioides*). Historical occurrences of the sharp sprite (*Promenetus exacuous*) and the umbilicate sprite (*Promenetus umbilicatellus*) were documented in the 1960s.

**Biodiversity Significance Rank Comments (B5):** This site supports a poor (D-ranked) occurrence of the globally vulnerable (G3/S1) Rocky Mountain capshell (*Acroloxus coloradensis*) and an unranked occurrence of the state rare (G5/S2) broad-leaved twayblade (*Listera convallarioides*). Historical occurrences of the state rare (G5/S2) sharp sprite (*Promenetus exacuous*) and the state rare (G4/S3) umbilicate sprite (*Promenetus umbilicatellus*) were documented in the 1960s, but current field surveys are needed to verify the existence of these populations.

Natural Heritage element occurrences at the Peterson Lake PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Mollusks | Acroloxus coloradensis | Rocky Mountain Capshell | G3 | S1 | | SC | USFS | D | 1993-06-99 |
| Vascular Plants | Listera convallarioides | broad - leaved twayblade | G5 | S2 | | | | | 1993-08-29 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes the entire wetland complex and a narrow terrestrial buffer. Some ecological processes that support this site originate outside of the boundary.

**Protection Urgency Rank Comments (P3):** A large portion of the site, and all of the element occurrences, are on private land that could be developed. One of the large gravel parking areas at Eldora Ski Area is within the site, while all of the parking and base developments drain into Peterson Lake. Water-bourne pollutants from

these areas certainly enter the lake. Most of the mining claims on the north side of the site have been acquired by the county, while other lands on Spencer Mountain are managed by the U.S. Forest Service.

**Management Urgency Rank Comments (M3):** There is an access road through the site; use is heavy in winter, with moderate (bike use) in summer. Effects of any cattle grazing in the area should be determined.

**Information Needs:** Specimens of two state rare mollusks, sharp sprite (*Promenetus exacuous*) and umbilicate sprite (*Promenetus umbilicatellus*), were collected in the 1960s. Further field work could locate current populations.

## References

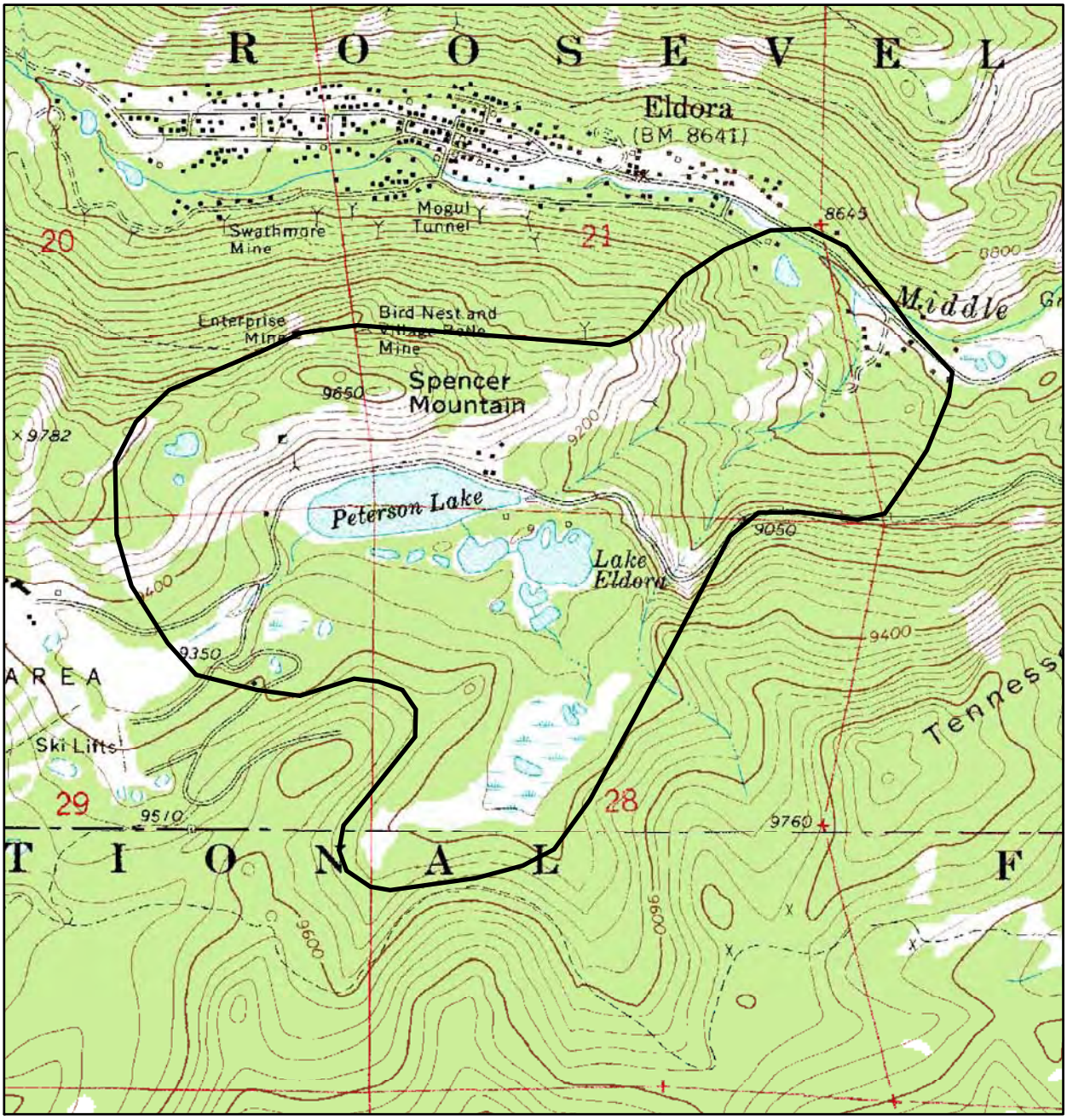
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

PIONEER ENVIRONMENTAL SERVICES INC. 1993. BIOLOGICAL ASSESSMENT, PROPOSED IMPROVEMENTS AT ELDORA MOUNTAIN RESORT. PREPARED FOR USFS, ROOSEVELT NF, BOULDER RD.

Pioneer Environmental Services, Inc. 1993. Results of survey for the Rocky Mountain Capshell Snail in Colorado alpine lakes.

**Version Author:** Siemers, J. L.

**Version Date:** 10/28/2008

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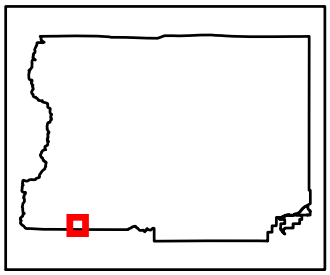
## Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Peterson Lake Potential Conservation Area, B5: General Biodiversity Interest

# Saint Vrain Creek

**Biodiversity Rank - B5: General Biodiversity Interest**

**Protection Urgency Rank - P2: Threat/Opportunity within 5 Years**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Hygiene, Longmont

**Size:** 1,440 acres (583 ha) **Elevation:** 4,850 - 5,110 ft. (1,478 - 1,558 m)

**General Description:** The site includes an approximately 12 mile reach of Saint Vrain Creek including surrounding riparian areas. Much of the site extends through urban/suburban areas of Longmont and the creek is influenced by associated channelization and water diversion. Cylindrical papershell (*Anodontoides ferussacianus*) was documented in the 1970s and northern redbelly dace (*Phoxinus eos*) was documented in the early 1900s. An occurrence of hornyhead chub (*Nocomis biguttatus*) was also documented in the early 1900s. This species has been extirpated from Colorado.

**Biodiversity Significance Rank Comments (B5):** This site is drawn for occurrences of four globally secure (G5), state rare fish species: southern redbelly dace (*Phoxinus erythrogaster*; S1), stonecat (*Noturus flavus*, S1), brassy minnow (*Hybognathus hankinsoni*, S3), and the common shiner (*Notropis cornutus,* S2). There is also a nesting occurrence of Bald Eagle (*Haliaeetus leucocephalus*, G5/S1B,S3N).

Natural Heritage element occurrences at the Saint Vrain Creek PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Birds | Haliaeetus leucocephalus | Bald Eagle | G5 | S1B,S3N | | ST | USFS | E | 2008-99-99 |
| Fish | Hybognathus hankinsoni | Brassy Minnow | G5 | S3 | | ST | | CD | 1995-04-08 |
| Fish | Notropis cornutus | Common Shiner | G5 | S2 | | ST | | E | 1995-04-08 |
| Fish | Noturus flavus | Stonecat | G5 | S1 | | SC | BLM | C | 1994-08-29 |
| Fish | Phoxinus erythrogaster | Southern Redbelly Dace | G5 | S1 | | SE | USFS | E | 1994-08-09 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** The boundary includes all occurrences and incorporates hydrological processes directly along the creek. The boundary follows the extent of the riparian vegetation. Some ecological processes that support the fish are included,

though inclusion of additional portions of uplands and ditches beyond site boundaries may be necessary for long-term protection.

**Protection Urgency Rank Comments (P2):** Land ownership is mixed between private and county open space.

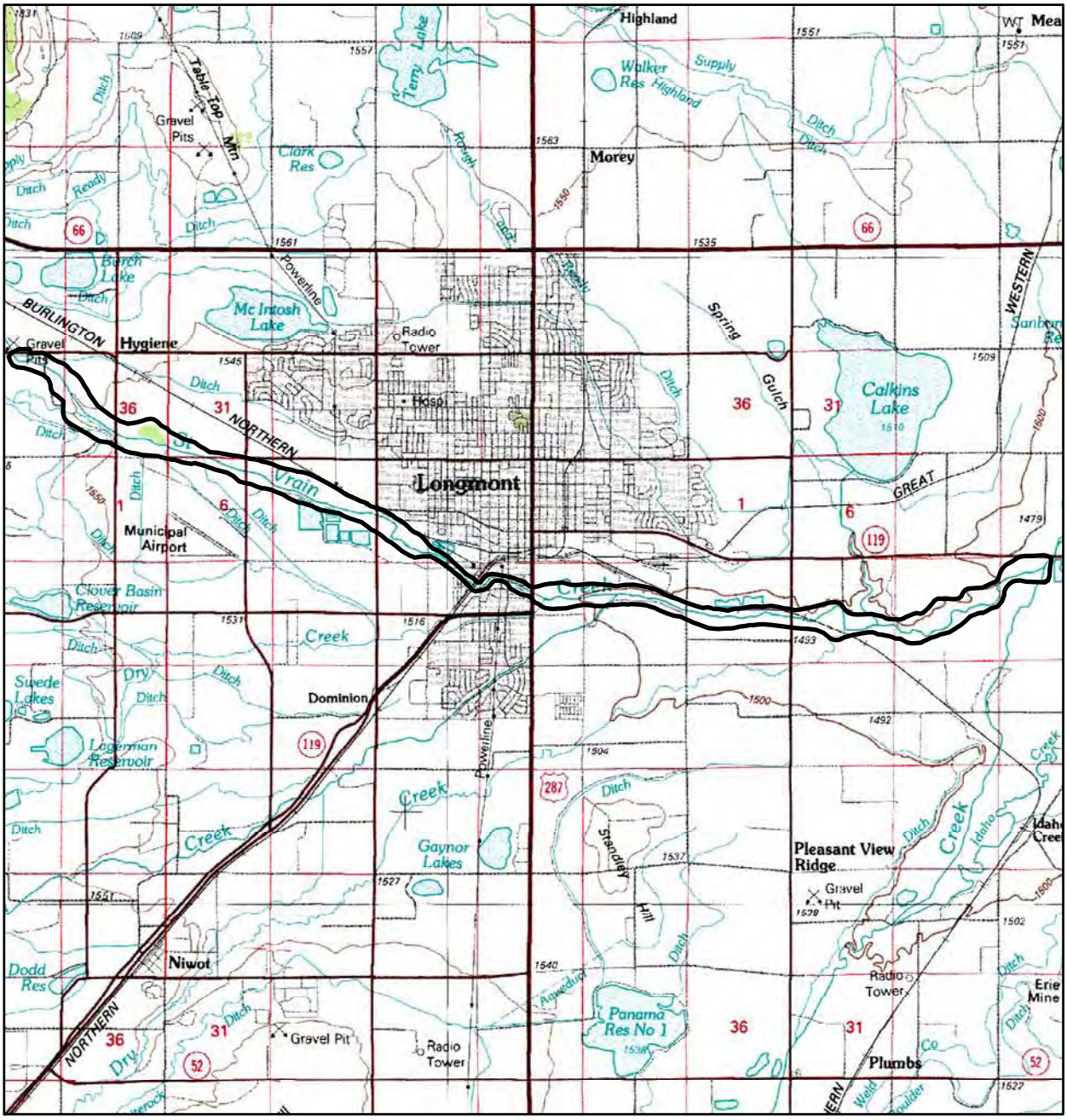
**Management Urgency Rank Comments (M2):** Actions that protect flow and water quality should be maintained. Threats from siltation, dewatering, and agricultural and urban runoff exist.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Siemers, J.L.

**Version Date:** 10/30/2008

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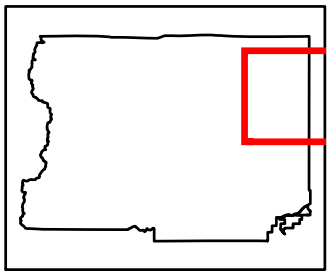
## Legend

PCA Boundary

Estes Park, 40105-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Saint Vrain Creek Potential Conservation Area, B5: General Biodiversity Interest

# South Boulder Canyon Ditch

**Biodiversity Rank - B5: General Biodiversity Interest**

**Protection Urgency Rank - P5: No Action to be Taken on this Site**

**Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss**

**U.S.G.S. 7.5-minute quadrangles:** Niwot

**Size:** 120 acres (48 ha)

**General Description:** This area is a ditch which supports a rare plant on its banks surrounded by smooth brome (*Bromus inermis*), prairie cordgrass (*Spartina pectinata*), spreading dogbane (*Apocynum androsaenifolium*), meadow rue (*Thalictrum*) and crack willow (*Salix fragilis*). Graminoids dominate the site. The man-made riparian zone is within city limits and is surrounded by development.

**Biodiversity Significance Rank Comments (B5):** This site is based on a fair (C-ranked) occurrence of the state imperiled (G5/S1) American groundnut (*Apios americana*)

Natural Heritage element occurrences at the South Boulder Canyon Ditch PCA.

| Major Group | State Scientific Name | State Common Name | Global Rank | State Rank | Federal Status | State Status | Fed Sens | EO Rank | Last Obs Date |
|---|---|---|---|---|---|---|---|---|---|
| Vascular Plants | Apios americana | American groundnut | G5 | S1 | | | | C | 2000-08-08 |

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

**Boundary Justification:** Included in the site is the intermittent flowing ditch and a small buffer surrounding the banks to deter direct disturbance, especially from maintenance on the utility ditch.

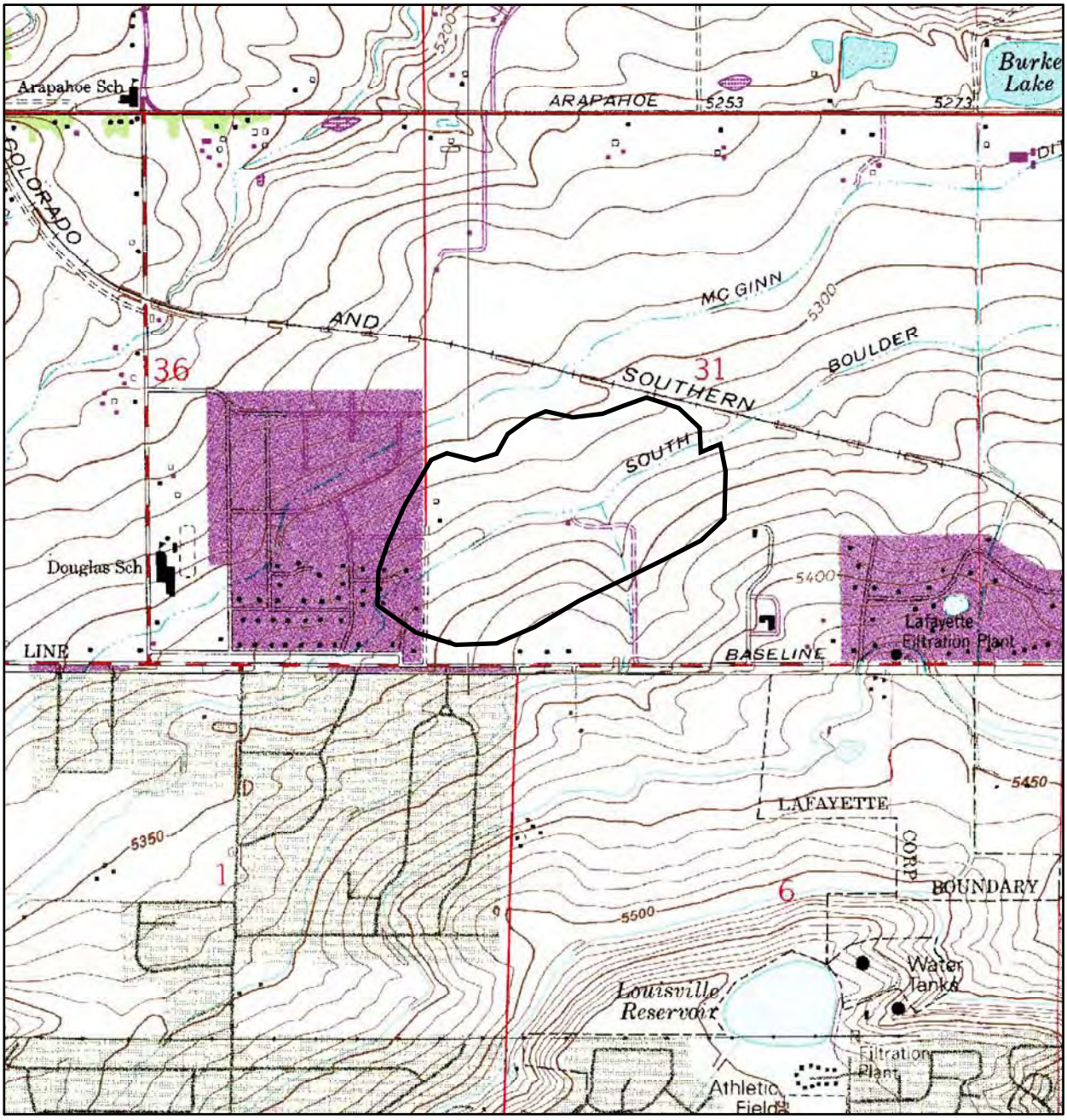
**Protection Urgency Rank Comments (P5):** The site is city Open Space. No threats were reported.

**Management Urgency Rank Comments (M2):** This is a small population in a disturbed area. Maintenance activities on the ditch may disturb and increase the already present exotic plant species problem.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Fayette, K.K.
**Version Date:** 03/20/1997

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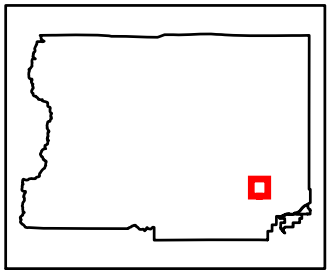
## Legend

PCA Boundary

Louisville, 39105-H2
Niwot, 40105-A2

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



South Boulder Canyon Ditch Potential Conservation Area, B5: General Biodiversity Interest

## Appendix D. Network of Conservation Area Profiles.

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# Front Range Foothills-Carter Lake to Boulder NCA

**Location:** This network of conservation areas extends along the foothill hogbacks from Carter Lake in Larimer County, south to Fourmile Canyon Road west of Boulder in Boulder County.

**County:** Boulder, Larimer

**Size:** 64,241 acres (25,998 ha) **Elevation:** 5,128 - 6,972 ft. (1,563 - 2,125 m)

**General Description:** This network of conservation areas encompasses the series of hogbacks and valleys formed by the uplift and subsequent erosion of Tertiary and Cretaceous sedimentary bedrock layers by the mountain building of the modern Rocky Mountains. The hogbacks are a series of ridges of resistant rock types and the valleys are formed by the more erodible layers. These hogbacks occur at the transition between the Southern Rocky Mountains and the High Plains. The vegetation is transitional between the mountains and plains, but with systems unique to the foothills as well. Ponderosa pine (*Pinus ponderosa*) savanna bleeds down the mountain slopes from the west forming a mosaic with mountain mahogany (*Cercocarpus montanus*) shrublands. Deeper, finer-textured soils in valleys support grasslands. Where not developed for agriculture, native grasslands typically have needlegrasses (*Hesperostipa* species) with remnant patches of tallgrasses like big bluestem (*Andropogon gerardii)* and little bluestem (*Schizachyrium scoparium*). Embedded within the hogbacks are isolated pockets of shale barrens, typically along exposures of Niobrara shale. These support globally rare Bell's twinpod (*Physaria bellii*), which is endemic to the northern Front Range in Colorado. The hogbacks are cut through by stream drainages, which form gaps in the otherwise continuous hogbacks.

**Key Environmental Factors:** Front Range foothill hogback systems; Tertiary and Cretaceous sedimentary bedrock (Fountain, Lyons, Lykins, Morrison, Dakota, Benton, Niobrara).

## Associated Potential Conservation Areas (PCA)

| PCA Site Name | PCA Biological Diversity Significance |
|---|---|
| Carter Lake Reservoir Hogbacks | B3: High Biodiversity Significance |
| Hertha Reservoir Ridge | B4: Moderate Biodiversity Significance |
| Indian Lookout Mountain | B2: Very High Biodiversity Significance |
| Mount Sanitas Hogbacks | B2: Very High Biodiversity Significance |
| North Boulder Grasslands | B2: Very High Biodiversity Significance |
| Rabbit Mountain | B1: Outstanding Biodiversity Significance |
| Red Hill south of Lyons | B1: Outstanding Biodiversity Significance |
| Steamboat Mountain | B2: Very High Biodiversity Significance |

**Boundary Justification:** This NCA was drawn to encompass sites that include relatively intact Front Range foothill hogback systems and the biodiversity they support. The site extends from just north of Carter Lake in Larimer County to the City of Boulder in Boulder County. It likely can extend farther north; the habitat is present but unsurveyed for its conservation value. The nature of the foothills in Larimer County is different than that in Boulder County where the foothills are adjacent to the Denver Basin landform. The foothills in Boulder County are more compressed whereas there are additional series of hogbacks across a wider transition zone in Larimer County. The biodiversity features are relatively uniform and thus hold these sites together.

**Protection Urgency Rank Comments (P?):** Approximately half of this area is in private ownership. Other significant landowners include the State Land Board of Colorado, Boulder County Parks and Open Space, City of Boulder Open Space and Mountain Parks, and Larimer County Parks and Open Lands.

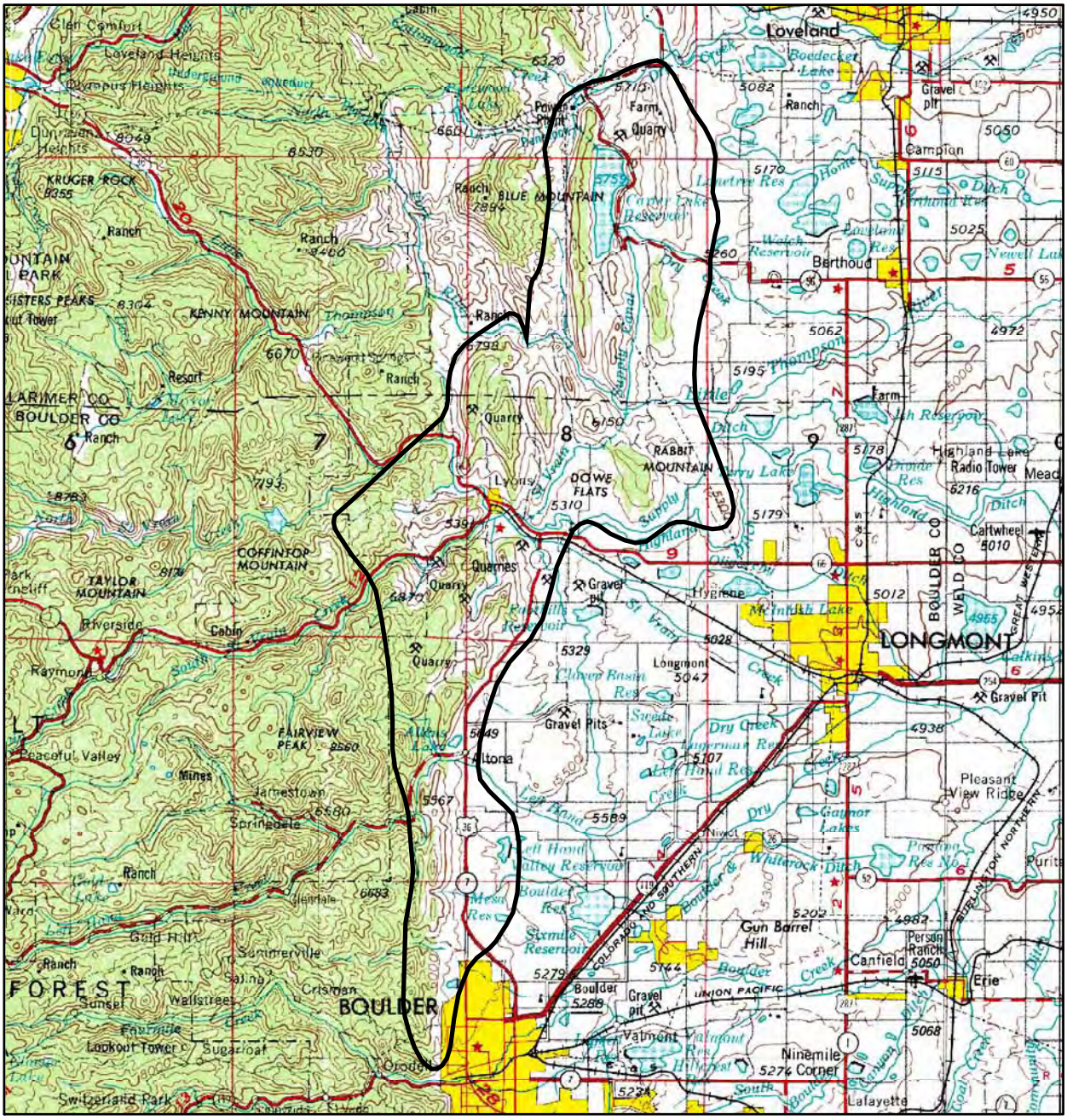
**Management Urgency Rank Comments (M?):** Quarrying is a significant and catastrophic disturbance in these habitats. Grazing management can influence species composition and non-native weed infestations.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 11/13/2008

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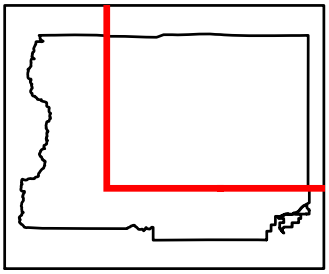
## Legend

PCA Boundary

Greeley, 40104-A1

1x2 Degree Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



# North Saint Vrain-Hermit Park NCA

**Location:** This Network of Conservation Areas spans the Boulder-Larimer county boundary. It encompasses the large area between Highway 36 between Lyons and Estes Park and Highway 7 between Estes Park south to Riverside. From Riverside, the boundary trends southeast to Jamestown. It is north of Left Hand Canyon Road and west of the foothills adjacent to Highway 36 south of Lyons.

**County:** Boulder, Larimer

**Size:** 91,368 acres (36,975 ha) **Elevation:** 5,840 - 11,401 ft. (1,780 - 3,475 m)

**General Description:** The North Saint Vrain-Hermit Park NCA is embedded in the Front Range of Colorado. It spans the montane zone between the foothill hogbacks to the east and the subalpine forest to the west. Bedrock units are generally Precambrian metamorphic rocks (1.7 billion years old) with more recent surficial Quaternary deposits (approximately 10,000 years old) in stream drainages. The majority of the site consists of Precambrian metamorphic rocks intruded primarily by Silver Plume granite with minor amounts of Sherman granite. The rugged, granitic hills are carved by North St. Vrain Creek and its tributaries, which have formed deep, narrow canyons and starkly contrasting aspects on the hillslopes above them. The steep slopes have an extensive mosaic of conifer forest, shrublands, grassland openings, and cliffs and rock outcrops. This rough, craggy landscape supports an extensive ponderosa pine (*Pinus ponderosa*) woodland system that spans 7,000-9,500 feet in elevation. Ponderosa pine is primarily dominant throughout on steep, south-, west-, and east-facing slopes as well as on the many rocky tors and ridgelines. Cool, north-facing slopes have dense, mixed conifer forest. Bitterbrush (*Purshia tridentata*) is the most common shrub. Montane grasslands punctuate the landscape on flatter areas with deeper soils. Mountain muhly (*Muhlenbergia montana*) and Parry's oatgrass (*Danthonia parryi*) are common. The ridgelines and rocky tors of the North St. Vrain watershed support the highest concentration of known Larimer aletes (*Aletes humilis*) locations. This species is narrowly endemic to Silver Plume granite in the montane zone of the Colorado Front Range. Larimer aletes thrives in the shallow, gravelly surface soils around rock outcrops. This habitat also supports Rocky Mountain cinquefoil (*Potentilla rupincola*) as well. Riparian areas support well-developed montane riparian vegetation that is a mosaic of woodlands, shrublands, and extensive wet meadows and small, isolated glacial pothole ponds.

**Key Environmental Factors:** Silver Plume granite; ponderosa pine (*Pinus ponderosa*) ecological system; lower to upper montane elevation zone.

| Associated Potential Conservation Areas (PCA) | |
|---|---|
| **PCA Site Name** | **PCA Biological Diversity Significance** |
| Button Rock Mountain | B2: Very High Biodiversity Significance |
| Coffintop Mountain | B2: Very High Biodiversity Significance |
| Fairview Peak | B2: Very High Biodiversity Significance |
| Hermit Park | B2: Very High Biodiversity Significance |
| Lily Mountain | B2: Very High Biodiversity Significance |
| North Saint Vrain | B2: Very High Biodiversity Significance |
| South Saint Vrain | B2: Very High Biodiversity Significance |

**Boundary Justification:** The Network of Conservation Area (NCA) boundary includes all known targeted occurrences and the natural processes that support them. It delineates a relatively intact landscape containing many smaller sites that are interrelated. While these smaller sites have been separated based on ecological factors such as breaks in the distribution of elements the designation of the NCA recognizes the importance and value of the larger system in the maintenance and long term viability of the smaller sites. The NCA spans the elevation zone of ponderosa pine (*Pinus ponderosa*) ecological system from its transition from mixed conifer and spruce - fir (*Picea engelmannii - Abies lasiocarpa*) forests at upper elevations and ponderosa pine savanna and foothill shrublands at lower elevations. It is underlain by a large batholith of Silver Plume granite.

**Protection Urgency Rank Comments (P?):** Exurban development is fragmenting the landscape in this NCA. It is a patchwork of private land, U.S. Forest Service lands (Arapaho-Roosevelt National Forest), Boulder County open space, and Larimer County open space.

**Management Urgency Rank Comments (M?):** Wildfire fuels management is the most important management need in this NCA. Invasive exotic plant species provide another management threat; the site has some of Colorado's most noxious species, like cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) but these are not extensive at this time. An increase of exotic species may decrease the biodiversity significance of the site by altering the native floral and faunal species composition (Bock and Bock 1988). Grazing or fire management could be used as a tool to reduce the presence of these species and increase the proportion of native species. Fragmentation could also impact many of the elements. Even low intensity development may limit the use of some management techniques (e.g., fire) that may be essential for the long term persistence of the elements at the site. Evaluation of the impacts of fire on rare species within the NCA would be helpful.

**Exotic Species Comments:** The site has some of Colorado's most noxious species, like cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) but these are not extensive at this time.

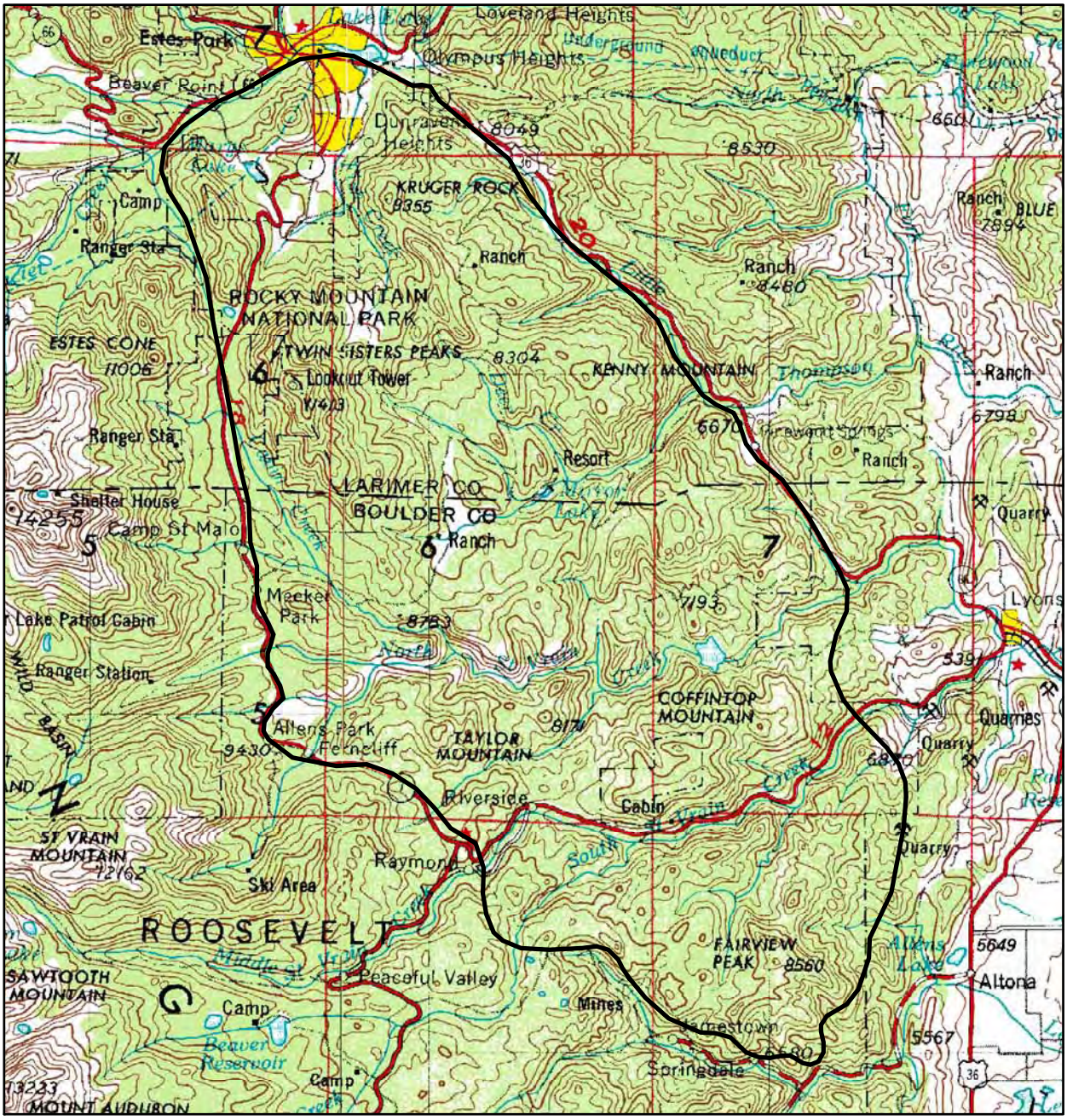
## References

Bock, C. E., and J. H. Bock. 1988. Grassland birds in southeastern Arizona: impacts of fire, grazing, and alien vegetation. ICBP Technical Publication No. 7:43-58.

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 11/15/2008

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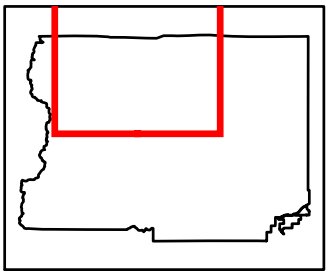
## Legend

PCA Boundary

Greeley, 40104-A1

1x2 Degree Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



# Rocky Flats Grasslands NCA

**Location:** This Network of Conservation Area is bounded to the west by the Front Range foothills and to the east by County Road 17 south of Superior. It is bounded on the north side by Route 170 and Highway 36 in Boulder County and it extends just south of Highway 72 in Jefferson County.

**County:** Broomfield, Boulder, Jefferson

**Size:** 20,844 acres (8,435 ha) **Elevation:** 5,610 - 6,890 ft. (1,710 - 2,100 m)

**General Description:** This Network of Conservation Area incorporates part of the large outwash plain against the foothills of the Colorado Front Range. It consists of large, rolling mesas and swales. Bedrock geology of the area is Cretaceous shale (Laramie Formation and Pierre shale) capped with a mosaic of Quaternary alluvium (a mosaic of Rocky Flats, Verdos, Slocum, and Louviers deposits interspersed with Piney Creek terrace deposits). The gravelly, well-drained soils of the mesa tops are covered with grassland mosaic dominated by mid- and tallgrass species. Big bluestem (*Andropogon gerardii*) is the hallmark species, but the grassland has a remarkable diversity of grasses like porcupine grass (*Hesperostipa spartea*), prairie dropseed (*Sporobolus heterolepis*), sideoats grama (*Bouteloua curtipendula*), needle-and-thread (*Hesperostipa comata*), mountain muhly (*Muhlenbergia montana*), western wheatgrass (P*ascopyrum smithii*), and others. Forbs are likewise very diverse with many prairie relict species. The grassland expression correlates with different Quaternary alluvium layers, with many stable communities that have persisted for millennia. Stream networks that drain the area are a mix of ephemeral, intermittent, and perennial creeks. Cottonwood (*Populus deltoides*) and willow (*Salix* spp.) occur along perennial drainages. Wet meadows and swales occur in ephemeral drainages with little to no surface flow.

**Key Environmental Factors:** Quaternary alluvium layers including Rocky Flat, Louviers, Slocum, Verdos, Piney Creek, post-Piney Creek.

## Associated Potential Conservation Areas (PCA)

| PCA Site Name | PCA Biological Diversity Significance |
|---|---|
| Coal Creek at Rocky Flats | B3: High Biodiversity Significance |
| Coal Creek below Rocky Flats | B3: High Biodiversity Significance |
| Marshall Mesa | B2: Very High Biodiversity Significance |
| Rocky Flats | B2: Very High Biodiversity Significance |
| Walnut Creek | B5: General Biodiversity Interest |

**Boundary Justification:** The Network of Conservation Area (NCA) boundary includes all known targeted occurrences and the natural processes that support them. It incorporates a large area of outwash plain in the Colorado Piedmont against

the Front Range foothills. The older surfaces of Nussbaum and Rocky Flats transition to younger Verdos, Louviers, and Slocum, and then to recent alluvium progressing from west to east. The boundary is large enough to support grazing and prescribed fire regimes that could maintain the full spectrum of Piedmont grassland expressions.

**Protection Urgency Rank Comments (P?):** This NCA has significant area of private lands. Other significant owners include the federal government (Rocky Flats), City of Boulder Open Space and Mountain Parks, and the Colorado State Land Board.

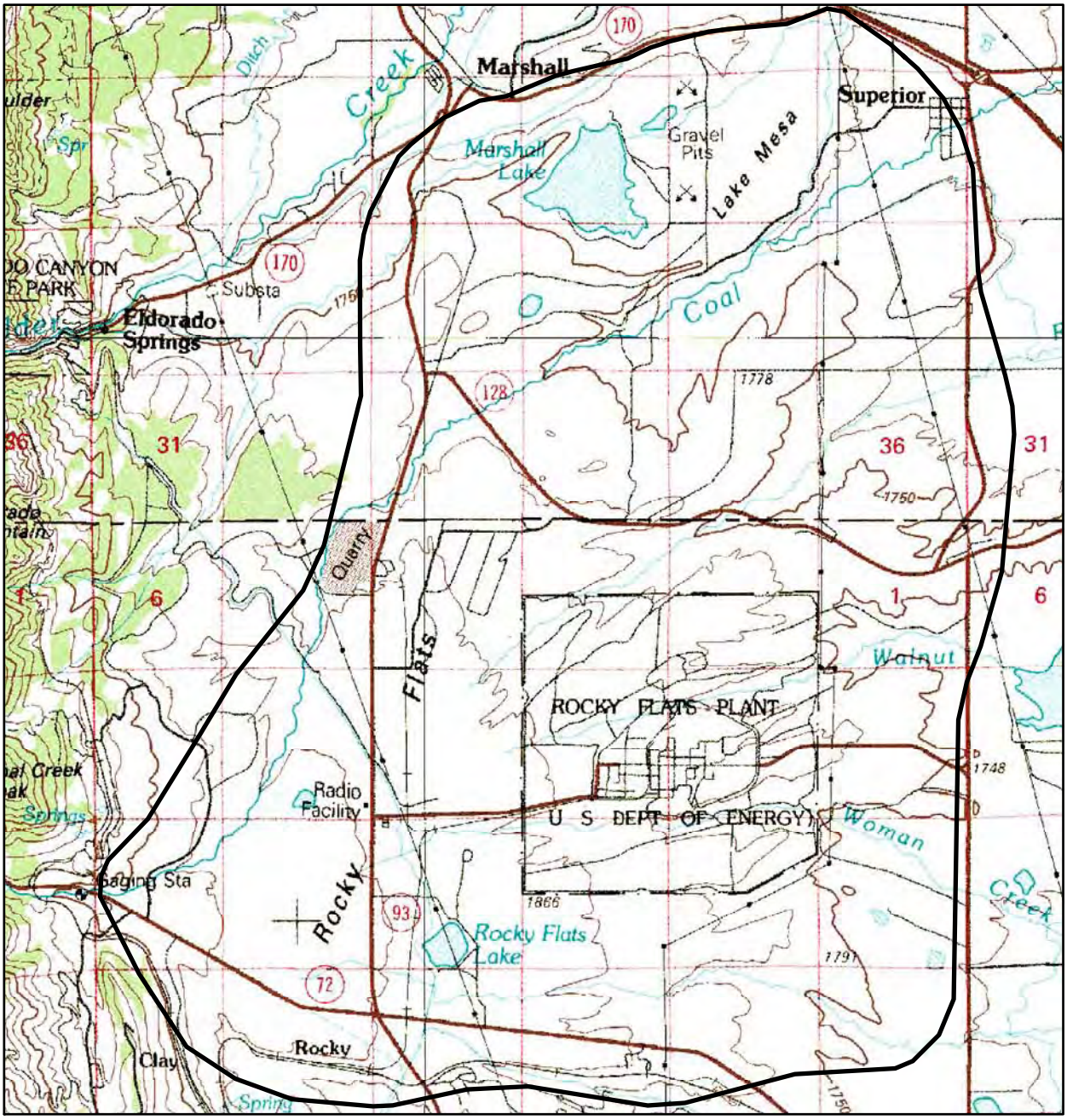
**Management Urgency Rank Comments (M?):** Maintaining large, contiguous blocks of native grassland will continue to support the unique grassland biodiversity that occurs. Grazing and fire are management tools for maintaining the pattern of tall- and midgrass mosaic and support the bird biodiversity within the area.

## References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

**Version Author:** Neid, S.L.

**Version Date:** 11/14/2008

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## Legend

PCA Boundary

Denver West, 39105-E1

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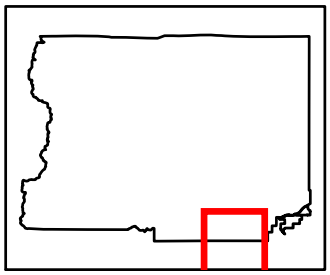
Location in Boulder County



Rocky Flats Grasslands Network of Conservation Areas

**APPENDIX E. Characterization Abstracts for Select Species of Concern in Boulder County.**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## AMPHIBIANS

### Boreal Toad *(Bufo boreas boreas)*



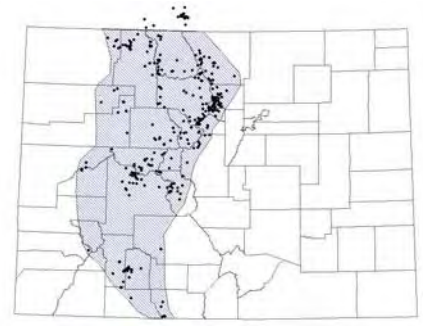
**Taxonomy:**
Class:
.0 Amphibia
Order: Anura
Family: Bufonidae
Genus: *Bufo*

**Taxonomic Comments:** Prior to the 1990s, morphological, biogeochemical, and vocal differences were noted between toads of the *Bufo boreas* complex in the southern Rocky Mountains and those in the Pacific Northwest (Burger and Bragg 1947, Hubbard 1972). Goebel (1996) described *Bufo boreas* in the southern Rocky Mountains as genetically distinct from those in the Pacific Northwest. These differences may warrant recognition as one or more distinct species. Until this change is formally accepted, Hammerson (1999) has offered the common name of Mountain Toad for the interim, and suggests that the Latin name may become *Bufo pictus*. For the purposes of this report, we are referring all naming to boreal toad (*Bufo boreas boreas*).

**CNHP Ranking:** G4T1Q, S1

**State/Federal Status:** State Endangered/USFWS candidate for listing (warranted but precluded)/USFS Sensitive

**Habitat Comments:** The boreal toad breeds in still or slowly moving water such as can be found in marshes, ponds, and lakes. Successful breeding generally requires permanent or semipermanent water sources. Post breeding, one may find the boreal toad in more terrestrial environments. Though they still tend to linger near water in damp environments, some females will use drier, more densely vegetated areas. Rocks, logs and rodent burrows provide cover while away from water during periods of inactivity (Hammerson 1999).



**Distribution:** The southern Rocky Mountain population of boreal toads is likely distinct from other populations (A. Goebel, unpbl. data). Although relationships among populations of this toad are not resolved, recent genetic evaluations suggest that the southern Rocky Mountain population ranges from southern Idaho to New Mexico (Goettl 1997; Steve Corn pers. comm.; A. Goebel unpbl. data). In Colorado, this species occurs throughout the mountains above approximately 8,000 feet in elevation. There are approximately 206 historical localities for the boreal toad in Colorado, while currently there are just 35 known active breeding sites.

**Important Life History Characteristics:** Boreal toads are long-lived, reaching ages of nine years or more (Campbell 1976). Reproductive maturity does not occur until age four in males and six in females (Carey 1976). Other important considerations include sensitivity to toxicants, relatively short breeding season (starting as the winter snowpack begins to thaw), and slow metabolic rates of the larvae (Hammerson

1999).

**Known Threats and Management Issues:** The boreal toad is currently found in 67 known Colorado breeding locations comprising 32 populations, only two of which are considered viable (T. Jackson, CDOW, pers. comm.). This species has disappeared from 83 percent of its historic locations in Colorado, 94 percent in Wyoming, and is believed to be extirpated from New Mexico (USFWS 2004). The boreal toad was once known from 25 counties in Colorado, including Grand County, where it was considered common. Its distribution in Colorado is now restricted to 14 counties. Available information suggests that boreal toad populations continue to decline (Keinath and McGee 2005). Reasons for the declining toad population are still being investigated. Proposed causes include chytrid fungus (*Batrachochytrium dendrobatidis*), acid rain, drought, pollution, increased UV radiation, natural population flux, or some synergistic combination of these and/or other factors (USFWS 2004). The major source of decline is believed to be chytrid fungus, which has been linked to major declines in proximate areas such as Rocky Mountain National Park (Muths et al. 2003, USFWS 2004). Examinations of infected toads show that chytrid fungus suppresses the immune system to a point that a secondary infection (e.g. red-leg disease) is usually the ultimate cause of death (USFWS 2004). Researchers hypothesize that one or a combination of environmental stressors is reducing the toads' ability to survive this pathogen (Loeffler 2001a). At this time, researchers do not know whether or not populations can persist in the presence of chytrid fungus. Research is on-going, but it may be several more years before this question can be answered (T. Jackson, CDOW, pers. comm.).

Grand County contracted with the Colorado Natural Heritage Program (CNHP) to evaluate boreal toad habitat within the proposed road corridor, and to identify impacts that could result from implementation of Fraser Valley Parkway project. CNHP conducted surveys for the boreal toad within and adjacent to the proposed Fraser Valley Parkway alignment during the spring and summer breeding season of 2005 . No toads, tadpoles, egg masses, or metamorphs in any of the surveyed areas along the road alignment. CNHP biologists estimated about 2.3 ha of summer habitat and no breeding habitat would be directly affected by the road. About 3 ha of possible breeding habitat and about 14 ha of possible summer habitat within and/or adjacent to the proposed parkway would be affected (Gaughan and Grunau 2005).

References: Burger and Bragg 1947, Hubbard 1972, Goebel (1996), A. Goebel, unpbl. data, Hammerson (1999), Goettl 1997; Steve Corn pers. comm.; Campbell 1976, Carey 1976, T. Jackson, CDOW, pers. comm., USFWS 2004, Keinath and McGee 2005, Muths et al. 2003, Loeffler 2001a, Gaughan and Grunau 2005

Version date: March 2006

## BIRDS

### Black Swift *(Cypseloides niger)*



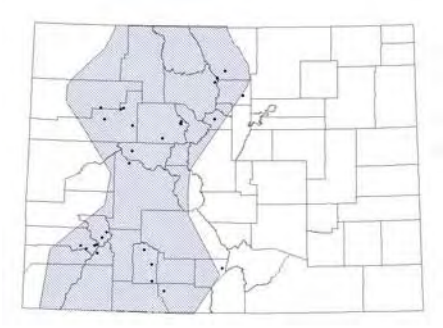
**Taxonomy:**
Class: Aves
Order: Apodiformes
Family: Apodidae
Genus: *Cypseloides*

**Taxonomic Comments:** Subfamily Cypseloidinae

**CNHP Ranking:** G4 S3B

**State/Federal Status:** USFS Sensitive

**Habitat Comments:** Black Swifts nest on vertical rock faces, near waterfalls or in dripping caves (Lack 1956). Beyond that requirement, they inhabit a variety of landscapes, from seacoasts to the high elevations of the Rocky Mountains (CBBA 1998).



**Distribution:** Black swifts breed in scattered colonies in western North America, from southeast Alaska to central Mexico, and migrate to the Neotropics in the winter (Stiles and Negret 1994). In Colorado, black swifts breed most commonly in the San Juan mountains, with scattered colonies in four other mountain ranges -- Sangre de Cristo, Flat Tops, Gore, and Front (CBBA 1998).

**Important Life History Characteristics:** After arriving in Colorado in June, black swifts take all summer to raise a single nestling (CBBA 1998). The cool microclimates they select for nesting presumably slows the developmental metabolism of the nestlings. Since nestlings are typically fed only once per day after the adults return from a day of foraging, slower development rates would help the survival.

**Known Threats and Management Issues:** There are few obvious threats to this species, except where development alters nesting habitat. The Colorado Breeding Bird Atlas (1998) hypothesizes that at least 20% of all black swifts breed in Colorado.

## American Peregrine Falcon *(Falco peregrinus anatum)*



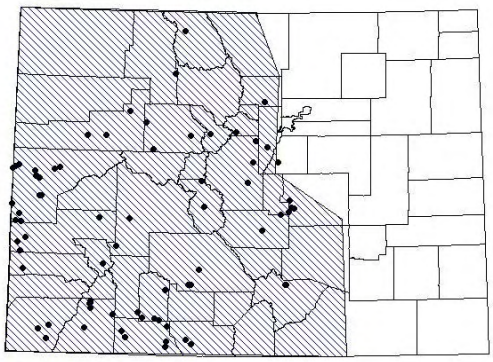
**Taxonomy:**
Class: Aves
Order: Falconiformes
Family: Falconidae
Genus: *Falco*

**Taxonomic Comments:** *Falco peregrinus anatum* refers to the populations of *F. peregrinus* that once ranged the continent and now occur across the western and interior portions of North America, while *F. p. pealei* and *F. p. tundrinus* refer to the northwest coastal and northern North American populations respectively.

**CNHP Ranking:** G4T3 S3B,SZN

**State/Federal Status:** CO species of special concern

**Habitat Comments:** Peregrine falcons nest on foothill and mountain cliffs from 4,500 to over 9,000 feet in elevation (Rocky Mtn./SW Peregrine Recovery Team 1977). Pinyon/Juniper occurs in the vicinity of about half of all nest sites, and ponderosa pine at about one-quarter of the sites (CBBA 1998).



**Distribution:** *Falco peregrinus anatum* once ranged the entire continent, but is now restricted to the western part of the U.S. where it is a full-time resident (NGS 1987). The peregrine falcon breeds in several locations along Colorado's Front Range, but higher concentrations nest in the river valleys and canyons of the Western Slope, including the Dolores and Colorado River drainages and Dinosaur National Monument (CBBA 1998).

**Important Life History Characteristics:** Pairs defend a small area around the nest of about 100 yards. Females lay 3-4 eggs and the young remain in the nest for about 39-46 days after hatching (CBBA 1998).

**Known Threats and Management Issues:** Though breeding occurrence numbers appear stable to increasing, human disturbance of nests by recreational rock climbers, illegal capture by falconers, and uncertain breeding status across the state are factors considered important in the conservation of this species (CNHP 1997).

## Bald Eagle *(Haliaeetus leucocephalus)*



Photo by Mary Kiesling

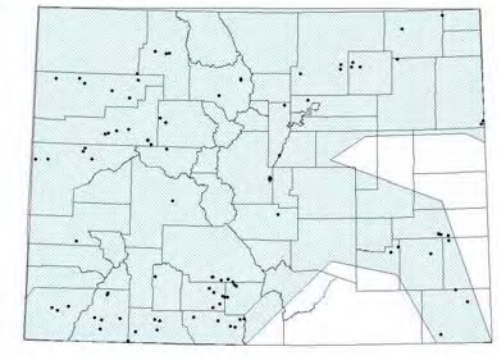
**Taxonomy:**
Class: Aves
Order: Falconiformes
Family: Accipitridae
Genus: *Haliaeetus*

**Taxonomic Comments:** none.

**CNHP Ranking:** G4 S1B,S3N

**State/Federal Status:** Federally threatened

**Habitat Comments:** Breeding habitat for Bald Eagles consists of forested areas near large bodies of water (Andrew and Mosher 1982, Usgaard and Higgins 1995). Nests typically are placed in tops of tall trees located near suitable foraging habitat (Anthony et al. 1982, Anthony and Isaacs 1989, Kralovec et al. 1992). Factors affecting the quality of foraging habitats include the characteristics of the prey base (Livingston et al. 1990), the structure of the aquatic habitat (MacDonald and Austin-Smith 1989), and the extent of human development and disturbance (McGarigal et al. 1991). Sites used for diurnal perching tend to include tall trees located near shoreline foraging habitat (Steenhof et al. 1980, Chester et al. 1990, Buehler et al. 1992, Canton et al. 1992, Chandler et al. 1995). Winter habitats occur along major river systems and along eastern and western North American coasts (Millsap 1986) and are characterized by the presence of abundant food, protected roost sites, and little or no human disturbance (Steenhof et al. 1980, Keister et al. 1987). Roosting habitat consists of tall trees that offer protection from prevailing winds and are generally located near aquatic foraging areas (Steenhof et al. 1980, Anthony et al. 1982, Keister and Anthony 1983, Grubb et al. 1989, Chester et al. 1990, Buehler et al. 1991*b*). Most roosting sites for Bald Eagles in western North America are in coniferous (or sometimes in riparian) trees (Anthony et al. 1982, Keister and Anthony 1983, Crenshaw and McClelland 1989, Grubb et al. 1989).



**Distribution:** Bald Eagles breed in suitable habitats throughout much of North America, including Alaska, Canada, all 48 contiguous states in the U.S. except Vermont and Rhode Island, and parts of Mexico (Buehler 2000). No records exist of Bald Eagles breeding outside North America (Buehler 2000). Most wintering areas for Bald Eagles are located in the lower 48 states and in coastal areas of Alaska and Canada, in aquatic habitats where open water persists for foraging (Millsap 1986). Some adult Bald Eagles migrate seasonally as necessary when food becomes unavailable (McClelland et al. 1982, Millsap 1986, Buehler et al. 1991*a*, Harmata and Stahlecker 1993), whereas others remain in the vicinity of their breeding territories throughout the year (Sherrod et al. 1976, Swenson et al. 1986, Garrett et al. 1993, Jenkins and Jackman 1993). Many of the Bald Eagles that winter in Colorado migrate to breeding areas in Saskatchewan and Manitoba in January-March (Harmata and Stahlecker 1993). Bald Eagles breed in northwestern, southwestern, and north-central Colorado (Andrews and Righter 1992).

**Important Life History Characteristics:** Bald Eagles are opportunistic foragers and their diet varies greatly, depending upon the location and the availability of various types of prey (Todd et al. 1982). In

most regions Bald Eagles forage in aquatic habitats and prefer fishes (McEwan and Hirth 1980, Knight and Knight 1986, Brown 1993, Stalmaster and Kaiser 1998). Mammals and birds, however, are important components of the diet at many sites (Bent 1937, Todd et al. 1982, Kralovec et al. 1992). Bald Eagles typically hunt from perches or while soaring, but they also feed on carrion on the ground in areas where they are not disturbed by humans (Buehler 2000). At some wintering sites, ungulate carrion is a critical component of the diet (Houston 1978, Swenson et al. 1986). Bald Eagles often engage in kleptoparasitism or food piracy; typically they steal fishes or other prey items from other Bald Eagles or from Ospreys while in flight or on the ground (Burr 1912, Bent 1937, Todd et al. 1982, Knight and Knight 1983, Stalmaster and Gessaman 1984, Hansen 1986). Bald Eagles use sticks and branches to build large nests which often are reused each year (Buehler 2000). A well-known nest in Ohio was used for 34 years before the tree in which it was located blew down (Herrick 1924). Bald Eagles roost communally (or sometimes solitarily) at traditional winter roosting sites (Anthony et al. 1982, Keister et al. 1987, Crenshaw and McClelland 1989, Grubb et al. 1989), and, in some cases, at post-breeding-season summer roosting sites (Chester et al. 1990). Mated pairs of Bald Eagles defend their breeding territories against encroachments by other Bald Eagles (Gerrard et al. 1992*b*, Buehler 2000). Male and female Bald Eagles exhibit strong fidelity to their mates and to their nest sites (Gerrard et al. 1992*a*, Jenkins and Jackman 1993). A female Bald Eagle in Saskatchewan, for example, used the same territory for 13 years (Gerrard et al. 1992*a*). If one member of a mated pair dies or disappears, the surviving eagle typically continues to occupy the same territory and finds a new mate (Postupalsky and Holt 1975, Grubb et al. 1988, Jenkins and Jackman 1993). Many Bald Eagles also show fidelity (i.e., they return year after year) to their wintering areas (McCollough 1989, Harmata and Stahlecker 1993).

**Known Threats and Management Issues:** Major threats to the Bald Eagle include the loss of critical habitat components such as nest trees (Weekes 1974), perch sites, and winter roosts (Hansen et al. 1981) to natural or man-induced causes. Throughout the range of the Bald Eagle, loss of critical breeding and wintering habitats is a serious problem (Therres et al. 1993, Shapiro et al. 1982, Wood et al. 1989). Human activities and disturbance can affect populations of Bald Eagles and other birds in many important ways. These factors can alter foraging patterns, distribution, and habitat use (Stalmaster and Newman 1978, Skagen 1980, Knight and Knight 1984, Buehler et al. 1991*b*, Grubb and King 1991, Knight et al. 1991, McGarigal et al. 1991, Brown and Stevens 1997), reduce reproductive success (White and Thurow 1985) and foraging efficiency (Knight and Knight 1986, Knight et al. 1991, Skagen et al. 1991, Stalmaster and Kaiser 1998), and increase energy expenditures (Knight and Knight 1983, Stalmaster 1983) and stress (Fernandez and Azkona 1993). Additional threats to the Bald Eagle include shooting (Hamerstrom et al. 1975, Fraser 1983, Reichel et al. 1984), trapping, electrocution (Smith and Murphy 1972, Hamerstrom et al. 1975), and poisoning by pesticides or lead shot (Hickey and Anderson 1968, Wiemeyer et al. 1978, 1984, Swenson et al. 1986, Anthony et al. 1993, Kramer and Redig 1997).

Version: 2002

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## Black-necked stilt *(Himantopus mexicanus)*




Black-necked stilt. *Photo © J. M. Spendelow*

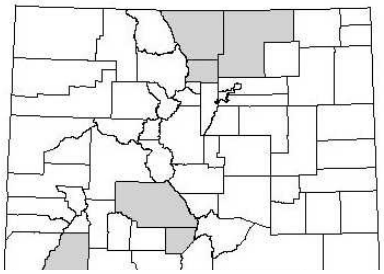
**Taxonomy**
Class: Aves
Order: *Charadriiformes*
Family: *Recurvirostridae*
Genus: *Himantopus*

**Taxonomic Comments***: H. m. mexicanus* and *H. m. knudseni* are regarded as distinct species by some authors. Subspecies *knudsenii*, known from Hawaii, is listed as endangered by the USFWS.

**CNHP Ranking**: G5 S3B

**State/Federal Status**: None

**Description and Phenology:** Black-necked stilt is a tall slender wader with a long straight slender bill, black (male) or brownish (female) upperparts, white underparts, very long red or pink legs and feet, and a white spot above the eye. Immature birds have buffy edges on the dark feathers of the upperparts. Both adults, in turn, incubate 4 eggs about 25 days (Terres 1980). Young are tended by both adults, and become independent in about 4 weeks (Harrison 1978). They first fly at 7-8 weeks (Berger 1981)



Distribution of black-necked stilts in Colorado.

**Global range:** The species has a large range, covering western and southern U. S. and extending into South America and Hawaii. It is globally secure due primarily to its large range, but occurrences tend to be very localized, and population trends are poorly known for many regions.

**State range:** There are seven occurrences in CNHP's database, including one from La Plata County at Pastoris Reservoir documented in 2003. Other counties are Alamosa, Boulder, Larimer, Saguache and Weld.

**Habitat Comments:** Black-necked stilts inhabit shallow salt or fresh water areas with soft muddy bottoms; grassy marshes, wet savanna, mudflats, shallow ponds, flooded fields, borders of salt ponds and mangrove swamps (Tropical to Temperate zones) (AOU 1983, Raffaele 1983). They may nest on the ground or in shallow water on a plant tussock.

**Known Threats and Management Issues**: Although globally secure, locally the birds may be limited by suitable habitat.

**Version date**: May 2004

## Brown-Capped Rosy Finch *(Leucosticte australis)*

**Taxonomy:**
Class: Aves
Order: Passeriformes
Family: Fringillidae
Genus: *Leucosticte*



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**Taxonomic Comments:** Brown-capped rosy finch (*Leucosticte australis*), a Southern Rocky Mountains endemic, nest in vertical cliffs and crags of the tundra and feed in the surrounding area. They often use snowfields for feeding, especially when strong winds cross snowfields the updrafts are cut off and insects fall stunned on the snow surface, where these finches forage on an abundant food source (Nelson 1998).

**CNHP Ranking:** G4,S3BS4N

**State/Federal Status:** none

**Habitat Comments:** These finches make their nests in vertical cliffs and crags above the timberline in the high alpine zone.

**Distribution:** Endemic to the southern Rockies, mainly Colorado but it can be found across the Wyoming border in the Snowy Range and across the New Mexico Border in the southern Sangre de Cristos as well.

These fiches range from the San Miguels and San Juans to the Sangre de Cristos and the Spanish Peaks; from the West Elks and Elks up to the Sawatch to the Mosquitoes and Park Range over all the Front Range from Pikes Peak to the Mummy Range, Never Summers, and Rawah Wilderness.




Brown-capped Rosy-Finch Distribution (Birds of North America 2006).

**Important Life History Characteristics:** These finches are one of the few passerines whose females determine territories and choose nest sites. Males have poorly developed songs because they do not use them to defend territories. Males outnumber females 6:1. The female chooses a mate based on the display by the male, and they form a monogamous bond for the nesting season. The female incubates a single brood of 4-5 eggs in a bulky grass nest that she builds and may use for several seasons. After 12-14 days the eggs hatch and the young fledge for only 18 days more.

**Version date**: March 2006

## FISH

### Greenback Cutthroat Trout *(Oncorhynchus clarki stomias)*

**Taxonomy**
Class: Osteichthyes
Order: Salmoniformes
Family: Salmonidae
Genus: *Oncorhynchus*

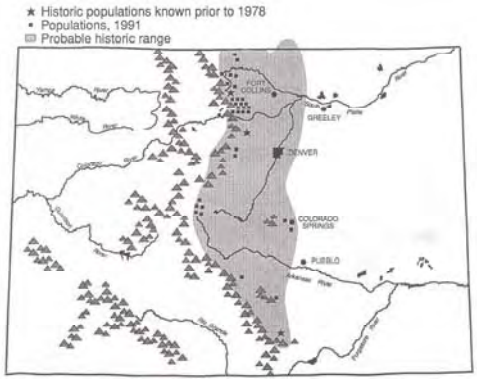


*Photograph by J. Woodling*

**Taxonomic Comments**: Greenback cutthroat trout are closely related to Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). Greenback cutthroat trout hybridize with various species and subspecies of the genus *Oncorhynchus* and therefore local cutthroat populations can range in appearance from "pure-looking" to obvious hybrids (U.S. Fish and Wildlife Service 1998).

**CNHP Ranking**: G4T2T3 S2

**State/Federal Status**: Listed as federally threatened.




*Historical and current greenback cutthroat trout distributions (from U.S. Fish and Wildlife Service 1998)*

**Habitat Comments**: Inhabits clear, cold, well-oxygenated mountain streams with moderate gradients, rocky to gravelly substrates, and abundant riparian vegetation; also is found in ponds and lakes (Trotter 1987).

**Distribution**: The exact historical distribution of the greenback cutthroat trout is uncertain because the species declined so rapidly during the 1800s. The species is native to the headwaters of the South Platte and Arkansas river drainages in Colorado and to a short portion of the South Platte drainage in Wyoming (U.S. Fish and Wildlife Service 1998). By the early 1900s, greenback cutthroat trout were thought to be extinct (Greene 1937). Since then, ten native populations of greenback cutthroat trout have been discovered in the South Platte drainage (seven populations) and in the Arkansas River watershed (three populations); two of the three populations in the Arkansas River drainage are considered stable (Severy Creek in El Paso County and South Apache Creek in Huerfano County) (U.S. Fish and Wildlife Service 1998, Policky *et al.* 1999). The Colorado Division of Wildlife has reintroduced greenback cutthroat trout at many sites in the South Platte and Arkansas River drainages, and 25 areas in the Arkansas river watershed are managed for the species (Policky *et al.* 1999). Twenty (six historical and 14 reintroduced) populations of greenback cutthroat trout are currently thought to be stable and self-sustaining (U.S. Fish and Wildlife Service 1998).

**Important Life History Characteristics**: Greenback cutthroat trout spawn in gravel-bottomed areas in running water during the spring when water temperatures reach 5-8°C (41-46°F); the timing of spawning varies with elevation and the age of the fish (U.S. Fish and Wildlife Service 1998). Although female greenbacks in hatcheries produce eggs when two years old, females in small alpine streams in Colorado typically reach sexual maturity at three or four years of age (U.S. Fish and Wildlife Service 1998). An opportunistic feeder, the greenback cutthroat trout consumes a wide range of prey but focuses mainly on

invertebrates (Trotter 1987, U.S. Fish and Wildlife Service 1998). Vertebrates such as salamanders and small fishes also are consumed (U.S. Fish and Wildlife Service 1998).

**Known Threats and Management Issues**: The decline in greenback cutthroat trout populations was caused by several factors related to human activities. The major factor was the introduction of non-native salmonid species (rainbow trout, brook trout, brown trout, and Yellowstone cutthroat trout) into the South Platte and Arkansas river drainages (U.S. Fish and Wildlife Service 1998). Rainbow trout and various cutthroat subspecies readily hybridize with greenback cutthroat trout (Everhart and Seaman 1971, U.S. Fish and Wildlife Service 1998). Introduced brook trout (Behnke and Zarn 1976, Behnke 1979) and brown trout (Wang 1989) tend to outcompete and ultimately displace greenback cutthroat trout. Finally, because cutthroat trout are more easily caught than other salmonid species, harvest by anglers may have played an important role in reducing greenback cutthroat populations, particularly in waters where non-native species were present with greenbacks (U.S. Fish and Wildlife Service 1998).

Other factors that contributed to the decline of greenback cutthroat trout populations also were associated with the human settlement and development of the Front Range. Exploitation of land, water, minerals, timber resources, and fisheries adversely affected greenback cutthroat trout and their habitat (U.S. Fish and Wildlife Service 1998). The diversion of streams and the removal of water for irrigation of agricultural lands had major impacts on the ecology and hydrology of waters occupied by greenback cutthroat trout.

Preliminary experiments indicated that greenback cutthroat trout were susceptible to whirling disease (caused by microscopic, water-borne parasite *Myxobolus cerebralis*) and that mortalities among infected greenbacks were higher than those among infected rainbow trout despite the fact that greenbacks showed no overt signs of infection (no skeletal deformities or tail-chasing behavior) (U.S. Fish and Wildlife Service 1998).

**Version date**: 2003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## INVERTEBRATES

### Arogos Skipper *(Atrytone arogos)*

**Taxonomy**:
Class: Insecta
Order: Lepidoptera
Family: Hesperiidae
Genus: *Atrytone*

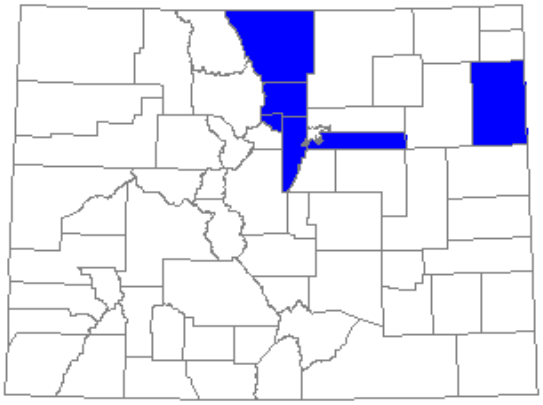


*photo by Phyllis Pineda*

**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**: G3G4 S2

**State/Federal Status**: None.



Colorado Distribution (Opler *et al.* 2004)

**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 the northern lower Front Range and extreme northeastern Colorado in six counties (Opler *et al.* 2004): Arapahoe, Boulder, Gilpin, Jefferson, Larimer, and Yuma.

**Habitat Comments**: Maximum elevation: 1890m (6200 ft). 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 grasses 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.

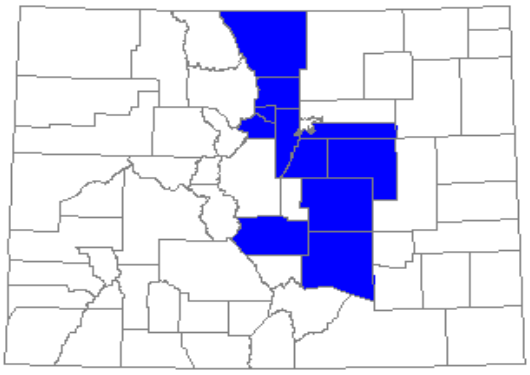
# Moss' Elfin *(Callophrys mossii schryveri)*

**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 larval hostplant. Subspecies *schryveri* occurs in Colorado (Ferris and Brown 1981). *C. mossii schryveri*'s range is restricted to the Rocky Mountain region. *Callophrys mossii schryveri* 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**: G4T3 S2S3

**State/Federal Status**: None.



Colorado Distribution (Opler *et al.* 2004)

**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 ft) (Ferris and Brown 1981). Known from eleven counties in the Colorado Rocky Mountain region (Opler *et al.* 2004): Arapahoe, Boulder, Clear Creek, Douglas, Elbert, El Paso, Fremont, Gilpin, Jefferson, Larimer, and Pueblo.

**Habitat Comments**: Elevational range is between 1828 and 2438m (6000 to 8000 ft). 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.

# Hops Feeding Azure *(Celastrina humulus)*

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

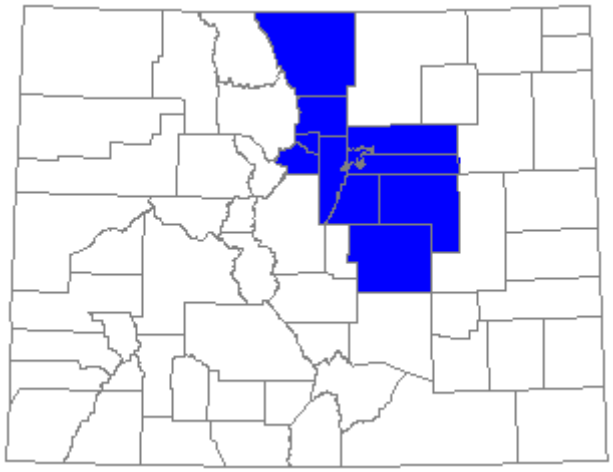
**Taxonomic Comments**: Formally described in 1998, this is the species incorrectly referred to as "form" *neglectamajor* from Colorado. Wright is a leading expert on this genus and the authors make a solid case for this as a valid taxon, although the authors note it could possibly end up as a subspecies of some eastern species (Scott and Wright 1998). This species appeared in earlier CNHP reports as *Celastrina* sp.1.

**CNHP Rank**: G2G3 S2

**State/Federal Status**: None.



*Photo by Phyllis Pineda*



Colorado Distribution (Opler *et al.* 2004)

**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 eleven Front Range counties in Colorado (Opler *et al*. 2004): Adams, Arapahoe, Boulder, Clear Creek, Denver, Douglas, El Paso, Elbert, Gilpin, Jefferson, and Larimer.

**Habitat Comments**: Minimum elevation: 1615m (5300 ft). Typical habitats are mountain canyons and valleys that contain permanent water and contain wild hops (*Humulus lupulus*) (Wright 1998) 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). Its formal description may increase collecting pressure (Opler pers. comm.). Management should include control of noxious weeds and control tree density. Hostplant is a disturbance tolerant 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.

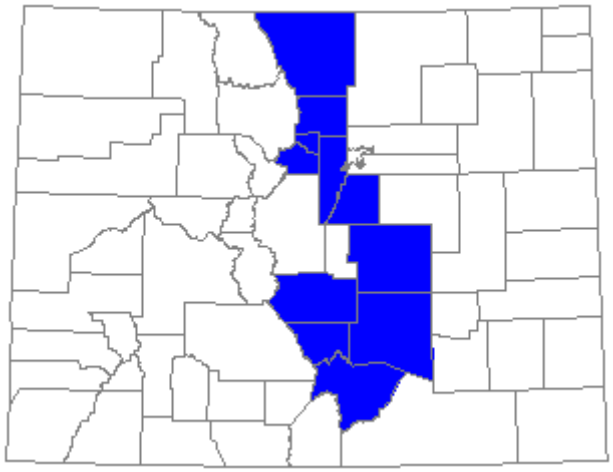
## Mottled Duskywing *(Erynnis martialis)*

**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**: G3G4 S2S3

**State/Federal Status:** None.



Colorado Distribution (Opler *et al.* 2004)

**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 ft) (Ferris and Brown 1981). Reported from eleven counties (Opler *et al*. 2004): Boulder, Clear Creek, Custer, Douglas, El Paso, Fremont, Gilpin, Huerfano, Jefferson, Larimer, Pueblo.

**Habitat Comments**: Elevational range: 1371 to 3000m (4500 to 8200 ft). 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.

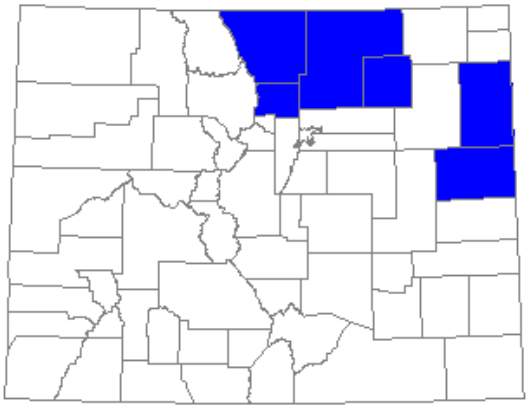
## *T*wo-Spotted Skipper *(Euphyes bimacula)*

**Taxonomy**:
Class: Insecta
Order: Lepidoptera
Family: Hesperiidae
Genus: *Euphyes*

**Taxonomic Comments**: Two subspecies are provisionally recognized in North America: *acanootus* and *illinois* (Miller and Brown 1981). 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).

**CNHP Rank**: G4 S2

**State/Federal Status**: None.



Colorado Distribution (Opler *et al.* 2004)

**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 six counties in northeastern Colorado: Larimer, Boulder, Weld, Morgan, Yuma, and Kit Carson (Opler *et al*. 2004).

**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**: Hairyfruit sedge (*Carex trichocarpa*) (Scott 1986); 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 exotic plants, 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.

# Ottoe Skipper *(Hesperia ottoe)*

**Taxonomy**:
Class: Insecta
Order: Lepidoptera
Family: Hesperiidae
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:** G3G4 S2

**State/Federal Status**: USFS sensitive.

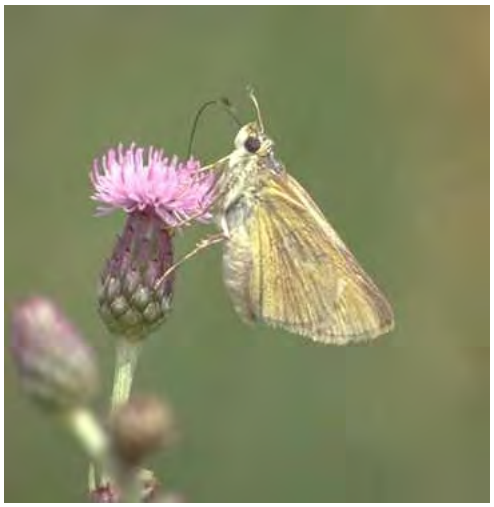
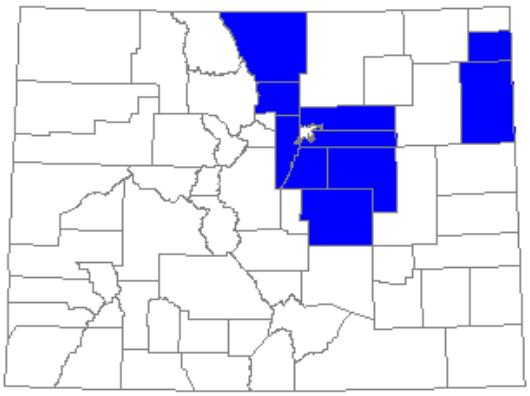


Photo by Phyllis M. Pineda



Colorado Distribution (Opler *et al.* 2004)

**Distribution**: Global range: Great Plains range extends from southern Manitoba south to northern Texas, and northeastward to the Great Lakes Regions (Scott 1986, Ferris and Brown 1981). State range: Base of the Front Range from El Paso County north to Larimer County, and a few records from the eastern plains of Colorado. Apparently a Front Range disjunct restricted to mid- and tallgrass prairies. Known from ten counties in Colorado (Opler *et al*. 2004): Adams, Arapahoe, Boulder, Douglas, Elbert, El Paso, Jefferson, Larimer, Phillips, and Yuma.

**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 ft). 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 1991).

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

## *Rocky Mountain Jutta Arctic (Oeneis jutta reducta)*

**Taxonomy:**
Class: Insecta
Order: Lepidoptera
Family: Satyridae
Genus: *Oeneis*

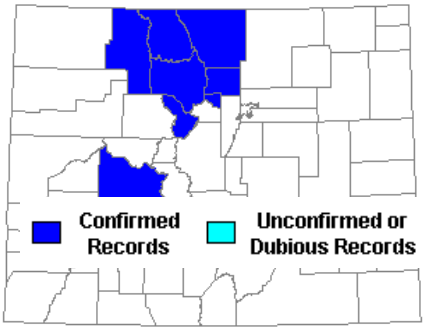
**Taxonomic Comments:** Upperside is gray-brown. Both wings have a broken yellow-orange submarginal band surrounding 2-4 black spots. Underside of hindwing is mottled brown and gray with an obscure median band.

**CNHP Ranking:** G5T4, S1

**State/Federal Status:** none

**Habitat Comments:** Wet tundra, spruce bogs, lodgepole pine forest.

**Distribution:** Holarctic. In North American subarctic habitats from Alaska east across Canada and the northern Great Lakes to Maine. Isolated populations south in the Rocky Mountains to Colorado.




**Important Life History Characteristics:** Males perch on logs and vegetation, and occasionally patrol, to find females. Eggs are scattered near the host plants. In some areas, 2 years are required to complete development; young caterpillars hibernate the first winter, older caterpillars the second. Caterpillar hosts are sedges, including cottongrass, while adult food is flower nectar.

**Known Threats and Management Issues:** Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Version date: March 2006

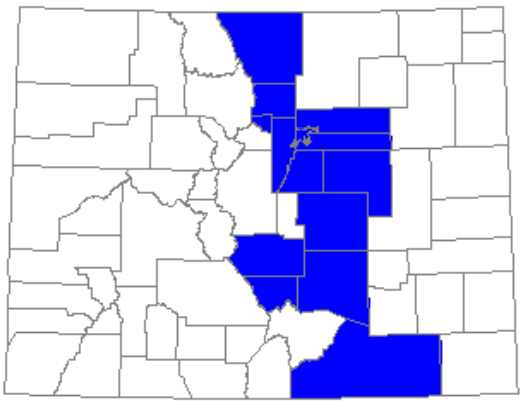
## Cross-line skipper *(Polites origenes)*

**Taxonomy**:
Class: Insecta
Order: Lepidoptera
Family: Hesperiidae
Genus: *Polites*

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

**CNHP Ranking**: G5 S3

**State/Federal Status:** None.



Colorado Distribution (Opler *et al.* 2004)

**Distribution**: Global range: This species occurs in the eastern United States and southern Canada, with disjunct populations in tallgrass 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 14 counties in Colorado (Opler *et al*. 2004): Adams, Arapahoe, Boulder, Custer, Denver, Douglas, El Paso, Elbert, Fremont, Gilpin, Jefferson, Larimer, Las Animas, Pueblo.

**Habitat Comments**: Elevational range: 1645 to 2316m in Colorado (5400 to7600 ft). Grasslands, serpentine or sandy barrens, canyon openings near plains typify its preferred habitat landscape (Pyle 1981). May be encountered in swales and grassy meadows adjoining the 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 recorded as purpletop (*Tridens flavus*), little bluestem (*Schizachyrium scoparius*), and other grasses (Opler *et al*. 2004).

**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 formerly open prairie habitat.

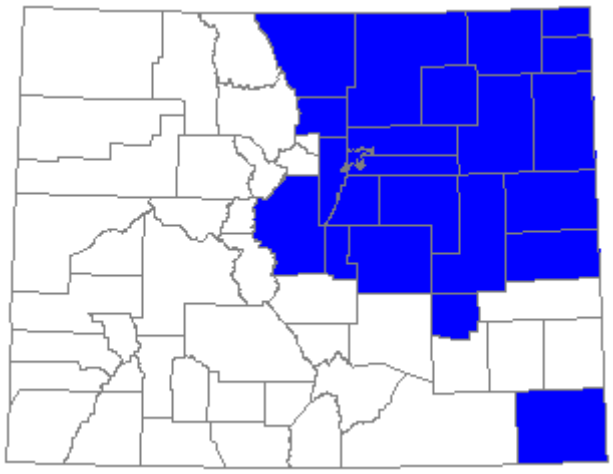
## Regal Fritillary *(Speyeria idalia)*

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

**Taxonomic Comments**: No subspecies are recognized in this large, distinctive, and formerly widespread, species.

**CNHP Rank**: G3 S1

**State/Federal Status**: USFS sensitive.



Colorado Distribution (Opler *et al.* 2004)

**Distribution**: Global range: Historically the range 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 Jersey, West Virginia, Ohio, and Michigan. Status is unknown in Virginia but extant (1993-94); apparently reliable reports for North Carolina in 1994 (Swengel and Swengel 1994) and western Arkansas in 2000 (Gary N. Ross, pers. comm.). State range: One confirmed colony in Kit Carson County (Stanford pers. comm.); one fresh individual observed in appropriate habitat in Boulder County. Sightings of worn individuals outside of breeding season known from 21 other Colorado counties (Opler *et al*. 2004): Adams, Arapahoe, Baca, Cheyenne, Crowley, Denver, Douglas, Elbert, El Paso, Jefferson, Larimer, Lincoln, Logan, Morgan, Park, Phillips, Sedgewick, Teller, Washington, Weld, and Yuma.

**Habitat Comments**: Tall-grass prairie and other open sites, including damp meadows, marshes, wet fields, and mountain pastures.

**Phenology**: One brood from mid-June to early September. Females do not lay many eggs until August. Males patrol all day to seek females. Unfed first-stage larvae hibernate.

**Larval Hostplant**: Violets, including *Viola pedatifida.*

**Known Threats and Management Issues:** Threats to habitat include cropland conversion of wet meadows in prairie habitats, weedy invasions, and suburban development, all resulting in habitat destruction and fragmentation. Rapid decline in many areas over the past three decades is not well understood.

## MAMMALS

### *Townsend's Big-eared Bat* ***(Corynorhinus townsendii pallescens)***

**Taxonomy**
Class: Mammalia
Order: Chiroptera
Family: Vespertilionidae
Genus: *Corynorhinus*

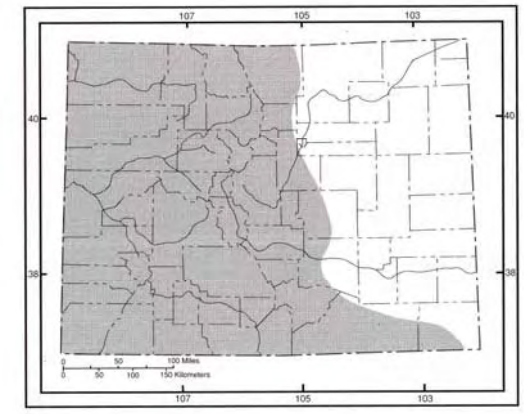
**Taxonomic Comments**: The generic name was recently changed from *Plecotus* to *Corynorhinus*.

**CNHP Ranking:** G4T4 S2

**State/Federal Status**: BLM sensitive; USFS sensitive; state species of special concern (Colorado).



*Photo by J. Siemers*




**Habitat Comments**: Townsend's big-eared bats occur in a wide range of habitats including semi-desert shrublands, pinyon-juniper woodlands, and dry coniferous forest (Fitzgerald *et al*. 1994). Because they naturally roost (and hibernate) in caves, their presence is strongly correlated with the availability of caves or cave-like roosting sites (Pierson *et al*. 1999). Population densities are highest in areas with substantial surface exposures of cavity-forming rock (i.e., limestone, sandstone, gypsum, or volcanic) and in old mining areas (Pierson *et al*. 1999). Hibernacula generally are characterized by stable low temperatures and moderate airflow (Colorado Division of Wildlife 1984) and they are thought to be a population limiting factor for Townsend's big-eared bats (Fitzgerald *et al*. 1994).

**Distribution**: The two western subspecies of *C. townsendii* are widely distributed throughout western North America; in several northwestern states there are extensive zones of intergradation of the two subspecies (Pierson *et al.* 1999). *C. t. pallescens* occurs throughout Colorado except on the eastern plains, and is found in mines, caves, and human-made, cave-like structures at elevations up to 9500 ft (2930 m) (Colorado Division of Wildlife 1984). Only 11 maternity roosts and 30 hibernacula have been documented in Colorado (Pierson *et al.* 1999). Almost all known colonies in Colorado are very small (< 30 bats); known historical records of big-eared bats in Colorado include only about 350 individuals (Pierson *et al.* 1999). Available evidence suggests that dramatic declines in the sizes of Colorado colonies of big-eared bats may have occurred historically (Pierson *et al.* 1999).

**Important Life History Characteristics**: Big-eared bats emerge from their daytime roosts after dark and feed on insects (especially moths) which they capture in flight or glean from foliage (Colorado Division of Wildlife 1984, Nowak 1999). Much of their feeding occurs over water or sagebrush, or along the edges of patches of vegetation (Fitzgerald *et al.* 1994). After the young are born in May or June (only one offspring per female) the females congregate in nursery colonies where they share metabolic heat; warm nursery sites are critical for the survival of the young (Humphrey and Kunz 1976). No long-distance migrations have been reported for *C. townsendii* (Barbour and Davis 1969, Clark and Stromberg 1987, Fitzgerald *et al.*

1994). Site fidelity is high: individual bats tend to return each year to the same hibernation (Humphrey and Kunz 1976) and nursery (Pearson *et al.* 1952) roosts. Nonetheless, during hibernation there is much movement of bats within a cave and among caves as environmental conditions fluctuate and the animals seek more favorable microclimatic conditions (Bee *et al.* 1981, Schwartz and Schwartz 1981, Fitzgerald *et al.* 1994).

**Known Threats and Management Issues**: Townsend's big-eared bats have very specific habitat requirements with regard to temperature and humidity levels at roosting sites; relatively few sites offer conditions appropriate for roosting by these bats (see refs. cited by Pierson *et al.* 1999). Moreover, *C. townsendii* is highly vulnerable to human disturbance (Colorado Division of Wildlife 1984, Clark and Stromberg 1987, Nowak 1999). Unlike many other species of bats, Townsend's big-eared bats do not seek shelter in protected crevices when roosting, but instead they cluster in highly visible locations (i.e., cave ceilings) where they are easily disturbed (Handley 1959, Barbour and Davis 1969). In Colorado, human visitation and disturbance rates at nursery and hibernation caves are very high (Pierson *et al.* 1999). In addition to human disturbance, other factors that threaten *C. townsendii* include the closure of abandoned mines (loss of roosting habitat), the impoundment of toxic materials (direct mortality), pesticide spraying (reduction of insect prey base), vegetation conversion and livestock grazing (loss of foraging habitat), and timber harvesting (loss of foraging and roosting habitats) (Pierson *et al.* 1999).

## Black-tailed Prairie Dog *(Cynomys ludovicianus)*

**Taxonomy**
Class: Mammalia
Order: Rodentia
Family: Sciuridae
Genus: *Cynomys*

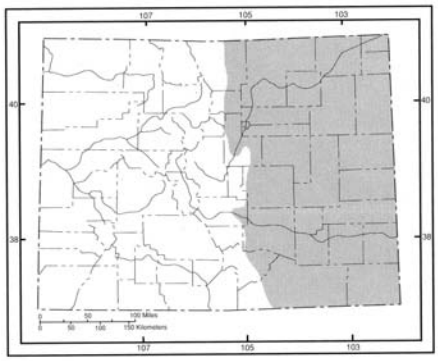
**Taxonomic Comment**s: Of the two recognized subspecies, only one occurs in Colorado (*Cynomys ludovicianus ludovicianus*).

**CNHP Ranking**: G4 S4

**State/Federal Status**: USFS sensitive; state species of special concern (Colorado).



*photo by R. Rondeau*



*Black-tailed prairie dog distribution in Colorado (from Fitzgerald et al. 1994)*

**Habitat Comments**: *Cynomys ludovicianus* occupies shortgrass and mixed-grass prairie habitats with well-drained, friable soils that permit the construction of complex burrow systems. The shrubs and herbaceous vegetation within colonies of black-tailed prairie dogs tend to be shorter than those located within colonies of Gunnison's and white-tailed prairie dogs because black-tailed prairie dogs clip tall plants (without eating them) to increase the detectability of approaching aerial and terrestrial predators (King 1955, Pizzimenti 1975, Fitzgerald *et al.* 1994, Hoogland 1995).

**Distribution**: Of the five species of prairie dogs in North America, *Cynomys ludovicianus* is the most widely distributed (Hoogland 1996). Today the species occurs in isolated patches throughout its historical range, which included much of the Great Plains from southern Saskatchewan (Canada) to northern Mexico (Hoogland 1996). In Colorado, black-tailed prairie dogs occupy suitable included in the eastern 40 percent of the state, inhabiting shortgrass prairie and other areas of low-growing vegetation (Fitzgerald *et al.* 1994). Throughout its range, the species occurs in much lower densities and in smaller colonies than it did historically (Fitzgerald *et al.* 1994, Hoogland 1996).

**Important Life History Characteristics:** Black-tailed prairie dogs are diurnal, burrowing, colonially-dwelling, herbivorous rodents that are active above-ground throughout the year. Unlike the Gunnison's, Utah, and white-tailed prairie dogs, they do not hibernate (Hoogland 1996). Within a colony, black-tailed prairie dogs live in territorial family groups called coteries, which include an adult male, usually two or three adult females, and several non-breeding yearlings and juveniles (Hoogland 1996). Males tend to disperse (leave the natal coterie) before they mature sexually; this behavior reduces inbreeding and may result in colonization of new areas (Hoogland 1982, Garrett and Franklin 1988). Rather than dispersing, females tend to remain in the natal coterie throughout their lives; for this reason, females within a coterie usually are closely related (Hoogland 1995). Through their foraging behavior and their clipping of tall plants, black-tailed prairie dogs have dramatically changed the composition of plant communities throughout their range (Hoogland 1996). In addition, the presence of prairie dog towns greatly increases the zoological diversity of prairie ecosystems by attracting predators and many other animals (e.g., Tyler 1970, Campbell and Clark 1981, Clark *et al.* 1982, Hoogland 1995).

**Known Threats and Management Issues:** Black-tailed prairie dogs have been subjected to extermination programs (public and private) for more than 100 years (Hoogland 1995). Outbreaks of plague (caused by the bacillus *Yersinia pestis* and transmitted by fleas) continue to reduce or even eliminate some colonies (Barnes 1982, Ebasco Serv., Inc. 1989). As in the past, however, the greatest threats to black-tailed prairie dogs come from humans due to conflicts with agricultural and other economic interests.

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

**Taxonomy**
Class: Mammalia
Order: Rodentia
Family: Zapodidae
Genus: *Zapus*

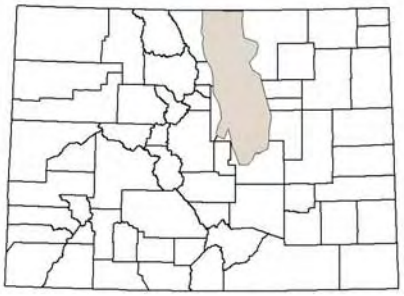
**Taxonomic Comments**: Some taxonomists use the family name "Dipodidae" instead of "Zapodidae."

**CNHP Ranking:** G5T2 S1

**State/Federal Status**: Listed as federally threatened (proposed for delisting); listed as state threatened (Colorado).



*Photo by P. Schuerman*



*Preble's meadow jumping mouse distribution in Colorado (CNHP data)*

**Habitat Comments**: Preble's meadow jumping mouse occurs in areas of lush, rank vegetation along watercourses and in marshy areas and wet meadows (Krutzsch 1954, Whitaker 1972, Fitzgerald *et al*. 1994). Habitats often are characterized by high species richness and well-developed vegetative cover (Meaney *et al*. 1997). Hibernacula generally are located upslope (and may be quite distant) from areas used in summer (Hafner 1997).

**Distribution**: *Z. h. preblei* historically occurred in marshy areas along the upper drainages of the North Platte River in southeastern Wyoming (Long 1965, Clark and Stromberg 1987) and on the western edge of the Colorado piedmont along the South Platte River drainage south to the Denver area (Armstrong 1972). Current distribution is severely restricted and fragmented; habitats are likely to continue to decline both qualitatively and quantitatively (Hafner *et al.* 1998)

**Important Life History Characteristics**: *Zapus hudsonius preblei* hibernates for a longer period than most mammalian hibernators: from September or October through late April or early May each year (Whitaker 1963, 1972). During the 4-6 month period of activity each spring/summer, jumping mice feed on seeds, fruits, fungi, and insects; they do not cache food but store body fat before hibernating (Fitzgerald *et al.* 1994, Nowak 1999). Jumping mice generally are nocturnal and crepuscular, but they sometimes are active in daylight (Whitaker 1963, Fitzgerald *et al.* 1994). For protection, jumping mice construct nests of grasses, leaves, or other plant material. Nests are placed in protected locations beneath logs or shrubs and are usually underground but well above the water table (Fitzgerald *et al.* 1994). When hot summer weather reduces the availability of mesic habitat, Preble's meadow jumping mice sometimes abandon their home ranges and wander widely in search of moist sites (Fitzgerald *et al.* 1994:291, Nowak 1999).

**Known Threats and Management Issues**: The replacement of natural wetlands by reservoirs and by agricultural and urban development has severely impacted many populations (Fitzgerald *et al.* 1994, Garza 1995). Preble's meadow jumping mouse may have been extirpated over most of its former range in Wyoming by extensive overgrazing (habitat loss) and pesticide use (Hafner *et al.* 1998). Conservation of critical mesic forb-grassland habitats and the dispersal corridors that connect isolated patches of habitat is essential to the continued survival of this subspecies (Hafner 1997).

## PLANTS

### *Aletes humilis* (Larimer Aletes)

**Taxonomy**
Class: Dicotyledoneae
Order: Apiales
Family: Apiaceae
Genus: *Aletes*

**Taxonomic comments**: Looks like *A. acaulis* *A. acaulis* forms loose clumps, with flowers taller than the leaves (Spackman *et al*. 1997).

**CNHP Ranking**: G2G3 S2S3

**State/Federal Status**: None.



Colorado Distribution



*CNHP photo*

**Phenology**: Flowers March to June, Fruits May to July.

A perennial herb that forms low mounds of leathery leaves 2-10 cm high, and produces clusters of small yellow flowers.

**Habitat Comments**: On and around large, west and north-facing cliffs of Silver Plume granite. In cracks in massive rocks and in adjacent thin soils of decomposed granite. Also in pine duff under ponderosa pines (Spackman *et al*. 1997). Elev. 6500-8700 ft.

**Global Range:** There are 40 occurrences in a restricted area of Colorado; one historical (1902) occurrence from Wyoming near the Colorado-Wyoming border (Moore and Fridley 2004).

**State Range:** Boulder and Larimer counties

**Distribution/Abundance:** Populations are small to moderate with the number of individuals ranging from 50 to at least 1,000 (Moore and Friedley 2004). Estimated number of individuals rangewide is about 27,000 (Moore and Friedley 2004).

**Known Threats and Management Issues:** The plants are probably somewhat protected by their inaccessible habitat; perhaps the greatest threat is inadvertent destruction by hikers and rock climbers. The potential for invasives negatively impacting *Aletes* is negligible, but due to the narrow distribution of this plant, a proactive measure would be monitoring for new or "unknown" invasives within populations near developments. Monitoring could be simply looking for non-natives and documenting the presence of *Aletes*.

**Version date**: May 2005

Moore, L. and S. Friedley. 2004. *Aletes humilis* Coult. & Rose (Colorado aletes): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/aleteshumilis.pdf (accessed April 7, 2005).

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

## *Amorpha nana (*Dwarf wild indigo*)*

**Taxonomy**
Class: Dicotyledoneae
Order: Fabales
Family: Fabaceae
Genus: *Amorpha*

**Taxonomic Comments:** none

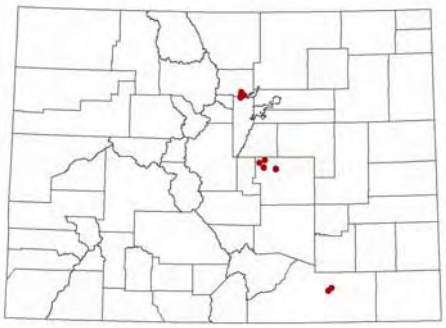
**CNHP Ranking:** G5 S2S3

**State/Federal Status:** none


photo by Nan Lederer

**Description and Phenology:** *Amorpha nana* is a low, erect, woody, sometimes rhizomatose shrub up to 1 m tall. Newer branches are reddish-brown to pale olivaceous, clustered near top of stem; older branches are usually light gray or pale brownish. Leaves are alternate and odd-pinnate, usually with 3-15 pairs of leaflets. The foliage and calyces are glabrous or nearly so, never canescent. Racemes are solitary at the tips of the branches, crowded with dark purple flowers. Flowers from May through July across its range.

**Habitat Comments:** Dry prairies and rocky or sandy hillsides and buttes.


Distribution in Colorado

**Global Range:** Widespread throughout much of the midwest from southern Manitoba and Saskatchewan to Minnesota and northwest Iowa, from North Dakota to Oklahoma, west to Colorado and New Mexico.

**State Range:** Boulder, Jefferson, El Paso, Las Animas Counties

**Distribution/Abundance:** There are six known occurrences in Colorado, but *Amorpha nana* is believed to be locally common.

**Known Threats and Management Issues:** Populations are threatened by development and grazing, although the effect of grazing on this species is currently unknown.

**Version date**: Jan. 2007

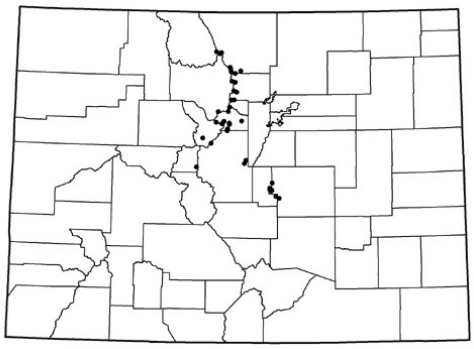
## *Aquilegia saximontana (*Rocky Mountain columbine*)*

**Taxonomy**
Class: Dicotyledoneae
Order: Ranunculales
Family: Ranunculaceae
Genus: *Aquilegia*

**Taxonomic Comments**: None.

CNHP Ranking: G3 S3

State/Federal Status: None.



*Colorado Distribution*



*Photo by B.Jennings*

Plant abstract adapted from Colorado Rare Plant Field Guide, (http://www.cnhp.colostate.edu/rareplants/intro.html), unless otherwise cited.

**Description/Phenology**: A perennial herb, usually 8-15 cm tall. Flowers bloom in early to late July and are usually less than 2 cm long with blue spurs and sepals; fruit is produced in August.

**Habitat Comments**: Found on cliffs and rocky slopes, supalpine and alpine, between 9,000 and 12,300 feet.

**Global Range**: Endemic to central and north central Colorado.

**State Range**: See above.

**Distribution/Abundance**: Near the Continental Divide. 44 occurrences documented in Boulder, Clear, El Paso, Gilpin, Jackson, Jefferson, Lake, Larimer, Park, Pueblo, San Juan, Summit, and Teller Counties.

**Known Threats and Management Issues**: Threats to this species are currently unknown. It may be somewhat protected by its relatively unusable, inaccessible habitat (CNHP Biotics Database). One report (1975) lists this as a rare endemic which is threatened by collectors who want it for their rock gardens and Weber's Colorado Flora (1990) states that it is rare or locally abundant.

**Version date**: March 2006

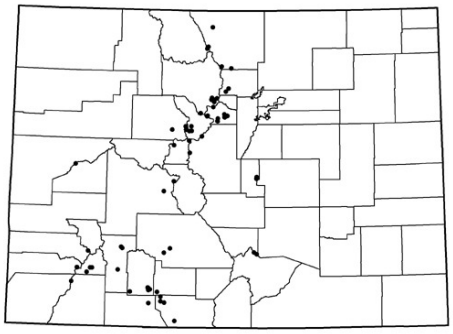
## *Botrychium echo (*Reflected moonwort*)*

**Taxonomy**
Class: Ophioglossopsida
Order: Ophioglossales
Family: Ophioglossaceae
Genus: *Botrychium*

**Taxonomic Comments**: None.

**CNHP Ranking**: G3 S3

**State/Federal Status**: None.



*Colorado Distribution*



*Photo by L. Yeatts*

Plant abstract adapted from NatureServe Explorer 2006, unless otherwise cited.

**Description/Phenology**: A perennial fern that produces a shiny green leaf (the trophophore) and a taller, erect spore-bearing spike (the sporophore). Both arise from a common stalk and can be thought of as a single, highly modified fern frond. This species tends to have a reddish brown stripe along the common stalk from the base of the trophophore stalk. Mature plants are 3-15 cm tall. B. echo produces clusters of minute, spheric gemmae at the root bases. Leaves appear in June and die in September. Spores produced in July (Spackman et al. 1997).

**Habitat Comments**: Naturally occurring on disturbed sites. Found along gravelly soils by roadsides and trails, rocky hillsides, grassy slopes, meadows and lake edges at elevations between 9,500 and 11,000 feet (CNHP 2006; Spackman et al. 1997).

**Global Range:** N. Arizona, N. Utah and central Colorado.

**State Range**: Mostly documented along the continental divide and central Colorado, with 64 occurrences documented by CNHP.

**Distribution/Abundance**: Occurrences scattered across northern Utah and central Colorado. Report for northern Arizona needs verification. Many occurrences consist of fewer than ten individuals and the total number of individuals documented at all extant sites is less than 50. This species hybridizes with western moonwort (B. hesperium). Several known populations of B. echo in Colorado are near roads or trails or picnic areas. If these areas receive heavy use during its growing season, it could negatively impact some populations.

**Known Threats and Management Issues**: This species naturally occurs on disturbed sites, therefore it is somewhat tolerant. However, it cannot withstand trampling from sheep grazing and it can be forage for animals.

**Version date**: March 2006

Colorado Natural Heritage Program (CNHP). 2006. Biodiversity Tracking and Conservation System (BIOTICS). Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

NatureServe. 2006. An online encyclopedia of life (web application). Version 4.4 Arlington, Virginia. [website] Accessed 2006. http://www.natureserve.org/explorer

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

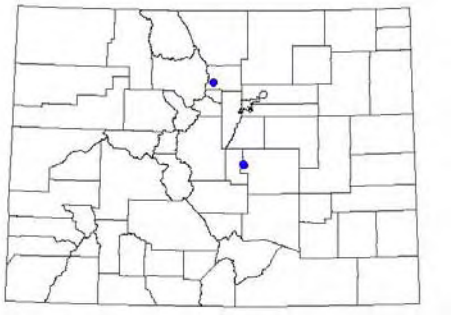
## *Botrychium lineare* (Narrowleaf grapefern)

**Taxonomy**
Class: Ophioglossopsida
Order: Ophioglossales
Family: Ophioglossaceae
Genus: *Botrychium*

**Taxonomic Comments**: None.

CNHP Ranking: G1 S1

State/Federal Status: Forest Service Sensitive



*Colorado Distribution*



*Photo copyright © 1999 by J. Sellers*

Phenology: Sporophores (the spore bearing structure in moonworts) are produced in June.

Habitat Comments: Grassy slopes, among medium-height grasses, along edges of streamside forests, between 7,900 and 9,500 ft (2,436 to 2,930 m) in Colorado.

Global Range: Found in seven widely scattered locations throughout North America (New Brunswick, Quebec, Idaho, Montana, Oregon, California, and Colorado).

State Range: Previously documented in Boulder County, but the only known extant occurrence is in El Paso County.

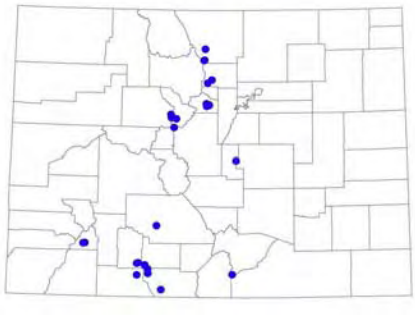
Distribution/Abundance: The occurrence in El Paso County, Colorado is the second largest known occurrence globally, where 45 individuals have been seen previously.

Known Threats and Management Issues: According to the U.S. Fish and Wildlife Service, threats to this species throughout its range include habitat succession as a result of fire suppression, livestock grazing, exotic species, development, timber harvest, road maintenance activities, and recreational impacts such as trampling and campfires. The occurrence in El Paso County is threatened by some of these issues, including invasion of yellow toadflax (*Linaria vulgaris)* and trampling by hikers.

Version date: December 2001

## *Botrychium hesperium* (Western moonwort)

No Photo Available



*Colorado Distribution*

Taxonomy
Class: Ophioglossopsida
Order: Ophioglossales
Family: Ophioglossaceae
Genus: *Botrychium*

Taxonomic Comments: Synonyms of *Botrychium hesperium* (Maxon and Clauson)Wagner and Lellinger include *Botrychium lunaria* (L.) Sw. ssp. *occidentale* A.& D. Löve & Kapoor ; *Botrychium matricariifolium* (A. Braun ex Dowell) A. Braun ex Koch ssp. *hesperium* Maxon & Clausen; and *Botrychium matricariifolium* (A. Braun ex Dowell) A. Braun ex Koch var. *hesperium* (Maxon & Clausen) Broun.

According to Karen Myhre (Minnesota HP Botanist; 9/22/98 message to Sharron Nelson), experts plan to separate the eastern (Michigan and Minnesota) plants of *B. hesperium* from the western (Colorado) plants and call the eastern plants *B. michiganense*.

CNHP Ranking: G3 S2

State/Federal Status: None

Phenology: *B. hesperium* is similar to other *Botrychiums* but is a duller green color than *B. echo*, and has ovate to oblong lower pinnae. Leaves appear in midspring and die in early fall. Spores are produced in July.

Habitat Comments: *Botrychium hesperium* occurs primarily in early successional habitats and others that require periodic disturbance. In the western portion of its range, B. hesperium tends to occur at higher elevations along roadsides, in grassy, meadow-like areas, in sandy fields, in flat roadside ditches, and at edges of lakes. In the eastern portion of its range, it occurs in sand dune habitats, in moist, shrubby jack pine forest in dune valleys, in grassy roadsides and fields, and in mature, mesic northern forests dominated by sugar maple, yellow birch, and hemlock.

Global Range: *Botrychium hesperium* occurs in both eastern and western North America. In the West it is widely distributed in the Rocky Mountains, ranging from the southern Rocky Mountains in Arizona through Colorado to the northern Rockies in western Montana, southwestern Alberta, and Saskatchewan. In eastern North America, western moonwort occurs from northern Lower Michigan and Upper Michigan to localities along the shore of Lake Superior in southern Ontario.

State Range: There are 27 occurrences from 13 counties in Colorado documented in the CNHP database. The occurrence documented here was from a clearcut at Nipple Mountain, and is included in the Blackhead Peak PCA.

Distribution/Abundance: *Botrychium hesperium* occurs infrequently, in localized areas, and with small population sizes, but over a large geographical range. Although it can occur in large numbers in pure stands, it more often occurs as one or a few individuals scattered among plants of other *Botrychium* species. This species can remain dormant for long periods and root bases may not produce an aboveground leaf every year (Lesica and Ahlenslager 1995). Because *B. hesperium* is small and inconspicuous, it may at times be overlooked and underrepresented by population surveys.

Known Threats and Management Issues: Threats to *B. hesperium* are not well understood. Because this species occurs in both naturally and artificially disturbed sites, threats include natural plant succession as well as the same human activities (recreation, road and trail maintenance activities, selection of grazing areas) that have also apparently resulted in suitable habitat. Agriculture and forestry activities may also threaten this species in some areas. Strategies for the protection of this species include determining its specific habitat requirements and its sensitivity to disturbance. Long term monitoring would help to determine its life history characteristics, population stability, and dynamics over time.

Potential Conservation Areas that support *Botrychium hesperium*:
Blackhead Peak on page 124

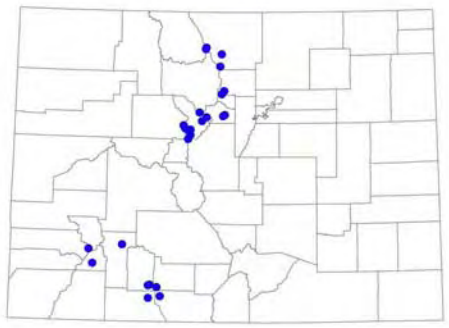
References: Lesica and Ahlenslager 1995

Version date: June 2003
Source: Upper San Juan Basin, Sovell et al., 2003

Lesica, P. and K. Ahlenslager. 1995. Demography and life history of three sympatric species of BOTRYCHIUM subg. BOTRYCHIUM in Waterton Lakes National Park, Alberta, Canada. Draft manuscript prepared in cooperation with Waterton National Park, U.S. Fish and Wildlife Service, and Montana Natural Heritage Program. 22 pp.

## *Botrychium minganense* (Mingan moonwort)

No Photo Available



*Colorado Distribution*

Taxonomy
Class: Ophioglossopsida
Order: Ophioglossales
Family: Ophioglossaceae
Genus: *Botrychium*

Taxonomic Comments: *Botrychium minganense* Victorin has been considered at variety of *B. lunaria*, but is tetraloid while *B. lunaria* is diploid. Dr. Peter Root recognizes the species as occurring in Colorado. Collections made in Archuleta County in 2001 were identified by Dr. Root and Dr. Peter Zika as *B. minganense*.

CNHP Ranking: G4 S1

State/Federal Status: None

Phenology: *B. minganense* is similar to other *Botrychiums* in having two fronds, one sterile and the other bearing spores. The sterile frond is dull green to yellow-green. Leaves appear in spring and throughout summer, and spores are produced in July.

Habitat Comments: *Botrychium minganense* shares the same habitat requirements, including some natural disturbance, as the other *Botrychium* species described here.

Global Range: *Botrychium minganense* is one of the most widespread moonworts in North America, occurring across most of Canada, into Alaska, and south into the United States in almost all of the western states.

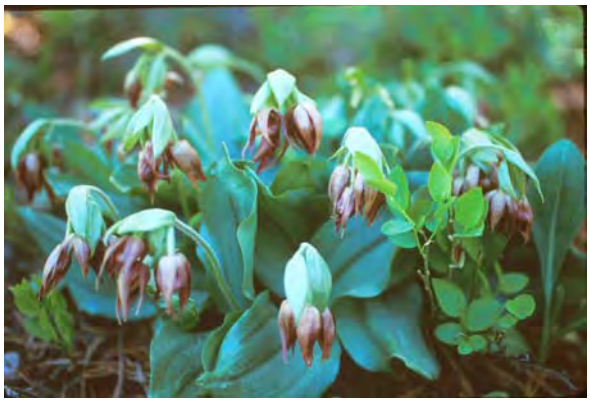
State Range: In Colorado, there are records from 14 counties, but most of these are unranked, and abundance is not known.

Distribution/Abundance: *Botrychium minganense* is widespread across most of Canada, into Alaska, and south into the United States, occurring in almost all of the western states. It is rare in each state and province throughout its range, but its distribution is great enough that it is considered to be globally secure.

Known Threats and Management Issues: Threats to *B. minganense* are not well understood. Because this species occurs in both naturally and artificially disturbed sites, threats include natural plant succession as well as the same human activities (recreation, road and trail maintenance activities, selection of grazing areas) that have also apparently resulted in suitable habitat. Agriculture and forestry activities may also threaten this species in some areas. Strategies for the protection of this species include determining its specific habitat requirements and its sensitivity to disturbance. Long term monitoring would help to determine its life history characteristics, population stability, and dynamics over time.

Version date: June 2003

## *Cypripedium fasciculatum* (purple lady's-slipper)



**Taxonomy:**
Class: Monocotyledoneae
Order: Orchidales
Family: Orchidaceae
Genus: *Cypripedium*

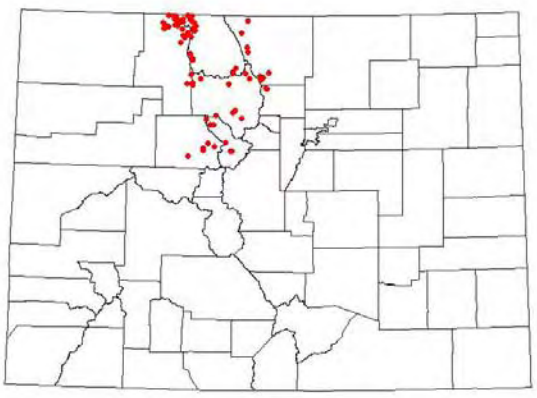
**Taxonomic Comments:** There is some question as to whether the Colorado populations are a different species than the northwestern U.S. populations.

**CNHP Ranking:** G4S3

**State/Federal Status:** Forest Service Sensitive

**Phenology:** The large purple flowers are seen in mid-June through mid-July (Spackman et al. 1997).

**Habitat Comments:** Known from many geology and soil types within coniferous forests, the purple lady's-slipper is apparently not limited by potential habitat. Although habitat seems plentiful this species is usually found in low numbers. In Colorado, the elevation range is approximately 8000-10,500 feet.



Colorado Distribution

**Global Range:** The purple lady's-slipper is found in California, Oregon, Washington, Idaho, Montana, Wyoming, Utah and Colorado (Brownell and Catling 1987). It is reported to occur in southern British Columbia but apparently no longer occurs there, or was incorrectly reported (Brownell and Catling 1987).

**State Range:** It is known from Routt, Summit, Jackson, Larimer, Grand, Boulder and Eagle counties.

**Distribution/Abundance:** There are approximately 13,000 individuals documented in Colorado from around 60 locations.

**Known Threats and Management Issues:** In Colorado, this species is known only from National Forest Service properties (including several locations in wilderness areas), and the species is a Forest Service Sensitive Species, protected by the Forest Management Act. The threats may not as high as those species occurring on private property. However, recreation impacts, logging, and fire suppression are threats to the purple lady's-slipper.

References: Brownell and Catling 1987, Spackman et al. 1997

Version date: March 2000

Brownell, V.R. and P.M. Catling. 1987. Notes on the distribution and taxonomy of *Cypripedium fasciculatum* Kellogg ex Watson (Orchidaceae). *Lindleyana* 2(1): 53-57.

Spackman, S., B. Jennngs, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. forest Service and the U.S. fish and Wildlife Service by the Colorado Natural Heritage Program.

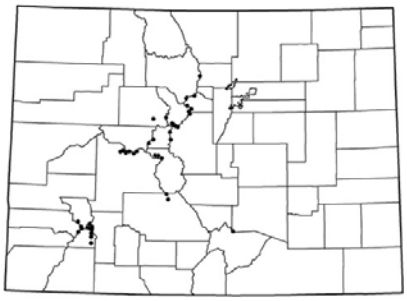
## *Draba exunguiculata* (clawless draba)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae
Genus: *Draba*

Taxonomic Comments: None.

CNHP Ranking: G2 S2

State/Federal Status: None.



*Colorado Distribution*



*Photo by B. Jennings*

Description/Phenology: An alpine perennial herb with flowering stems, 2-7 cm tall, from a tuft of thick basal leaves (NatureServe 2006). Yellow flowers produced in late June through July with fruits in early August.

Habitat Comments: Found at 12,000 to 14,000 feet, on rocky, gravelly slopes and talus; fellfields; usually granitic bedrock (Spackman et al. 1997).

Global Range: Endemic to Colorado.

State Range: See above.

Distribution/Abundance: Found only in Colorado in Boulder, Clear Creek, El Paso, Gilpin, Grand, Lake, Park and Summit Counties. CNHP has documented 18 occurrences ranging in size from fewer than 15 to as many as 100 individuals.

Known Threats and Management Issues: Trampling and recreational disturbances are the only known threats at this time and is not a major concern (NatureServe 2006).

References: CNHP 2006; NatureServe 2006; Spackman et al. 1997

Version date: March 2006

Colorado Natural Heritage Program (CNHP). 2006. Biodiversity Tracking and Conservation System (BIOTICS). Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

NatureServe. 2006. An online encyclopedia of life (web application). Version 4.4 Arlington, Virginia. [website] Accessed 2006. http://www.natureserve.org/explorer

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

## *Gaura neomexicana ssp. coloradensis* (Colorado Butterfly Plant)

Taxonomy
Class: Dicotyledoneae
Order: Myrtales
Family: Onagraceae
Genus: *Gaura*

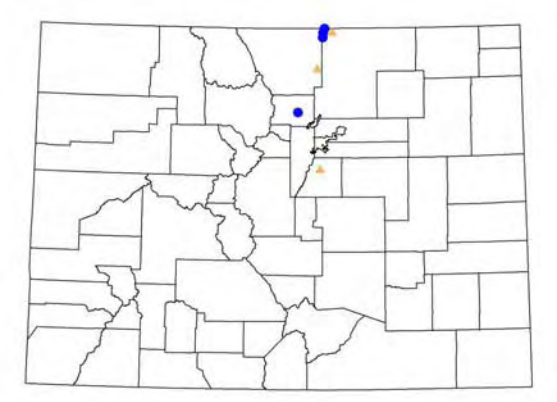
Taxonomic comments: Possibility that it may become recognized at species level.

CNHP Ranking: G3T2 S1

State/Federal Status: Listed as federally threatened



*photo by G. Doyle*



Colorado Distribution
(triangles represent historic occurrences)

Phenology: Flowering June-September. Fruiting July-October.
Perennial herb with one to several reddish, pubescent stems 50-80 cm tall (Spackman *et al*. 1997).

Habitat Comments: Subirrigated, alluvial soils on level or slightly sloping floodplains and drainage bottoms. Colonies are often found in low depressions or along bends in wide, meandering stream channels, a short distance upslope of the actual channel. Elev. 5000-6400 feet. (Spackman *et al*. 1997, Fertig 2000).

Global Range: Laramie County, Wyoming, western Kimball County, Nebraska, and Weld and Boulder counties in northcentral CO.

State Range: Weld and Boulder counties. Historically, this taxon was also known from Larimer and Douglas counties in CO, but these populations are thought to be extirpated.

Distribution/Abundance: Population fluctuations inherent to biennial taxa. Locally abundant to sparse.

Known Threats and Management Issues: Periodic disturbance events are necessary to maintain suitable habitat, control competing vegetation, and open bare ground for seedling establishment (Fertig 2000). On agricultural lands, herbicide spraying, grazing by cattle and horses, haying and mowing, water development, conversion of rangeland to cultivation, competition from exotic plants, and loss of habitat to urban expansion are also threats.

Fertig, W. 2000. Wyoming Natural Diversity Database state species abstract for *Gaura neomexicana ssp. coloradense*, Colorado butterfly plant, Onagraceae. 6 pp.

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

Version Date: May 2005

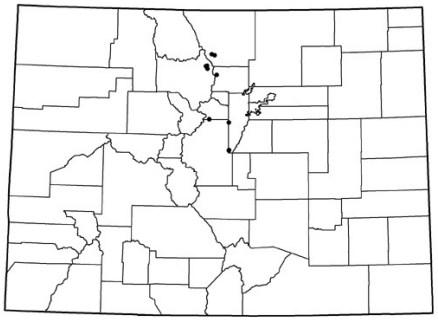
## *Mimulus gemmiparus* (Weber's monkey flower)

Taxonomy
Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae
Genus: *Mimulus*

Taxonomic Comments: None.

CNHP Ranking: G1 S1

State/Federal Status: (C2),S-FS.



Colorado Distribution



*Photo copyright © 1999 by B. Jennings*

Description/Phenology: A small, annual herb, completely glabrous; stems 1-10 cm tall, unbranched with opposite, ovate leaves up to 10 mm long and 7mm wide. Rarely produces sterile, solitary, yellow flowers in July. Reproduction is by propagula - a dormant embryonic shoot forms inside the leaf stems, which are swollen, and sac-like; these fall off the mother plant as it matures and are thought to be water dispersed (NatureServe 2006).

Habitat Comments: A subalpine species found at elevations between 8,500-10,500 feet. Found on granitic seeps, slopes and alluvium in open sites within spruce-fir and aspen forests (Spackmant et al. 1997). Often observed with other Mimulus species in areas protected by granite overhangs (NatureServe 2006).

Global Range: A narrowly restricted Colorado endemic with a small-moderate population size which is known only from higher elevations in and around Rocky Mountain National Park and surrounding counties (NatureServe 2006).

Distribution/Abundance: Eight occurrences documented by CNHP in Boulder, Clear Creek, Grand, Jefferson, Larimer and Park Counties; each occurrence ranging in size from a few to 1500 individuals.

Known Threats and Management Issues: Most populations are not seriously threatened, though one large population is bissected (as of 1983) by a hiking trail in Rocky Mountain National Park and could receive damage from hikers or inadvertent damage from trail maintenance activities (NatureServe 2006). Infrequent flowering can also make this species difficult to identify and survey for.

References: CNHP 2006; NatureServe 2006; Spackman et al. 1997

Version date: March 2006

Colorado Natural Heritage Program (CNHP). 2006. Biodiversity Tracking and Conservation System (BIOTICS). Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

NatureServe. 2006. An online encyclopedia of life (web application). Version 4.4 Arlington, Virginia. [website] Accessed 2006. http://www.natureserve.org/explorer

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

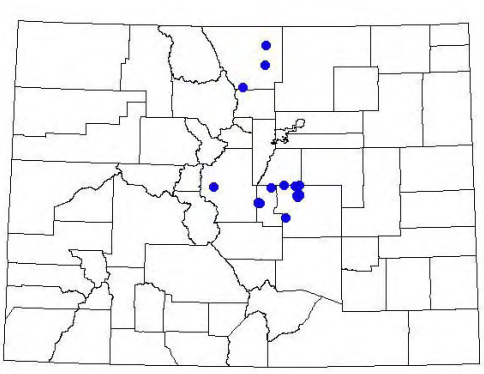
## *Oligoneuron album* (Prairie Goldenrod)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Genus: *Oligoneuron*

Taxonomic Comments: formerly *Unamia alba* and *Solidago ptarmicoides.*

CNHP Ranking: G5 S2S3

State/Federal Status: None.



*Colorado Distribution*



*Photo copyright © 1999 by L. Barzee*

Phenology: The inflorescences with creamy white flowers bloom in July and continue through August; fruiting continues through September (Spackman *et al.* 1997).

Habitat Comments: Dry, open prairies or montane meadows; often on limestone bluffs in sandy or gravelly soil (Spackman *et al.* 1997). In El Paso County, this species is found on Alfisols, primarily on Elbeth and Kettle soil types ( J. Von Ahlefeldt, pers. comm.). In Colorado, it ranges from 7500 to 9300 ft in elevation.

Global Range: Saskatchewan east to New England, south to Colorado.

State Range: Found in El Paso, Larimer, Park, and Teller counties.

Distribution/Abundance: This species is common in other parts of its range, but very little is known about the abundance of this species in Colorado. No reports cite more than 50 individuals in one location.

Known Threats and Management Issues: Residential development is the greatest threat to this species in Colorado. Appropriate habitat for this species is being rapidly converted to subdivisions throughout the Front Range. This species has probably declined significantly in recent years as a result of the widespread transformation of its habitat. Eight of the 16 occurrences known from Colorado have not been seen in over 20 years, and some may have disappeared.

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.
Version Date: May 2005

## *Physaria bellii* (Bell's Twinpod)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae
Genus: *Physaria*

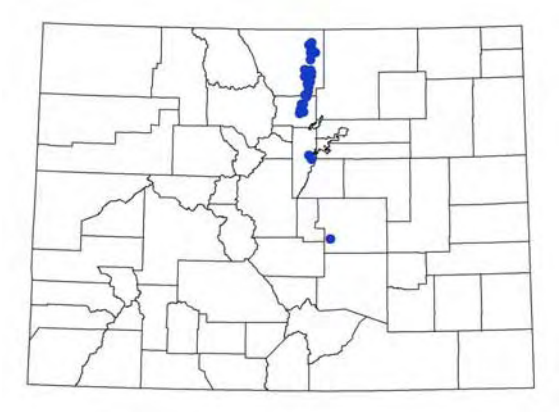
Taxonomic comments: Looks like *P. vitulifora* which has larger, fiddle shaped leaves as opposed to obovate leaves in *P. obcordata* (pers. comm. Coles 1994).

CNHP Ranking: G2 S2

State/Federal Status: None.



*photo by G. Doyle*



Colorado Distribution

Phenology: Flowers May through June, fruits July and August.

A perennial herb with semi-prostrate flowering stems, 5-12.5 cm long, radiating from a basal rosette of silvery-green leaves so that the rosette is often encircled with yellow flowers.

Habitat Comments: Limestones and limey shales of the Niobrara and Pierre formations. Often found where the rock has been exposed by road cuts, and along natural outcrops, such as ridge crests. Also described as loose, gray shale washes, slopes of hogbacks, sloping down to grassy meadows containing some scattered seeps (Peterson and Harmon 1981). Recently documented on a range of red hogback forming sandstone formations including Fountain/Ingleside and Lykins. Most abundant in sparsely vegetated areas such as eroding rivulets. Elev. 5200-5700 feet.

Global Range: Hogbacks along northern Front Range of Colorado.

State Range: Larimer, Boulder, and Jefferson counties. One 1912 record from El Paso County.

Distribution/Abundance: There are 28 extant documented occurrences with a total of approximately one million individual plants. Locally common.

Known Threats and Management Issues: Current threats include limestone mining, suburban expansion along the Front Range and road construction (Peterson and Harmon 1981). Also, invasion of habitat by non-native species.

Peterson, J.S. and W. Harmon. 1981. Status report for *Physaria bellii*. Unpublished report prepared for U.S. Fish and Wildlife Service, Golden, CO.

Version Date: May 2005

## *Potentilla rupincola* (Rocky Mountain Cinquefoil)

Taxonomy
Class: Dicotyledoneae
Order: Rosales
Family: Rosaceae
Genus: *Potentilla*

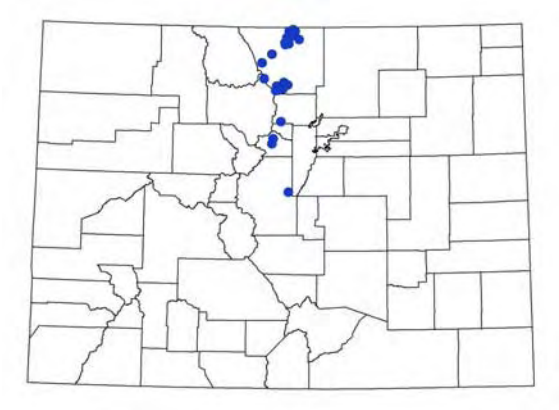
Taxonomic comments: Weber and Wittman (2001) recognize the full species *Potentilla rupincola*, as does Kartesz (1999); others (including Kartesz (1994)) recognize *P. effusa* var. *rupincola*. Distinguished from *P. effusa* var. *effusa* by glabrous leaf surface.

CNHP Ranking: G2 S2

State/Federal Status: USFS sensitive.



*photo by D.G. Anderson*



Colorado Distribution

Phenology: According to herbarium specimen collections, flowering occurs from mid-June until late August.

Habitat Comments: Granite and gravel soils. Steep, often granite outcroppings on shelves or niches of cliffs, well drained areas. Gravelly soils. Often associated with ponderosa pine or limber pine. May occur with *Aletes humilis*. Elev. 6,900 ft. - 10,500 ft.

Global Range: Colorado endemic.

State Range: Colorado endemic, Larimer and Park Counties; historical herbarium specimens from Boulder and Clear Creek Counties (CNHP 2005).

Distribution/Abundance: *Potentilla rupincola* is known from 23 occurrences with a total population size estimated to be approximately 36,000 individuals (Anderson 2004).

Known Threats and Management Issues: Threats include exotic species invasion, residential and commercial development, secondary impacts of grazing, right-of-way management, off-road vehicle use and other recreation, and effects of population size (Anderson 2004). Fourteen of the 23 occurrences are located in areas where they have some degree of protective land status (USFS, NPS, TNC) (Anderson 2004).

Anderson, D.G. 2004. Potentilla rupincola Osterhout (rock cinquefoil): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/potentillarupincola.pdf (accessed April 6, 2005).

Colorado Natural Heritage Program (CNHP). 2005. Biodiversity Tracking and Conservation System (BIOTICS). Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

Kartesz, J.T. 1994. A Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland, Volume II. 2nd ed. Timber Press, Portland, OR.

Kartesz, J.T. 1999. A synonomized checklist and atlas with biological attributes for the vascular flora of the United States, Canada, and Greenland. 3rd edition, CD-ROM. North Carolina Botanical Garden, Chapel Hill, North Carolina.

Version Date: May 2005

## *Spiranthes diluvialis* (Ute Ladies' Tresses)



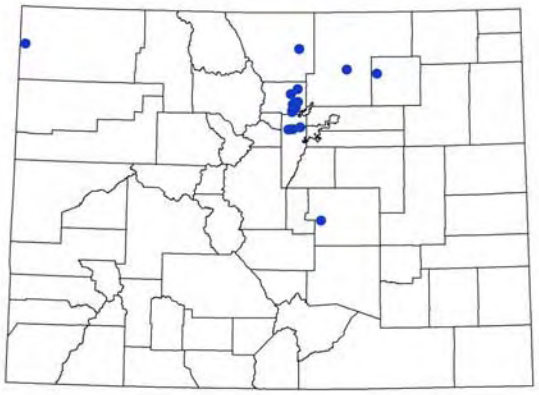
*photo by G. Doyle*

Taxonomy
Class: Monocotyledoneae
Order: Orchidales
Family: Orchidaceae
Genus: *Spiranthes*

Taxonomic comments: The similar species *Spiranthes romanzoffiana* has deeply constricted lip petals, more densely congested and shorter spikes, and occurs at higher elevations (Spackman *et al*. 1997).

CNHP Ranking: G2G3 S2

State/Federal Status: Listed as federally threatened.



Colorado Distribution

Phenology: Blooms mainly from late July through September. Plants probably do not flower every year (Fertig 2001)

Habitat Comments: Moist to very wet meadows along streams or in abandoned stream meanders that still retain ample ground water. Also near springs, seeps, and lakeshores. 1800-6800 ft. elevation (Fertig 2001).

Global Range: Western Nebraska, southeastern Wyoming, northcentral Colorado, southern Utah, east-central Idaho, southwestern Montana, and central Washington (Moseley 1998). A historical population is known from south-central Nevada.

State Range: Boulder, Jefferson, Larimer, and Moffat counties. Historic (1800's) occurrences in El Paso, Morgan, and Weld counties.

Distribution/Abundance: Currently, the largest documented population - with about 5500 plants - is in Colorado. The century-old Nevada collection has not been relocated, and several historic populations in Utah and Colorado are presumed extirpated.

Known Threats and Management Issues: Threatened by many forms of water developments, intense domestic livestock grazing, haying, exotic species invasion, fragmentation and urbanization in particular.

Fertig, W. 2001. Wyoming Natural Diversity Database state species abstract for *Spiranthes diluvialis*, Ute ladies' tresses, Orchidaceae. 5 pp.

Moseley, R.K. 1998. Ute ladies tresses (*Spiranthes diluvialis*) in Idaho. Report prepared by the Idaho Conservation Data Center, Boise ID.

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

Version Date: May 2005

## *Utricularia minor* (Lesser bladderwort)

**Taxonomy**
Class: *Dicotyledoneae*
Order: *Scrophulariales*
Family: *Lentibulariaceae*
Genus: *Utricularia*

**Taxonomic Comments:** *Utricularia minor*

**CNHP Ranking:** G5 S2 (as of 2004)

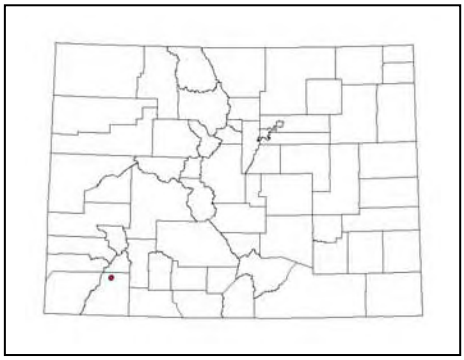
**State/Federal Status:** USFS sensitive



**Figure 42. *Utricularia minor.* Photo copyright [www.sarracenia.com](http://www.sarracenia.com)**

**Description and Phenology:** This perennial carnivorous aquatic plant is recognizable by its yellow flowers and bladders that trap and digest prey. Bladders are small (1 -2 mm) and pear-shaped, one to 5 per leaf. When disturbed, trigger hairs open the bladders and suck in water and aquatic creatures that are then digested. When digestion is complete, special cells extract the water and reset the trap by restoring a vacuum inside the bladders.

**Habitat Comments:** *Utricularia minor* grows in shallow water or on wet soils in fens or other wetlands that are often calcium-rich. *Utricularia* species are generally found in quiet, pollution-free, acidic ponds and bog-associated waters (Juniper et al. 1989).



2004 Distribution in Colorado

**Global Range:** The species is circum-boreal and extends in the U. S. as far south as California. It is known from 28 states.

**State Range:** In Colorado it is currently known from nine locations in Delta, Montezuma, Boulder, Jackson, Larimer and Park counties. The species is easily overlooked, and may be more common in Colorado than is presently known. Efforts in 2005 to inventory fens on the San Juan National Forest may turn up more occurrences.

**Distribution/Abundance:** Little is known of the abundance of the species in Colorado. CNHP added the species to its list of tracked plants in 2004. Most existing records have no census of number of individuals, although some mention that it is "common", "locally abundant" or "rare". More research is needed to determine its status in Colorado.

**Known Threats and Management Issues:** Primary threats to *Utricularia minor* are degradation of water quality, habitat loss, and invasive species. These threats directly impact populations of *U. minor*; it is sensitive to habitat perturbations, both on local and more general scales. Further, its primary habitat, peatlands, is sensitive to environmental change and is restricted in distribution and abundance (Neid 2004).

Source: Rare plants, San Juan Public Lands in Dolores and Montezuma Counties, Lyon and Hanson, 2005

Juniper, B.E., Robins, R.J. and Joel, D.M. (1989) The Carnivorous Plants. London: Academic Press.

Neid, Stephanie. 2004. *Utricularia minor* L. (Lesser Bladderwort): A Technical Conservation Assessment Prepared for the USDA, Forest Service, Rocky Mountain Region, http://www.fs.fed.us/r2/projects/scp/assessments/utriculariaminor.pdf

Version date: March 2005