Biological Survey of Mineral County, Colorado 1999 Final Report

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The Nature Conservancy

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Prepared for:

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Users Guide/Background Information

The Mineral County Biological Inventory, conducted by the Colorado Natural Heritage Program (CNHP), is part of an ongoing inventory of Colorado counties, with the San Luis Valley a priority. In 1997, CNHP began the San Luis Valley inventory with Saguache County (Rondeau and others 1998). The Mineral County report represents the second San Luis Valley County inventory. In 1999 CNHP will continue the biological inventory of the San Luis Valley in Rio Grande and Conejos County.

In addition to the County Inventory, a riparian vegetation classification study was conducted in the Rio Grande Basin in 1995 and 1998 (Kittel and others 1999). The riparian study randomly selected sites throughout the basin, of which 23 plots were studied in Mineral County.

Glossary

biodiversity- The diversity of living things within an ecosystem ranging from genetic diversity within a species to diversity within a natural community.

ecological processes- A variety of natural forces that influence and direct changes in ecosystems. These forces can be physical (slope erosion, river meandering, flooding), biological (vegetation growth, animal grazing, predation, pollinization), or both (fire cycles, soil development).

ecosystem- The basic functional unit of nature that includes living things, their nonliving environment, and the ecological processes that sustain them. Examples of Saguache County ecosystems include the sand dunes, shallow wetlands, and coniferous forests.

element- Species and communities are considered an element of natural diversity, or simply an element.

endemic- Lifeforms that are restricted to a particular locality, such as the Great Sand Dunes tiger beetle, which is found only in the Great Sand Dunes of the San Luis Valley.

non-native/exotic- A term used to describe animal or plant species which are not native to a given region or ecosystem. Most noxious weeds fall into this category, having evolved in areas with a long history of human-caused or natural disturbance. In most cases, invasion by non-native species is more closely linked to human-caused disturbance than deliberate introductions, with the exception of aquatic habitats, where non-native gamefish have been widely introduced.

watershed- The area from which a surface watercourse or groundwater system derives its water, e.g. the Rio Grande watershed includes most of southeast Colorado, much of New Mexico, west Texas, and northern Mexico.

Acknowledgments

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Executive Summary

Mineral County lies in the southern part of Colorado (Figure 1) in the San Juan Mountains (part of the Colorado Rocky Mountains). It straddles two main watersheds, Rio Grande and San Juan River, of which most of the county is in the Rio Grande Basin (Figure 1). Mineral County contains a diverse array of montane habitats, including grasslands, woodlands, riparian, wetlands, montane forests, and alpine communities. With funding from Great Outdoors Colorado! (GOCO), the Nature Conservancy, a private nonprofit conservation organization, contracted the Colorado Natural Heritage Program to inventory Mineral County for areas of special biological significance. The primary goal of the project was to identify the locations that have natural heritage significance, with a special emphasis on private lands. Such locations were identified by: 1) examining existing biological data from the Colorado Natural Heritage Program's database, 2) accumulating additional existing information on rare or imperiled plant species, animal species, and significant plant communities (collectively called **elements**), and, 3) conducting extensive field surveys. Areas which were found to contain significant elements were delineated as "proposed conservation areas." These sites were prioritized on the basis of their biological importance and are presented in this report.

The Mineral County inventory documented 63 biologically significant elements, including 19 plants, 28 plant communities, 2 mammals, 6 birds, 3 fish, 2 amphibians, and 3 invertebrates.

Mineral County was found to be very important, and possibly the center of distribution for three rare plants: Smith whitlow-grass (*Draba smithii),* Black canyon gilia (*Gilia penstemonoides),* and Southern Rocky Mountain cinquefoil (*Potentilla ambigens)*.

We have identified 22 proposed conservation areas, containing the 64 elements documented in this report. If protected, these sites would help to conserve the biological integrity of Mineral County and Colorado. Of these 22 sites, several stand out as very significant. These harbor some of the world's largest and healthiest populations of Smith whitlow-grass and Black Canyon gilia. These sites include Bellows Creek, North Creede, Deep Creek Uplands, Antelope Park and Rat Creek Pond.

Of the 22 proposed conservation sites, we identified 5 *very significant* (B2), 10 *significant (*B3), 3 *moderate* (B4), and 4 of *general biodiversity significance* (B5). Overall, the concentration and quality of imperiled elements and habitats attest to the fact that conservation efforts in Mineral County will have both state and global significance. In order to enhance conservation efforts in Mineral County, a list of the major threats to biodiversity in Mineral County and nine recommendations for enhancing conservation efforts have also been provided.

Introduction

The Mineral County Biological Inventory conducted by the Colorado Natural Heritage Program (CNHP) used the methodology that is used throughout Heritage Programs in North America. Our primary focus was to identify the location and quality of the plants, animals, and plant communities on CNHP's list of rare and imperiled elements of biodiversity.

The primary goal of the collective project was to identify the locations in Mineral County that have natural heritage significance. These locations were identified by:

- Examining existing biological data from CNHP;
- Accumulating additional existing information on rare or imperiled plant species, animal species, and significant plant communities (collectively called **elements**);
- 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. **The potential conservation area boundaries delineated in this report do not confer any regulatory protection of the site.** The boundaries are based on the ecological processes known to support the elements at each site. Twenty-two sites are described and prioritized. The sites are prioritized according to their **biodiversity significance rank**, or "B-rank," which ranges from B1 (outstanding biodiversity significance) to B5 (general or state-wide biodiversity significance). The B1-B3 sites are the highest priorities for conservation actions. The sum of all the sites in this report represents the area CNHP recommends for protection to preserve the natural heritage of Mineral County.

Major Threats and Stresses to Biodiversity in Mineral County

- **Hydrological Modification**

River impoundment in the form of lakes and reservoirs and irrigation ditches or canals are a threat to aquatic dependent plants and animals (e.g., Chien 1985). Annual flooding is a natural ecological process that has been severely altered by the addition of lakes and reservoirs. Alterations have taken place without the normal peak high flows that were once a part of the Rio Grande flow regime. The vegetation responds to the natural flows and many plants can only reproduce with very high floods, e.g., cottonwood trees (e.g., Rood and Mahoney 1993). As the plant composition changes to reflect changes in the flooding regime, the aquatic and terrestrial fauna composition also changes.

In addition to river impoundment, rivers have also been altered by stream bank stabilization projects (Rosgen 1996). Most streams and rivers are dynamic and inherently move throughout a landscape. By "stabilizing" the banks, forces the river to stay put, which often leads to changes in riparian ecology and more serious destruction downstream. It is also well known that different plant communities require different geomorphologic structures, e.g., point bars are

required for some species of willows to regenerate, whereas terraces are required for mature cottonwood/shrubland forests. By stabilizing a river, we often stop the creation of point bars and terraces, and other features. The fauna that depends upon the plant comminutes are affected as well.

- **Development**

Residential development is a localized but increasing threat in Mineral County. Although growth rates in the San Luis Valley have lagged well behind most other Colorado regions, it is likely that the Valley may begin to receive "overflow" development pressure, especially in Mineral County. Development creates a number of stresses, including habitat loss and fragmentation, introduction of non-native species, fire suppression, and domestic animals (dogs and cats) (Oxley and others 1974; Coleman and Temple 1994). Habitat loss to development is considered irreversible and should therefore be channeled to areas with less biological significance. Grasslands types are the most threatened by these stresses due to their potential for development (i.e., they are flat, scenic, or have good soils) and their vulnerability to sustained fire suppression. Development also tends to occur adjacent to watercourses in this arid region, with consequent effects on aquatic and riparian habitats.

- **Mining**

Mining has been a traditional industry in Mineral County for over a century. Poorly planned or managed mining operations have the potential to impact biodiversity for decades after the activity has ceased. Summitville, just south of the study area, has been the country's most highly publicized mining mishap in recent years.

Stresses from mining activities can include habitat loss and fragmentation, water pollution by acid mine drainage and excessive sedimentation of streams. Aquatic systems are the most threatened by these stresses, but riparian communities can be impacted as well.

- **Livestock Grazing**

Another traditional industry of the county, domestic livestock grazing, has left a much broader and often subtle impact on the landscape. Historic livestock grazing probably had a large influence on the composition of nonforested comminutes on the Rio Grande National Forest (USDA Forest Service 1996). As early as 1820, there were records of cattle being brought into the San Luis Valley. By the close of the century, and through the early part of the 20th century, there were high numbers of livestock. It appears that by 1929, stocking rates started declining dramatically due to documented overuse of the resource (USDA Forest Service 1996).

Plant species generally react in predictable outcomes to repeated livestock grazing. As more palatable plants are reduced or eliminated from a community over time, there are other native plants that increase in prominence. There are also introduced plants that increase significantly under frequent, repeated livestock grazing. Depending on grazing practices and local environmental conditions, impacts can be minimal, moderate and largely reversible (slight shifts in species composition, willow browsing), to severe and irreversible (extensive gullying, introduction of non-native forage species, extirpation of local willow populations). Stresses due

to sediment deposition and water quality changes from improper grazing practices are more difficult to judge, but they may be detrimental to aquatic biota (Gifford and others 1975).

Observations during the Mineral County field assessment for this report indicated that livestock impacts are most severe in the wide valley bottoms, where mild topography and open range allow the livestock to congregate in riparian areas. Non-native species and degraded willow and sedge stands are abundant in riparian habitats of this area.

- **Logging**

For the past 45 years, the annual volume of timber sold from the Rio Grande National Forest, predominantly Engelmann spruce (*Picea engelmanii*) and subalpine fir (*Abies lasiocarpa*), has averaged 19.7 million board feet (USDA Forest Service 1996). The volume of live timber sold annually during the 10 years from 1985 to 1994 ranged from 24.9 million board feet to 32.9 million board feet. Most logging operations require a large network of roads. These roads have their own threats to biodiversity (see Roads on the following page for more detailed discussion). The Forest Service watches over this activity closely, nonetheless, problems can still occur e.g., a buffer zone around a boreal toad pond was logged in 1998 (Husung and Alves 1998).

- **Fire**

Fires are a natural ecological process that has been suppressed since the 1910's (USDA Forest Service 1996). Some of the forested zones, especially ponderosa pine (*Pinus ponderosa*) and Douglas fir (P*seudotsuga menziesii*) are adapted to short-interval fires. These sites are conditioned to low-intensity surface fires at frequent intervals. These fires clean up the forest floor, reduce competition, and prepare natural seedbeds (USDA Forest Service 1993 as cited in USDA Forest Service 1996). These stands are affected more dramatically, and faster, by suppression of natural fires than are the spruce-fir communities.

Not allowing natural fires to burn in these forests allows the more shade-tolerant, fire-intolerant Douglas fir to move into ponderosa pine sites, where it may eventually displace the ponderosa pine. Additionally, the increased fuel loading from dense regeneration and natural dead-and-down accumulation predisposes the site for high-intensity, stand-replacing fires (USDA Forest Service 1996).

- **Recreation**

Recreation, once very local and perhaps even unnoticeable, is on the increase and is becoming a threat to the county's ecology. Like grazing, recreation practices and their stresses differ, mostly between motorized and non-motorized activities. All terrain vehicles (ATV's) are becoming increasingly popular and the Rio Grande National Forest is a favorite area for ATV use (especially for big-game retrieval). ATV's 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. ATV's may also be a vector for the invasion of non-native species.

Non-motorized recreation, mostly hikers but also some mountain biking presents a different set of problems (Cole and Knight 1990; Knight and Cole 1991; Holmes and others 1993). Wildlife

behavior can be significantly altered by repeat visits of hikers/bicyclists. Trampling of sensitive plant species, particularly in high alpine areas (among the most popular destinations for hikers), is of concern along the most popular areas such as 14,000-ft. peak routes (Spackman, pers. comm.).

- **Roads**

Much of the Rio Grande Basin is roaded due to past timber harvest and mining operations. Expansion of the existing road network will detrimentally affect the natural heritage values 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 and others 1997).

Roads function as conduits, barriers, habitats, sources, and sinks (Bennett 1991; Forman 1995). Road networks crossing landscapes cause local hydrologic and erosion effects, whereas roads that parallel streams and valleys receive major peak-flow and sediment impacts. Chemical effects on the landscape mainly occur near roads. Road networks interrupt horizontal ecological flows, alter landscape spatial pattern, and therefore inhibit important interior species (Forman and Alexander 1998).

The ecological effect of road avoidance caused by traffic disturbance is probably much greater than that of roadkills seen along the road. Traffic noise appears to be the most important 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, similar to those in a library reading room (Reijnen and others 1995). Even low-level noise was found to affect population densities of all woodland birds (Forman and Alexander 1998).

- **Non-native Species**

Although non-native species are mentioned repeatedly as stresses in the above discussions, because they can come from 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 essentially 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. Cheatgrass (*Bromus tectorum*), smooth brome (*Bromus inermis*), and crested wheatgrass (*Agropyron spicatum*) are hardy, xeric grasses from Eurasia that are very difficult to control (H. Dixon, pers. comm.). 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.

Recommendations

1. **Develop and implement a plan for protecting the proposed conservation areas profiled in this report, with most attention directed toward sites with biodiversity rank (B-rank) B2 and B3.** The sites in this report provide Mineral County with a basic framework for implementing a comprehensive conservation program. The B2 and B3 sites, because they have global significance, should receive priority attention. The sum of all the sites in this report represents the area CNHP recommends for protection to ensure that the county's natural heritage is not lost as the population and associated development increase.

2. **Incorporate the information included in this report in the review of proposed activities in or near conservation sites so that the activities do not adversely affect natural heritage elements.** All of the sites presented contain natural heritage elements of state or global significance. Development activities in or near a site may affect the element(s) present. Wetland and riparian sites 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 activities within Mineral County are considered, they should be compared to the site maps presented herein (and the wall map provided to Mineral County). If a proposed project has the potential to impact a site, planning personnel should contact persons, organizations, or agencies with the appropriate expertise for input in the planning process. The Colorado Natural Heritage Program, Colorado Natural Areas Program, and Colorado Division of Wildlife routinely conduct environmental reviews statewide and should be considered as valuable resources.

3. **Develop and implement a comprehensive county-wide program to protect wetlands**. Use the U.S. Fish and Wildlife Service definition of wetlands to guide this program, and include riparian areas in the wetland conservation program. Recognizing the ability for off-site activities, such as agricultural pollutants, sediment, or groundwater pumping as potential impact to wetlands. Some wetlands, such as those harboring rare or particularly sensitive species, may require larger buffers.

4. **In the effort to protect natural diversity, promote cooperation among landowners, pertinent government agencies, and non-profit conservation organizations.** The long-term protection of natural diversity in Mineral County will be facilitated with the cooperation of many government agencies, non-government organizations, and private landowners. Efforts to this end should continue, providing stronger ties among federal, state, local, and private interests involved in the protection or management of natural lands.

5. **Promote proper management of the natural heritage resources that exist within Mineral County, recognizing that designation of conservation sites does not by itself confer protection of the plants, animals, and plant communities.** Development of a conservation plan is a necessary component of the site designation. Because some of the most serious threats to Mineral County ecosystems are at a landscape scale (altered hydrology, residential encroachment, and non-native species invasion), considering each site in the context of its surroundings is critical. Building partnerships is essential to the long-

term protection of a site. An important component of partnerships could be research and development of techniques to maintain or restore sites for preservation of imperiled elements. Several organizations and agencies are available for consultation in the development of conservation plans, including the Colorado Natural Areas Program, The Nature Conservancy, the Colorado Natural Heritage Program, the Colorado Division of Wildlife, the Natural Resources Conservation Service, and various academic institutions. In addition, partnerships with local agencies, non-profits, and other educational groups could provide the means to implement some of the management and protection recommendations. For example, partnerships could be formed with the San Luis Valley Environmental Conservation and Education Coalition (ECEC), the Boy Scouts and Girl Scouts, 4H Club, and Center Soil Conservation District.

6. **Increase public awareness of the benefits of protecting significant natural areas.** Natural lands are becoming ever more scarce, especially those near densely populated metropolitan areas. Rare and imperiled species will continue to decline if not given appropriate protection. This will result not only in the reduction of our natural heritage and quality of life, but may also lead to additional conflicts between developers and natural resource managers. Increasing the public's knowledge of the remaining significant areas will build support for the programmatic initiatives necessary to protect them. Finally, to build awareness of the commitment to protect sites of biodiversity significance, the county should publicize the significant conservation and cooperation actions taken.

7. **Consider using incentives, including tax breaks, to promote conservation actions on private lands.** Conservation of important natural heritage resources can only take place with the cooperation of private landowners. Tax incentives could be used to help landowners defray the costs of protecting something that will benefit Mineral County residents.

8. **Continue natural heritage resource inventories where necessary, including inventories for species that cannot be surveyed adequately in one field season and inventories on lands that CNHP could not access in 1998.** Not all targeted inventory areas can be field surveyed in one year due to either access problems or inadequate time. Because some species are ephemeral or migratory, completing inventory in one field season is often difficult or inconclusive. Despite the best efforts of one field season, it is likely that some elements occur at sites not identified in this report.

9. **Prohibit the introduction and/or sale of non-native species that are known to negatively and profoundly affect natural areas, especially wetlands and riparian areas.** These include but are not limited to purple loosestrife, wild chamomile, and non-native fish species. Natural area managers, public agencies, and private landowners should be encouraged to remove these species from their properties. If restoration of an area is necessary, CNHP recommends the use of native species.

Project Background

Study Area

Antelope Park along the Rio Grande

Mineral County lies within south-central Colorado and most of the county is within the Rio Grande watershed although a portion lies within the San Juan watershed. The county covers approximately ¼ million acres, of which private lands comprise about 5% and federal lands approximately 95%. The majority of the private lands are located along the river bottoms (Figure 1). Elevations range from nearly 7,600 feet to approximately 13,500 feet.

Mineral County falls within the Southern Rocky Mountain Steppe ecoregional provinces (Bailey and others 1994), and is best characterized as a mountainous topography varying from wide and flat river bottoms to dramatic and scenic cliffs.

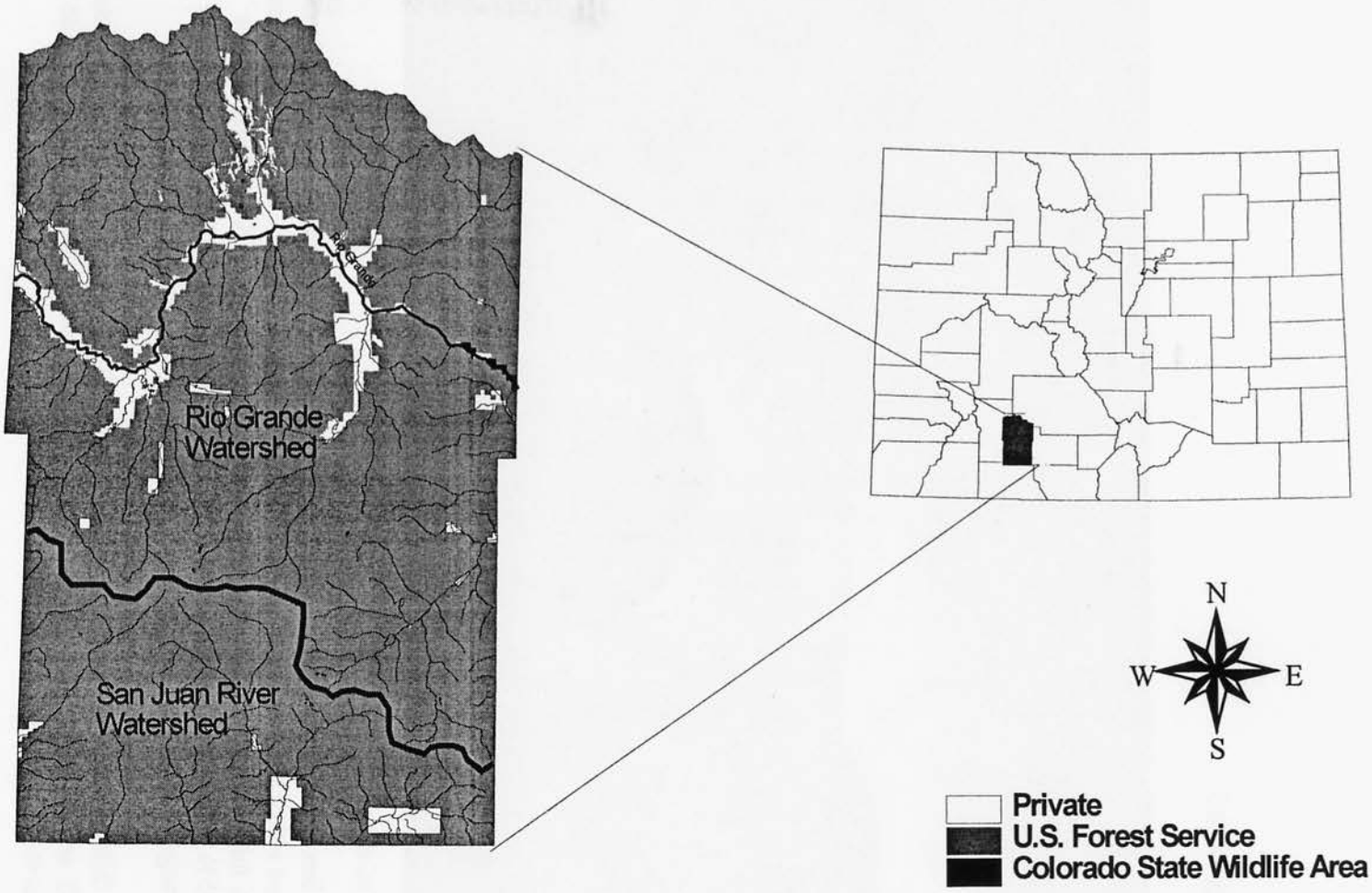


Figure 1. **Mineral County Land Status**

Geology
Mineral County is most simply described as a landscape shaped by volcanoes and glaciers (Steven and Lipman 1976; Steven and others 1995). The San Juan Mountains consist mainly of volcanic rocks that formed from numerous volcanoes some 26 to 30 million years ago (Steven and Epis 1968; Steven 1975). A series of eroding, faulting, and uplifting events continued to shape the volcanic plateau during the late Miocene and early Pliocene times (Steven 1968). This led to rejuvenated downcutting by all the streams. It was the volcanic activity that made it possible for the productive mining period that Mineral County enjoyed in the early 1900's.

Some 20,000 to 3 million years ago a strong temperature change produced an ice age that produced numerous glaciers in Mineral County (Steven and others 1995). The glaciers widely modified both the late Miocene hanging topography and the Pliocene canyons that had been cut into it. Much of the mountain scenery that Mineral County is famous for is a result of glacial erosion. One of the best examples of this can be seen at the Antelope Park area of the Rio Grande (see above picture).

Soils
Soils of Mineral County range from shallow to very deep, usually contain considerable rock fragments, and were formed in primarily volcanic rocks on mountain slopes.

Climate
Cold winters and cool summers characterize the study area. At Rio Grande Reservoir, the average maximum January temperature between 1977 and 1998 was 33 F (average minimum was –7 F) and the average maximum July temperature was 73 F (average minimum was 38 F, http://www.wrcc.dri.edu). The annual precipitation was 20.5 inches per year. The distribution of precipitation is fairly uniform across the seasons, although fall generally receives the most (6 inches http://www.wrcc.dri.edu). Local microclimates are strongly influenced by topography. The higher elevations are decidedly cooler and moister, except during winter thermal inversions which trap the coldest air at the valley floor.

Vegetation
The San Juan Mountains contain typical southern Rocky Mountain vegetation including mixed forests of Douglas fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*), and occasional stands of white fir (*Abies concolor*) at lower elevations, and Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) at higher elevations. Dry south-facing slopes at high elevations support open woodlands of bristle-cone pine (*Pinus aristata*). Aspen (*Populus tremuloides*) stands are abundant throughout the study area at elevations over 8,500 feet. Mountain wetlands are largely vegetated with willows (*Salix* spp.), sedges (*Carex* spp.), and wetland grasses such as Canadian reedgrass (*Calamagrostis canadensis*) and tufted hairgrass (*Deschampsia cespitosa*). Montane grasslands are abundant, especially above the Rio Grande. These grasslands are primarily dominated by Arizona fescue (*Festuca arizonica*) and slimstem muhly (*Muhlenbergia filiculmis*) with patches of Parry's oatgrass (*Danthonia parryi*).

The Natural Heritage Network and Biodiversity

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

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

Recognizing that rare and 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. 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 rareness 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 began to realize that plant communities are equally important as individual species, this methodology has also 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. Natural Heritage Network data centers are located in each of the 50 U.S. states, five provinces of Canada, and 13 countries in South and Central America and the Caribbean. This network enables scientists to monitor the status of species from a state, national, and global perspective. It also enables conservationists and natural resource managers to make informed, objective decisions in prioritizing and focusing conservation efforts.

What is Biological Diversity?

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on earth, from unicellular bacteria and protists, through multicellular plants, animals, and fungi. 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 among these levels. All levels are necessary for the continued survival of species and plant communities, and all are important for the well-being of humans. It stands to reason that biological diversity should be of concern to all people.

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

1. **Genetic Diversity** -- the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species is variable between populations within its geographic range. Loss of a population results in a loss of genetic diversity for that species and a reduction of total biological diversity for the region. This unique genetic information cannot be reclaimed.

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

3. **Community Diversity** -- the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic or even endemic to an area. It is within communities that all life dwells.

4. **Landscape Diversity** -- the type, condition, pattern, and connectedness of plant communities. A landscape consisting of a mosaic of plant 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. Humans and the results of their activities are integral parts of most landscapes.

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

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 state-wide conservation priorities. After

operating in Colorado for 14 years, the Program was relocated from the State Division of Parks and Outdoor Recreation to the University of Colorado Museum in 1992, and more recently to the College of Natural Resources at Colorado State University.

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

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

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

The Natural Heritage Ranking System

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

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the degree of imperilment of an element. For example, the lynx, which is thought to be secure in northern North America but is known from less than 5 current locations in Colorado, is ranked G5S1. The Rocky Mountain Columbine which is known only from Colorado, from about 30 locations, is ranked a G3S3. Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1S1. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to vulnerable (S1 - S3). Those with a ranking of S3S4 are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 1.

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", e.g., S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N", e.g., S4N, refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table 1. Definition of Colorado Natural Heritage Imperilment Ranks.

Global imperilment ranks are based on the range-wide status of a species. State imperilment ranks are based on the status of a species in an individual state. State and Global ranks are denoted, respectively, with an "S" or a "G"

G/S1	Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G/S2	Imperiled globally/state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G/S3	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).
G/S4	Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.
G/S5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GX	Presumed extinct.
G#?	Indicates uncertainty about an assigned global rank.
G/SU	Unable to assign rank due to lack of available information.
GQ	Indicates uncertainty about taxonomic status.
G/SH	Historically known, but not verified for an extended period, usually.
G#T#	Trinomial rank (T) is used for subspecies or varieties. These species or subspecies are ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not permanent residents.
S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used
SZ	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
SA	Accidental in the state.
SR	Reported to occur in the state, but unverified.
S?	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

Notes: Where two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the element falls between the two numbers.
represents rank (1-5)

Legal Designations

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

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

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

Table 2. Federal and State Agency Special Designations.

Federal Status:

1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)

LE Endangered; species or subspecies formally listed as endangered.

E(S/A) Endangered due to similarity of appearance with listed species.

LT Threatened; species or subspecies formally listed as threatened.

P Proposed Endangered or Threatened; species or suabspecies formally proposed for listing as endangered or threatened.

C Candidate: species or subspecies for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.

2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as "S")

FS Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by:

a. Significant current or predicted downward trends in population numbers or density.

b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")

BLM Sensitive: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species.

State Status:

1. Colorado Division of Wildlife

E Endangered

T Threatened

SC Special Concern

Element Occurrence Ranking

Actual locations of elements, whether they be single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to the estimated viability or probability of persistence (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 3 factors:

> **Size** – a quantitative measure of the area and/or abundance of an occurrence such as area of occupancy, population abundance, population density, or population fluctuation.
>
> **Condition** – an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include reproduction and health, development/maturity for communities, ecological processes, species composition and structure, and abiotic physical or chemical factors.
>
> **Landscape Context** – an integrated measure of the quality of biotic and abiotic factors, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include landscape structure and extent, genetic connectivity, and condition of the surrounding landscape.

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

A Excellent estimated viability.
B Good estimated viability.
C Fair estimated viability.
D Poor estimated viability.
E **V**iability has not been assessed.
H Historically known, but not verified for an extended period of time.
X Extirpated

Proposed Conservation Areas

In order to successfully protect populations or occurrences, it is necessary to delineate conservation areas. These conservation areas focus on capturing the ecological processes that are necessary to support the continued existence of a particular element occurrence of natural

heritage significance. Conservation areas may include a single occurrence of a rare element or a suite of rare element occurrences or significant features.

The goal of the process is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence or suite of element occurrences depends for its continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses.

In developing proposed conservation area boundaries, CNHP staff consider a number of factors that include, but are not limited to:

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

The proposed boundary does not automatically exclude all activity. It is hypothesized that some activities will prove degrading to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the preliminary conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

As the label "conservation planning" indicates, the boundaries presented here are for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with protection goals for natural heritage resources and sensitive species. Please note that these boundaries are based primarily on our understanding of the 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.

Off-Site Considerations

Furthermore, it is often the case that all relevant ecological processes cannot be contained within a proposed conservation area of reasonable size. The boundaries illustrated in this report signify the immediate, and therefore most important, area in need of protection. Continued landscape level conservation efforts are needed. This will involve county-wide efforts as well as coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

Ranking of Proposed Conservation Areas

Biodiversity Rank

One of the strongest ways that the CNHP uses element and element occurrence ranks is to assess the overall biodiversity significance of a site, which may include one or many element occurrences. If an element occurrence is unranked due to a lack of information the element occurrence rank is considered a C rank. Similarly, if an element is a GU or G? it is treated as a G4. Based on these ranks, each site is assigned a **biodiversity** (or B-) **rank**:

B1 Outstanding Significance: only site known for an element or an excellent occurrence of a G1 species.

B2 Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type, good occurrence of a G3 species, or a large concentration of good occurrences of state rare species.

B4 Moderate or Regional Significance: good example of a community type, excellent or good occurrence of state-rare species.

B5 General or State-wide Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

Protection Urgency Ranks

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

P1 Immediately threatened by severely destructive forces, within 1 year of rank date; protect now or never!
P2 Threat expected within 5 years.
P3 Definable threat but not in the next 5 years.
P4 No threat known for foreseeable future.
P5 Land protection complete or adequate reasons exists not to protect the site; do not act on this site.

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

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

Management Urgency Ranks

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

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

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

M1 Management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

M2 New management action will be needed within 5 years to prevent the loss of element occurrences.

M3 New management action will be needed within 5 years to maintain current quality of element occurrences.

M4 Although not currently threatened, management may be needed in the future to maintain the current quality of element occurrences.

M5 No serious management needs known or anticipated at the site.

Methods

The methods for assessing and prioritizing conservation needs over a large area are necessarily diverse. The Colorado Natural Heritage Program follows a general method which is continuously being developed specifically for this purpose. The Mineral County Biological Inventory was conducted in several steps summarized below. Additionally, input from a local guidance committee of local public and private interests was sought at all stages.

Collect Available Information

CNHP databases were updated with information regarding the known locations of species and significant plant communities within Mineral County. A variety of information 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, Adams State College, Rocky Mountain Herbarium, and local private collections. The Colorado Division of Wildlife provided extensive data on the fishes of Mineral County as well as information regarding the status of the boreal toad. Both general and specific literature sources were incorporated into CNHP databases, in the form of either locational information or as biological data pertaining to a species in general. Such information covers basic species and community biology including range, habitat, phenology (reproductive timing), food sources, and substrates. This information was entered into CNHP databases.

Identify Rare or Imperiled Species and Significant Plant Communities with Potential to Occur in Mineral County

The information collected in the previous step was used to refine the potential element list and to refine our search areas. In general, species and plant communities that have been recorded from Mineral County, or from adjacent counties, were included in this list. Species or plant communities which prefer habitats that are not included in this study area were removed from the list.

The following list of elements includes those elements currently monitored by CNHP that were thought to potentially occur in Mineral County, and were therefore targeted in CNHP field inventories (Table 3). Over 150 rare species and significant plant communities were targeted in these surveys.

The amount of effort given to the inventory for each of these elements was prioritized according to the element's rank. Globally rare (G1 - G3) elements were given highest priority, state rare elements were secondary.

Table 3. Targeted Elements of Global or State-wide Concern.
List of targeted elements, organized by taxonomic group, identified for the Mineral County Biological Inventory in 1998. The species in bold were documented in Mineral County prior to the inventory.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Plants				
Aletes sessiliflorus	smoothleaved aletes	G2	S2	
Aster alpinus var vierhapperi	**alpine aster**	**G5TU**	**S1**	
Astragalus bodinii	Bodin milkvetch	G4	S2	
Botrychium echo	**reflected moonwort**	**G2**	**S2**	
Botrychium hesperium	western moonwort	G3	S2	
Botrychium lanceolatum* var *lanceolatum	**lance-leaved moonwort**	**G5T4**	**S2**	
Botrychium lunaria	**moonwort**	**G5**	**S2**	
Botrychium pallidum	pale moonwort	G2	S2	
Botrychium pinnatum	**northern moonwort**	**G4?**	**S1**	
Carex limosa	mud sedge	G5	S2	
Carex oreocharis	a sedge	G3	S1	
Comarum palustre	marsh cinquefoil	G5	S1S2	
Corydalis caseana* ssp *brandegei	**sierra corydalis**	**G5T3T4**	**S3S4**	
Crepis nana	dwarf hawksbeard	G5	S2	
Cryptantha weberi	Weber's catseye	G5	S3	
Cryptogramma stelleri	slender rock-brake	G5	S2	
Cystopteris montana	mountain bladder fern	G5	S1	
Delphinium alpestre	a larkspur	G2G3	S2?	
Draba fladnizensis	arctic draba	G4	S2S3	
Draba grayana	Gray's peak whitlow-grass	G2	S2	
Draba rectifructa	**mountain whitlow-grass**	**G3**	**S2**	
Draba smithii	**Smith whitlow-grass**	**G2**	**S2**	
Draba spectabilis var *oxyloba*		G3T3Q	S3	
Draba streptobrachia	**Colorado Divide whitlow-grass**	**G3**	**S3**	
Erigeron philadelphicus	**Philadelphia fleabane**	**G5**	**S1**	
Eriogonum coloradense	Colorado wild buckwheat	G2	S2	
Eriophorum altaicum* var *neogaeum	**Altai cottongrass**	**G4T?**	**S2**	
Gilia penstemonoides	**Black Canyon gilia**	**G3**	**S2S3**	
Goodyera repens	**dwarf rattlesnake-plantain**	**G5**	**S2**	
Isoetes echinospora	spiny-spored quillwort	G5	S2	
Lilium philadelphicum	**wood lily**	**G5**	**S3**	
Machaeranthera coloradoensis	Colorado tansy-aster	G2?	S2	
Neoparrya lithophila	rock-loving neoparrya	G2	S2	
Oenothera kleinii	**Wolf Creek evening primrose**	**GXQ**	**SX**	
Platanthera sparsiflora var *ensifolia*	canyon bog-orchid	G4G5T3	S2	
Potentilla ambigens	**Southern Rocky Mountain cinquefoil**	**G3**	**S1S2**	

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Pyrola picta	**pictureleaf wintergreen**	**G4G5**	**S2**	
Stellaria irrigua	Altai chickweed	G4?	S2	
Plant Communities				
Abies concolor-Picea pungens-Populus angustifolia/Acer glabrum	montane riparian forest	G1	S1	
Abies lasiocarpa/Erigeron eximus	**subalpine forest**	**G5**	**S4**	
Abies lasiocarpa/Vaccinium myrtillus	**subalpine forest**	**G5**	**S5**	
Abies lasiocarpa-Picea engelmanii/Mertensia ciliata	**montane riparian forest**	**G5**	**S5**	
Abies lasiocarpa-Picea engelmannii/Salix drummondiana	montane riparian forest	G4	S4	
*Alnus incana/*mesic forb	thinleaf alder-mixed willow riparian shrubland	G3	S3	
Alnus incana-mixed willow	thinleaf alder-mixed willow riparian shrubland	G3G4	S3S4	
*Betula occidentalis/*mesic forb	foothills riparian shrubland	G2G3	S2	
Calamagrostis stricta	slimstem reedgrass	GU	S1?Q	
Cardamine cordifolia-Caltha leptosepala	alpine wetland	G4	S4	
Cardamine cordifolia-Mertensia ciliata-Senecio triangularis	**alpine wetland**	**G4**	**S4**	
Carex aquatilis wetland	montane wet meadow	G5	S3S4	
Carex lasiocarpa montane wetland	montane wetland	G4	S1	
Carex simulata	wet meadow	G3	S3	
Carex utriculata	beaked sedge montane wet meadow	G5	S3	
Catabrosa aquatica-Mimulus glabratus	spring wetland	GU	S3	
Ceratoides lanata/Pascopyrum smithii-Bouteloua gracilis	western slope grassland	GU	S?	
Cercocarpus montanus/Muhlenbergia montana	mixed mountain shrubland	GU	S2	
Deschampsia cespitosa	wet meadow	G4	SU	
Distichlis spicata var stricta	great plains salt meadow	G4	S3	
Eleocharis quinqeflora	**alpine wetlands**	**G4**	**S3S4**	
Festuca arizonica-Muhlenbergia filiculmis	**montane grassland**	**G3**	**S2**	
Festuca arizonica-Muhlenbergia montana	**montane grassland**	**GU**	**SU**	
Muhlenbergia filiculmis	**montane grassland**	**G2**	**S2**	
Picea pungens/Alnus incana	montane riparian forest	G3	S3	
Pinus aristata/Festuca arizonica	**montane woodland**	**G4**	**S3**	
Pinus aristata/Festuca thurberi	**lower montane woodland**	**G3**	**S2**	
Pinus edulis-(Juniperus monosperma)/Stipa scribneri	foothills pinyon-juniper woodland	G2G3	S1?	
Pinus edulis/Stipa comata	xeric western slope pinyon-pine juniper woodland	G2	S2	

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Pinus edulis/Stipa scribneri	foothills pinyon-juniper woodland	G3	S1?	
Pinus ponderosa/Arctostaphylos uva-ursi	upper montane woodland	G4	S4	
Pinus ponderosa/Festuca arizonica	**lower montane forests**	**G4G5**	**S4**	
Pinus ponderosa/Muhlenbergia montana	foothills ponderosa pine savanna	G5	S2S3	
Pinus ponderosa/Oryzopsis hymenoides	western slope pondersoa pine woodland	G1	S1	
Populus angustifolia/Alnus incana	**montane riparian forest**	**G3**	**S3**	
Populus angustifolia/Betula occidentalis	montane riparian forest	G3	S1	
Populus angustifolia/Salix drummondiana-Acer glabrum	montane riparian forest	G1	S1	
Populus angustifolia/Salix lucida var. *caudata*	montane riparian forest	G1	S1	
Populus angustifolia-Juniperus scopulorum	montane riparian forest	G2	S2	
Populus angustifolia-Picea pungens/Alnus incana	**montane riparian forest**	**G3**	**S3**	
Populus angustifolia-Pseudotsuga menziesii	**montane riparian forest**	**GU**	**S2**	
Populus tremuloides/Acer glabrum	montane riparian forest	G2	S1S2	
Populus tremuloides/Alnus incana	montane riparian forest	GU	S3	
Populus tremuloides/Betula occidentalis	montane riparian forest	G1	S1	
Populus tremuloides/Cornus sericea	montane riparian forest	G3	S2S3	
*Populus tremuloides/*tall forb	montane aspen forest	G5	S5	
Pseudotsuga menziesii/Acer glabrum	mixed deciduous-evergreen forest	G?	S?	
Pseudotsuga menziesii/Betula occidentalis	montane riparian forest	G4	S3	
Pseudotsuga menziesii/Juniperus communis	lower montane forest	G5	S?	
Salix bebbiana	montane willow carr	G3	SU	
Salix brachycarpa/Carex aquatilis-Carex utriculata	subalpine willow carr	GU	S3S4	
*Salix drummondiana/*mesic forb	montane riparian shrubland	G4	S4	
*Salix exigua/*barren soil	coyote willow/bare soil	G5	S5	
Salix geyeriana/Carex aquatilis	montane willow carr	G3?	SU	
*Salix geyeriana/*mesic forb	montane willow carr	G3	SU	
Salix geyeriana-Salix monticola/Calamagrostis canadensis	montane willow carr	G3	S3	
Salix geyeriana-Salix monticola/mesic graminoid	montane riparian willow carr	GU	S3	
*Salix monticola/*mesic graminoid	montane willow carr	G4	S4	
Salix monticola/Calamagrostis canadensis	montane willow carr	G3	S3	
Salix planifolia/Calamagrostis	subalpine willow carr	G4	S4	

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
canadensis				
Salix planifolia/Caltha leptosepala	montane willow carr	GU	SU	
Salix planifolia/Carex aquatilis	montane willow carr	GU	S?	
Salix planifolia/Deschampsia cespitosa	montane willow carr	G2G3	S3	
Amphibians				
Bufo boreas pop 1	**boreal toad (Southern Rocky Mountain population)**	**G5T2Q**	**S1**	**(C), E**
Rana pipiens	**northern leopard frog**	**G5**	**S3**	**SC**
Birds				
Accipiter cooperii *	Cooper's hawk *	G4	S3S4B,S4N	
Accipiter gentilis	**northern goshawk**	**G5**	**S3B,SZN**	
Accipiter striatus *	sharp-shinned hawk *	G5	S3S4B,S4N	
Aegolius funereus	**boreal owl**	**G5**	**S2B**	
Amphispiza belli	sage sparrow	G5	S3B,SZN	
Aquila chrysaetos *	golden eagle *	G5	S3S4B, S4N	
*Asio otus**	long-eared owl	G5	S3S4B, S	
Circus cyaneus	northern harrier	G5	S3B,SN	
*Contopus borealis**	olive-sided flycatcher*	G5	S3S4B,S	
Cypseloides niger	**black swift**	**G4**	**S3B**	
Falco mexicanus *	prairie falcon *	G4G5	S3S4B,S4N	
Falco peregrinus anatum	**American peregrine falcon**	**G4T4**	**S2B, SZN**	**T**
Haliaeetus leucocephalus	**bald eagle**	**G4**	**S1B, S3N**	**(LT), T**
Lanius ludovicianus	loggerhead shrike	G4G5	S3S4B,SZN	
Larus delawarensis	ring-billed gull	G5	SHB, SZN	
*Leucosticte australis**	brown-capped rosy-finch*	G4	S3S4B, S	
Pandion haliaetus	osprey	G5	S3B, SZN	
Pelecanus erythrorhynchos	American white pelican	G3	S1B,SZN	SC
Picoides tridactylus *	three-toed woodpecker *	G5	S3S4	
Porzana carolina *	sora *	G5	S3S4B,SZN	
Progne subis	purple martin	G5	S3B, SZN	
Spiza americana	dickcissel	G5	S3B, SZN	
Strix occidentalis lucida	Mexican spotted owl	G3T3	S2S3, SZN	
Fish				
Catostomus plebeius	Rio Grande sucker	G4	S1	E
Gila pandora	**Rio Grande chub**	**G3**	**S1**	**SC**
Oncorhynchus clarki pleuriticus	**Colorado river cutthroat**	**G4T2T3**	**S2**	**SC**
Oncorhynchus clarki virginalis	**Rio Grande cutthroat**	**G4T2**	**S2**	**SC**
Mammals				
Corynorhinus townsendii pallescens	pale lump-nosed bat	G4T4	S2	
Cynomys gunnisoni gunnisoni	Gunnison's prairie dog subsp.	G5T?	S3	
Felis lynx canadensis	**lynx**	**G5**	**S1**	**E**
Sorex nanus	dwarf shrew	G4	S2S3	
Insects				
Amblyscirtes simius	simius roadside skipper	G4	S3	
Boloria acrocnema	Uncompahgre fritillary	G2	S2	(LE)

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Cercyonis meadii alamosa	Alamosa satyr butterfly	G5T4?	S2	
Cicindela decemnotata	**a tiger beetle**	**G4**	**S1?**	
Erebia theano demmia	demmia alpine	G4T2	S2	
Euphilotes spaldingi	Spalding's blue	G3G4	S2S3	
Libellula nodisticta	hoary skimmer	G3	S1	
Oeneis alberta	alberta arctic	G5	S3	
Oeneis jutta reducta	jutta arctic	G5TU	S1	
Oeneis polixenes	polixenes arctic	G5	S3	
Oeneis taygete	white-veined arctic	G5?	S3	
Papilio bairdii *	Baird's swallowtail	G4	S3S4	
Paratrytone snowi	Snow's skipper	G4	S3	
Physa skinneri	Skinner's physa			
Polites caras	Peck's skipper	G5	S1	
Polites rhesus	rhesus skipper	G4	S2S3	
Pyrgus xanthus	mountain checkered skipper	G3G4	S3	
Speyeria cybele cybele	great spangled fritillary	G5T5	S1	
Speyeria nokomis nokomis	Great Basin silverspot butterfly	G4T2	S1	
Mollusks				
Pisidium sanquinichristis	Sangre de Cristo pea clam	G1?	S1	
Valvata sincera	**mossy valvata**	**G?**	**S3**	

* watchlisted

Identify Targeted Inventory Areas

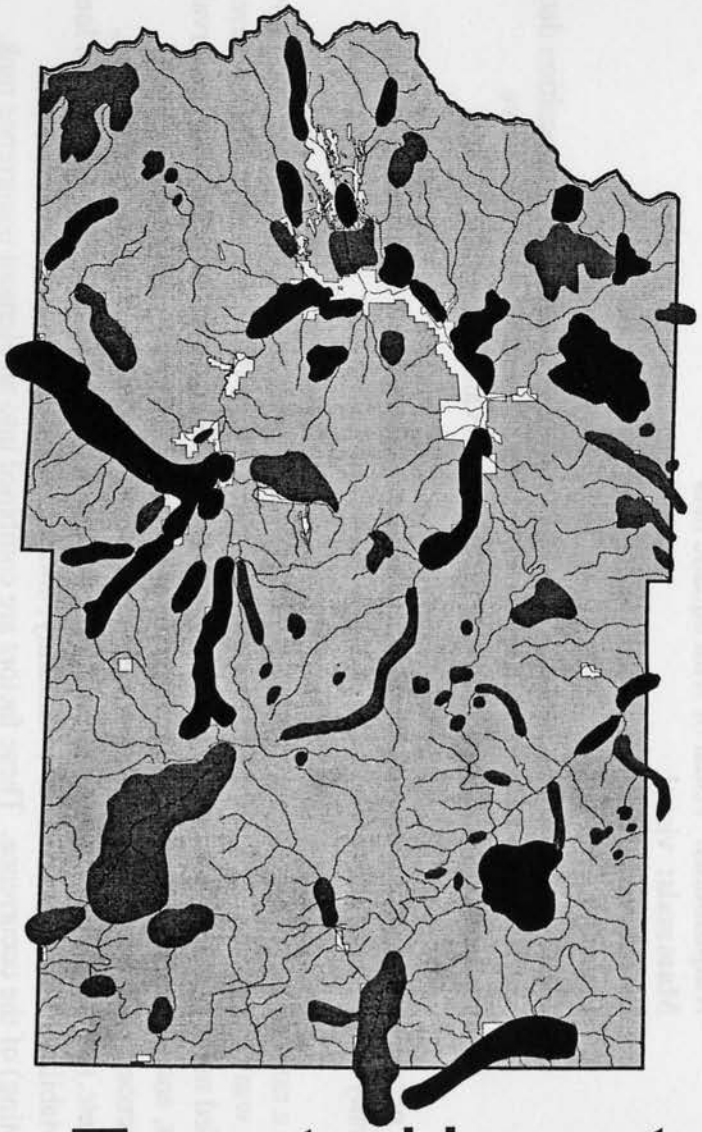
Survey sites were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities. Known locations were targeted, and additional potential areas were chosen using available information sources, such as aerial photography. Precisely known element locations were always included so that they could be verified and updated. Many locations were not precisely known due to ambiguities in the original data, e.g., "headwaters of Goose Creek." In such cases, survey sites for that element were chosen in likely areas in the general vicinity. Areas with potentially high natural values were chosen using aerial photographs, geology maps, vegetation surveys, personal recommendations from knowledgeable local residents, and numerous roadside surveys by our field scientists. Aerial photography is perhaps the most useful tool in this step of the process. High altitude infrared photographs at 1:40,000 scale (National Aerial Photography Program) were used for this project and are well suited for assessing vegetation types and, to some extent, natural conditions on the ground.

Using the biological information stored in the CNHP databases, these information sources were analyzed for sites having the highest potential for supporting specific elements. General habitat types can be discerned from aerial photographs. 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, quarries, and other human modifications.

The above information was used to delineate over 75 survey areas that were believed to have relatively high probability of harboring natural heritage resources. These areas, illustrated on the map of Targeted Inventory Areas (Figure 2), varied in size from less than 10 acres to several thousand acres and include all major habitat types in the study area.

Because of the overwhelming number of Targeted Inventory Areas and limited resources, surveys for all elements were prioritized by the degree of imperilment and land ownership. For example, all 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 were included in the surveys and documented as they were encountered. Higher priority was assigned to Targeted Inventory Areas located on private land.

Additionally, the natural condition of Targeted Inventory areas was evaluated with roadside surveys where possible. For example, the condition of grasslands is especially difficult to discern from aerial photographs, and a quick survey from the road can reveal such features as weed infestation or overgrazing.



Targeted Inventory Area
Visited
Not Visited

Land Ownership
Private
U.S. Forest Service

N
W E
S

10 0 10 Miles

Figure 2. Targeted Inventory Areas

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 records at the Mineral County assessor's office. The Advisory Board, comprised of Mineral County citizens, recorded the landowners and made the initial contact. Landowners were then either contacted by phone or mail 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 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 phenology of the individual elements. It is essential that surveys take place during a time when the targeted elements are detectable. For instance, breeding birds cannot be surveyed outside of the breeding season and plants are often not identifiable without flowers or fruit which are only present during certain seasons.

The methods used in the surveys necessarily 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 in order to capture and document their presence. These are summarized below:

Amphibians: visual or with aquatic nets
Mammals: visual
Birds: visual or by song/call, evidence of breeding sought
Insects: aerial net
Plant communities: visual, collect qualitative or quantitative composition data
Wetland plant communities: visual, collect qualitative or quantitative composition, soil, hydrological, function, and value data

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

When a rare species or significant plant community was detected, its precise location and known extent was recorded on 1:24,000 scale topographic maps. Other data recorded at each occurrence included 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 quality (size, vigor, etc.) of the population or community, the condition or naturalness of the habitat, the long-term viability of the population or community, and the defensibility (ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank,

useful in refining conservation priorities. See the section on Natural Heritage Methodology for more about element occurrence ranking.

Delineate Proposed Conservation Area Boundaries

Since the objective for this inventory is to prioritize specific areas for conservation efforts, boundaries for proposed conservation areas were delineated. Such a boundary is an estimation of the minimum area needed to assure persistence of the element. Primarily, in order to insure the preservation of an element, the ecological processes that support that occurrence must be preserved. The preliminary conservation planning boundary is meant to include features on the surrounding landscape that provide these functions and serve as a starting point for planning long-term protection efforts. Data collected in the field are essential to delineating such a boundary, but other sources of information such as aerial photography are also used. These boundaries are considered preliminary and additional information about the site or the element may call for alterations to the boundaries.

Results

Elements of biodiversity significance

Our study combined with previous inventories of Mineral County reports a large number of biologically significant elements found throughout the county. A total of 63 biologically significant elements have been noted, including 19 plants, 28 plant communities, 2 mammals, 6 birds, 3 fish, 2 amphibians, and 3 invertebrates. See Table 4 for the complete list. These elements of concern and their occurrences provide the foundation for a total of 22 Proposed Conservation Areas that follow. All of the data collected are housed and maintained in the Biological and Conservation Data System (BCD) at the Colorado Natural Heritage Program.

Table 4. List Of Known Elements of Concern For Mineral County by Taxonomic Group. Elements with the highest global significance (G1-G3) are in bold type.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Plants				
Aster alpinus var *vierhapperi*	alpine aster	G5TU	S1	
Astragalus brandegei	Brandegee milkvetch	G5	S1S2	BLM
Botrychium echo	**reflected moonwort**	**G2**	**S2**	**FS**
Botrychium lanceolatum var *lanceolatum*	lance-leaved moonwort	G5T4	S2	
Botrychium lunaria	moonwort	G5	S3	
Botrychium pinnatum	northern moonwort	G4?	S1	
Cryptantha weberi	**Weber's catseye**	**G2**	**S2**	
Draba graminea	**San Juan whitlow-grass**	**G2**	**S2**	
Draba rectifructa	**mountain whitlow-grass**	**G3**	**S2**	
Draba smithii	**Smith whitlow-grass**	**G2**	**S2**	**FS**
Draba streptobrachia	**Colorado Divide whitlow-grass**	**G3**	**S3**	
Erigeron philadelphicus	Philadelphia fleabane	G5	S1	

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Eriophorum altaicum var *neogaeum*	Altai cottongrass	G4T?	S2	FS
Gilia penstemonoides	**Black Canyon gilia**	**G3**	**S3**	**FS**
Goodyera repens	dwarf rattlesnake-plantain	G5	S2	
Lilium philadelphicum	wood lily	G5	S3	
Oenothera kleinii	Wolf Creek evening primrose	GXQ	SX	
Potentilla ambigens	**Southern Rocky Mountain cinquefoil**	**G3**	**S1S2**	
Pyrola picta	pictureleaf wintergreen	G4G5	S3	
Plant Communities				
Abies concolor-Picea pungens-Populus angustifolia/Acer glabrum	**montane riparian forests**	**G2**	**S2**	
Abies lasiocarpa/Erigeron eximius	subalpine forests	G5	S4	
Abies lasiocarpa/Vaccinium myrtillus	subalpine forests	G5	S5	
Abies lasiocarpa-Picea engelmannii/Alnus incana	montane riparian forests	G5	S5	
Abies lasiocarpa-Picea engelmannii/Mertensia ciliata	montane riparian forests	G5	S5	
Abies lasiocarpa-Picea engelmannii/Salix drummondiana	montane riparian forest	G5	S4	
Alnus incana/mesic forb	thinleaf alder/mesic forb riparian shrubland	G3G4Q	S3	
***Alnus incana*-mixed S*alix* species**	**thinleaf alder-mixed willow species**	**G3**	**S3**	
Alnus incana-Salix drummondiana	**montane riparian shrubland**	**G3**	**S3**	
Cardamine cordifolia-Mertensia ciliata-Senecio triangularis	alpine wetlands	G4	S4	
Carex aquatilis	montane wet meadows	G5	S4	
Carex aquatilis-Carex utriculata	montane wet meadows	G4	S4	
Carex utriculata	beaked sedge montane wet meadows	G5	S4	
Danthonia parryi	**montane grasslands**	**G3**	**S3**	
Eleocharis quinqueflora	alpine wetlands	G4	S3S4	
Festuca arizonica-Muhlenbergia filiculmis	**montane grasslands**	**G3**	**S2**	
Festuca arizonica-Muhlenbergia montana	montane grasslands	GU	SU	
Muhlenbergia filiculmis	**montane grasslands**	**G2**	**S2**	
Picea pungens/Alnus incana	**montane riparian forests**	**G3**	**S3**	

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status
Pinus aristata/Festuca arizonica	montane woodlands	G4	S3	
Pinus aristata/Festuca thurberi	**lower montane woodlands**	**G3**	**S2**	
Populus angustifolia-Picea pungens/Alnus incana	**montane riparian forests**	**G3**	**S3**	
Populus angustifolia-Pseudotsuga menziesii	**montane riparian forest**	**G2?**	**S2**	
Pseudotsuga menziesii/Mahonia repens	Douglas fir/creeping Oregon-grape	G5	S1?	
Salix geyeriana/Carex utriculata	Geyer's willow/beaked sedge	G5	S3	
Salix monticola/Carex aquatilis	**montane riparian willow carr**	**G3**	**S3**	
***Salix monticola/*mesic forb**	**montane riparian willow carr**	**G3**	**S3**	
***Salix monticola/*mesic graminoid**	**montane riparian willow carr**	**G3**	**S3**	
Amphibians				
Bufo boreas pop 1	**boreal toad (southern rocky mountain population)**	**G4T1Q**	**S1**	**C, FS, E**
Rana pipiens	northern leopard frog	G5	S3	FS, SC
Birds				
Accipiter gentilis	northern goshawk	G5	S3B,SZN	FS
Aegolius funereus	boreal owl	G5	S2	FS
Cypseloides niger	black swift	G4	S3B	FS
Falco peregrinus anatum	American peregrine falcon	G4T4	S2B,SZN	LE
Haliaeetus leucocephalus	bald eagle	G4	S1B,S3N	LT, T
Nycticorax nycticorax	black-crowned night-heron	G5	S3B,SZN	
Fish				
Gila pandora	**Rio Grande chub**	**G3**	**S1?**	**SC**
Oncorhynchus clarki pleuriticus	**Colorado River cutthroat**	**G5T3**	**S3**	**FS, SC**
Oncorhynchus clarki virginalis	**Rio Grande cutthroat**	**G4T3**	**S3**	**FS, SC**
Mammals				
Cynomys gunnisoni gunnisoni	**Gunnison prairie dog subsp.**	**G5T3**	**S3**	
Felis lynx canadensis	Lynx	G5	S1	C, FS, E
Insects				
Cicindela decemnotata	a tiger beetle	G4	S1?	
Oarisma edwardsii	Edward's skipperling	G4	S3	
Mollusks				
Valvata sincera	mossy valvata	G?	S3	

Our study discovered several new and large locations for Smith whitlow-grass (*Draba smithii)* and Black Canyon gilia (*Gilia penstemonoides*). Both of these Colorado endemic plants have a limited distribution and have only been found in southern Colorado (see Appendix A for distribution map). This study found Smith whitlow-grass and Black Canyon gilia to be fairly common in a few places in Mineral County, making Mineral County an extremely important place for conservation of these plants. In addition to the above two plants, we located the first Mineral County record of the rare Weber's catseye (*Cryptantha weberi),* a G2S2 plant that was only known from Saguache County prior to this study. Another plant, Southern Rocky Mountain cinquefoil (*Potentilla ambigens*) has a limited Colorado distribution, with less than 6 known locations, of which only the Mineral County population contains more than 50 individuals. We found over 2,500 individuals within the Bellows and Goose Creek potential conservation areas.

Mineral County harbors the only known San Luis Valley breeding site of the boreal toad. The Jumper Creek site was home for approximately 1500tadpoles this year (Husung and Alves 1998). This breeding site occurs in road ruts that are spring fed. The Division of Wildlife and Forest Service continue to monitor this site for health and size of the population.

The Rio Grande cutthroat trout and Rio Grande chub are endemic to the Rio Grande basin. Mineral County is an important area for both restocking and brood stock lakes for both of these species. At least two relict populations of Rio Grande cutthroat trout are reported for Mineral County.

Sites of biodiversity significance

In order to protect Mineral County's most biologically important areas, we have delineated 22 proposed conservation sites (Figure 3 and Table 5). These sites include all of the elements of concern found in Mineral County and will serve as an important step in preserving the County's natural heritage.

Of the 22 proposed conservation sites, several stand out as very significant. Table 5 lists all of the proposed conservation sites in order of their biological or conservation significance, i.e., a site with a B1 biodiversity rank is the most irreplaceable and in need of permanent protection, while a site with a B5 biodiversity rank is of general significance. Overall, of the 22 proposed conservation sites, we identified 5 that were ranked as *very significant* (B2), 10 *significant* (B3), 4 *moderate* (B4), and 3 of *general biodiversity significance* (B5). Figure 3 denotes the location of all of Mineral County's proposed conservation areas with their associated B-rank.

All of the element and site data are housed in the Biological and Conservation Data System (BCD) which is maintained by the Colorado Natural Heritage Program. Moreover, geographic information system (GIS) coverage has been created for the sites. This coverage can be provided to Mineral County, upon request.

Table 5. Sites Of Biodiversity Significance.
The following sites, organized by biodiversity rank, were identified during this study. The Biodiversity Significance, Protection Urgency, and Management Urgency Ranks are included. See pages 21-23 for explanation of ranks.

Site Name	Biodiversity Rank	Protection Urgency Rank	Management Urgency Rank
Antelope Park	B2	P2	M3
Bellows Creek	B2	P4	M4
Deep Creek Uplands West	B2	P4	M4
Haven of the Reflected Moonwort	B2	P4	M4
Rat Creek Pond	B2	P4	M4
Bennett Creek	B3	P2	M2
Black Mountain at Pagosa Peak	B3	P4	M2
East Fork Park	B3	P2	M2
Goose Creek	B3	P2	M4
Jumper Creek	B3	P4	M4
North Creede	B3	P2	M4
Piedra River	B3	P3	M3
Six Mile Flats	B3	P2	M3
Spar City	B3	P4	M4
Wolf Creek	B3	P3	M3
Beaver Creek of West Fork San Juan	B4	P4	M4
Himes Creek	B4	P5	M4
Pass Creek at South Fork Rio Grande	B4	P4	M2
Red Mountain Creek	B4	P3	M2
Cutthroat Trout Ponds	B5	P4	M4
Fourmile Creek of San Juan River	B5	P5	M5
San Juan	B5	P4	M5

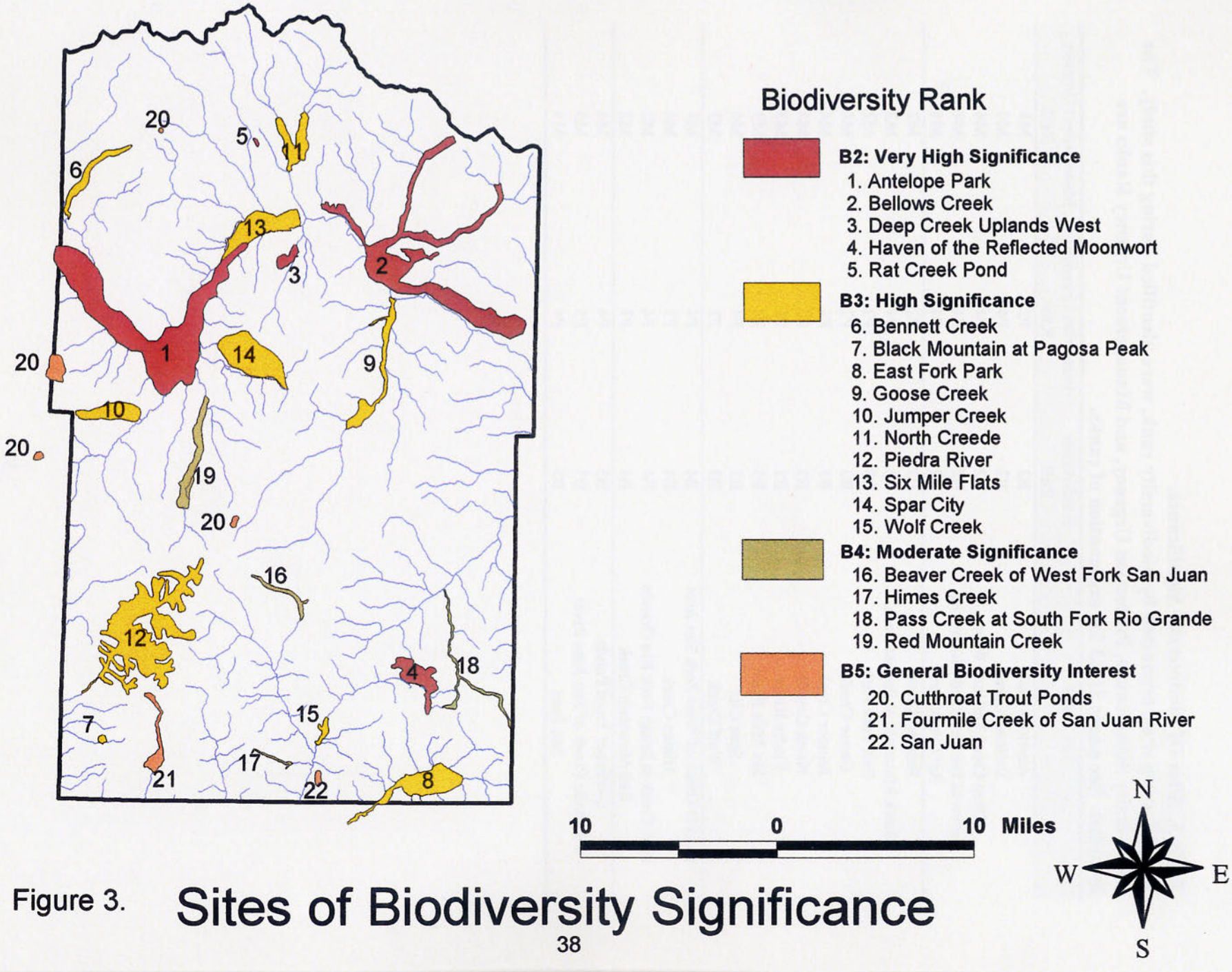


Figure 3. Sites of Biodiversity Significance

Site Profile Explanation

Each preliminary site is described in a standard site report which reflects data fields in CNHP's Biological and Conservation Data System (BCD), used to track rare and imperiled elements. The sections of this report and the contents are outlined and explained below.

Biodiversity Rank (B-rank): The overall significance of the site in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. Please see page 21 for the definitions of the ranks.

Protection Urgency Rank (P-rank): An estimate of the time frame in which conservation protection must occur. This rank generally refers to the need for a major change of protective status (e.g., ownership or designation as a natural area). Please see page 22 for the definitions of the ranks.

Management Urgency Rank (M-rank): An estimate of the time frame in which conservation management must occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (legal, political, or administrative measures). See page 23 for the definitions of the ranks.

Location: General location.

Legal Description: U.S.G.S. 7.5 minute Quadrangle name and Township Range Section(s).

General Description: A brief narrative picture of the topography, vegetation, and current use of the proposed conservation site. Common names are used along with the scientific names. The approximate acreage included within the proposed conservation area boundary for the site is reported.

Biodiversity Rank Justification: A synopsis of the rare species and significant plant communities that occur within the proposed conservation area. A table within the area profile lists each element occurrence found in the site, global and state ranks of these elements, the occurrence ranks and federal and state agency special designations. The species or community that is the primary element of concern is bolded within the table. See Table 1 for explanations of ranks and Table 2 for legal designations.

Boundary Justification: Justification for the location of the proposed conservation area boundary delineated in this report, which includes all known occurrences of natural heritage resources and, in some cases, adjacent lands required for their protection.

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

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

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Proposed Conservation Areas

The following section includes the description of all of the Proposed Conservation Areas that have been identified by CNHP.

The order is as follows:

Proposed Conservation Area	Biodiversity Rank
Antelope Park	B2
Bellows Creek	B2
Deep Creek Uplands West	B2
Haven of the Reflected Moonwort	B2
Rat Creek Pond	B2
Bennett Creek	B3
Black Mountain at Pagosa Peak	B3
East Fork Park	B3
Goose Creek	B3
Jumper Creek	B3
North Creede	B3
Piedra River	B3
Six Mile Flats	B3
Spar City	B3
Wolf Creek	B3
Beaver Creek of West Fork San Juan	B4
Himes Creek	B4
Pass Creek at South Fork Rio Grande	B4
Red Mountain Creek	B4
Cutthroat Trout Ponds	B5
Fourmile Creek of San Juan River	B5
San Juan	B5

Antelope Park

Biodiversity Rank: B2 (Very high significance)
This site contains the wide riparian/wetland floodplain of the Rio Grande, the adjacent montane grasslands, and the rhyolitic cliffs that harbor the Colorado endemic Black Canyon gilia (*Gilia penstemonoides*).

Protection Urgency Rank: P2
Multiple private ranches comprise over 90% of this site (see following ownership map). The majority of the Black Canyon gilia population is on Rio Grande National Forest lands. The primary conservation concern is with the management of the private portions of this site.

Management Urgency Rank: M3
Current management of the private lands is oriented towards working cattle ranches, including irrigation ditches, hay meadows, cattle grazing, and private fishing resorts. Although natural plant communities exist, they have an altered species composition that reduces its natural biodiversity significance. A more natural state would benefit the biological integrity of the Rio Grande floodplain, but of utmost importance is to continue to limit development along this wide valley.

Location: This site is located in the Antelope Park region of the Rio Grande. (See following map for exact location).

U.S.G.S. 7.5 minute quadrangles: Workman Creek; Hermit Lakes; Bristol Head

Legal Description:	T40N, R1W	S 5-8, 17-19, 30
	T40N, R2W	S 3-6, 8-16, 23-26
	T41N, R1W	S 15, 16, 20-22, 28, 29, 31-33
	T41N, R2W	S 19, 20, 28-33
	T41N, R3W	S 24, 25

Elevation: 8,800-9,530 feet Acreage: 11,350

General Description: This site encompasses the broad floodplain of Trout Creek and the Rio Grande as it flows through Antelope Park. The Park is some 10 miles long and over one mile wide in places, with the Rio Grande and Trout Creek swaying back and forth in numerous meanders. Geologists believe Antelope Park was not formed by the Rio Grande, but instead by the terminal moraine of the last glacier some 20,000 thousand years ago (Chronic 1980; Steven and others 1995**)**. The vegetation mirrors the geomorphology and is best characterized as a mosaic of large wet meadows with small patches of willow shrublands. The wet meadows are usually dominated by beaked sedge (*Carex utriculata*), while the willow shrublands are Geyer's willow (*Salix geyeriana*) or Rocky Mountain willow (*S. monticola*). The willow patches are usually restricted to the edge of the main channel.

Adjacent to the wide and open floodplain are uplands of montane grasslands on rolling hills broken up by rhyolitic cliffs. Arizona fescue (*Festuca arizonica*) and slimstem muhly

(*Muhlenbergia filiculmis*) dominate the extensive grasslands. Volcanic cliffs, primarily on the northern side of the valley, harbor the rock-loving and Colorado-restricted Black Canyon gilia plants.

The predominant uses of the site are ranching and recreation. Several ranches are operated as combined cattle ranch/fishing resorts. The Soward Ranch maintains small manmade ponds for rainbow trout fishing; these ponds are important habitat for the mossy valvata snail (*Valvata sincera*), a species that is rare in Colorado. The adjacent streams are not known to harbor the snail.

Wildlife History: In 1875, more than 1,000 pronghorn antelope were counted in Antelope Park (Wason 1926 as cited in USDA Forest Service 1996). The herd in Antelope Park dwindled to a single specimen in 1883 (USDA Forest Service 1936, as cited in USDA Forest Service 1996). Wolverines were shot in Antelope Park and were said to have been common in the 1880's (Cary 1911). Today there are no wolverines left in Mineral County. Many Rocky Mountain sheep were on Bristol Head in the early days, but in 1936 there were only three rams sighted (USDA Forest Service 1936 as cited in USDA Forest Service 1996). Prior to the 1990's there are no reports of moose in Mineral County, but between 1990 and 1993, 100 moose were transplanted onto the Creede Ranger District (USDA Forest Service 1996).

Biodiversity Rank Justification: This site contains six elements of concern at ten locations. The large population of Black Canyon gilia on the cliffs at the northern edge of this site is the primary reason for the high biodiversity rank. Black Canyon gilia has been found in Gunnison, Montrose, Hinsdale and Mineral counties, with approximately 25 known occurrences. (See Appendix A for the global and state distribution maps). Mineral County supports the largest known populations, of which the Antelope Park site is among the best, with over 100 individuals estimated for the area.

In addition to the rare gilia, this site supports a montane willow carr association: Geyer's willow/beaked sedge (*Salix geyeriana*/*Carex utriculata*). Large and numerous stands of beaked sedge wetlands (*Carex utriculata*) occur throughout the site.

The Soward Ranch ponds harbor the only known Mineral County occurrence of the mossy valvata. This snail has a patchy distribution from the eastern U.S. to the Rocky Mountain states and a widespread range within Colorado. (See Appendix A for the global and state distribution maps).

The extensive montane grasslands (*Festuca arizonica-Muhlenbergia filiculmis*) are important range lands for both domestic livestock and wild large game. Within the winter range, Arizona fescue, blue grama (*Bouteloua gracilis*), fringed sage (*Artemisia frigida*), and mountain muhly (*Muhlenbergia montana*) are major components of the bighorn diets that occur in Arizona fescue stands (Shepherd 1975). All of these grasses and forbs are present at this site and the adjacent Six Miles Flat site.

Natural Heritage element occurrences at Antelope Park site. The element responsible for the biodiversity rank is in bold typeface. Multiple listings of elements represent separate locations.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plants						
Gilia penstemonoides	**Black Canyon gilia**	**G3**	**S3**	**FS**	**A**	**1998-07-27**
Plant Communities						
Carex utriculata	Beaked sedge montane wet meadows	G5	S4		B	1998-08-12
Festuca arizonica-Muhlenbergia filiculmis	Montane grasslands	G3	S2		C	1998-07-24
Festuca arizonica-Muhlenbergia montana	Montane grasslands	GU	SU		B	1998-07-27
Salix geyeriana/Carex utriculata	Geyer's willow/beaked sedge	G5	S3		B	1998-07-25
Salix geyeriana/Carex utriculata	Geyer's willow/beaked sedge	G5	S3		B	1998-08-12
Mollusks						
Valvata sincera	Mossy valvata	G?	S3		H	1988-09-17

*EO=Element Occurrence

Further Management Considerations: The Antelope Park site grasslands, in general, exhibit a good cover of Arizona fescue, which is considered to be an indicator of proper grazing management (Judd 1962). "Although not as palatable as other range grasses, Arizona fescue is particularly important because of its abundance and, on many ranges, furnishes much of the forage" (Dayton and others 1937).

Arizona fescue is an obligate outcrosser, so pollen must get from one plant to another to set seed. The maximum distance between plants for seed set is 6-9 ft. Once Arizona fescue plants get more than 9-12 ft apart (Dayton and others 1937), the stand will regress. Johnston (1997) states that at least a thousand years may be necessary to produce an Arizona fescue grassland if the site becomes severely degraded. Care should be taken that the ranges are not overstocked, especially in the dry late spring and early summer period, and that uniform distribution is secured (Dayton and others 1937).

Boundary Justification: The site boundaries are drawn to envelope the floodplain of Rio Grande and Trout Creek at Antelope Park and include the adjacent montane grasslands and volcanic cliffs. Although not contained in the present site boundary, contributory watersheds should be managed to avoid downstream impacts in the Antelope Park site. Further research on the grasslands of Antelope Park may warrant a larger boundary.

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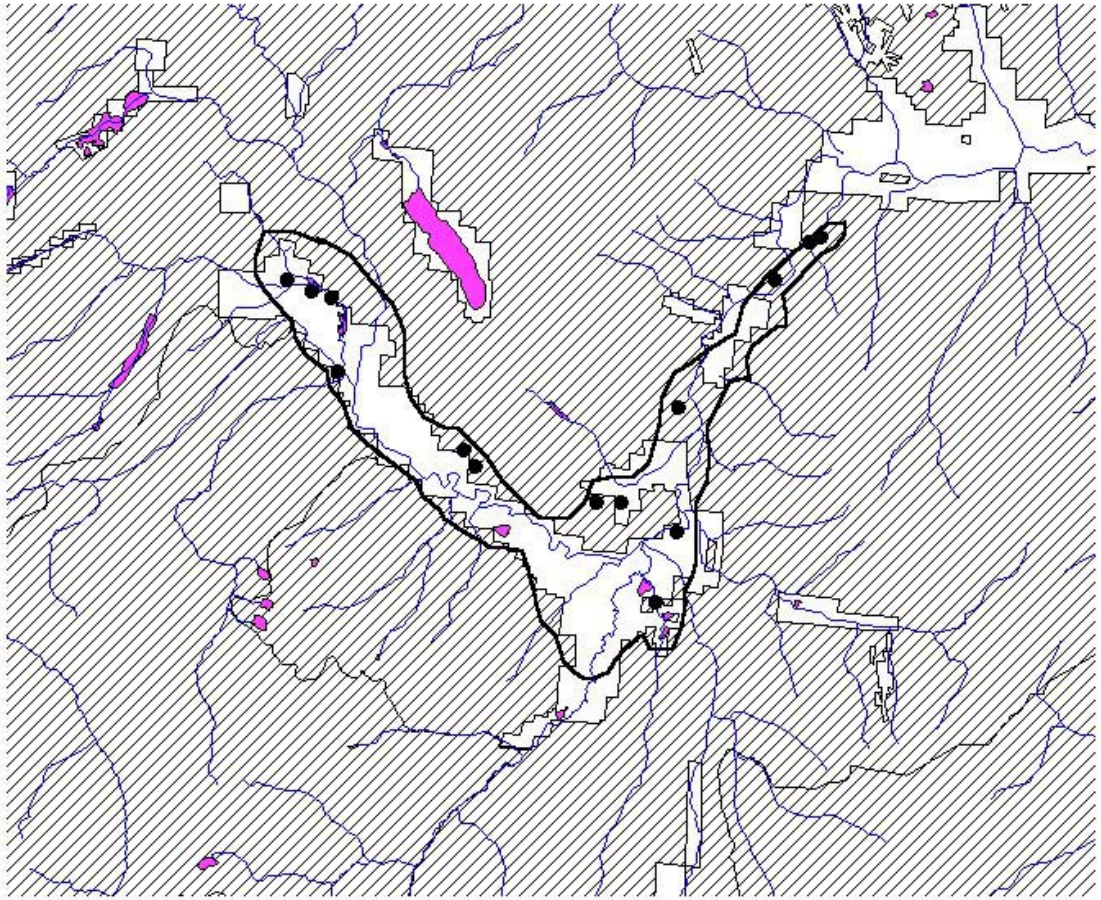
Antelope Park

Ownership Status



5 0 5 10 Miles

Site Boundary

Elements of Concern

Private

U.S. Forest Service

N

W E

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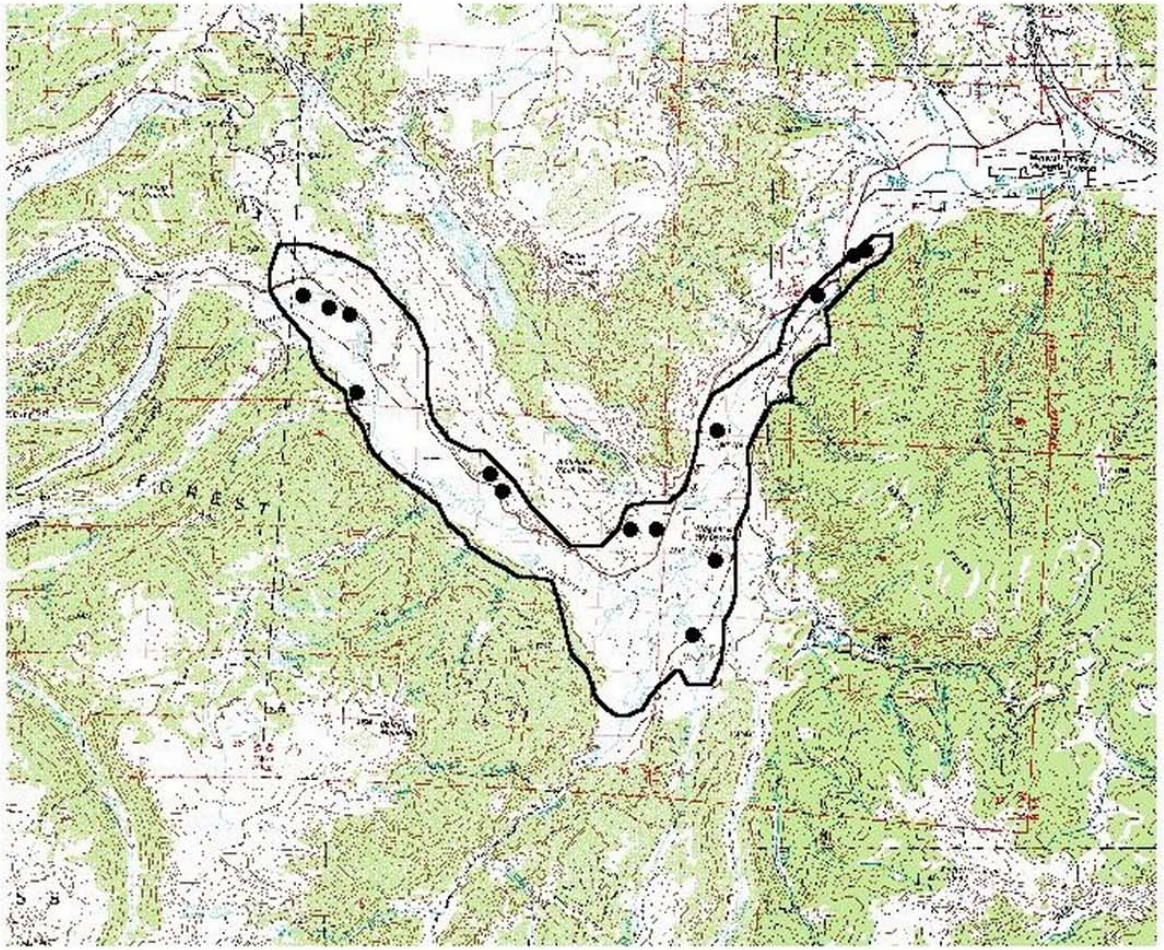
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

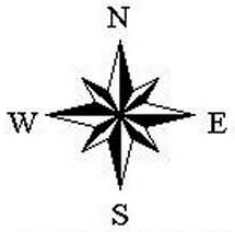
Antelope Park



5 0 5 10 Miles

Site Boundary

Elements of Concern



The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Bellows Creek

Biodiversity Rank: B2 (Very high significance)
The Bellows Creek site contains excellent examples of the globally rare and Colorado-restricted Smith whitlow grass (*Draba smithii*) and Black Canyon gilia (*Gilia penstemonoides*). Small populations of the Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis)* were found in both West and East Bellows Creek which has high quality riparian plant communities. The grasslands above the cliffs have exemplary occurrences of montane grasslands, while the grasslands adjacent to the Rio Grande support the globally rare Southern Rocky Mountain cinquefoil (*Potentilla ambigens*) and Gunnison prairie dog (*Cynomys gunnisoni gunnisoni*).

Protection Urgency Rank: P4
This site is of mixed ownership (see the following ownership map); the La Garita Ranch owns much of the lower elevations, while the upper elevations are within the La Garita Wilderness Area of the Rio Grande National Forest (see ownership map). The La Garita Ranch supports a conservation easement which precludes known threats for the foreseeable future.

Management Urgency Rank: M4
Current management of the terrestrial elements appears to be adequate, but adjustments may be needed in the future to ensure the viability of the elements. The Rio Grande cutthroat trout have direct competition from brook and rainbow trout (stocked on a regular basis) and would benefit from more intensive management. Elimination of the non-native trout may be impossible, although biologically desirable. The affects of grazing on the Southern Rocky Mountain cinquefoil are unknown. Basic research and monitoring of the shortgrass prairie in which the cinquefoil grows would be useful for identifying management plans.

Location: The Bellows Creek site is located in the northeastern portion of Mineral County and includes Wagon Wheel gap and East and West Bellows Creeks.

U.S.G.S. 7.5 minute quadrangle: Pool Table Road; Wagon Wheel Gap; Creede; South Fork West; Lake Humphreys

Legal Description:	T40N, R2E	S 1-4
	T41N, R1E	S 1, 4, 5, 9, 10, 12-15, 22-27
	T41N, R2E	S 2, 3, 7-10, 16-20, 28-36
	T42N, R1E	S 36
	T42N, R2E	S 17, 19-21, 30, 31, 35
Elevation: 8,400-11,720 feet		Acreage: 9,310

General Description: The Bellows Creek site is diverse, with East and West Bellows Creeks, volcanic cliffs near Wagon Wheel Gap, and grasslands along the Rio Grande and above the cliffs. East and West Bellows Creeks are similar in that they are moderate gradient mountain streams in a V-shaped valley. The creeks have a pool-drop nature with beaver ponds common throughout. Both of these streams provide habitat for the Rio Grande cutthroat trout. Along the banks of these streams are high quality examples of montane

riparian forest (*Abies lasiocarpa-Picea engelmannii/Salix drummondiana*) grading into willow carrs as the two streams join and form a low-gradient and wide floodplain. Large cliffs and talus slopes that support some of the rare flora of the site (Smith whitlow grass and Black Canyon gilia) border both of the creeks. Aside from the small and seldom used trails that parallel the streams, the creeks are unmodified. Below the confluence of East and West Bellows Creeks is a ditch that diverts water into four ponds that are used for maintaining rainbow trout for the fishing resort.

This site also includes shortgrass prairie adjacent to the Rio Grande. Although limited in area due to the geology, several rare or imperiled species use this habitat, including the Southern Rocky Mountain cinquefoil and the Gunnison prairie dog. Above the shortgrass prairie, cliffs constituting remnants of the 25 to 30 million year old caldera (Chronic 1980) tower 200 to 2000 feet above the flats. This dramatic scenery provides essential habitat for the rare plants as well as the vulnerable peregrine falcon (*Falco peregrinus anatum*). Sloping benches break up the cliff line and provide for Arizona fescue (*Festuca arizonica*) grasslands. Above these cliffs and benches a grassland mosaic with Parry's oatgrass (*Danthonia parryi*), Arizona fescue and slimstem muhly (*Muhlenbergia filiculmis*) occupies thousands of acres. Surrounding the montane grasslands is a montane forest of aspen (*Populus tremuloides*), Douglas fir (*Pseudotsuga menziesii*), and Engelmann spruce (*Picea engelmannii*), with occasional pondersosa pine (*Pinus ponderosa*) or bristlecone pine (*Pinus aristata*) patches.

The primary use of this land is private and public recreation. The La Garita Ranch supports a long-standing private fishing resort, while the adjacent Forest Service lands have general recreation use, including hiking, camping, hunting, and sightseeing (especially for Wheeler Geologic Area). Pool Table Road, a popular two-track road that leads to Wheeler Geologic Area, intersects with the eastern portion of this site. The upper elevations of this site are within the La Garita Wilderness Area.

Biodiversity Rank Justification: A total of 12 elements of concern were found in 25 separate locations within the Bellows Creek site. The most outstanding of these elements are the globally rare plants. Two Colorado endemic plant species: Smith whitlow-grass and Black Canyon gilia have some of the largest known populations at the Bellows Creek site. The Smith whitlow-grass has been found in Mineral, Saguache, Costilla, and Las Animas counties, with approximately 15 known occurrences. (See Appendix A for the global and state distribution maps). Of the known occurrences, Mineral County harbors the largest populations, and Bellows Creek site is the exemplary site for this species, with at least 500 individuals estimated.

The Black Canyon gilia has been found in Gunnison, Montrose, Hinsdale and Mineral counties with approximately 25 known occurrences. (See Appendix A for the global and state distribution maps). Mineral County supports the largest known populations, of which the Bellows Creek site is among the best, with over 100 plants counted and an estimated population near one thousand.

In addition to the Colorado endemics, the Southern Rocky Mountain cinquefoil is another globally rare plant that was found at the site. This member of the rose family is restricted to Wyoming, Colorado, and New Mexico. It has been found only once in Wyoming, while it has been found in four counties in both Colorado and two counties in New Mexico (Colorado Natural Heritage Program 1998). Only a few of the documented occurrences note numbers of individuals: two plants in Larimer County, 50 to 100 in El Paso County, and thousands of plants in Mineral County. Bellows Creek and the adjacent Goose Creek site harbor the largest known population with 500 and 2,000 plants respectively. Of special interest is the fact that over 90% of the habitat for the Southern Rocky Mountain cinquefoil on these two sites is privately owned.

Also noteworthy are the high quality and large occurrences of the montane grasslands. The Parry's oatgrass occupies extensive areas above the cliffs. Parry's oatgrass is one of the most palatable native grasses in Colorado (DeVelice and others 1986) and a decreases in abundance with grazing use (Johnston 1997). Parry's oatgrass has apparently decreased markedly in area, especially from settlement to World War II. It was already "of scattered occurrence" by the mid-1930's (Dayton and others 1937), but it has started showing up more abundantly following reductions in livestock grazing intensity beginning in the 1950's (Johnston 1997). Mineral County supports several examples of the Parry's oatgrass community, and the Bellows Creeks site is the best of these.

Although the rare plants are responsible for the high biodiversity rank of this site, imperiled or declining mammals, fish, and birds are also represented. A small and genetically unpure population (John Alves, DOW pers. comm.) of the Rio Grande cutthroat trout was found in both East and West Bellows Creek. The declining Gunnison prairie dog occurs in several locations on the shortgrass prairie. The peregrine falcon was observed nesting in 1994 on the cliffs adjacent to Hwy 149, although not observed in 1998.

Natural Heritage element occurrences at Bellows Creek site. Multiple listings of elements represent separate locations. Elements responsible for the biodiversity rank are in bold typeface.

Latin name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plants						
Cryptantha weberi	Weber's catseye	G2	S2		C	1998-07-09
Draba smithii	**Smith whitlow-grass**	**G2**	**S2**	**FS**	**A**	**1998-07-09**
Draba smithii	Smith whitlow-grass	G2	S2	FS		
Draba smithii	Smith whitlow-grass	G2	S2	FS	A	1998-07-12
Draba smithii	Smith whitlow-grass	G2	S2	FS	A	1998-07-09
Draba smithii	Smith whitlow-grass	G2	S2	FS	A	1998-07-09
Gilia penstemonoides	**Black Canyon gilia**	**G3**	**S3**	**FS**	**A**	**1998-07-09**
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	A	1998-07-10
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	A	1998-07-09
Gilia penstemonoides	Black Canyon gilia	G3	S3		A	1998-07-09

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	A	1998-07-09
Potentilla ambigens	**Southern Rocky Mountain cinquefoil**	**G3**	**S1S2**		**B**	**1998-07-09**
Potentilla ambigens	Southern Rocky Mountain cinquefoil	G3	S1S2		C	1998-07-09
Potentilla ambigens	Southern Rocky Mountain cinquefoil	G3	S1S2		C	1998-07-10
Potentilla ambigens	Southern Rocky Mountain cinquefoil	G3	S1S2		U	1996-08-18
Plant communities						
Abies lasiocarpa-Picea engelmannii/Salix drummondiana	Montane riparian forest	G5	S4		B	1998-07-12
Danthonia parryi	**Montane grasslands**	**G3**	**S3**		**A**	**1998-08-10**
Festuca arizonica-Muhlenbergia filiculmis	**Montane grasslands**	**G3**	**S2**		**A**	**1998-08-10**
Festuca arizonica-Muhlenbergia montana	Montane grasslands	GU	SU		C	1998-07-09
Salix monticola/Carex aquatilis	Montane riparian willow carr	G3	S3		A	1995-08-09
Birds						
Falco peregrinus anatum	American peregrine falcon	G4T4	S2B,SZN	LE		1994-07-15
Fish						
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS, SC	C	1998-07-12
Mammals						
Cynomys gunnisoni gunnisoni	Gunnison prairie dog subsp.	G5T3	S3		C	1998-07-10
Cynomys gunnisoni gunnisoni	Gunnison prairie dog subsp.	G5T3	S3		C	1998-07-10
Cynomys gunnisoni gunnisoni	Gunnison prairie dog subsp.	G5T3	S3		C	1998-07-10

*EO=Element Occurrence

Boundary Justification: The site boundary includes the cliffs, talus slopes, grasslands, and riparian areas that harbor the elements of concern. It also includes nearby suitable habitat that has not been thoroughly inventoried, but is likely to include many of the elements of concern. The site boundary was based on initial aerial photo analysis, a field visit by CNHP, and subsequent validation with a digital elevation model and 7.5 minute topographical maps.

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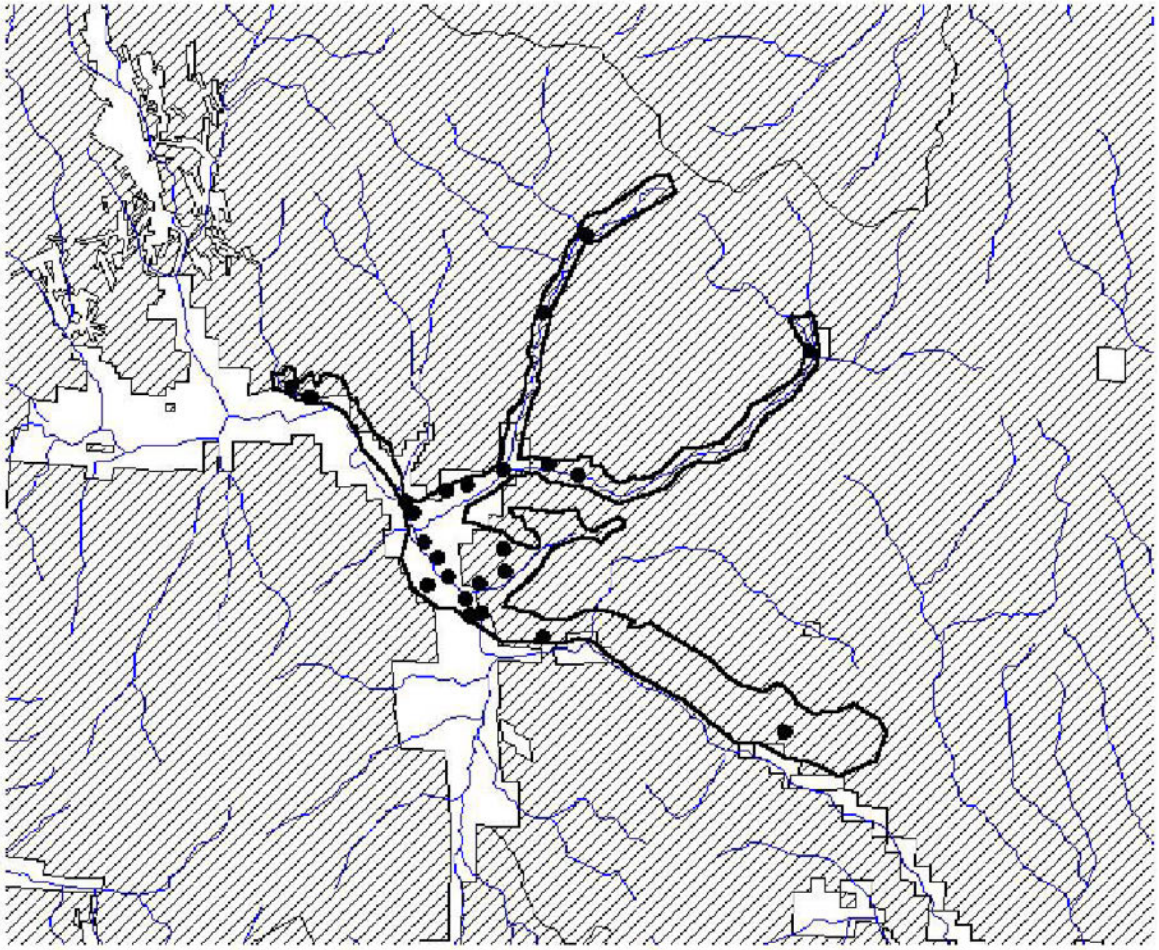
Smith whitlow grass (Draba smithii).

Black Canyon Gilia (*Gilia penstemonoides*)

Montane grasslands of Bellows Creek site.

Bellows Creek

Ownership Status



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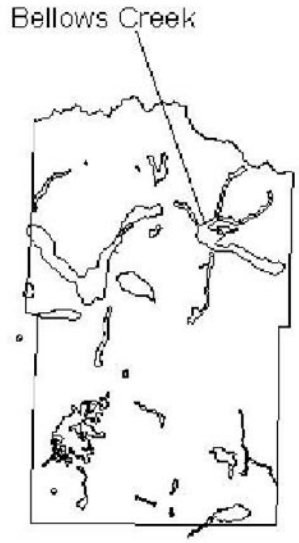

Site Boundary

Elements of Concern

Private

U.S. Forest Service

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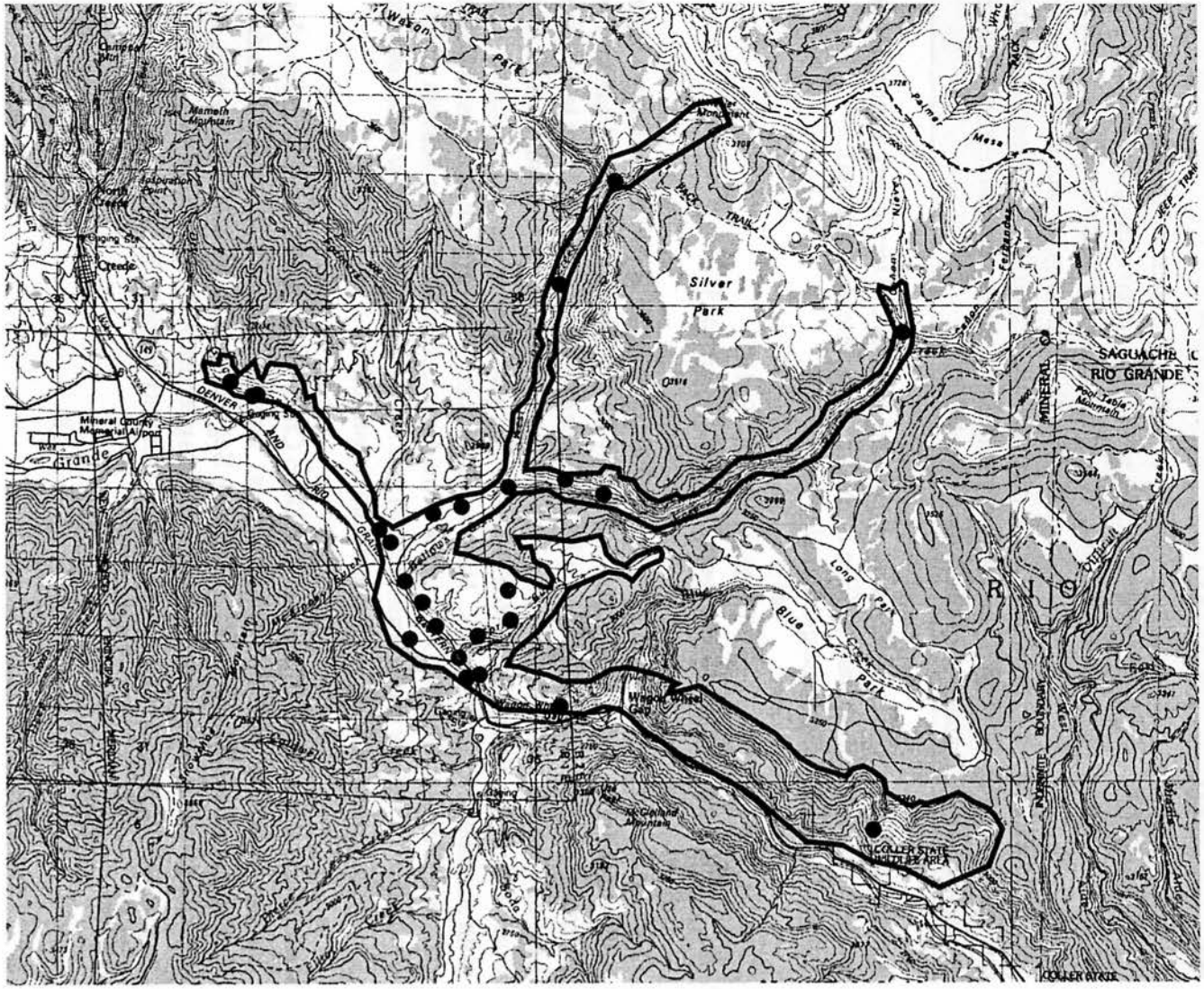
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Bellows Creek



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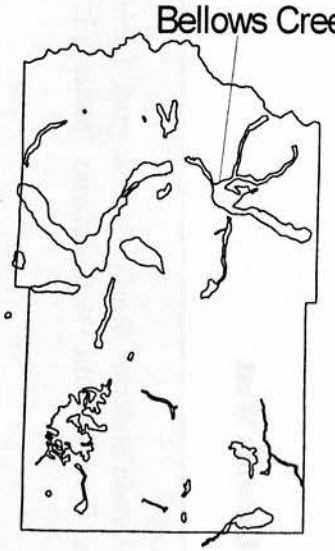

Site Boundary

Elements of Concern

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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Deep Creek Uplands West

Biodiversity Rank: B2 (Very high significance)
This site supports a large population of the Colorado endemic Smith whitlow-grass (*Draba smithii*) and a healthy stand of bristlecone pine (*Pinus aristata*) with Arizona fescue (*Festuca arizonica*).

Protection Urgency Rank: P4
The Rio Grande National Forest owns and manages the entire site (see following ownership map), although the Forest Service does not have a management plan for this specific area.

Management Urgency Rank: M4
Current land use practices (light recreation by hikers and hunters) at this site are not endangering the rare plants. This site does not appear to have any stresses on the rare elements. If present land uses continue, monitoring the abundance of the population every 5-10 years would suffice. A baseline count of Smith whitlow-grass would help to identify a threshold population size that should be maintained. Research on pollination, seed dispersal, predators, seed germination, and longevity is needed. As the natural history of the plant becomes known, management plans may be refined.

Location: The rhyolitic cliffs, talus slopes and uplands of Deep Creek approximately 1.6 miles south of the Rio Grande. (See following map for exact location).

U.S.G.S. 7.5 minute quadrangle: Creede
Legal Description: T41N R1W S 13, 24
T41N R1E S 18, 19
Elevation: 9,080-10,480 feet Acreage: 415

General Description: The Deep Creek Uplands West site is part of a montane valley oriented south to north. Steep slopes with rhyolitic cliffs provide limited habitat for the narrowly restricted Black Canyon gilia (*Gilia penstemonoides*), while the talus slopes at the base of the cliffs harbor excellent habitat for the Colorado endemic Smith whitlow-grass. Surrounding the cliffs are forested slopes of Douglas fir (*Pseudotsuga menziesii*) interspersed with Arizona fescue grasslands. Near the ridge top, the vegetation changes to bristlecone pine with Arizona fescue. Deep Creek provides excellent habitat for beavers which use the Drummond's willow (*Salix drummondii*) and Rocky Mountain willow (*Salix monticola*) found beside the stream for food and dam construction.

Biodiversity Rank Justification: The Deep Creek Uplands West site includes a large and healthy occurrence of Smith whitlow-grass. This herbaceous mustard has been found only in the southern Colorado counties of Mineral, Saguache, Costilla, and Las Animas, totaling approximately 15 known occurrences. (See Appendix A for the global and state distribution maps). Of the known occurrences, Mineral County harbors the largest documented populations, and the Deep Creek site is among the best of these, with an estimated 500 individuals.

The Black Canyon gilia has been found in Gunnison, Montrose, Hinsdale and Mineral counties, with approximately 25 known occurrences. (See Appendix A for the global and state distribution maps). Mineral County supports the largest known populations, however Deep Creek supports a small population.

Natural Heritage element occurrences at the Deep Creek Uplands West site. The element responsible for the site's high biodiversity rank is in bold typeface.

Latin name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plants						
Draba smithii	Smith whitlow-grass	G2	S2	FS	A	1998-07-27
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	C	1998-07-27
Plant communities						
Pinus aristata/Festuca arizonica	Montane woodlands	G4	S3			1998-07-28

*EO=Element Occurrence

Future Research Needs: We know that Smith whitlow-grass grows well on steep rocky slopes, often of volcanic origin, and that it has a large elevation range of 8000-11,000 feet (Spackman and others 1997). These criteria are met throughout the San Juan Mountains, yet the plant is rarely present. Future studies are needed to help understand what other factors are limiting this plant to so few sites.

Boundary Justification: Deep Creek Uplands West site includes the known occurrences of the two globally rare plants and the montane woodlands. In addition, nearby suitable habitat for the elements has been included within this boundary. We used on-the-ground inventory and 7.5 minute topographic map to delineate the boundary.

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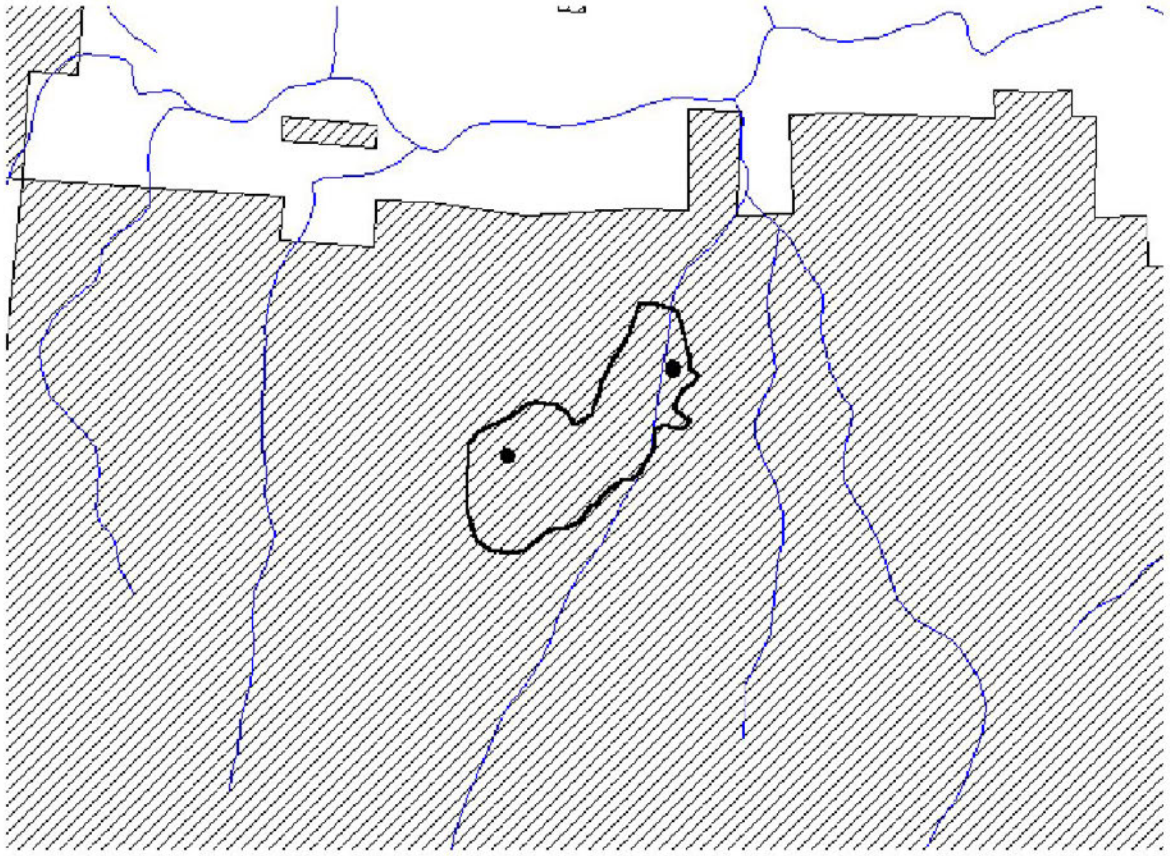
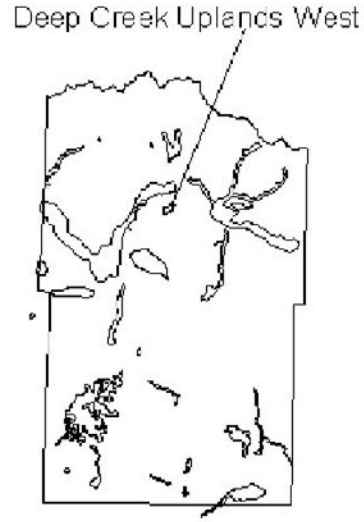
Deep Creek Uplands West

Ownership Status





Site Boundary

Elements of Concern

Private

U.S. Forest Service

N

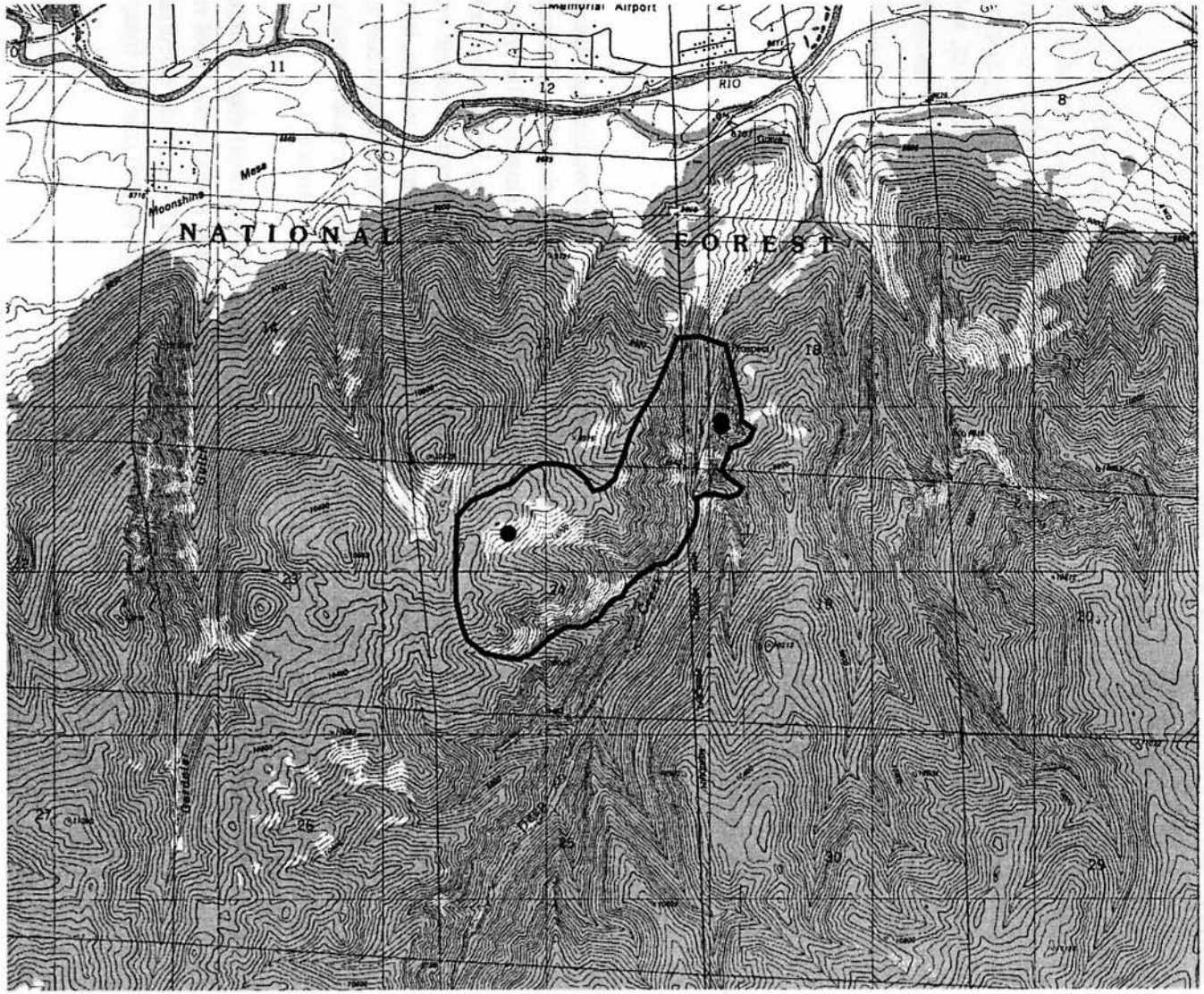
W E

S

1 0 1 2 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Deep Creek Uplands West



1 0 1 2 Miles

Deep Creek Uplands West

Site Boundary

Elements of Concern

N
W E
S

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Haven of the Reflected Moonwort

Biodiversity Rank: B2 (Very high significance)
This site includes four rare plant species, all in the genus *Botrychium,* (moonworts). Members of the moonwort (fern) family are often found together in naturally or human disturbed sites. This site contains the globally rare reflected moonwort (*Botrychium echo*) and three moonwort species that are rare in Colorado but globally common.

Protection Urgency Rank: P4
The site is within the Rio Grande National Forest. Immediate threats to the moonworts at this site are unknown but the noted stability of the moonwort population may imply low threats. See following map for ownership.

Management Urgency Rank: M4
Surrounding potential habitat should be surveyed for additional individuals. Moonworts are adapted to sites with indirect natural disturbance, however, direct impacts to individual plants should be avoided. Road maintenance on the secondary road may affect these occurrences. A baseline count of reflected moonwort would help to identify a threshold population size that should be maintained or increased. Research on predators, seed germination, and longevity is needed. As the natural history of the plant becomes known, management plans for this species may be refined.

Location: At the summit of Wolf Creek Pass. See following map for exact location.
U.S.G.S. 7.5 minute quadrangle: Wolf Creek Pass; Mount Hope

Legal Description:	T37N R2E	S 4, 5, 6, 8
	T38N R1E	S 25, 36
	T38N R2E	S 31, 32, 33
Elevation: 10,400-11,870 feet		Acreage: 1,515

General Description: The Haven of the Reflected Moonwort site is within the subalpine zone, primarily south-facing with a 10-20% slope. Surface rock is primarily volcanic ash/tuff and scattered Engelmann spruce (*Picea engelmannii*) dominate the slopes. The sparsely vegetated and gravelly openings within the forest provide ideal habitat for the moonworts. A two-track dirt road winds up from Hwy 160 to the Radio Towers, a popular scenic side road for tourists traveling over Wolf Creek Pass. Some selected tree cutting is visible, but the area has never been clearcut. Part of Wolf Creek ski area is included in this site and has a known occurrence of moonworts. Many of the rare plants were found above or below road cuts on lands that were disturbed at least 25 years ago (D. Earhardt, pers. comm.).

Biodiversity Rank Justification: The Haven of the Reflected Moonwort site includes four rare moonwort species, of which reflected moonwort, *Botrychium echo,* is the most rare. Reflected moonwort has the most limited distribution, with only 19 locations documented (Colorado Natural Heritage Program 1998). Of the 19 locations, all but one are from the Colorado Rocky Mountains (Colorado Natural Heritage Program 1998), but the Flora of

North America (1993) shows the range as northern Arizona, western Colorado and eastern Utah. (See Appendix A for global and state distribution maps).

Natural Heritage elements at the Haven of the Reflected moonwort site. Multiple listings represent separate locations. The element responsible for the high biodiversity rank is in bold typeface.

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plants						
Botrychium echo	**Reflected moonwort**	**G2**	**S2**	**FS**	**B**	**1998-07-25**
Botrychium echo	Reflected moonwort	G2	S2	FS		1998-07-16
Botrychium echo	**Reflected moonwort**	**G2**	**S2**	**FS**		**1998-07-25**
Botrychium lanceolatum var *lanceolatum*	Lance-leaved moonwort	G5T4	S2		B	1996-07-25
Botrychium lanceolatum var *lanceolatum*	Lance-leaved moonwort	G5T4	S2			1996-07-25
Botrychium lunaria	Moonwort	G5	S3		B	1996-07-25
Botrychium lunaria	Moonwort	G5	S3		B	1996-07-25
Botrychium pinnatum	Northern moonwort	G4?	S1			1996-07-25

*EO=Element Occurrence

Boundary Justification: The boundary was drawn to encompass the occurrences of the moonworts and adjacent suitable habitat. The site boundary was based on initial aerial photo analysis, a field visit by CNHP, and inspection of the 7.5 minute topographical map.

Further Management and Research Considerations: There is some recreational use of the area concentrated along the roads. Although this site does not appear to be threatened at this time, this could change if substantial recreational impacts or road development occurred. If present land uses continue, it should be sufficient to monitor the abundance of the population every 5-10 years. Dean Erhardt, ecologist with the Rio Grande National Forest, is monitoring on a yearly basis for presence/absence of the population. We suggest adopting a monitoring protocol that would quantify changes of 20-50% relative to the 1998 density over a five-year period.

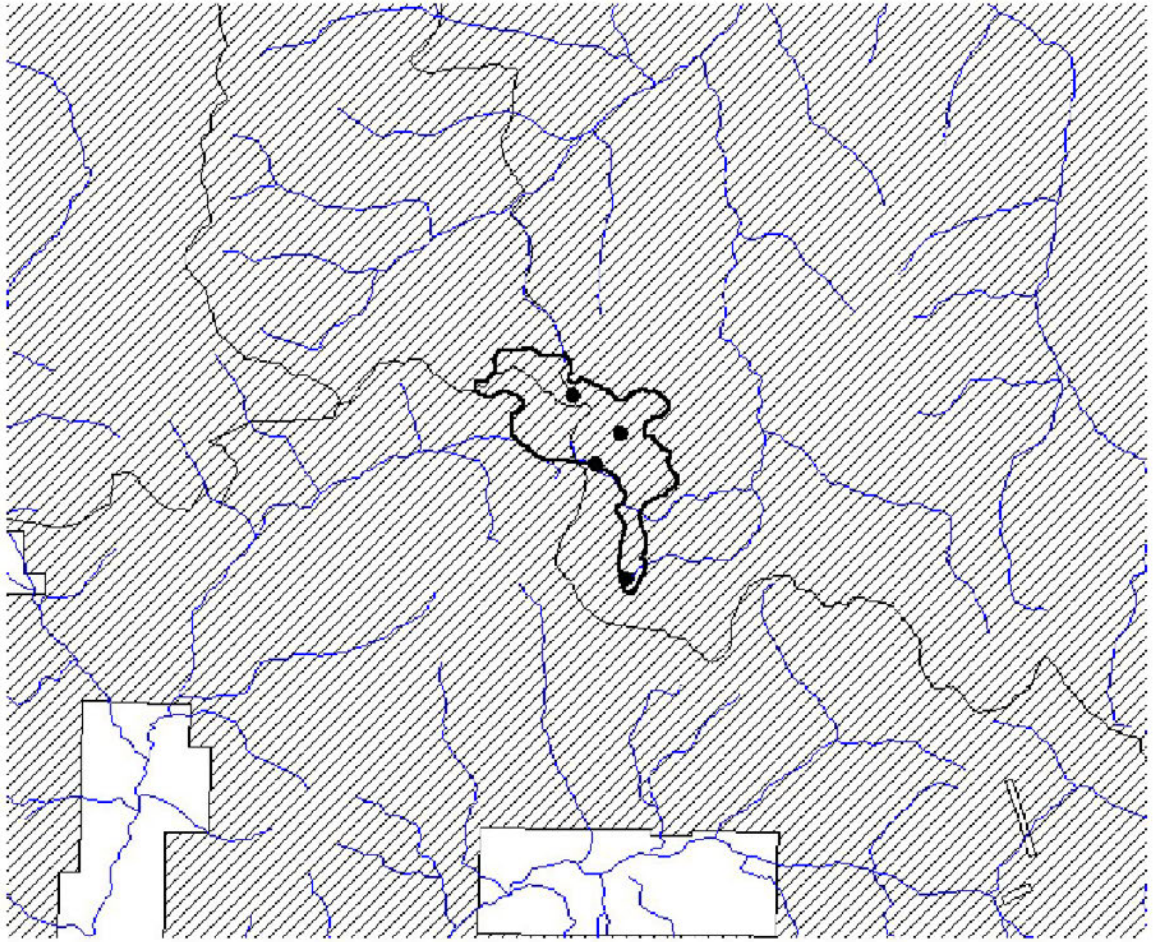
Literature cited

Colorado Natural Heritage Program, 1998, Biological and Conservation Data System: Fort Collins, CO, Colorado Natural Heritage Program.

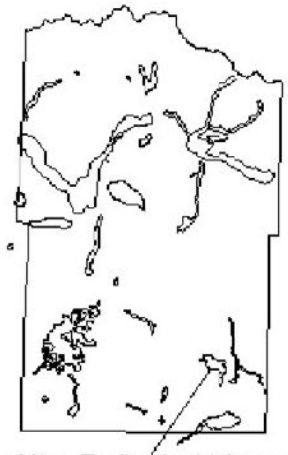
Flora of North America Editorial Committee, 1993, Flora of North America, north of Mexico, Vol 2: New York, New York, Oxford University Press, Inc.

Haven of the Reflected Moonwort

Ownership Status



1 0 1 2 3 4 5 Miles



Haven of the Reflected Moonwort

Site Boundary

Elements of Concern

Private

U.S. Forest Service

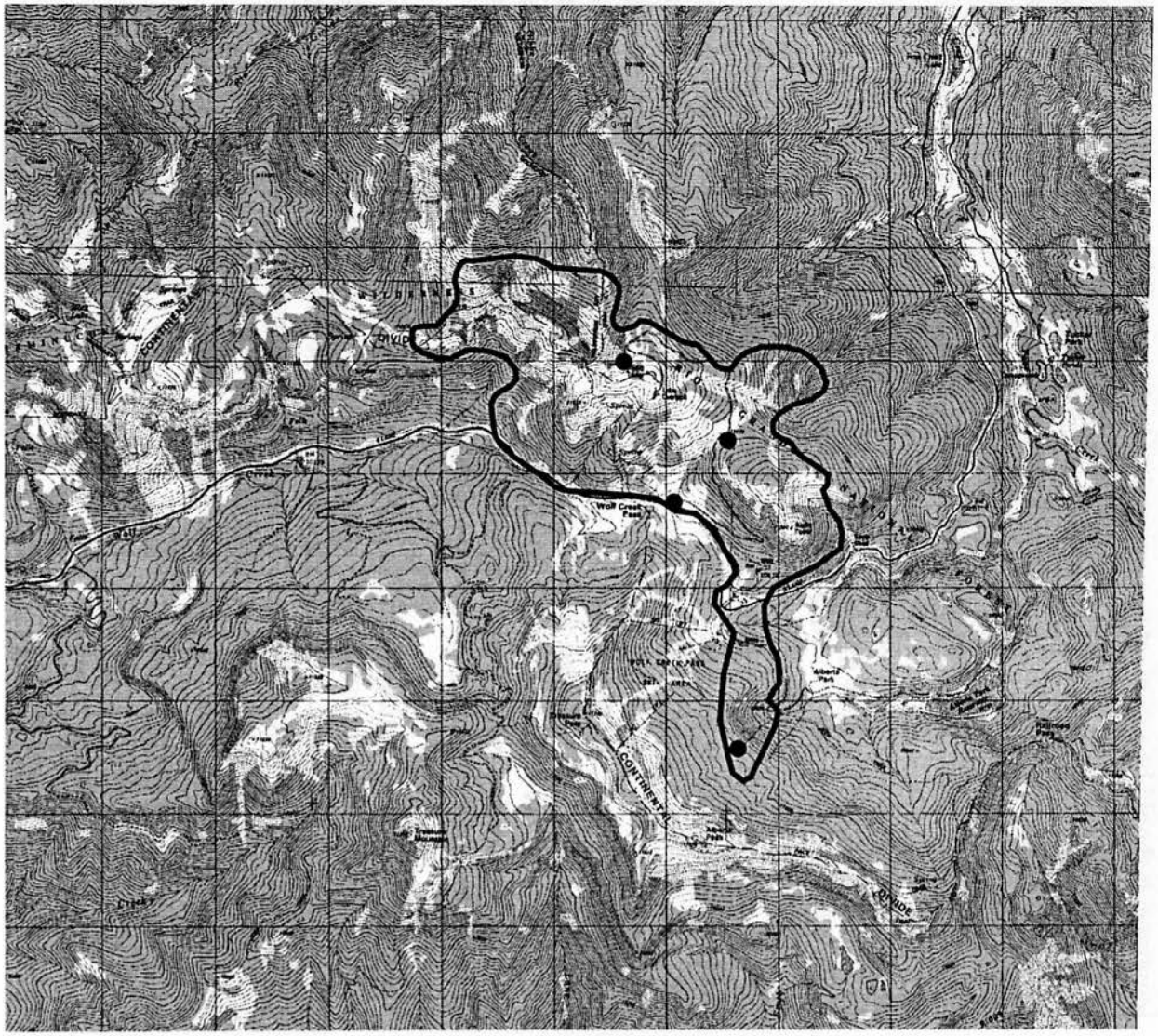
N

W E

S

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Haven of the Reflected Moonwort



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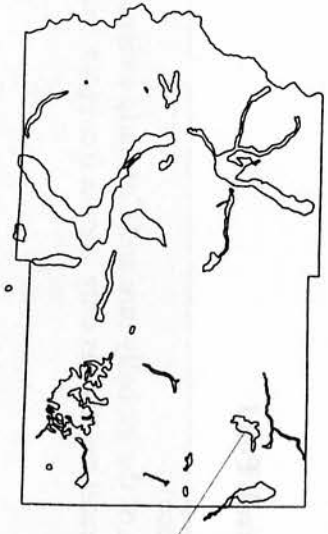

Haven of the Reflected Moonwort

Site Boundary

Elements of Concern

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W E
S

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Rat Creek Pond

Biodiversity Rank: B2 (Very high significance)
This site supports a medium sized population of the globally rare and Colorado endemic Smith whitlow-grass (*Draba smithii*). This small mustard is only known from four counties in southern Colorado.

Protection Urgency Rank: P4
The site is completely within the Rio Grande National Forest and no threats are foreseen in the near future. A four-wheel drive road used for recreation bisects the site. Alteration or improvements to the road may affect the population of the Smith whitlow-grass.

Management Urgency Rank: M4
Current land use practices at this site are not endangering the rare plant. If present land uses continue, it should be sufficient to monitor the abundance of the population every 5-10 years. We recommend developing a research plan to identify the specific requirements of Smith whitlow-grass, especially for pollination, seed dispersal, predators, seed germination, and longevity. As the natural history of the plant becomes known, management plans for this species should be refined. Any planned changes of the 4-wheel drive road should consider the location of this plant population.

Location: Approximately one mile northwest of Bulldog Mountain above Rat Creek.
U.S.G.S. 7.5 minute quadrangle: San Luis Peak; Creede
Legal Description: T42N R1E S 22, 23
Elevation: 10,400-10,600 feet Acreage: 38

General Description: Rat Creek Pond site is best characterized as small volcanic rock outcrops with talus slopes and a kettle pond. The surrounding vegetation is a montane forest dominated by either Engelmann spruce (*Picea engelmannii*) or aspen (*Populus tremuloides*) with isolated patches of bristlecone pine (*Pinus aristata*). The talus slopes at the base of the rock outcrops as well as on the west-facing slopes of the kettle pond provide excellent habitat for Smith whitlow-grass. The kettle pond was seething with salamanders during our 1998 summer visit. Pikas were common throughout the rocky areas and we observed numerous rodent bites out of the Smith whitlow-grass that may be attributed to the pikas.

Biodiversity Rank Justification: The Rat Creek Pond site includes a large and healthy occurrence of Smith whitlow-grass. Smith whitlow-grass has been found in Mineral, Saguache, Costilla, and Las Animas counties, with approximately 15 known occurrences. (See Appendix A for the global and state distribution maps). Of the known occurrences, Mineral County harbors the largest populations. In 1998, the Colorado Natural Heritage Program estimated 200 individuals within the Rat Creek Pond site.

Natural Heritage element at the Rat Creek Pond site.

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plants						
Draba smithii	Smith whitlow-grass	G2	S2	FS	A	1998-07-27

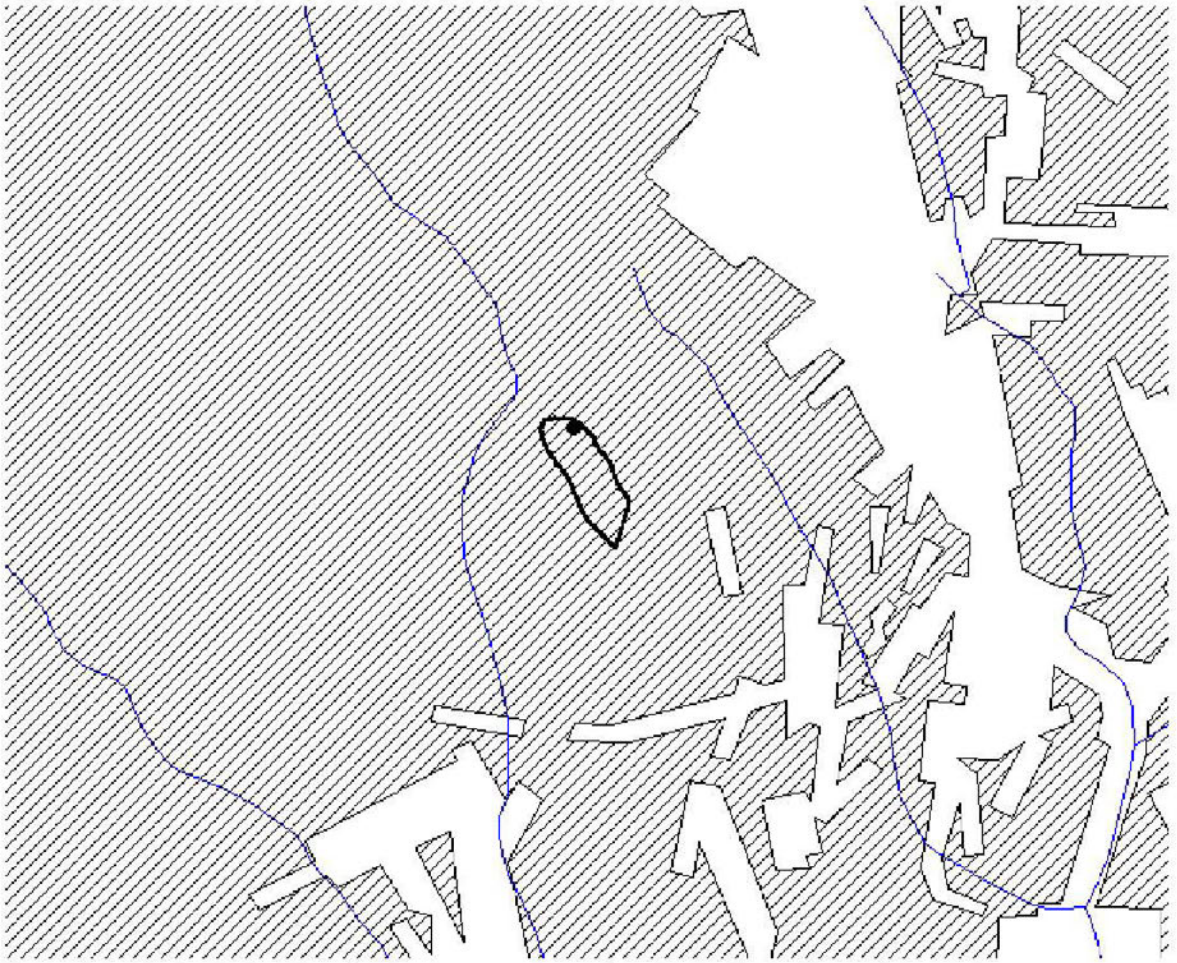
*EO=Element Occurrence

Boundary Justification: The boundary was drawn to encompass the occurrence of the Smith whitlow-grass and adjacent suitable habitat. The site boundary was delineated by an on-the ground survey and referenced to the 7.5 minute topographic map.

Smith whitlow-grass (*Draba smithii*)

Rat Creek Pond

Ownership Status



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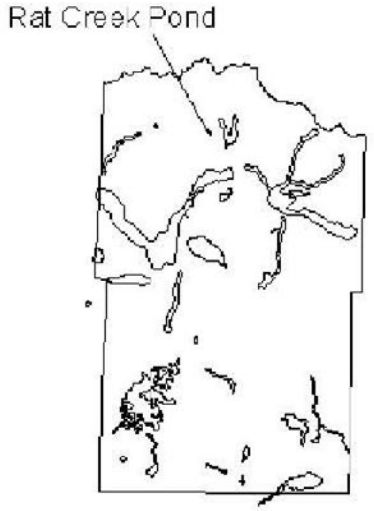

Site Boundary

Elements of Concern

Private

U.S. Forest Service

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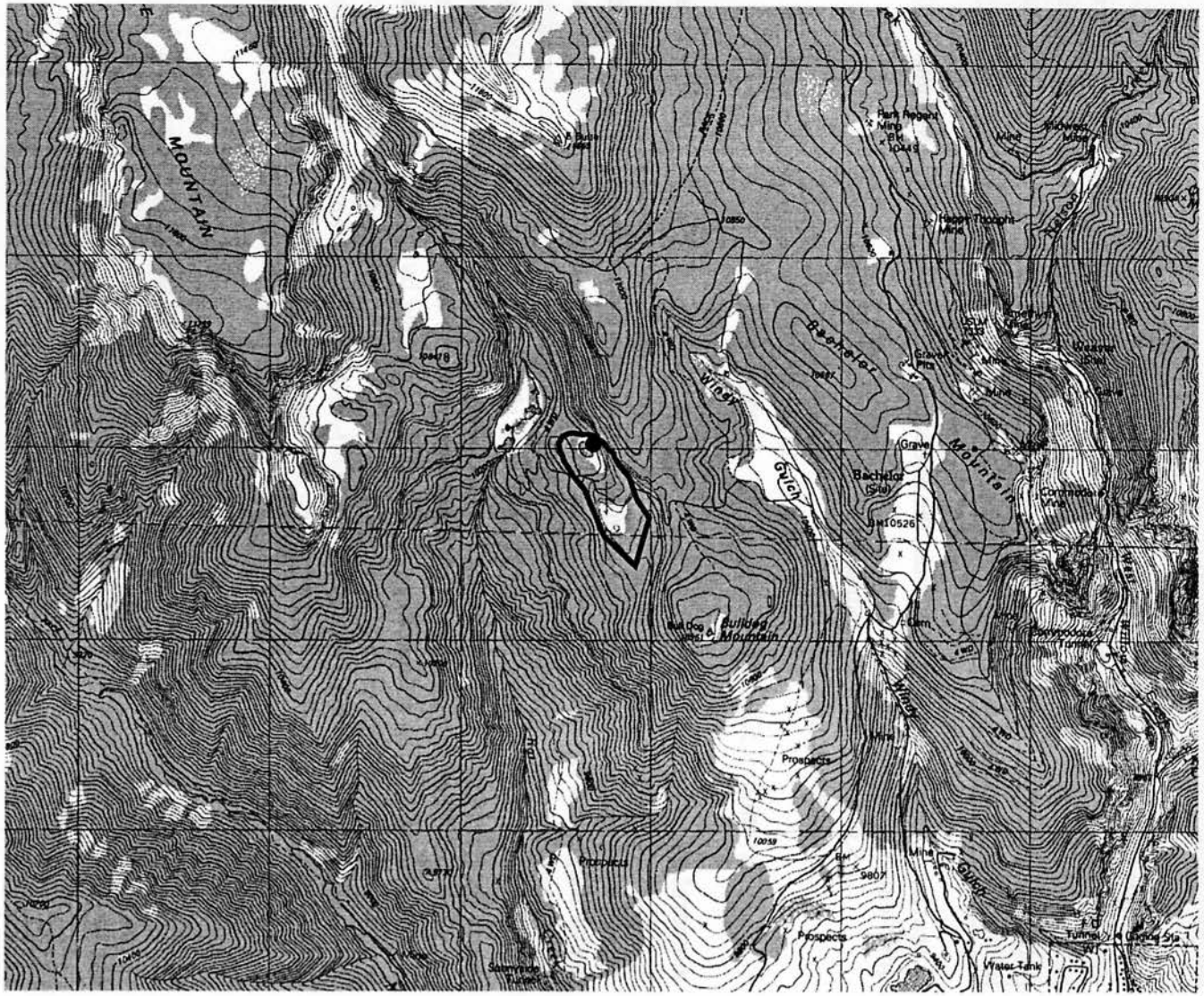
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Rat Creek Pond



The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Bennett Creek

Biodiversity Rank: B3 (Moderate significance)
The Bennett Creek site supports the only remaining Mineral County relict population of Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) and a small but pristine stand of Parry oat grassland (*Danthonia parryi*).

Protection Urgency Rank: P2
Most of this site is within the Rio Grande National Forest, although the lower portion that contains most of the fish population is privately owned (see following ownership map). The private land has no formal conservation protection but a conservation easement or other form of conservation protection is warranted.

Management Urgency Rank: M2
Stream degradation from bank erosion and road encroachment along the lower portion of the site are the most serious management concerns. Regeneration of native plants especially willows, alders, and cottonwoods should be encouraged. The Division of Wildlife monitors the trout population.

Location: Along Bennett Creek from the aqueduct to the base of Table Mountain. (See following map for exact location).

U.S.G.S. 7.5 minute quadrangle: Hermit Lakes; Bristol Head
Legal description: T41N R2E S 5-7, 18
T42N R2E S 22, 27-29, 31, 32
Elevation: 9,520-12,080 feet Acreage: 995

General Description: Bennett Creek is a first order subalpine to upper montane tributary of the Rio Grande. The upper reach begins in a scenic subalpine rolling meadow at the base of alpine scree slopes. The vegetation along the upper portion of the creek is dominated by water sedge (*Carex aquatilis*) and Canada reed grass (*Calamagrostis canadensis*). As the creek steepens and narrows, planeleaf willow (*Salix planifolia*) with Canada reed grass dominates the riparian vegetation. The adjacent slopes of the upper portion are comprised of Parry oatgrass grassland (*Danthonia parryi*). At approximately 11,000 feet in elevation the creek quickly picks up gradient and has cut a narrow and steep-walled canyon. The riparian vegetation reflects the change in gradient and is dominated by Engelmann spruce (*Picea engelmannii*) and Drummond's willow (*Salix drummondii*), while the slopes are forested with a mosaic of spruce-fir *(Picea engelmannii-Abies lasiocarpa*) and aspen (*Populus tremuloides*). At the mouth of the canyon a montane riparian forest of narrowleaf cottonwood (*Populus angustifolia*), thinleaf alder (*Alnus incana*), and Drummond's willow (*Salix drummondii*) dominates.

An aqueduct and a two-track dirt road that leads to Santa Maria Reservoir bisect the lower portion of this site.

Biodiversity Rank Justification: The Bennett Creek site supports the last remaining relict population of Rio Grande cutthroat trout in Mineral County. Although this population is small, the genetic purity has been rated an "A" by Division of Wildlife and is considered one of the most important populations to monitor and protect (John Alves, DOW, pers. comm.).

Also noteworthy is the small but pristine occurrence of a Parry's oatgrass montane grassland. The Parry's oatgrass occupies the upper meadows of the site. Parry's oatgrass is one of the most palatable native grasses in Colorado (DeVelice and others 1986) and a decreaser with grazing use (Johnston 1997). Parry's oatgrass has apparently decreased markedly in area, especially from settlement to World War II. It was already "of scattered occurrence" by the mid-1930's (Dayton and others 1937), but it started showing up more abundantly following reductions in livestock grazing intensity beginning in the 1950's (Johnston 1997). Mineral County supports several examples of the Parry's oatgrass community, of which Bennett Creek is among the best (see Bellows Creeks site for the largest Mineral County occurrence).

Natural Heritage element occurrences at the Bennett Creek Site. Element responsible for the biodiversity rank is in bold typeface.

Latin name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plant Communities						
Danthonia parryi	**Montane grasslands**	**G3**	**S3**		**B**	**1998-07-28**
Fish						
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS, SC	B	1998

*EO=Element Occurrence

Boundary Justifications: This boundary includes the stretch of Bennett Creek containing the fish occurrence and approximately a 1,000 foot buffer, as well as the headwaters necessary to maintain the natural hydrologic regime. The upper elevation of the site includes the grassland occurrence and adjacent suitable habitat. Digital elevation models, the 7.5 minute topographic map, and on-the-ground survey were referenced for delineating boundaries for this site.

Literature Cited

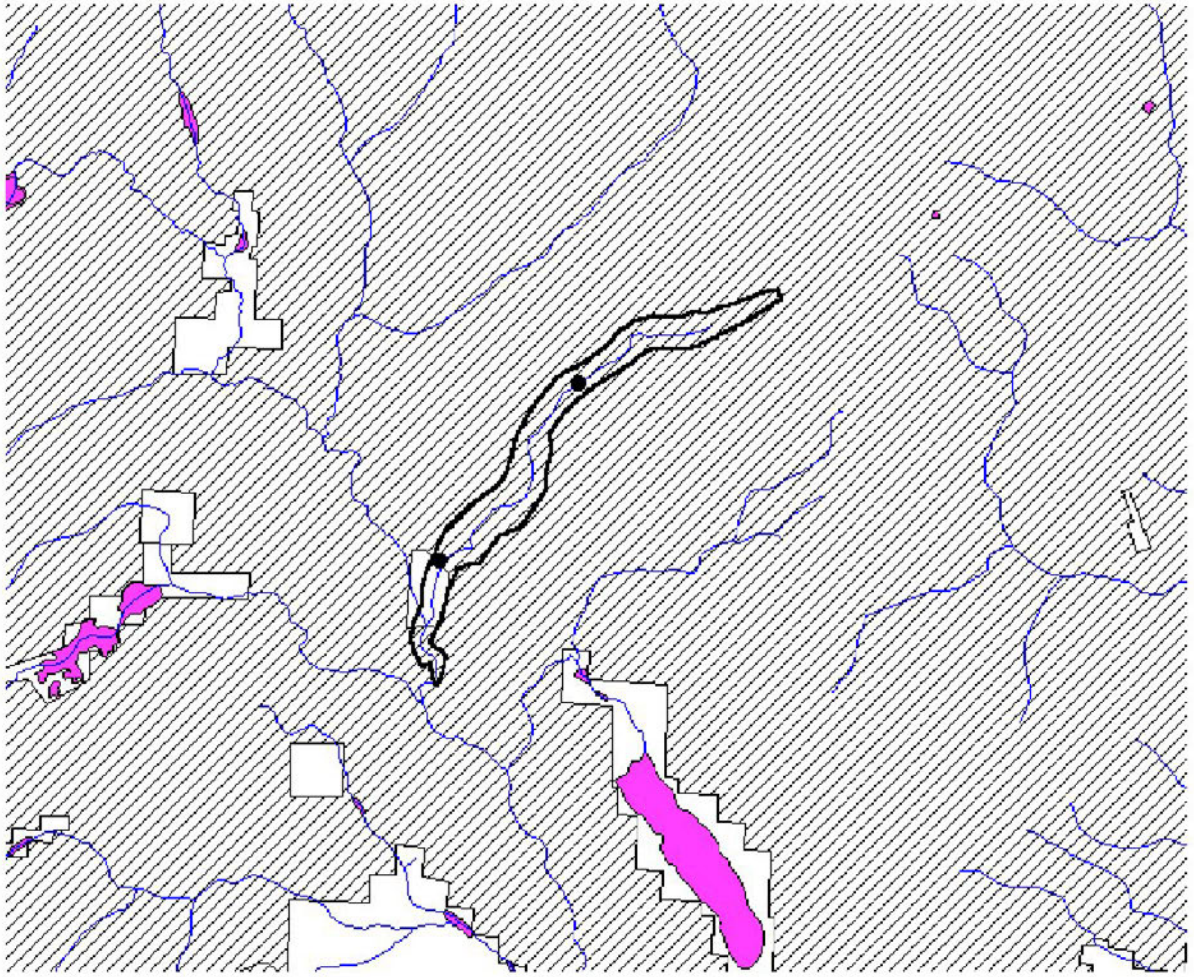
Dayton W. A., T. Lommasson, B. C. Park, C. A. Kutzleb, O. Julander, A. R. Standing, S. S. Huchings, L. W. Swift, E. P. Cliff, D. W. Hayes and others. 1937. Range plant handbook. U.S.D.A. Washington, D.C. nonsequential pagination pp.

DeVelice R. L., J. A. Ludwig, W. H. Moir and F. Ronco. 1986. A classification of forest habitat types of northern New Mexico and southern Colorado. USDA Forest Service General Technical Report RM-131 Volume Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. 59 pp.

Johnston B. C. 1997. Ecological types of the Upper Gunnison Basin. Review draft. USDA, Forest Service, Gunnison, CO. 539 pp.

Bennett Creek

Ownership Status



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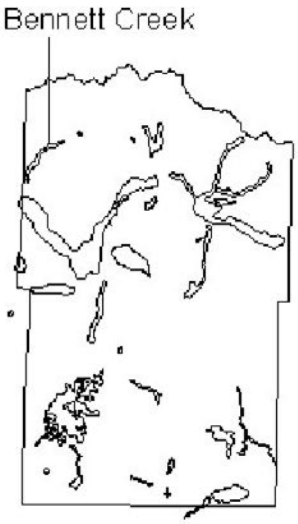

Site Boundary

Elements of Concern

Private

U.S. Forest Service

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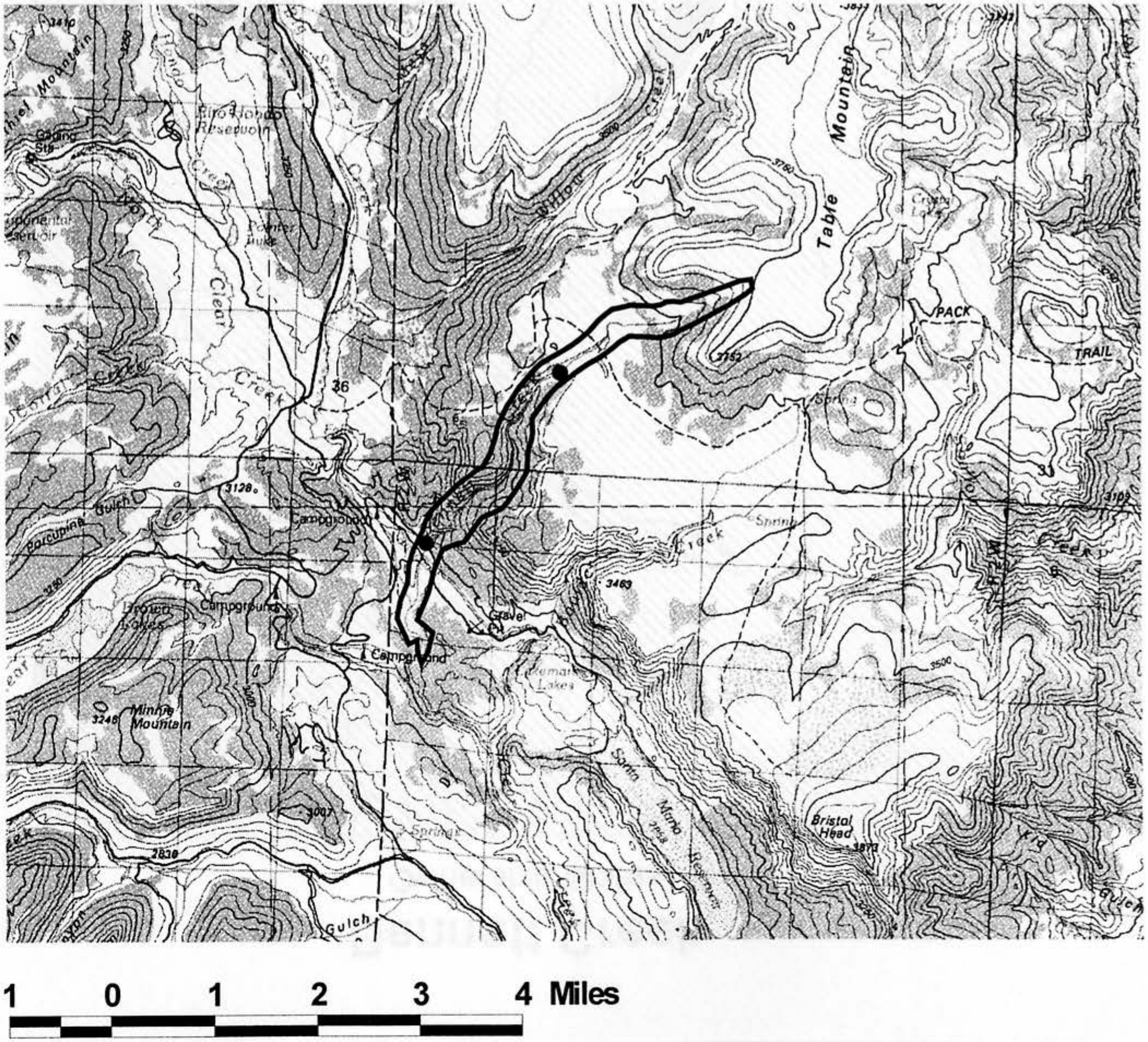
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Bennett Creek



Site Boundary

Elements of Concern

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Black Mountain at Pagosa Peak

Biodiversity Rank: B3 (High significance)
This site contains unranked occurrences of the reflected moonwort (*Botrychium echo*) and lance-leaved moonwort (*B. lanceolatum*).

Protection Urgency Rank: P4
The Black Mountain at Pagosa Peak site is just outside the Weminuche Wilderness Area of the Rio Grande National Forest. (See following map for ownership.)

Management Urgency Rank: M2
The moonwort plants are beside an old skid road. The area has signs of moderate to heavy livestock use. Surrounding potential habitat should be surveyed for additional individuals. Moonworts are adapted to sites with indirect disturbance; however, direct impacts to individual plants should be avoided. Road maintenance on the secondary road may affect these occurrences. A baseline count of reflected moonwort would help to identify a threshold population size that should be maintained or increased. Research on predators, seed germination, and longevity is needed. As the natural history of the plant becomes known, management plans for this species may be refined.

Location: On the southeast slope of Black Mountain. See following map for exact location.
U.S.G.S. 7.5 minute quadrangle: Pagosa Peak
Legal Description: T37N, R2W S 16, 17, 20, 21
Elevation: 9,720-10,440 feet Acreage: 89

General Description: The Black Mountain at Pagosa Peak site is an open Engelmann spruce (*Picea engelmannii*) forested montane site on a slope with a southwest aspect. The surface geology is comprised of a volcanic ash flow. The area was clearcut in the late 1960's. An active grazing allotment is within this site, although the area was not grazed in 1995, and had also been rested approximately 5 of the last 10 years prior to 1995 (Colorado Natural Heritage Program 1998).

Biodiversity Rank Justification: The Black Mountain at Pagosa Peak site includes two rare moonwort species, of which reflected moonwort is the most rare. Reflected moonwort has only 19 locations documented (Colorado Natural Heritage Program 1998). Of the 19 locations, all but one are from the Colorado Rocky Mountains (Colorado Natural Heritage Program 1998), but the Flora of North America (1993) shows the range as northern Arizona, western Colorado and eastern Utah. (See Appendix A for global and state distribution maps).

Natural Heritage elements at the Black Mountain at Pagosa Peak site. Element responsible for the biodiversity rank is in bold typeface.

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plants						
Botrychium lanceolatum var lanceolatum	Lance-leaved moonwort	G5T4	S2			1996-07-30
Botrychium echo	**Reflected moonwort**	**G2**	**S2**	**FS**		**1996-07-30**

*EO=Element Occurrence

Boundary Justification: The boundary encompasses the element occurrence and provides a small buffer of approximately 1,000 feet to limit direct disturbance.

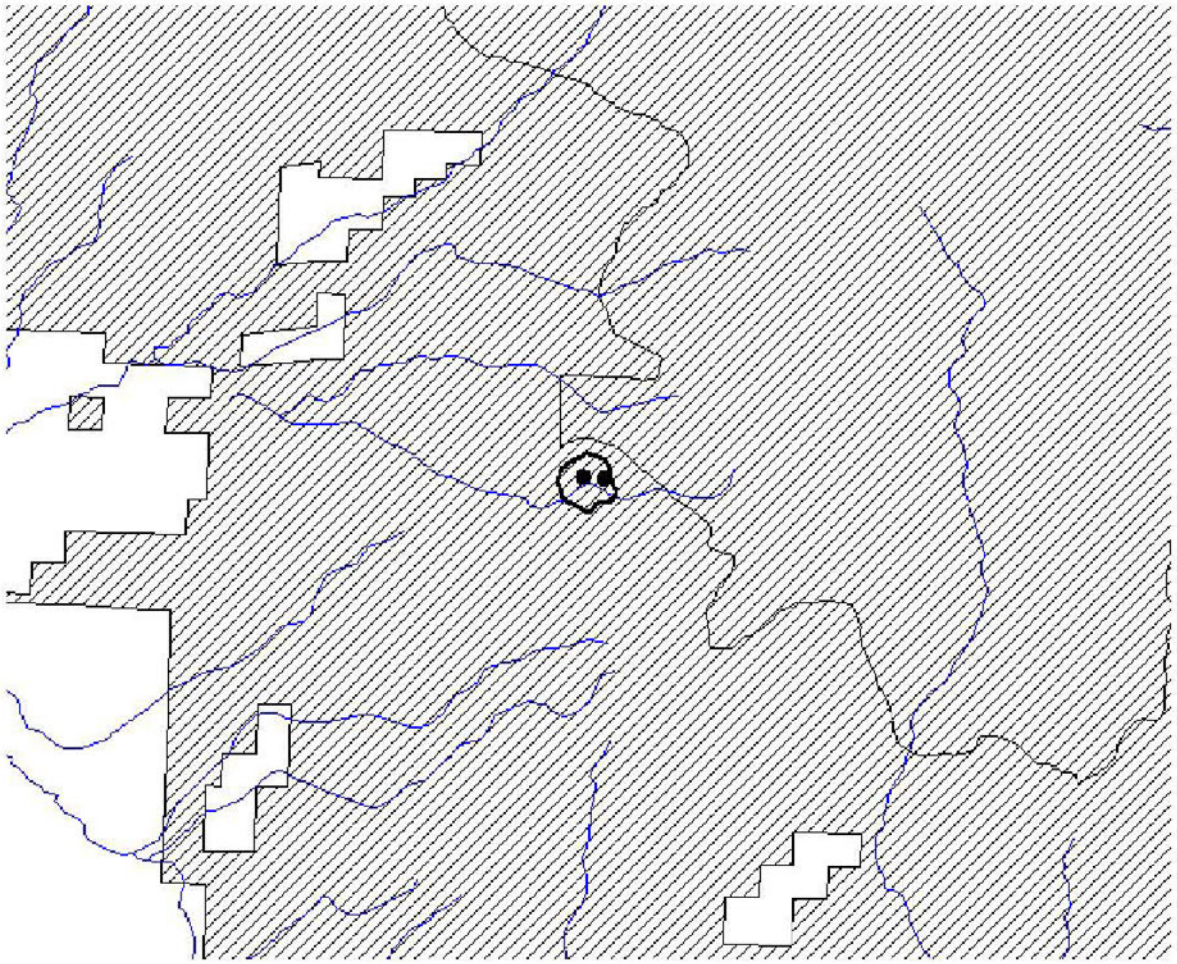
Literature cited

Colorado Natural Heritage Program. 1998. Biological and Conservation Data System: Fort Collins, CO, Colorado Natural Heritage Program.

Flora of North America Editorial Committee. 1993. Flora of North America, north of Mexico, Vol 2: New York, New York, Oxford University Press, Inc.

Black Mountain at Pagosa Peak

Ownership Status



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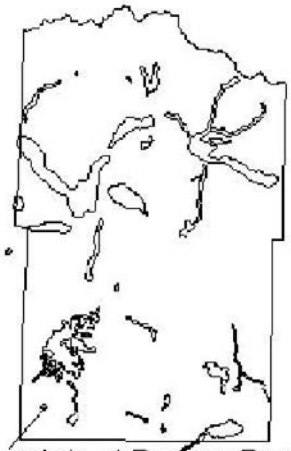

Black Mountain at Pagosa Peak

Site Boundary

Elements of Concern

Private

U.S. Forest Service

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W E

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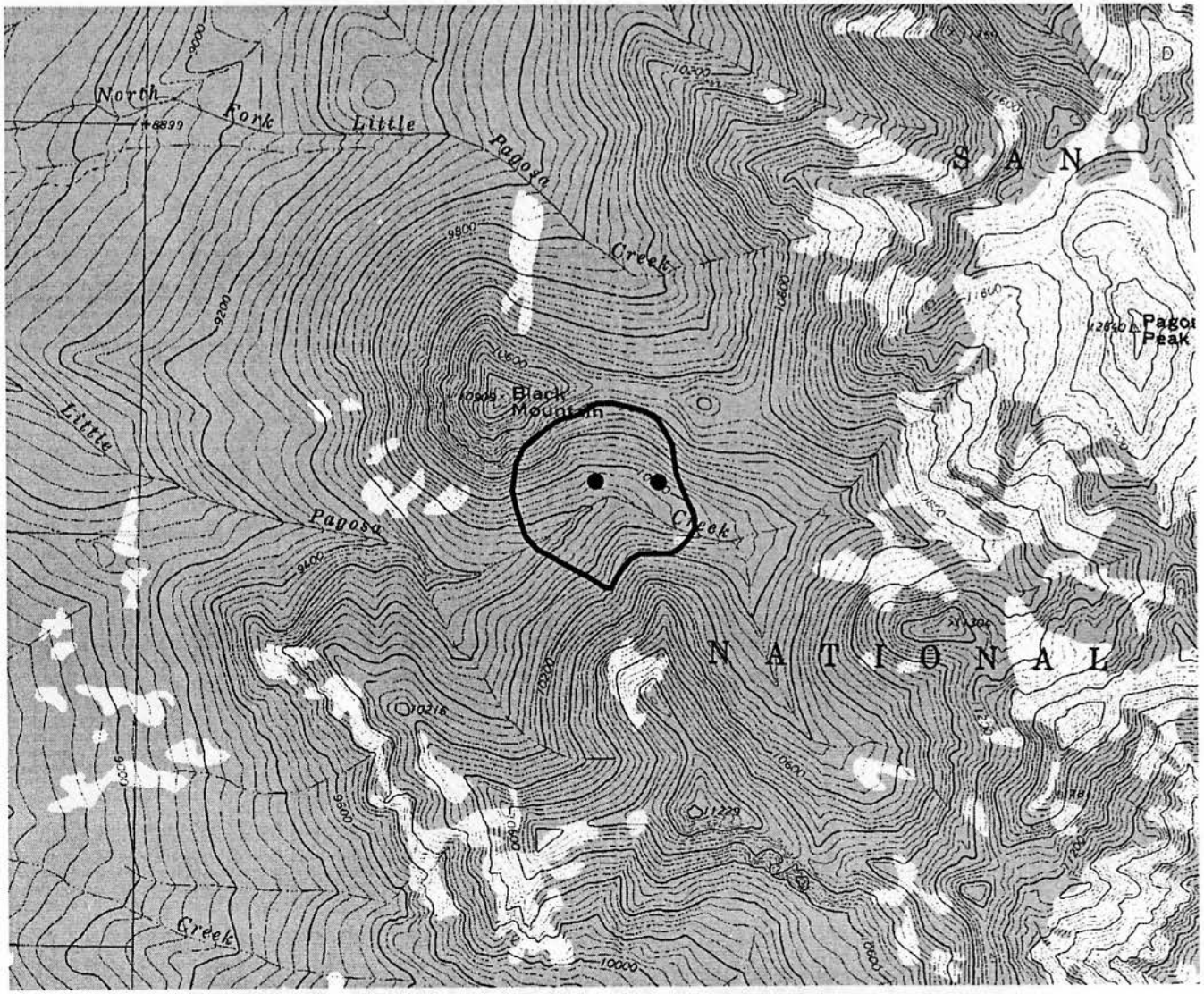
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Black Mountain at Pagosa Peak



1 0 1 Miles

Black Mountain at Pagosa Peak

Site Boundary

Elements of Concern

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W E
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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

East Fork Park

Biodiversity Rank: B3 (Moderate significance)
The East Fork Park site supports good examples of montane riparian forest, shrublands, and wetlands. The adjacent slopes support an unusual example of old-growth Douglas fir forest that provides excellent habitat for plants that are rare in Colorado. The 200-foot cliffs harbor nesting peregrine falcons and black swifts.

Protection Urgency Rank: P2
Over 75 % of the site is a privately owned ranch that is also an inholding in the Rio Grande National Forest (see following ownership map). The private land has no formal conservation protection, although the owner is interested in protecting the area from large development projects. A conservation easement on the private land is warranted.

Management Urgency Rank: M2
Current management of the riparian zone on private lands is directed towards a reduction and eventual elimination of livestock grazing. Much of the riparian system is in need of weed management and willow restoration. The private property owner is aware and concerned about the weeds. Some stream restoration work has occurred along the upper elevations, and there may be plans for further work downstream. We recommend researching the historical geomorphology in order to understand if the current braided stream is natural. If research finds that it has always been a braided stream, we believe stream restoration should maintain it as a braided stream. Regeneration of native plants especially willows, alders, and cottonwoods would increase the biological value of this site. A reduction in livestock grazing may enhance natural reproduction of the native vegetation, although weed production may also increase. The natural hydrology should be maintained or restored.

Location: East Fork of the San Juan and the adjacent uplands from Quartz Creek to one mile below Sand Creek confluence. (See following map for exact location).

U.S.G.S. 7.5 minute quadrangle: Wolf Creek Pass

Legal description:	T36N R1E	S 1-5
	T37N R1E	S 35, 36
	T37N R2E	S 27-34
Elevation: 7,720-9,520 feet		Acreage: 2,580

General Description: The East Fork Park site includes an upper section of the East Fork of the San Juan River and adjacent upland forest. This section of the river opens up into a one-half mile wide valley below the Quartz Creek confluence and narrows again some five miles downstream. The river is low gradient, shallow, and braided, with a cobble bottom. The riparian vegetation is composed of a mosaic of three vegetation types, including narrowleaf cottonwood-blue spruce/thinleaf alder (*Populus angustifolia-Picea pungens/Alnus incana*) in the upper portion, with thinleaf alder-mixed willow shrublands (*Alnus incana*-mixed *Salix* species) and perched wetlands of beaked sedge (*Carex utriculata*) in the lower half. Beavers are found on the secondary channels and help to maintain the wetlands. Grassy-forb meadows, often weedy, dominate the terraces and lower slopes and grade into forested

slopes. North facing slopes support a good stand of old growth Douglas fir forest with a moist forb-dominated understory. Small natural ponds and wetlands provide excellent habitat for deer, elk, and possibly frogs. The south facing slopes are dominated by aspen (*Populus tremuloides*), ponderosa pine (*Pinus ponderosa*), or oak (*Quercus gambelii*).

Cattle grazing has been the dominant use of this site, although this is currently changing. There are no ditches, dams, man-made ponds, or irrigated hay meadows at this site—an unusual event given the elevation and geomorphology of the river.

Biodiversity Rank Justification: The East Fork Park site supports one of the healthiest riparian areas of its type in Mineral County. Most of the wide floodplains in Mineral County include hydrologic modifications such as irrigation ditches, hay meadows, or small man-made ponds. The East Fork Park site is an exception for its geomorphology and elevation. The perched wetlands of beaked sedge are rare in Mineral County, with Red Mountain Creek the only other Mineral County site where we observed the unusual geomorphology. Both the thinleaf alder-mixed willow species and the montane riparian forest (*Populus angustifolia-Picea pungens/Alnus incana*) are globally imperiled plant communities (see Appendix A for global and state distribution maps). The old-growth Douglas fir/Oregon-grape forest community (*Pseudotsuga menziesii/Mahonia repens*) is the first ever recorded for the state of Colorado. Although Douglas fir is a common tree and Oregon grape a common ground cover, the usual co-dominant is a shrub, e.g. snowberry (*Symphoricarpos oreophilus*). The East Fork Park site has a diverse shrub layer without a single co-dominant. Several plants that are rare in Colorado were found in this lush old-growth forest. The Forest Service lands protect breeding populations of peregrine falcon (*Falco peregrinus anatum*) and black swift (*Cypseloides niger*).

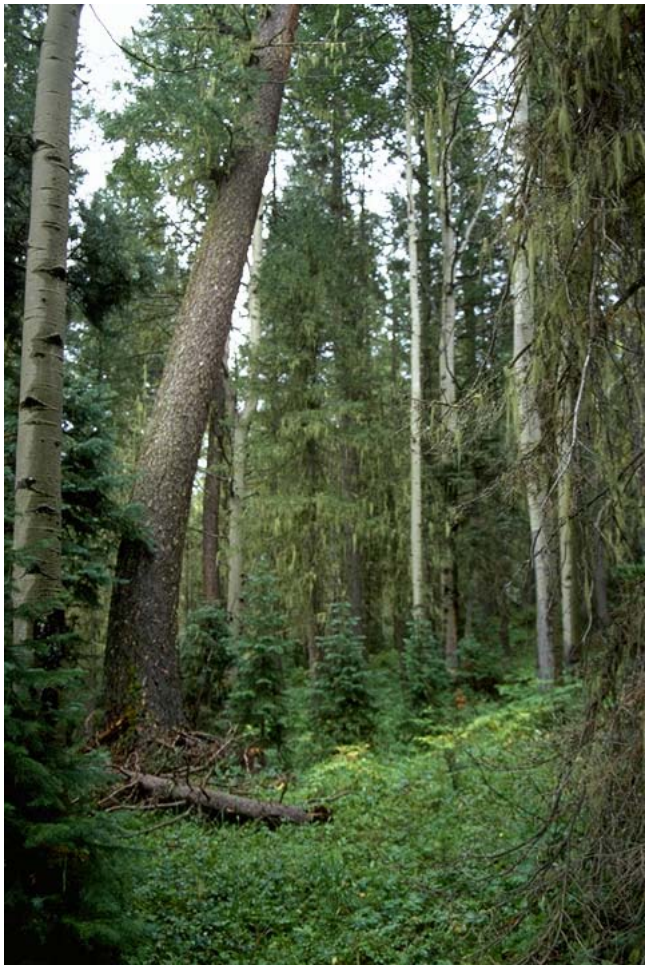
Natural Heritage element occurrences at the East Fork Park Site. Multiple listings of elements represent separate locations. The element responsible for the biodiversity rank is in bold typeface.

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plants						
Cryptogramma stelleri	Slender rock-brake	G5	S2			1977-06-13
Goodyera repens	Dwarf rattlesnake-plantain	G5	S2		A	1998-08-11
Goodyera repens	Dwarf rattlesnake-plantain	G5	S2			1985-07-15
Pyrola picta	Pictureleaf wintergreen	G4G5	S3		C	1998-08-11
Plant Communities						
Alnus incana-mixed *Salix* species	Thinleaf alder-mixed willow species	G3	S3		C	1998-08-11
Carex utriculata	Beaked sedge montane wet meadows	G5	S4		B	1998-08-11
Populus angustifolia-Picea pungens/Alnus incana	**Montane riparian forests**	**G3**	**S3**		**B**	**1998-08-11**

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Pseudotsuga menziesii/Mahonia repens	**Douglas fir/creeping Oregon-grape**	**G5**	**S1?**		**B**	**1998-07-11**
Birds						
Cypseloides niger	Black swift	G4	S3B	FS		1997-08-28
Falco peregrinus anatum	American peregrine falcon	G4T4	S2B,SZN	LE		1996

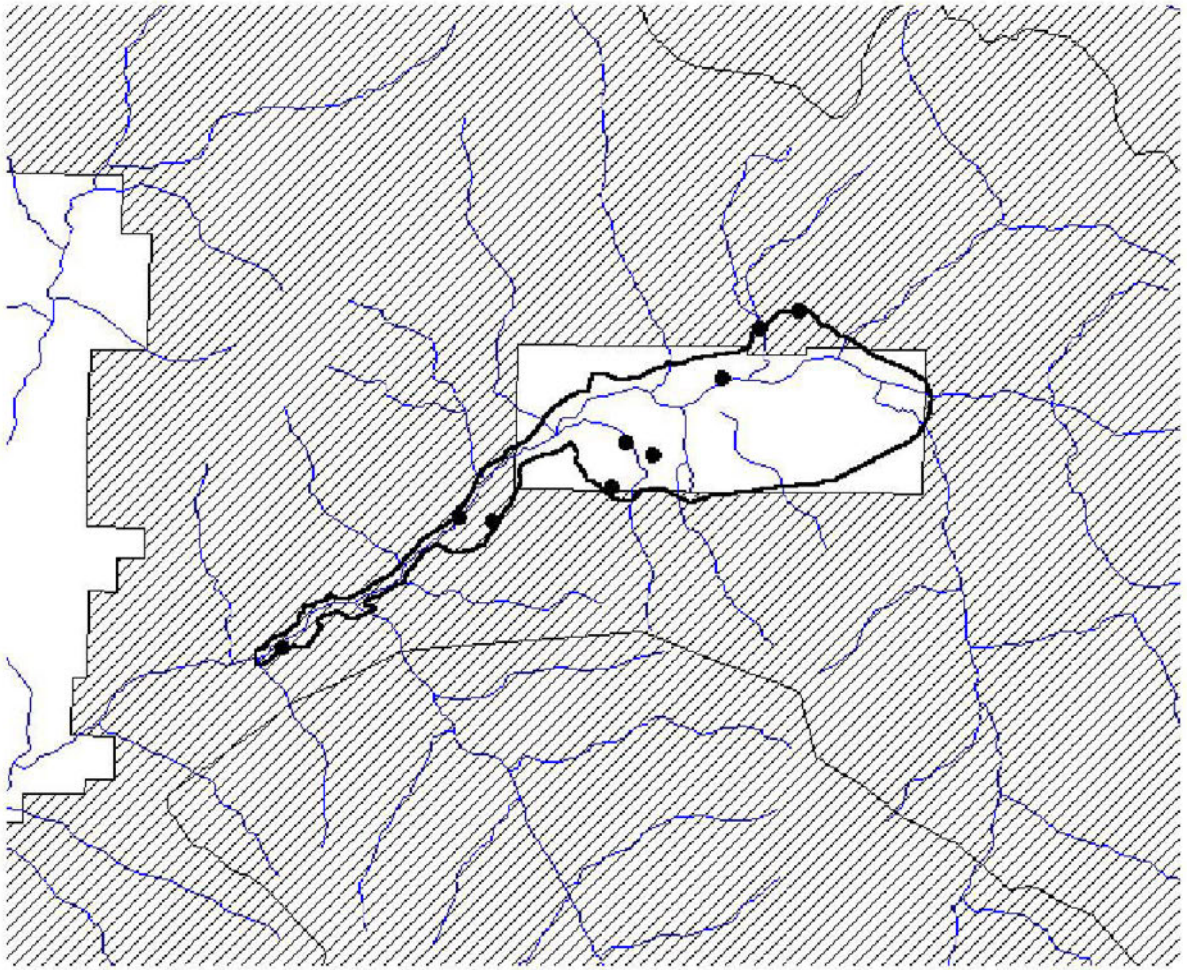
*EO=Element Occurrence

Boundary Justifications: This boundary is drawn to include the wetland/riparian complex and uplands that supports the elements of biodiversity found at the site. Digital elevation models, the 7.5 minute topographic map, and on-the-ground survey were referenced for delineating boundaries for this site.



Douglas fir old growth at East Fork Park site.

East Fork Park



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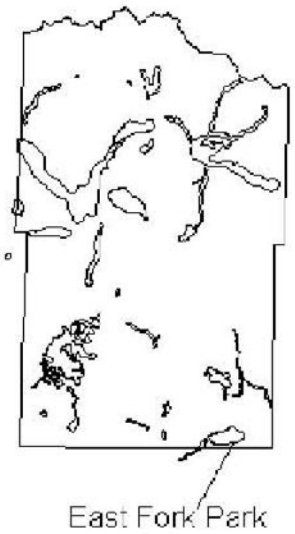

Site Boundary

Elements of Concern

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W E

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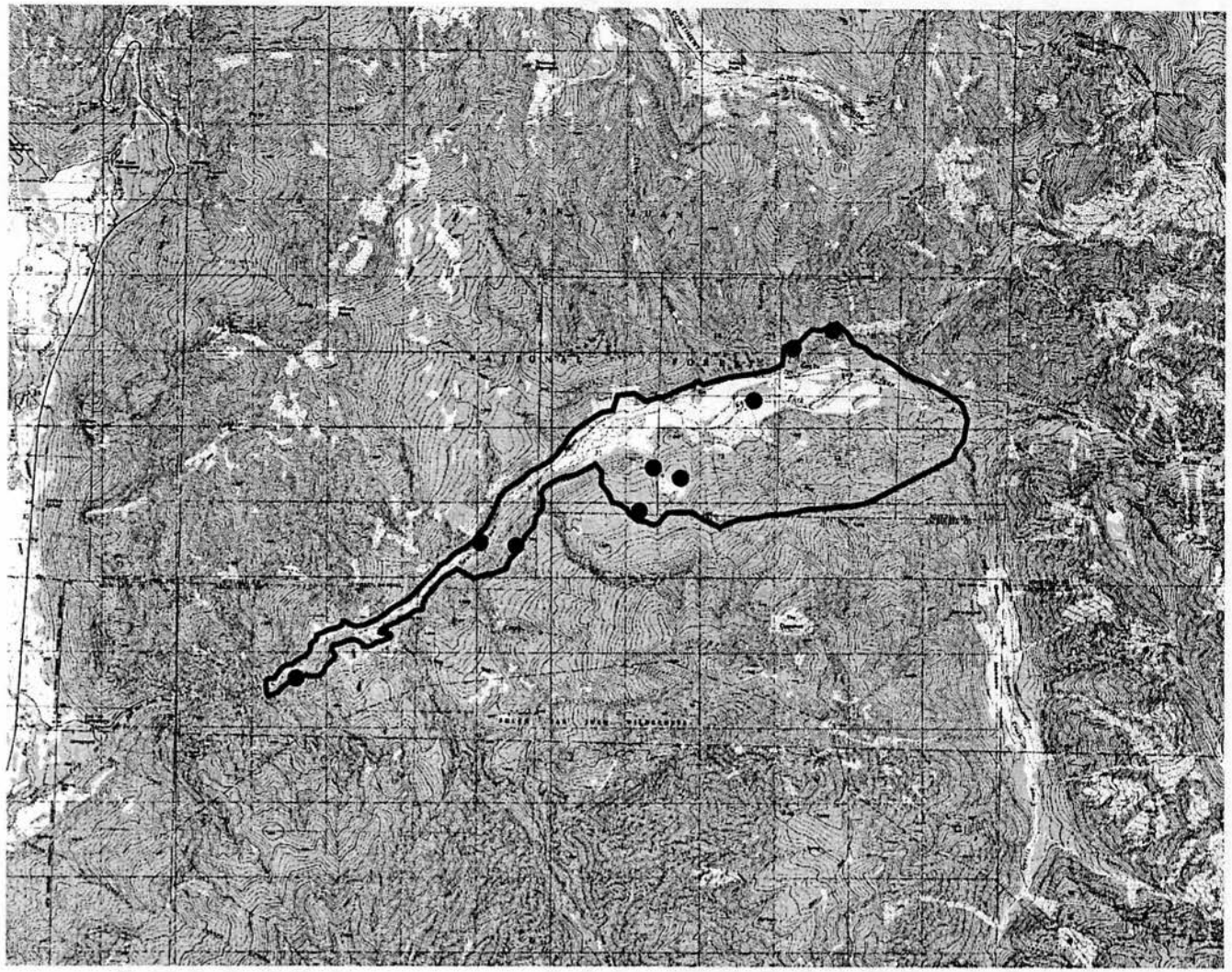
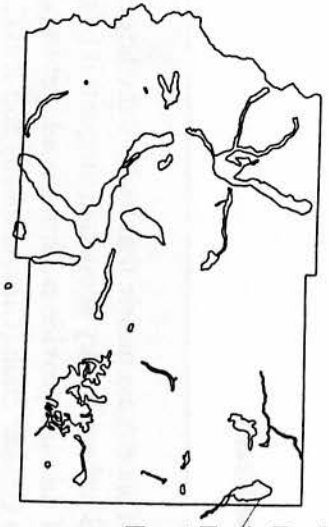
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

East Fork Park





Site Boundary

Elements of Concern

1 0 1 2 3 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Goose Creek

Biodiversity Rank: B3 (High significance)
The Goose Creek site contains a small strip of shortgrass prairie that harbors the largest known occurrence of the globally imperiled Southern Rocky Mountain cinquefoil (*Potentilla ambigens*). The lakes on the upper portion of this site provide an introduced, yet important, brood stock for the declining fish species Rio Grande chub (*Gila pandora*) and Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*).

Protection Urgency Rank: P2
This site is of mixed ownership (see following ownership map). Rio Grande National Forest land is a small portion of this site, with the Weminuche Wilderness Area adjacent to the southern portion. The private lands have no formal conservation protection, although the owners are interested in protecting the area from further development.

Management Urgency Rank: M4
The requirements of the Southern Rocky Mountain cinquefoil are unknown. If present land uses continue, monitoring the abundance of the population every 5 years may suffice. A baseline study of the population would help to develop a threshold population size that should be maintained or increased. Research on pollination, seed dispersal, predators, seed germination, longevity, and grazing requirements is needed. As the natural history of the plant becomes known, management plans for this species will be refined. Goose Creek riparian plant communities are, for the most part, in fair condition due to cattle grazing and hay meadow production. The irrigated hay meadow on lower Goose Creek is a conduit for non-native species and has altered the natural plant communities, especially willows. The current fence around Goose Creek should be expanded to include a larger portion of the riparian zone. The wintering elk herd may be deleterious to the remaining willows.

Location: The Goose Creek site is located south of Wagon Wheel Gap, surrounding the lower reaches of Goose Creek, a tributary to the Rio Grande. (See the following map for the exact location).

U.S.G.S. 7.5 minute quadrangle: Wagon Wheel Gap; Lake Humphrey's
Legal Description: T40N, R1E S 2, 3, 11, 14, 15, 23, 26-28, 33, 34
T41N, R1E S 35
Elevation: 8,480-9,600 feet Acreage: 1,555

General Description: The Goose Creek site can easily be divided into two sections, the upper elevation and the lower elevations. The upper elevations includes two large lakes. In 1923, Lake Humphrey's was created by constructing a concrete dam on Goose Creek. An earthen dam for Hay Press Lake was built many years later. These two lakes are used primarily for private fishing and other recreation. The Division of Wildlife stocks Lake Humphrey's with rainbow trout. The stocking adds to the existing population of non-native brook trout and hybrid Rio Grande cutthroat and rainbow trout known as "cutbows." Upstream of Hay Press Lake and Lake Humphrey's is a small man-made pond known locally as "Walden Pond." It is here that a dense and healthy population of Rio Grande chub was

documented. The most likely explanation for this disjunct population is an introduction by a fisherman, since chub are known to be used as bait fish (John Alves, DOW, pers. comm.). Another smaller and ephemeral bermed pond is beside the Roaring Fork River. This 300 x 300 foot pond had a healthy population of salamanders.

The surrounding landscape to all of the ponds and lakes is that of an idyllic montane steep valley. A mosaic of aspen (*Populus tremuloides*) and Engelmann spruce (*Picea engelmannii*) dominate the slopes, with occasional rhyolitic cliffs jutting out. On the cliffs or rock outcrops we found small populations of Black Canyon gilia (*Gilia penstemonoides*). A few drier, south-facing slopes are dominated by Arizona fescue (*Festuca arizonica*) grasslands with isolated stands of bristlecone pine (*Pinus aristata*).

Bill Dooley, a ranch manager, reported that boreal toads were common along upper Goose Creek in "his younger days," but that they have been gone for many years now. At the end of August 1998 he found one adult boreal toad on his doorstep.

The area surrounding the lakes has been maintained since 1920's as a family/friends fishing-vacation resort. A two-track dirt road and several cabins border the western side of Lake Humphrey's. Past structures included a tennis court, golf course, and swimming pool. The owners currently have approximately 12 horses. This property is sandwiched between the Weminuche Wilderness Area and the lower elevations.

The lower elevations has been operated as a fly fishing resort and guest ranch since the 1940's. This portion of Goose Creek has formed a wide and gently sloping valley oriented south to north. Although much of the valley bottom is currently an irrigated hay meadow, it was probably once willow and sedge dominated. The upper stretches are narrower and dominated by a montane riparian forest of Engelmann spruce and alder (*Alnus incana*). The hillsides are either Engelmann spruce or Arizona fescue grasslands with patches of bristlecone pine throughout.

Immediately above the floodplain along the lower mile of Goose and Pierce Creeks a small but very important strip of shortgrass prairie exists on the east-facing gentle colluvial slopes. The two-track dirt road that parallels Goose and Pierce Creeks passes through this limited habitat.

Yearly stocking with rainbow trout and Snake River cutthroat trout provides the guests with ample fishing opportunities. Six years ago the ranch eliminated most of their cattle, but they currently maintain a herd of 30 horses and four longhorns. In 1990, livestock were fenced out of a narrow zone along Goose Creek. In addition, rocks were placed in the stream to interrupt the current and provide resting places for trout.

Historic land uses included a school and a fluorspar mine, both still visible. Currently the fishing resort supports cabins, tennis courts, a pool, and other amenities for their guests. A two-track dirt road parallels the floodplain. The area is reported to be used by over 400 wintering elk.

Biodiversity Rank Justification: The Goose Creek site includes the largest known population of the Southern Rocky Mountain cinquefoil (*Potentilla ambigens*). This member of the rose family is restricted to Wyoming, Colorado, and New Mexico. It has been found only once in Wyoming, while it has been found in four counties in both Colorado and New Mexico (Colorado Natural Heritage Program 1998). (See Appendix A for the global and state distribution maps.) Only a few of the documented occurrences note numbers of individuals: two plants in Larimer County, 50 to 100 in El Paso County, and thousands in Mineral County. Goose Creek and the adjacent Bellows Creek site harbor the largest known population with 2,000 and 500 plants respectively. Of special interest is the fact that over 90% of the habitat for the Southern Rocky Mountain cinquefoil on these two sites is privately owned.

The Rio Grande chub (*Gila pandora*) and Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*), both endemic to the Rio Grande basin, have declined in both numbers of individuals as well as number of locations since the early 1900's (Colorado Natural Heritage Program 1997). The DOW actively manages for both species and currently stocks suitable streams with both of these species. Although Goose Creek probably never had Rio Grande chub, the "Walden Pond" population is an important brood stock for DOW reintroduction plans. Goose Creek probably had a native population of cutthroat trout, but currently it is only the introduced population in Hay Press Lake that remains viable. This population is an important brood stock for repatriating Rio Grande valley streams.

Natural Heritage element occurrences at Goose Creek site. Multiple listings of elements represent separate locations. Elements responsible for the biodiversity rank are in bold typeface.

Latin Name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plants						
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	C	1998-07-11
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	C	1998-07-11
Gilia penstemonoides	**Black Canyon gilia**	**G3**	**S3**	**FS**	**C**	**1998-07-11**
Potentilla ambigens	**Southern Rocky Mountain cinquefoil**	**G3**	**S1S2**		**B**	**1998-07-23**
Potentilla ambigens	Southern Rocky Mountain cinquefoil	G3	S1S2		B	1998-07-23
Potentilla ambigens	Southern Rocky Mountain cinquefoil	G3	S1S2		B	1998-07-23
Potentilla ambigens	Southern Rocky Mountain cinquefoil	G3	S1S2		B	1998-07-23
Plant Communities						
Picea pungens/Alnus incana	**Montane riparian forests**	**G3**	**S3**		**B**	**1998-07-22**
Amphibians						
Bufo boreas pop 1	Boreal toad (Southern Rocky Mountain population)	G4T1Q	S1	C, FS, E	D	1998-08

Latin Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Fish						
Gila pandora	**Rio Grande chub**	**G3**	**S1?**	**SC**	**I**	**1998-07-11**
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS, SC	H	1975-07-15
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS, SC		1994

*EO=Element Occurrence

Boundary Justification: The Goose Creek site boundary includes all of the occurrences listed in this site. It also includes suitable nearby habitat that has not been thoroughly inventoried, but is likely to include many of the elements of concern. The boundary was based on referencing the 7.5 minute topographic maps and an on-the-ground survey.

Literature Cited

Colorado Natural Heritage Program. 1997. Conservation status of the rare and imperiled vertebrates of Colorado. Fort Collins, CO: Colorado Natural Heritage Program.

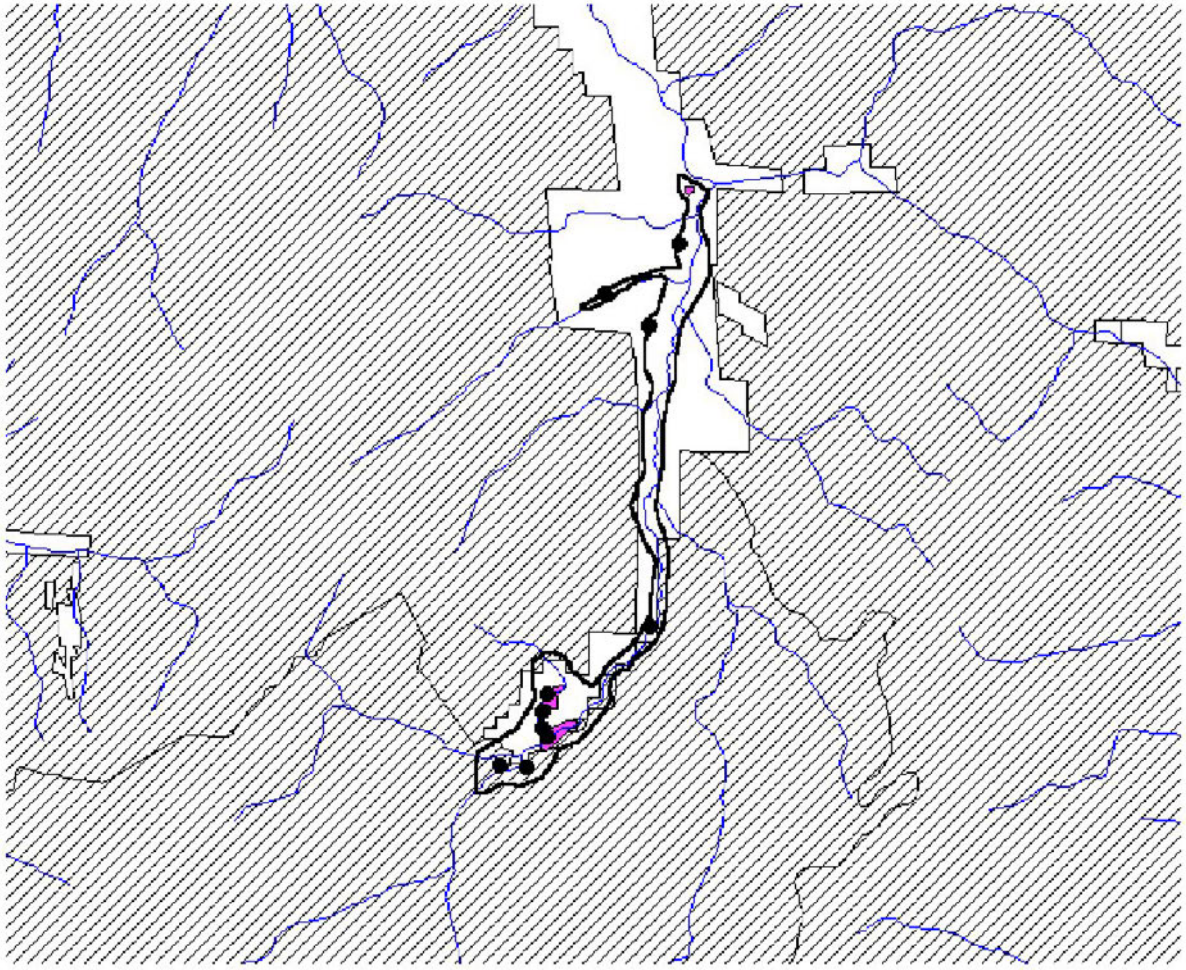
Colorado Natural Heritage Program. 1998. Biological and Conservation Data System. Colorado Natural Heritage Program, Fort Collins, CO.

Rocky Mountain cinquefoil (*Potentilla ambigens*)

Blue spruce with alder along Goose Creek

Goose Creek

Ownership Status



2 0 2 4 6 Miles

Site Boundary

Elements of Concern

Private

U.S. Forest Service

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W E

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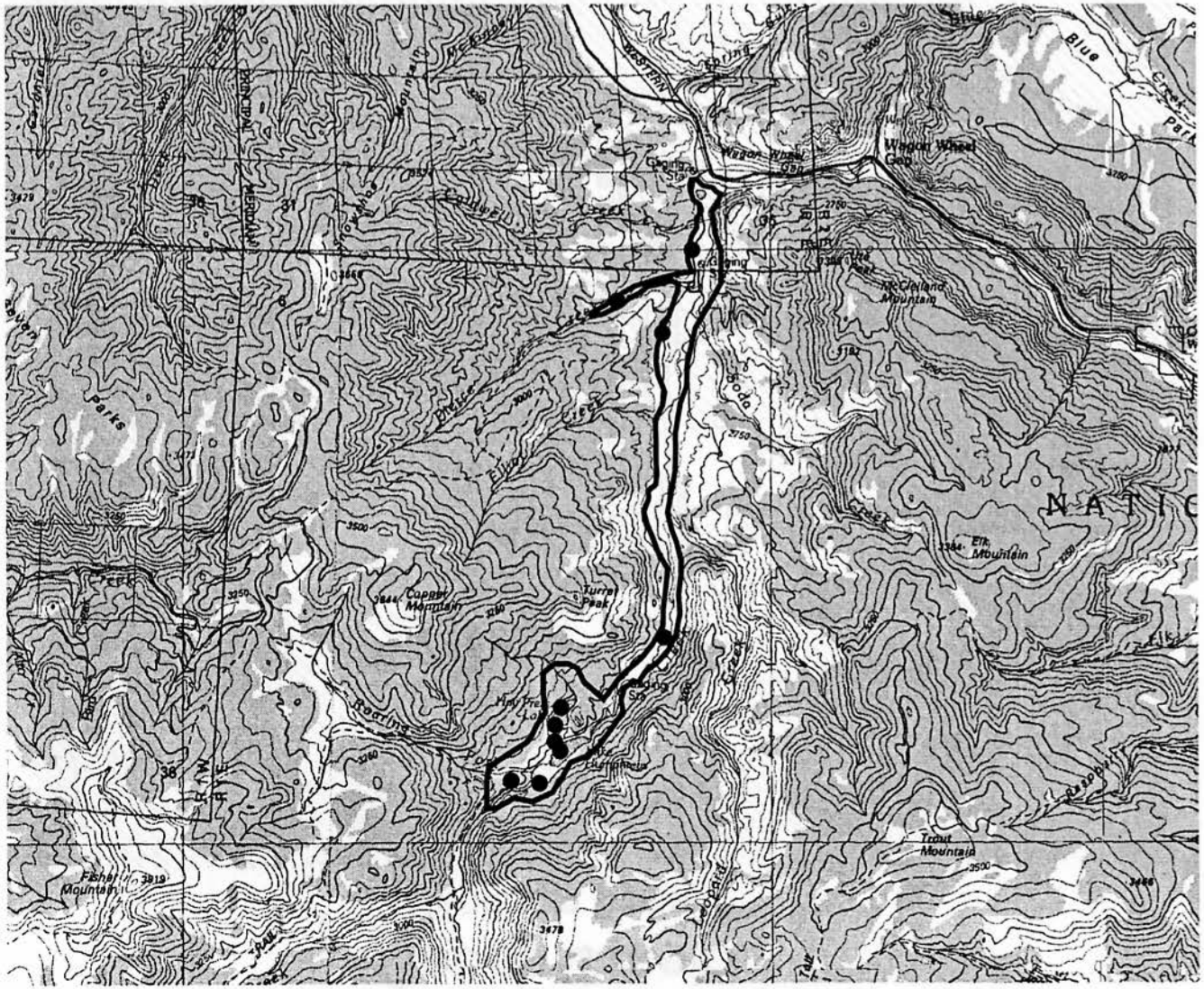
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Goose Creek



2 0 2 4 6 Miles

Goose Creek

Site Boundary

Elements of Concern

N

W E

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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Jumper Creek

Biodiversity Rank: B3 (High significance)
The Jumper Creek site contains the only documented Rio Grande National Forest breeding population of boreal toad (Goettl 1997). The toad was once common in many parts of Colorado including the San Juans, but has been steadily declining for the past 20 years (Goettl 1997), with less than 20 high priority breeding sites remaining in Colorado (Steve Corn, pers. comm.; Lauren Livo, pers. comm., as cited in Colorado Natural Heritage Program 1997). In addition, an excellent example of a montane riparian forest *(Populus angustifolia-Picea pungens/Alnus incana*) occurs at the lower elevations.

Protection Urgency Rank: P4
Over 90% of the Jumper Creek site is owned and managed by Rio Grande National Forest, with only the lower section along the riparian area privately owned. The site has no special protection status on either the private or federal lands, although the Forest Service and Division of Wildlife pay special attention to the boreal toad breeding site.

Management Urgency Rank: M4
Management of this boreal toad population requires fairly intensive human interaction. The Forest Service and Division of Wildlife currently manage the boreal toad population by closing off the logging road during the summer. The road puddle is spring fed through overflow from a blocked culvert. The Forest Service has installed a spring box and a temporary fence around the site. After the toadlets leave the area, the road is opened up during hunting season in order to maintain depth in the road ruts. Logging is very active at this site. The effects of logging on this toad population are unknown, although Husung and Alves (1998) presume the logging may be too close to the site.

Location: This site begins ½ mile above Jumper Lake and includes Jumper Creek and adjacent slopes to ½ mile below confluence of Jumper Creek with Trout Creek.

U.S.G.S. 7.5 minute quadrangle name : Workman Creek
Legal Description: T39.5N, R2W S 2-5
T40N, R2W S 32-36
Elevation: 9,000-11,900 feet Acreage: 1,640

General Description: The Jumper Creek site is within a montane spruce-fir forest, currently managed as a logging area by the Rio Grande National Forest. Jumper Lake at the top of this site is a man-made lake that may have supported a historic population of boreal toads. Above Jumper Creek and along one of the logging roads is a large puddle that harbors the sole documented breeding boreal toad site in Rio Grande National Forest. A spring upstream of the road helps to ensure ample water levels during the boreal toad breeding season. Below the Jumper-Trout Creek confluence the stream widens and supports a riparian area with narrowleaf cottonwood (Baker 1990) and thinleaf alder (*Alnus incana*). This site is just above the Antelope Park site.

Biodiversity Rank Justification: The Jumper Creek site contains the only known Rio Grande Forest populations of the declining and critically imperiled boreal toad (Husung and Alves 1998). In addition, a globally imperiled montane riparian community occupies a small reach of Trout Creek.

Natural Heritage elements at the Jumper Creek site. Multiple listings of elements represent separate locations. Elements responsible for the high biodiversity rank are in bold typeface.

Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plant communities						
Populus angustifolia-Picea pungens/Alnus incana	**Montane riparian forests**	**G3**	**S3**		**A**	**1995-06-19**
Alnus incana-Salix drummondiana	Montane riparian shrubland	G3	S3		A	1995-06-19
Amphibians						
Bufo boreas pop 1	Boreal toad (Southern Rocky Mountain population)	G4T1Q	S1	C, FS	H	1992-08-99
Bufo boreas *pop 1*	**Boreal toad (Southern Rocky Mountain population)**	**G4T1Q**	**S1**	**C, FS**	**B**	**1998-06-10**

*EO=Element Occurrence

Boundary Justification: The boundary drawn encompasses the existing boreal toad breeding population and the riparian community of Jumper Creek and adjacent parts of Trout Creek. The boundary also includes suitable but unoccupied habitat for the boreal toad.

Literature cited

Baker W. L. 1990. Climatic and hydrologic effects on the regeneration of *Populus angustifolia* James along the Animas River, Colorado. Journal of Biogeography 17: 59-73.

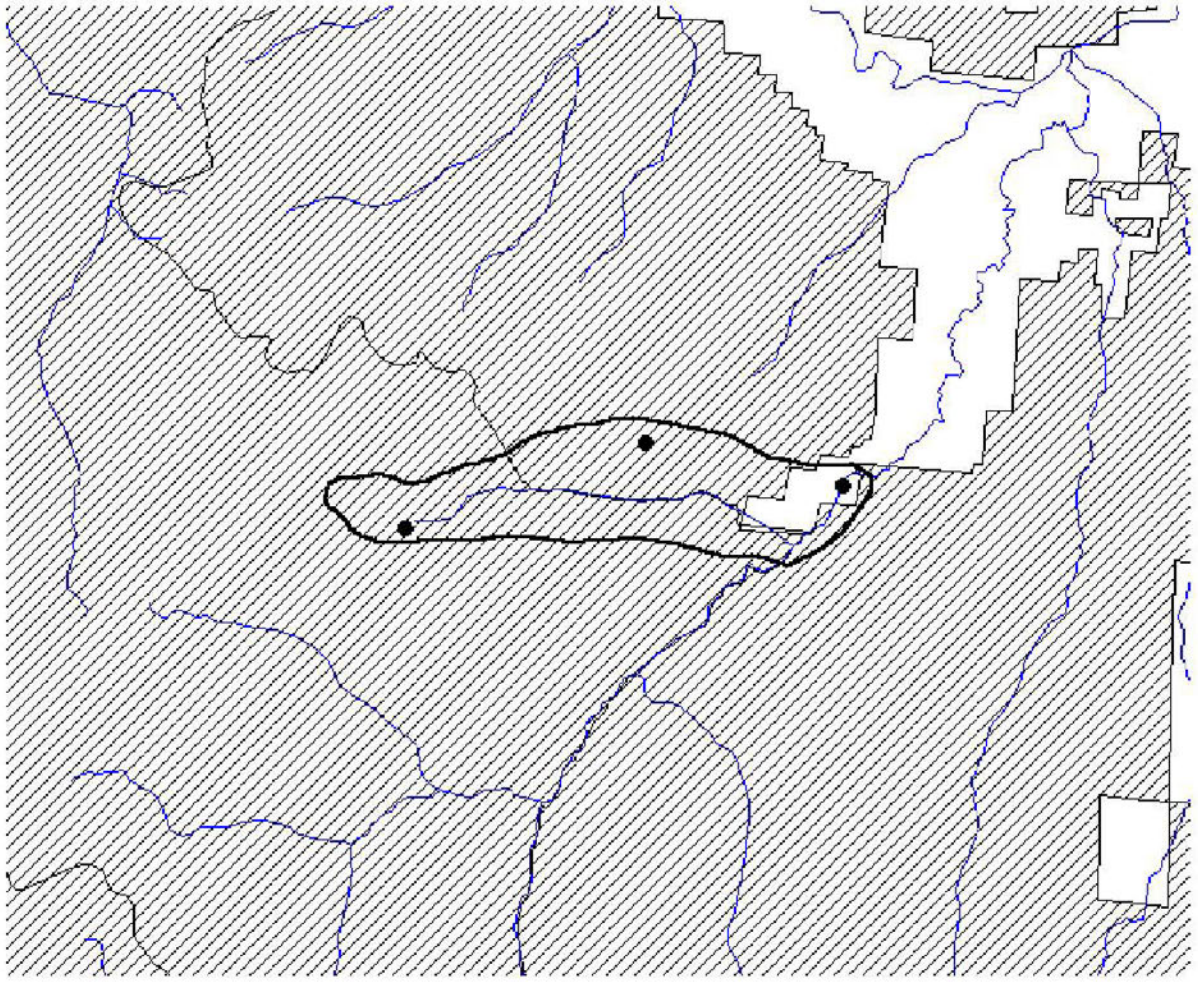
Colorado Natural Heritage Program. 1997. Conservation status of the rare and imperiled vertebrates of Colorado. Fort Collins, CO: Colorado Natural Heritage Program.

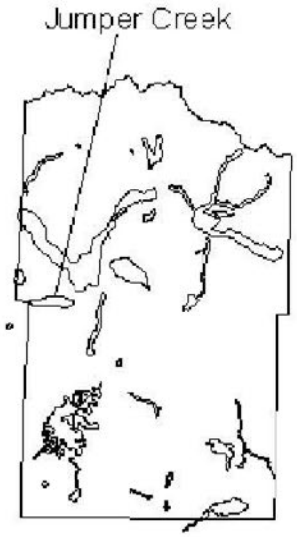
Goettl J. P. 1997. Boreal toad (*Bufo boreas boreas*) (Southern Rocky Mountain Population), recovery plan. Denver, CO: Colorado Division of Wildlife.

Husung B. and J. Alves. 1998. Boreal toad surveys in the South San Juan Mountains of Colorado. Monte Vista, CO: Department of Natural Resources, Colorado Division of Wildlife.

Jumper Creek

Ownership Status





Site Boundary

Elements of Concern

Private

U.S. Forest Service

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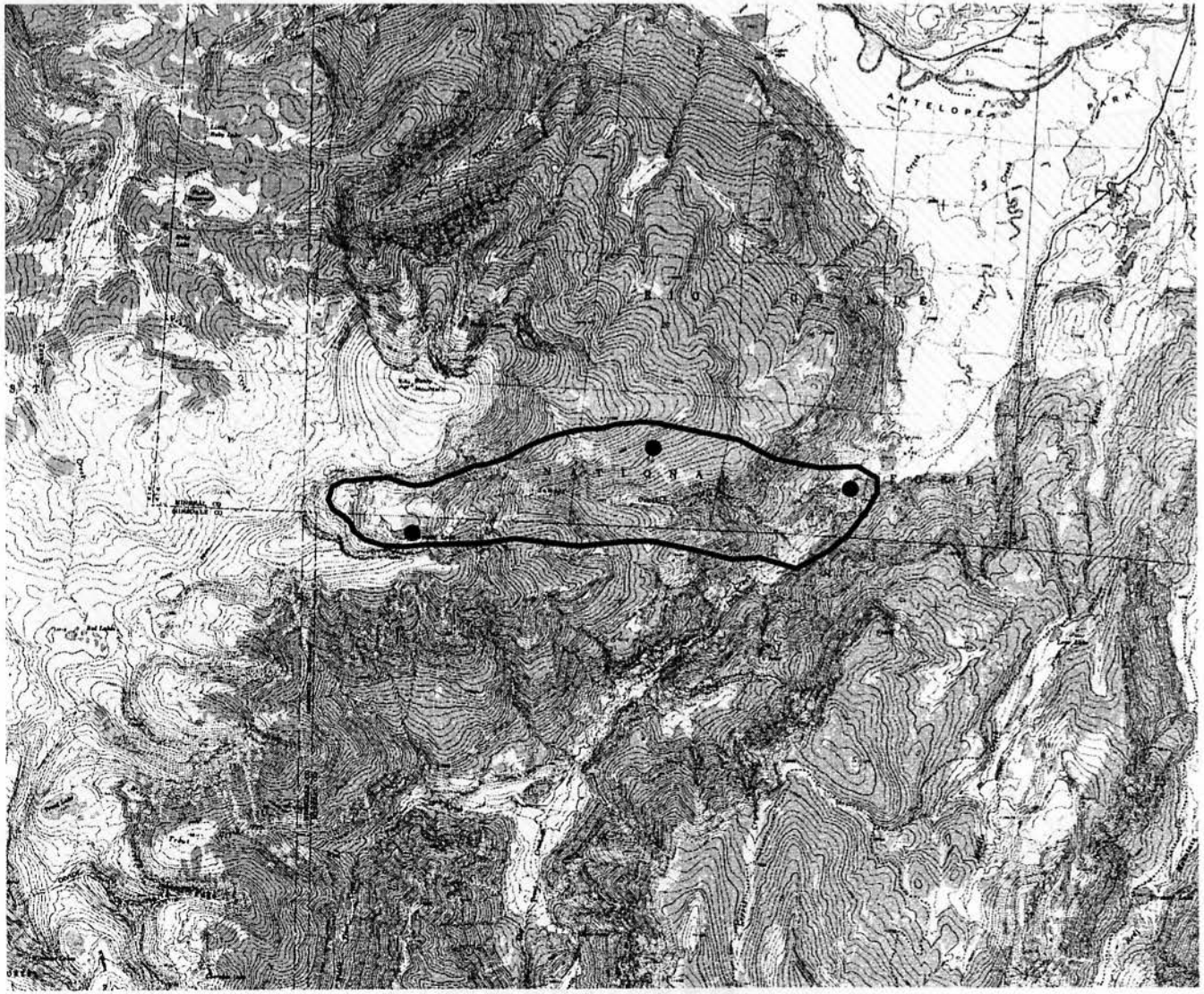
1 0 1 2 3 4 5 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Jumper Creek



1 0 1 2 3 4 5 Miles

Site Boundary

Elements of Concern

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

North Creede

Biodiversity Rank: B3 (High significance)
This site supports a large population of two Colorado endemic plants, Smith whitlow-grass (*Draba smithii*) and Black Canyon gilia (*Gilia penstemonoides*).

Protection Urgency Rank: P2
The site has a fragmented ownership with private and Rio Grande National Forest lands well represented. (See following ownership map). The private lands have no special conservation protection. The Forest Service is aware of the plant populations, although no management plans are in place.

Management Urgency Rank: M4
Current land use practices at this site are not endangering the rare plants. Although this site does not appear to have any stresses, this could change if mining is ever reactivated or the road is severely altered. If present land uses continue, monitoring the abundance of the population every 5-10 years would suffice. A baseline count of Smith whitlow-grass and Black Canyon gilia would help to identify a threshold population size that should be maintained. Research on pollination, seed dispersal, predators, seed germination, and longevity is needed. As the natural history of the plants becomes known, management plans for these species may be refined.

Location: The rhyolitic cliffs and talus slopes north of Creede on the "Bachelor Loop Trail." (See following map for exact location).

U.S.G.S. 7.5 minute quadrangle: San Luis Peak; Creede
Legal Description: T42N R1E S 7, 18, 19, 30
T42N R1W S 13, 24, 25
Elevation: 8,880-11,040 feet Acreage: 1,480

General Description: The North Creede site includes the scenic and dramatic volcanic cliffs that provide the town of Creede with a most picturesque backdrop. This area was the hub for the successful silver mining industry that began in 1891 and lasted until 1985 (Chronic 1980; Bachelor Historic Tour Guide Book). Currently, it is known as the historical and popular scenic drive known as the "Bachelor Loop Trail." Numerous old mines, both small and large, and old town sites are scattered throughout. The rare plants that are found at this site are found on the same cliffs and talus slopes that were mined. In fact, several old and undisturbed mine tailing piles and road construction debris piles provide the talus slopes that Smith whitlow-grass requires. Current land use is primarily recreation, mainly as a scenic drive through the historic mining operations.

Biodiversity Rank Justification: Two Colorado endemic plant species, Smith whitlow-grass and Black Canyon gilia, have some of the largest known populations at the North Creede site. The Smith whitlow-grass has been found in Mineral, Saguache, Costilla, and Las Animas counties, with approximately 15 known occurrences. (See Appendix A for the

global and state distribution maps). Of the known occurrences, Mineral County harbors the largest populations, and the North Creede site contains one of the largest populations, with at least several hundred individuals estimated.

The Black Canyon gilia has been found in Gunnison, Montrose, Hinsdale and Mineral counties with approximately 25 known occurrences. (See Appendix A for the global and state distribution maps). Mineral County supports the largest known populations, of which the North Creede site is among the best, with an estimated population size of several hundred plants.

Natural Heritage element occurrences at the North Creede site. Elements responsible for the high biodiversity rank are in bold typeface.

Latin name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plants						
Draba smithii	Smith whitlow-grass	G2	S2	FS	B	1998-08-09
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	B	1998-08-09

*EO=Element Occurrence

Future Research Needs: We know that Smith whitlow-grass grows well on steep rocky slopes, often of volcanic origin, and that it has a large elevation range of 8000-11,000 feet (Spackman et al. 1997). These criteria are met throughout the San Juan Mountains, yet the plant is rarely present. Future studies are needed to help understand what other factors are limiting this plant to so few sites.

Boundary Justification: The boundaries drawn include the elements found within the site. In addition, similar suitable habitat for both of these plants has been included within this boundary. We used on-the-ground surveys and 7.5 minute topographic maps to delineate the boundary.

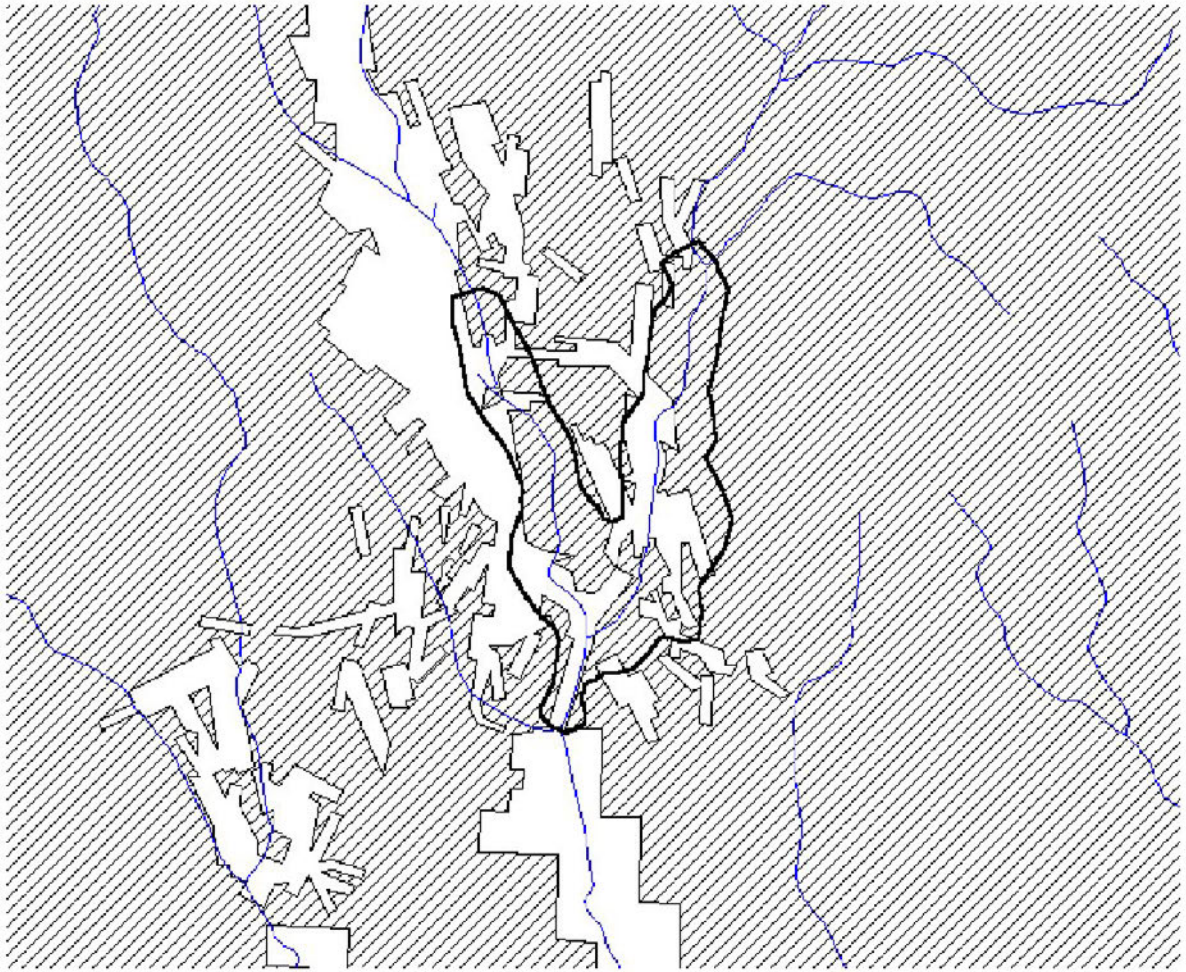
Literature cited

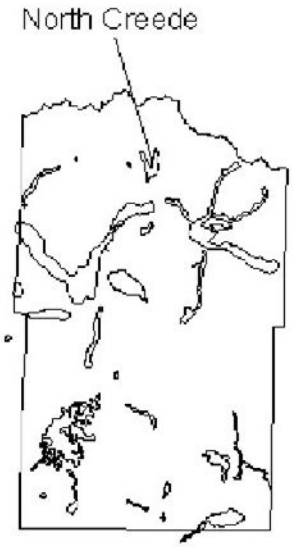
Chronic, Halka, 1980, Roadside geology of Colorado: Missoula, Montana, Mountain Press Publishing Co.

Spackman, S., Jennings, B., Coles, J., and others, 1997, Colorado rare plant field guide. Prepared for the Bureau of Land Mangement, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program: Fort Collins, CO, Colorado Natural Heritage Program.

North Creede

Ownership Status





Site Boundary

Elements of Concern

Private

U.S. Forest Service

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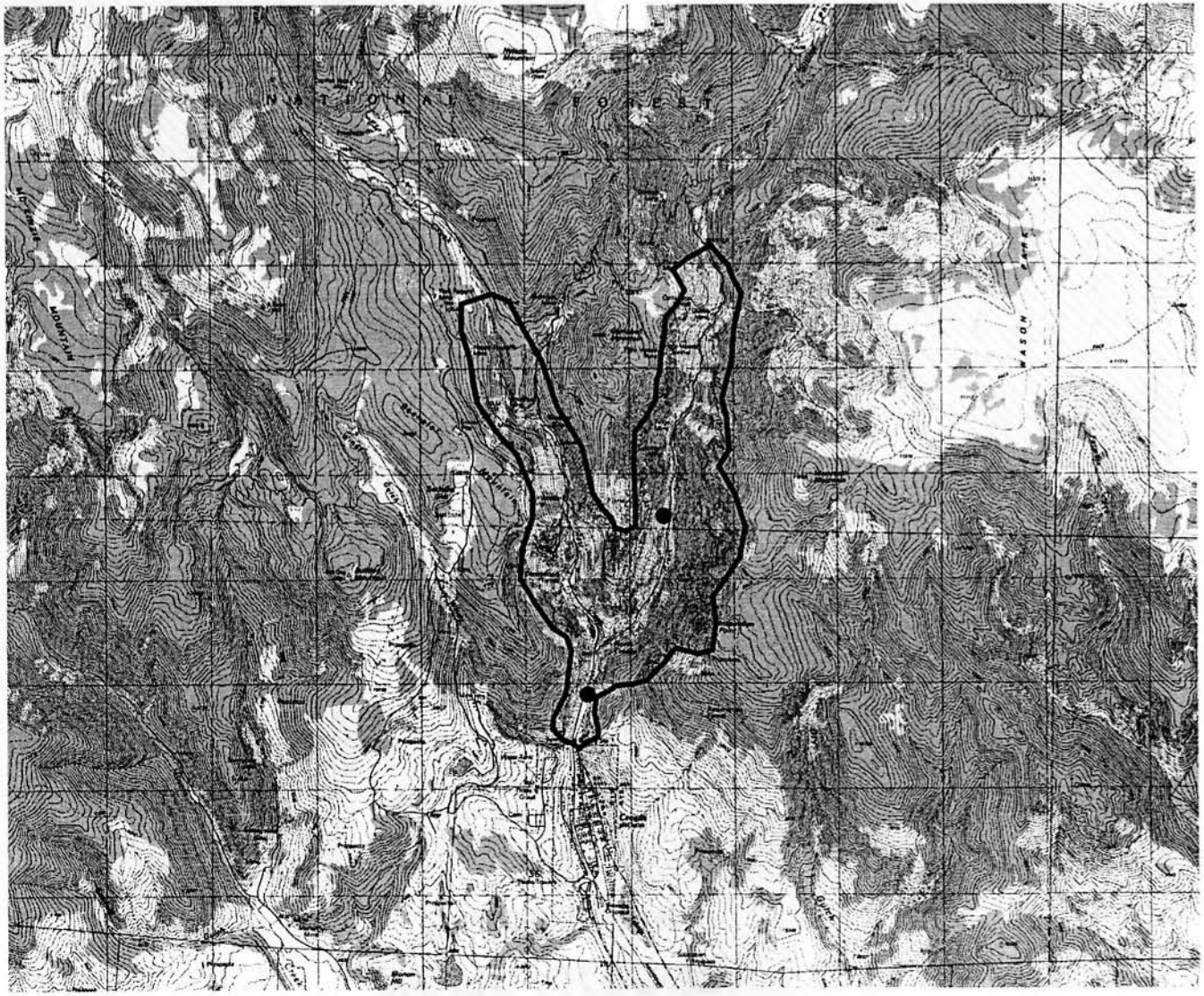
1 0 1 2 3 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

North Creede



1 0 1 2 3 Miles

Site Boundary

Elements of Concern

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W E
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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Piedra River

Biodiversity Rank: B3 (High significance)
This site contains a population of the imperiled Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). The population has a genetic purity rank of "A-." In addition to the fish, the site supports a good example of a rare montane riparian forest.

Protection Urgency Rank: P3
Over 99% of the Piedra River site is within the Weminuche Wilderness Area of the San Juan National Forest. The most downstream portion of the site is privately owned.

Management Urgency Rank: M3
The most important management concerns are with introduced rainbow trout as rainbow trout are known to hybridize with the native cutthroat trout. Division of Wildlife and the National Forest are monitoring the fish at this site. A waterfall prevents most non-native fish from mixing with the native Colorado River cutthroat trout, although DOW believes a past introduction of rainbow trout above the falls caused the genetic impurity of the Colorado River cutthroat trout (Mark Japhet pers. comm.). The hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

Location: Along the East Fork of the Piedra River and tributaries, from the base of Piedra Peak downstream to 8,160 feet in elevation. See following map for exact location.

U.S.G.S. 7.5 minute quadrangle: Palomino Mountain; Pagosa Peak

Legal Description:	T37N, R2W	S 1-5
	T38N, R1W	S 6, 7, 19
	T38N, R2W	S 1-3, 9-16, 20-29, 32-36
	T39N, R1W	S 32

Elevation: 8,160-12,520 feet Acreage: 9,120

General Description: This site includes alpine and montane habitat. The site is generally characterized as a narrow valley with a high gradient stream above the falls. The slopes are primarily white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*) with aspen (*Populus tremuloides*); Mexican white pine (*Pinus strobiformis*) and ponderosa pine (*Pinus ponderosa*) are subdominant. Ponderosa pine is more prevalant on the west-facing slope of the valley. Exotics are invading from grazing lands down valley. Canada thistle is the most prevelant of the non-natives. The stream bed is composed of very coarse cobble and boulder fragments.

The upper elevations support a tundra habitat where over 200 individuals of the state rare Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) have been found. The cottongrass occurs on a saturated slope with a volcanic extrusive parent material on a glacial outwash plain.

In 1997 an unconfirmed boreal toad (*Bufo boreas* pop. 1) egg mass was discovered in a kettle pond near Monument Lake.

Biodiversity Rank Justification: A healthy population of the imperiled Colorado River cutthroat trout and a good example of a montane riparian forest are driving the rank of this site.

Natural Heritage elements at the Piedra River site. Multiple listings of elements represent separate locations. Elements responsible for the biodiversity rank are in bold typeface.

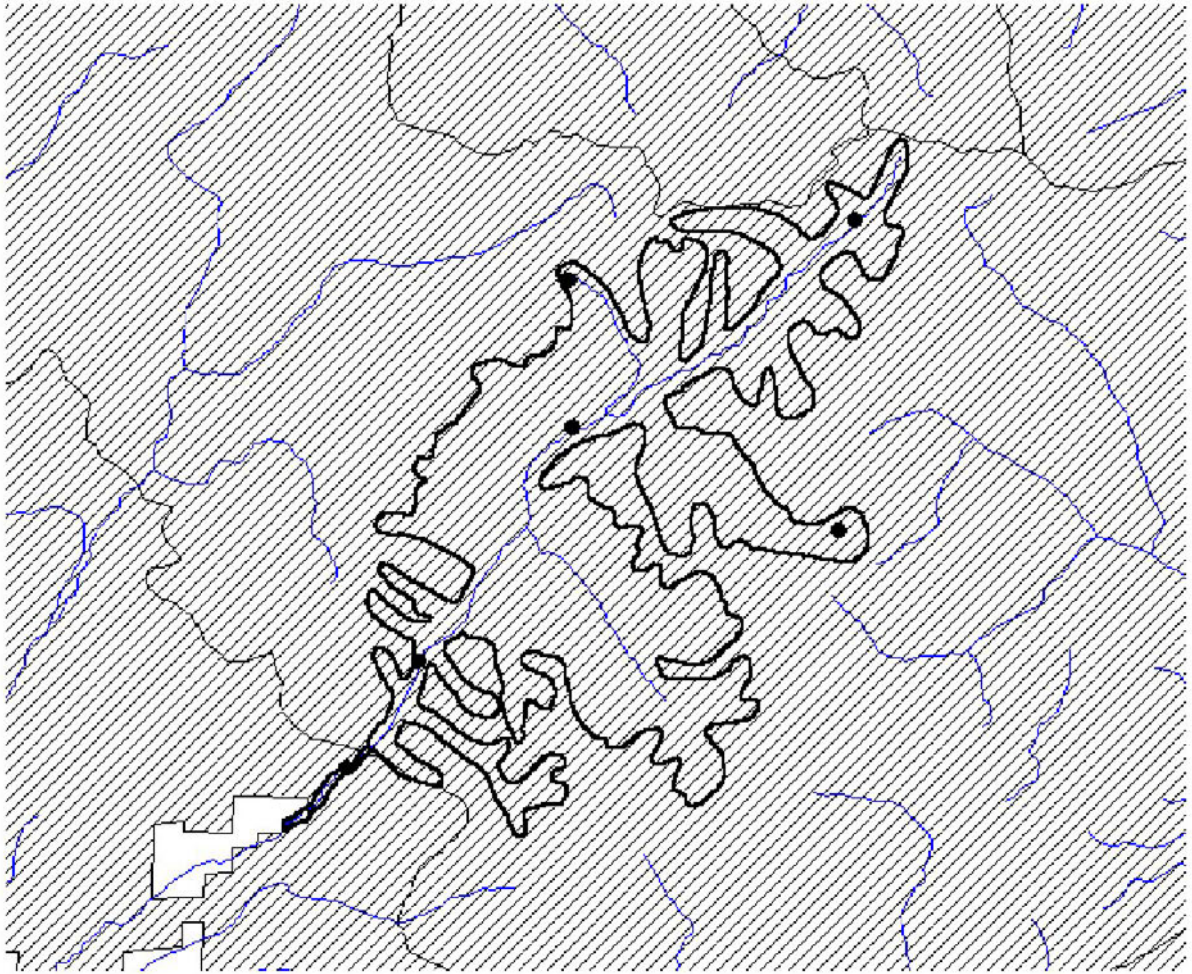
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plant Communities						
Populus angustifolia/Alnus incana	**Montane riparian forest**	**G3?**	**S3**		**B**	**1995-08-26**
Plants						
Eriophorum altaicum var *neogaeum*	Altai cottongrass	G4T?	S2	FS		1995-08-16
Mammals						
Ursus arctos	Grizzly bear	G4	SX	LT	X	1957
Amphibians						
Bufo boreas pop 1	Boreal toad (Southern Rocky Mountain population)	G4T1Q	S1	FS, C		1995-09-27
Fish						
Oncorhynchus clarki pleuriticus	Colorado River cutthroat	G5T3	S3	FS		1996
Oncorhynchus clarki pleuriticus	Colorado River cutthroat	G5T3	S3	FS		1993

*EO=Element Occurrence

Boundary Justification: The planning boundary includes the headwaters and major tributaries from both ends of the fish barriers. A 1,000 foot upland buffer is provided to limit direct physical disturbance and local hydrologic alteration. This should be sufficient to protect potential breeding habitat for the boreal toad as well.

Piedra River

Ownership Status



Site Boundary

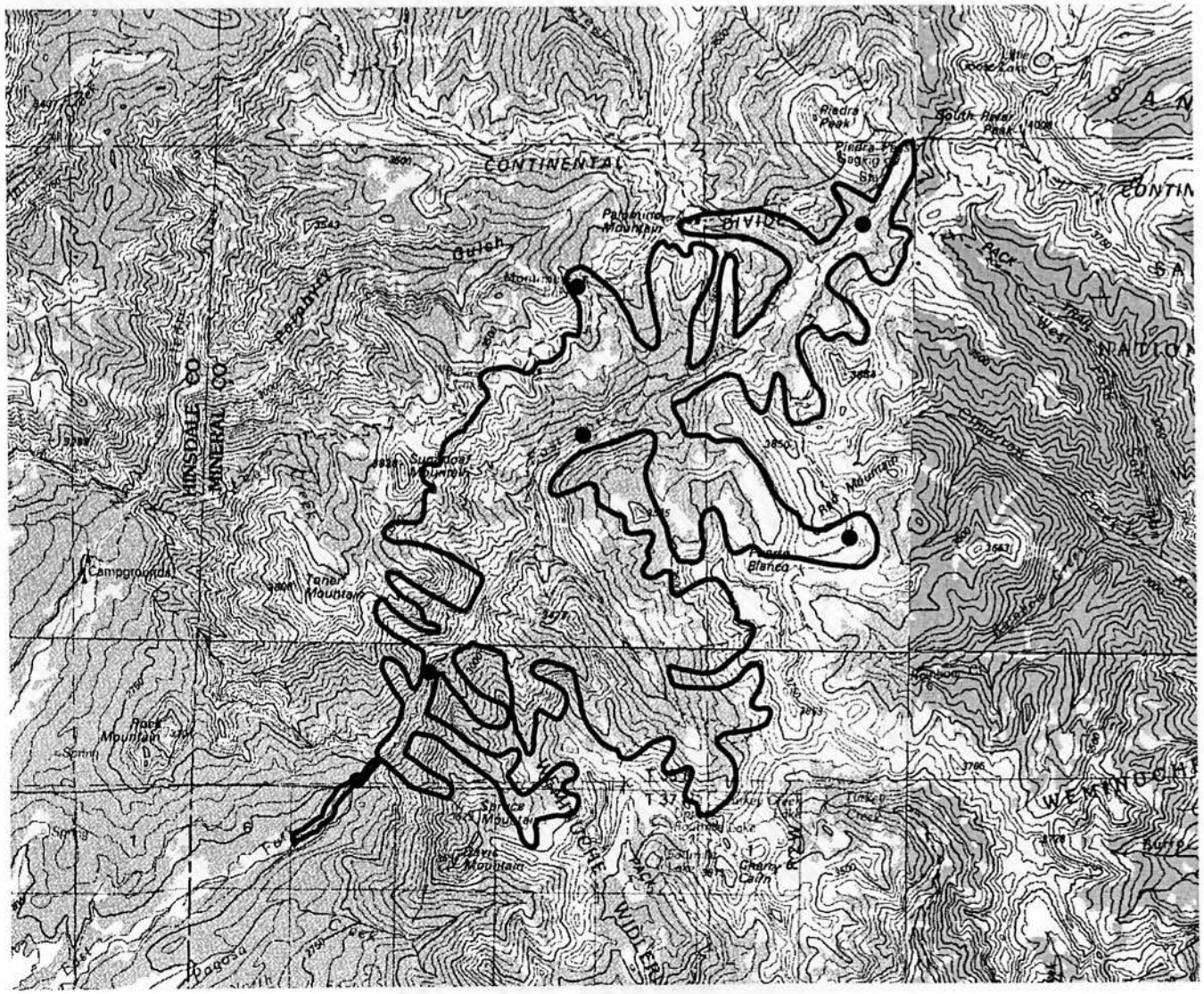
Elements of Concern

Private

U.S. Forest Service

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be mocified as new information is incorporated into the decision making process.

Piedra River



2 0 2 4 6 Miles

Piedra River

Site Boundary

Elements of Concern

N

W E

S

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Six Mile Flats

Biodiversity Rank: B3 (High significance)
The Six Mile Flats site contains a good example of a rare montane grassland that supports the Gunnison prairie dog (*Cynomys gunnisoni gunnisoni*) and a skipper butterfly that is rare in Colorado (*Oarisma edwardsii)*.

Protection Urgency Rank: P2
This site includes many small private parcels (see following ownership map). The primary stress is housing development. Multiple conservation easements or other forms of protection may encourage planned growth and thereby limit negative impacts caused by development.

Management Urgency Rank: M3
Fires and grazing may have been important ecological processes for these grasslands (Johnston 1997). Current ownership patterns limit both of these processes. A management plan should incorporate all the landowners and contain a strategy that would help to maintain the integrity of the unique grassland, e.g. limited or clustered development that provides for extensive acres of open space.

Location: Six Mile Flats south of Creede. This site includes the area around Mineral County airport. (See following map for exact location)

U.S.G.S. 7.5 minute quadrangle: Creede
Legal Description**:** T41N R1W S 1- 3, 10-12, 14-16, 21, 22
T41N R1E S 6, 7
Elevation: 8,600-9,040 feet Acreage: 2,670

General Description: The Six Mile Flats site represents an interesting geological structure unique in Mineral County. Just south of Creede and above the entrenched Rio Grande River, a mile wide bench extends over most of the valley width. The flat nature of the site is unusual in this otherwise mountainous region and is believed to be the remains of an ancient glacial deposit that flowed down the Rio Grande Valley (Steven and others 1995). Reflecting the geology, the vegetation is also of interest and is of a rare grassland type comprised of slimstem muhly (*Muhlenbergia filiculmis*). A diverse array of native herbaceous perennials (some of which are excellent large game forage plants) are found throughout the grassland. The site provides moderate foraging habitat for wintering elk herds, and possibly big horn sheep, and provides good habitat for the Gunnison prairie dog, found along the northern edge of the site near Hwy 149.

Several man-made structures fragment this site, including Hwy 149, the Mineral County airport, and several small housing developments with two-track roads throughout. Land uses include several large ranches and small subdivisions. The proximity to Creede and the flat nature of the site increases the potential for housing development.

Biodiversity Rank Justification: This site contains a large, but fragmented, occurrence of slimstem muhly montane grassland (*Muhlenbergia filiculmis)* and a small occurrence of

Arizona fescue montane grassland (*Festuca arizonica-Muhlenbergia filiculmis)*. The slimstem muhly grassland is globally restricted to Saguache and Mineral counties of Colorado, with approximately six known occurrences. (See Appendix A for global and state distribution maps). Slimstem muhly is moderately preferred forage for cattle, sheep, horses, elk, and deer (Dennis and Antonio 1980), and is therefore a grass that increases with livestock grazing. The Colorado Natural Heritage Program believes that this grassland is a naturally occurring plant community when it occurs on these expansive, flat, and windswept open areas. Within the winter range, Arizona fescue, blue grama (*Bouteloua gracilis*), fringed sage (*Artemisia frigida*), and mountain muhly (*Muhlenbergia montana*) are major foods for bighorn sheep that visit Arizona fescue stands (Shepherd 1975). All of these grasses and forbs are present at this site and the adjacent Antelope Park site.

The Gunnison prairie dog, although once common, has been declining in population. This species provides an important food source to many of the animals found in Mineral County, including many raptors. Most of the Mineral County occurrences of the prairie dog occur along Hwy 149, and the occurrence at Six Mile Flats is no exception. Roads, especially as large as Hwy 149, have a negative effect on animals (Forman and Alexander 1998). One of the more obvious effects is the numerous roadkills, which are common at this site.

Natural Heritage element occurrences at the Six Mile Flats site. Multiple listings represent separate locations. Elements responsible for the biodiversity rank are in bold typeface.

Latin name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plants						
Erigeron philadelphicus	Philadelphia fleabane	G5	S1			1990-08-15
Plant Communities						
Muhlenbergia filiculmis	**Montane grasslands**	**G2**	**S2**		**C**	**1998-07-24**
Festuca arizonica-Muhlenbergia filiculmis	**Montane grasslands**	**G3**	**S2**		**C**	**1998-07-24**
Festuca arizonica-Muhlenbergia filiculmis	Montane grasslands	G3	S2		C	1998-07-24
Mammals						
Cynomys gunnisoni gunnisoni	Gunnison's prairie dog subsp.	G5T3	S3		C	1998-07-25
Insects						
Oarisma edwardsii	Edward's skipperling	G4	S3		C	1998-07-24

*EO=Element Occurrence

Boundary Justification: This boundary is drawn to include the entire geologically unique flats adjacent to the Rio Grande. It includes both the known as well as suitable habitat for the elements of biodiversity found at the site. The boundary was delineated using on-the-ground verification and 7.5 minute topographic maps.

Literature cited

Dennis, E. C. and D.W. Antonio. 1980. Common Colorado range plants (partial list): Denver, CO, USDA Soil Conservation Service.

Forman, R. T. T. and L. E. Alexander. 1998. Roads and their major ecological effects: Annu. Rev. Ecol. Syst., v. 29, p. 207-231.

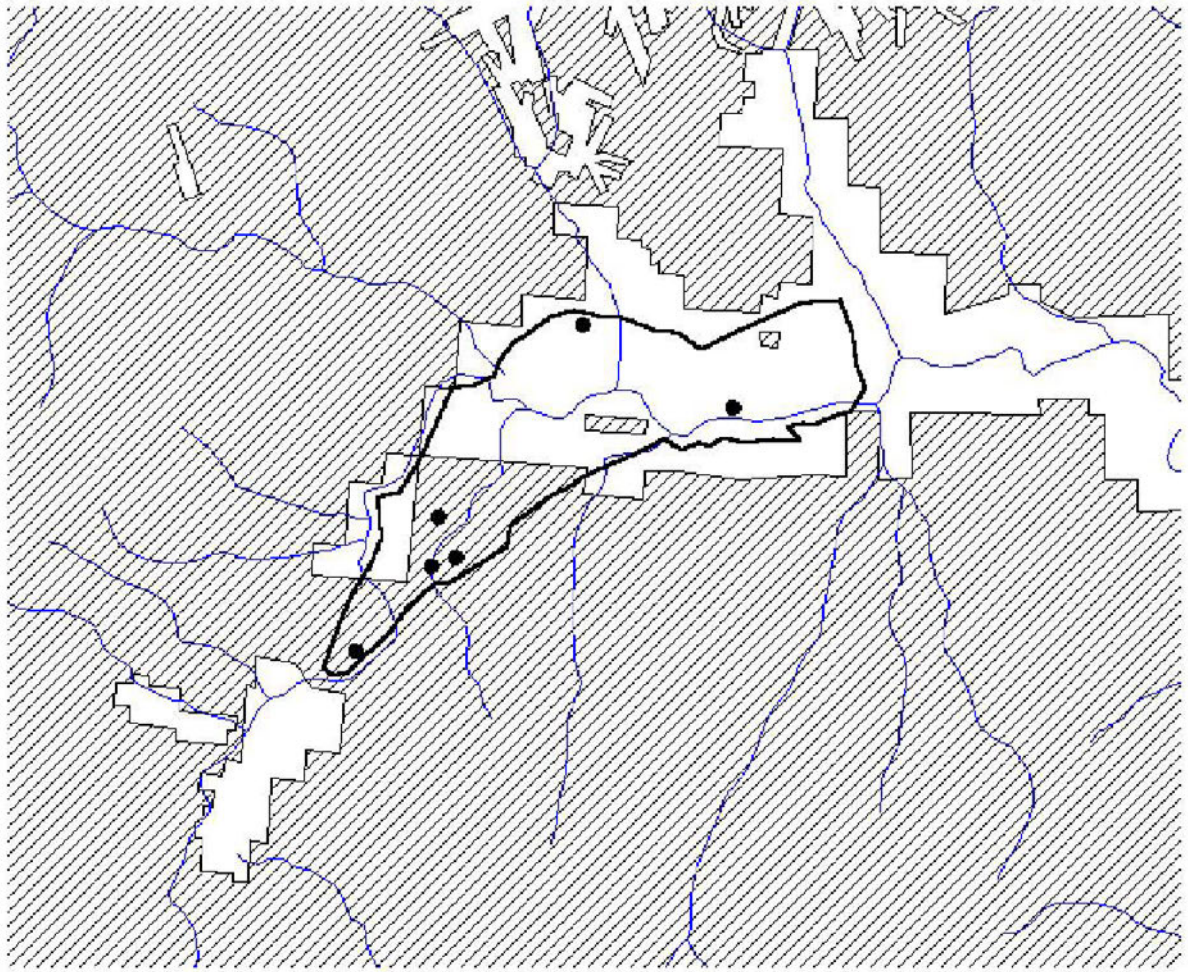
Johnston, B. C. 1997. Ecological types of the Upper Gunnison Basin. Review draft: Gunnison, CO, USDA, Forest Service.

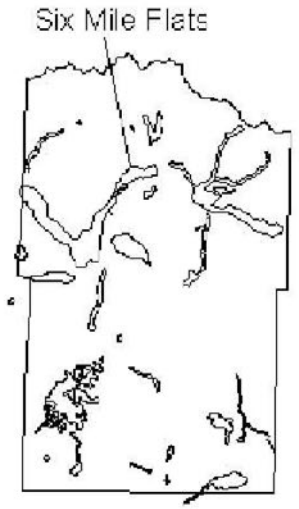
Shepherd, H. R. 1975. Vegetation of two dissimilar bighorn sheep ranges in Colorado: Place of publication not stated, Colorado Division of Wildlife, 223.

Steven T. A., K. Hon, M. A. Lanphere. 1995. Neogene geomorphic evolution of the central San Juan Mountains near Creede, Colorado [1:100,000]. Map I-2504 U.S. Department of the Interior: U.S. Geological Survey.

Six Mile Flats

Ownership Status





Site Boundary

Elements of Concern

Private

U.S. Forest Service

N

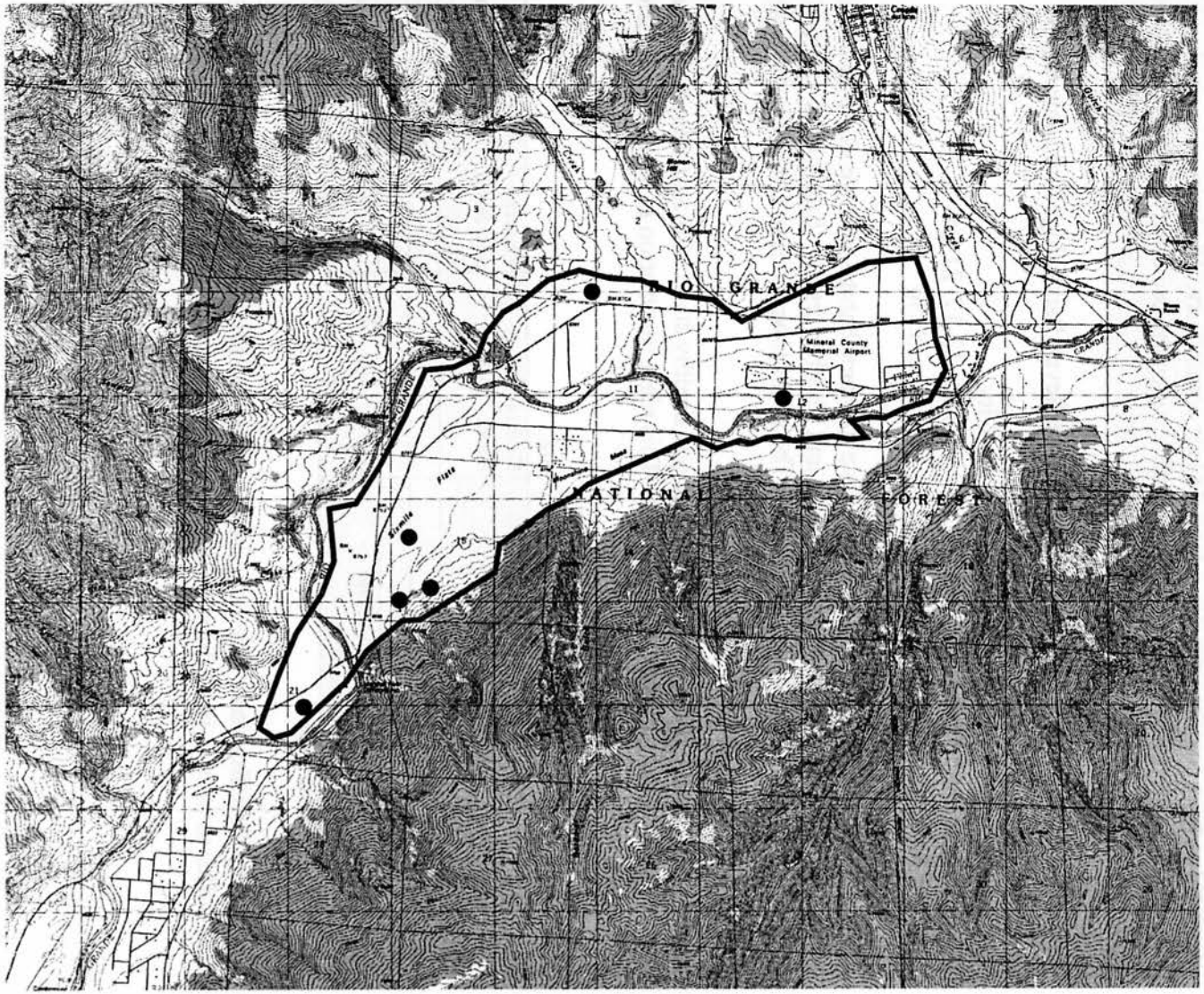
W E

S

2 0 2 4 6 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Six Mile Flats



2 0 2 4 Miles

Six Mile Flats

Site Boundary

Elements of Concern

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W E
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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Spar City

Biodiversity Rank: B3 (High significance)
The Spar City site contains a large and excellent quality occurrence of a bristle cone pine/Thurber fescue (*Pinus aristata/Festuca thurberi*) montane woodland.

Protection Urgency Rank: P4
Over 95% of the Spar City site is owned and managed by the Rio Grande National Forest; the remaining portion is privately owned. (See the following ownership map.)

Management Urgency Rank: M4
Bristlecone pine forests are a fire-adapted plant community. Fire suppression should be avoided and controlled burns may be desirable, since the proximity to Spar City is of concern.

Location: The south-facing slopes between the Seven Parks ridge and Lime Creek. See the following map for exact location.

U.S.G.S. 7.5 minute quadrangle: Spar City
Legal Description: T40N, R1W S 8-11, 13-17, 21-24
Elevation: 9,400-11,480 feet Acreage: 3250

General Description: The Spar City site is a montane habitat with gentle to moderately steep slopes dominated by bristlecone pine and Thurber fescue. Engelmann spruce (*Picea engelmannii*) is also dominant in patches. The small town of Spar City is at the base of this site.

Biodiversity Rank Justification: A large and healthy stand of bristlecone pine/Thurber fescue determines the B3 rank of this site. This plant association is limited to the southern Rocky Mountain ecoregion.

Natural Heritage elements at the Spar City site.

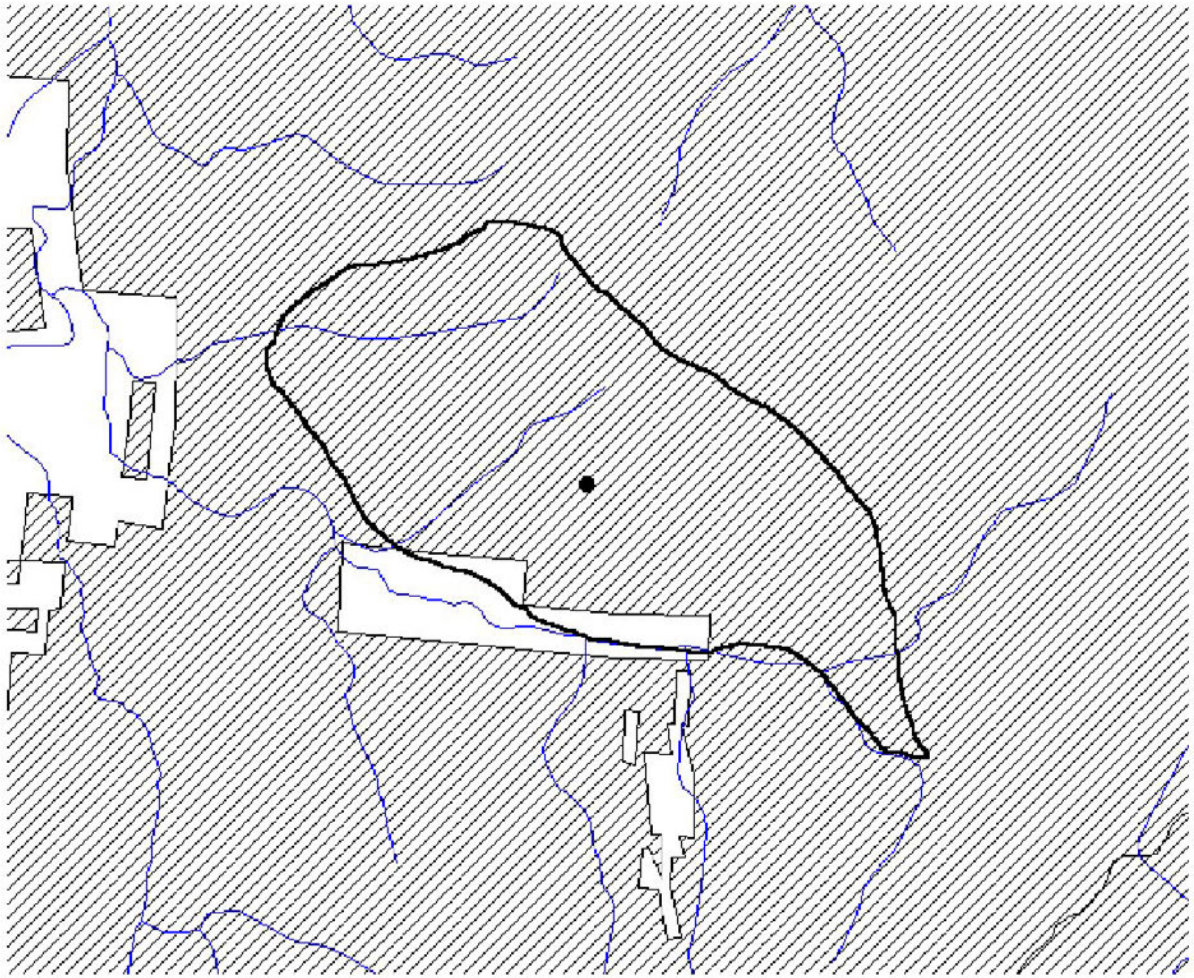
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plant Communities						
Pinus aristata/Festuca thurberi	Lower montane woodlands	G3	S2		A	1994-08-12

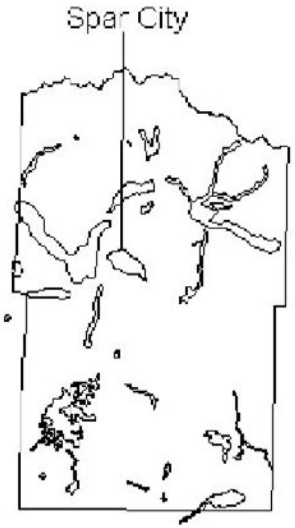
*EO=Element Occurrence

Boundary Justification: The boundary includes the bristlecone pine woodland with a 200 foot buffer to protect from direct disturbance. This site was not visited by CNHP in 1998.

Spar City

Ownership Status





Site Boundary

Elements of Concern

Private

U.S. Forest Service

N

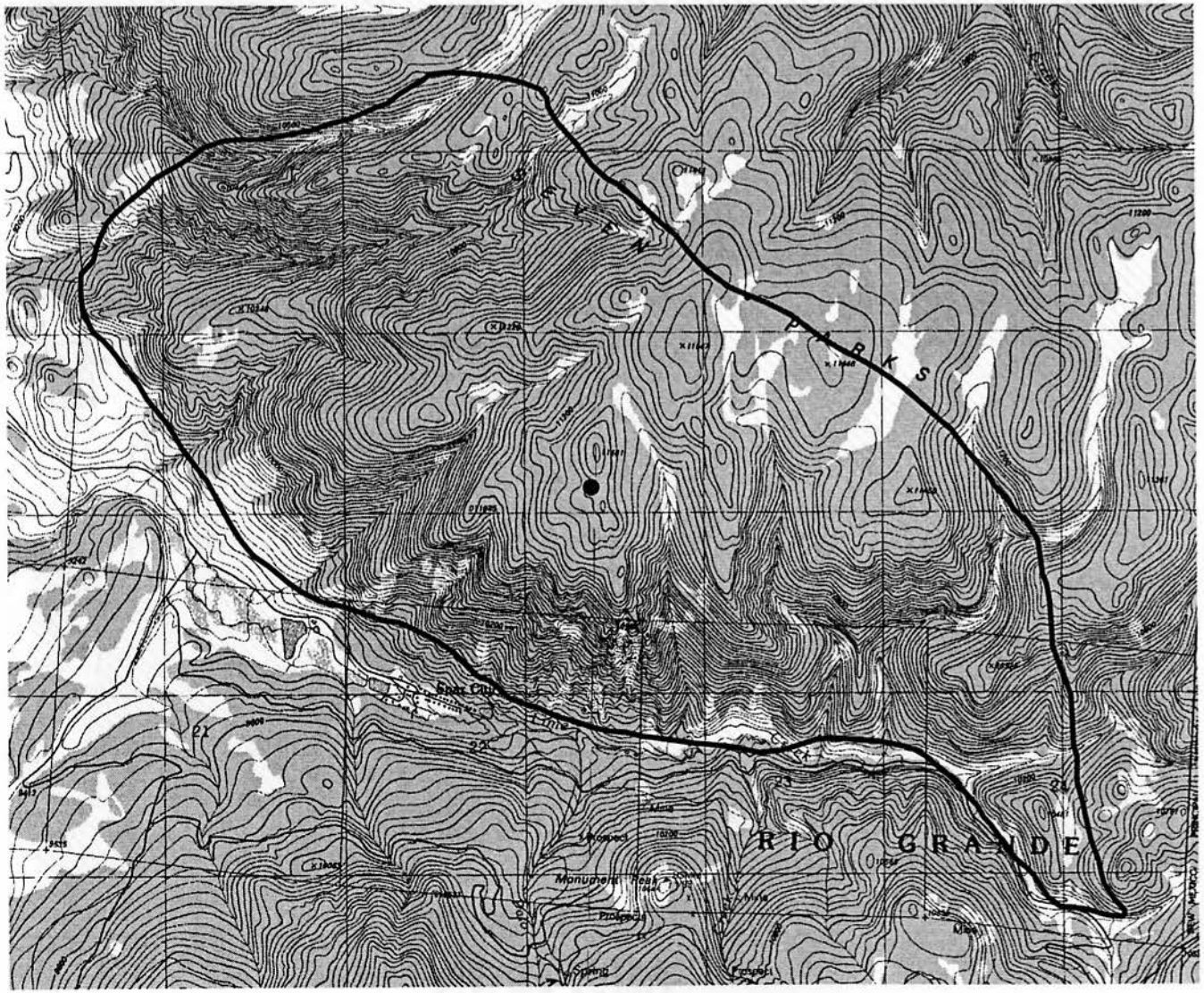
W E

S

2 0 2 4 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Spar City



1 0 1 2 Miles

Spar City

Site Boundary

Elements of Concern

N
W E
S

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Wolf Creek

Biodiversity Rank: B3 (High significance)
The Wolf Creek site contains a good occurrence of a rare and imperiled riparian community comprised of narrowleaf cottonwood-Douglas fir (*Populus angustifolia-Pseudotsuga menziesii*).

Protection Urgency Rank: P3
Over 90% of the Wolf Creek site is owned and managed by the San Juan National Forest. The remaining portion is privately owned. To our knowledge there is no protection of the privately owned portion. (See the following ownership map.)

Management Urgency Rank: M3
Recreational use may need to be managed, especially within the riparian area. Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing, and flow must be managed to maintain site viability.

Location: Just east of overlook below Wolf Creek Pass. See the following map for exact location.

U.S.G.S. 7.5 minute quadrangle: Saddle Mountain
Legal Description: T37N R1E S 9, 16, 17
Elevation: 7,800-9,040 feet Acreage: 260

General Description: The Wolf Creek site includes Wolf Creek and the upper slopes that support the rare plants of the site. The riparian area near Wolf Creek Campground is comprised of a Douglas fir/narrowleaf cottonwood-white fir (*Pseudotsuga menziesii/Populus angustifolia-Abies concolor)* community. The community overstory is very diverse with numerous species of trees and shrubs. Age class is diverse with very large individuals of narrowleaf cottonwood and white fir. Upland communities are also diverse. Lower slopes are composed of blue spruce/white fir (*Picea pungens/Abies concolor*) with Douglas fir. Mexican white pine (*Pinus strobiformis*) is subdominant. The upper slopes are composed of subalpine fir/Engelmann spruce (*Abies lasiocarpa/Picea engelmannii*). The valley receives high precipitation creating a very lush and productive landscape. Grazing occurs in the valley below but does not appear to affect this community.

CNHP did not visit this site in 1998.

Biodiversity Rank Justification: A good occurrence of a globally rare montane riparian plant community.

Natural Heritage elements at the Wolf Creek site. Elements responsible for the biodiversity rank are in bold typeface.

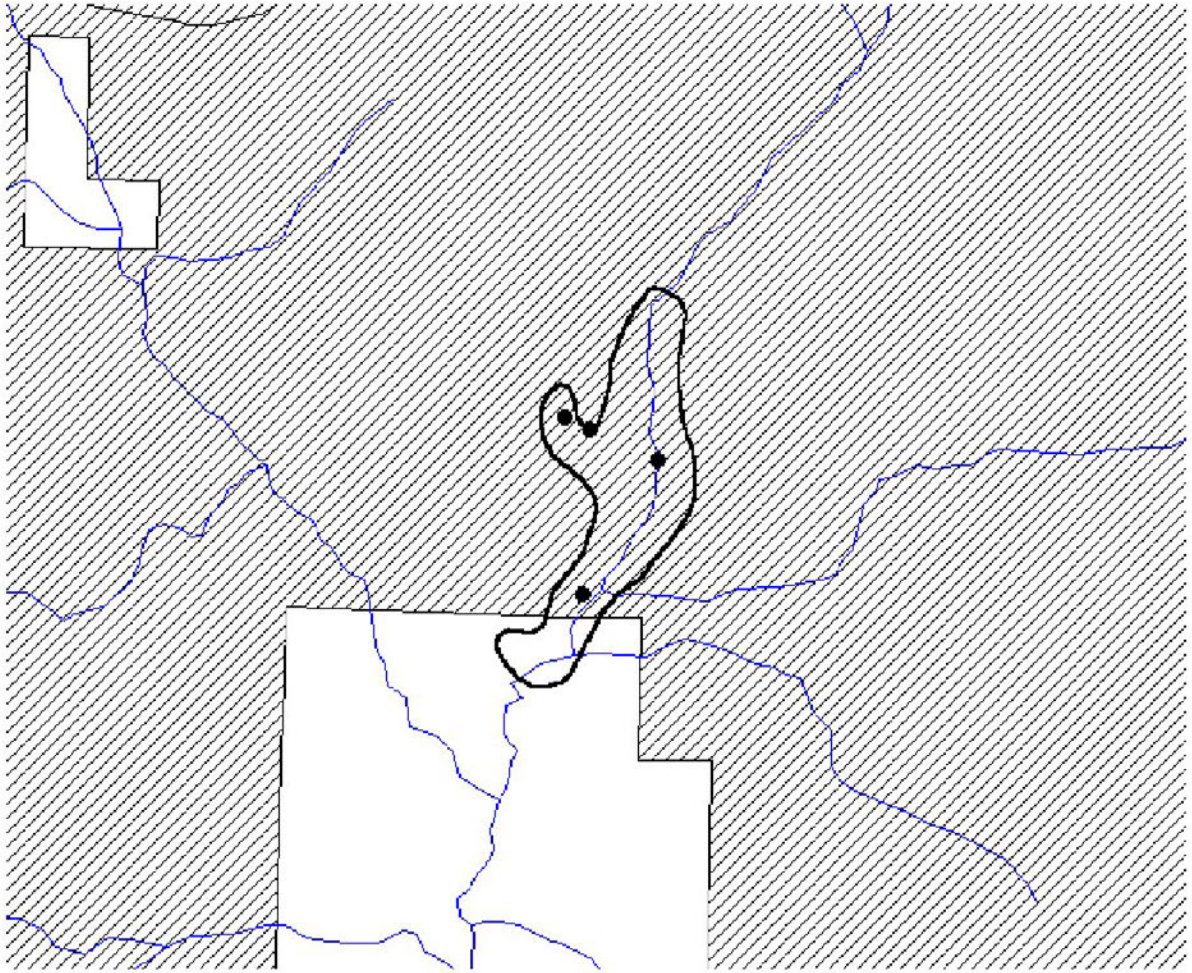
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plant Communities						
Populus angustifolia-Pseudotsuga menziesii	**Montane riparian forest**	**G2?**	**S2**		**B**	**1995-08-25**
Abies concolor-Picea pungens-Populus angustifolia/Acer glabrum	Montane riparian forest	G2	S2		BC	1986-07-23
Plants						
Oenothera kleinii	Wolf Creek evening primrose	GUGHQ	SX		X	1981-09-18
Pyrola picta	Pictureleaf wintergreen	G4G5	S3		C	1985-09-04

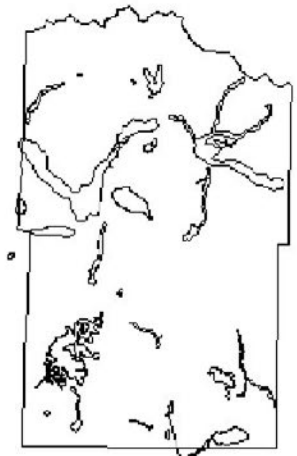
*EO=Element Occurrence

Boundary Justification: The boundary encompasses the occurrences and an approximate 1,000 foot buffer. This boundary should protect the occurrence from direct disturbance. This site was not visited by CNHP in 1998.

Wolf Creek

Ownership Status



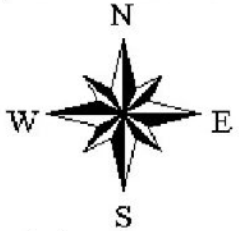


Site Boundary

Elements of Concern

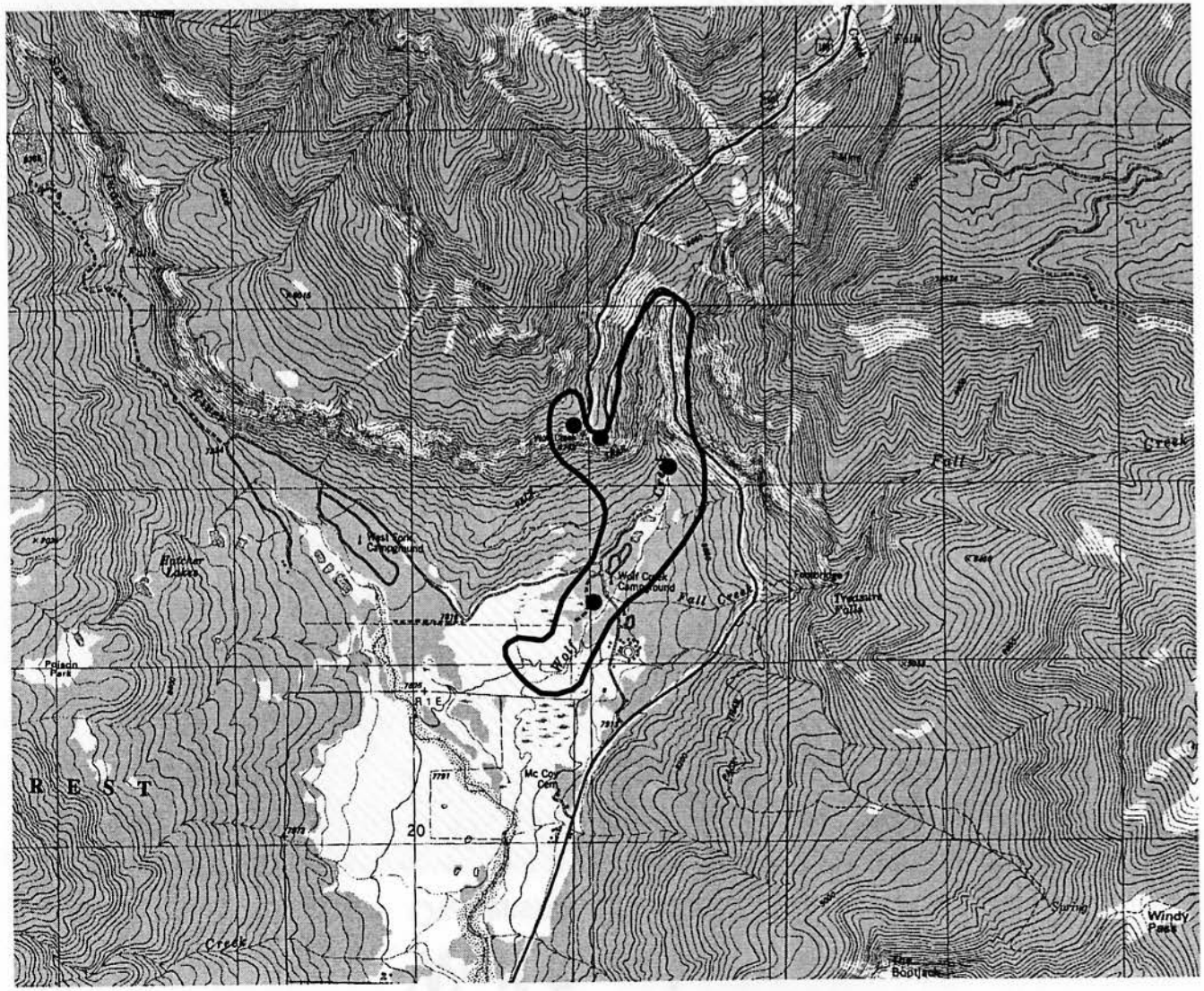
Private

U.S. Forest Service



The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Wolf Creek



1 0 1 2 Miles

Wolf Creek

Site Boundary

Elements of Concern

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W E

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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Beaver Creek of West Fork San Juan

Biodiversity Rank: B4 (Moderate significance)
The Beaver Creek of West Fork San Juan has a small population of the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*).

Protection Urgency Rank: P4
The Beaver Creek of West San Juan site is owned and managed by San Juan National Forest.

Management Urgency Rank: M4
The Division of Wildlife and the San Juan National Forest are monitoring this population of Colorado River cutthroat trout.

Location: Beaver Creek in the Weminuche Wilderness Area. See the following map for exact location.

U.S.G.S. 7.5 minute quadrangle: South River Peak
Legal Description: T38N, R1W S 1, 2, 3, 11, 12
T38N, R1E S 7, 8, 17, 18
Elevation: 9,880-11,720 feet Acreage: 469

General Description: This site was not visited by CNHP in 1998 and CNHP's conservation database does not include a description.

Biodiversity Rank Justification: An unranked occurrence of an imperiled cutthroat trout subspecies.

Natural Heritage elements at the Beaver Creek of West Fork San Juan site.

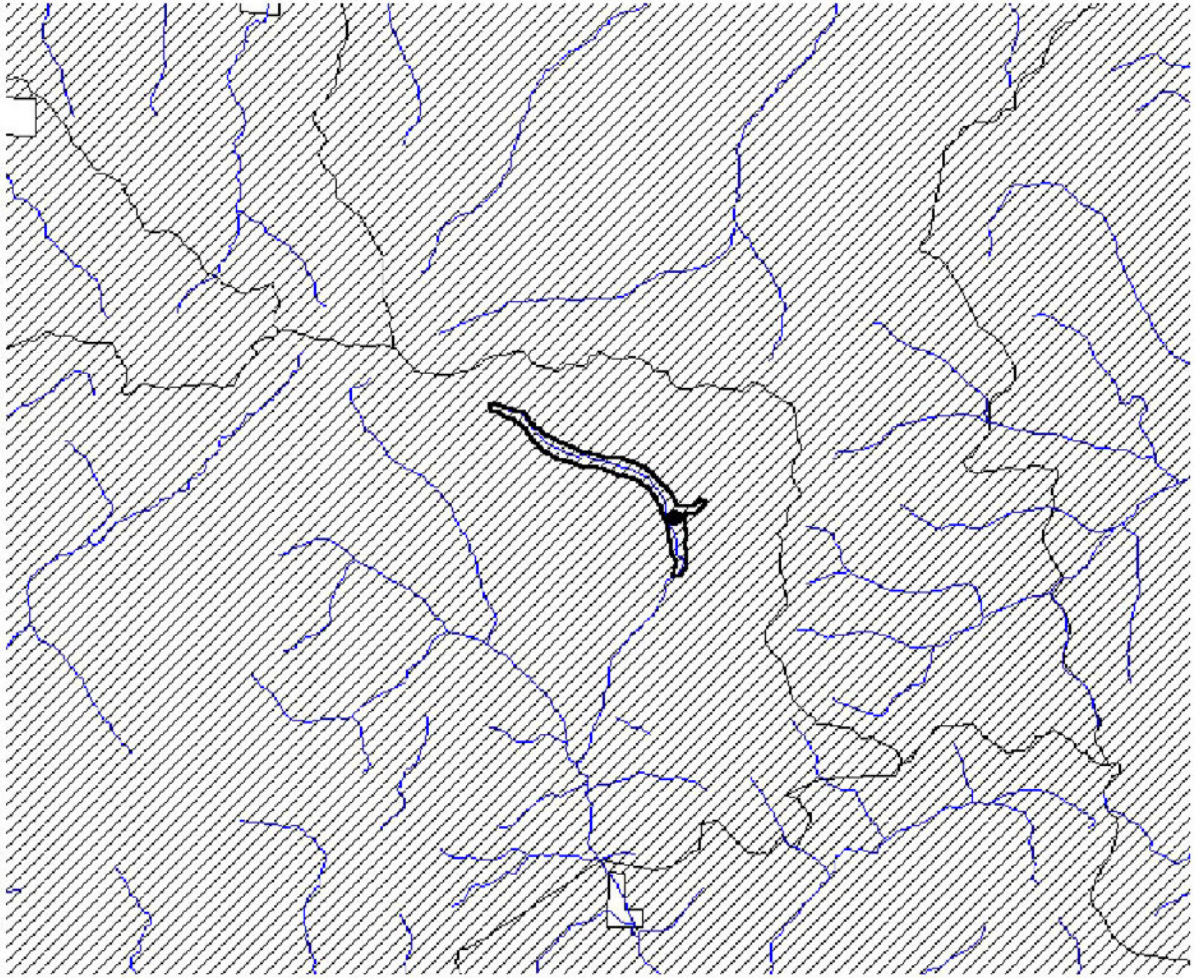
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Fish						
Oncorhynchus clarki pleuriticus	Colorado River cutthroat	G5T3	S3	FS		1994

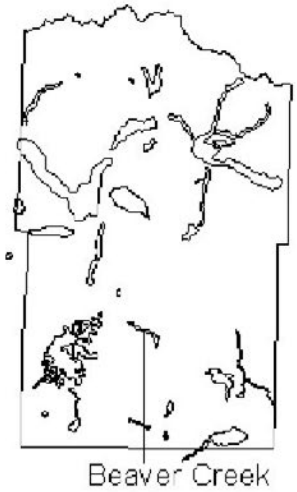
*EO=Element Occurrence

Boundary Justification: The boundary was drawn to include the headwaters of Beaver Creek and a small portion of a confluence with another creek, where the fish is known to occur. A small buffer surrounding the stream is included to protect from direct impacts.

Beaver Creek of West Fork San Juan

Ownership Status



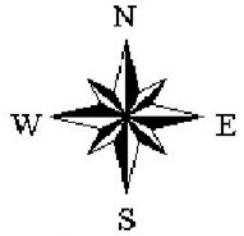


Site Boundary

Elements of Concern

Private

U.S. Forest Service



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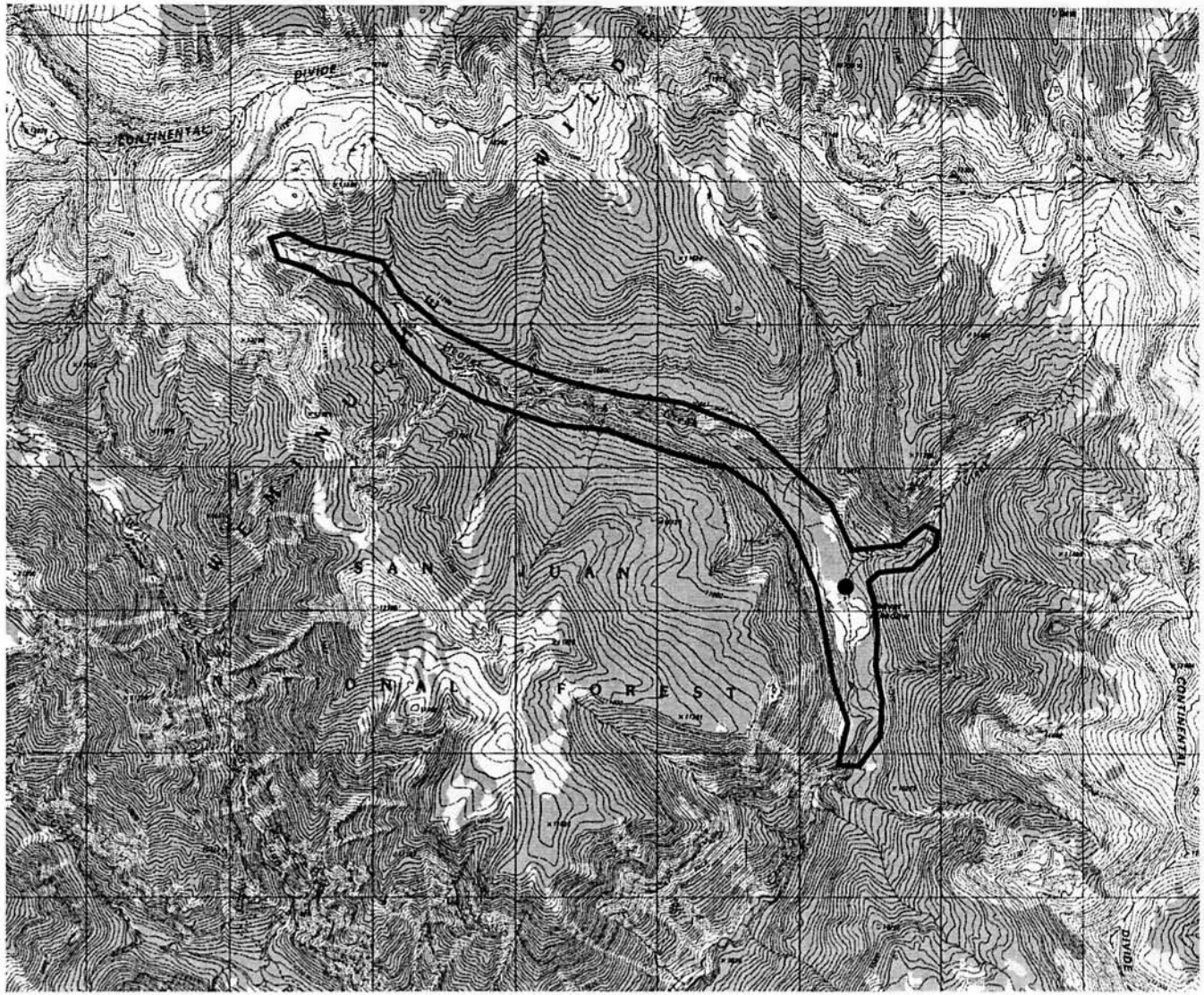
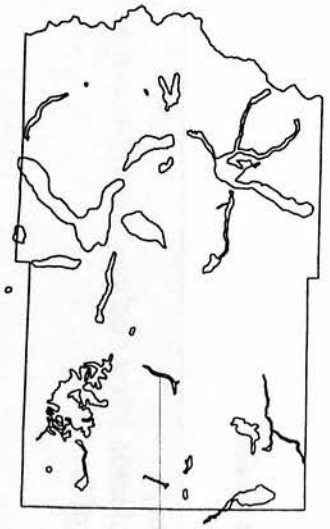
Beaver Creek of West Fork San Juan





Beaver Creek

Site Boundary

Elements of Concern

N
W E
S

1 0 1 2 3 4 Miles

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Himes Creek

Biodiversity Rank: B4 (Moderate significance)
A small population and relict population of Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) with a genetic purity rating of "A."

Protection Urgency Rank: P5
The Himes Creek site is owned and managed by San Juan National Forest.

Management Urgency Rank: M4
No serious management needs known or anticipated at this site. Division of Wildlife and the San Juan National Forest are monitoring this population of Colorado River cutthroat trout. The hydrological processes originating outside of the planning boundary, including water quality, quantity, timing, and flow must be managed to maintain site viability.

Location: From the headwaters of Himes Creek to the confluence with the Rod and Gun Club Lake tributary. See the following map for exact location.

U.S.G.S. 7.5 minute quadrangle: Saddle Mountain
Legal Description: T37N, R1E S 19, 30
T37N, R1W S 23, 24
Elevation: 8,360-11,360 feet Acreage: 139

General Description: This site was not visited by CNHP in 1998 and CNHP's conservation database does not include a description.

Biodiversity Rank Justification: A small but healthy relict population of Colorado River cutthroat trout with a purity rank of "A".

Natural Heritage elements at the Himes Creek site.

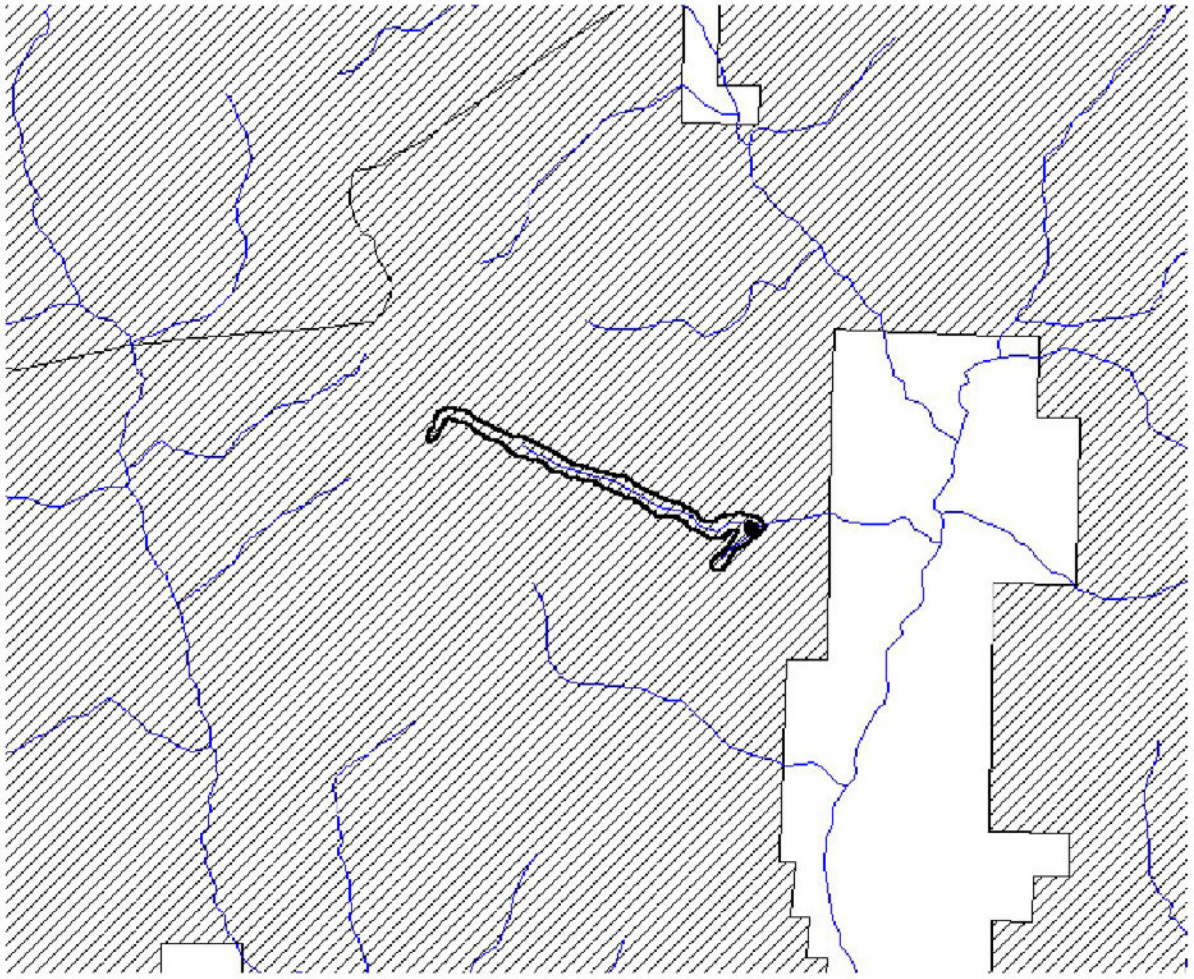
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Fish						
Oncorhynchus clarki pleuriticus	Colorado River cutthroat	G5T3	S3	FS		1994

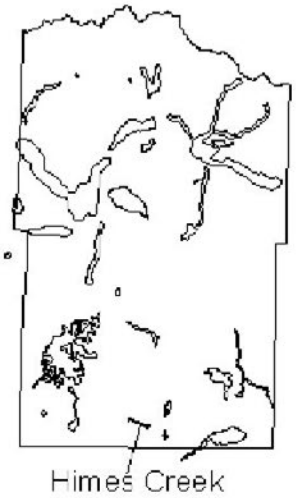
*EO=Element Occurrence

Boundary Justification: The boundary includes the headwaters and major tributaries. A 1,000 foot upland buffer is provided to limit direct physical disturbance and local hydrologic alteration.

Himes Creek

Ownership Status



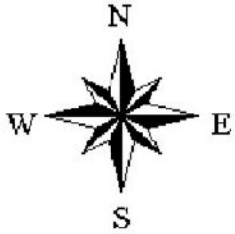


Site Boundary

Elements of Concern

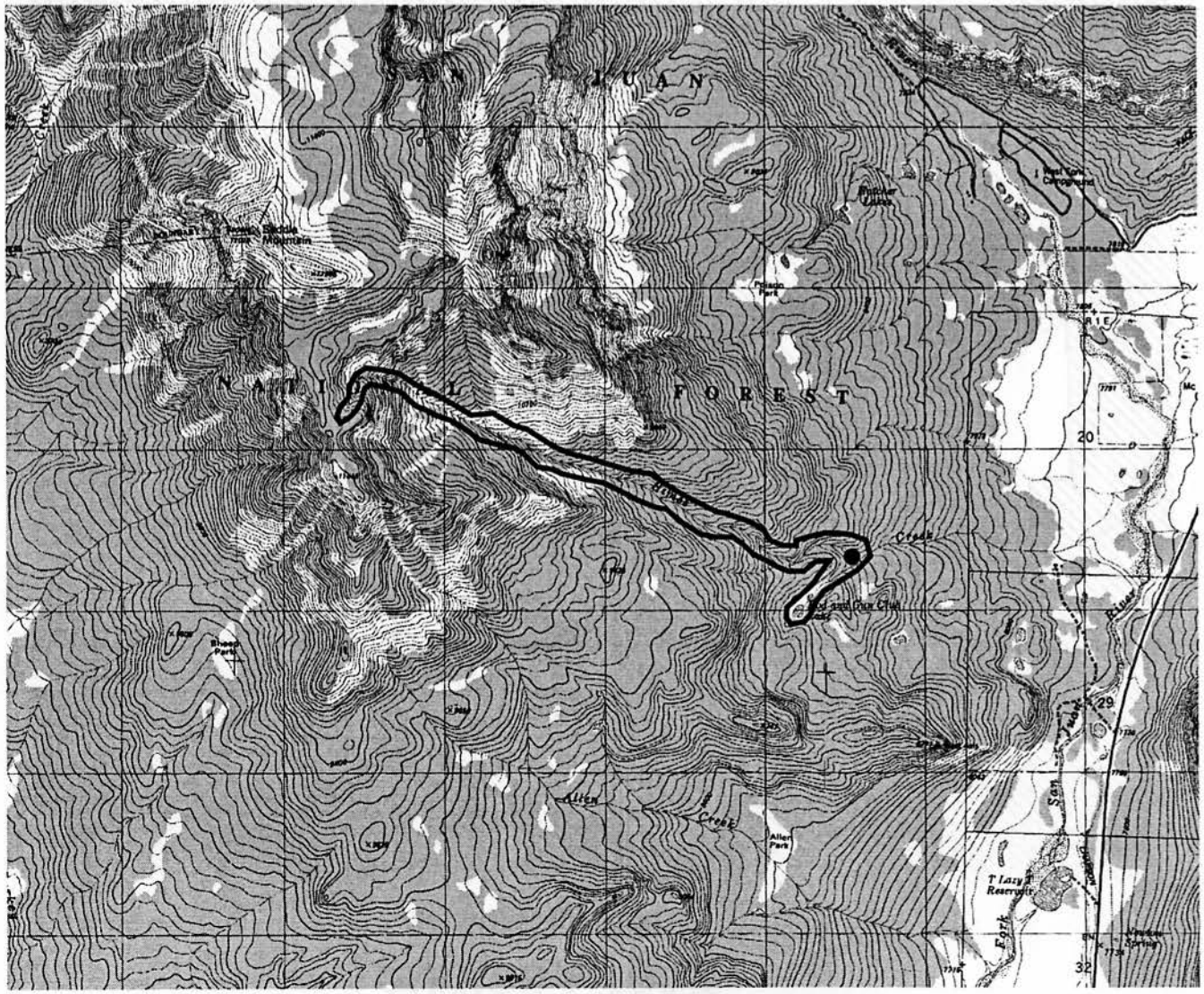
Private

U.S. Forest Service



The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Himes Creek



1 0 1 2 Miles

Site Boundary

Elements of Concern

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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Pass Creek at South Fork Rio Grande

Biodiversity Rank: B4 (Moderate significance)
This site supports a historic Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) population that has a genetic purity rating of "B." In addition to the trout, a small occurrence of a montane willow carr is also present.

Protection Urgency Rank: P4
The Pass Creek at South Fork Rio Grande site is owned and managed by Rio Grande National Forest. (See the following map for ownership.)

Management Urgency Rank: M2
The current biomass and density of the Rio Grande cutthroat trout are 17 lb/acre and 42 fish/acre, respectively. The population is at risk and declining from brook trout competition and historic rainbow trout stocking (John Alves, pers. comm.).

Location: Pass Creek, from Alberta Reservoir to South Fork of Rio Grande. See the following map for exact location.

U.S.G.S. 7.5 minute quadrangle: Wolf Creek Pass; Mount Hope; Elwood Pass
Legal Description: T37N, R02E S 1, 2, 3, 9, 10, 12, 13
T38N, R02E S 9, 16, 21, 28, 33, 34
Elevation: 8,920-10,720 feet Acreage: 806

General Description: The Pass Creek at South Fork Rio Grande site is generally a narrow montane valley with steep slopes and often sheer rock walls. Highway 160 parallels most of this site. Upland vegetation is dominated by a blue spruce-subalpine fir-aspen (*Picea pungens-Abies lasiocarpa-Populus tremuloides*) forest, or by a steeply sloping meadow of shrubby cinquefoil/fescue/northern bedstraw (*Pentaphylloides floribunda/Festuca/Galium septentrionale*). The riparian area has a good example of a dense willow stand. The proximity of the road to the riparian area affects stream movement, runoff, and abundance of non-native species.

Biodiversity Rank Justification: Although this site contains important riparian elements (cutthroat trout and a willow carr), the occurrence rank of the elements reflects the impact from non-native fish species and the effect of the highway on the willow carr.

Natural Heritage elements at the Pass Creek at South Fork Rio Grande site. Multiple listings of elements represent separate locations. Elements responsible for the biodiversity rank are in bold typeface.

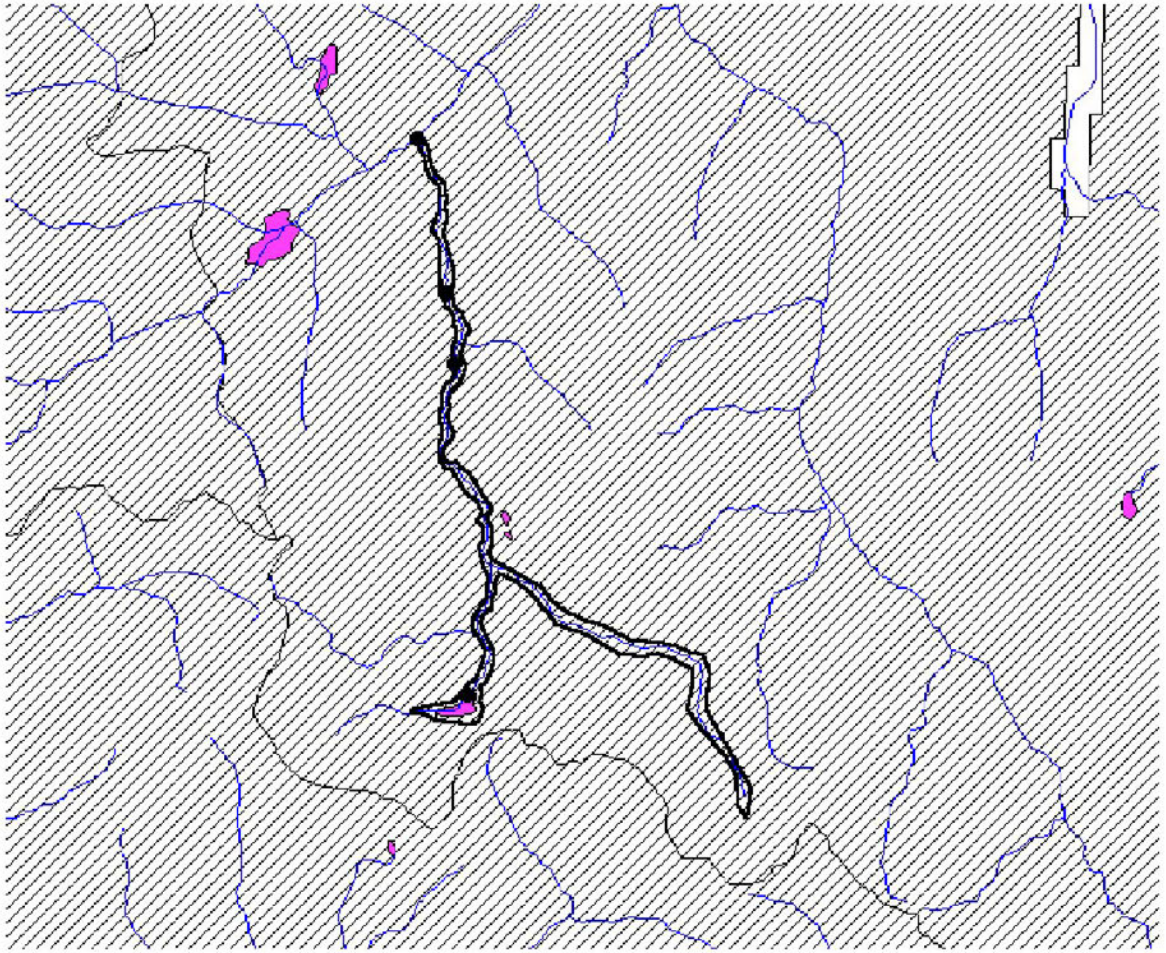
Latin name	**Common Name**	**Global Rank**	**State Rank**	**Federal and State Status**	**EO* Rank**	**Last observation**
Plant communities						
***Salix monticola*/mesic forb**	**Montane riparian willow carr**	**G3**	**S3**		**B**	**1995-08-01**
Fish						
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS	H	
Oncorhynchus clarki virginalis	**Rio Grande cutthroat**	**G4T3**	**S3**	**FS**	**C**	**1995-09-28**
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS		1996-08-26

*EO=Element Occurrence

Boundary Justification: Includes the stocked fingerlings of Rio Grande cutthroat trout in Alberta Reservoir as well as the occurrence of the historic population in Pass Creek where a "B" purity population of Rio Grande cutthroat trout remain.

Pass Creek at South Fork Rio Grande

Ownership Status



Site Boundary

Elements of Concern

Private

U.S. Forest Service

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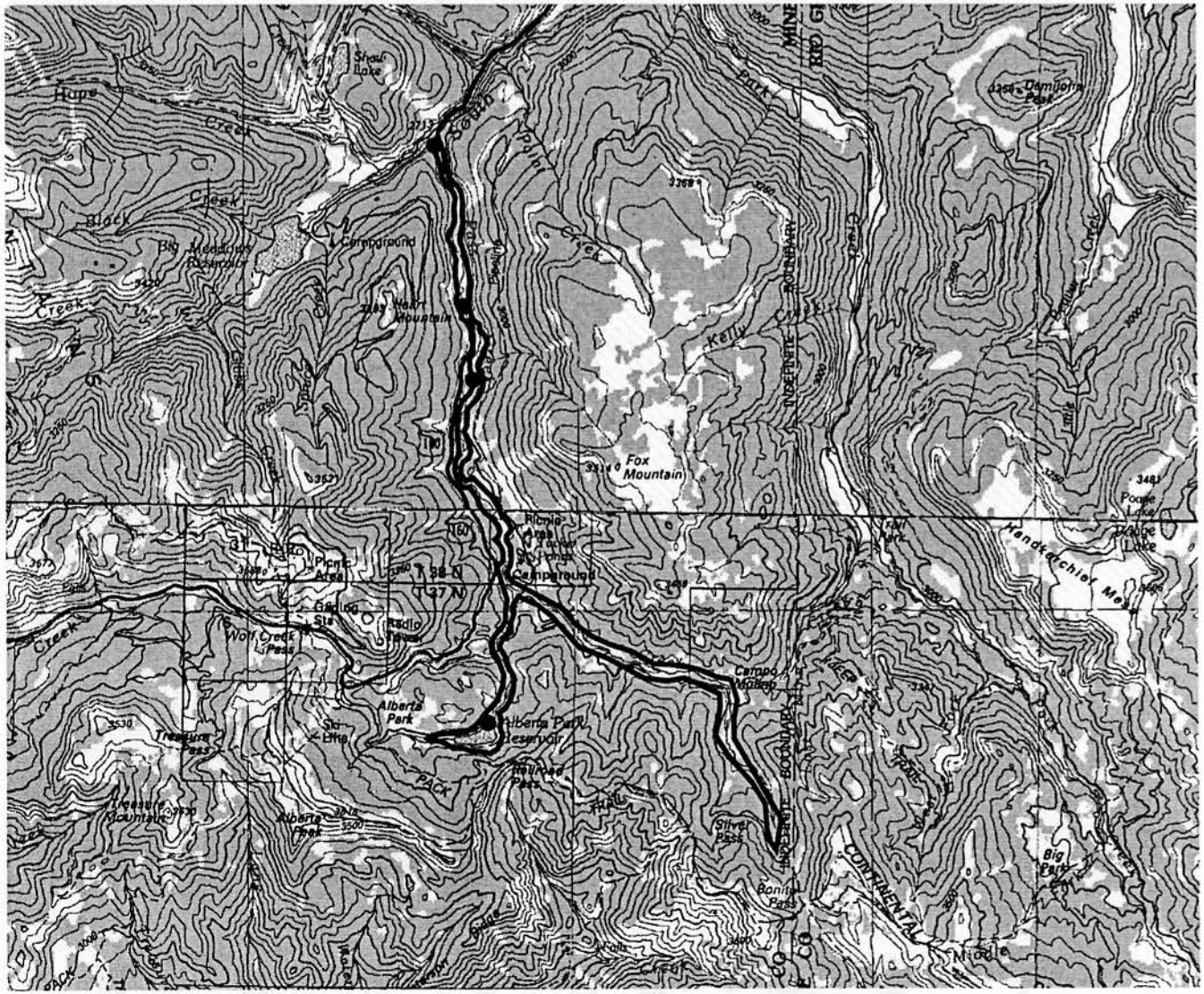
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Pass Creek at South Fork Rio Grande



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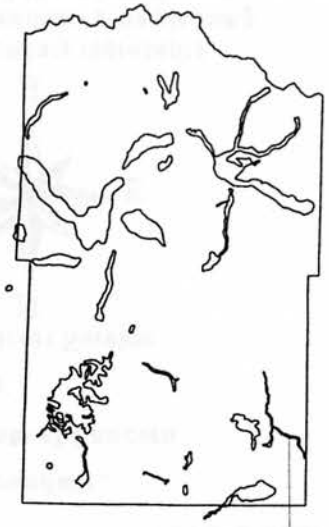

Site Boundary

Elements of Concern

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Red Mountain Creek

Biodiversity Rank: B4 (Moderate significance)
The Red Mountain Creek site contains good examples of common riparian and wetland plant communities, including montane wet meadows (*Carex aquatilis-C. utriculata*) and montane riparian willow carrs (*Salix geyeriana/Calamagrostis canadensis*). Historic records of the declining boreal toad (*Bufo boreas boreas*) were recorded from here in 1991 and 1992.

Protection Urgency Rank: P3
The privately owned portion occupies the middle portion of this site, while the remainder of the site is managed by Rio Grande National Forest (see the following ownership map). The private portion has no form of conservation protection.

Management Urgency Rank: M2
For most of the century the main activity on the private portion of the site was cattle and horse grazing. Four years ago this changed to grazing of just 10 horses. Approximately 25 years ago, on Memorial Day, a debris flow scoured Red Mountain Creek and removed most of the willows (Margaret Lamb and Dean Earhardt pers. comm.). Prior to this event the riparian vegetation did not include conifers. Present day riparian vegetation consists of scattered spruce trees amongst the willows. Although the geomorphology remains the same from Streams Lake to the northern end of the site, the riparian vegetation does not. The private lands appear to have not yet fully revegetated after the debris flow whereas the public lands represent a more fully recovered system, i.e. a denser and more expansive willow and wet meadow mosaic. A riparian management plan that would restore the private land riparian area to more closely resemble that of the public lands downstream is recommended. Fencing off a wide riparian corridor from horse grazing and eliminating diversions and gravel mining may help restore the riparian vegetation.

Location: The Red Mountain Creek site is along Red Mountain Creek from "Airplane Park" to ½ mile below Ivy Creek confluence. (See the following map for exact location).

U.S.G.S. 7.5 minute quadrangle: Workman Creek; Palomino Mountain; Spar City

Legal Description:	T39N, R1W	S 5, 8, 17-20
	T40N, R1W	S 29, 32
Elevation: 9,120-10,200 feet		Acreage: 1,390

General Description: Red Mountain Creek begins in the alpine zone near the continental divide by Piedra Peak. At approximately 10,200 feet in elevation it opens up into an upper montane-subalpine park, locally known as Airplane Park. A willow carr dominated by planeleaf willow (*Salix planifolia*) and mountain sedge (*Carex scopulorum*) occupies much of the park. As the creek crosses into the privately owned portion it changes quickly to a different system, beginning with Streams Lake, a natural pond that was modified by dynamiting the beaver pond, draining it, and then building an earthen dam sometime in the early 1900's (Margaret Lamb, pers. comm.). Another man-made pond, approximately ½ mile below Streams Lake was built in 1990 by diverting water from Red Mountain Creek. Geyer's willow (*Salix geyeriana*) and Rocky Mountain willow (*S. monticola*) replace

planeleaf willow and the wet meadows become dominated by beaked sedge, water sedge (*Carex aquatilis*) or reed grass (*Calamagrostis canadensis*). A mosaic of Engelmann spruce (*Picea engelmannii)* and aspen (*Populus tremuloides*) dominate the majority of the slopes, although the lower elevation slopes are dominated by Arizona fescue (*Festuca arizonica*) grasslands.

Biodiversity Rank Justification: The riparian zone along Red Mountain Creek supports an extensive occurrence of a fairly common montane willow carr, *Salix geyeriana/Calamagrostis canadensis*. This occurrence has a split occurrence rank with the higher ranking portion along the lower elevations. One of the most interesting biological features of this site is the perched wetlands, dominated primarily by beaked and water sedge. This unusual geomorphology has been recorded only at two locations in Mineral County (the other location is along the East Fork of the San Juan River).

Although we did not find the boreal toad in any of these wetlands, they were recorded from this site in 1991 and 1992. Husung and Alves (1998) recorded this as a potential site for reintroduction. The presence of a viable occurrence of boreal toads at the site would significantly change the biodiversity rank upward.

A small population (less than 20 plants) of the globally rare Black Canyon gilia (*Gilia penstemonoides*) was found on the cliffs. Due to the small size, this population is not a driving force for the site.

Natural Heritage element occurrences at Red Mountain Creek site. Multiple listings of elements represent separate locations. The element responsible for the biodiversity rank is in bold typeface.

Latin Name	**Common Name**	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plants						
Gilia penstemonoides	Black Canyon gilia	G3	S3	FS	D	1998-07-13
Plant communities						
Carex aquatilis-Carex utriculata	Montane wet meadows	G4	S4		B	1998-07-13
Salix geyeriana/ Calamagrostis canadensis	**Montane riparian shrubland**	**G5**	**S3**		**B/C**	**1998-07-13**
Amphibians						
Bufo boreas pop 1	Boreal toad (Southern Rocky Mountain population)	G4T1Q	S1	C, FS, E	H	1991-09-24
Bufo boreas pop 1	Boreal toad (Southern Rocky Mountain population)	G4T1Q	S1	C, FS, E	H	1992-06-22

*EO=Element Occurrence

Boundary Justification: The Red Mountain Creek site boundary includes all of the occurrences listed in this site. It also includes similar suitable habitat that has not been thoroughly inventoried, but is likely to include many of the elements of concern. The site boundary was based on initial aerial photo analysis, a field visit by CNHP, and inspection of 7.5 minute topographical maps.

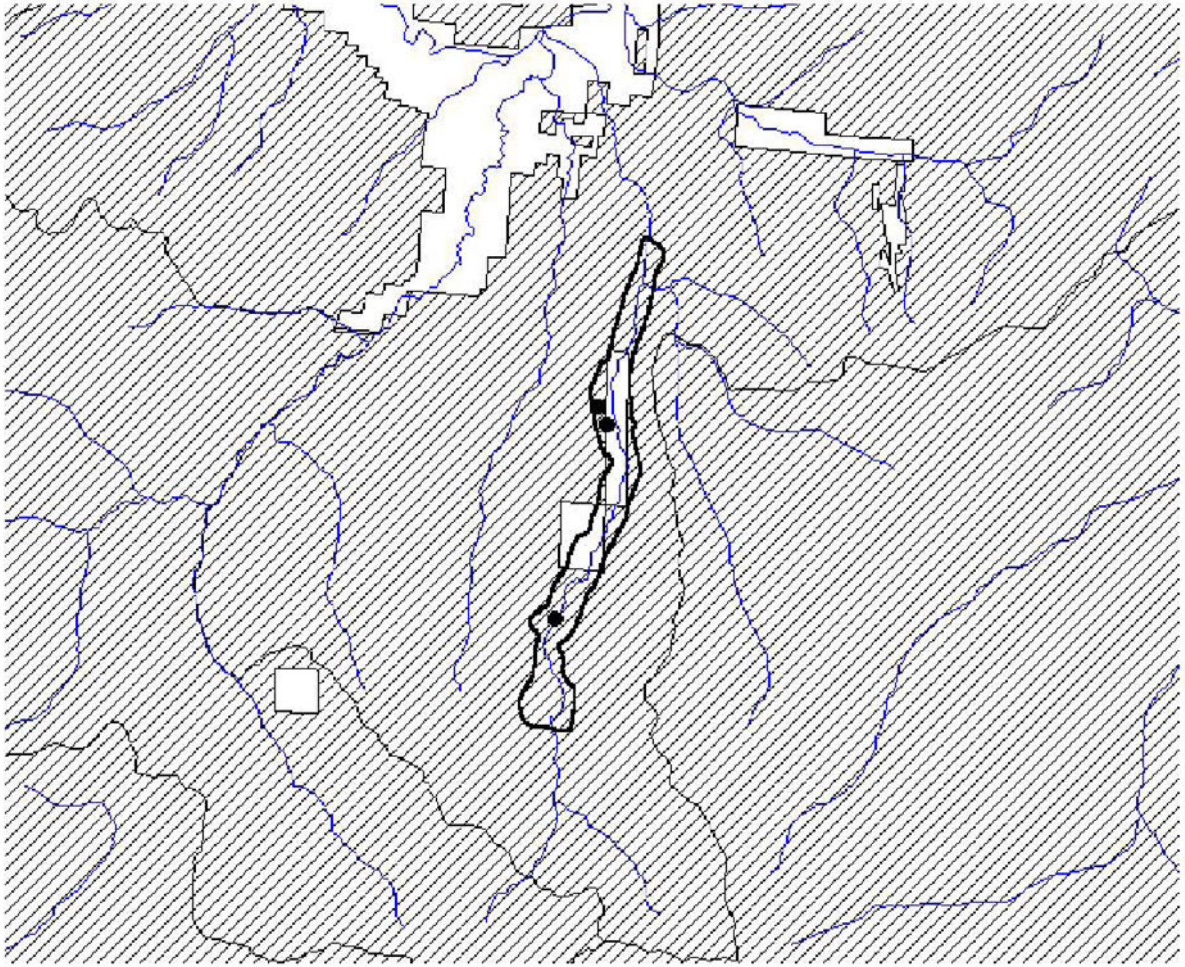
Literature cited

Husung, B. and J. Alves. 1998. Boreal toad surveys in the South San Juan Mountains of Colorado: Monte Vista, CO, Department of Natural Resources, Colorado Division of Wildlife.

Red Mountain Creek.

Red Mountain Creek

Ownership Status



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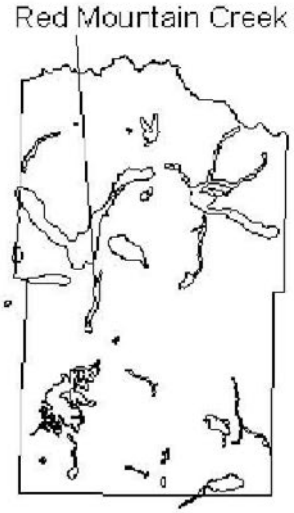

Site Boundary

Elements of Concern

Private

U.S. Forest Service

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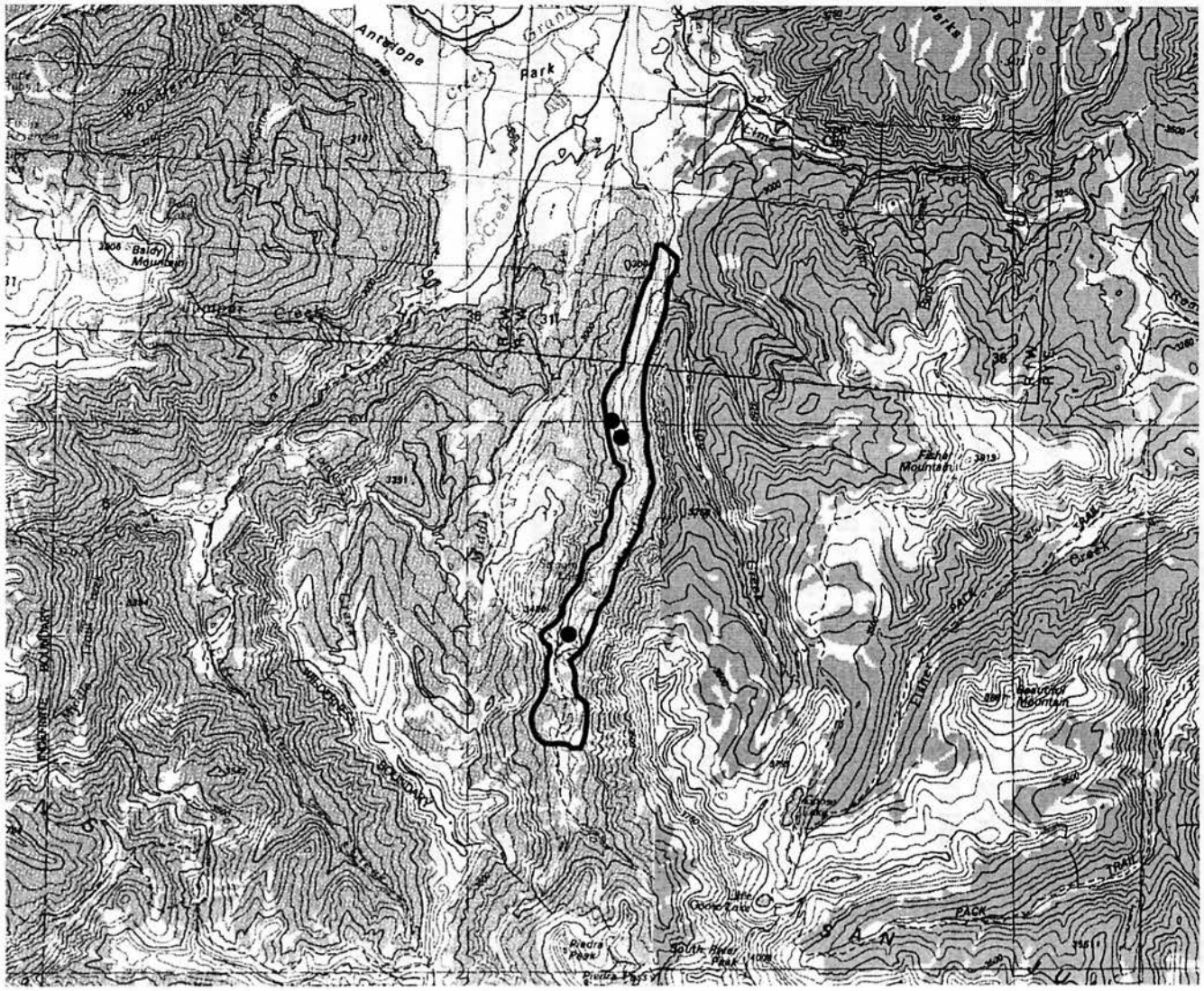
Red Mountain Creek



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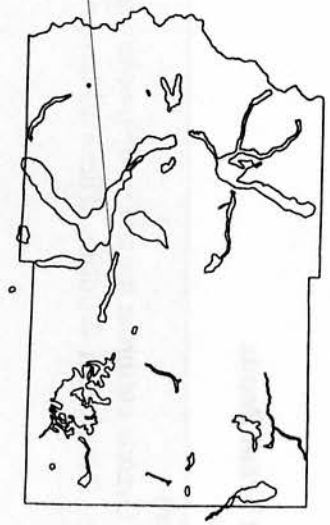
Red Mountain Creek



Site Boundary

Elements of Concern

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Cutthroat Trout Ponds

Biodiversity Rank: B5 (General significance)
Four separate ponds have populations of Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) that were introduced/stocked by the Division of Wildlife. These all have an "A" purity rank.

Protection Urgency Rank: P4
The Cutthroat Trout Ponds are owned and managed by Rio Grande National Forest. (See the following ownership map.)

Management Urgency Rank: M4
The Division of Wildlife is stocking and monitoring these ponds; their continued assistance is necessary to maintain these populations.

Location: This site consists of four ponds within the Rio Grande watershed. See the following map for exact location.

U.S.G.S. 7.5 minute quadrangle: South River Peak; Little Squaw Creek; Baldy Cinco
Legal Description: T39N, R01W S 27
T39N, R03W S 1
T40N, R02W S 19, 30
T40N, R03W S 24, 25
T42N, R02W S 13, 14, 23, 24
Elevation: 11,120-12,240 feet Acreage: 865

General Description: This site consists of small isolated ponds at four locations within the upper reaches of the Rio Grande watershed. The isolation of the ponds helps ensure that the stocked native cutthroat trout do not mingle with non-native species such as brook and rainbow trout.

Biodiversity Rank Justification: The Rio Grande cutthroat trout was once common throughout the Rio Grande basin but has severely declined in distribution with overharvesting and the introduction of non-native species of fish. The small isolated populations of Rio Grande cutthroat trout within this site are stocked and managed by the Division of Wildlife. It is unclear whether these populations existed prior to DOW's stocking.

Natural Heritage elements at the Cutthroat Trout Ponds site. Multiple listings of elements represent separate locations.

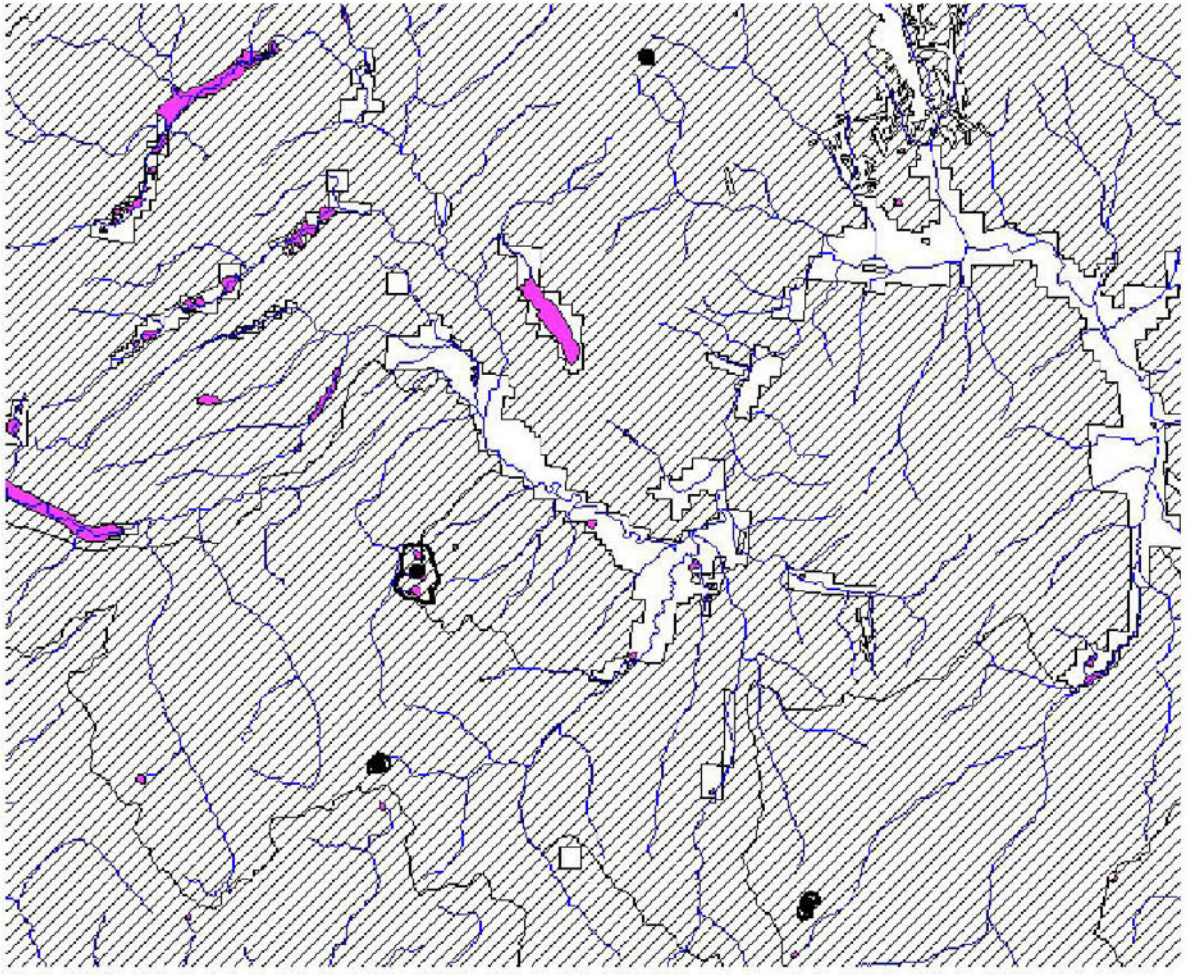
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Fish						
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS		1996-09-20
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS		1996-09-20
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS		1997-09-16
Oncorhynchus clarki virginalis	Rio Grande cutthroat	G4T3	S3	FS		1997-09-16

*EO=Element Occurrence

Boundary Justification: The boundary drawn encompasses all of the stocked ponds and a small buffer to protect from direct disturbance.

Cutthroat Trout Ponds - Mineral County

Ownership Status



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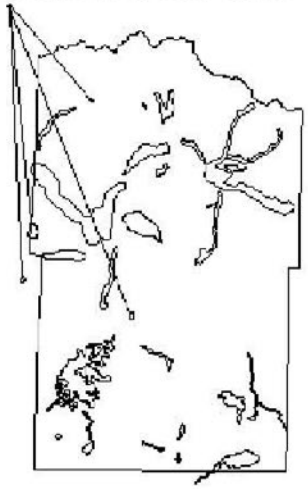
Cutthroat Trout Ponds



Site Boundary

Elements of Concern

Private

U.S. Forest Service

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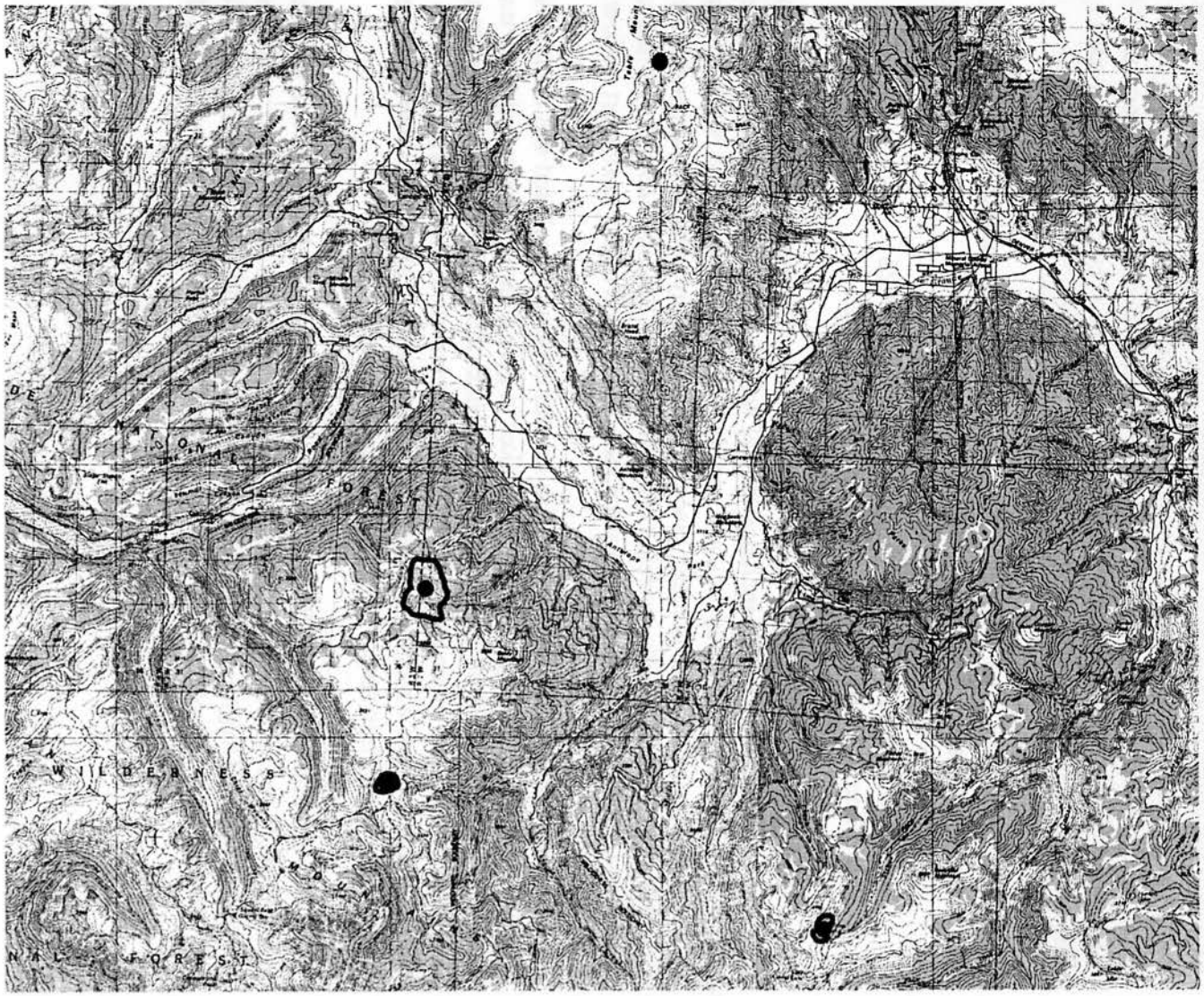
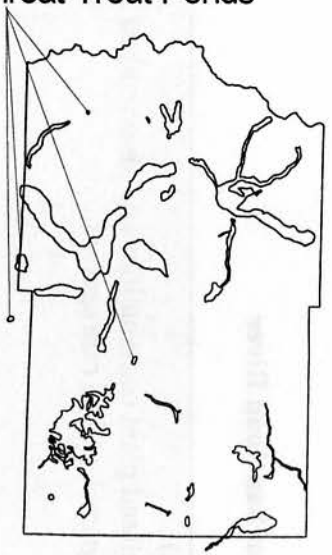
Cutthroat Trout Ponds - Mineral County



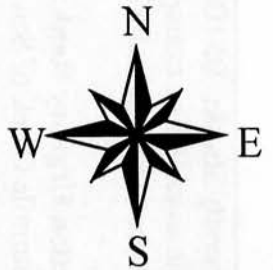
5 0 5 10 15 20 Miles

Cutthroat Trout Ponds



Site Boundary

Elements of Concern



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Fourmile Creek of San Juan River

Biodiversity Rank: B5 (General significance)
This site as excellent examples of common wetland plant communities and an unranked occurrence of pictureleaf wintergreen (*Pyrola picta)*, a state rare species.

Protection Urgency Rank: P5
The Fourmile Creek of San Juan River site is within the Weminuche Wilderness Area of the Rio Grande National Forest. (See the following ownership map.)

Management Urgency Rank: M4
Although not currently threatened, manangement may be needed in the future to maintain the current quality of the element occurrences. Trail maintenance may impact the plant occurrence. In order to fully protect the alpine wetlands the natural hydrology must be maintained. Some erosion from the trail on the east slope was reported. Non-native plants were also reported along the trail.

Location: From the alpine zone above Fourmile Lake to approximately four miles downstream. (See the following map for exact location.)

U.S.G.S. 7.5 minute quadrangle: Pagosa Peak
Legal Description: T37N, R2W S 2, 11-14, 23-26
Elevation: 8,690-11,580 feet Acreage: 742

General Description: Much of Fourmile Creek within this site is a narrow canyon below a large snowmelt basin. The site includes several waterfalls and many sheer rock faces along the canyon. Bedrock is igneous rock and conglomerate. The streambed is very rocky and consists of exposed bedrock in many places. The steep canyon slopes suppport mesic forb stands comprised of bluebells-senecio (*Mertensia ciliata-Senecio triangularis*) and scattered fumewort (*Corydalis casenea*). Below the falls, the canyon opens to support willow stands.

The upper elevations are a large basin with several large snowmelt-fed wet meadows in relatively flat valleys along with two large lakes in glacial tarns. Two small trails traverse the basin and are regularly used by hikers and horseback riders. The meadows support spikerush (*Eleocharis*) beds and diverse tufted hairgrass (*Deschampsia*) stands. This is a wide valley with a sinuous stream which drains the nearby mountains. Talus slopes dominate the west side of the valley while spruce-fir forest dominate the east side.

The lower elevation is a white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), aspen (*Populus tremuloides*) and snowberry (*Symphoricarpes rotundifolius*). The ground cover is lush with Oregon-grape (*Mahonia repens*) and meadowrue (*Thalictrum*). Volcanic tuff is the primary parent material. The pictureleaf wintergreen is found within this forest.

Biodiversity Rank Justification: Excellent examples of common wetland plant communities.

Natural Heritage elements at the Fourmile Creek of San Juan River site. Elements responsible for the biodiversity rank are in bold typeface.

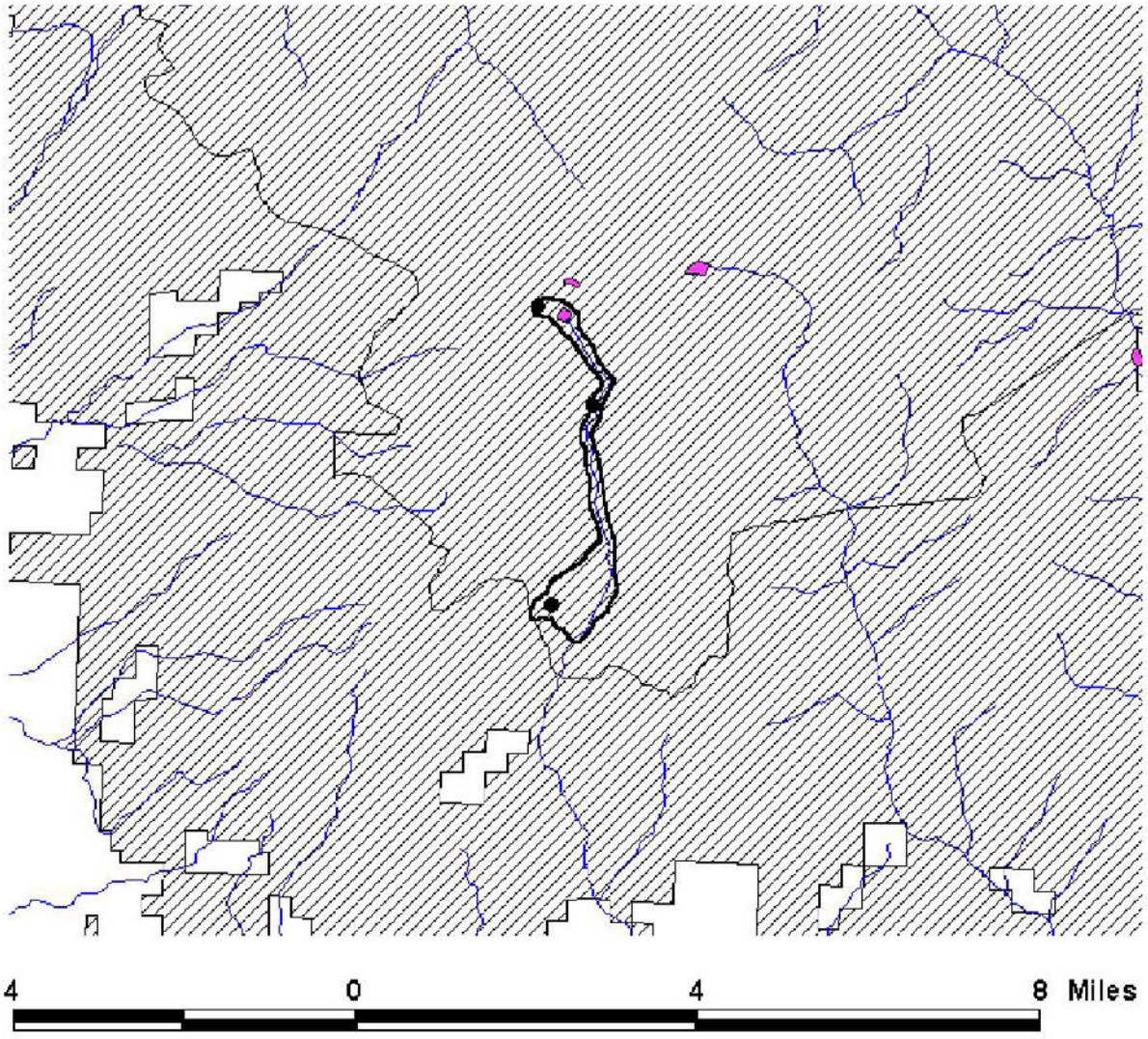
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Plant communities						
Eleocharis quinqueflora	**Alpine wetlands**	**G4**	**S3S4**		**A**	**1994-08-16**
Cardamine cordifolia-Mertensia ciliata-Senecio triangularis	Alpine wetlands	G4	S4		A	1994-08-16
Plants						
Pyrola picta	Pictureleaf wintergreen	G4G5	S3			1995-08-29

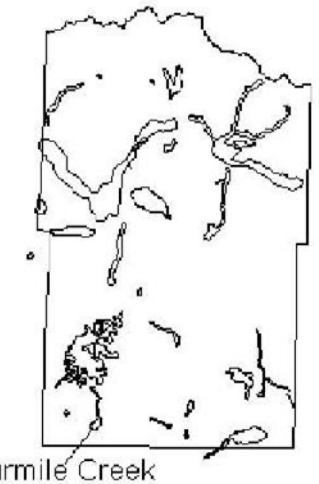
*EO=Element Occurrence

Boundary Justification: The boundary includes the headwater basin and the riparian zone of Fourmile Creek with a small buffer zone to help protect the wetland occurrences from trampling or other surface disturbance. The lower montane slopes are included for complete protection of pictureleaf wintergreen.

Fourmile Creek of San Juan River

Ownership Status



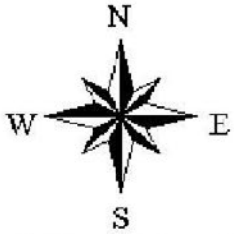


Site Boundary

Elements of Concern

Private

U.S. Forest Service



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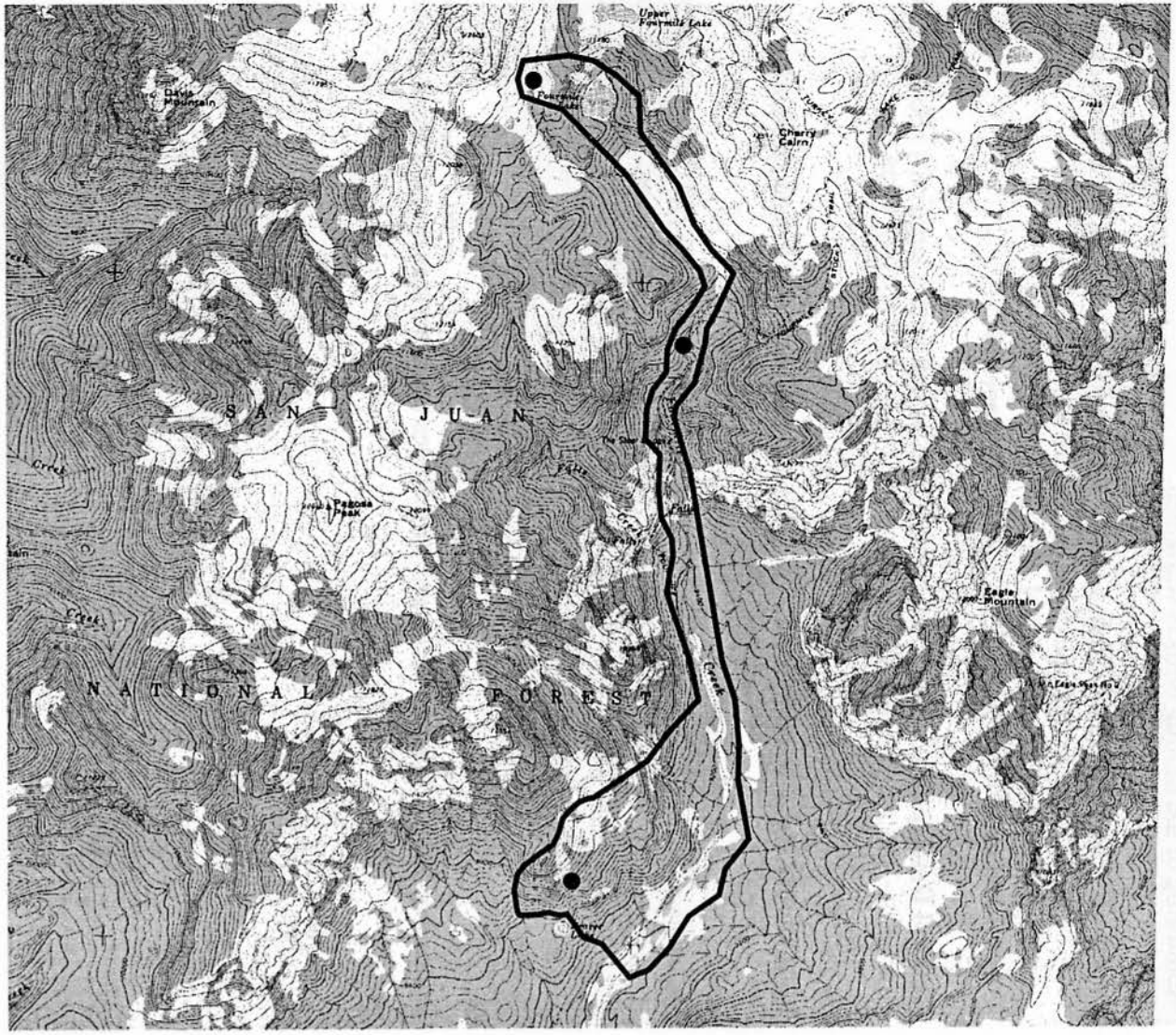
Fourmile Creek of San Juan River



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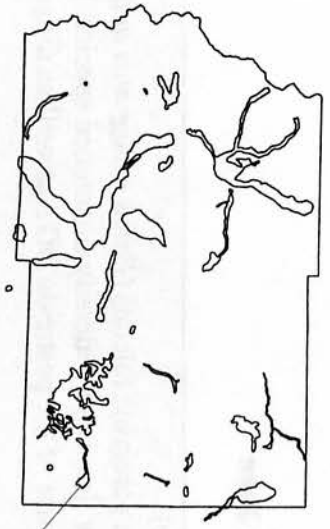

Fourmile Creek

Site Boundary

Elements of Concern

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The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

San Juan

Biodiversity Rank: B5 (General significance)
The San Juan site is used by nesting American peregrine falcons (*Falco peregrinus anatum*). The American peregrine falcon was previously listed as a federally threatened species, but has made a comeback due to a decrease in the use of the pesticide DDT as well as diligent efforts by the U.S. Fish and Wildlife Service.

Protection Urgency Rank: P4
Approximately 75% of the San Juan site is privately owned. The remaining portion is owned and managed by the San Juan National Forest. (See the following ownership map.)

Management Urgency Rank: M5
Monitoring of the nesting birds is warranted.

Location: The cliff faces of Indian Head. See the following map for exact location.
U.S.G.S. 7.5 minute quadrangle: Saddle Mountain
Legal Description: T37N, R01E S 28, 29, 32, 33
Elevation: 7,920-9,205 feet Acreage: 131

General Description: This site is in a montane habitat with a large cliff above the West Fork of the San Juan River. This site was not visited by CNHP in 1998.

Biodiversity Rank Justification: An unranked occurrence of a state rare bird.

Natural Heritage element at the San Juan site.

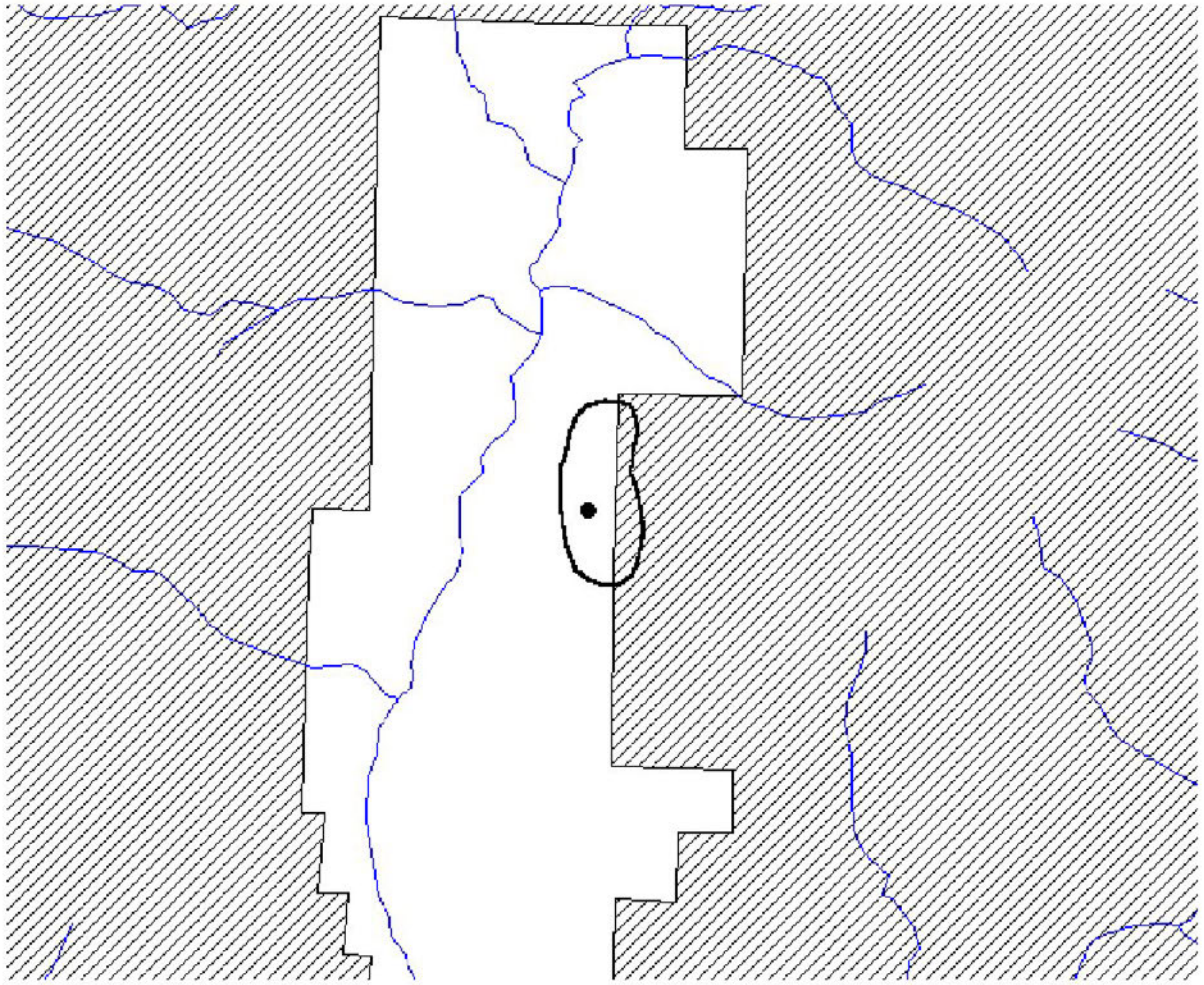
Latin name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank	Last observation
Birds						
Falco peregrinus anatum	American peregrine falcon	G4T4	S2B,SZN	LE		1994-07-15

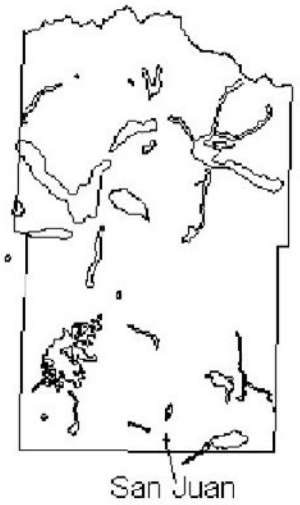
*EO=Element Occurrence

Boundary Justification: The boundary includes the nesting area and a small buffer.

San Juan

Ownership Status





Site Boundary

Elements of Concern

Private

U.S. Forest Service

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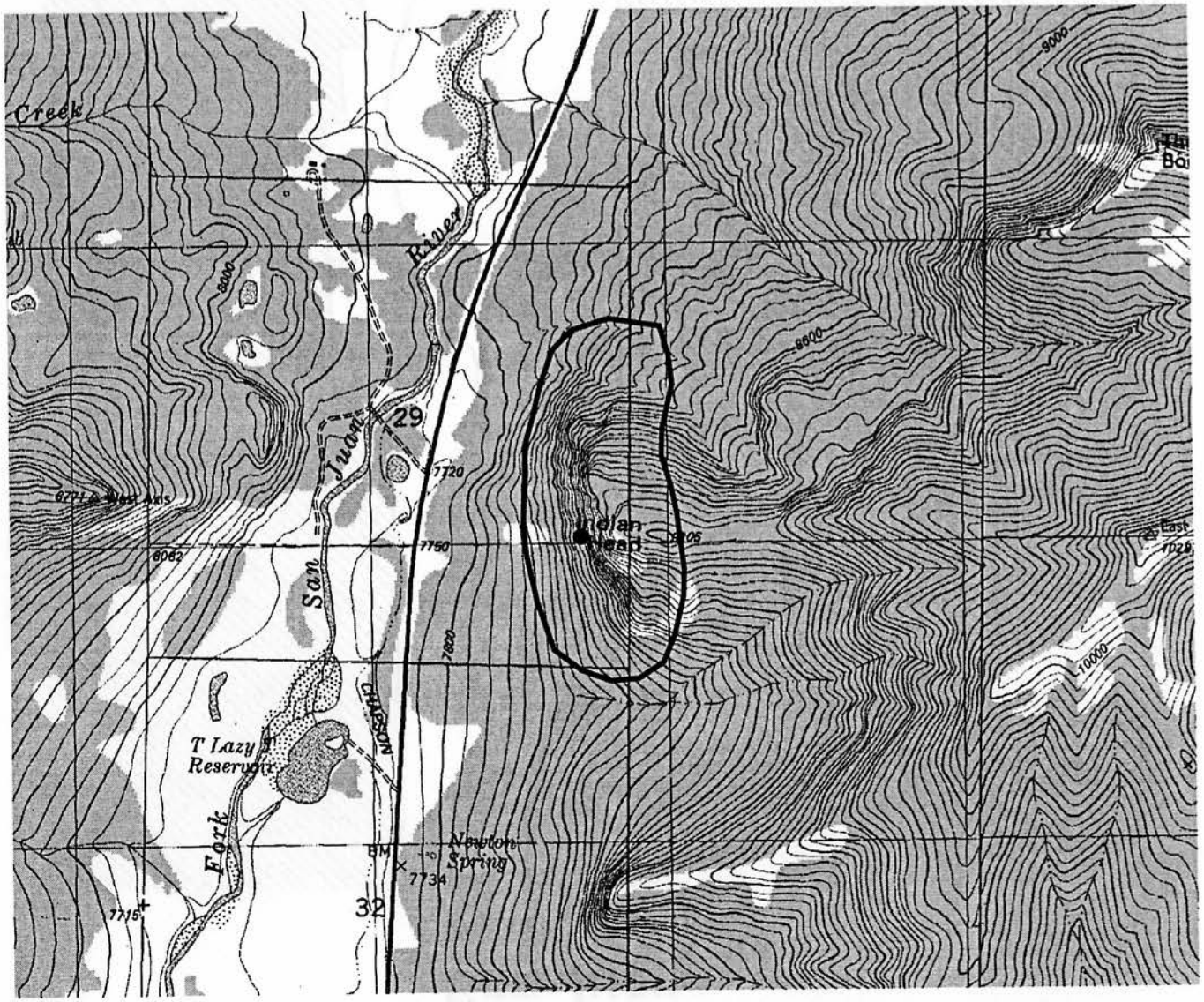
The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

San Juan



Site Boundary

Elements of Concern

The site boundary represents preliminary conservation planning boundaries that are based upon perceived ecological processes. The boundary may be modified as new information is incorporated into the decision making process.

Appendix A. Characteristic Abstracts and range Maps For Selected Plants, Plant Communities and Animals

Plants:
Botrychium echo
Draba smithii
Cryptantha weberi
Gilia penstemonoides
Potentilla ambigens

Plant communities:
Carex aquatilis-Carex utriculata
Carex utriculata
Danthonia parryi
Festuca arizonica-Muhlenbergia filiculmis
Muhlenbergia filiculmis
Salix geyeriana/Carex utriculata
Picea pungens/alnus incana

Amphibians
Bufo boreas pop. 1
Falco peregrinus anatum

Fish
Gila pandora
Oncorhynchus clarki virginalis

Mollusk
Valvata sincera

Plant Characterization Abstract for Colorado

BOTRYCHIUM ECHO
REFLECTED MOONWORT

Taxonomy:

TAXCLASS:	OPHIOGLOSSOPSIDA	ORDER:	OPHIOGLOSSALES
FAMILY:	OPHIOGLOSSACEAE	GENUS:	BOTRYCHIUM

Status:

GLOBAL RANK: G2 STATE RANK: S2
FED. STATUS: AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 9500 feet
MAXIMUM ELEV: 11000 feet

HABITAT COMMENTS:

Roadsides, grassy slopes, and along the edges of lakes. (Wagner 1983). Gravelly soils near roads and trails, rocky hillsides, grassy slopes, and meadows (CNHP Rare Plant Guide). At elevations between 9,500- 11,000 feet (Ryke and Vest 1994).

State Distribution:

RANGE: Boulder, Clear Creek, El Paso, Grand, Gunnison, Larimer, and San Juan Counties. The Reflected Moonwort is found in mountain meadows in Central Colorado, including El Paso and Clear Creek Counties (Ryke and Vest 1994).

Phenology:

PHENOLOGY COMMENTS:

Plants have been observed releasing spores in mid-July (Biological Conservation Database - Element Occurrence Record).

Look Alikes:

The lower pinnae of B. echo are well separated and linear to lanceolate with pointed tips; those of B. pallidum, B. lunaria, B. "colorado", and B. simplex are fan-or wedge shaped; those of B. hesperium and B. pinnatum are oblong to ovate with rounded tips and not clearly separated. In addition, B. hesperium is dull green while B. echo is bright green.

Management:

MANAGEMENT COMMENTS:

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 (Biological Conservation Database - Element Occurrence Record).

Global Distribution:

Northern Arizona, northern Utah, and central Colorado

References:

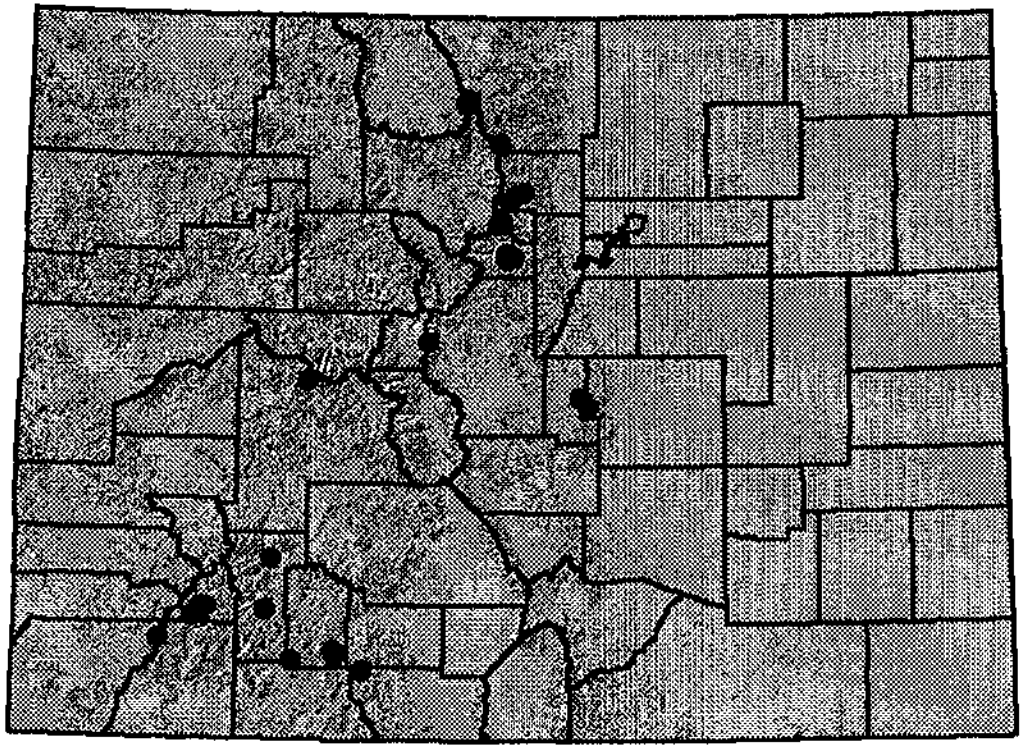
ABBREVIATED CITATION:	FULL CITATION:
Ryke and Vest 1994	Ryke, N., D. Winters, L. McMartin and S. Vest. 1994. Threatened, Endangered and Sensitive Species of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands. May 25, 1994.

Wagner 1983 — Wagner, W. L. 1983. New Species and Combinations in the Genus Oenothera (Onagraceae). Annals of the Missouri Botanical Garden 70:194-196.

Wagner, et al., 1983 — Wagner, W.H. Jr., and F.S. Wagner. 1983. Two moon-worts of the Rocky Mountains; Botrychium hesperium and a new species formerly confused with it. American Fern J. 73(2): 53-62.

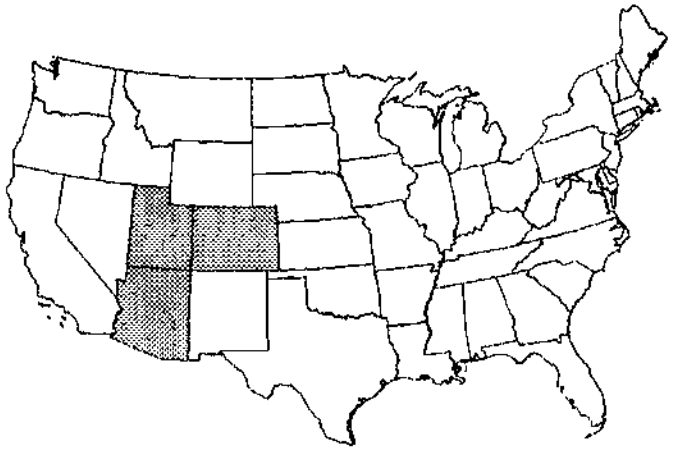
Botrychium echo
Reflected Moonwort

State Range



S2: State Imperiled

Global Range



G2: Globally Imperiled

Plant Characterization Abstract for Colorado

CRYPTANTHA WEBERI
WEBER'S CATSEYE

Taxonomy:

TAXCLASS: DICOTYLEDONEAE ORDER: LAMIALES

FAMILY: BORAGINACEAE GENUS: CRYPTANTHA

TAXONOMIC COMMENTS:

Synonym: Oreocarya weberi

Status:

GLOBAL RANK: G2 STATE RANK: S2

FED. STATUS: AGENCY STATUS:

Habitat:

MINIMUM ELEV: feet

MAXIMUM ELEV: feet

HABITAT COMMENTS:

This plant is an endemic that occurs on volcanic ash on Cochetopa Pass (Weber 1987).

State Distribution:

RANGE: C. weberi is an endemic that occurs in the San Luis Hills, Conejos County, and on volcanic ash on Cochetopa Pass (Weber 1996).

Phenology:

PHENOLOGY COMMENTS:

Look Alikes:

Management:

MANAGEMENT COMMENTS:

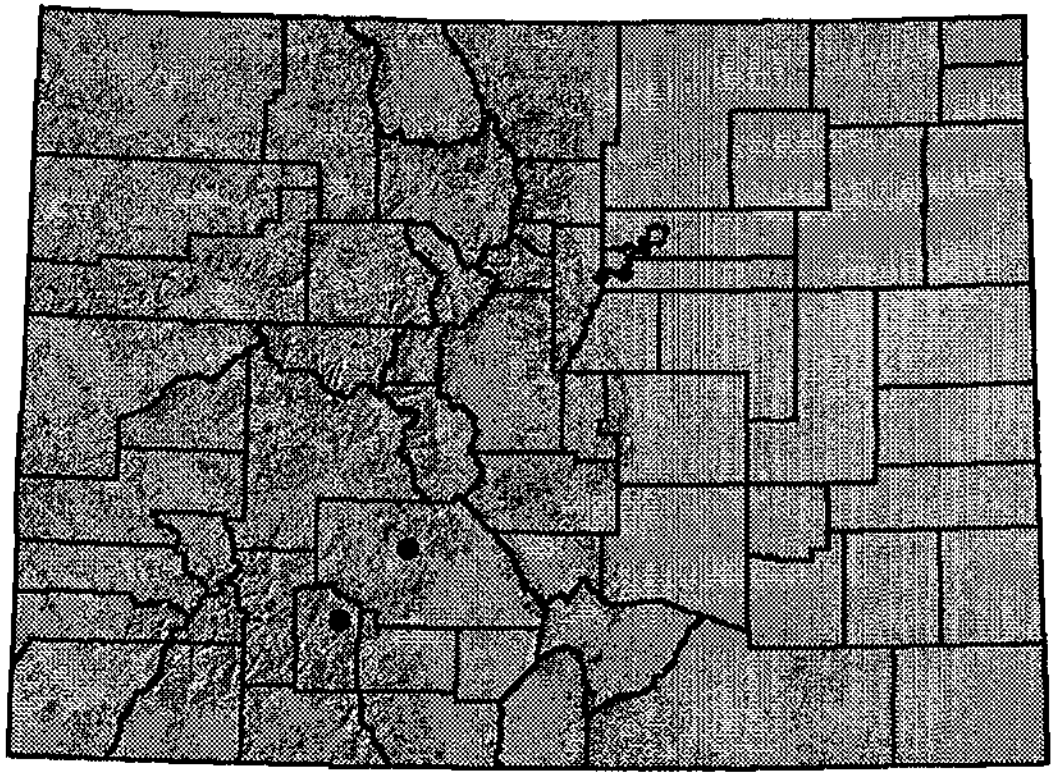
Global Distribution:

References:

ABBREVIATED CITATION:	FULL CITATION:
Weber 1987	Weber, W. A. 1987. Colorado Flora: Western Slope. Colorado Associated University Press, Boulder, CO.
Weber and C 1996	Weber, William A. and Ronald C. Wittmann. 1996. Colorado Flora: Eastern Slope.

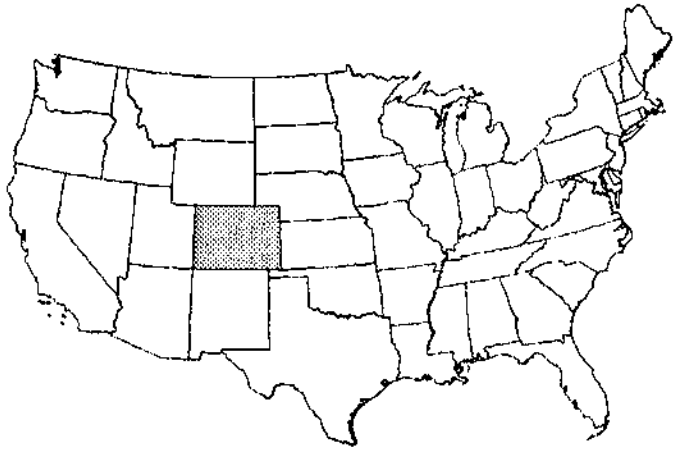
Cryptantha weberi
Weber's Catseye

State Range



S2: State Imperiled

Global Range



G2: Globally Imperiled

Plant Characterization Abstract for Colorado

DRABA SMITHII
SMITH WHITLOW-GRASS

Taxonomy:

TAXCLASS:	DICOTYLEDONEAE	ORDER:	CAPPARALES
FAMILY:	BRASSICACEAE	GENUS:	DRABA

TAXONOMIC COMMENTS:
Because of the uniform dense short branched trichomes D. smithii is quite distinct form any other of our American species (A41HIT01COUS).

Status:

GLOBAL RANK: G2	STATE RANK: S2
FED. STATUS:	AGENCY STATUS: FS

Habitat:

MINIMUM ELEV:	8000	feet
MAXIMUM ELEV:	11000	feet

HABITAT COMMENTS:
Draba smithii occurs mostly in rock crevices between 8000 and 10,000 feet (Hitchcock 1941). Associated species include: Ribes cerum, Rhus trilobata, Gilia calcarea, Artemisia tridentata, Potentilla plattensis, Vitis sp., Mertensia cilata, Symphocarpus spp., Poa pratensis, Pentaphylloides flouribunda, Eriogonum sp., Lepidium montanum, Bouteloua gracilis. It is found in talus slopes and crevices and between rocks in shaded, protected sites in upper montane and lower subalpine areas at elevations between 8,000 to 11,000 feet (Ryke and Vest 1994).

State Distribution:
RANGE: Custer, Lake, Las Animas, Mineral, and Saguache Counties). The Smith's Whitlow Grass is endemic to cliffs and canyons of south-central Colorado, including Custer, Lake, Las Animas and Saguache Counties (Ryke and Vest 1994).

Phenology:
PHENOLOGY COMMENTS:
Flowering and fruiting from June through July (Kettler, et al., 1993) (Ryke and Vest 1994).

Look Alikes:
Draba smithii is distinguished from Draba cana in being much more finely and densely stellate-pubescent; also, Draba cana grows in open sites in dry tundra (Kettler, et al., 1993).

Management:
MANAGEMENT COMMENTS:

Global Distribution:
Draba smithii is endemic to south-central Colorado (U85PRI01COUS).

References:
ABBREVIATED CITATION: FULL CITATION:

Hitchcock 1941 — Hitchcock, C. L. 1941. A Revision of the Drabas of Western North America. University of Washington Publications in Biology 11:1-132.

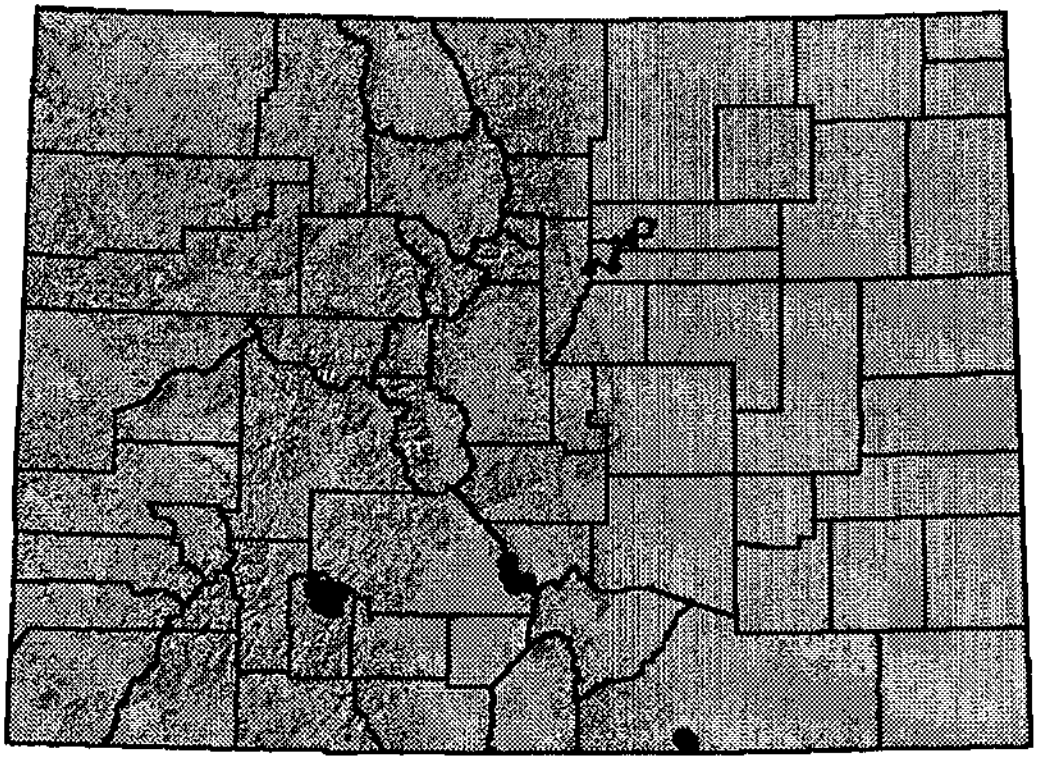
Kettler, et al., 1993 — Kettler, S. M., N. D. Lederer, D. Bacher, and S. Spackman. 1993. Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands Plants of Special Concern. Colorado Natural Heritage Program.

Price 1985 — Price, R. 1985. Locality information for Draba (Brassicaceae) in Colorado. Unpublished report prepared for the Colorado Natural Areas Program, Denver, CO.

Ryke and Vest 1994 — Ryke, N., D. Winters, L. McMartin and S. Vest. 1994. Threatened, Endangered and Sensitive Species of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands. May 25, 1994.

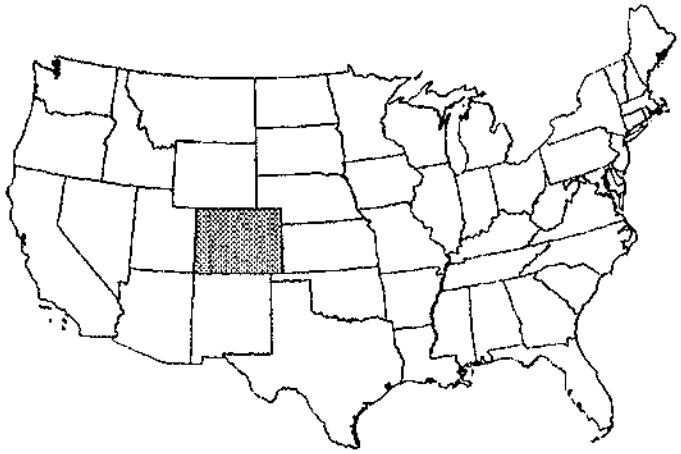
Draba smithii
Smith Whitlow-Grass

State Range



S2: State Imperiled

Global Range



G2: Globally Imperiled

Plant Characterization Abstract for Colorado

GILIA PENSTEMONOIDES
BLACK CANYON GILIA

Taxonomy:

TAXCLASS: DICOTYLEDONEAE ORDER: SOLANALES

FAMILY: POLEMONIACEAE GENUS: GILIA

TAXONOMIC COMMENTS:

Harrington (1954) considers Gilia penstemonoides to be a related entity to and synonomyzed under G. laydeni (Harrington 1954).

Status:

GLOBAL RANK: G3 STATE RANK: S3

FED. STATUS: AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 6800 feet

MAXIMUM ELEV: 9000 feet

HABITAT COMMENTS:

This species is found in cracks on vertical walls, narrow ledges and cliff rims. Grows in gneiss, rhyolite, schist, and shale (Peterson 1981).

State Distribution:

RANGE: Endemic member of the Colorado flora (Peterson 1981). Gunnison, Hinesdale, Mineral, and Montrose Counties.

Phenology:

PHENOLOGY COMMENTS:

Extended flowering period which begins in early June and proceeds through late August. Fruiting begins in mid-June and terminates by September (Peterson 1981).

Look Alikes:

Superficially resembles purple flowered species of Stephanomeria (pers. comm. Coles 1994).

Management:

MANAGEMENT COMMENTS:

The land adjacent to the known populations within the Black Canyon of the Gunnison National Monument are used primarily by tourists viewing geologic features. The Bureau of Land Management (BLM) adjacent lands are used primarily for grazing. The actual sites are generally inaccessible. There is no known present threat or threatened destruction, modification or curtailment of the habitat or range of G. penstemonoides (Peterson 1981). The Rio Grande National Forest lands in which G. penstemonoides occurs in Mineral County are currently not threatened.

Global Distribution:

Colorado endemic

References:

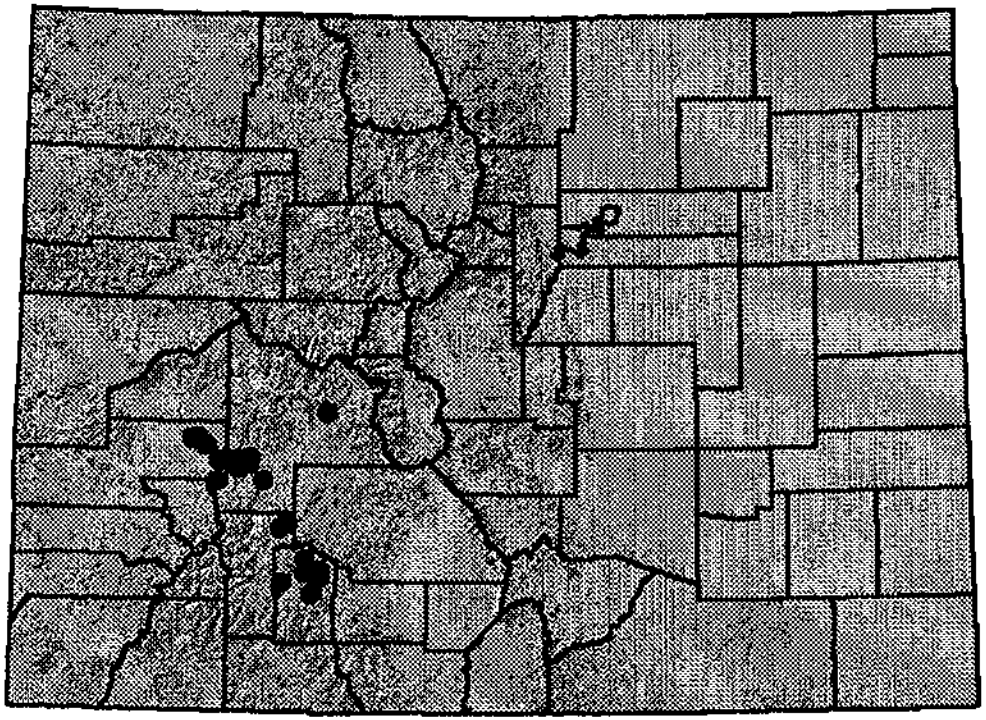
ABBREVIATED CITATION: FULL CITATION:

O'Kane 1988 O'Kane, S. L. 1988. Noteworthy Collections, Colorado. Madrono, 35(4):353-359.

Peterson 1981 Peterson, J. S. 1981. Status Report on Gilia penstemonoides. Unpublished report prepared for the Colorado Natural Areas Program, Denver, CO.

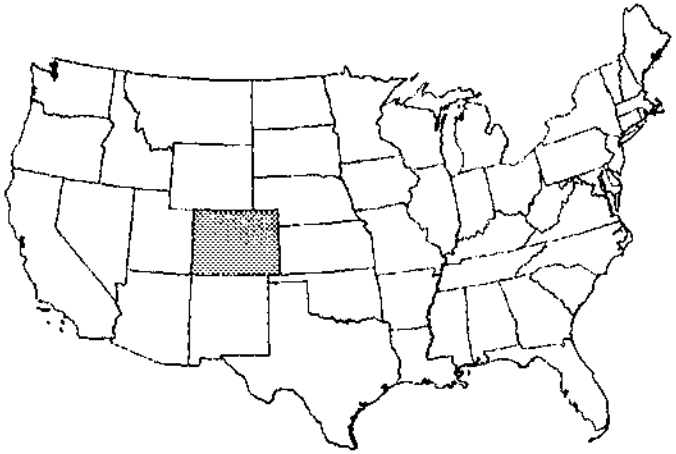
Gilia penstemonoides
Black Canyon Gilia

State Range



S3: State Rare

Global Range



G3: Globally Rare

Plant Characterization Abstract for Colorado

POTENTILLA AMBIGENS
SOUTHERN ROCKY MOUNTAIN CINQUEFOIL

Taxonomy:

TAXCLASS: DICOTYLEDONEAE ORDER: ROSALES
FAMILY: ROSACEAE GENUS: POTENTILLA

TAXONOMIC COMMENTS:
No known taxonomic problems.

Status:

GLOBAL RANK: G3 STATE RANK: S1S2
FED. STATUS: AGENCY STATUS:

Habitat:

MINIMUM ELEV: 8500 feet
MAXIMUM ELEV: 9000 feet

HABITAT COMMENTS:
Potentilla ambigens may occur in montane woods (Johnston 1980), although most Colorado populations are on grassy or colluvium slopes (S84WEBUCCOUS, Rondeau personal communication, 1999).

State Distribution:

RANGE: Potentilla ambigens is known from north central and southwestern Colorado (Harrington 1954). El Paso and Mineral Counties (Specimens at CU and CSU Herbarium as of 1/95). There is one record from 1896 from Larimer County.

Phenology:

PHENOLOGY COMMENTS:
Flowers in mid- to late July, produces fruits in August (Herbarium specimens at the University of Colorado Herbarium as of 1/95).

Look Alikes:

Potentilla ambigens resembles a gigantic P. hippiana var hippiana (Johnston 1980).

Management:

MANAGEMENT COMMENTS:
Threats are currently unknown.

Global Distribution:

Potentilla ambigens is known from one occurrence in southern Wyoming, several populations scattered throughout Colorado, and New Mexico (pers. comm. Rondeau 1999, B54HARO1COUS).

References:

ABBREVIATED CITATION:	FULL CITATION:
Cramer 1980	Cramer, J. 1980. A Flora of New Mexico. Originally by Martin, W.C. and C.R. Hutchins. 1923.
Harrington 1954	Harrington, H. D. 1954. Manual of the Plants of Colorado. Sage Books, Denver, CO.

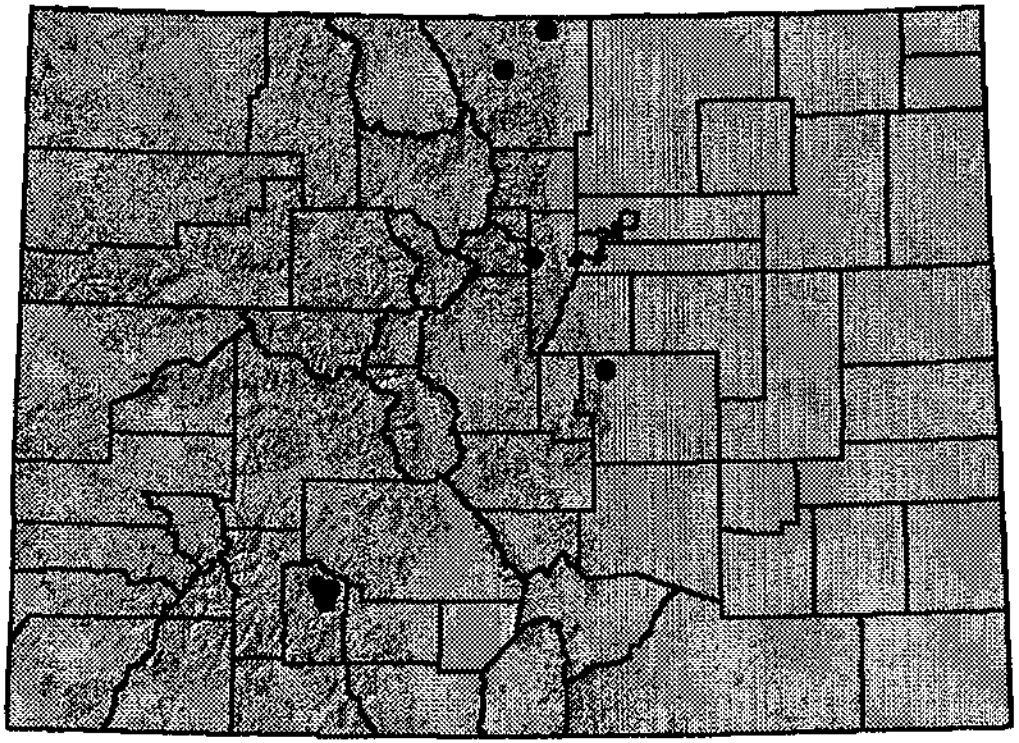
Johnston 1980 — Johnston, B. C. 1980. Studies of population variability leading to a new classification of Potentilla sect. Multijugae (Rosaceae). MS Thesis, University of Colorado, Boulder, CO.

Weber 1984 — Weber, W.A. 1984. Plants collected in 1984 by W.A. Weber deposited at University of Colorado Herbarium, Boulder, Colorado.

Potentilla ambigens

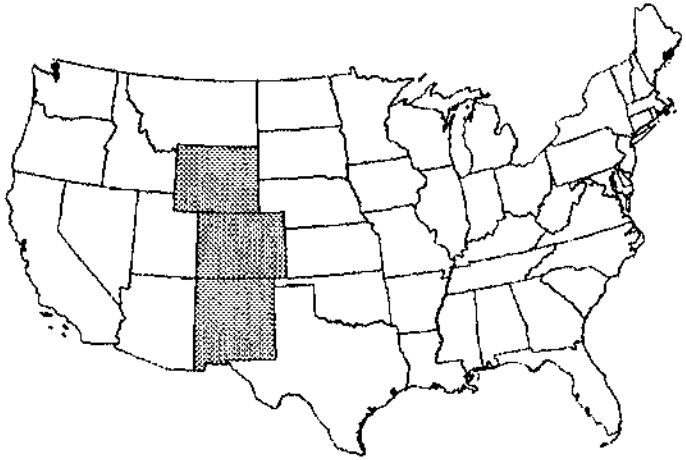
Southern Rocky Mountain Cinquefoil

State Range



S1S2: State Critically Imperiled/State Imperiled

Global Range



G3: Globally Rare

WORD PROCESSING TEMPLATE
COMMUNITY CHARACTERIZATION ABSTRACT SUB-NATIONAL - BASIC
FOR VEGETATED TERRESTRIAL, ESTUARINE, AND PALUSTRINE
COMMUNITIES

«ELCODE»CEGL001803

«SEL.SUMMARY»**General Description and Comments:** This plant association is recognized by the presence of both *Carex aquatilis* and *Carex utriculata* in roughly equal proportions. This is a common association that generally occurs in small to moderate size patches in very shallow, slow-moving to still water or on saturated soils near low-order streams, lakes, and backwater areas of larger rivers.

«STATE.CCODE» CRWCCAAQ0B
«STATE»CO
«GNAME» ***Carex aquatilis–Carex utriculata***
«GCOMNAME» **water sedge-beaked sedge**
«SNAME» ***Carex aquatilis–Carex utriculata***
«SCOMNAME» **water sedge-beaked sedge**
«SYSTEM»Palustrine
«PHYSIOGTYPE»Mesophytic Sod-Forming Subalpine-Alpine Grasslands
«SERIES» *Carex aquatilis* Seasonally Flooded Herbaceous Alliance
«GCLASSIFICATION.COM»
«SCLASSIFICATION.COM»**Classification Problems:** There remains some question as to whether the *Carex aquatilis-Carex utriculata* plant association is a distinct type or simply an intermixing of the *Carex aquatilis* and *Carex utriculata* plant associations (Padgett *et al.* 1989). In Colorado, we considered the latter two associations as clearly distinct types, occurring on different environmental settings. *Carex aquatilis* typically occurs on mineral soils often having a high organic component, while pure *Carex utriculata* stands typically occur on organic soils.

However, there are stands that do not easily classify into any one of the three plant associations. And although there is ample stand data on the *Carex aquatilis-Carex utriculata* plant association, more information is needed to clearly sort out the various classes of composition and environmental settings.

«SSIMILAR.COMMUNITIES»**Related Types/Synonyms:** The *Carex rostrata-Carex aquatilis* community type (Girard *et al.* 1995, Komarkova 1986, as cited in Reid and Bourgeron 1994, Hess and Wasser 1982), the *Carex rostrata-*(*Carex aquatilis* phase) (Hansen *et al.* 1989) community type, the *Carex aquatilis/Carex utriculata* Johnson 1987) plant association and the *Carex utriculata-Carex aquatilis* (Cooper 1986) plant association are considered synonymous with the Colorado *Carex aquatilis-Carex utriculata* plant association. *Carex utriculata* has often been incorrectly identified as *Carex rostrata*, in Colorado (Weber 1987, Weber and Whitmann 1995).

«SNAMES.COM»

«SPHYSPROV»
«COUNTYCODE»
«COUNTYNAME»
«COUNTY.OCCUR.STAT»
«COUNTY.OCCUR.REF»

«SECOREGCODE»
«SECOREG.OCCUR.STAT»
«SECOREG.OCCUR.REF»

«SWSHEDCODE»
«SWSHED.OCCUR.STAT»
«SWSHED.OCCUR.REF»

«S.EMAP.HEXCODE»
«S.EMAP.OCCUR.STAT»
«S.EMAP.OCCUR.REF»

«SLOCALJURIS»
«SLOCAL.OCCUR.STAT»
«SLOCAL.OCCUR.REF»

«SRANGE»
«SRANGECOM»
«SDISTRIBUTION.COM» **Regional Distribution:** This plant association occurs in subalpine meadows throughout the Rocky Mountains including Montana (Hansen *et al.* 1989), Idaho, Utah, Wyoming (Girard *et al.* 1995) and Colorado (Johnston 1987, Komarkova 1986, as cited in Reid and Bourgeron 1994, Hess and Wasser 1982, Colorado Natural Heritage Program 1997). It also may occur in Arizona and Nevada (Bourgeron and Engelking 1994).

Distribution in Colorado: This association occurs throughout the Rocky Mountains of Colorado (Hess and Wasser 1982, Johnston 1987, Kettler and McMullen 1996, Kittel *et al.* 1994, Kittel *et al.* 1995, Komarkova 1986, as cited in Reid and Bourgeron 1994, Richard *et al.* 1996)

«SMINELEV»
«SMAXELEV»
«SKEY.ENVIRO.FACTORS»
«SENVIRO.COM»**Elevation Range:** 8200-11,100 ft. (2500-3400 m). **Site Geomorphology:** This plant association occurs in broad, glaciated, subalpine meadows that remain saturated with snowmelt runoff for most of the growing season. It is also often associated with beaver activity. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are narrow, deep, and

planifolia (planeleaf willow), *Salix brachycarpa* (barrenground willow), *Salix wolfii* (Wolf willow), *Salix boothii* (Booth willow), or *Salix geyeriana* (Geyer willow) shrublands. *Deschampsia cespitosa* (tufted hairgrass) grasslands often occur on drier margins and *Veratrum tenuipetalum* (Colorado false hellebore) patches often occur on moist toe-slope seeps.

Adjacent upslope vegetation: *Abies lasiocarpa-Picea engelmannii* (subalpine fir-Engelmann spruce) and *Pinus contorta* (lodgepole pine) forests and *Artemisia tridentata* (big sagebrush) shrublands occur on adjacent hillslopes.

«GRANK»G3G4
«GREASONS»This is a common community, well documented throughout the western states.
«SRANK»S4
«SREASONS»In Colorado, over one-hundred stands have been documented and many enjoy formal protection within National Parks or Wilderness Areas.
«SEXEMPLARY.EO»
«SEXEMP.EO.SITENAME»
«SEOTRACK»
«SPROT»
«SSTATCOM»

«SMANAGE.COM»**Management:** Palatable *Carex* (sedge) species can be heavily utilized by livestock in riparian areas in mid- to high-elevation rangelands. Overgrazing by livestock can dry sites, increase non-native grass cover, and result in decreased vigor of native species root structure that can eventually eliminate them from the site. The wet and often saturated soils of this plant association are also vulnerable to compaction by livestock and heavy equipment. In order to maintain productivity and vigor of the plants and prevent damage to the soils, livestock grazing should be deferred until soils dry (Hansen *et al.* 1995).

Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant regrowth. Late summer and fall grazing is not recommended if there are adjacent willow shrublands, as willow species are vulnerable to pruning damage due to limited regrowth at the end of the growing season (Hansen *et al.* 1995).

Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams create a high water table, abate channel downcutting, bank erosion, and movement of sediment by slowing the stream flow and reducing stream gradients. Beaver dams raise the water table across the floodplain and provided year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raises the channel bed and creates a wetland environment. Land managers should consider maintaining beaver activity rather than removing them (Hansen *et al.* 1995).

Burning of this plant association temporarily increases the productivity of *Carex aquatilis* (aquatic sedge) and *Carex utriculata* (beaked sedge). However, livestock grazing needs to be eliminated for the year prior to burning and for at least 2-3 years after to prevent livestock from damaging young, palatable regrowth and to allow for root reserve build up (Hansen *et al.* 1995).

Carex aquatilis and *Carex utriculata* (beaked sedge) are effective stream bank stabilizers due to their rhizomatous root growth. They tend to form a dense, thick sod that is highly resistant to erosion (Hansen *et al.* 1995).

«SINVENTORY.COM»

«SANALYSIS.DATA.MANAGE.COM»
«SCOMMUNITY.COM»

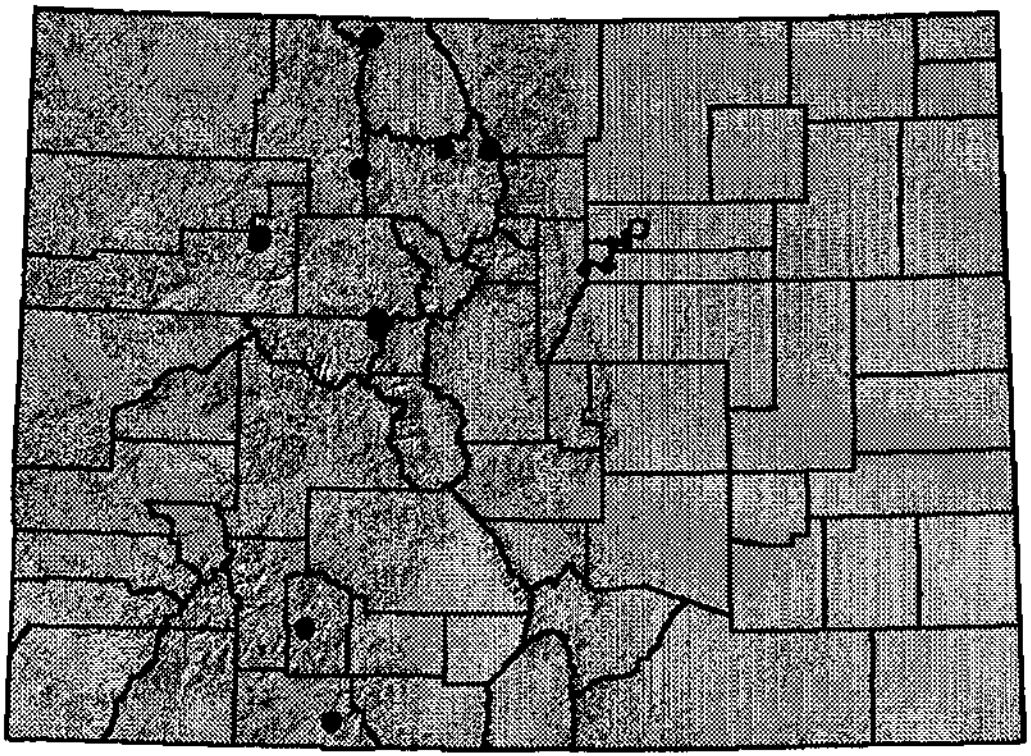
«SADDTL.TOPICS»
«STOPIC.KEYWORDS»

«SOURCECODE»
«CITATION»

«SEDITION»1997-10-28, 1997-12-01, 1998-01-22
«SEDAUTHOR»Kittel, G., E. VanWie, M. Damm
«SUPDATE»

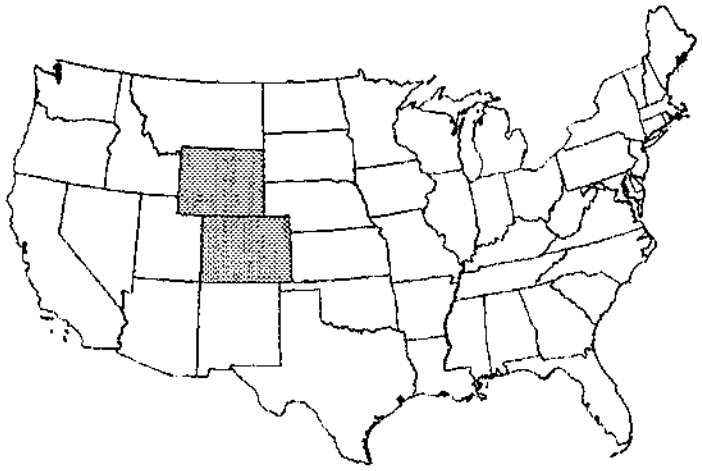
Carex aquatilis-Carex utriculata
Montane Wet Meadow

State Range



S4: State Apparently Secure

Global Range



G4: Globally Apparently Secure

WORD PROCESSING TEMPLATE
COMMUNITY CHARACTERIZATION ABSTRACT SUB-NATIONAL - BASIC
FOR VEGETATED TERRESTRIAL, ESTUARINE, AND PALUSTRINE COMMUNITIES

«ELCODE»CEGL001562
«SEL.SUMMARY»**General Description and Comments:** The *Carex utriculata* (beaked sedge) plant association is a common wet meadow that community that occurs around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains. The water table is usually near the surface for most of the growing season.

«STATE.CCODE»CRWCCARO6A
«STATE»CO
«GNAME»***Carex utriculata***
«GCOMNAME»**Beaked sedge**
«SNAME»***Carex utriculata***
«SCOMNAME»**Beaked sedge**
«SYSTEM»Palustrine
«PHYSIOGTYPE»
«SERIES»*Carex utriculata* Seasonally Flooded Herbaceous Alliance
«GCLASSIFICATION.COM»
«SCLASSIFICATION.COM»**Classification Problems:** *Carex utriculata* has been incorrectly identified as *Carex rostrata* in previous Colorado literature (Weber and Whitman 1992).

«SSIMILAR.COMMUNITIES»**Related Types/Synonyms:** The *Carex rostrata* community types from Oregon (Kovalchik 1987), Nevada (Manning and Padgett 1995), Utah (Padgett *et al.* 1989), Montana (Hansen *et al.* 1995), Idaho, Wyoming (Youngblood *et al.* 1985, Girard *et al.* 1995) and Colorado (Cooper and Cottrell 1990) are synonymous with the Colorado *Carex utriculata* plant association. Closely related communities are more broadly defined, and probably contain stands that would match the Colorado *Carex utriculata* plant association. These closely related communities include: the *Carex rostrata-Carex aquatilis* (Hess and Wasser 1982), the *Carex aquatilis-Carex utriculata-Carex utriculata* Phase (Johnston 1987), and the *Carex aquatilis-Carex rostrata-Deschampsia cespitosa* (Baker 1989) plant association.

«SNAMES.COM»
«SPHYSPROV»
«COUNTYCODE»
«COUNTYNAME»
«COUNTY.OCCUR.STAT»
«COUNTY.OCCUR.REF»
«SECOREGCODE»
«SECOREG.OCCUR.STAT»
«SECOREG.OCCUR.REF»

«SWSHEDCODE»
«SWSHED.OCCUR.STAT»
«SWSHED.OCCUR.REF»
«S.EMAP.HEXCODE»
«S.EMAP.OCCUR.STAT»
«S.EMAP.OCCUR.REF»
«SLOCALJURIS»
«SLOCAL.OCCUR.STAT»
«SLOCAL.OCCUR.REF»
«SRANGE»
«SRANGECOM»
«SDISTRIBUTION.COM»**Regional Distribution:** This plant association occurs in Oregon (Kovalchik 1987), Nevada (Manning and Padgett 1995), Utah (Padgett *et al.* 1989), Idaho, Wyoming (Youngblood *et al.* 1985, Jones and Walford 1995), Montana (Hansen et al. 1995), and Colorado (Colorado Natural Heritage Program 1997).

Distribution in Colorado: This plant association occurs in Rocky Mountain National Park, the Roosevelt, Arapaho, White River, Routt, Gunnison and San Juan National Forests, (Johnston 1987, Kettler and McMullen 1996, Richard *et al.* 1996), and the Yampa, San Miguel/Dolores (Kittel and Lederer 1993), White, Colorado (Kittel *et al.* 1994), Gunnison (Kittel *et al.* 1995), Arkansas (Kittel *et al.* 1996), South Platte River Basins (Kittel *et al.* 1997) and the Rio Grande and Closed Basins (Colorado Natural Heritage Program 1997).

«SMINELEV»
«SMAXELEV»
«SKEY.ENVIRO.FACTORS»
«SENVIRO.COM»**Elevation Range:** 7500-9600 ft (2300-2900 m). **Site Geomorphology:** *Carex utriculata* (beaked sedge) grows in standing water or saturated soils of wet swales and overflow channels along low-gradient streams. It also occurs along the margins of lakes and beaver ponds. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are wide and slightly sinuous (Rosgen's Channel Type: B5 and B6). **Soils:** Soils are saturated organics or fine silty clays to clays over cobbles and alluvium. Mottling often occurs within a few centimeters of the surface. In the Colorado River Basin, the soils classify as very-fine clayey to loamy skeletal calcareous Cumulic or Typic Cryaquolls, Aquepts, fine-loamy and sandy-skeletal Typic Cryaquents, and Histic Cryaquepts.

«SVEGETATION.COM»The following information is based on twenty-one quantitative plots: six from the Routt National Forest (93K051, 93K111, 93K131, 93K203, 93K302, 94R596), four from the Gunnison River Basin (94GK19, 94JB28, 94JB49, 94RR36), three from the San Miguel/Dolores River Basin (91NL17, 91NL34, 91NL87), six from the San Juan National Forest (93C163, 93C222, 93C562, 94DR07, 94MS15, 94MS07), and three from the Rio Grande and Closed Basins (95RG74, 95RG77, 97EV13) (Colorado Natural Heritage Program 1996).

Vegetation: This plant association is characterized by nearly pure stands of *Carex utriculata* (beaked sedge) (20-98%). Graminoids dominate the herbaceous layer and can be quite diverse. Other *Carex* (sedge) species present include *C. lenticularis* and *C. microptera* (small-wing sedge), but usually with low cover (<10-30%). Other graminoid species present are *Glyceria striata* (fowl mannagrass), *Calamagrostis canadensis* (Canadian reedgrass), and *Juncus balticus* (mountain rush). Forb cover is low (<10%). Willow carrs (shrublands) are often adjacent and a few scattered willows will occur within the *Carex utriculata* (beaked sedge) stand, such as *Salix monticola* (mountain willow), *Salix drummondiana* (Drummond willow), *S. geyeriana* (Geyer willow) or *S. planifolia* (planeleaf willow).

«SOTHER.SPP.COM»
«SVARIABILITY.COM»

«SSUCCESS.DYNAM.COM» **Successional and Ecological Processes:** The *Carex utriculata* plant association occurs on the wettest sites of the riparian or wetland area, such as low-lying swales, and shallow margins of lakes and ponds, often in standing water. It is an early-seral community and is known to invade margins of newly formed beaver ponds, as well as the freshly exposed silt beds of drained beaver ponds (Padgett *et al.* 1989). With time, the *Carex utriculata* plant association will grade into a *Carex aquatilis* and *Calamagrostis canadensis* associations. *Calamagrostis canadensis* dominates the driest sites with the lowest water tables and colonizes drying stands of *Carex utriculata* and *C. aquatilis* (Cooper 1986).

Successional shifts in species composition can be initiated by a change in the physical environment of the riparian area. Flooding events can result in sediments deposited on the floodplain, raising the surface higher above the water table (Cooper 1986). As aggradation, or build up, of the floodplain proceeds, the site can become drier and the dominant graminoid cover changes.

Abandoned beaver ponds also go through a similar succession. With time, ponds become silted-in and *Carex utriculata* establishes on the new, saturated substrate. As the site becomes firm and raised above the old pond level, *Carex aquatilis* and willows may become established. With further aggradation and time *Calamagrostis canadensis* may become established in the undergrowth. Depending on site characteristics, various willow species may become established in the overstory as well, creating the *Salix monticola/Carex utriculata* plant association and the *Salix geyeriana/Calamagrostis canadensis* plant association, for example.

Distance from the stream channel can also differentiate the graminoid dominance spatially within the riparian mosaic. *Carex utriculata* commonly occurs at the stream channel edge where the water table is close to or at the ground surface. As the floodplain surface becomes higher with increased distance from the channel edge, the ground becomes slightly less saturated and shifts to mesic meadows of *Carex aquatilis*, or on higher surfaces, to slightly drier meadows of *Calamagrostis canadensis* (Kittel 1994).

«SSPATIAL.COM»**Adjacent Riparian Vegetation:** This association is often part of a wetland mosaic, with *Salix monticola, Salix drummondiana,* and *Salix geyeriana* shrublands. It also occurs adjacent to and intergrades with *Carex aquatilis* or *Eleocharis palustris* meadows. *Populus angustifolia-Picea pungens, Populus angustifolia* and *Picea pungens* riparian forests occur on adjacent stream terraces in narrower valleys.

Adjacent Upland Vegetation: *Abies lasiocarpa-Picea engelmannii* forests, *Populus tremuloides* woodlands at higher elevations; *Pinus ponderosa* and *Populus tremuloides* forests and *Quercus gambelii* shrublands occur on adjacent hillslopes at lower elevations.

«GRANK»G5
«GREASONS»This association is well documented throughout the western states.
«SRANK»S4
«SREASONS»This association is well documented throughout its habitat in Colorado.
«SEXEMPLARY.EO»
«SEXEMP.EO.SITENAME»
«SEOTRACK»
«SPROT»
«SSTATCOM»

«SMANAGE.COM»**Management:** *Carex utriculata* generally occupies the wettest habitats in the riparian area. The soils are highly susceptible to compaction and churning. Heavy use by livestock can dry the site, increase non-native grass cover, and reduce the vigor of willow root structure. However, *Carex utriculata* has a low palatable, especially late in the season (Herman 1970). The wet and often saturated soils of this plant association are also vulnerable to compaction by livestock and heavy equipment. In order to maintain productivity and vigor of the plants and prevent damage to the soils, livestock grazing should be deferred until soils dry (Hansen *et al.* 1995).

Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant establishment. Late summer and fall grazing is not recommended because adjacent willow individuals are vulnerable to pruning damage due to limited regrowth before the end of the growing season (Hansen *et al.* 1995, Kovalchik and Elmore 1992).

Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams aid in controlling channel down cutting, stream bank erosion, and downstream movement of sediment. Beaver dams raise the water table and provide water for hydrophytic plants including willows and sedges. The trapping of sediment behind beaver dams, along with plant reproduction, raises the channel bed and creates a wetland environment. Land managers should consider maintaining beaver activity in an area versus their removal (Hansen *et al.* 1995).

Burning of this plant association temporarily increases the productivity of *Carex utriculata* (beaked sedge) and *Carex aquatilis* (aquatic sedge) . However, livestock grazing needs to be eliminated for the year prior to burning and for at least 2-3 years after burning. This is necessary in order to keep livestock from consuming young, palatable regrowth. Prescribed burning is also an effective method of rejuvenating decadent clumps of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow burning fires can actually damage the plants. (Hansen *et al.* 1995).

«SINVENTORY.COM»

«SANALYSIS.DATA.MANAGE.COM»
«SCOMMUNITY.COM»

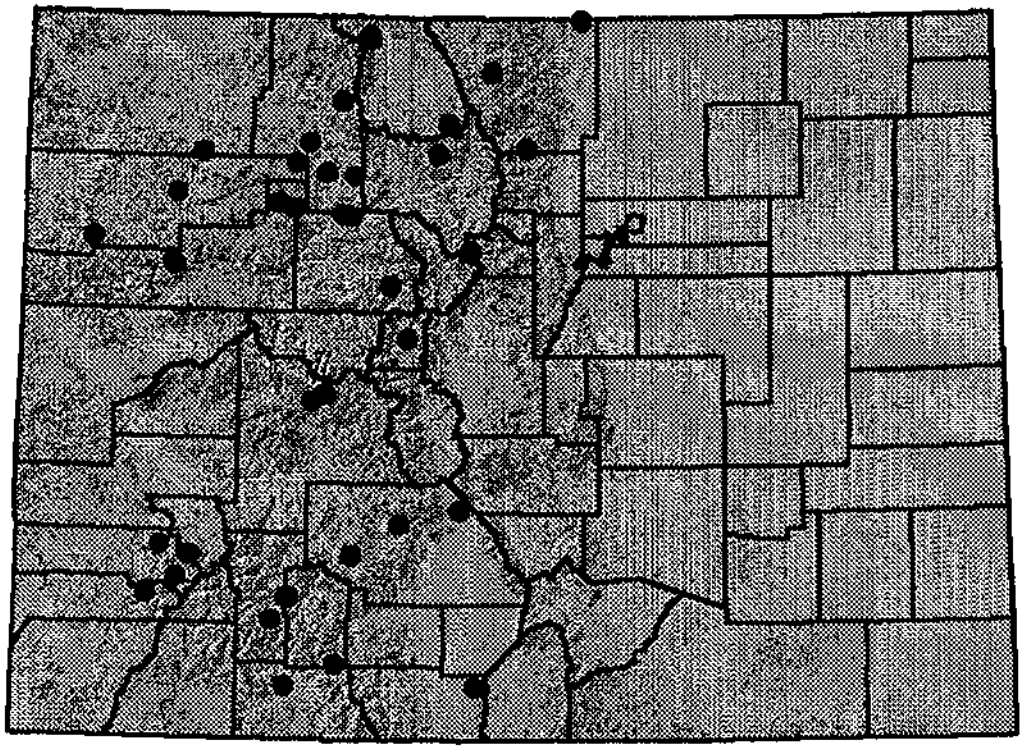
«SADDTL.TOPICS»
«STOPIC.KEYWORDS»

«SOURCECODE»
«CITATION»

«SEDITION»1998-01-22
«SEDAUTHOR»Kittel, G., E. VanWie, M. Damm
«SUPDATE»

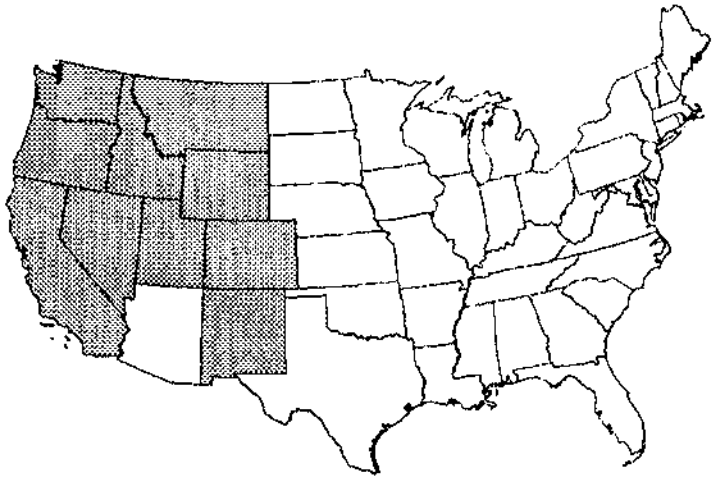
Carex utriculata
Beaked Sedge Montane Wet Meadow

State Range



S4: State Apparently Secure

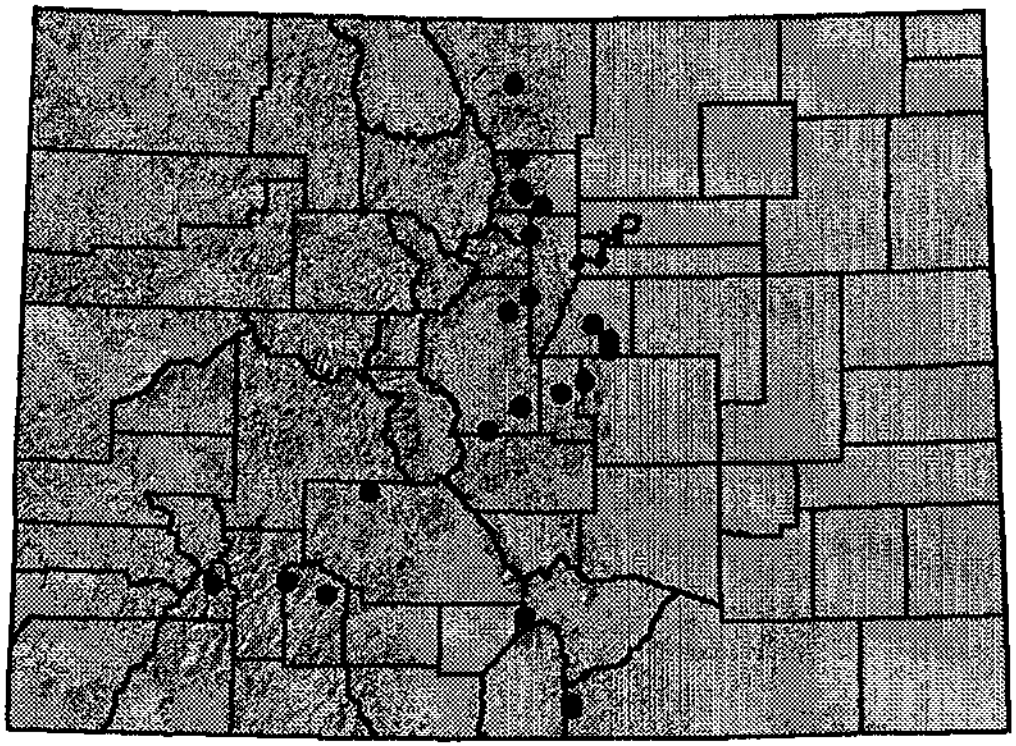
Global Range



G5: Globally Demonstrably Secure

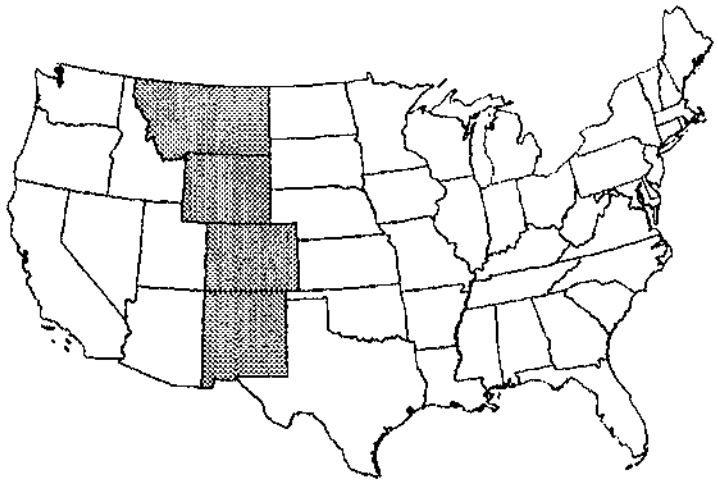
Danthonia parryi
Montane Grassland

State Range



S3: State Rare

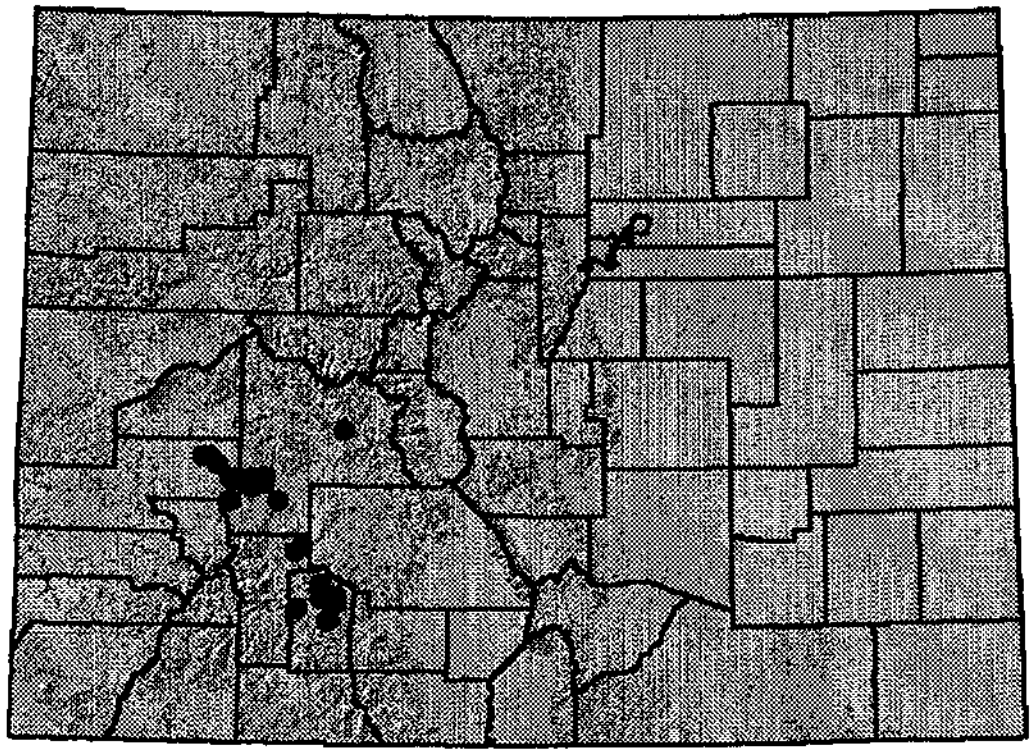
Global Range



G3: Globally Rare

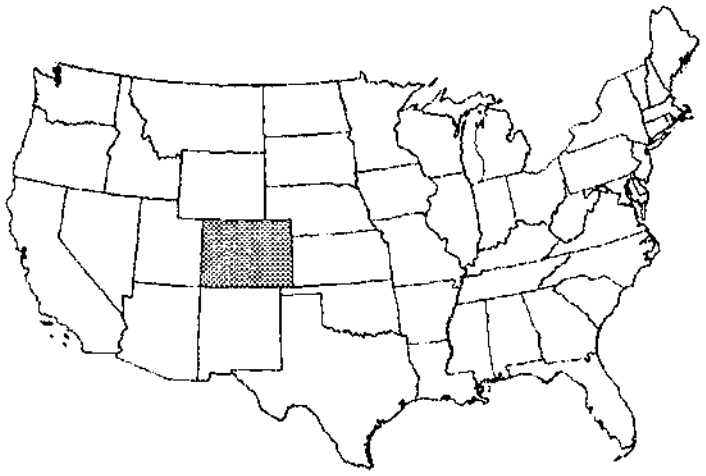
Festuca arizonica-Muhlenbergia filiculmis
Montane Grassland

State Range



S2: State Imperiled

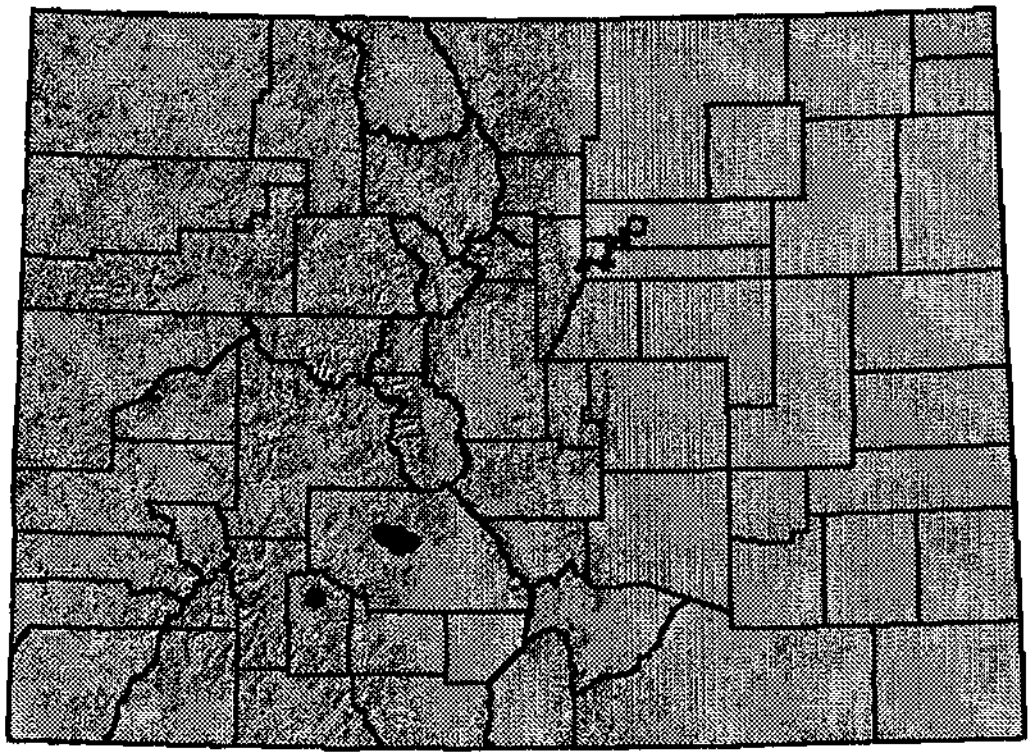
Global Range



G2: Globally Imperiled

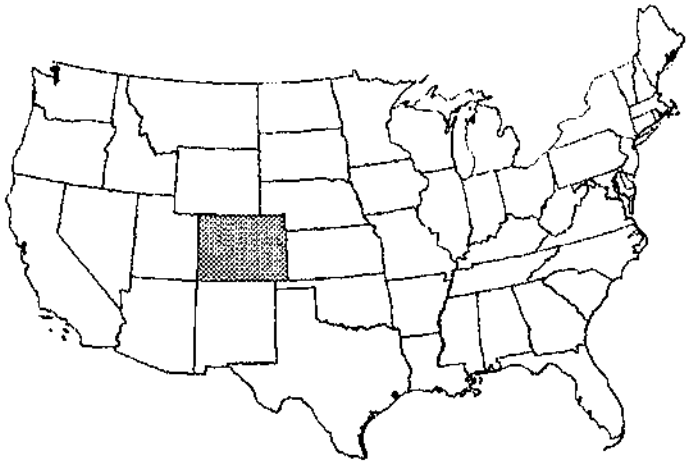
Muhlenbergia filiculmis
Montane Grassland

State Range



S2: State Imperiled

Global Range



G2: Globally Imperiled

WORD PROCESSING TEMPLATE
COMMUNITY CHARACTERIZATION ABSTRACT SUB-NATIONAL - BASIC
FOR VEGETATED TERRESTRIAL, ESTUARINE, AND PALUSTRINE
COMMUNITIES

«ELCODE»CRWASAGE2C

«SEL.SUMMARY»**General Description and Comments:** The *Salix geyeriana/Carex utriculata* (Geyer willow/beaked sedge) plant association is a tall (5-15 ft, 1.5-2.5 m), deciduous shrubland with a nearly closed canopy of willows and thick carpet of sedges in the undergrowth. It is often wet, with saturated soils throughout much of the growing season.

«STATE.CCODE»
«STATE»CO
«GNAME» ***Salix geyeriana/Carex utriculata***
«GCOMNAME» **Geyer willow/beaked sedge**
«SNAME» ***Salix geyeriana/Carex utriculata***
«SCOMNAME» **Geyer willow/beaked sedge**
«SYSTEM»Palustrine
«PHYSIOGTYPE»Deciduous Alluvial Shrubland
«SERIES» *Salix geyeriana*
«GCLASSIFICATION.COM»
«SCLASSIFICATION.COM» **Classification Problems:** Without catkins (the flowering stalk), *Salix drummondiana* (Drummond willow) can be difficult to distinguish from the similar looking *Salix geyeriana* (Geyer willow). Both species are tall, greater than 5 feet (2 meters), montane willows with strongly pruinose (a waxy covering that rubs off, similar to the coating on a plum) current-year twigs. Luckily, the two species can be distinguished using only vegetative characters. *Salix geyeriana* (Geyer willow) leaves are never more than 0.5 inches (13 mm) wide and *Salix drummondiana* (Drummond willow) leaves are, on average, over 0.5 inches (13 mm) wide (on non-sucker shoots) (Welsh *et al.* 1987).

«SSIMILAR.COMMUNITIES»**Related Types/Synonyms:** The *Salix geyeriana/ Carex rostrata* (Geyer willow/beaked sedge) community type (Hansen *et al.* 1995, Youngblood *et al.* 1985, Padgett *et al.* 1989, Girard *et al.* 1995, Jones 1992) and the *Salix geyeriana-Salix* spp./*Carex utriculata* (Geyer willow-willow spp./beaked sedge) plant association (Phillips 1977, Johnson 1987) are synonymous with the Colorado *Salix geyeriana/Carex utriculata* plant association. *Carex rostrata* var. *utriculata* is a synonym for *Carex utriculata* (Kartesz 1994).

«SNAMES.COM»
«SPHYSPROV»
«COUNTYCODE»
«COUNTYNAME»
«COUNTY.OCCUR.STAT»

«COUNTY.OCCUR.REF»

«SECOREGCODE»
«SECOREG.OCCUR.STAT»
«SECOREG.OCCUR.REF»

«SWSHEDCODE»
«SWSHED.OCCUR.STAT»
«SWSHED.OCCUR.REF»

«S.EMAP.HEXCODE»
«S.EMAP.OCCUR.STAT»
«S.EMAP.OCCUR.REF»

«SLOCALJURIS»
«SLOCAL.OCCUR.STAT»
«SLOCAL.OCCUR.REF»

«SRANGE»
«SRANGECOM»
«SDISTRIBUTION.COM» **Regional Distribution:** This plant association occurs in Montana (Hansen *et al.* 1995), Utah (Padgett *et al.* 1989), Idaho and Wyoming (Youngblood *et al.* 1985, Girard *et al.* 1995, Jones 1992) and Colorado (Johnston 1987, Colorado Natural Heritage Program 1997).

Distribution in Colorado: This plant association occurs in north-central Colorado, the Arapaho-Roosevelt (Johnston 1987) and Routt National Forests (Kettler and McMullen 1996), in the Yampa (Kittel and Lederer 1993) and South Platte River Basins (Kittel *et al.* 1997).

«SMINELEV»
«SMAXELEV»
«SKEY.ENVIRO.FACTORS»
«SENVIRO.COM»**Elevation Range:** 6800-9000 ft (2100-2800 m). **Site Geomorphology:** This association occurs in moderately wide to wide valley bottoms in swales and overflow channels of active floodplains adjacent to wide stream channels. This association often occurs near beaver activity. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are slightly meandering (Rosgen's Channel Type: B4) or braided from beaver activity (Rosgen's Channel Type: D6). **Soil:** Soils textures are silty clay loam, clay, and sandy clay, usually forming thick, cohesive layers interspersed with layers of gravel or sand. Mottling or gleying is often present. In Utah, this association occurs on organic and mineral soils. Mottling often occurs in the mineral soil horizons (Padgett *et al.* 1989)

«SVEGETATION.COM»The following information is based on a total of nine quantitative plots: four from the Yampa River Basin (67, 71, 93, GK16), three from the Routt National Forest (71, 271, 536), and two from the South Platte River Basin (96LS01, 96LS03) (Colorado Natural Heritage Program 1997).
Vegetation: *Salix geyeriana* (Geyer willow) dominates the shrub overstory with 20-60% cover. Other willow species include 0-20% cover of *Salix monticola* (mountain willow) and 0-10% cover each of *Salix drummondiana* (Drummond willow), *Salix wolfii* (Wolf willow) and *Salix planifolia* (planeleaf willow). Other shrubs with less than 10% cover include *Alnus incana* spp. *tenuifolia* (thinleaf alder) and *Lonicera involucrata* (honeysuckle). The graminoid layer is dominated by 20-60% cover of *Carex utriculata* (beaked sedge). Other graminoids include 0-30% cover of *Carex aquatilis* (water sedge), 0-10% cover of *Calamagrostis canadensis* (bluejoint reedgrass) and 0-5% cover each of *Carex nebrascensis* (Nebraska sedge) and *Carex praegracilis* (clustered field sedge). Forb cover is generally minor.

«SOTHER.SPP.COM»
«SVARIABILITY.COM»

«SSUCCESS.DYNAM.COM» **Successional and Ecological Processes:** *Salix geyeriana* dominated associations appear to be long-lived and late-seral, remaining in areas where a shallow water table saturates soils, not dropping below 3 ft. (1 m) for much of the growing season. Stands are limited to cold, wet environments of broad valley bottoms at high elevations. Due to the colder environments, organic matter builds up in the soils and succession to other associations is likely to be slow (Padgett *et al.* 1989). Beaver activity is also important in maintaining this association since it may be the last successional community to establish on naturally silted-in beaver ponds (Cooper and Cottrel 1990).

Carex utriculata (beaked sedge), *Carex aquatilis* (aquatic sedge), and *Calamagrostis canadensis* (bluejoint reedgrass) are common dominant undergrowth of several *Salix* plant associations. These three graminoids indicate different micro-environments, generally separating out along a moisture gradient related to the depth of the water table, and can represent different stages of succession of the floodplain (Cooper 1986).

Carex utriculata (beaked sedge) occurs on the wettest sites, such as shallow pond margins, low-lying swales, and overflow channel with the shallowest water tables. *Carex aquatilis* (water sedge) occurs on intermediate sites that have saturated but not inundated soils. *Calamagrostis canadensis* (bluejoint reedgrass) dominates the drier sites with lower water tables. As wetter sites become drier, it can colonize stands of *Carex utriculata* (beaked sedge) and *Carex aquatilis* (water sedge) (Cooper 1986).

Changes in the physical environment, brought on by flooding or other disturbance, can initiate successional shifts in species composition. Sediment deposition on the floodplain raises the surface higher above the water table (Cooper 1986). As aggradation, or build up, of the floodplain proceeds, the site becomes drier and the dominant graminoid

understory changes. Thus *Carex aquatilis* (water sedge) dominated stands (regardless of any overstory canopy) may shift toward *Calamagrostis canadensis* (bluejoint reedgrass) dominated stands.

«SSPATIAL.COM» **Adjacent Riparian Vegetation:** Adjacent riparian areas have *Populus tremuloides* (quaking aspen) and *Picea pungens* (Colorado blue spruce) forests, *Salix monticola* (mountain willow) and *Alnus incana* (thinleaf alder) shrublands and *Carex utriculata* (beaked sedge) or *Ranunculus aquatilis* (water crowfoot) wet meadows.

Adjacent Upland Vegetation: *Pinus contorta* (lodgepole pine) forests and *Artemisia tridentata* (big sagebrush) scrub occur on surrounding hillslopes.

«GRANK»G5
«GREASONS»This association is well documented from many western states.
«SRANK»S3
«SREASONS» This association is relatively uncommon in Colorado. Few stands are in pristine condition. It may be less common than it was historically due to heavy grazing at the turn of the century. Today it continues to be threatened by improper livestock grazing, stream flow alterations and heavy recreational use.

«SEXEMPLARY.EO»
«SEXEMP.EO.SITENAME»
«SEOTRACK»
«SPROT»

«SSTATCOM»

«SMANAGE.COM»**Management:** *Salix geyeriana* (Geyer willow) appears to be less tolerant of browsing pressure than other tall montane willow species (Hansen *et al.* 1995). *Salix geyeriana* (Geyer willow) will form the classic "mushroom" shape with over browsing by deer and cattle. *Carex* (sedge) species are often heavily grazed by livestock in narrow riparian areas in mid-elevation rangelands. Overgrazing by livestock can dry the site, increase non-native grass cover, and reduce the vigor of willow root structure. The wet and often saturated soils of this plant association are also vulnerable to compaction by livestock and heavy equipment. In order to maintain productivity and vigor of the plants and prevent damage to the soils, livestock grazing should be deferred until soils dry (Hansen *et al.* 1995).

Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant establishment. Late summer and fall grazing is not recommended because willow species are vulnerable to pruning damage due to limited regrowth at the end of the growing season (Hansen *et al.* 1995).

Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams abate channel downcutting, bank erosion, and movement of sediment by slowing stream flow and reducing stream gradients. Beaver dams raise the water table across the floodplain and provided year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raises the channel bed and creates a wetland environment. Land managers should consider maintaining beaver activity rather than removing them (Hansen *et al.* 1995).

According to Hansen *et al.* (1995), burning this plant association temporarily increases the productivity of *Carex utriculata* (beaked sedge) and *Carex aquatilis* (aquatic sedge) . However, livestock grazing needs to be eliminated for the year prior to burning and for at least 2-3 years after to prevent livestock from consuming young, palatable regrowth. Prescribed burning is also an effective method of rejuvenating decadent stands of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow burning fires can actually damage the plants.

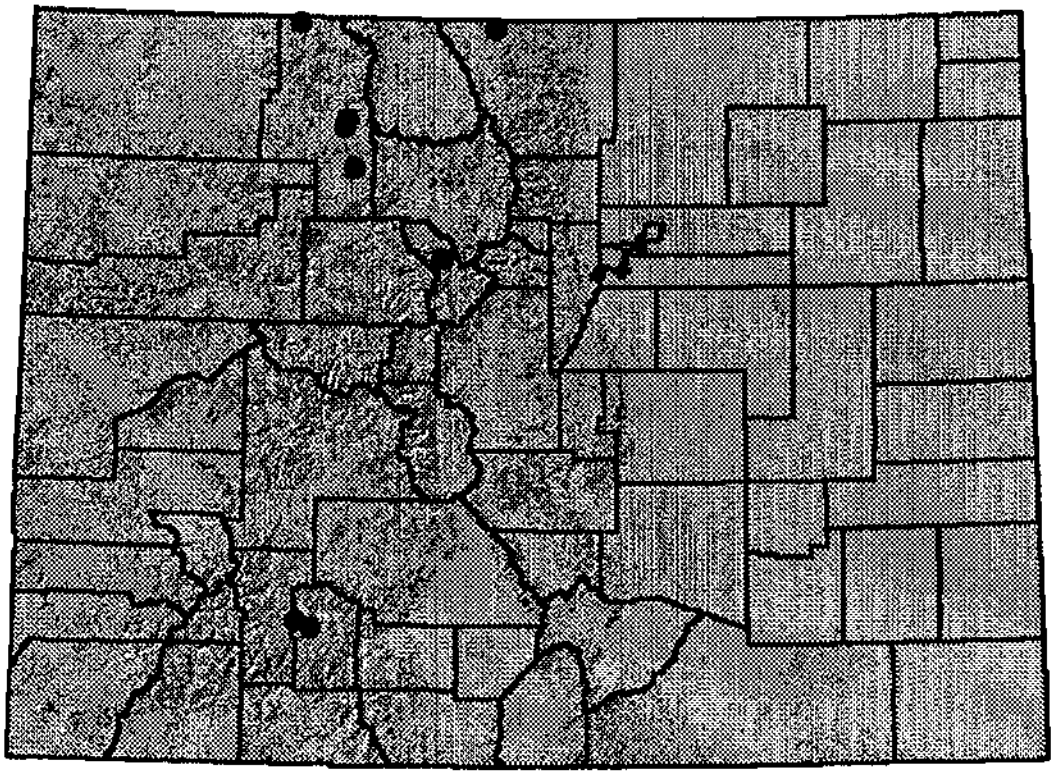
Salix geyeriana (Geyer willow), *Carex utriculata* (beaked sedge) and *Carex aquatilis* (aquatic sedge) are all effective stream bank stabilizers. *Carex utriculata* and *Carex aquatilis* are useful due to their dense network of rhizomatous roots. *Salix geyeriana* can be grown from nursery cuttings and then transplanted. Cuttings should be taken in the spring from dormant, 2-4 year-old wood. Cuttings should be 12-20 inches (30-50 cm) long and at least 0.5 inches (1 cm) in diameter. Roots and shoots should appear 10-15 days after planting if conditions are right (Hansen *et al.* 1995).

«SINVENTORY.COM»
«SANALYSIS.DATA.MANAGE.COM»
«SCOMMUNITY.COM»
«SADDTL.TOPICS»
«STOPIC.KEYWORDS»
«SOURCECODE»
«CITATION»
«SEDITION»1997-02-24, 1997-10-22, 1997-11-05, 1998-02-05
«SEDAUTHOR»Kittel, G., E. VanWie, M. Damm
«SUPDATE»

Salix geyeriana/Carex utriculata

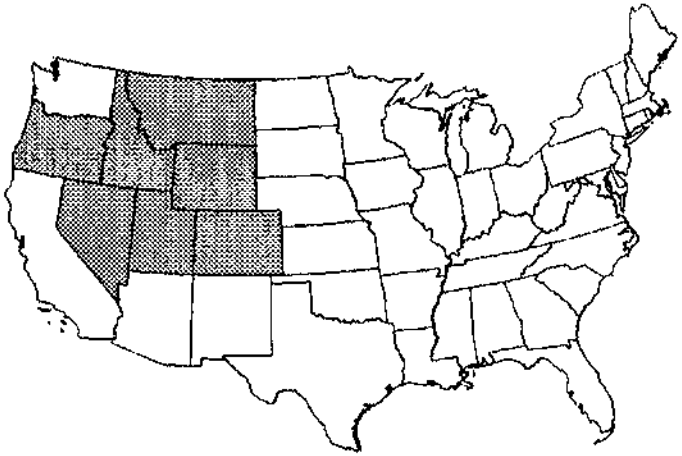
Geyer's Willow/Beaked Sedge

State Range



S3: State Rare

Global Range



G5: Globally Demonstrably Secure

WORD PROCESSING TEMPLATE
COMMUNITY CHARACTERIZATION ABSTRACT SUB-NATIONAL - BASIC
FOR VEGETATED TERRESTRIAL, ESTUARINE, AND PALUSTRINE
COMMUNITIES

«ELCODE»CRFEOPIPU0A

«SEL.SUMMARY»**General Description and Comments:** The *Picea pungens/Alnus incana* ssp. *tenuifolia* (Colorado blue spruce/thinleaf alder) plant association occurs in montane riparian areas in Colorado. It occurs in deep, shaded canyons and narrow valleys along relatively straight stream reaches. It generally forms small patches, but can be continuous for several river miles.

«STATE.CCODE»
«STATE»CO
«GNAME» ***Picea pungens/Alnus incana* ssp. *tenuifolia***
«GCOMNAME» **Colorado blue spruce/thinleaf alder**
«SNAME» ***Picea pungens/Alnus incana* ssp. *tenuifolia***
«SCOMNAME» **Colorado blue spruce/thinleaf alder**
«SYSTEM»Palustrine
«PHYSIOGTYPE»Evergreen Forest
«SERIES» *Picea pungens*
«GCLASSIFICATION.COM»
«SCLASSIFICATION.COM»
«SSIMILAR.COMMUNITIES»**Related Types/Synonyms:** The *Picea pungens/Alnus incana* ssp. *tenuifolia* plant association (Baker 1989) is synonymous with the Colorado *Picea pungens/Alnus incana* plant association. Several stands within the *Populus angustifolia-Picea pungens/Alnus incana* ssp. *tenuifolia-Lonicera involucrata* (narrowleaf cottonwood-Colorado blue spruce/thinleaf alder-honeysuckle) plant association (Baker 1989) matched the *Picea pungens/Alnus incana* Plant association and were moved to that name.

A closely related community is the *Picea pungens/Alnus incana* ssp. *tenuifolia* plant association (Johnston 1987), but includes New Mexico stands which contain significant amounts of *Abies concolor* (white fir).

«SNAMES.COM»

«SPHYSPROV»
«COUNTYCODE»
«COUNTYNAME»
«COUNTY.OCCUR.STAT»
«COUNTY.OCCUR.REF»

«SECOREGCODE»

«SECOREG.OCCUR.STAT»
«SECOREG.OCCUR.REF»

«SWSHEDCODE»
«SWSHED.OCCUR.STAT»
«SWSHED.OCCUR.REF»

«S.EMAP.HEXCODE»
«S.EMAP.OCCUR.STAT»
«S.EMAP.OCCUR.REF»

«SLOCALJURIS»
«SLOCAL.OCCUR.STAT»
«SLOCAL.OCCUR.REF»

«SRANGE»
«SRANGECOM»
«SDISTRIBUTION.COM» **Regional Distribution:** This plant association occurs in Wyoming and Colorado (Johnston 1987, Colorado Natural Heritage Program 1997).

Distribution in Colorado: This plant association occurs in the Routt National Forest, the Yampa, White, Colorado, Gunnison, and San Miguel/Dolores River Basins, and the San Juan and Rio Grande National Forests (Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel *et al.* 1994, Kittel *et al.* 1995, Richard *et al.* 1996, Johnston 1987, Baker 1989).

«SMINELEV»
«SMAXELEV»
«SKEY.ENVIRO.FACTORS»
«SENVIRO.COM»**Elevation Range:** 6100-9400 ft. (1900-2900 m). **Site Geomorphology:** This plant association occurs along narrow to moderately wide floodplains and stream benches in canyons subject to cold air drainage and limited sunlight. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are steep and narrow (Rosgen's Channel Type: A3, A4), moderately broad and slightly sinuous (Rosgen's Channel Type: B3, B4), or broad and highly sinuous (Rosgen's Channel Type: C3, C4). **Soils:** Soils are generally shallow and range from loamy sand to silty clay loams with heavy organic matter content over gravel, cobbles, and boulders. In stands in the White and Colorado River Basins, the soils classify as sandy typic and oxyaquic Cryorthents, loamy typic and oxyaquic Cryoborolls, and fragmental typic Cryochrepts.

«SVEGETATION.COM»The following information is based on a total of twenty-eight quantitative plots: six from the Routt National Forest (81, 221, 231, 372, 391, 392), three from the Yampa River Basin (47, 51, 91GK01), four from the White River Basin

(92NL12, 92NL16, 92GK17, 92GK54), five from the Colorado River Basin (93SS41, 93SS43, 93RR59, 93RR62, 93DR08), two from the Gunnison River Basin (94MD07, 94RR26), two from the San Miguel/Dolores River Basin (5, 83), and six from the San Juan National Forest (28, 32, 39, 40, 50, 203) (Colorado Natural Heritage Program 1997).
Vegetation: *Picea pungens* (Colorado blue spruce) dominates the overstory with 10-70% cover. There are typically many seedling and saplings as well as mature trees. *Abies lasiocarpa* (subalpine fir) may also be present with 0-25% cover. The thick shrub understory is confined to a narrow band lining the stream channel. Shrub species include 10-70% cover of *Alnus incana* (thinleaf alder), 0-40% cover of *Salix drummondiana* (Drummond willow), 0-30% cover each of *Salix monticola* (mountain willow) and *Acer glabrum* (mountain maple), and 0-10% cover each of *Cornus sericea* (red-osier dogwood) and *Lonicera involucrata* (honeysuckle). The forb layer is species rich with up to 40 species and dense, with a total of up to 50% cover. Forb species include *Actea rubra* (baneberry), *Conioselinum scopulorum* (hemlock parsley), *Oxypolis fendleri* (cowbane), *Geranium richardsonii* (Richardson geranium), *Heracleum lanatum* (cow parsnip), *Maianthemum stellatum* (false Solomon seal), *Mertensia ciliata* (mountain bluebells), *Rudbeckia laciniata* (cutleaf cornflower), and *Equisetum arvense* (field horsetail).

«SOTHER.SPP.COM»
«SVARIABILITY.COM»

«SSUCCESS.DYNAM.COM» **Successional and Ecological Processes:** In deep, narrow canyons with swift-moving streams and narrow floodplains and stream benches, *Picea pungens* (Colorado blue spruce) appears to be a climax riparian species. *Picea pungens* will remain until removed or damaged by a catastrophic flood. More information is needed about the establishment requirements and successional role of *Picea pungens*.

Alnus incana ssp. *tenuifolia* (thinleaf alder) is a long-lived, early-seral species. It is one of the first species to establish on fluvial or glacial deposits as well as the spoils of placer mining (Viereck 1970, Van Cleve *et al.* 1971, Chapin *et al.* 1994, Hansen *et al.* 1989). After establishment, young stands of *Alnus incana* are continually flooded. As stands mature, the stems can slow flood waters and trap sediment. Fine-textured sediments accumulate on top of the coarser alluvial material and the land surface eventually rises above annual flood levels. Flooding is then less frequent and soils begin to develop (Padgett *et al.* 1989).

Alnus incana is shade-intolerant (Viereck 1970, Chapin *et al.* 1994), and many mature stands in Colorado are restricted to stream bank edges, possibly because these are the only sites where light can penetrate the neighboring overstory canopy. *Alnus incana* has been observed on high-gradient streams and is thought to require well-aerated water (Hansen *et al.* 1988, Padgett *et al.* 1989).

Undisturbed *Alnus incana* (thinleaf alder) stands may become dominated by *Salix* (willow) species or conifer stands (Hansen *et al.* 1989). In Alaska, thick stands of alders inhibit succession by competing with spruce for nutrients and light (Chapin *et al.* 1994). In Utah, *Acer negundo* (boxelder) often becomes the dominant canopy species on more xeric sites (Padgett *et al.* 1989).

Alnus incana (thinleaf alder) fixes atmospheric nitrogen through a symbiotic relationship with the bacteria *Frankia* and increases the ecosystem nitrogen supply with the deposition of nitrogen-rich leaf litter (Binkley 1986). The annual input of nitrogen to soils from alder species ranges from 16 to 150 kg/ha annually compared to 1 to 10 kg/ha/yr deposited by atmospheric precipitation alone (Binkley 1986, Bowman and Steltzer *in press*). Nitrogen rich detritus is an important source of nutrients for the aquatic ecosystem as well.

«SSPATIAL.COM» **Adjacent riparian vegetation:** This plant association is often the only community along narrow streams. However, adjacent riparian communities can include *Picea pungens* (Colorado blue spruce), *Abies lasiocarpa-Picea engelmannii* (subalpine fir-Engelmann spruce), or *Populus angustifolia* (narrowleaf cottonwood) forests or *Alnus incana* (thinleaf alder), *Salix geyeriana* (Geyer willow), or *Salix boothii* (Booth willow) shrublands.

Adjacent upland vegetation: At higher altitudes, *Abies lasiocarpa-Picea engelmannii* (subalpine fir-Engelmann spruce) and *Populus tremuloides* (aspen) forests often occur on adjacent hill slopes. At slightly lower altitudes, *Populus tremuloides* (quaking aspen), *Pseudotsuga menziesii* (Douglas-fir), and *Pinus ponderosa* (ponderosa pine) forests and *Pinus edulis-Juniperus osteosperma* (pinyon pine-one-seed juniper) and *Quercus gambelii* (Gambel oak) woodlands often occur on adjacent hill slopes.

«GRANK»G3
«GREASONS»This association is known from Wyoming to New Mexico. Stands are not large and are threatened by development, road building and maintenance, heavy recreational use, improper livestock grazing, and stream flow alterations.
«SRANK»S3
«SREASONS»Fewer than 100 stands exist in Colorado, and very few of these are in pristine condition. This association is threatened by development, road building and maintenance, heavy recreational use, improper livestock grazing, and stream flow alterations.

«SEXEMPLARY.EO»
«SEXEMP.EO.SITENAME»
«SEOTRACK»
«SPROT»
«SSTATCOM»

«SMANAGE.COM»**Management:** Due to heavy shading, this plant association provides low forage value for livestock. Dense stands of *Alnus incana* (thinleaf alder) hinder livestock access into this plant association. *Alnus incana* is not particularly palatable to livestock, but can be trampled as animals search for more palatable species. Open stands may provide moderate forage and shade in the summer (Hansen *et al.* 1995).

Most fires kill *Alnus incana* dominated stands, resulting in a sparse herbaceous understory and bank destabilization due to root death. *Alnus incana* sprouts quickly when cut at 4-5 year intervals and can be used for restabilizing stream banks. Cutting in spring and winter results in rapid sprouts. Cutting in the summer results in fewer, slow growing sprouts (Hansen *et al.* 1995).

«SINVENTORY.COM»

«SANALYSIS.DATA.MANAGE.COM»
«SCOMMUNITY.COM»

«SADDTL.TOPICS»
«STOPIC.KEYWORDS»

«SOURCECODE»
«CITATION»

«SEDITION»1997-01-02, 1997-04-25, 1997-11-18, 1998-01-18
«SEDAUTHOR»Kittel, G., E. VanWie, M. Damm
«SUPDATE»

Vertebrate Characterization Abstract for Colorado

BUFO BOREAS POP 1
BOREAL TOAD (SOUTHERN ROCKY MOUNTAIN POPULATION)

Taxonomy:

TAXCLASS: AMPHIBIA
ORDER: ANURA
FAMILY: BUFONIDAE
GENUS: BUFO

Status:

GLOBAL RANK: G4T1Q
STATE RANK: S1
FED. LEGAL STATUS: C
STATE LEGAL STATUS: E
FED. AGENCY STATUS: FS

GLOBAL STATUS COMMENTS:
Candidate for USFWS listing as Endangered or Threatened; in March 1995, USFWS determined that listing is warranted but precluded by actions of higher priority (Federal Register, 23 March 1995).

Habitat:

MINIMUM ELEV: 7000
MAXIMUM ELEV: 11860

HABITAT COMMENTS:
Lives near springs, streams, ponds, and lakes in foothill woodlands, mountain meadows, and moist subalpine forest up to 11,860 ft. (source unknown). Breed in any body of water lacking a strong current and with gradual descending banks. Beaver ponds and glacial kettle ponds are typical breeding habitat. Tadpoles have been found in both large lakes and in small puddles (Hammerson 1982). Most individuals are found in marshy areas around complexes of beaver ponds or ponds formed by snow melt (Carey 1993). Within the Colorado Front Range the boreal toad occupies a wide variety of habitats with the largest populations occurring between 8500-11,000 ft. (Campbell 1970). They are most common between 8,500-11,000 feet in elevation. This toad inhabits marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds in subalpine areas of Colorado. It is found in shallow water or among sedges and shrubby willows where soil is damp or wet (Ryke and Vest 1994).

REPRODUCTIVE HABITAT COMMENTS:
Tadpoles have been observed resting on the bottom in 2 to 6 inches of water (Burger and N 1946). Breeding begins late in spring as winter snowpack begins to melt. Breeding males emit a soft chirping call to attract females. Strings of eggs usually are deposited in shallow pools or along lake margins in late May or early June. Tadpoles metamorphose during their first summer at elevations below 9000 ft. At higher elevations, metamorphosis does not occur until the second summer; tadpoles overwinter beneath the ice. Toads do not breed successfully every year at elevations above 11,000 ft. (Hammerson 1982). Reproductive maturity occurs at 4 to 6 years (Carey 1993).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
In Boulder County, Colorado, egg laying occurs usually in late May or early June. Larvae metamorphose usually in first summer, possibly may overwinter once at highest elevations. In Colorado, metamorphosis occurs usually in August, sometimes in late July.

Distribution:
GLOBAL RANGE: See EGR

STATE RANGE: Apparently absent from Sangre de Cristo range, Wet Mountains, and Pikes Peak region. These toads are most common between 8500-11,000 feet. Rarely found as low as 7000 feet (Hammerson 1982). The Boreal Toad occurs throughout most of the mountainous portions of Colorado but appears to be absent from the Wet Mountains and Pikes Peak region (Ryke and Vest 1994).

Phenology:
PHENOLOGY COMMENTS:
Toads spent winter in a natural, rock-bounded chamber that opened next to a creek in a small opening in subalpine forest in Boulder County. Toads emerged from snow-covered chamber during May and began to move back to hibernaculum during late August and early September. By October, most toads had entered hibernation (Hammerson 1982). During the day, it buries itself in loose soil or in gopher or squirrel burrows near water; but at night, it ranges away from water for feeding (source unknown).

GLOBAL PHENOLOGY COMMENTS:
Active day or night in summer, depending on conditions; probably mainly diurnal. Inactive in colder months; in Colorado, most end activity by October.

SREPROCOM: Tadpoles have been observed resting on the bottom in 2 to 6 inches of water (Burger and N 1946). Breeding begins late in spring as winter snowpack begins to melt. Breeding males emit a soft chirping call to attract females. Strings of eggs usually are deposited in shallow pools or along lake margins in late May or early June. Tadpoles metamorphose during their first summer at elevations below 9000 ft. At higher elevations, metamorphosis does not occur until the second summer; tadpoles overwinter beneath the ice. Toads do not breed successfully every year at elevations above 11,000 ft. (Hammerson 1982). Reproductive maturity occurs at 4 to 6 years (Carey 1993).

Management:
MANAGEMENT COMMENTS:
Potential threats include disturbance, degradation, and loss of wetland habitats; conversion of small ponds into larger reservoirs by damming; and trout introduction and predation

on toad larvae. In addition, impacts by livestock, timber management practices, human recreation, and water pollution may potentially jeapordize toad populations (source unknown). Pollution, pesticides, acid precipitation, habitat destruction, increase in UV radiation, and introduction of predators or competitors into breeding areas have all been proposed as possible causes of decline. It has been suggested that some environmental factors or synergistic effects of more than one factor can lead to sublethal "stress". This stress directly causes suppression of the immune system, or indirectly cause immunosuppression by effecting elevated secretion of adrenal cortical hormones. Immunosuppression, coupled with the apparent effect of cold body temperatures on the ability of the immune system of ectothermic animals to fight disease leads to infection by aeromonas or other infectious agents, and to subsequent death of individuals and extinction of populations (Carey 1993). CDOW has a full management plan for this species (Management Recommendation Meetings for Larimer County Inventory 1996). Included in this plan are buffer zones of 200 meters which should be connected to the forest (males move 200m into forest to hibernate while females can move up to 5 miles), restrictions of development activities from October 1-May 1, control sedimentation of wetlands, rodent controls (BUFOs use burrows for hibernation), control hydrologic processes such as water flows (water levels that are too low or too high can be detrimental, as can decreased water temperatures). Predators upon BUFOs are sandpipers and corvids; increased residential development has been shown to increase corvid numbers (Management Recommendation Meetings for Larimer County Inventory 1996). Fish stocking impacts are unknown. CDOW monitors this species annually (Management Recommendation Meetings for Larimer County Inventory 1996).

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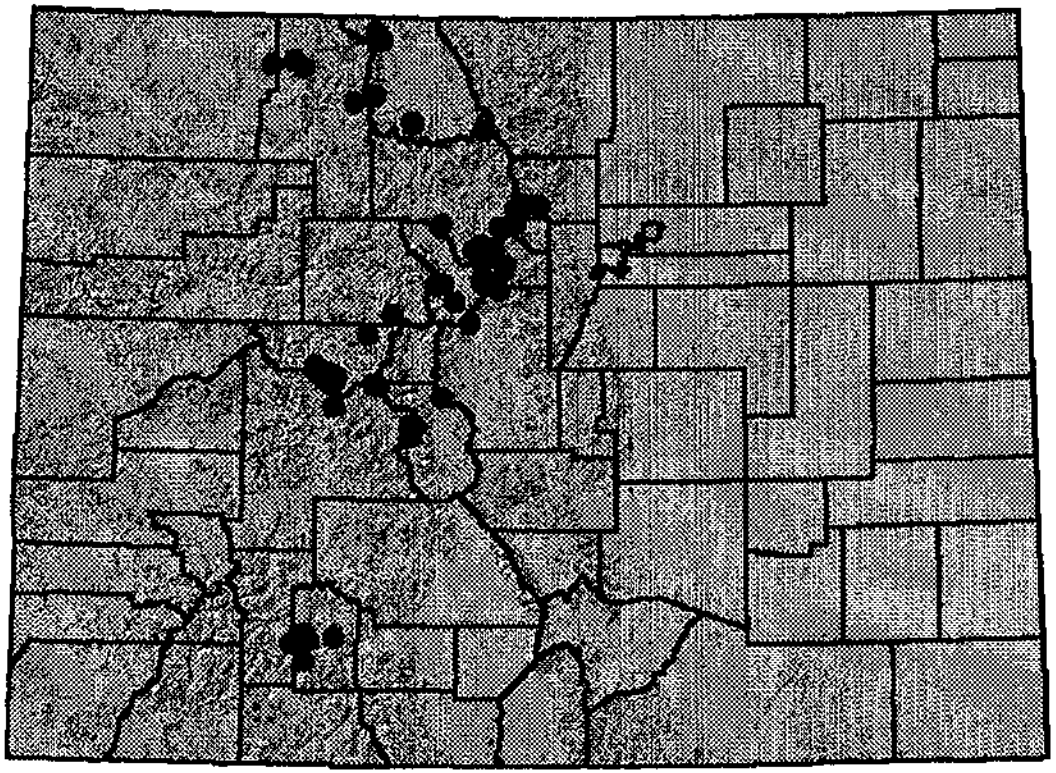
DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO MARCH 1999

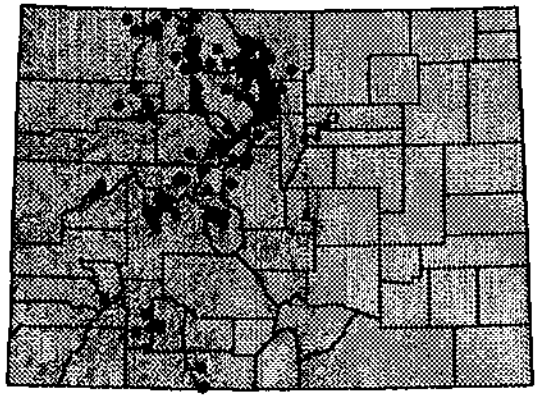
Bufo boreas pop. 1
Boreal Toad
(Southern Rocky Mountain Population)

State Range*

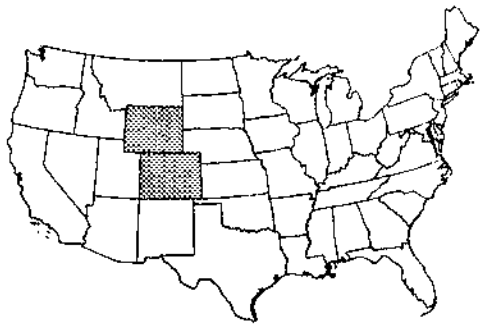


S1: State Critically Imperiled
** Post 1985 Data*

State Range Prior to 1985



Global Range



G4T1: Globally Apparently Secure Subspecies Globally Critically Imperiled

Vertebrate Characterization Abstract for Colorado

FALCO PEREGRINUS ANATUM
AMERICAN PEREGRINE FALCON

Taxonomy:

TAXCLASS:	AVES	ORDER:	FALCONIFORMES
FAMILY:	FALCONIDAE	GENUS:	FALCO

TAXONOMIC COMMENTS:
Medium-sized hawk with long, pointed wings and long tail. Rapid, shallow wing beats. Adult is slate gray above, wing and tail feathers and flanks barred with black. Throat white. Below white and reddish buffy, extensively spotted and barred with black. Legs and feet yellow.

Status:

GLOBAL RANK: G4T3 STATE RANK: S2B,SZN
FED. LEGAL STATUS: LE-P STATE LEGAL STATUS:
FED. AGENCY STATUS:

GLOBAL STATUS COMMENTS:
USFWS (Federal Register, 30 June 1995) proposed removing this subspecies from the list of endangered and threatened wildlife; also proposed was the removal of the similarity of appearance provision that currently exists for all free-flying FALCO PEREGRINUS within the coterminous U.S.

Habitat:

MINIMUM ELEV: 3500
MAXIMUM ELEV: 11500

HABITAT COMMENTS:
Nests on cliffs and forages over adjacent coniferous and riparian forests, sometimes other habitats (Andrews and Righter 1992).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
See files for FALCO PEREGRINUS.

Distribution:
GLOBAL RANGE:See EGR

STATE RANGE: Summer resident in foothills and lower mountains; in 1991 there were 58 active nest sites: 42 on Western Slope, 16 on Eastern Slope, and increasing (Andrews and Righter 1992).

Phenology:
PHENOLOGY COMMENTS:
Breeding dates 21 April - 31 July; locally breeding race is nesting before tundrius race has migrated through (Nelson 1993).

GLOBAL PHENOLOGY COMMENTS:
See files for FALCO PEREGRINUS.

SREPROCOM:

Management:
MANAGEMENT COMMENTS:

References:

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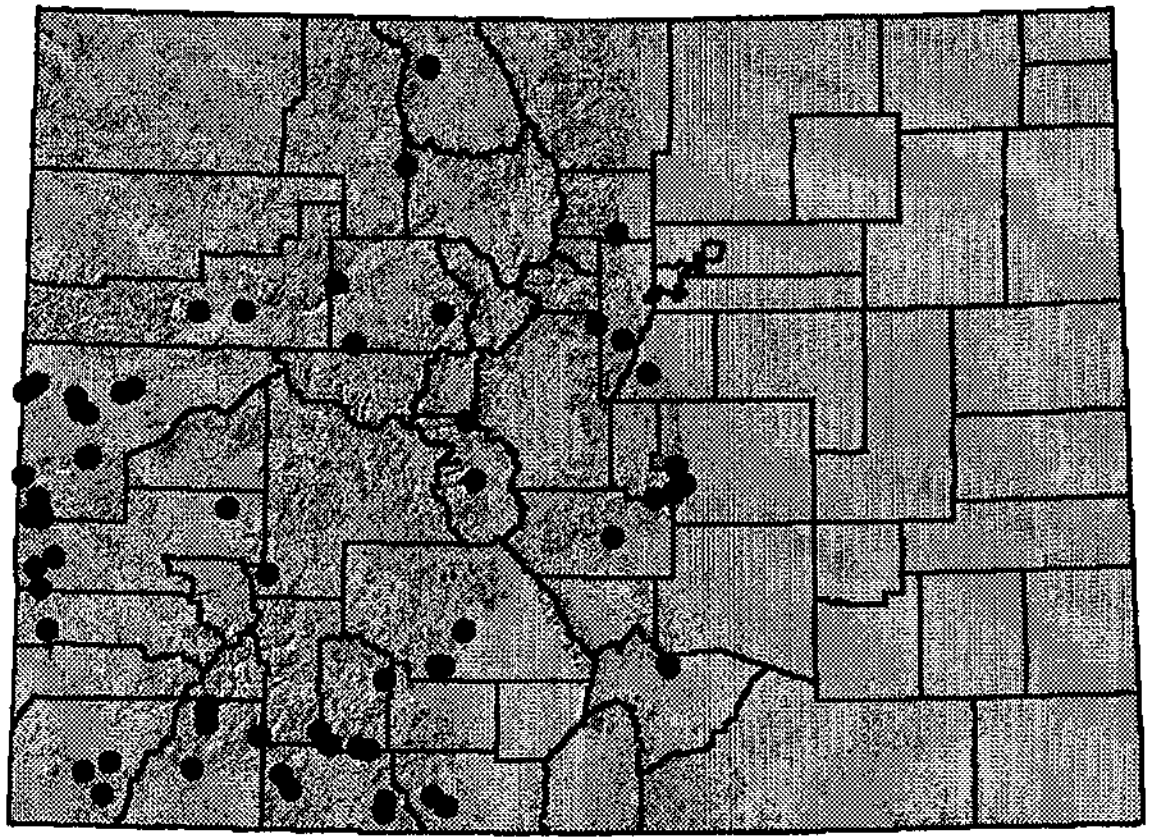
DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO MARCH 1999

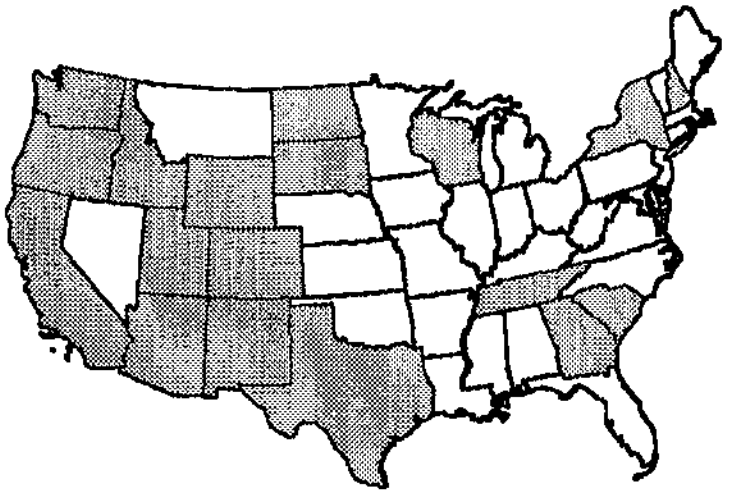
Falco peregrinus anatum
American Peregrine Falcon

State Range*



S2B: State Imperiled During the Breeding Season
** Post 1985 Data*

U.S. Range



G4T4: Globally Apparently Secure
Subspecies Globally Apparent
Secure

Vertebrate Characterization Abstract for Colorado

GILA PANDORA
RIO GRANDE CHUB

Taxonomy:

TAXCLASS:	OSTEICHTHYES	ORDER:	CYPRINIFORMES
FAMILY:	CYPRINIDAE	GENUS:	GILA

GLOBAL TAXONOMIC COMMENTS:
Hybridizes with RHINICHTHYS CATARACTAE (may be due to breeding-season crowding caused by drought and/or withdrawals of water for irrigation). Morphological variation among populations in Canadian River, Pecos River, and Rio Grande are believed to represent ecophenotypic variation (B90SUB01NA).

Status:

GLOBAL RANK: G3 STATE RANK: S1?
FED. LEGAL STATUS: STATE LEGAL STATUS: SC
FED. AGENCY STATUS:

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
Pools of small to moderate streams near areas of current. Small impoundments in the san luis valley, undercut banks. (Woodling 1985)

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Spawns in spring and early summer.

Distribution:
GLOBAL RANGE: See EGR

STATE RANGE: Native, restricted to rio grande basin; found in scattered locations; 1984- collected from upper dome lake in cochetopa creek basin (in co river basin) [b85woo01cous]

Phenology:
PHENOLOGY COMMENTS:

SREPROCOM:

Management:
MANAGEMENT COMMENTS:

Biology unknown, population from upper dome lake probably originated as part of fish stocking activities or as a bait bucket transfer. [b85woo01cous]

References:

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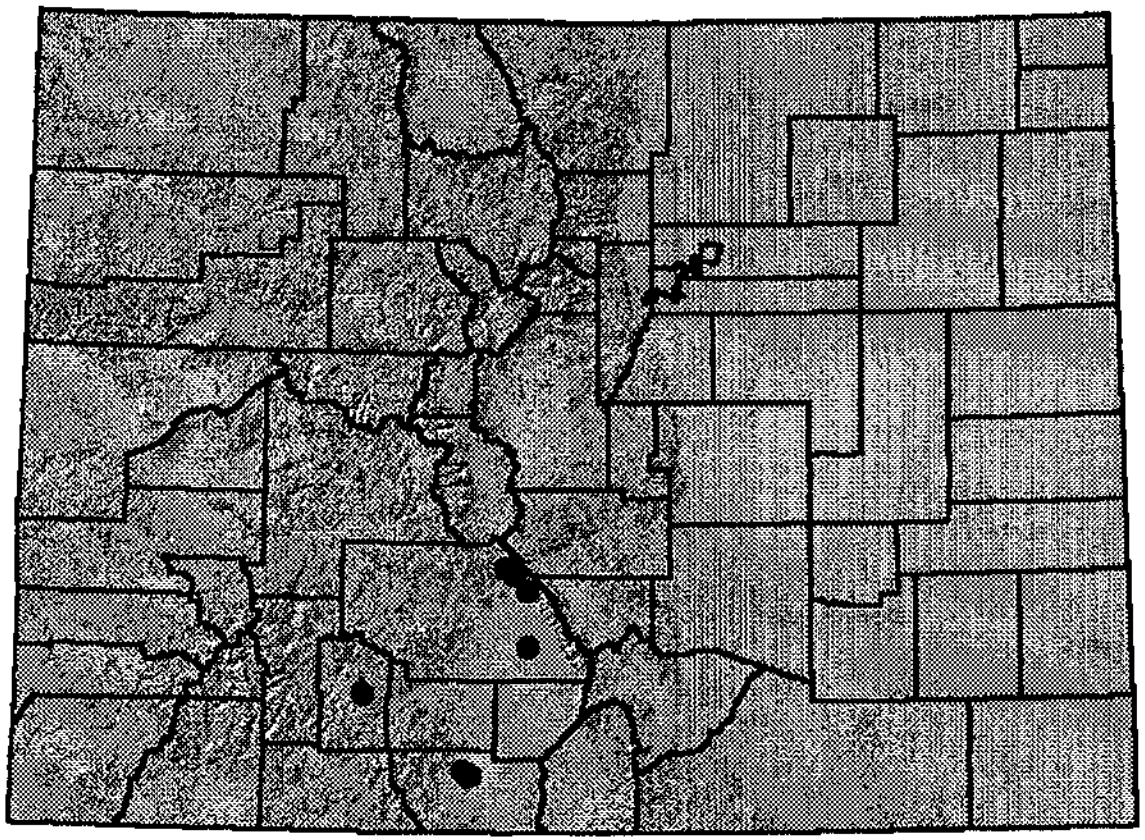
Robins 1991	Robins, C. R., et al. 1991. Common and scientific names of fishes from the United States and Canada. American Fisheries Society, Special Publishing 20. 183 pp.
Sublette	Sublette, J. E., M. D Hatch, and M. Sublette. The Fishes of New Mexico. University New Mexico Press, Albuquerque, New Mexico. 393 pp.
Woodling 1985	Woodling, J. 1985. Colorado's Little Fish: A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado. Colorado Division of Wildlife, Denver.

DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO MARCH 1999

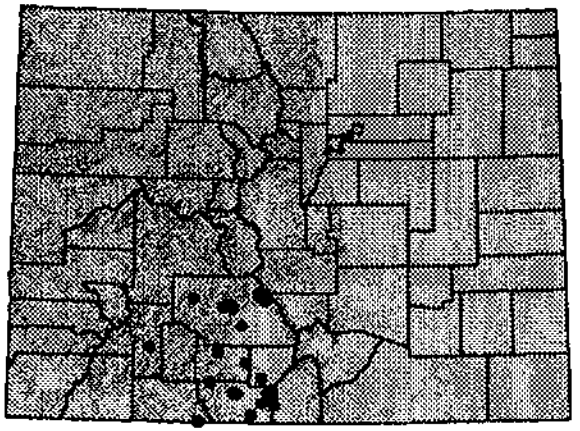
Gila pandora
Rio Grande Chub

State Range*

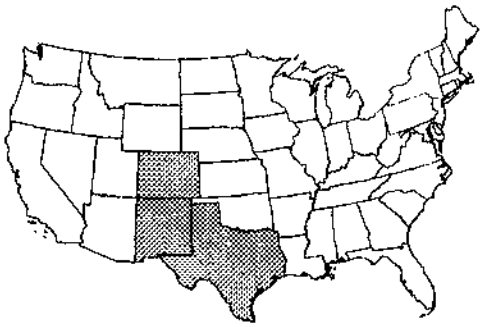


S1: State Critically Imperiled
** Post 1985 Data*

State Range Prior to 1985



U.S. Range



G3: Globally Rare

Vertebrate Characterization Abstract for Colorado

ONCORHYNCHUS CLARKI VIRGINALIS
RIO GRANDE CUTTHROAT

Taxonomy:

TAXCLASS:	OSTEICHTHYES	ORDER:	SALMONIFORMES
FAMILY:	SALMONIDAE	GENUS:	ONCORHYNCHUS

GLOBAL TAXONOMIC COMMENTS:
Readily hybridizes (or introgresses) with other spring spawning trout such as introduced rainbow trout or other subspecies of cutthroat (Sublette et al. 1990). See Behnke (1992) for a discussion of taxonomic history.

Status:

GLOBAL RANK: G4T3	STATE RANK: S3
FED. LEGAL STATUS:	STATE LEGAL STATUS: SC
FED. AGENCY STATUS: FS	

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
In NM, most populations restricted to headwater systems where allocthonous materials comprise primary energy input. ().

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Spawns from March through July, depending on water temperature (Sublette et al. 1990). In colder waters, growth is slow, and age at maturity may be 4 years (Rinne 1995).

Distribution:
GLOBAL RANGE:See EGR

STATE RANGE: Historic range not definitely known; probably encompassed all "trout waters" in Rio Grande drainage, including the Chama, Jemez, and Rio San Jose drainages. ().

Phenology:
PHENOLOGY COMMENTS:

SREPROCOM:

Management:
MANAGEMENT COMMENTS:

Much habitat has been degraded by overgrazing by livestock; other threats include hybridization (or introgression) and competition with introduced salmonids; breed stock for reintroduction and other management purposes is being developed at mescalero national fish hatchery. ().

References:

ABBREVIATED CITATION:	FULL CITATION:
Behnke 1992	Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. xx + 275 pp.
Rinne 1995	Rinne, J. R. 1995. Rio Grande cutthroat trout. Pages 24-27 in M. K. Young, technical editor. USDA Forest Service Gen. Tech. Rep. RM-GTR-256. iv + 61 pp.
Sublette	Sublette, J. E., M. D Hatch, and M. Sublette. The Fishes of New Mexico. University New Mexico Press, Albuquerque, New Mexico. 393 pp.

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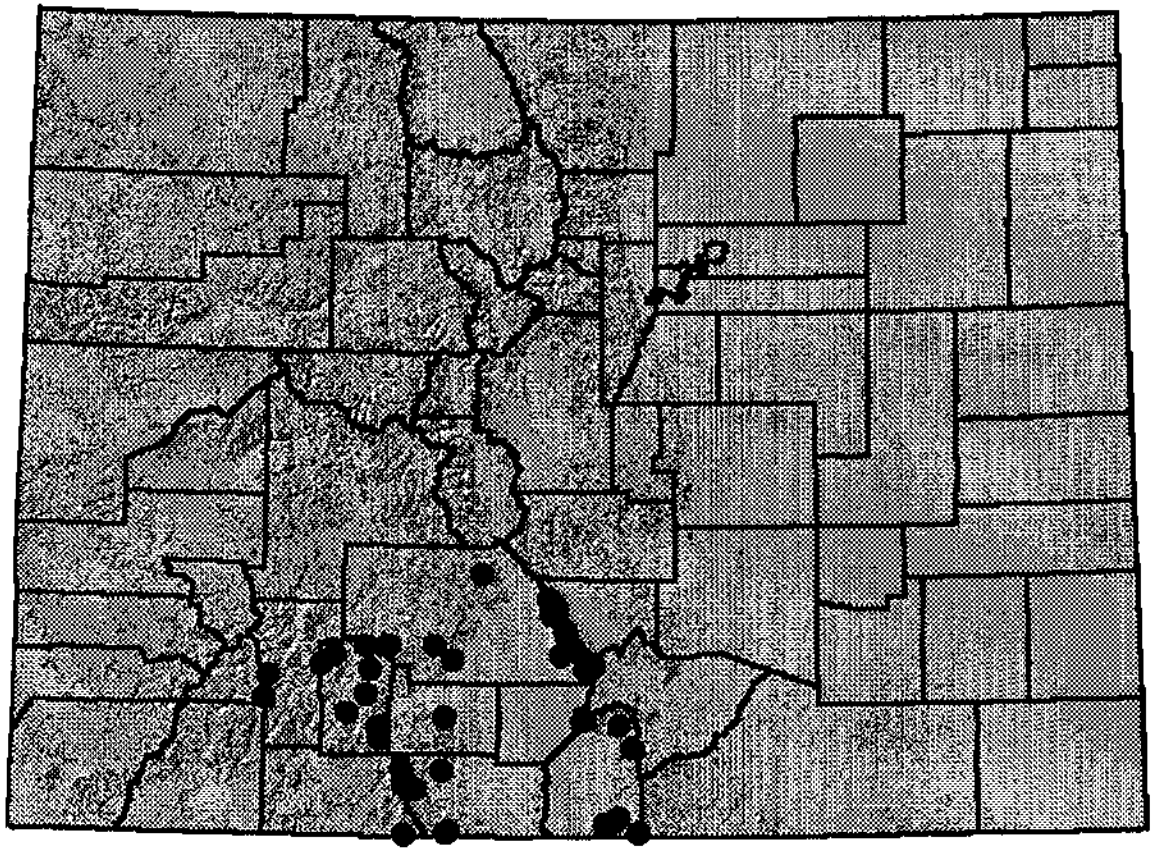
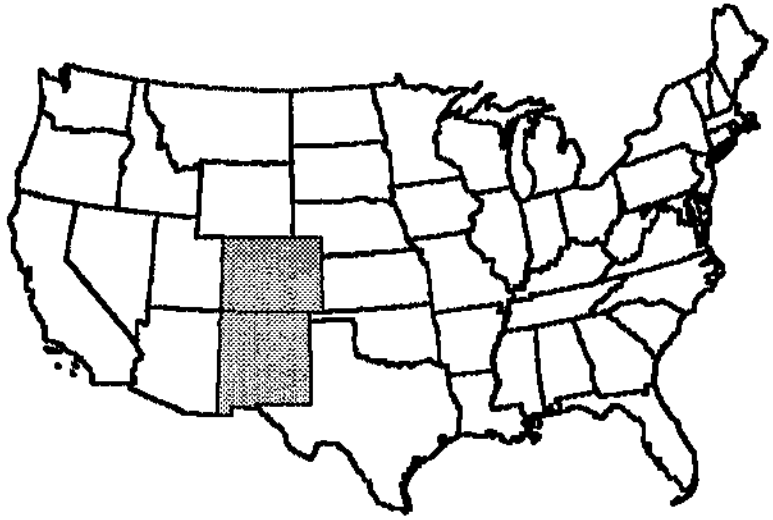
Oncorhynchus clarki virginalis
Rio Grande Cutthroat

State Range*



S3: State Rare
**Post 1985 Data*

Global Range



G4T3: Globally Apparently Secure
Subspecies Globally Rare

Invertebrate Characterization Abstract for Colorado

VALVATA SINCERA
MOSSY VALVATA

Taxonomy:

TAXCLASS: GASTROPODA
ORDER: MESOGASTROPODA
FAMILY: VALVATIDAE
GENUS: VALVATA

IDENTIFICATION COMMENTS:
yellowish-brown in color, spire medium, suture well impressed; whorls evenly rounded, regularly increasing in diameter. Aperature circular, umbilicus round and deep. Operculum multispiral, circular and translucent. (Wu 1993).

Status:

GLOBAL RANK: G?
STATE RANK: S3
FED. LEGAL STATUS:
STATE LEGAL STATUS:
FED. AGENCY STATUS:

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
Inhabits high altitude lakes in the western plateau. Chiefly a species of lakes and deep water (Baker 1928). It has been demonstrated that in the northern part of its range it also occurs in small water bodies, as do other presumably cold-stenothermal species (Clarke 1973). At one site, found on a sandy substrate in 5m of water, pH 8.3, total oxygen 10 ppm, free carbon dioxide 1ppm, and alkalinity as CaCO3 (Harman and Berg 1971). Also reported on substrates of mud with or without coarser sediments and on rocks (Clarke 1973). See Wu 1989.

REPRODUCTIVE HABITAT COMMENTS:

Distribution:

STATE RANGE:
Inhabits high altitude lakes in the western plateau. Headwaters of the Yampa, White, San Juan and Rio Grande River drainages. A locality in Wellsville's hot springs might represent an introduced population ().

Phenology:

PHENOLOGY COMMENTS:

Selected Life History Traits:

Known Threats and Management Issues::

References:

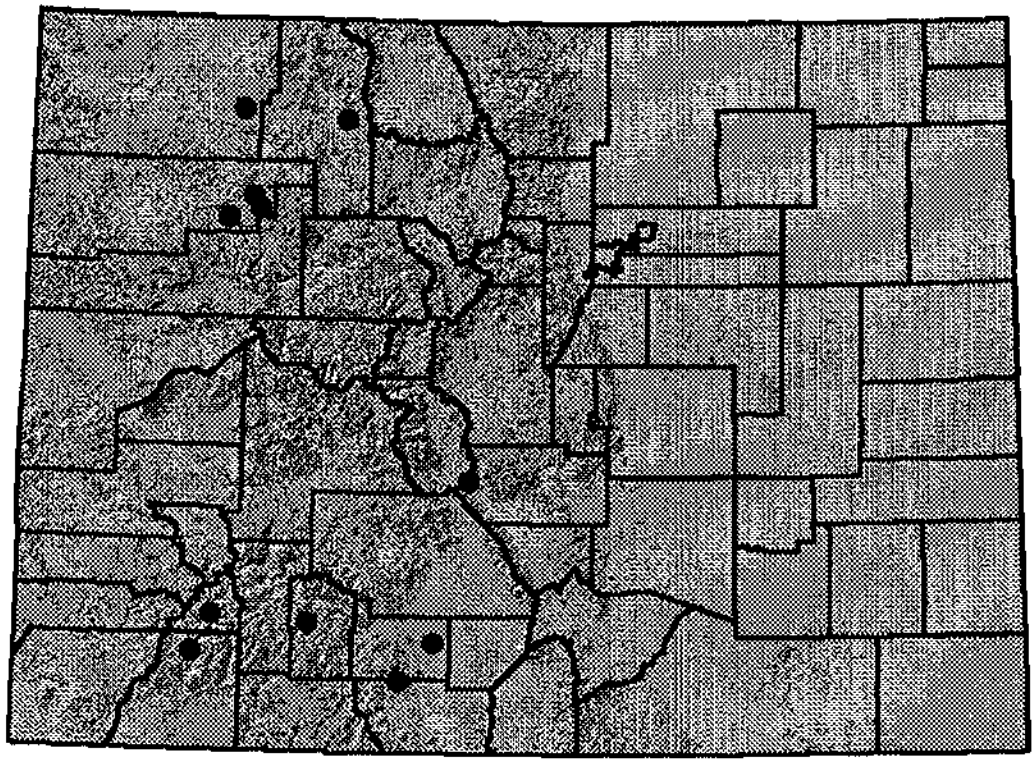
ABBREVIATED CITATION:	FULL CITATION:
Baker 1928	Baker, F. C. 1928. The Freshwater Mollusca of Wisconsin, Part I, Gastropoda. Bull. Wisconsin Geol. and Natu. Hist. Surv., 70:1-507.
Clarke 1973	Clarke, A. H. 1973. The Freshwater Molluscs of the Canadian Interior Basin. Malacologia, 13:1-509.
Harman and O 1971	Harman, W. N. and C. O. Berg. 1971. The Freshwater Snails of Central New York. Search, Cornell Univ. Agricultural Staion. 1(4):1-68.

DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO MARCH 1999

Valvata sincera

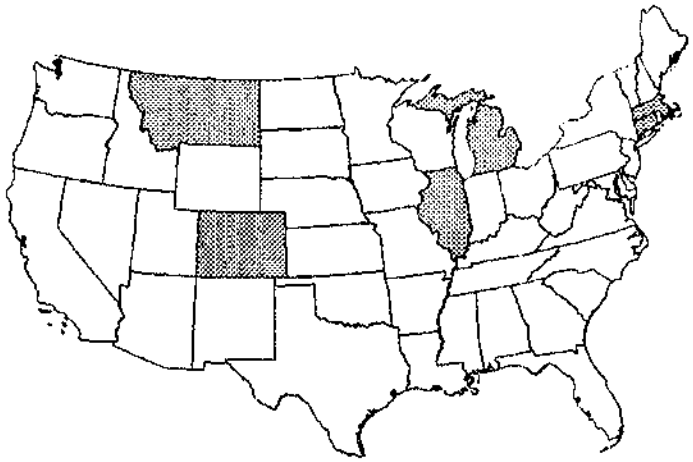
Mossy Valvata

State Range



S3: State Rare

Global Range



G?: Globally Unranked